BLACKCRAIG & MARGREE WINDFARMS
132KV GRID CONNECTION

Environmental Statement [FEBRUARY 2011]

VOLUME 2

CHAPTERS 8 - 15

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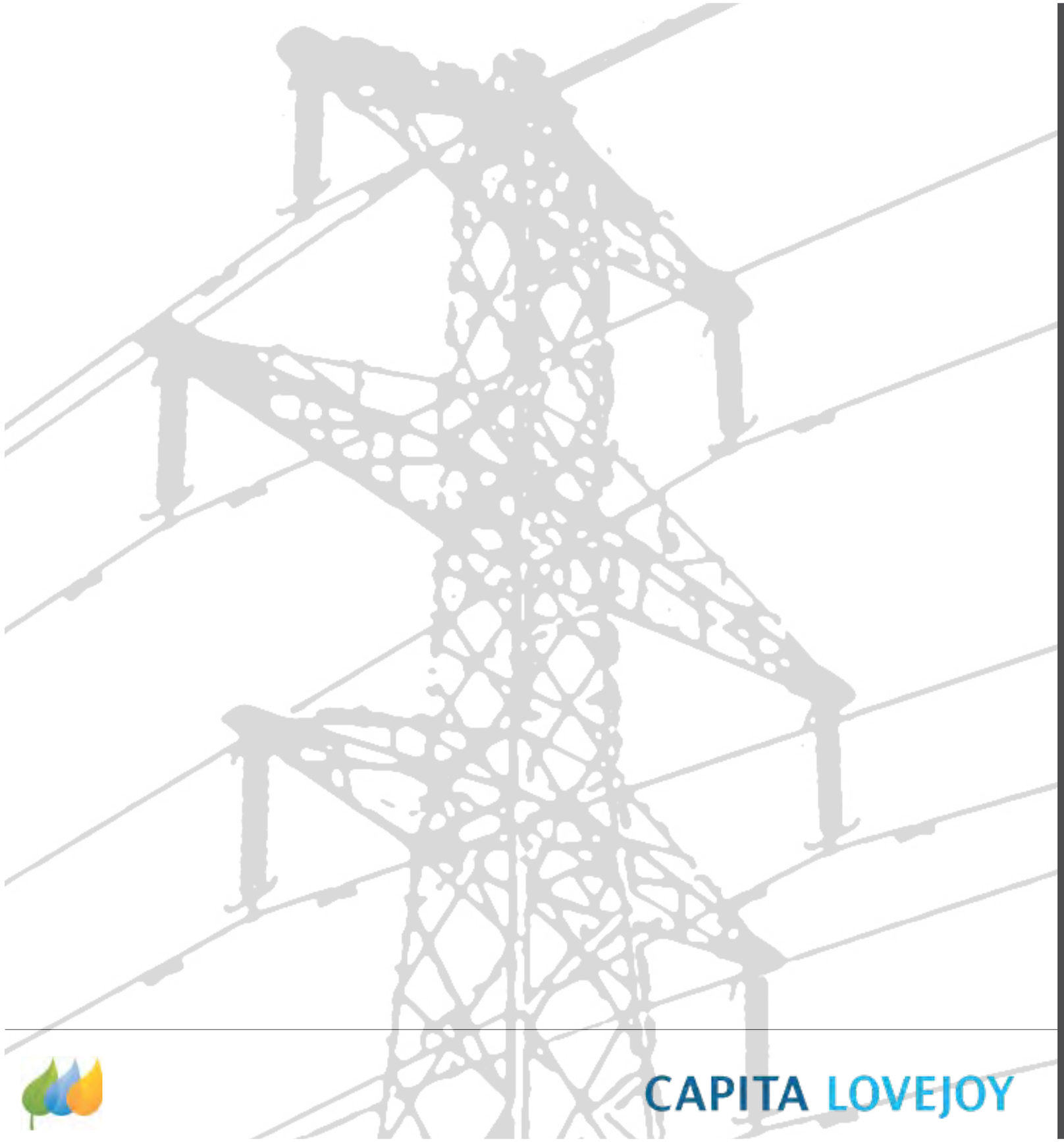

TOC

Table of Contents - Volume 2

Blackcraig and Margree Windfarms
Grid Connection
Environmental Statement

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Table of Contents Volume 2

Table of Contents - Volume 2 1

Ecology 9

8.1 Introduction 12
- 8.1.1 Background 12
- 8.1.2 The Proposal 12
- 8.1.3 The Study Area 12
- 8.1.4 Summary of Potential Effects 12
- 8.1.5 Relevant Legislation, Policy and Guidance 12

8.2 Assessment Methodology 14
- 8.2.1 Introduction 14
- 8.2.2 Approach to Ecological Mitigation 15
- 8.2.3 Scoping and Desk Study 15
- 8.2.4 Field Surveys 16
- 8.2.5 Nature Conservation Evaluation 17
- 8.2.6 Effect Significance 17

8.3 Baseline Conditions 18
- 8.3.1 Designated Sites 18
- 8.3.2 Terrestrial Habitats and Notable Flora 19
- 8.3.3 Watercourses, Waterbodies and Fish 31
- 8.3.4 Non-avian Protected Fauna 34

8.4 Nature Conservation Evaluation 46
- 8.4.1 Introduction 46
- 8.4.2 Designated Sites 46
- 8.4.3 Terrestrial Habitats 46
- 8.4.4 Watercourses, Waterbodies and Fish 47
- 8.4.5 Non-avian Protected Fauna 48

8.5 Assessment of effects 52
- 8.5.1 Introduction 52
- 8.5.2 Design Mitigation 52
- 8.5.3 Sensitive Ecological Receptors 52
- 8.5.4 Elements of the Project Relevant to this Assessment 52
- 8.5.5 Terrestrial Habitats and Flora - Construction Phase Effects 54
- 8.5.6 Terrestrial Habitats and Flora - Dismantling Phase Effects 54
- 8.5.7 Terrestrial Habitats and Flora - Operational Phase Effects 55
- 8.5.8 Waterbodies, Wetlands and Fish - Construction Phase Effects 56
- 8.5.9 Waterbodies, Wetlands and Fish - Dismantling Phase Effects 56
- 8.5.10 Waterbodies, Wetlands and Fish - Operational Phase Effects 57
- 8.5.11 Non-avian Protected Fauna - Construction Phase Effects 57
- 8.5.12 Non-avian Protected Fauna - Dismantling Phase Effects 57
- 8.5.13 Non-avian Protected Fauna - Operational Phase Effects 58

8.6 Mitigation, Management and residual effects 59
- 8.6.1 Terrestrial Habitats and Flora - Construction Phase Mitigation 59
- 8.6.2 Terrestrial Habitats and Flora - Dismantling Phase (redundant N-Route) 60
- 8.6.3 Terrestrial Habitats and Flora - Operational Phase 60
- 8.6.4 Waterbodies, Wetlands and Fish - Construction Phase 60
- 8.6.5 Waterbodies, Wetlands and Fish - Dismantling Phase (redundant N-Route) 61
- 8.6.6 Waterbodies, Wetlands and Fish - Operational Phase 62
- 8.6.7 Non-avian Protected Fauna - Construction Phase 62
- 8.6.8 Non-avian Protected Fauna - Dismantling Phase (redundant N-Route) 63
- 8.6.9 Non-avian Protected Fauna - Operational Phase 63

8.7 Potential Cumulative Effects 64
- 8.7.1 Methodology 64
- 8.7.2 Assessment 64

8.8 Conclusion and Summary Effects Table 64

Ornithology 73

9.1 Introduction 76
- 9.1.1 Background 76
- 9.1.2 The Proposal 76
- 9.1.3 Summary of Potential Effects 76
- 9.1.4 Relevant Legislation, Policy and Guidance 76

9.2 Assessment Methodology 78
- 9.2.1 Summary of the Project Approach 78
- 9.2.2 Consultation and Scoping 79
- 9.2.3 Desk Study 79
- 9.2.4 Survey Methods 79
- 9.2.5 Effects Assessment 81

9.3 Baseline Conditions and Evaluation 125
- 9.3.1 Summary Description of the Study Area 125
- 9.3.2 Do Nothing Scenario 125
- 9.3.3 Designated Sites 125
- 9.3.4 Summary of Flight Activity Recorded in all Sections 126
- 9.3.5 Summary of Breeding Bird Survey Results 127
- 9.3.6 Target Species Accounts 140
- 9.3.7 Notable Secondary Species / Species of Conservation Concern 150
- 9.3.8 Conclusions to Nature Conservation Evaluation 152

9.4 Assessment of Effects 152
- 9.4.1 Introduction 152
- 9.4.2 Sensitive Avian Receptors 152
- 9.4.3 Elements of the Scheme Relevant to this Assessment 153
- 9.4.4 Construction Phase Effects 153
- 9.4.5 Dismantling Phase Effects 154
- 9.4.6 Operational Phase Effects 154

9.5 Proposed Mitigation Measures and Residual Impacts 158
- 9.5.1 Introduction 158
- 9.5.2 Construction Phase Mitigation and Residual Impacts 158
- 9.5.3 Dismantling Phase Effects 159
- 9.5.4 Operation Phase Mitigation and Residual Impacts 159
- 9.5.5 Summary of Mitigation Measures 161

9.6 Cumulative Assessment 161
- 9.6.1 Methodology 161
- 9.6.2 Assessment 161

9.7 Assessment Conclusion 162

Archaeology & Cultural Heritage 165

10.1 Introduction 167
- 10.1.1 Scope 167
- 10.1.2 Objectives 167
- 10.1.3 Study Areas 167
- 10.1.4 Potential effects 177
- 10.1.5 Strategic Mitigation and Modifications to Scheme Design 177

10.2 Statutory and Planning Context 177
- 10.2.1 Statute and National Planning Policy 177
- 10.2.2 Regional and Local Planning Policy 178

10.3 Methods of Assessment 179
- 10.3.1 General 179
- 10.3.2 Consultation 179
- 10.3.3 Desk-based Data Sources 179
- 10.3.4 Field survey within the Narrow Corridor Study Area 179
- 10.3.5 Identification of Receptors within ZTV Study Area and Characterisation of Setting 179
- 10.3.6 Significance Criteria 180
- 10.3.7 Criteria for Assessment of Physical Effects 180
- 10.3.8 Criteria for Assessment of Effects on Setting 181

10.4 Baseline Conditions 182
- 10.4.1 General 182
- 10.4.2 Cultural Heritage Assets within the Narrow Corridor 182
- 10.4.3 Cultural Heritage Features within the Broad Corridor 187
- 10.4.4 Potential for Undiscovered Archaeology within the Proposed Works Footprint 188
- 10.4.5 Cultural Heritage Features within the ZTV Study Area 188
- 10.4.6 Future Baseline Conditions without the Proposed Works 188

10.5 Effects and Mitigation 189
- 10.5.1 Felling and Construction Effects (Physical Effects) 189
- 10.5.2 Operational Effects (Effects on Setting) 195

10.5.3 Secondary effects ... 196
10.5.4 Cumulative effects ... 196
10.5.5 Summary of Effects ... 197

10.6 Summary ... 197

10.7 Baseline Sources Consulted ... 198
10.7.1 Bibliographic ... 198
10.7.2 Cartographic ... 198
10.7.3 Aerial Photograph Sorties Examined (RCAHMS) ... 198
10.7.4 Web ... 198

Hydrology & Hydrogeology ... 199

11.1 Chapter Summary ... 202

11.2 Introduction ... 202

11.3 Scope of Assessment ... 202

11.4 Scoping and Consultation Responses ... 202

11.5 Guidance and Policy Context ... 202
11.5.1 Baseline Assessment ... 202
11.5.2 Significance Criteria ... 203

11.6 Baseline Conditions ... 203
11.6.1 Context ... 203
11.6.2 Designated and Protected Areas ... 203
11.6.3 Climate ... 204
11.6.4 Geology ... 204
11.6.5 Hydrogeology ... 204
11.6.6 Geomorphology ... 204
11.6.7 Soils ... 204
11.6.8 Hydrology ... 205
11.6.9 Modifying Influences ... 221
11.6.10 Information Gaps ... 221

11.7 Predicted Effects and Mitigation Measures ... 221
11.7.1 Development Characteristics ... 221

11.8 Effects on Surface Water ... 230
11.8.1 Receptor sensitivity ... 230
11.8.2 Construction effects ... 230
11.8.3 Predicted ongoing and operational effects ... 230
11.8.4 Predicted decommissioning effects ... 231
11.8.5 Summary of effects on surface water ... 231

11.9 Effects on Groundwater ... 231
11.9.1 Receptor sensitivity ... 231
11.9.2 Construction effects ... 231
11.9.3 Predicted ongoing and operational effects ... 232
11.9.4 Predicted decommissioning effects ... 232
11.9.5 Summary of effects on groundwater ... 232

11.10 Effects on Peat and Soils ... 232
11.10.1 Receptor sensitivity ... 232
11.10.2 Construction effects ... 232
11.10.3 Predicted ongoing and operational effects ... 232
11.10.4 Decommissioning effects ... 233
11.10.5 Summary of effects on peat and soils ... 233

11.11 Effects on Water Supplies ... 233
11.11.1 Receptor sensitivity ... 233
11.11.2 Construction effects ... 233
11.11.3 Predicted ongoing and operational effects ... 236
11.11.4 Decommissioning effects ... 236
11.11.5 Summary of effects on water supplies ... 236

11.12 Cumulative Effects ... 236

11.13 Summary of Assessment ... 237

Tourism & Recreation ... 239

12.1 Introduction ... 241
12.1.1 Sources of Information ... 241
12.1.2 Methodology ... 241
12.1.3 Conclusions ... 241

12.2 Baseline Conditions ... 242
12.2.1 Socio-Economic Baseline Conditions ... 242
12.2.2 Tourism and Recreation Baseline Conditions ... 242
12.2.3 Tourism and Recreation Audit ... 242

12.3 Potential Effects ... 245
12.3.1 Comparative Research on Potential Effects ... 245

12.4 Assessment of Effects ... 246
12.4.1 Evaluation Criteria ... 246
12.4.2 Tourism and Recreation Impact Assessment ... 247
12.4.3 Summary of Effects ... 248
12.4.4 Summary of Beneficial Effects ... 250
12.4.5 Construction and Other Effects ... 250

12.5 Mitigation ... 250
12.5.1 Proposed Mitigation Measures ... 250
12.5.2 Construction Mitigation ... 250
12.5.3 Operational Mitigation ... 250

12.6 Residual Effects ... 250

12.7 Conclusion ... 250
12.7.1 Adverse Effects ... 250
12.7.2 Beneficial Effects ... 250

Traffic & Transport ... 251

13.1 Introduction ... 253
13.1.1 Overview ... 253
13.1.2 Study Area description ... 253

13.2 Assessment Methodology ... 254
13.2.1 Overview ... 254
13.2.2 Data Sources And Guidance ... 254
13.2.3 Consultation ... 254
13.2.4 Consideration Of Sensitive Receptors ... 254
13.2.5 Significance Criteria ... 254
13.2.6 Assessment Assumptions ... 254

13.3 Baseline Conditions ... 255
13.3.1 Overview ... 255
13.3.2 Traffic Flows ... 255
13.3.3 Road Traffic Accidents ... 256

13.4 Traffic Generation And Assignment ... 256
13.4.1 Types Of Vehicle ... 256
13.4.2 Trip Generation ... 256
13.4.3 Trip Distribution ... 261

13.5 Assessment ... 261
13.5.1 Overview ... 261
13.5.2 Assessment Of Potential Effects ... 261
13.5.3 Summary Of Effects ... 262
13.5.4 Mitigation ... 263
13.5.5 Residual Effects ... 264

13.6 Cumulative Effect Of Windfarm Construction ... 264
13.6.1 Overview ... 264
13.6.2 Assessment Of Potential Effects ... 264
13.6.3 Summary Of Effects ... 265
13.6.4 Residual Effects ... 265

13.7 Cumulative Effect Of Windfarm & SWS Project Construction ... 266
13.7.1 Overview ... 266
13.7.2 Assessment Of Potential Effects ... 266
13.7.3 Summary Of Effects ... 266
13.7.4 Residual Effects ... 266

13.8 Summary ... 267

Other Issues 269

14.1 Noise & EMF 271

14.1.1 Construction Noise 271

14.1.2 Operational Noise 271

14.1.3 Electric and Magnetic Fields 272

14.2 Waste Management 272

14.3 Land use 273

Summary of Effects 275

15.1 Introduction 276

List of Figures Volume 2

Table of Contents - Volume 2 1

Ecology 9

Figure 8.01 - Proposed OHL route - Overview 13

Figure 8.02 - Designated Sites - Area A 20

Figure 8.03 - Designated Sites - Area B 21

Figure 8.04 - Designated Sites - Area C 22

Figure 8.05 - Designated Sites - Area D 23

Figure 8.06 - Broad Habitat Types - Area A 24

Figure 8.07 - Phase 1 - Area B 25

Figure 8.08 - Phase 1 - Area C 28

Figure 8.09 - Phase 1 - Area D 29

Figure 8.10 - Otter Survey - Area B 37

Figure 8.11 - Otter Survey - Area C 38

Figure 8.12 - Otter Survey - Area D 39

Figure 8.13 - Bat Survey - Area B 40

Figure 8.14 - Bat Survey - Area C 41

Figure 8.15 - Bat Survey - Area D 42

Figure 8.16 - Red Squirrel Survey - Area B 43

Figure 8.17 - Red Squirrel Survey - Area C 44

Figure 8.18 - Red Squirrel Survey - Area D 45

Ornithology 73

Figure 9.01 - Proposed OHL route - Overview 77

Figure 9.02 - Survey Area - Area B 83

Figure 9.03 - Survey Area - Area C 84

Figure 9.04 - Survey Area - Area D 85

Figure 9.05 - Flight Activity Survey Effort - Period 01 - Area B 86

Figure 9.06 - Flight Activity Survey Effort - Period 01 - Area C 87

Figure 9.07 - Flight Activity Survey Effort - Period 01 - Area D 88

Figure 9.08 - Flight Activity Survey Effort - Period 02 - Area B 89

Figure 9.09 - Flight Activity Survey Effort - Period 02 - Area C 90

Figure 9.10 - Flight Activity Survey Effort - Period 02 - Area D 91

Figure 9.11 - Flight Activity Survey Effort - Period 03 - Area B 92

Figure 9.12 - Flight Activity Survey Effort - Period 03 - Area C 93

Figure 9.13 - Flight Activity Survey Effort - Period 03 - Area D 94

Figure 9.14 - Raptor Flights - Period 01 - Area B 95

Figure 9.15 - Raptor Flights - Period 01 - Area C 96

Figure 9.16 - Raptor Flights - Period 01 - Area D 97

Figure 9.17 - Raptor Flights - Period 02 - Area B 98

Figure 9.18 - Raptor Flights - Period 02 - Area C 99

Figure 9.19 - Raptor Flights - Period 02 - Area D 100

Figure 9.20 - Raptor Flights - Period 03 - Area B 101

Figure 9.21 - Raptor Flights - Period 03 - Area C 102

Figure 9.22 - Raptor Flights - Period 03 - Area D 103

Figure 9.23 - Goose and Swan Flights - Period 01 - Area B 104

Figure 9.24 - Goose and Swan Flights - Period 01 - Area C 105

Figure 9.25 - Goose and Swan Flights - Period 01 - Area D 106

Figure 9.26 - Goose and Swan Flights - Period 02 - Area B 107

Figure 9.27 - Goose and Swan Flights - Period 02 - Area C 108

Figure 9.28 - Goose and Swan Flights - Period 02 - Area D 109

Figure 9.29 - Goose and Swan Flights - Period 03 - Area B 110

Figure 9.30 - Goose and Swan Flights - Period 03 - Area C 111

Figure 9.31 - Goose and Swan Flights - Period 03 - Area D 112

Figure 9.32 - Other Waterbirds Flights - Period 01 - Area B 113

Figure 9.33 - Other Waterbirds Flights - Period 01 - Area C 114

Figure 9.34 - Other Waterbirds Flights - Period 01 - Area D 115

Figure 9.35 - Other Waterbirds Flights - Period 02 - Area B 116

Figure 9.36 - Other Waterbirds Flights - Period 02 - Area C 117

Figure 9.37 - Other Waterbirds Flights - Period 02 - Area D 118

Figure 9.38 - Other Waterbirds Flights - Period 03 - Area B 119

Figure 9.39 - Other Waterbirds Flights - Period 03 - Area C 120

Figure 9.40 - Other Waterbirds Flights - Period 03 - Area D 121

Figure 9.41 - Black Grouse Flights - Area B 122

Figure 9.42 - Black Grouse Flights - Area C 123

Figure 9.43 - Black Grouse Flights - Area D 124

Figure 9.44 - Moorland and Woodland Breeding Bird Results - 1 of 12 128
Figure 9.45 - Moorland and Woodland Breeding Bird Results - 2 of 12 129
Figure 9.46 - Moorland and Woodland Breeding Bird Results - 3 of 12 130
Figure 9.47 - Moorland and Woodland Breeding Bird Results - 4 of 12 131
Figure 9.48 - Moorland and Woodland Breeding Bird Results - 5 of 12 132
Figure 9.49 - Moorland and Woodland Breeding Bird Results - 6 of 12 133
Figure 9.50 - Moorland and Woodland Breeding Bird Results - 7 of 12 134
Figure 9.51 - Moorland and Woodland Breeding Bird Results - 8 of 12 135
Figure 9.52 - Moorland and Woodland Breeding Bird Results - 9 of 12 136
Figure 9.53 - Moorland and Woodland Breeding Bird Results - 10 of 12 137
Figure 9.54 - Moorland and Woodland Breeding Bird Results - 11 of 12 138
Figure 9.55 - Moorland and Woodland Breeding Bird Results - 12 of 12 139

Archaeology & Cultural Heritage 165

Figure 10.01.1 - Cultural heritage constraints 1 168
Figure 10.01.2 - Cultural heritage constraints 2 169
Figure 10.01.3 - Cultural heritage constraints 3 170
Figure 10.01.4 - Cultural heritage constraints 4 171
Figure 10.01.5 - Cultural heritage constraints 5 172
Figure 10.01.6 - Cultural heritage constraints 6 173
Figure 10.01.7 - Cultural heritage constraints 7 174
Figure 10.01.8 - Cultural heritage constraints 8 175
Figure 10.01.9 - Cultural heritage constraints 9 176
Figure 10.02.1 - Cultural heritage constraints & perceptibility 1 183
Figure 10.02.2 - Cultural heritage constraints & perceptibility 2 184
Figure 10.02.3 - Cultural heritage constraints & perceptibility 3 185
Figure 10.03 - Cultural heritage sites and N-Route visibility 186

Hydrology & Hydrogeology 199

Photograph 11.1a 205
Photograph 11.1b 205
Figure 11.01a - Hydrological features 1 of 8 207
Figure 11.01b - Hydrological features 2 of 8 208
Figure 11.01c - Hydrological features 3 of 8 209
Figure 11.01d - Hydrological features 4 of 8 210
Figure 11.01e - Hydrological features 5 of 8 211
Figure 11.01f - Hydrological features 6 of 8 212
Figure 11.01g - Hydrological features 7 of 8 213
Figure 11.01h - Hydrological features 8 of 8 214
Figure 11.02a - Catchments 1 of 3 215
Figure 11.02b - Catchments 2 of 3 216
Figure 11.02c - Catchments 3 of 3 217
Figure 11.03a - Water Framework Directive Waterbody classification 1 of 3 218
Figure 11.03b - Water Framework Directive Waterbody classification 2 of 3 219
Figure 11.03c - Water Framework Directive Waterbody classification 3 of 3 220
Figure 11.04a - Flood risk areas 1 of 8 222
Figure 11.04b - Flood risk areas 2 of 8 223
Figure 11.04c - Flood risk areas 3 of 8 224
Figure 11.04d - Flood risk areas 4 of 8 225
Figure 11.04e - Flood risk areas 5 of 8 226
Figure 11.04f - Flood risk areas 6 of 8 227
Figure 11.04g - Flood risk areas 7 of 8 228
Figure 11.04h - Flood risk areas 8 of 8 229

Tourism & Recreation 239

Figure 12.01 - Study Area 241
Figure 12.02 - ZTV and 10km Study Area Comparison Map 242
Figure 12.03 - Distribution of Adverse Effects of Proposed grid connection on Tourism and Recreation receptors 250
Figure 12.04 - Distribution of Beneficial Effects of Proposed Removal of the N-Route on Tourism and Recreation receptors 250

Traffic & Transport 251

Figure 13.01 - Road network considered as part of this assessment 253

Other Issues 269

Summary of Effects 275

List of Tables Volume 2

Table of Contents - Volume 2 1

Ecology 9

Table 8.01 - National Biodiversity Action Plan Priority Habitats and Species and Local Biodiversity Action Plan 'Local Habitats' and Scottish Biodiversity List Species that have been identified as potentially relevant to this assessment (species list focuses on vertebrate fauna, excluding avifauna)..... 14

Table 8.02 - Summary of Scoping - Points raised in relation to Ecology. 15

Table 8.03 - Summary of Information Requested during the Desk Study..... 16

Table 8.04 - Nature Conservation Evaluation Criteria..... 17

Table 8.05 - Categorisation of Effect Magnitude (includes consideration of effect duration) 17

Table 8.06 - Matrix Showing the Relationship between Effect Magnitude and Nature Conservation Value in the Determination of the Significance of Effects 17

Table 8.07 - East Ayrshire - Non Statutory Designated Sites for Nature Conservation 18

Table 8.08 - Dumfries & Galloway - Non Statutory Designated Sites for Nature Conservation..... 18

Table 8.09 - East Ayrshire - Ancient Woodland Inventory Sites 18

Table 8.10 - Dumfries & Galloway - Ancient Woodland Inventory Sites..... 19

Table 8.11 - Estimated Broad Habitat Types within the Study Area for Section 1 of the project (i.e. within 500m of the route of the existing OHL where is out side of the Phase I habitat survey area for the proposed route)..... 19

Table 8.12 - Estimated Phase 1 Habitat Types within the Study Area for Section 2 of the project (i.e. within 500m of the route of the proposed OHL)..... 19

Table 8.13 - Estimated Phase 1 Habitat Types within the Study Area for Section 3 of the project (i.e. within 500m of the route of the proposed OHL*)..... 27

Table 8.14 - Estimated Phase 1 Habitat Types within the Study Area for Section 4 of the project (i.e. within 500m of the route of the proposed OHL)..... 30

Table 8.15 - Summary table of nature conservation evaluation for sensitive terrestrial and aquatic ecological receptors 51

Table 8.16a: Estimates of the Area of Habitat Lost (permanent and long-term) as a Percentage of the Total Extent of each Habitat within 500m of the Proposed OHL..... 53

Table 8.16b: Estimates of the Area of Habitat Damaged/Disturbed during Construction (i.e. habitats subject to reinstatement and restoration) as a Percentage of the Total Extent of each Habitat within 500m of the Proposed OHL 53

Table 8.16c: Estimates of the Area of Peatland Habitats Potentially affected by Localised Hydrological Changes in the Long-term as a Percentage of the Total Extent of each Habitat within 500m of the Proposed OHL (NB this applies only to blanket bog (modified and unmodified) and acid / basic flush habitats, i.e. 'peatland' habitats that are considered to be particularly vulnerable to this effect) 53

Table 8.17 - Potential Unmitigated Effects Due to Construction Damage 54

Table 8.18 - Potential Unmitigated Effects Due to Pollution - Construction Phase..... 54

Table 8.19 - Potential Unmitigated Effects Due to Dismantling Damage..... 55

Table 8.20 - Potential Unmitigated Effects Due to Pollution - Dismantling Phase 55

Table 8.21 - Potential Unmitigated Effects Due to Permanent Habitat Loss..... 55

Table 8.22 - Potential Unmitigated Effects Due to Operational Related Damage..... 55

Table 8.23 - Potential Unmitigated Effects Due to Construction Damage 56

Table 8.24 - Potential Unmitigated Effects Due to Pollution - Construction Phase..... 56

Table 8.25 - Potential Unmitigated Effects Due to Dismantling Damage..... 56

Table 8.26 - Potential Unmitigated Effects Due to Pollution - Dismantling Phase 56

Table 8.27 - Potential Unmitigated Effects Due to Permanent Habitat Loss..... 57

Table 8.28: Potential Unmitigated Effects Due to Maintenance..... 57

Table 8.29: Non-avian fauna - Potential Unmitigated Effects Due to Construction Disturbance... 57

Table 8.30 - Non-avian fauna - Potential Unmitigated Effects Due to Pollution of Habitats During Construction 57

Table 8.31 - Non-avian fauna - Potential Unmitigated Effects Due to Dismantling Disturbance ... 58

Table 8.32 - Non-avian fauna - Potential Unmitigated Effects Due to Pollution of Habitats During Dismantling 58

Table 8.33 - Non-avian fauna - Potential Unmitigated Effects Due to Habitat Loss / Degradation or Fragmentation 58

Table 8.34 - Non-avian fauna - Potential Unmitigated Effects Due to Operational Disturbance ... 58

Table 8.35 - Non-avian fauna - Potential Unmitigated Effects Due to Operational Pollution 58

Table 8.36 - Mitigated Effects Due to Construction Damage..... 59

Table 8.37 - Mitigated Effects Due to Pollution - Construction Phase 59

Table 8.38 - Mitigated Effects Due to Dismantling Damage 60

Table 8.39 - Mitigated Effects Due to Pollution - Dismantling Phase..... 60

Table 8.40 - Mitigated Effects Due to Construction Damage..... 60

Table 8.41 - Mitigated Effects Due to Pollution - Construction Phase 61

Table 8.42 - Mitigated Effects Due to Dismantling Damage 61

Table 8.43 - Mitigated Effects Due to Pollution - Dismantling Phase..... 61

Table 8.44 - Mitigated Effects Due to Maintenance 62

Table 8.45 - Non-avian fauna - Mitigated Effects Due to Construction Disturbance 62

Table 8.46 - Non-avian fauna - Mitigated Effects Due to Pollution of Habitats During Construction 63

Table 8.47 - Non-avian fauna - Mitigated Effects Due to Dismantling Disturbance..... 63

Table 8.48 - Non-avian fauna - Mitigated Effects Due to Pollution of Habitats During Dismantling.. 63

Table 8.49 - Non-avian fauna - Mitigated Effects Due to Habitat Loss / Degradation or Fragmentation 63

Table 8.50 - Non-avian fauna - Potential Mitigated Effects Due to Operational Disturbance..... 63

Table 8.51 - Non-avian fauna - Mitigated Effects Due to Operational Pollution / Damage 63

Table 8.52 - Summary Effects Assessment for Ecology (significant effects are highlighted in bold text) 65

Ornithology 73

Table 9.01 - Priority UK BAP Species, Species on the Scottish Biodiversity List and Local BAP Species of Potential Relevance to the Assessment of Effects for this Proposal..... 78

Table 9.02 - Summary of Scoping Responses Relevant to the Assessment of Effects on Ornithological Receptors 79

Table 9.03 - Summary of Flight Activity Survey Effort by Survey Period..... 80

Table 9.04 - Nature Conservation Value of Ornithological Interests (habitats and populations) .. 81

Table 9.05 - Categorisation of Effect Magnitude (inc. consideration of effect duration)..... 82

Table 9.06 - Matrix Illustrating the Relationship between Effect Magnitude and Nature Conservation Value in the Determination of the Significance of Effects 82

Table 9.07 - Bird Species (breeding, passage or wintering) of Conservation Concern and Sensitivity to OHL Development Present / Potentially Present in the Study Area..... 125

Table 9.08 - Recorded Flights by Target and Selected Secondary Species within the Proposed OHL Survey Area and Transits, all Heights Bands, Across the Routes of the Proposed and Existing OHLs (target species highlighted in bold) 126

Table 9.09 - Transits per hour at all Flight Height Recording Bands by Target and Selected Secondary Species Across the Routes of the Proposed OHL within the three Flight Activity Survey Periods (target species highlighted in bold, target species which were not observed during flight activity surveys crossing the proposed or existing OHLs are not listed)..... 126

Table 9.10 - Estimated Breeding Pairs / Territories of Birds of Conservation Concern Recorded within the Breeding Bird Survey Area and within each Section of Project..... 127

Table 9.11 - Summary of the Nature Conservation Values of Features / Bird Species / Grouped Species Present within the OHL Route Study Area..... 152

Table 9.12 - Construction Phase - Pre-mitigation Assessment of Disturbance for Breeding and Wintering Birds..... 154

Table 9.13 - Dismantling Phase - Pre-mitigation Assessment of Disturbance for Breeding and Wintering Birds..... 154

Table 9.14 - Operational Phase - Pre-mitigation Assessment of Habitat Loss for Breeding Birds 155

Table 9.15 - Collision Rates (%) Adopted for the Estimates of Collision Mortality for Target Species in the Study Area. 156

Table 9.16 - Estimated Annual Collisions for the Proposed OHL and Existing OHLs from Flights within all Height Bands for Target and Selected Secondary Species (using data from all surveys) 156

Table 9.17 - Operational Phase - Pre-mitigation Assessment of Collision Risk for Bird Receptors 157

Table 9.18 - Operational Phase - Pre-mitigation Assessment of Maintenance and Emergency Works Disturbance for Bird Receptors 157

Table 9.19 - Estimated Wing Span of Selected Target Species within Proposed OHL Route Survey Area (Cramp and Simmons 1980)..... 158

Table 9.20 - Operational Phase – Pre-mitigation Assessment of Electrocution Risk for Each Bird Receptor 158

Table 9.21 - Construction Phase – Residual Effects Assessment of Disturbance for Breeding and Wintering Birds 159

Table 9.22 - Dismantling Phase – Residual Effects Assessment of Disturbance for Breeding and Wintering Birds 159

Table 9.23 - Operational Phase – Residual Effects Assessment of Habitat Loss for Breeding Birds 159

Table 9.24 - Operational Phase - Residual Effects Assessment of Collision Risk for Bird Receptors 160

Table 9.25 - Operational Phase - Residual Effects Assessment of Maintenance and Emergency Works Disturbance for Bird Receptors 160

Table 9.26 Summary Effects Assessment for Ecology (significant effects are highlighted in bold text) 163

Archaeology & Cultural Heritage 165

Table 10.01 - Source of Impact and Possible Effects on Cultural Heritage 177

Table 10.02 - Regional and Local Planning Policies 178

Table 10.03 - Sensitivity of Cultural Heritage Assets 180

Table 10.04 - Magnitude of Physical Effects 180

Table 10.05 - Physical Effects 181

Table 10.06 - Contribution of Setting to the Understanding and Appreciation of a Cultural Heritage Receptor 181

Table 10.07 - Sensitivity of Setting of a Receptor 181

Table 10.08 - Magnitude of Effects on Setting 181

Table 10.09 - Effects on Setting 181

Table 10.10 - Summary of Likely Potential Felling and Construction (Physical) Effects 194

Table10.11 - Assessment of Effect on Setting of Craigengillan GDL (GDL 110) 195

Table 10.12 - Assessment of Effect on Setting of Craigengillan Lodge (LB 1086) 196

Table 10.13 - Receptors Where Cumulative Operational Effects are Likely 197

Hydrology & Hydrogeology 199

Table 11.01 - Summary of scoping and consultation responses relating to soil and water 202

Table 11.02 - Definitions of sensitivity 203

Table 11.03 - Definitions of magnitude 203

Table 11.04 - Effects matrix 203

Table 11.05 - Soils information 204

Table 11.06 - Catchment area information 205

Table 11.07 - Private water supply locations 206

Table 11.08 - Summary of waterbody classification 206

Table 11.09 - Effects on public water supplies 233

Table 11.10 - Effects on private water supplies 233

Table 11.11 - Summary of predicted construction effects 237

Table 11.12 - Summary of predicted ongoing & operational effects 237

Table 11.13 - Summary of predicted decommissioning effects 237

Tourism & Recreation 239

Table 12.01 - Evaluation of Effects Criteria 246

Table 12.02 - Summary of Adverse Effect of Proposed OHL on Tourism and Recreation 248

Table 12.03 - Summary of Beneficial Effect of Proposed OGC on Tourism and Recreation 250

Traffic & Transport 251

Table 13.01 - Significance 254

Table 13.02 - Baseline Traffic Flow Data & Capacity on Relevant Routes 255

Table 13.03 - Personal injury accidents on road network in the past three years 256

Table 13.04 - Total trips by forest access point (felling operations) 257

Table 13.05 - Total and average trips by road (felling operations) 257

Table 13.06 - Road Network connecting to Access Points 257

Table 13.07 - Total and Average Trips for Stone Loads (access tracks) 257

Table 13.08 - Total number of trips required for construction of substation 258

Table 13.09 - Average trips per day on roads in the network 258

Table 13.10 - Total number of trips required for construction of substation 258

Table 13.11 - Average trips per day on roads in the network 258

Table 13.12 - Stone Quantity/Trips for wood pole Construction 259

Table 13.13 - Trips Generated by wood pole Construction 259

Table 13.14 - Total and average number of trips for wood pole construction distributed on the road network 259

Table 13.15 - Total number of trips required for stone loads to construct compounds 259

Table 13.16 - Average number of trips for construction compounds distributed on the road network 259

Table 13.17 - Concrete & Aggregate Quantities/Trips for L7 Tower Erection 260

Table 13.18 - Total and average number of Concrete & Aggregate Trips for L7 Tower erection distributed on the road network 260

Table 13.19 - Total and average number of Concrete & Aggregate Trips for L7 Tower erection distributed on the road network 260

Table 13.20 - Total and average number of Steel Tower construction 260

Table 13.21 - Total number of stone load trips for construction of compounds 261

Table 13.22 - Average number of trips per day for construction of compounds 261

Table 13.23 - Estimated construction traffic distribution on network 261

Table 13.24 - Percentage change over baseline traffic flow for construction period 262

Table 13.25 - Development Traffic Impact on Capacity 262

Table 13.26 - Mitigation and Residual Effect on Road Network 264

Table 13.27 - Percentage change over baseline traffic flow for construction period (including windfarm traffic) 264

Table 13.28 - Development Traffic Impact on Capacity (including Windfarm Traffic) 265

Table 13.29 - Mitigation and Remedial Effect on Road Network (including windfarm traffic) 265

Table 13.30 - Percentage change over baseline traffic flow for construction period (including windfarm traffic & SWS Project traffic) 266

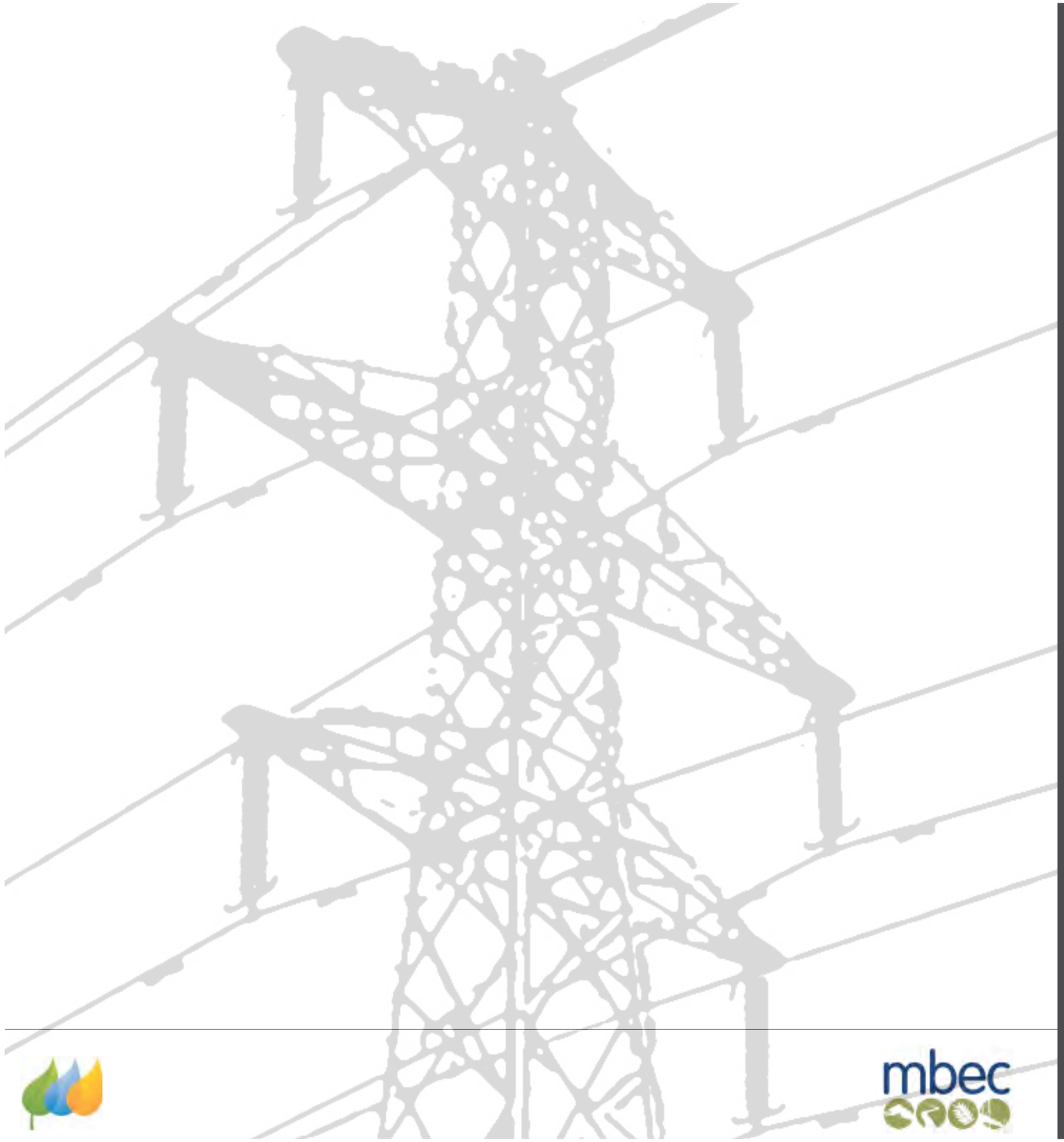
Table 13.31 - Development Traffic Impact on Capacity (including windfarm traffic & SWS Project traffic) 266

Table 13.32 - Mitigation and Remedial Effect on Road Network (including windfarm traffic & SWS Project traffic) 266

Other Issues 269

Summary of Effects 275

Table 15.01 - Summary of Significant Effects table 277



08

Ecology

Blackcraig and Margree Windfarms
Grid Connection
Environmental Statement

Table of Contents

8.1 Introduction ... 12
8.1.1 Background ... 12
8.1.2 The Proposal ... 12
8.1.3 The Study Area ... 12
8.1.4 Summary of Potential Effects ... 12
8.1.4.1 Construction Phase ... 12
8.1.4.2 Dismantling Phase ... 12
8.1.4.3 Operational Phase ... 12
8.1.5 Relevant Legislation, Policy and Guidance ... 12
8.1.5.1 Local Plan Polices ... 14
8.1.5.2 National and Local Biodiversity Action Plans ... 14
8.1.5.3 The Scottish Biodiversity Strategy ... 14
8.1.5.4 Methodological and Mitigation Guidance ... 14

8.2 Assessment Methodology ... 14
8.2.1 Introduction ... 14
8.2.2 Approach to Ecological Mitigation ... 15
8.2.3 Scoping and Desk Study ... 15
8.2.4 Field Surveys ... 16
8.2.4.1 Habitat Survey ... 16
8.2.4.2 Protected Species Surveys ... 16
8.2.4.3 Ecological Survey Constraints and Data Limitations ... 16
8.2.5 Nature Conservation Evaluation ... 17
8.2.6 Effect Significance ... 17

8.3 Baseline Conditions ... 18
8.3.1 Designated Sites ... 18
8.3.1.1 Statutory Designated Sites - East Ayrshire ... 18
8.3.1.2 Statutory Designated Sites - Dumfries & Galloway ... 18
8.3.1.3 Non-Statutory Designated Sites ... 18
8.3.1.4 Ancient Woodland Inventory Sites ... 18
8.3.2 Terrestrial Habitats and Notable Flora ... 19
8.3.2.1 Section 1 (Smithston to Glenmuck) ... 19
8.3.2.2 Section 2 (Meikle Hill to Glenmuck) ... 19
8.3.2.3 Section 3 (Glenmuck to Dalshangan) ... 26
8.3.2.4 Section 4 (Dalshangan to Blackcraig Windfarm Substation) ... 30
8.3.3 Watercourses, Waterbodies and Fish ... 31
8.3.3.1 Study Area Overview ... 31
8.3.3.2 Salmonids ... 32
8.3.3.3 Section 1 (Smithston to Glenmuck) ... 33
8.3.3.4 Section 2 (Meikle Hill to Glenmuck) ... 33
8.3.3.5 Section 3 (Glenmuck to Dalshangan) ... 33
8.3.3.6 Section 4 (Dalshangan to Blackcraig Windfarm substation) ... 33
8.3.4 Non-avian Protected Fauna ... 34
8.3.4.1 Section 1 (Smithston to Glenmuck) ... 34
8.3.4.2 Section 2 (Meikle Hill Sub-Station to Glenmuck) ... 34
8.3.4.3 Section 3 (Glenmuck to Dalshangan) ... 35
8.3.4.4 Section 4 (Dalshangan to Blackcraig Sub-Station) ... 36

8.4 Nature Conservation Evaluation ... 46
8.4.1 Introduction ... 46
8.4.2 Designated Sites ... 46
8.4.3 Terrestrial Habitats ... 46
8.4.3.1 Section 1 (Smithston to Glenmuck) ... 46
8.4.3.2 Section 2 (Meikle Hill Substation to Glenmuck) ... 46
8.4.3.3 Section 3 (Glenmuck to Dalshangan) ... 46
8.4.3.4 Section 4 (Dalshangan to Blackcraig Hill Substation) ... 47
8.4.4 Watercourses, Waterbodies and Fish ... 47
8.4.4.1 Section 1 (Smithston to Glenmuck) ... 47
8.4.4.2 Section 2 (Meikle Hill to Glenmuck) ... 47
8.4.4.3 Section 3 (Glenmuck to Dalshangan) ... 48
8.4.4.4 Section 4 (Dalshangan to Windfarm substations) ... 48
8.4.5 Non-avian Protected Fauna ... 48
8.4.5.1 Relevant Legislation and National / Regional Conservation Status ... 48
8.4.5.2 Evaluation of Section 1 (Smithston to Glenmuck) Receptors ... 50
8.4.5.3 Evaluation of Section 2 (Meikle Hill Substation to Glenmuck) Receptors ... 50
8.4.5.4 Evaluation of Section 3 (Glenmuck to Dalshangan) Receptors ... 50
8.4.5.5 Evaluation of Section 4 (Dalshangan to Blackcraig Hill Substation) Receptors ... 51

8.5 Assessment of effects ... 52
8.5.1 Introduction ... 52
8.5.2 Design Mitigation ... 52
8.5.3 Sensitive Ecological Receptors ... 52
8.5.4 Elements of the Project Relevant to this Assessment ... 52
8.5.4.1 Infrastructure Allowance ... 52
8.5.5 Terrestrial Habitats and Flora - Construction Phase Effects ... 54
8.5.5.1 Damage During Construction ... 54
8.5.5.2 Pollution of Terrestrial Habitats ... 54
8.5.5.3 Changes to Hydrology ... 54
8.5.6 Terrestrial Habitats and Flora - Dismantling Phase Effects ... 54
8.5.6.1 Damage due to Dismantling Works ... 55
8.5.6.2 Pollution during Dismantling Works ... 55
8.5.7 Terrestrial Habitats and Flora - Operational Phase Effects ... 55
8.5.7.1 Habitat Loss ... 55
8.5.7.2 Indirect Habitat Loss/Degradation ... 55
8.5.7.3 Damage due to Maintenance Activities ... 55
8.5.8 Waterbodies, Wetlands and Fish - Construction Phase Effects ... 56
8.5.8.1 Damage Due to Construction ... 56
8.5.8.2 Pollution of Habitats ... 56
8.5.9 Waterbodies, Wetlands and Fish - Dismantling Phase Effects ... 56
8.5.9.1 Damage due to Dismantling Works ... 56
8.5.9.2 Pollution of Habitats during Dismantling Works ... 56
8.5.10 Waterbodies, Wetlands and Fish - Operational Phase Effects ... 57
8.5.10.1 Habitat Loss ... 57
8.5.10.2 Damage / Pollution due to Maintenance Activities ... 57
8.5.11 Non-avian Protected Fauna - Construction Phase Effects ... 57
8.5.11.1 Disturbance ... 57
8.5.11.2 Pollution of Habitats ... 57
8.5.12 Non-avian Protected Fauna - Dismantling Phase Effects ... 57
8.5.12.1 Disturbance ... 57
8.5.12.2 Pollution of Habitats during Dismantling Works ... 58
8.5.13 Non-avian Protected Fauna - Operational Phase Effects ... 58
8.5.13.1 Habitat Loss / Fragmentation / Degradation ... 58
8.5.13.2 Disturbance during Maintenance Works ... 58
8.5.13.3 Pollution / Damage of Habitats during Maintenance Works ... 58
8.5.13.4 Collision Risk to Bat Species ... 58
8.5.13.5 Electrocution Risk ... 58

8.6 Mitigation, Management and residual effects ... 59
8.6.1 Terrestrial Habitats and Flora - Construction Phase Mitigation ... 59
8.6.1.1 Damage due to Construction ... 59
8.6.1.2 Pollution of Terrestrial Habitats ... 59
8.6.1.3 Changes to Hydrology ... 59
8.6.2 Terrestrial Habitats and Flora - Dismantling Phase (redundant N-Route) ... 60
8.6.2.1 Damage due to Dismantling Works ... 60
8.6.2.2 Pollution during Dismantling Works ... 60
8.6.3 Terrestrial Habitats and Flora - Operational Phase ... 60
8.6.3.1 Indirect habitat Loss / Degradation ... 60
8.6.3.2 Damage due to Operational Activities ... 60
8.6.4 Waterbodies, Wetlands and Fish - Construction Phase ... 60
8.6.4.1 Damage Due to Construction ... 60
8.6.4.2 Pollution of Habitats ... 60
8.6.5 Waterbodies, Wetlands and Fish - Dismantling Phase (redundant N-Route) ... 61
8.6.5.1 Damage due to Dismantling Works ... 61
8.6.5.2 Pollution of Habitats during Dismantling Works ... 61
8.6.6 Waterbodies, Wetlands and Fish - Operational Phase ... 62
8.6.6.1 Damage / Pollution due to Maintenance Activities ... 62
8.6.7 Non-avian Protected Fauna - Construction Phase ... 62
8.6.7.1 Disturbance ... 62
8.6.7.2 Pollution of Habitats ... 62
8.6.8 Non-avian Protected Fauna - Dismantling Phase (redundant N-Route) ... 63
8.6.8.1 Disturbance ... 63
8.6.8.2 Pollution of Habitats during Dismantling Works ... 63
8.6.9 Non-avian Protected Fauna - Operational Phase ... 63
8.6.9.1 Habitat Loss / Fragmentation / Degradation ... 63
8.6.9.2 Disturbance during Maintenance Works ... 63
8.6.9.3 Pollution / Damage of Habitats during Maintenance Works ... 63

8.7 Potential Cumulative Effects ... 64
8.7.1 Methodology ... 64
8.7.2 Assessment ... 64

8.8 Conclusion and Summary Effects Table ... 64

Table of Figures

Figure 8.01 - Proposed OHL route - Overview 13

Figure 8.02 - Designated Sites - Area A 20

Figure 8.03 - Designated Sites - Area B 21

Figure 8.04 - Designated Sites - Area C 22

Figure 8.05 - Designated Sites - Area D 23

Figure 8.06 - Broad Habitat Types - Area A 24

Figure 8.07 - Phase 1 - Area B 25

Figure 8.08 - Phase 1 - Area C 28

Figure 8.09 - Phase 1 - Area D 29

Figure 8.10 - Otter Survey - Area B 37

Figure 8.11 - Otter Survey - Area C 38

Figure 8.12 - Otter Survey - Area D 39

Figure 8.13 - Bat Survey - Area B 40

Figure 8.14 - Bat Survey - Area C 41

Figure 8.15 - Bat Survey - Area D 42

Figure 8.16 - Red Squirrel Survey - Area B 43

Figure 8.17 - Red Squirrel Survey - Area C 44

Figure 8.18 - Red Squirrel Survey - Area D 45

List of Tables

Table 8.01 - National Biodiversity Action Plan Priority Habitats and Species and Local Biodiversity Action Plan 'Local Habitats' and Scottish Biodiversity List Species that have been identified as potentially relevant to this assessment (species list focuses on vertebrate fauna, excluding avifauna). 14

Table 8.02 - Summary of Scoping - Points raised in relation to Ecology. 15

Table 8.03 - Summary of Information Requested during the Desk Study 16

Table 8.04 - Nature Conservation Evaluation Criteria 17

Table 8.05 - Categorisation of Effect Magnitude (includes consideration of effect duration) 17

Table 8.06 - Matrix Showing the Relationship between Effect Magnitude and Nature Conservation Value in the Determination of the Significance of Effects 17

Table 8.07 - East Ayrshire - Non Statutory Designated Sites for Nature Conservation 18

Table 8.08 - Dumfries & Galloway - Non Statutory Designated Sites for Nature Conservation 18

Table 8.09 - East Ayrshire - Ancient Woodland Inventory Sites 18

Table 8.10 - Dumfries & Galloway - Ancient Woodland Inventory Sites 19

Table 8.11 - Estimated Broad Habitat Types within the Study Area for Section 1 of the project (i.e. within 500m of the route of the existing OHL where is out side of the Phase I habitat survey area for the proposed route) 19

Table 8.12 - Estimated Phase 1 Habitat Types within the Study Area for Section 2 of the project (i.e. within 500m of the route of the proposed OHL) 19

Table 8.13 - Estimated Phase 1 Habitat Types within the Study Area for Section 3 of the project (i.e. within 500m of the route of the proposed OHL*) 27

Table 8.14 - Estimated Phase 1 Habitat Types within the Study Area for Section 4 of the project (i.e. within 500m of the route of the proposed OHL) 30

Table 8.15 - Summary table of nature conservation evaluation for sensitive terrestrial and aquatic ecological receptors 51

Table 8.16a: Estimates of the Area of Habitat Lost (permanent and long-term) as a Percentage of the Total Extent of each Habitat within 500m of the Proposed OHL 53

Table 8.16b: Estimates of the Area of Habitat Damaged/Disturbed during Construction (i.e. habitats subject to reinstatement and restoration) as a Percentage of the Total Extent of each Habitat within 500m of the Proposed OHL 53

Table 8.16c: Estimates of the Area of Peatland Habitats Potentially affected by Localised Hydrological Changes in the Long-term as a Percentage of the Total Extent of each Habitat within 500m of the Proposed OHL (NB this applies only to blanket bog (modified and unmodified) and acid / basic flush habitats, i.e. 'peatland' habitats that are considered to be particularly vulnerable to this effect) 53

Table 8.17 - Potential Unmitigated Effects Due to Construction Damage 54

Table 8.18 - Potential Unmitigated Effects Due to Pollution - Construction Phase 54

Table 8.19 - Potential Unmitigated Effects Due to Dismantling Damage 55

Table 8.20 - Potential Unmitigated Effects Due to Pollution - Dismantling Phase 55

Table 8.21 - Potential Unmitigated Effects Due to Permanent Habitat Loss 55

Table 8.22 - Potential Unmitigated Effects Due to Operational Related Damage 55

Table 8.23 - Potential Unmitigated Effects Due to Construction Damage 56

Table 8.24 - Potential Unmitigated Effects Due to Pollution - Construction Phase 56

Table 8.25 - Potential Unmitigated Effects Due to Dismantling Damage 56

Table 8.26 - Potential Unmitigated Effects Due to Pollution - Dismantling Phase 56

Table 8.27 - Potential Unmitigated Effects Due to Permanent Habitat Loss 57

Table 8.28: Potential Unmitigated Effects Due to Maintenance 57

Table 8.29: Non-avian fauna - Potential Unmitigated Effects Due to Construction Disturbance 57

Table 8.30 - Non-avian fauna - Potential Unmitigated Effects Due to Pollution of Habitats During Construction 57

Table 8.31 - Non-avian fauna - Potential Unmitigated Effects Due to Dismantling Disturbance 58

Table 8.32 - Non-avian fauna - Potential Unmitigated Effects Due to Pollution of Habitats During Dismantling 58

Table 8.33 - Non-avian fauna - Potential Unmitigated Effects Due to Habitat Loss / Degradation or Fragmentation 58

Table 8.34 - Non-avian fauna - Potential Unmitigated Effects Due to Operational Disturbance 58

Table 8.35 - Non-avian fauna - Potential Unmitigated Effects Due to Operational Pollution 58

Table 8.36 - Mitigated Effects Due to Construction Damage 59

Table 8.37 - Mitigated Effects Due to Pollution - Construction Phase 59

Table 8.38 - Mitigated Effects Due to Dismantling Damage 60

Table 8.39 - Mitigated Effects Due to Pollution - Dismantling Phase 60

Table 8.40 - Mitigated Effects Due to Construction Damage 60

Table 8.41 - Mitigated Effects Due to Pollution - Construction Phase 61

Table 8.42 - Mitigated Effects Due to Dismantling Damage 61

Table 8.43 - Mitigated Effects Due to Pollution - Dismantling Phase 61

Table 8.44 - Mitigated Effects Due to Maintenance 62

Table 8.45 - Non-avian fauna - Mitigated Effects Due to Construction Disturbance 62

Table 8.46 - Non-avian fauna - Mitigated Effects Due to Pollution of Habitats During Construction 63

Table 8.47 - Non-avian fauna - Mitigated Effects Due to Dismantling Disturbance 63

Table 8.48 - Non-avian fauna - Mitigated Effects Due to Pollution of Habitats During Dismantling 63

Table 8.49 - Non-avian fauna - Mitigated Effects Due to Habitat Loss / Degradation or Fragmentation 63

Table 8.50 - Non-avian fauna - Potential Mitigated Effects Due to Operational Disturbance 63

Table 8.51 - Non-avian fauna - Mitigated Effects Due to Operational Pollution / Damage 63

Table 8.52 - Summary Effects Assessment for Ecology (significant effects are highlighted in bold text) 65

8.0 Ecology

8.1 Introduction

8.1.1 Background

1 This chapter provides an assessment of the potential effects on sensitive ecological receptors (i.e. habitats, flora and non-avian fauna of nature conservation value) of the proposed Blackcraig Hill & Margree windfarms 132kV overhead line (OHL). The S37 Applications for these OHLs includes the substations at Blackcraig and Margree (as ancillary development) and therefore these have been considered and are reported within the ES. A summary of the methodologies used in this assessment, relevant guidance and nature conservation policy and legislation context are also provided. This chapter also includes a summary of the ecological baseline and assessment of the nature conservation value of all relevant habitats and non-avian fauna present within the EIA Study Area. A baseline description, evaluation and effect assessment for ornithological interests are provided separately in Chapter 9.

2 Baseline desk and field surveys, and the assessment provided within this chapter, were completed by MBEC ecological consultants. All habitats, fauna and flora surveys and assessments have been completed by suitably qualified and experienced ecologists. The assessment has been informed by data collated from a range of sources and specific ecological field surveys. MBEC is grateful to all individuals and organisations that provided information for this assessment, a full acknowledgment is provided in Appendix C.3 to this chapter.

8.1.2 The Proposal

1 The route of the proposed OHL is located in Dumfries & Galloway and East Ayrshire. A detailed description of the proposed and existing transmission network is given in Chapter 5 and the route is shown in Figure 8.01. The proposed OHL passes through a range of broad habitat types; primarily improved grassland and mature conifer woodland. Other broad habitat types present within the survey area include mixed plantation, semi-natural broadleaved woodland, wet modified blanket bog, wet and dry heath, species-rich semi-improved grassland and marsh / marshy grassland.

2 The proposed OHL will be approximately 36.5km in length, connecting new substations at Blackcraig (Grid Reference NX 689 835) and Margree windfarms (Grid Reference NX 679 850) to the transmission network at a new substation, not part of this proposal, at Meikle Hill (Grid Reference NS 520 080).

3 The section of the proposed OHL from Blackcraig Hill to Dalshangan (GR 259415, 589221) will be supported on wooden poles (a single circuit flat formation wood "H" pole design). A short underground section will then link the wood pole section accross the A713. From this location, northwards to Meikle Hill substation, the OHL will be supported on steel lattice towers (L7H type). In addition, a section of 33 kV underground power cable, approximately 2.7km in length, will be laid within an existing forestry track (at Corriedoo Forest) to connect Blackcraig Hill wind farm to the Blackcraig substation. Details of tower / pole dimensions and line heights are provided in Chapter 5.

4 The installation of the new L7 Towers will allow 132kV OHLs that are part of the electricity transmission network (known as the 'N-Route') to be transferred from their existing towers. This will result in the dismantling of the towers between Dalshangan and near Smithston.

8.1.3 The Study Area

1 For the purposes of this assessment, due to the relatively large linear scale of the project, it has been divided into four sub-sections (see Figure 8.01). These sections equate to the following parts of the OHL proposal, from north to south:

- Section 1: Existing N-Route OHL from Smithston to Glenmuck, to be dismantled (c. 16.4km);
- Section 2: Proposed L7 Tower OHL from Glenmuck to the proposed substation at Meikle Hill (c. 8.8km);
- Section 3: Proposed L7 Tower OHL from Glenmuck to Dalshangan (c. 15.7km) and the approximately parallel section of the existing N-Route OHL from Glenmuck to Dalshangan to be dismantled (c. 15.5km); and
- Section 4: Proposed single circuit flat formation wood pole line design supported OHL from Dalshangan to the proposed Margree and Blackcraig Hill windfarm substations (c. 12.4km).

8.1.4 Summary of Potential Effects

1 The potential adverse ecological effects, of the proposed OHL as assessed in this chapter, can be divided between the construction, dismantling (of existing infrastructure) and operational phases. Potential effects associated with each of these phases of the development are summarised below:

8.1.4.1 Construction Phase

- Construction works for the OHL resulting in physical damage to sensitive habitats (e.g. habitats of nature conservation importance, local and national biodiversity action plan habitats, habitats of conservation importance at a European level);
- Potential damage to sensitive habitats through indirect effects of construction works, e.g. hydrological changes resulting from tree felling, access track drainage, earthworks (including potential for disruption of blanket bog hydrology);
- Potential for pollution of watercourses and associated adverse effects on aquatic habitats and species from construction materials, hydrocarbons, and site run-off, etc.; and
- Potential disturbance to protected mammals, reptiles and amphibian species, arising from the construction works.

8.1.4.2 Dismantling Phase

- Works associated with the dismantling of the OHL and towers resulting in physical damage to sensitive habitats;
- Potential for pollution of watercourses and associated adverse effects on aquatic species and habitats from hydrocarbons, and site run-off, etc.;
- Potential disturbance to protected mammals, reptiles and amphibian species, arising from the dismantling works; and
- Potential beneficial effects associated with the removal of a section of existing N-Route OHL that would become defunct as a result of the installation of the proposals.

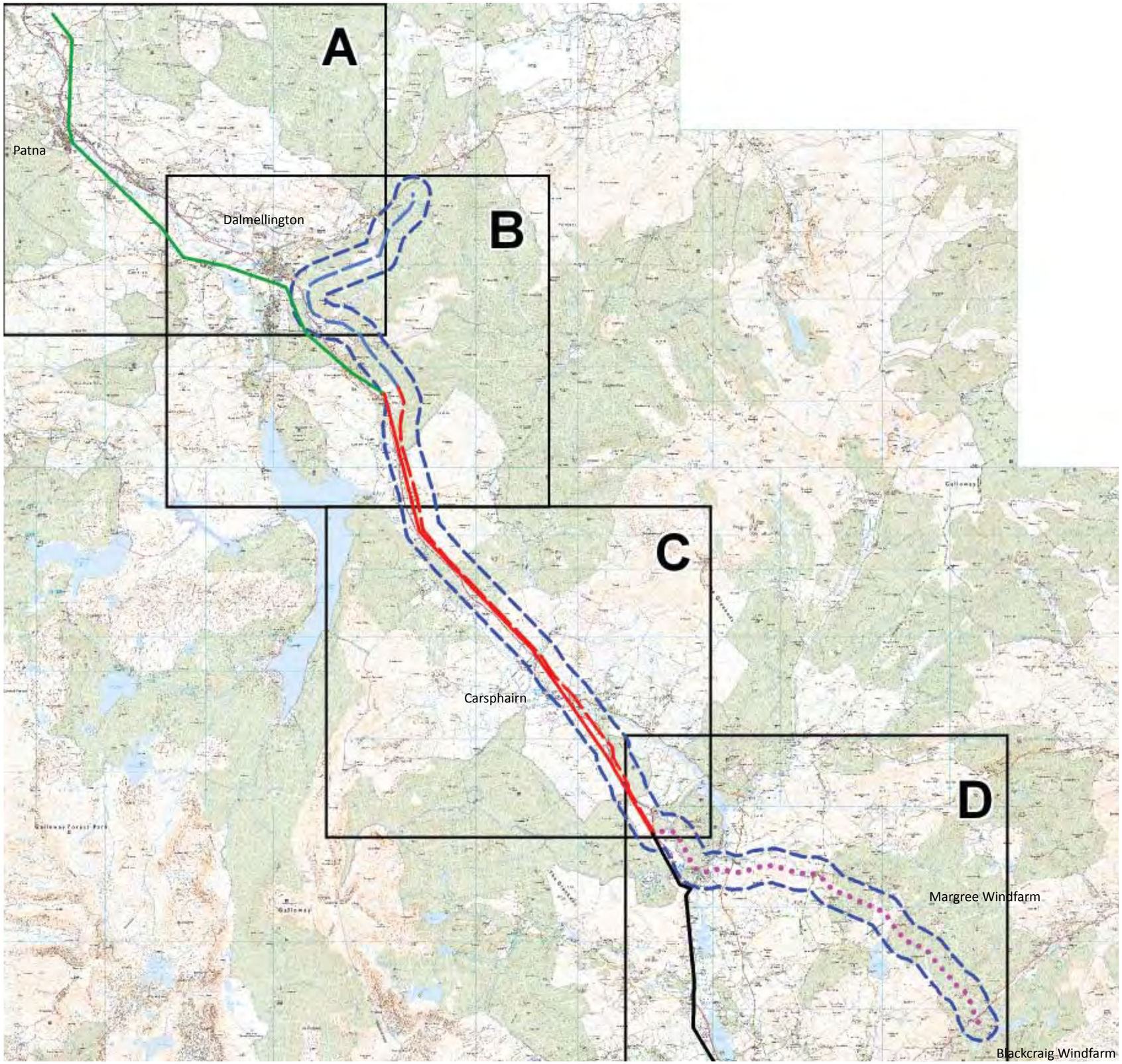
8.1.4.3 Operational Phase

- The permanent loss (direct or indirect) or disruption of sensitive habitats through the construction of the structures and wayleave management requirements;
- Potential damage to sensitive habitats from maintenance works which may require vehicle access and temporary working areas;
- Potential long-term disruption of natural surface hydrology affecting watercourses and blanket bog habitats;
- Potential for peat / soil chemistry changes arising from construction materials resulting in vegetation changes;
- The potential for wayleave management to positively or negatively affect species and habitats; and
- Potential mammalian collision (e.g. bats) and electrocution risk (e.g. red squirrel).

8.1.5 Relevant Legislation, Policy and Guidance

1 This assessment has been undertaken with due regard to the following relevant legislation and nature conservation policy:

- The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2000;
- The Conservation (Natural Habitats & c.) Regulations 1994 (The Habitats Regulations);
- EC Council Directive 92/43/EEC on the Conservation of Natural Habitats and Wild Fauna and Flora;
- Nature Conservation (Scotland) Act, 2004 (as amended);
- Wildlife and Countryside Act, 1981 (as amended);
- Protection of Badgers Act, 1992;
- Wild Mammals (Protection) Act, 1996;
- The Convention for the Conservation of European Wildlife and Natural Habitat (The Bern Convention), 1979;
- The relevant structure and local plans for the area;
- The relevant Local and National Biodiversity Action Plans (BAPs) and the Scottish Biodiversity List;



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Legend

Blackcraig and Margree - Route of proposed OHL overview

- 500m buffer (ecological survey area)
- Figure sub divisions
- **Section 1** Existing N-Route to be removed
- **Section 2** Proposed L7 Tower route
- **Section 3** Existing N-Route to be removed
- Proposed L7 Tower route
- **Section 4** Proposed Wood Pole line route
- Existing N-Route to be retained

0m 0.5km 1km 1.5km 2km 2.5km 3km

Figure 8.01 - Proposed OHL route - Overview

- Planning Advice Note 60: - Planning for Natural Heritage (2000); and
- Scottish Planning Policy Guidance.

8.1.5.1 Local Plan Polices

1 The East Ayrshire Local Plan and Dumfries and Galloway Local Plans provide guidelines and constraints for all development proposals in these local authority areas. Further information on the environmental local plan polices that are of relevance to this proposal are provided in Appendix C.1.

8.1.5.2 National and Local Biodiversity Action Plans

1 Conservation objectives arising from relevant Local and National Biodiversity Action Plans (LBAP and UKBAP) have been considered in this assessment. These include national and local priority habitats and species, which are listed in Table 8.01 below (full details are given in Appendix C.1). This is not a complete list of BAP priority habitats and species present within the survey area, but a list of habitats and species that have been identified as potential ecological receptors relevant to this assessment.

8.1.5.3 The Scottish Biodiversity Strategy

1 The Scottish Biodiversity Strategy, called "Scotland's Biodiversity: It's in Your Hands", was published by the Scottish Government in May 2004. It aims to conserve biodiversity for the health, enjoyment and wellbeing of the people of Scotland. Emerging from the Scottish Biodiversity Strategy was an inventory of key ecological features and the identification of species of principal importance for the conservation of biodiversity in Scotland. The results of this process, the Scottish Biodiversity List (2005), are species considered by the Scottish Ministers to be of principal importance for biodiversity conservation. The key species which were viewed as likely to be relevant to the assessment of this proposal are listed in Table 8.01 below.

8.1.5.4 Methodological and Mitigation Guidance

1 Relevant ecological survey and environmental impact assessment guidance includes, but is not restricted to:

- Handbook of EIA: Guidance for Competent Authorities, Consultees and others involved in the EIA process in Scotland, SNH, 2005;
- Institute of Ecology and Environmental Management (2006) Guidance for Ecological Impact Assessment in the United Kingdom (version dated 7th July 2006);
- JNCC (1993) handbook for Phase 1 habitat Survey - a technique for environmental audit. England Field Unit, Nature Conservancy Council;
- Scottish Executive Guidance on European Protected Species, Development Sites and the Planning System, Interim Guidance for Local Authorities on Licensing Arrangements, October 2001 (updated in December 2006);
- Species specific survey methodological guidance is cited in Appendix C.2.;
- Scottish Environment Protection Agency Pollution Prevention Guidelines (http://www.sepa.org.uk/about_us/publications/guidance/ppgs.aspx); and
- Forestry Commission Forest and Water Guidelines (4th Edition, 2004).

Table 8.01 - National Biodiversity Action Plan Priority Habitats and Species and Local Biodiversity Action Plan 'Local Habitats' and Scottish Biodiversity List Species that have been identified as potentially relevant to this assessment (species list focuses on vertebrate fauna, excluding avifauna).

Habitats and Species	UK BAP	Joint Ayrshire LBAP	Dumfries & Galloway LBAP	Scottish Biodiversity List
Habitats:				
Blanket Bog	✓	✓	✓	✓
Farmland		✓	✓	
Fens, Carr, Marsh, Swamp and Reedbed		✓	✓	✓
Lowland Calcareous Grassland	✓			✓
Lowland Dry Acid Grassland	✓	✓	✓	✓
Lowland Fens	✓			✓
Lowland / Upland Heathland	✓	✓	✓	✓
Lowland Meadows	✓	✓		✓
Lowland Mixed Deciduous Woodland	✓	✓	✓	✓
Lowland Raised Bog	✓	✓	✓	✓
Native Woodlands		✓	✓	✓
Parkland and Policy Woodland		✓		
Purple Moor Grass and Rush Pasture	✓	✓	✓	✓
Reedbeds	✓			✓
Rivers	✓	✓	✓	
Wet Woodland	✓			✓
Wood-Pasture Parkland	✓	✓		✓
Species:				
Atlantic Salmon	✓			✓
Brown Hare	✓			✓
Brown long-eared bat	✓			✓
Brown/Sea Trout	✓			
Common pipistrelle				✓
Daubenton's bat				✓
European Eel	✓			
Freshwater Pearl Mussel	✓			✓
Natterer's Bat				✓
Otter	✓			✓
Pine Marten	✓			
Red Squirrel	✓			✓
River Lamprey	✓			
Sea Lamprey	✓			✓
Soprano pipistrelle	✓			✓
Water Vole	✓			✓

8.2 Assessment Methodology

8.2.1 Introduction

2 This section of the chapter summarises the methods adopted for the ecological desk study, habitat and protected species surveys, receptor evaluation and effect assessment. Further detail on survey methods is provided in Appendix C.2.

3 The EIA Regulations provide broad guidelines on what is to be considered when determining the effects of development proposals. In combination with expert professional judgement and guidance from governmental agencies (e.g. SNH) and professional bodies (e.g. Institute of Ecology and Environmental Management (IEEM)) EIA practitioners assess potential effects and determine the likely level of significance.

4 The assessment of effects is a process that can be summarised as the following stages:

- Stage 1. Determination of the important receptors within the Study Area and their nature conservation value based on available, and suitably detailed, reliable and contemporary data derived from desk study and field surveys;
- Stage 2. Identification of the potential effects, based on the nature of the proposal including consideration of potential effects during construction, operation and decommissioning (where relevant) of the proposed development (informed by the Scoping Study);
- Stage 3. Determination of the scale and magnitude of the effects, including consideration of effect duration and any potential cumulative effects arising from other development proposals;
- Stage 4. Determination of the significance of potential effects, based on the interaction between effect magnitude and duration and the nature conservation value / sensitivity of the receptor affected;
- Stage 5. Identification of mitigation measures required to address significant adverse effects; and
- Stage 6. Assessment of residual effect significance, following the application of proposed mitigation measures.

5 The EIA process involves the application of specific criteria to evaluate and rank effects and features. However, due to the complexity of ecological systems and the potential uncertainty of indirect effects, the use of experienced professional judgement, in the evaluation of features and the determination of effect significance, is an important element of the process.

6 Additionally, with this proposal, potential ecological effects have been considered from an early stage in the process to determine the proposed route of the OHL.

8.2.2 Approach to Ecological Mitigation

1 During the process of selecting the preferred route a routeing Study Area was considered (see Chapter 3). Preliminary ecological surveys and a desk study were undertaken so that key constraints (i.e. those that had a bearing on route selection) could be identified. The identified constraints were considered in developing the proposed alignment for the preferred route. A description of how identified ecological, and other environmental constraints, were considered in route selection is provided in Chapter 3.

2 Once the preferred route had been identified it became the focus for more detailed field surveys. The survey area for the EIA was defined and based on the assumed maximum distance where potentially detectable effects on ecological receptors could conceivably occur. The potential for variation in the exact placement of infrastructure was also a consideration in the selection of the boundaries of the survey area. A survey area boundary offset from the preferred route by 500m on both sides (i.e. in a 1km wide survey corridor) was established; this is referred to as the 'core survey area' (see Figure 8.01).

3 Following consultation on the preferred route there were some modifications made to the alignment of the OHL (these are described in detail in Chapter 5) resulting in the development of the 'proposed route' which is the subject of this assessment. Any appreciable changes to the preferred route, occurring after baseline ecological surveys had been completed, outside of the original 1km wide survey corridor were subject to further survey.

4 The process which has led to the development of the proposed route has sought to avoid altogether, or to minimise, the potential magnitude of adverse effects by taking account of known ecological constraints (e.g. sensitive habitat receptors, protected species resting sites, etc.) within the Study Area. Further details of the process by which ecological constraints have been taken into consideration through the determination of the preferred and proposed routes is described in Chapter 3.

5 Where potential effects of the proposed route have been assessed as being potentially significant, or where current best practice requires, further mitigation has been proposed. For example, ecological input to the detailed design of access tracks and tower positions, best practice in relation to construction site environmental management procedures, measures to ensure habitat damage is minimised and appropriate reinstatement methods followed.

6 In summary, the adverse effects on ecological interests associated with this proposal have been addressed in three main ways:

- By avoiding / minimising effects through route selection, based on available baseline data (i.e. mitigation though design decisions);
- By avoiding / minimising effects through programming and the approach to construction works; and
- By offsetting of remaining potentially significant effects through ecologically sensitive management of wayleave zones.

8.2.3 Scoping and Desk Study

1 Consultation relating directly and indirectly to ecology and nature conservation interests within the Study Area, and the assessment of the potential effects of the proposal, has taken place with a range of organisations. The results of the EIA Scoping process, compiling responses from statutory consultees, such as Scottish Natural Heritage (SNH), Scottish Environment Protection Agency (SEPA), Scottish Government and non-statutory organisations such as Scottish Wildlife Trust (SWT), to the request for an EIA Scoping Opinion are are summarised in Table 8.02 below. These responses have been taken into consideration in the planning and implementation of the EIA baseline survey work and the preparation of this assessment.

2 Various organisations were contacted and requests made for available information on ecological interests (i.e. records of notable flora and fauna). Table 8.03 provides a list of the organisations contacted and the information requested. Details of non-sensitive ecological data received from consultees are provided in Appendix C.3. Sensitive / confidential information (e.g. location specific records of species of high conservation concern and / or at particular risk of persecution) is provided in a Confidential Appendix (Appendix C.11), which is separate to the ES and provided only to SNH. In addition to requests for data from a range of organisations, online sources were also queries. In particular, the National Biodiversity Network website (the NBN Gateway - http://www.nbn.org.uk/), which is an information network of biodiversity data provided by a collaboration between a large number of UK nature conservation organisations.

Table 8.02 - Summary of Scoping - Points raised in relation to Ecology.

Subject	Summary of Points Raised
General Points	All ecological survey methods conform to the best available standard methods for each habitat and species, and follow guidance published by SNH where this is available. Where standard methodologies do not exist, developers should propose and agree an appropriate methodology with SNH specialist advisers. All ecological survey data collected during ES survey work should be made available by the applicant to SG and SNH, in a form which would enable them to make future analysis of the effects of overhead power lines if appropriate.
Designated Sites	The ES should address the likely impacts on the nature conservation interests of all the designated sites in the vicinity of the proposed development. It should provide proposals for any mitigation that is required to avoid these impacts or to reduce them to a level where they are not significant. In the event that detailed survey or analysis is required in order to reach a view, the survey and analysis should be regarded as information contributing to that assessment. Note that such information should be provided for the overhead line itself together with any ancillary works, and cumulatively in combination with any other overhead line consented or formally proposed in the vicinity.
Habitats	Surveys should be carried out at appropriate times or periods of the year by appropriately qualified and experienced personnel, and suitability of the timing needs to be considered within the ES. The ES should provide a comprehensive account of the habitats present on the proposed development site. It should identify rare and threatened habitats, and those protected by European or UK legislation, or identified in national or local Biodiversity Action Plans.
Plants	A baseline survey of the plants present on the site should be undertaken, and field and existing data on the location of plants should be used to determine the presence of any rare or threatened species of vascular and no-vascular plants and fungi.
Habitat Management	Habitat enhancement and mitigation measures should be detailed, particularly in respect to blanket bog, in the contexts of both biodiversity conservation and the inherent risk of peat slide. Details of any habitat enhancement programme (such as native- tree planting, stock exclusion, etc) for the proposed development site should be provided. It is expected that the ES will address whether or not the development could assist or impede delivery of elements of relevant Biodiversity Action Plans. SNH and RSPB may wish to see a Habitat Management Plan for the area of the overhead line and any area managed in mitigation or compensation for the potential impacts of the development. Monitoring of any specific potential impacts of the development, and of the outcome of any habitat management measures, should form part of the ES proposals.
Protected Species (general)	The ES needs to show that the applicants have taken account of the relevant wildlife legislation and guidance namely, Council Directives on The Conservation of Natural Habitats and of Wild Flora and Fauna, and on Conservation of Wild Birds (commonly known as the Habitats and Birds Directives), the Wildlife & Countryside Act 1981, the Nature Conservation (Scotland) Act 2004, the Protection of Badgers Act 1992, the 1994 Conservation Regulations, Scottish Government Interim Guidance on European Protected Species, Development Sites and the Planning System and the Scottish Biodiversity Strategy and associated Implementation Plans. It needs to be categorically established which species are present on the site, and where, before the application is considered for consent. The presence of protected species such as Schedule 1 Birds or European Protected Species must be included and considered as part of the application process, not as an issue which can be considered at a later stage. An Annex of environmentally sensitive information may be required to provide information on nest locations or other environmentally sensitive information related to specially protected species. However, the annex should not include any information that is not confidential, or if it does this information should be contained elsewhere within the text of the Environmental Statement.
Mammals	A baseline survey of the species and number of mammals present on the site should be undertaken. Particular attention should be paid to specially protected and/or vulnerable species, especially European Protected Mammals, and those potentially affected by the development.
Birds	The ES should provide an assessment of the impact of the overhead power line on birds. A baseline survey of the species and number of birds present on the site throughout the year should be undertaken. Particular attention should be paid to specially protected and/or vulnerable species.
Reptiles and Amphibians	A baseline survey of the species and number of reptiles and amphibians present on the site should be undertaken. Particular attention should be paid to specially protected and/or vulnerable species, especially European Protected species, and those potentially affected by the development.
Fish	A baseline survey should be undertaken to demonstrate the species and abundance of fish present in the still and running waterbodies on and around the site throughout the year. This should extend to watercourses which may be affected by run-off from the site during construction, operation or decommissioning. The developer should ensure that the implications of changing water quality, quantity, channel morphology and habitat continuity are addressed specifically with reference to potential impacts on fish and that mitigation addresses these issues. Where this information is provided elsewhere in the document, it should be specifically highlighted. Where a development has the potential to impact on local fish populations the developer will be asked to develop an integrated fish and water quality monitoring programme with baseline, development and post-development sampling. Details of any proposed monitoring should be detailed.
Invertebrates	A baseline survey of invertebrates present on the site and in the waterbodies and watercourses on and around the site throughout the year should be undertaken. This should be guided by existing information on the presence, distribution and abundance of notable invertebrates.

Table 8.03 - Summary of Information Requested during the Desk Study

Organisation	Summary of Information Requested
Botanical Society of the British Isles (BSBI)	Data concerning 'notable' plant species (e.g. nationally threatened or rare, nationally scarce, locally rare, scarce or declining, UK or LBAP species) for the proposed route Study Area.
Dumfries & Galloway and Ayrshire Fisheries Trusts	Comments on particularly sensitive watercourses / waterbodies within the initial routing Study Area.
Forestry Commission Scotland	Notable flora or fauna for the Study Area, which included a 1km boundary either side of the OHL.
Local Badger Groups	Badger records for the proposed route Study Area, which included a 1km wide area either side of the OHL route.
Local Bat Groups	Bat records for the proposed route Study Area, which included a 3km wide area either side of the OHL route.
Local Biological Records Offices (Dumfries & Galloway and East Ayrshire)	Wildlife records concerning protected fauna and records of notable flora for the proposed route Study Area.
Local Council Biodiversity Officers (Dumfries & Galloway and East Ayrshire Council)	Local designated sites, wildlife records (e.g. protected species) for the initial routing Study Area.
Scottish Environment Protection Agency (SEPA)	Water quality data for the proposed route Study Area, which included a 2km wide area either side of the proposed OHL route.
Scottish Natural Heritage (SNH)	Data obtained from online and published SNH sources
Scottish Wildlife Trust	Wildlife records (e.g. protected species) and information on relevant SwT Wildlife Sites and Reserves within the initial routing Study Area.
Red Squirrels in Scotland Group	Red squirrel records for the initial routing Study Area.

8.2.4 Field Surveys

8.2.4.1 Habitat Survey

1 An Extended Phase 1 Habitat survey of the core survey area for the preferred route was undertaken in June and July 2008 and additional survey relating to changes in the proposed route in July 2009. Full details of the survey method are provided in Appendix C.4. Lists of all the plant species identified were compiled. Separate lists were produced for each habitat type. Scientific names for vascular plants follow those given in Stace (1997). Detailed species lists for the Phase 1 habitat types are provided in Appendix C.6.

2 The habitats within the Study Area were mapped as far as possible according to the techniques and definitions described in Handbook for Phase 1 Habitat Survey (Joint Nature Conservation Committee 1993). Target notes were taken to provide descriptions of the main habitats of the site, including information on species composition, habitat structure, evidence of management, habitats too small to map and transitional or mosaic habitats. Target notes from the habitat survey are provided in Appendix C.5.

3 In areas where there were sufficient extent of semi-natural habitats of conservation concern (i.e. those listed on Annex 1 of the EC Habitats Directive, or habitats considered to be of national conservation priority, e.g. UK BAP habitats) an assessment of the dominant National Vegetation Classification (NVC) community was undertaken following the methodology described in Averis et al (2004). Results from this assessment are summarised in Appendix 8.5. A fully detailed NVC survey was not considered necessary to inform the impact assessment. This is due to the chosen route and the relatively small areas of semi-natural habitats permanently affected by the proposals (i.e. those areas not subject to reinstatement measures).

8.2.4.2 Protected Species Surveys

1 The objectives of the survey were to assess habitat suitability, (likely) presence or absence of species and to estimate the extent of activity by protected mammal species within the survey area. As such, survey results do not provide details of the extent of territories, abundance, population structure or productivity of particular species. Full details of the survey methodologies are provided in Appendix C.2 and the mammal survey target notes and bat activity results are provided in Appendix C.7.

2 In summary, a route was walked within the survey area that came to within at approximately 200m of all points and to within 50m of all areas of potentially suitable habitat for protected mammal species. The survey area also included areas outside the cure survey boundary, which varied depending on the presence of suitable linking habitat to the core survey area (e.g. watercourses), to ensure that the use of the area immediately adjacent to the proposed OHL route was also assessed.

3 A walkover survey of the entire survey area was undertaken primarily to determine the presence of protected mammal species, focusing on badger (*Meles meles*), bat species, otter (*Lutra lutra*), red squirrel (*Sciurus vulgaris*) and water vole (*Arvicola terrestris*). Also any evidence of amphibians and reptiles was also recorded, and to assess the suitability of the habitats present on the site and the potential level of use. Signs of all protected and / or notable species were recorded, including regionally and nationally uncommon species. A handheld GPS was used to locate (±6m accuracy) important features and signs (e.g. holes, potential bat roosts, badger latrines, tracks, etc.). Surveys were undertaken by experienced ecologists familiar with the relevant field signs and possessing an understanding of the species' habitat requirements, which enabled them to undertake habitat quality assessments.

4 The banks of watercourses within the survey area were searched for the presence of otter and water vole and areas regarded as particularly suitable for other species were subject to careful survey. In addition, during the walkover survey, all areas of the site were assessed for their potential as suitable habitat for protected species. Incidental sightings of mammal species during other survey work were also recorded.

5 Bat surveys were undertaken using bat detectors during walked transects and from static locations with detectors connected to sound-activated recorders, placed at randomly chosen sampling points along watercourses within the survey area. The locations of the sampling points are shown in Figures 8.13 to 8.15.

6 In summary, the following protected mammal surveys were undertaken (protected mammal signs were also recorded where encountered during other ecological surveys) between June and August 2008 focused within the core survey area (i.e. within 500m of the proposed OHL route):

- Water vole walkover survey;
- Otter walkover survey;
- Red squirrel surveys (cone survey transects and habitat assessment);
- Badger walkover survey; and
- Bat activity survey and habitat quality assessment.

7 In addition, the potential presence of pine marten (*Martes martes*) signs (e.g. scats in particular) was considered and noted during all walkover surveys, with particular focus on forestry tracks and rides. Any potential scats (unless they could be unequivocally identified in the field) were collected and subjected to genetic analysis (real-time PCR tests) by Forestry Commission Research Services to differentiate between fox and pine marten in order to confirm identification.

8.2.4.3 Ecological Survey Constraints and Data Limitations

1 It is considered that there is sufficient baseline data available, at an appropriate level of detail, to enable a reliable assessment of the potential significant effects of the proposal under consideration. Taking into consideration the issues identified during EIA Scoping, the nature of the proposed development, potential effects of this proposal and habitats affected, there are considered to be no important gaps in the ecological baseline data.

2 However, it is important to note that due to a range of factors all ecological surveys are subject to limitations. For example, temporal variation i.e. daily, seasonal, inter-annual, and long-term fluctuations in plant and animal populations and associated communities. Single ecological surveys provide an estimate or sample of populations / habitats at a moment in time. Another limiting factor is the potential for locally rare species (which may or may not also be rare or scarce at a wider scale) to go unrecorded, given that rarity inevitably reduces detectability. This can be addressed through survey methods and / or increasing the intensity of search effort where appropriate.

3 The Phase 1 habitat surveys were undertaken during the optimal period for such surveys (i.e. during the period when most vascular plant species are flowering and / or seasonal vegetative growth by herbaceous perennials is evident).

4 Survey work was undertaken during an appropriate time of the year for the protected mammal species that were considered potentially present within the Study Area. Water levels within the various watercourses surveyed were considered to be at average levels throughout the survey; however there were periods of heavy rainfall between site visits which may have reduced the visibility of some signs of otter and water vole (e.g. feeding remains, spraints, droppings and prints).

5 Some mammal species, particularly otter and pine marten in relation to this study, are problematic to survey with walkover methods alone (i.e. 'cold searching') due to their wide-ranging habits and low population density. Every effort was taken to assess all locations with the survey area that were considered, based on known habitat requirements, to provide good potential habitat for these species (in particular potential resting sites).

6 Bat activity surveys were timed to be carried out during dry, mild weather during the period when maternity colonies are active. An assessment of habitat quality

(including an assessment of potential roost sites) was also completed during daytime walkover surveys in 2008. Due to the difficulty in confirming the location of bat tree roosts in woodland, and taking into consideration the large size of the survey area, the typical approach adopted was to assess potential for tree rooting bats at the scale of woodland blocks rather than to focus on individual trees. However, in some locations (e.g. in particular mature broadleaved trees adjacent to watercourses) more detailed assessment was undertaken.

8.2.5 Nature Conservation Evaluation

1 Assigning a nature conservation value to ecological receptors involves the consideration of a range of criteria. For example, there is a long-established and widely adopted method of determining the nature conservation value of a site based on the 'Ratcliffe Criteria' (Ratcliffe, 1977). The Ratcliffe Criteria provide a standardised and objective way of assessing the value of a site / feature using the following ten attributes: Size; Naturalness; Representativeness; Rarity; Diversity; Position; History; Fragility; Potential value; and Intrinsic appeal. In practice, rarity is often the most important criterion. Therefore, the nature conservation values described in Table 8.04, below, are primarily defined by the rarity within the different geographical units, with consideration also given to the quality of habitats. This geographical distinction is also useful in placing values in the context of nature conservation designations, which tend to be ranked according to geographical importance.

2 Guidance adopted for the identification and designation of sites of nature conservation importance has also been considered in this assessment, This includes the EU Habitats Directive (1992) Annex III, *Criteria for Selecting Sites Eligible for Identification as Sites of Community Importance and Designation as Special Areas of Conservation*, JNCC's *Guidelines for the Selection of Biological SSSIs*, JNCC's guidance on the *Selection Criteria and Principals for Annex I Habitat Types* as well as *guidelines for the selection of non-statutory Sites of Importance for Nature Conservation (Natural Assets*, Collis & Tyldesley, 1993), SNH's *Natural Heritage Zones, A National Assessment of Biodiversity Habitats* (2001) and *The Wildlife Sites Handbook* (The Wildlife Trusts, 1997). Other guidance considered in developing the approach adopted to nature conservation evaluation includes the Institute of Ecology and Environmental Management's *Guidelines for Ecological Impact Assessment in the UK* (2006).

Table 8.04 - Nature Conservation Evaluation Criteria

Value	Examples
Very High (International Importance)	Habitats or species that form part of the cited interest within an internationally protected site or candidate site (e.g. SAC, cSAC, SPA, pSPA, Ramsar site). A feature (e.g. habitat or population) which is either unique, or sufficiently unusual to be considered as being one of the highest quality examples in a international / national context, that the site is likely to be designated as an SAC / SPA.
High (National Importance)	Habitats or species that form part of the cited interest within a nationally designated site (SSSI, ASSI, NNR, MNR). A feature (e.g. habitat or population) which is either unique, or sufficiently unusual to be considered as being one of the highest quality examples in a national / regional context, for which the site could potentially be designated as an SSSI.
Medium (Regional Importance)	Habitats or species that form part of the cited interest of a Local Nature Reserve, or some local-level designated sites depending on specific site conditions. Viable areas of internationally or nationally important habitats (e.g. Annex I habitats, priority BAP habitats) present in quality and extent at a regional level, or relevant biogeoclimatic zone, of importance. Population of a species which is either unique or sufficiently unusual to be considered as being of nature conservation value at up to a national context (e.g. UK Nationally Scarce). Sites supporting critical habitats for a regularly occurring, regionally significant number of a nationally important species (e.g. priority UK BAP).
Low (Local Importance)	High: Sites meeting the criteria for Scottish Council area designation (such as Sites of Importance for Nature Conservation (SINC)), Wildlife Sites, which may include amenity and educational criteria in urban areas. Sites containing viable areas of any priority habitat identified in the UK BAP or Scottish Local Authority LBAPs. Sites supporting viable breeding populations of species known to be Scottish Local Authority rarities (e.g. included in the LBAP), and / or supplying critical elements of their habitat requirements. Any regularly occurring, locally significant population of bird species.
	Medium: Features / habitats or species which are not considered to qualify for non-statutory designation, but which provide locally important semi-natural habitats (i.e. approx. 10km radius from the site). Populations of any species conservation importance in the context of the local area (i.e. approx. 10km radius from the site).
	Low: Features / habitats or species which are not considered to qualify for non-statutory designation, but which provide locally important semi-natural habitats in the context of the immediate surrounding area (e.g. species-rich hedgerows, small ponds). Populations of any species of conservation importance in the context of the immediate surrounding area.
Negligible	Commonplace feature of little or no habitat / historical significance. Loss of such a feature would not be seen as detrimental to the ecology of the area.

3 The evaluation of the survey area for faunal receptors is based on consideration of conservation status, habitat extent and quality, and the potential population it could support, and the relative importance of these factors at a local, regional, national and international scale. As accurate population estimates are rarely available, other than at the national or international level, and the field survey methods were designed to determine species presence and evaluate habitat extent and quality, the evaluation is based principally on an understanding of habitat requirements, territory sizes and typical densities derived from available published studies and informed by professional judgement.

8.2.6 Effect Significance

1 Once identified, the ecological effects are ranked according to the comparative severity of their effect on the ecological feature / receptor. In defining and predicting effect significance, consideration is given to a range of parameters, including whether the effect is adverse or beneficial; effect magnitude, extent, duration, reversibility; and timing / frequency. The degree of confidence of the predicted effects (pre-mitigation and residual) is also discussed in the assessment, where appropriate.

2 The effect levels (effect magnitude) are ranked into one of five groups taking into account scale and duration of the effects. These levels are described in Table 8.05.

Table 8.05 - Categorisation of Effect Magnitude (includes consideration of effect duration)

Magnitude	Description
Total / Near Total	Would cause the loss of a major proportion or whole feature / population, or cause sufficient damage to a feature to immediately affect its viability.
High	Major effects on the feature / population, which would have a sufficient effect to alter the nature of the feature in the short-long term and affect its long-term viability. For example, more than 20 % habitat loss or damage.
Medium	Effects that are detectable in short and long-term, but which should not alter the long-term viability of the feature / population. For example, between 10 - 20 % habitat loss or damage.
Low	Minor effects, either of sufficiently small-scale or of short duration to cause no long-term harm to the feature / population. For example, less than 10 % habitat loss or damage.
Negligible	Minimal change on a very small scale: de-minimis.
Neutral	A potential effect that is not expected to affect the feature / population in any way; therefore no effects are predicted.
Duration Definitions	Long-term, 20 - 30 years or longer (Period D and beyond) Medium-term, 5 - 20 years (Periods B and C) Short-term, < 5 years (Period A)

3 The magnitude categories do not take into account the nature conservation value of the ecological receptor being affected upon and therefore, in isolation, cannot provide an assessment of relative significance of the effects. The determination of effect significance involves the interaction of effect magnitude and the nature conservation value / sensitivity. Table 8.06 indicates the theoretical process through which these effect significance levels have been reached, but is also open to amendment using professional judgement, where appropriate.

Table 8.06 - Matrix Showing the Relationship between Effect Magnitude and Nature Conservation Value in the Determination of the Significance of Effects

Effect Magnitude	Nature Conservation Value of Receptor				
	Very High	High	Medium	Low	Negligible
Total/ Near Total	Major	Major	Major	Moderate	Minor
High	Major	Major	Major-Moderate	Moderate	Minor
Medium	Major	Major-Moderate	Moderate	Moderate-Minor	Minor
Low	Moderate - Minor	Moderate - Minor	Moderate - Minor	Minor	Minor
Neutral / Negligible	None				

4 Those effects assessed to be of a Moderate or Major level are considered to be 'significant' in relation to the Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2000.

8.3 Baseline Conditions

8.3.1 Designated Sites

1 The proposed route of the OHL does not pass through, nor is it adjacent to (i.e. within 500m), any statutory site designated for the purposes of nature conservation; for example, National Nature Reserves (NNRs), Biological Sites of Special Scientific Interest (SSSIs), Special Areas of Conservation (SACs) and Special Protection Areas (SPAs). During the route selection process such designated sites were considered as high level environmental constraints.

2 The section of existing OHL from Smithston to Dalshangan, which would be dismantled following the installation of the proposed OHL, passes within 500m of two SSSIs (Dalmellington Moss and Bogton Loch SSSIs).

3 Listed below are the nearest (i.e. within 10km) statutory designated sites to the proposed route (see also Figures 8.02 - 8.05 for locations; further details of each designated site are given in Appendix C.4).

8.3.1.1 Statutory Designated Sites - East Ayrshire

- Dalmellington Moss SSSI (NS 465 064), approximately 0.2km north of the N-Route to be dismantled and approximately 2km northwest of the proposed OHL;
- Bogton Loch SSSI (NS 470 052), approximately 0.2km south of the N-Route to be dismantled and approximately 1.5km west of the proposed OHL;
- Ness Glen SSSI (NS 477 021), approximately 1.8km southwest of the N-Route to be dismantled and approximately 2.4km southwest of the proposed OHL; and
- Loch Doon SSSI (NX 497 975), approximately 1km west of the N-Route to be dismantled and approximately 1.2km west of the proposed OHL.

8.3.1.2 Statutory Designated Sites - Dumfries & Galloway

- Merrick-Kells SAC / SSSI (NX 450 840), approximately 6km southwest of the proposed and existing OHL routes;
- Cleugh SSSI (NX 611 867) is approximately 0.8km south of the route of the proposed OHL;
- Water of Ken Woods SSSI (NX 594 823, NX 595 809, NX 600 811, NX 610 800, NX 645 795) is approximately 5.5km south from the closest point of the proposed OHL;
- Hannaston Wood SSSI (NX 596 824) is approximately 5km south from the proposed OHL;
- Kenmure Holms SSSI (NX 638 765) is approximately 8km to the southwest of the proposed substation for Blackcraig Hill windfarm; and
- Loch Ken and River Dee Marshes SPA and Ramsar site is approximately 9km southwest of the southern end of the proposed OHL.

8.3.1.3 Non-Statutory Designated Sites

1 The proposed OHL does not pass through any non-statutory local authority local nature conservation site or Scottish Wildlife Trust Reserve or Wildlife Site. The existing transmission line (i.e. the 'N-Route') passes over two of these sites (Dalmellington Town Common and River Doon).

2 There are a total of 22 non-statutory designated sites / areas within 10km (at their nearest point) of the existing OHL to be dismantled and proposed route of the OHL in East Ayrshire. There and a total of 10 non-statutory designated sites / areas within 10km of the proposed route of the OHL / existing line to be dismantled in Dumfries & Galloway. These sites are listed in Tables 8.07 and 8.08 below.

Table 8.07 - East Ayrshire - Non Statutory Designated Sites for Nature Conservation

Site	Designation Type	Distance from proposed or existing route (Km)	Direction from proposed or existing route
Belston Loch	Provisional Wildlife Site	9.8	N
Benbeoch / Pennyvennie Glen	Provisional Wildlife Site	1.12	NW
Bent Burn	Provisional Wildlife Site	9.6	N
Bow Burn and Ashentree Glen Wood	Provisional Wildlife Site	2.0	NE
Bryan's Heights	Provisional Wildlife Site	0.4	SW
Carsphairn Forest	Red Squirrel Priority Woodland	0.0	N/A
Connel Burn / Benty Cowan Hill	Provisional Wildlife Site	4.8	E
Craigengillan and Ness Glen Woodland	Provisional Wildlife Site	1.3	SW
Cumnock Burn / Pennyvenie Bing	Provisional Wildlife Site	1.0	NE
Dalleagles Woodland	Provisional Wildlife Site	5.4	NE
Dallowie Burn Woods	Provisional Wildlife Site	3.0	W
Dalmellington Moss	SWT Reserve	0.2	N
Dalmellington Town Common	Provisional Wildlife Site	0.0	N/A
Doon Valley Wetlands	Provisional Wildlife Site	0.21	N
Dunanskin Glen / Benquhat Hill	Provisional Wildlife Site	1.1	NE
Martyre's Moss	Provisional Wildlife Site	4.0	N
Nith Bridge	Provisional Wildlife Site	9.2	NE
Nith Flood Plain	Provisional Wildlife Site	13.1	NE
Rankiston Scrub	Provisional Wildlife Site	4.1	NE
Rigfoot / Lanemark / Bogside Wetlands	Provisional Wildlife Site	8.0	NE
River Doon (Dalrymple to Patna)	Provisional Wildlife Site	0.0	N/A
Wallace Moor / Keirs Hill	Provisional Wildlife Site	0.5	SW

Table 8.08 - Dumfries & Galloway - Non Statutory Designated Sites for Nature Conservation

Site	Designation Type	Distance from proposed or existing route (Km)	Direction from proposed or existing route
Carsphairn Forest	Red Squirrel Priority Woodland	0.0	N/A
Castlemaddy	Red Squirrel Priority Woodland	0.0	N/A
Galloway Forest	Red Squirrel Priority Woodland	0.3	SW
Galloway Forest Park	Important Bird Area	0.0	N/A
Garcrogo	Red Squirrel Priority Woodland	3.8	SE
Island Block Oak Woodland	Local Wildlife Site	1.0	N
Knowetop Lochs	SWT Reserve	5.7	SE
Loch Ken & Dee Marshes	Important Bird Area	8.9	SW
Polmaddy	Local Wildlife Site	0.6	W
The Lowes	Local Wildlife Site	5.2	SE

8.3.1.4 Ancient Woodland Inventory Sites

1 The route of the proposed OHL passes within 2.5km of eighteen sites listed on the Forestry Commission (GLADE) ancient woodland inventory in East Ayrshire. These sites are summarised in Table 8.09 below (further details are provided in Appendix C.4).

Table 8.09 - East Ayrshire - Ancient Woodland Inventory Sites

Location	Distance from proposed or existing route (Km)	Direction from proposed or existing route
Bellsbank	0.3	S
Bellsbank Plantation	0.3	W
Bogton Plantation	0.9	W
Boreland Glen	1.0	W
Carskeoch Hill	0.3	W
Craighead Wood	1.7	SW
Cummnock Burn	1.1	NW
Dalcairnie Glen	1.3	S
Grimmet Glen	1.3	W
Hollybush Mains	1.7	NW
Keirs Glen	0.2	SW
Milreoch Cross Wood	1.5	NW
Pennyvenie Glen	1.1	N
Shankston Farm	1.4	W
Sloanston Burn	1.7	N
South Craig	1.8	NE
Yonderton	1.8	NW

2 There area a total of eleven ancient woodland inventory sites located within the proposed OHL-Route in Dumfries and Galloway. These sites are summarised in Table 8.10 below (further details are provided in Appendix C.4 and the locations are shown in Figures 8.02 to 8.05).

Table 8.10 - Dumfries & Galloway - Ancient Woodland Inventory Sites

Location	Distance from proposed or existing route (Km)	Direction from proposed or existing route
Carnavel	0.2	SW
Carsfad Loch	2.4	S
Dalshangan Plantation	0.0	N/A
Drummanister	1.7	SW
Dundeugh Hill	0.0	N/A
Dundeugh Wood	0.0	N/A
Glenhoul Wood	0.0	N/A
Green Well of Scotland	0.0	N/A
High Bridge of Ken	1.6	NE
Lamloch	1.0	SW
Water of Deugh	0.5	N

8.3.2 Terrestrial Habitats and Notable Flora

8.3.2.1 Section 1 (Smithston to Glenmuck)

8.3.2.1.1 Summary of Broad Habitat Types

1 No surveys of habitat and flora were undertaken for Section 1 of the project (i.e. the proposed section of the N-Route to be dismantled from Smithston to Glenmuck, see Figure 8.01). An assessment of the habitats present for this section was undertaken based on information available through a desk study and reference to aerial photography. Requests were made with various organisations for records of notable plant species. Non-confidential desk study findings are provided in Appendix C.3. Table 8.11 provides approximate total areas and percentage cover of each broad habitat type (based principally on examination of aerial photography) within this section. A map of these habitats is provided as Figure 8.06. Prior to any works being undertaken in this area a walk over habitat survey will be undertaken.

Table 8.11 - Estimated Broad Habitat Types within the Study Area for Section 1 of the project (i.e. within 500m of the route of the existing OHL where is out side of the Phase I habitat survey area for the proposed route)

Broad Habitat Type	Total Area (ha)	% of Total Area
Enclosed grassland	706.12	47.34
Conifer plantation	258.58	17.34
Unenclosed grassland / moorland	222.89	14.94
Buildings	78.82	5.28
Wetland habitats	78.48	5.26
Arable	39.02	2.62
Standing water	19.83	1.33
Broadleaved woodland	18.74	1.26
Broadleaved plantation	15.00	1.01
Quarry	12.33	0.83
Scattered broadleaved trees	11.91	0.80
Dense scrub	9.99	0.67
Mixed plantation / woodland	8.57	0.57
Disused tip	5.90	0.40
Scattered scrub	5.27	0.35
Bare ground	0.04	0.003

2 The route of the existing OHL within this section broadly follows the course of the River Doon, from Dalmellington to Smithston. The dominant broad habitat types along the route of the OHL are enclosed improved and semi-improved pasture, conifer plantation and unenclosed rough grassland and moorland. The principle land uses are sheep and cattle grazing, coniferous timber production and opencast coal mining. There are some areas of Sitka spruce (*Picea sitchensis*) dominated commercial conifer plantation woodland at the northern and southern ends of this section and also an important area of wetland habitat (comprising fen, willow carr, swamp and raised bog habitats) towards the southern end of the section, associated with Bogton Loch and Dalmellington Moss SSSIs (see Section on Watercourses, Wetland Habitats and Fish for a summary description).

3 This section contains small areas of broad-leaved woodland including sites at Laight, the banks of Dunaskin Burn, Low Keirs and along the banks of the River Doon at Smithston. In particular Low Kiers is listed on the Ancient Woodland Inventory.

4 In addition to this there are two bing features (old mining slag heaps) in the Study Area at Polnessan and Waterside. Bings can provide unique habitats for pioneer herbs, rare mosses, acidic grasses, scrub and oak, due to their particular soil chemistry.

8.3.2.1.2 Notable Flora

1 The BSBI recorder for Ayrshire provided records of several notable flora species in Section 1. These included narrow small-reed (*Calamagrostis stricta*), which has been found in the area around Bogton Loch, great sundew (*Drosera anglica*) found at Dalmellington Moss, corn spurrey (*Spergula arvensis*), mossy saxifrage (*Saxifraga hypnoides*), lesser tussock-sedge (*Carex diandra*), greater butterfly-orchid (*Platanthera chlorantha*), *Euphrasia artica* subsp. *borealis* and *Euphrasia micrantha* near Patna, night-flowering catchfly (*Silene noctiflora*) at Auchenroy and spignel (*Meum athamanticum*) at Dunston Hill. Details of non-confidential records are provided in Appendix C.3.

8.3.2.2 Section 2 (Meikle Hill to Glenmuck)

1 Extended Phase 1 habitat surveys were undertaken for Section 2 of the project (i.e. 8.8km long section of the proposed OHL, supported on L7 Towers, from the proposed Meikle Hill substation to Glenmuck). Requests were made with various organisations for records of notable plant species. Details of non-confidential desk study findings are provided in Appendix C.3. Table 8.12 provides approximate total areas and percentage cover of each Phase 1 habitat type within this section. Phase I habitat survey results and target notes are shown on Figure 8.07.

Table 8.12 - Estimated Phase 1 Habitat Types within the Study Area for Section 2 of the project (i.e. within 500m of the route of the proposed OHL)

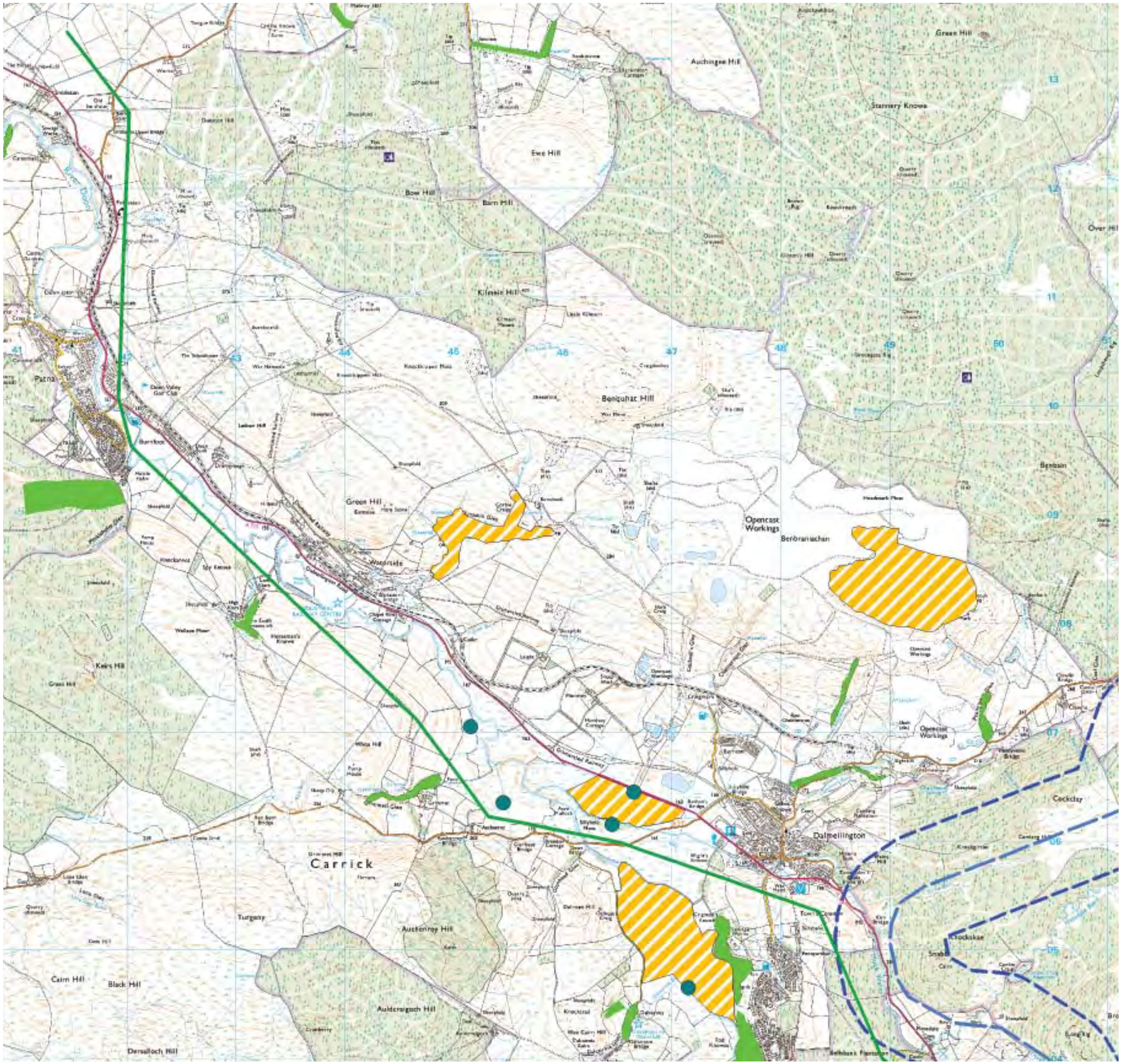
Habitat Type	Area (ha)	% of Total
Coniferous plantation woodland	523.02	57.62
Marsh / marshy grassland	72.80	8.02
Recently felled coniferous woodland	60.66	6.68
Mixed plantation woodland	45.81	5.05
Wet modified bog	42.07	4.63
Semi-improved acid grassland	40.58	4.47
Improved grassland	38.20	4.21
Broad-leaved plantation woodland	25.19	2.77
Semi-improved neutral grassland	22.69	2.50
Continuous bracken	14.42	1.59
Wet dwarf shrub heath	9.59	1.06
Scattered broad-leaved trees	6.07	0.67
Acid / neutral flush	3.03	0.33
Blanket bog	0.91	0.10
Acid dry dwarf shrub heath	0.80	0.09
Scattered bracken	0.48	0.05
Unimproved neutral grassland	0.46	0.05
Buildings	0.44	0.05
Amenity grassland	0.23	0.03
Standing water	0.20	0.02
Introduced shrub	0.06	0.01
Ephemeral / short perennial	0.05	0.01
Quarry	0.01	0.00
Broad-leaved semi-natural woodland	0.01	0.00

8.3.2.2.1 Coniferous Plantation

1 The majority of this section of the project is routed through commercial conifer plantation. South Kyle Forest, owned by Forestry Commission Scotland, is predominantly comprised of planted Sitka spruce, extending over 548.87 ha. The route of the proposed OHL passes through blocks of pole-stage and some thicket plantation. There are also some areas of recent clear-fell, some of which have been replanted with second rotation Sitka spruce. Further details on the age class structure and other aspects of this and other conifer plantation and woodland within the Study Area are provided in the Effects on Forestry Chapter (Chapter 6).

2 The Brown Hill Plantation is in private ownership and is managed for commercial timber production. The plantation is broadly similar in species composition to South Kyle with Sitka spruce dominating. The route of the proposed OHL passes through blocks of pole stage and some thicket Sitka spruce. There are also some areas of clear-fell which have been colonised by a typical, relatively species-poor, suite of ruderal herbs and grasses associated with disturbed ground and recent clear-fell areas.

3 The majority of the plantation woodland has little ground flora due to dense shading from the Sitka spruce. More open areas, such as second rotation / pre-thicket rotation, have a mix of wet modified bog dominated by purple moor-grass (*Molinia caerulea*), marshy grassland dominated by purple moor-grass or soft-rush, or wet heath with abundant heather (*Calluna vulgaris*). Much of the area was likely to have previously been blanket bog, but due to drainage and planting much of the original flora has been lost.



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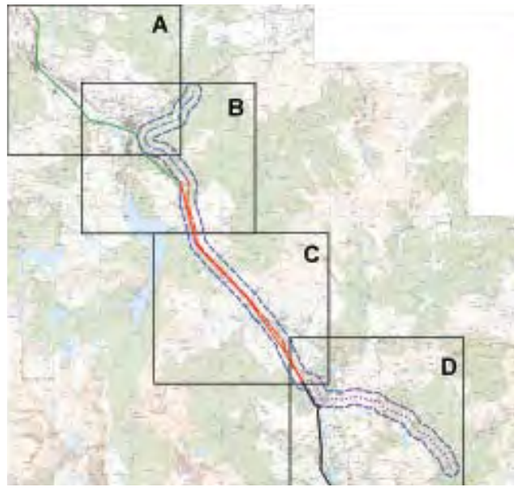
Legend

Statutory & non-statutory nature conservation designation, woodland and bog inventory sites - Area A

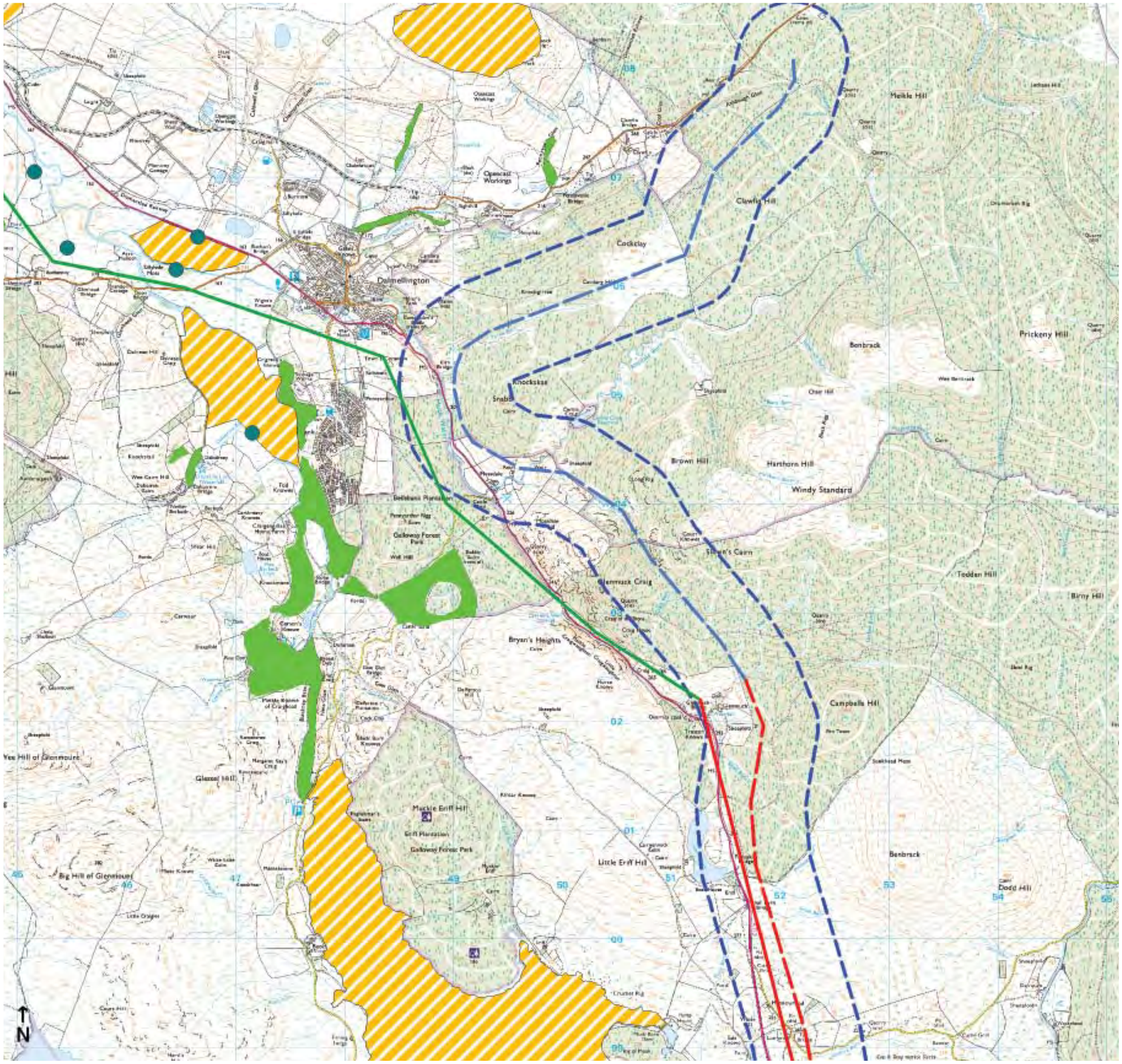
- 500m buffer
- **Section 1** Existing N-Route to be removed
- **Section 2** Proposed L7 Tower route
- **Section 3** Existing N-Route to be removed
- Proposed L7 Tower route
- **Section 4** Proposed Wood Pole line route
- Existing N-Route to be retained
- Special area of conservation
- Bioshere reserve
- Site of special scientific interest
- Ancient woodland inventory site
- Raised bog inventory site

Source: SNH Datasets of protected sites in Scotland



0m 0.5km 1km 1.5km 2km

Figure 8.02 - Designated Sites - Area A



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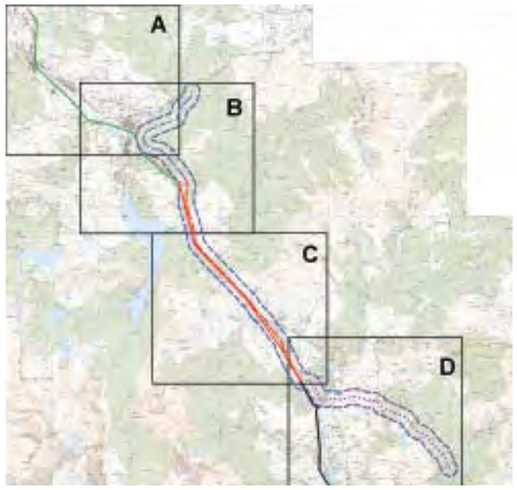
Legend

Statutory & non-statutory nature conservation designation, woodland and bog inventory sites - Area B

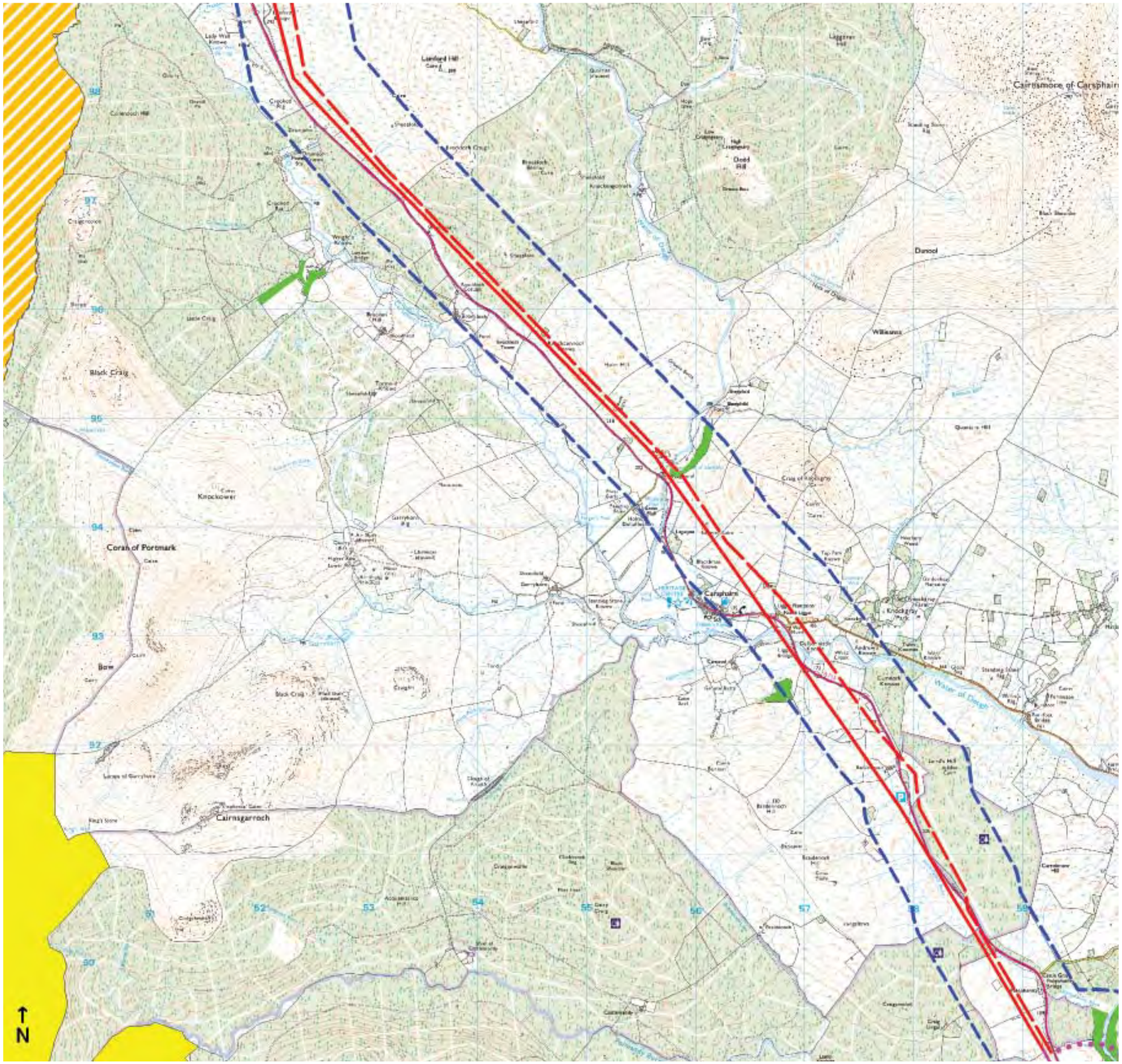
- 500m buffer
- **Section 1** Existing N-Route to be removed
- **Section 2** Proposed L7 Tower route
- **Section 3** Existing N-Route to be removed
- Proposed L7 Tower route
- **Section 4** Proposed Wood Pole line route
- Existing N-Route to be retained
- Special area of conservation
- Bioshere reserve
- Site of special scientific interest
- Ancient woodland inventory site
- Raised bog inventory site

Source: SNH Datasets of protected sites in Scotland



0m 0.5km 1km 1.5km 2km

Figure 8.03 - Designated Sites - Area B



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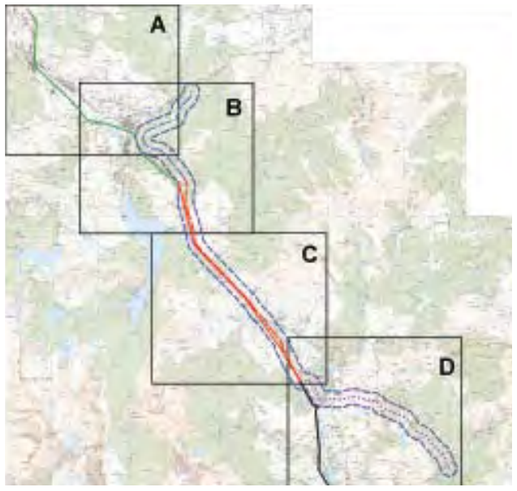
Legend

Statutory & non-statutory nature conservation designation, woodland and bog inventory sites - Area C

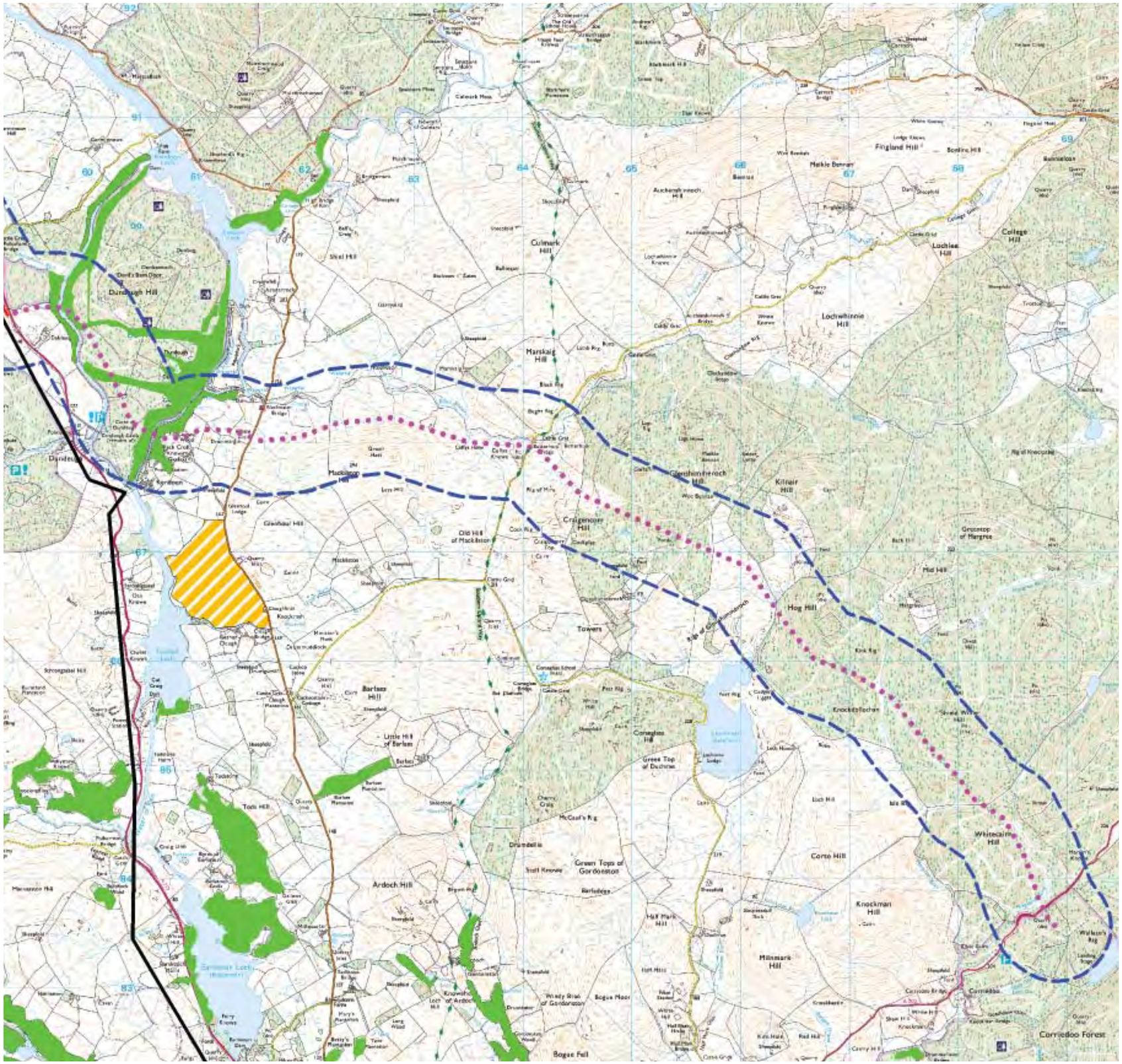
- 500m buffer
- **Section 1** Existing N-Route to be removed
- **Section 2** Proposed L7 Tower route
- **Section 3** Existing N-Route to be removed
- Proposed L7 Tower route
- **Section 4** Proposed Wood Pole line route
- Existing N-Route to be retained
- Special area of conservation
- Bioshere reserve
- Site of special scientific interest
- Ancient woodland inventory site
- Raised bog inventory site

Source: SNH Datasets of protected sites in Scotland



0m 0.5km 1km 1.5km 2km

Figure 8.04 - Designated Sites - Area C



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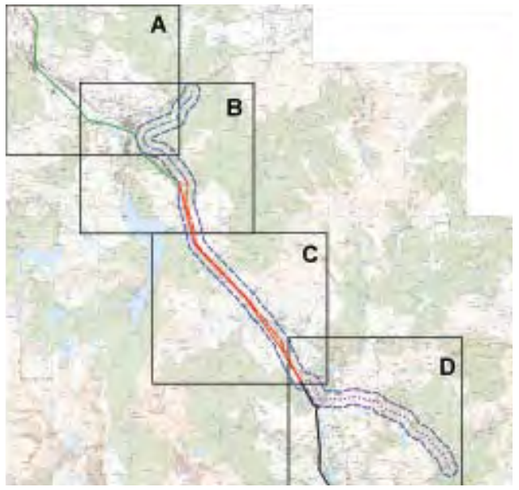
Legend

Statutory & non-statutory nature conservation designation, woodland and bog inventory sites - Area D

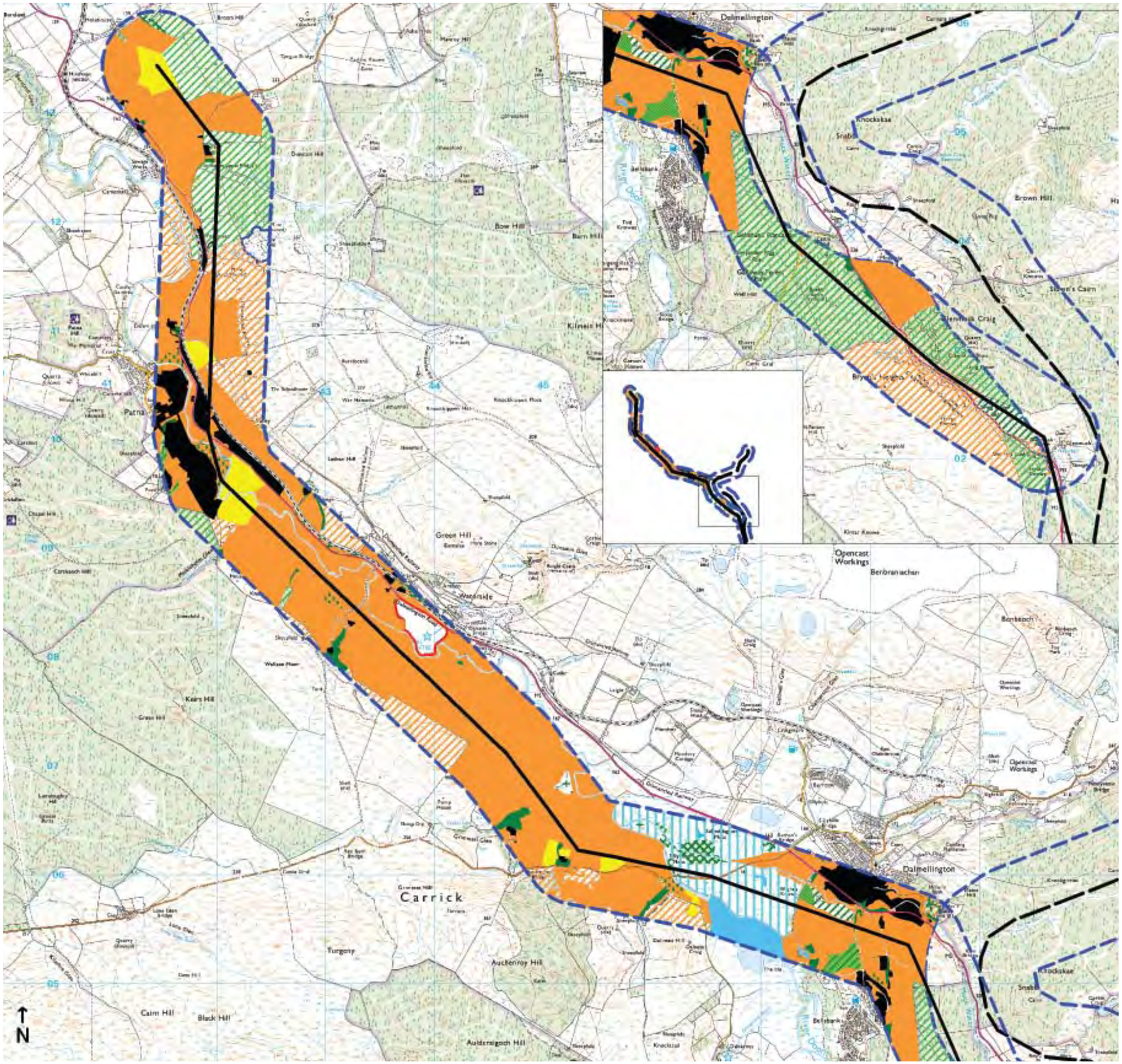
- 500m buffer
- **Section 1** Existing N-Route to be removed
- **Section 2** Proposed L7 Tower route
- **Section 3** Existing N-Route to be removed
- Proposed L7 Tower route
- **Section 4** Proposed Wood Pole line route
- Existing N-Route to be retained
- Special area of conservation
- Bioshere reserve
- Site of special scientific interest
- Ancient woodland inventory site
- Raised bog inventory site

Source: SNH Datasets of protected sites in Scotland



0m 0.5km 1km 1.5km 2km

Figure 8.05 - Designated Sites - Area D



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Legend

Broad habitat types - Area A

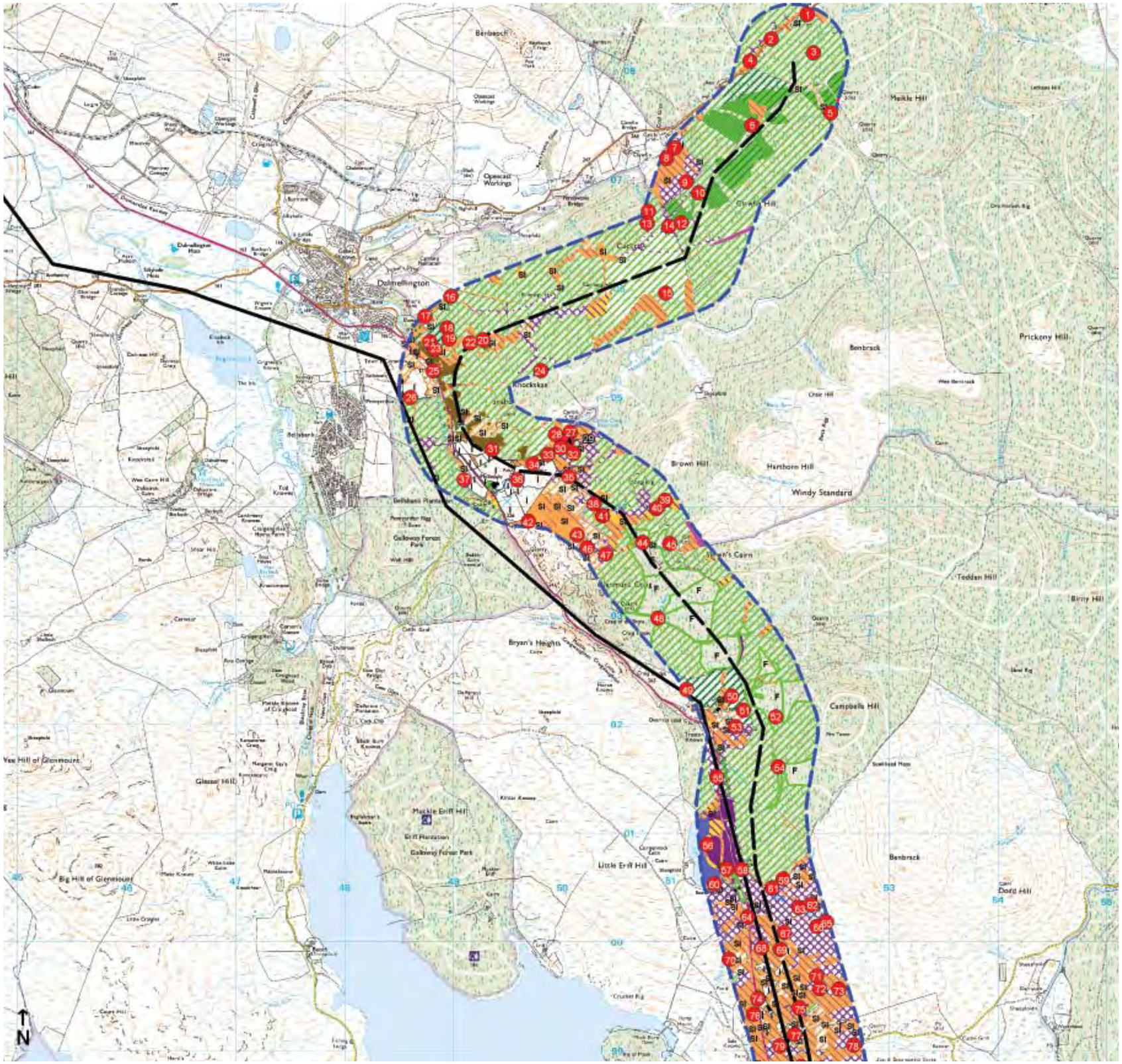
- Existing N-Route
- Proposed L7 Tower route
- Proposed Wood Pole line route
- 500m buffer

Broad habitat type

- Arable
- Bare ground
- Broad-leaved plantation
- Broad-leaved woodland
- Buildings
- Coniferous plantation
- Dense scrub
- Disused tip
- Enclosed grassland
- Mixed plantation
- Quarry
- Scattered broad-leaved trees
- Scattered scrub
- Standing water
- Unimproved grassland/moorland
- Wetland habitats

0m 0.5km 1km 1.5km 2km

Figure 8.06 - Broad Habitat Types - Area A



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Legend

Phase 1 Habitat survey results - Area B

- Existing N-Route
- Proposed L7 Tower route
- Proposed Wood Pole line route
- 500m buffer

Phase 1 Habitats:

- Broad-leaved semi-natural woodland
- Broad-leaved semi-plantation woodland
- Coniferous semi-natural woodland
- Coniferous plantation woodland
- Mixed semi-natural woodland
- Mixed plantation woodland
- Dense / continuous scrub
- Scattered broad-leaved trees
- Scattered coniferous trees
- Recently felled coniferous woodland
- Unimproved acid grassland
- Semi-improved acid grassland
- Semi-improved neutral grassland
- Improved grassland
- Marsh / marshy grassland
- Poor semi-improved grassland
- Continuous bracken
- Scattered bracken
- Tall ruderal
- Acid dry dwarf shrub heath
- Wet dwarf shrub heath
- dry heath / acid grassland mosaic
- Wet heath / acid grassland mosaic
- Blanket bog
- Wet modified bog
- Dry modified bog
- Acid / neutral flush
- Standing water
- Quarry
- Arable
- Amenity grassland
- Ephemeral / short perennial
- Buildings
- Bare ground

0m 0.5km 1km 1.5km 2km

Figure 8.07 - Phase 1 - Area B

8.3.2.2.2 Mixed Plantation

1 Within the South Kyle Plantation are several areas that have recently been clear-felled and replanted with mixed plantation, mainly dominated by silver birch (*Betula pendula*) and Scots pine (*Pinus sylvestris*). The ground flora is still relatively rich due to the open nature of the habitat at present, with Yorkshire-fog or tufted hair-grass often dominant, soft-rush, marsh thistle (*Cirsium palustre*) and rosebay willowherb (*Chamerion angustifolium*) frequent and sharp-flowered rush (*Juncus acutiflorus*), heather and ragwort (*Senecio jacobaea*) occasional.

8.3.2.2.3 Broadleaved Plantation

1 Silver birch, ash (*Fraxinus excelsior*) and rowan (*Sorbus aucuparia*) have been planted just to the east of Dame Helen's Castle. The ground flora reflects the habitat as it was before the trees were planted, and varies between neutral grassland dominated by Yorkshire-fog with frequent tufted hair-grass and occasional false oat-grass (*Arrhenatherum elatius*), and marshy grassland dominated by purple moor-grass with frequent mature heather and occasional blaeberry (*Vaccinium myrtillus*). A small area of broad-leaved trees has been planted at Glenmuck changing the habitat type from semi-acid grassland to developing plantation woodland.

8.3.2.2.4 Improved Grassland

1 Outside of the conifer plantation areas, a notable proportion of the study corridor, particularly around Mossdale, is comprised of improved grassland (used for sheep and cattle grazing). Perennial rye-grass is usually dominant with abundant white clover (*Trifolium repens*) and Yorkshire-fog. Other frequent species include annual meadow-grass, creeping soft-grass, timothy, common bent, creeping bent (*Agrostis stolonifera*), cock's-foot (*Dactylis glomerata*), creeping buttercup (*Ranunculus repens*), ribwort plantain (*Plantago lanceolata*), common mouse-ear (*Cerastium fontanum*), daisy (*Bellis perennis*) and broad-leaved dock (*Rumex obtusifolius*). Stands of common nettle (*Urtica dioica*), spear thistle (*Cirsium vulgare*) or soft-rush are frequent.

8.3.2.2.5 Semi-improved Acid Grassland

1 There are scattered areas categorised as semi-improved acid grassland within this Section, particular associated with unplanted open ground to the north-west of Glenmuck Craig, small patches of open ground within South Kyle Plantation and part of Dalmellington Town Common. The vegetation to the north-west of Glenmuck Craig is grazed by sheep and dominated by gramonids such as Yorkshire-fog, wavy hair-grass, mat-grass (*Nardus stricta*) and false oat-grass. Heath-rush (*Juncus squarrosus*) and deergrass (*Trichophorum cespitosum*) are frequent, with occasional tormentil and blaeberry.

2 Within the South Kyle Plantation the semi-improved acid grassland generally occurs within rides and along watercourses, where there is no canopy layer shading the grasses and forbs out. Yorkshire-fog is generally dominant with locally dominant common bent, locally abundant creeping soft-grass and wavy hair-grass, frequent tufted hair-grass, abundant tormentil and occasional heather and blaeberry.

3 The majority of Town Common within this section is also semi-improved acid grassland, grazed by cattle / sheep. Along with several grass species purple moor-grass is abundant, tormentil, blaeberry and common eyebright (*Euphrasia officinalis* agg.) frequent and common sedge (*Carex nigra*) and soft-rush occasional. Spignel is also locally frequent in this area.

8.3.2.2.6 Marsh / Marshy Grassland

1 Marshy grassland is a relatively frequent habitat type within unplanted areas of conifer plantation. This is often particularly associated with watercourses, where the dominant species is usually soft-rush, with associated species such as tufted hair-grass, sharp-flowered rush, marsh thistle, meadowsweet (*Filipendula ulmaria*), tormentil, marsh willowherb (*Epilobium palustre*) and various *Sphagnum* species.

2 Away from the watercourses, along rides and on open ground within the plantation, there are further patches of marshy grassland, some of which have a similar character to those described above, some of which are dominated by purple moor-grass with occasional soft-rush, frequent *Sphagnum* spp., occasional blaeberry, heather and tufted hair-grass.

3 There are also occasional areas of marshy grassland outside the plantation woodland, for example to the south-east of Clawfin, where there is a large area of marshy grassland dominated in part by rushes (sharp-flowered rush and soft-rush) and in part by purple moor-grass. Wavy hair-grass and tufted hair-grass are locally frequent in this area.

4 To the north-west of Glenmuck Craig there are patches of marshy grassland on the damper areas between acid and neutral grassland. Jointed rush (*Juncus articulatus*) is dominant with occasional flea sedge (*Carex pulicaris*), carnation sedge and bog asphodel (*Narthecium ossifragum*) and rare cross-leaved heath (*Erica tetralix*) and common butterwort (*Pinguicula vulgaris*).

8.3.2.2.7 Wet Heath

1 There are several small patches of wet heath within Section 2, mostly along rides and in open areas within the plantation woodlands. Heather and blaeberry are abundant, with frequent purple moor-grass, cross-leaved heath and hare's-tail cottongrass (*Eriophorum vaginatum*) and occasional *Sphagnum* spp.

8.3.2.2.8 Dry Heath

1 There is very little dry heath within this Section. The majority of this is along a small, rocky, steep-sided section of Trough Burn and is dominated by blaeberry with frequent heather.

8.3.2.2.9 Blanket Bog - Wet Modified Blanket Bog

1 A large amount of this Section was probably once blanket bog habitat, but the blanket bog vegetation has been heavily modified by the installation of forestry drainage ditches and the presence of coniferous plantations. There are several areas of blanket bog remaining within this Section, mainly within open areas of the plantation woodland. The peat depth is variable and is over 1m in some places.

2 Purple moor-grass is usually the dominant species, along with frequent hare's-tail cottongrass and tormentil, occasional heather, blaeberry, *Polytrichum commune*, heath bedstraw and *Sphagnum* spp. and rare cross-leaved heath, bog asphodel, sneezewort (*Ptarmica Achillea*), soft-rush and sharp-flowered rush.

8.3.2.2.10 Acid / Neutral Flush

1 There are few examples of acid flushes within this Section, most are identified within target notes as they are often to localised to map accurately. Common cottongrass (*Eriophorum angustifolium*), *Sphagnum compactum*, *Polytrichum commune* and *Pleurozium schreberi* are all frequent within these habitats.

8.3.2.2.11 Continuous Bracken

1 Continuous bracken covers several large areas of steeply sloping ground to the east of the main road near Dalmellington, where there are several minor watercourses flowing into the Muck Water from Kyle South Plantation. These areas have not been planted with conifers, probably due to the terrain, and bracken is dominant, shading out nearly all other species. Occasional stands have emerging young scattered broadleaved trees within them - e.g. planted ash, silver birch, downy birch (*Betula pubescens*), grey willow (*Salix cinerea*), rowan and hawthorn (*Crataegus monogyna*).

8.3.2.2.12 Notable Flora

1 Notable flora in this Section includes a tentative identification of woolly willow (*Salix lanata*) from desk study records, near Trough Burn to the north of Glenmuck Craig. Woolly willow is a UK BAP priority species and listed as Vulnerable under the IUCN Red List criteria ((IUCN Red List Categories and Criteria: Version 3.1, 2001). If verified this would be the first record for the region. It is a low shrub of damp base-rich mountain rock ledges and crags. Numbers have declined due to increasing grazing pressure by deer and sheep. Some populations have been reduced to single plants, and others lost altogether (Preston et al. 2002). The remaining populations are associated with high montane areas, focused on the Grampian Mountains.

2 A historical record of wood bitter-vetch (*Vicia orobus*) close to the proposed route of the OHL, also at Glenmuck Craig, was obtained during the desk study. This species is Nationally Scarce and is listed as Near Threatened on the GB Red List (Cheffings & Farrell 2005, updated 2006) and it is also on the Scottish Biodiversity List. Wood bitter-vetch is herb of grassy, often slightly base-enriched habitats on banks and the edges of fields, particularly amongst stones, boulders or bushes. It has been adversely affected by overgrazing and undergrazing, both of which have contributed to its decline (Preston et al. 2002).

3 Spignel, found during the Phase 1 habitat survey at Town Common (Dalmellington), is also Nationally Scarce and listed a Near Threatened species on the GB Red List (Cheffings & Farrell 2005, updated 2006) which is found in only a few localities in northern England and Wales and in Scotland populations are concentrated in Dumfries & Galloway, Perthshire and Angus.

8.3.2.3 Section 3 (Glenmuck to Dalshangan)

1 Extended Phase 1 habitat surveys were undertaken for Section 3 of the project (i.e. 15.7km long section of the proposed OHL from Glenmuck to Dalshangan and a 15.5km section of the existing N-Route OHL to be dismantled from Glenmuck

to Dalshangan). Requests were made to various organisations for any records of notable plant species. Details of non-confidential desk study findings are provided in Appendix C.3. Table 8.13 provides approximate total areas and percentage cover of each Phase 1 habitat type within this section. Phase 1 habitat map and target notes are shown on Figures 8.08 and 8.09.

Table 8.13 - Estimated Phase 1 Habitat Types within the Study Area for Section 3 of the project (i.e. within 500m of the route of the proposed OHL*)

Habitat Type	Area (ha)	% of Total
Wet modified bog	454.35	29.57
Coniferous plantation woodland	398.58	25.94
Marsh / marshy grassland	292.66	19.05
Semi-improved acid grassland	150.23	9.78
Semi-improved neutral grassland	78.88	5.13
Improved grassland	42.93	2.79
Continuous bracken	26.26	1.71
Recently felled coniferous woodland	24.42	1.59
Broad-leaved semi-natural woodland	13.44	0.88
Blanket bog	13.40	0.87
Broad-leaved plantation woodland	8.87	0.58
Standing water	6.32	0.41
Running water	6.31	0.41
Wet heath / acid grassland mosaic	5.33	0.35
Wet dwarf shrub heath	4.71	0.31
Mixed plantation woodland	4.22	0.27
Scattered broadleaved trees	2.03	0.13
Buildings	1.78	0.12
Acid dry dwarf shrub heath	0.40	0.03
Amenity grassland	0.39	0.03
Scattered bracken	0.27	0.02
Tall ruderal	0.17	0.01
Scattered coniferous trees	0.16	0.01
Dry modified bog	0.13	0.01
Dense scrub	0.08	0.01

**These figures can be taken as approximate values for the route of the existing OHL that would be dismantled as part of this project.*

8.3.2.3.1 Coniferous Plantation

1 The area extent of conifer plantation is much lower within this section in comparison to Section 2. The proposed OHL passes through part of the Brownhill plantation, just to the south of Glenmuck, before passing onto open moorland. There are two further areas of confer plantation that the route of the proposed OHL passes through at Brockloch Craig, where the plantation is at pole-stage, and then at the Carminnow Hill plantation, which is also at pole stage and dominated by Sitka spruce.

8.3.2.3.2 Broadleaved Plantation

1 The majority of the slope to the north of Glenmuck is young, recently planted broadleaved plantation of native species. Ash, alder (*Alnus glutinosa*), silver birch, downy birch and rowan are all present and vary in abundance throughout the area. Willow species are also occasional.

2 Due to the recently planted nature of the area the previous habitats are still evident. The area was a mosaic of marshy grassland dominated by purple moor-grass with frequent sharp-flowered rush and occasional soft-rush, wet modified bog dominated by purple moor-grass and semi-improved acid grassland with Yorkshire-fog, wavy hair-grass sweet vernal-grass, creeping bent and creeping soft-grass all frequent and varying in dominance.

8.3.2.3.3 Broadleaved Woodland

1 At the Green Well of Scotland there is an area of scattered mature broadleaved trees alongside the course of the Black Water, which is classified on the Ancient Woodland Inventory as a wood of ancient semi-natural origin. Species include sycamore, silver birch, oak and, most notably, aspen (*Populus tremula*), which is uncommon within the vice-county. There is also an area with a line of mature trees on the crest of an old river terrace; these trees stand in a heavy grazed area, which does not have any woodland associated ground flora.

8.3.2.3.4 Semi-Improved Neutral Grassland

1 Several areas of semi-improved neutral grassland can be found on the western side of the Study Area, north of the Carse of Deugh at Polquhanity and around Holm of Daltallochan. The majority of this grassland is used for cattle grazing. The dominant species varies but Yorkshire-fog, false oat-grass and sweet vernal-grass are often abundant, with frequent crested dog's-tail, clover spp., common bent, creeping bent, creeping buttercup and common sorrel, and occasional creeping thistle, soft-rush and common knapweed (*Centaurea nigra*).

2 The open habitat around Polquhanity contains many small patches of semi-improved neutral grassland in a mosaic with wet modified bog, occurring on the slightly higher areas of ground. Crested dog's-tail is abundant, with frequent creeping buttercup, white clover and occasional oval sedge (*Carex ovalis*) and creeping thistle (*Cirsium arvense*).

3 Semi-improved neutral grassland in an area adjacent to the Green Well of Scotland also supports a stand of spignel, which is a nationally-scarce species. Another notable species that occurs within this section, in an area close to Carsphairn, is meadow crane's-bill (*Geranium pratense*), which has scattered populations along roadsides. This species is uncommon in the county. (BSBI Dumfries & Galloway county recorder, 2008).

8.3.2.3.5 Semi-improved Acid Grassland

1 Small patches of semi-improved acid grassland are scattered throughout Section 3. The dominant species varies but red fescue (*Festuca rubra*), wavy hair-grass, sweet vernal-grass and mat-grass are often present, with frequent heath bedstraw and tormentil forming the main herbaceous element. Heath rush, creeping buttercup, common bent and purple moor-grass are also often occasional to frequent, with occasional stands of soft-rush.

2 There are also more extensive areas of semi-improved grassland, particularly around Brockloch Craig and Holm Hill, where wavy hair-grass, sweet vernal-grass and fescue sp. are the most abundant graminoids, with frequent heath bedstraw, tormentil, moss spp. and purple moor-grass and occasional heath rush, common bent and soft-rush.

8.3.2.3.6 Improved Grassland

1 There are several areas of improved grassland within Section 3 – near Brockloch, Holm of Daltallochan and along the Water of Deugh. These areas are sheep and cattle grazed and have a relatively low diversity of species.

8.3.2.3.7 Marsh/Marshy Grassland

1 There are extensive areas of marshy grassland within this Section, particularly in the open ground between Glenmuck and Brockloch, associated primarily with areas of former blanket bog and wet heath that have been heavily modified through grazing and artificial drainage. These heavily modified areas tend to be dominated by purple moor-grass which is often characteristic of wet modified bog, but when found on peat less than 0.5m is classified, in terms of the Phase 1 Habitat Survey methodology, as marshy grassland. In purple moor-grass dominated marshy grassland there are relatively few other species, but heath bedstraw and tormentil can be frequent, with occasional wavy hair-grass, tufted hair-grass, heather and cross-leaved heath and stands of soft-rush, jointed rush or sharp-flowered rush where the ground is wetter.

2 Other areas of marshy grassland, particularly along the edges of burns and in wetter areas of fields, are dominated by rush species – sharp-flowered rush or soft-rush - with frequent Yorkshire-fog, creeping buttercup and marsh thistle and occasional tormentil, sweet vernal-grass, meadow buttercup (*Ranunculus acris*) and marsh willowherb. In some places rushes and purple moor-grass can be co-dominant or form a mosaic.

8.3.2.3.8 Wet Heath

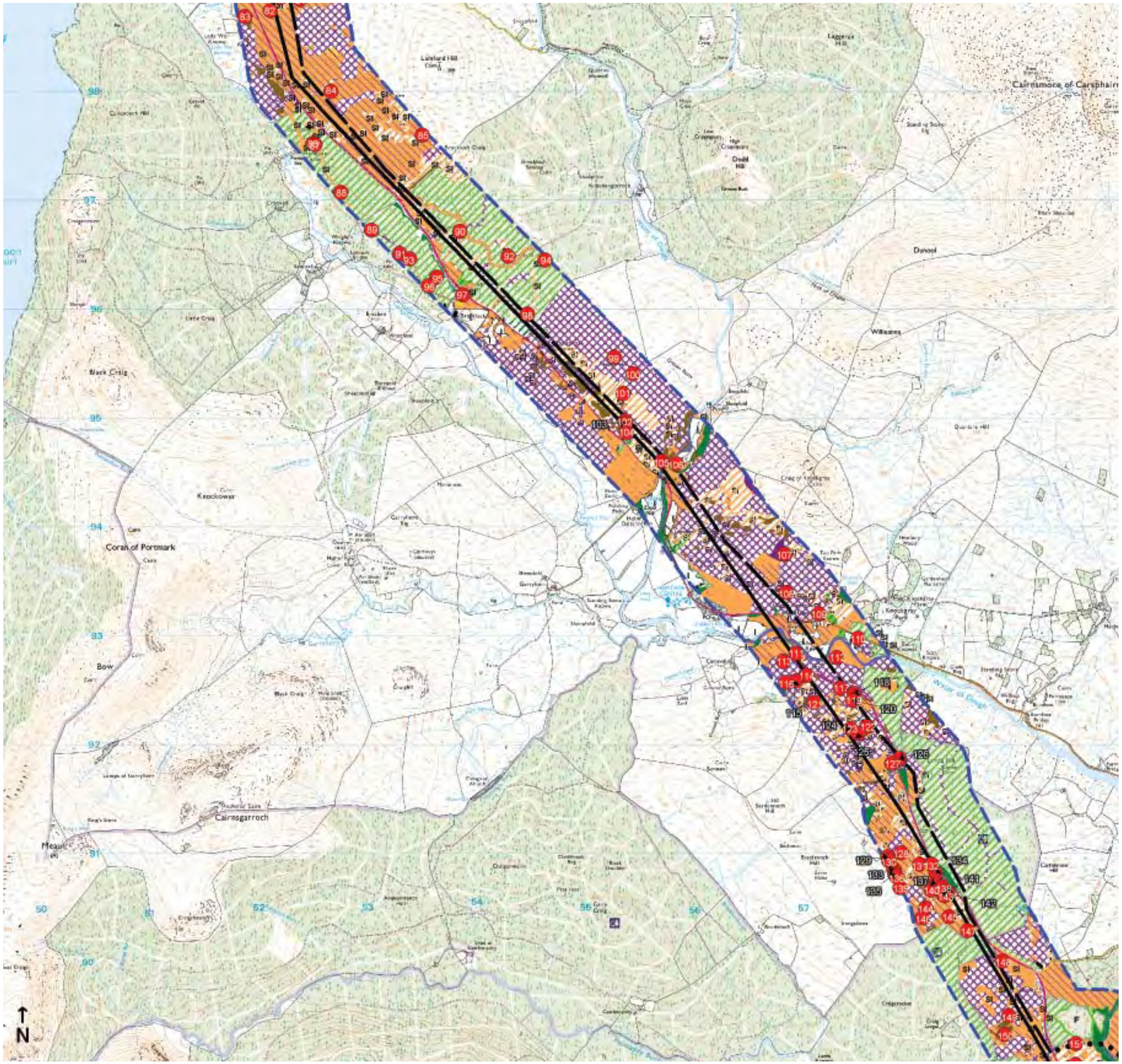
1 There are occasional, small areas of wet heath in Section 3, the largest being to the east of Loch Muck. This area has abundant heather and purple moor-grass, frequent blaeberry, heath rush and *Sphagnum* spp. and occasional tormentil and deergrass.

2 Other areas (e.g. NX 522 987 and NX 526 983) contain similar species, with heather, blaeberry and purple moor-grass usually abundant, deergrass, tormentil and Sphagnum spp. frequent and cottongrass spp. occasional.

3 The track through the conifer plantation to the north-east of Brockloch Cottage has wet heath / acid grassland mosaic either side, locally dominated by heather and Yorkshire-fog with frequent foxglove (*Digitalis purpurea*), common bird's-foot-trefoil (*Lotus corniculatus*), ribwort plantain and common knapweed.

8.3.2.3.9 Dry Heath

1 Dry heath only accounts for a very small proportion of this Section and only occurs either side of the main road at Glenmuck. Heather is dominant here, with occasional blaeberry and also stands of rosebay willowherb.



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Legend

Phase 1 Habitat survey results - Area C

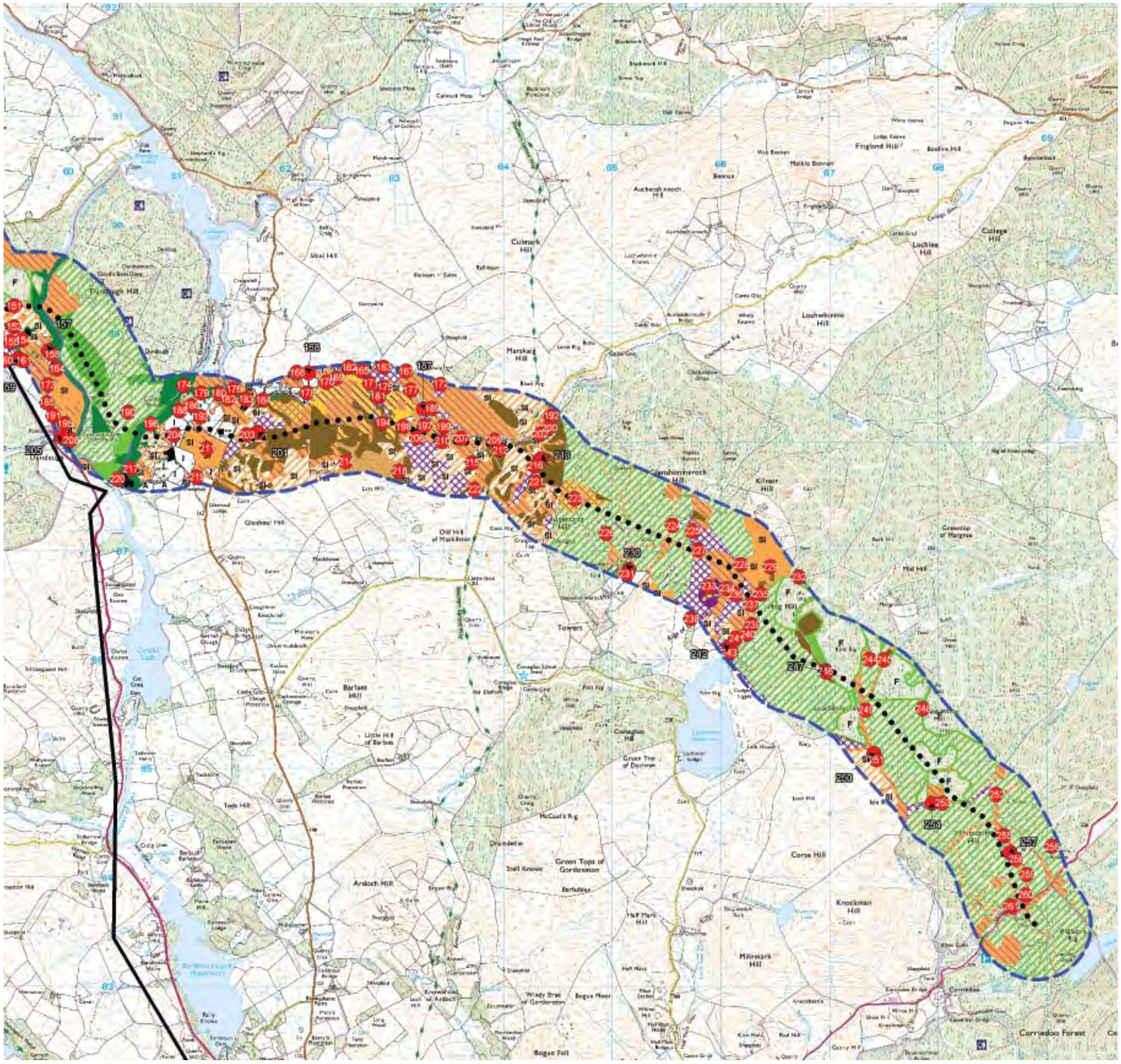
- Existing N-Route
- Proposed L7 Tower route
- Proposed Wood Pole line route
- 500m buffer

Phase 1 Habitats:

- Broad-leaved semi-natural woodland
- Broad-leaved semi-plantation woodland
- Coniferous semi-natural woodland
- Coniferous plantation woodland
- Mixed semi-natural woodland
- Mixed plantation woodland
- Dense / continuous scrub
- Scattered broad-leaved trees
- Scattered coniferous trees
- F — Recently felled coniferous woodland
- Unimproved acid grassland
- SI — Semi-improved acid grassland
- SI — Semi-improved neutral grassland
- I — Improved grassland
- Marsh / marshy grassland
- SI — Poor semi-improved grassland
- Continuous bracken
- Scattered bracken
- Tall ruderal
- Acid dry dwarf shrub heath
- Wet dwarf shrub heath
- dry heath / acid grassland mosaic
- Wet heath / acid grassland mosaic
- Blanket bog
- Wet modified bog
- Dry modified bog
- Acid / neutral flush
- Standing water
- Quarry
- A — Arable
- A — Amenity grassland
- Ephemeral / short perennial
- Buildings
- Bare ground

0m 0.5km 1km 1.5km 2km

Figure 8.08 - Phase 1 - Area C



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Legend

Phase 1 Habitat survey results - Area D

- Existing N-Route
- Proposed L7 Tower route
- Proposed Wood Pole line route
- 500m buffer

Phase 1 Habitats:

- Broad-leaved semi-natural woodland
- Broad-leaved semi-plantation woodland
- Coniferous semi-natural woodland
- Coniferous plantation woodland
- Mixed semi-natural woodland
- Mixed plantation woodland
- Dense / continuous scrub
- Scattered broad-leaved trees
- Scattered coniferous trees
- F Recently felled coniferous woodland
- Unimproved acid grassland
- SI Semi-improved acid grassland
- SI Semi-improved neutral grassland
- I Improved grassland
- Marsh / marshy grassland
- SI Poor semi-improved grassland
- Continuous bracken
- Scattered bracken
- Tall ruderal
- Acid dry dwarf shrub heath
- Wet dwarf shrub heath
- dry heath / acid grassland mosaic
- Wet heath / acid grassland mosaic
- Blanket bog
- Wet modified bog
- Dry modified bog
- Acid / neutral flush
- Standing water
- Quarry
- A Arable
- A Amenity grassland
- Ephemeral / short perennial
- Buildings
- Bare ground

0m 0.5km 1km 1.5km 2km

Figure 8.09 - Phase 1 - Area D

8.3.2.3.10 Blanket Bog

1 Several areas of relatively good quality blanket bog (i.e. with little evidence of modification displaying a good representative suite of bog plant species) were recorded in Section 3. There are a couple of small areas on the slopes of Craig of Knockgray, close to Carsphairn, but the majority occurs to the east Loch Muck. Deergrass is dominant, with frequent *Sphagnum* spp., cross-leaved heath, heather, hare's-tail cottongrass and blaeberry, and occasional purple moor-grass and round-leaved sundew.

8.3.2.3.11 Blanket Bog - Wet Modified Blanket Bog

1 There are extensive areas of wet modified blanket bog within this Section, forming a mosaic with the marshy grassland in the open areas between Polnaskie Bridge and Brockloch, and covering the majority of the open ground between Brockloch and Bardennoch. This habitat is usually dominated by purple moor-grass with occasional blaeberry, hare's-tail cottongrass, tormentil, *Sphagnum* spp., bog myrtle (*Myrica gale*), wavy hair-grass and deergrass, and rare bog asphodel.

8.3.2.3.12 Notable Flora

1 Occasional stands of spignel were found in the areas of marshy grassland to the south of Polquhanity. This species is Nationally Scarce and is listed as Near Threatened on the GB Red List for vascular plants (Cheffings & Farrell 2005, updated 2006).

8.3.2.4 Section 4 (Dalshangan to Blackcraig Windfarm Substation)

1 Extended Phase 1 habitat surveys were undertaken for Section 4 of the project (i.e. 12.4km long section of the proposed OHL from Dalshangan to the proposed substation for Blackcraig Hill windfarm at Corriedoo). Requests were made with various organisations for any records of notable plant species. Details of non-confidential desk study findings are provided in Appendix C.3. Table 8.14 provides approximate total areas and percentage cover of each Phase 1 habitat type within this section. The Phase I habitat survey map and target notes are shown on Figure 8.09.

Table 8.14 - Estimated Phase 1 Habitat Types within the Study Area for Section 4 of the project (i.e. within 500m of the route of the proposed OHL)

Habitat Type	Area (ha)	% of Total
Coniferous plantation woodland	471.09	37.22
Marsh / marshy grassland	210.36	16.62
Semi-improved acid grassland	114.32	9.03
Recently felled coniferous woodland	97.93	7.74
Wet modified bog	72.51	5.73
Continuous bracken	72.08	5.70
Semi-improved neutral grassland	45.26	3.58
Improved grassland	37.40	2.95
Broad-leaved semi-natural woodland	35.34	2.79
Wet heath / acid grassland mosaic	24.52	1.94
Mixed plantation woodland	20.50	1.62
Wet dwarf shrub heath	17.94	1.42
Scattered broad-leaved trees	12.24	0.97
Running water	7.03	0.56
Mixed semi-natural woodland	4.57	0.36
Dry heath / acid grassland mosaic	4.17	0.33
Coniferous semi-natural woodland	4.02	0.32
Blanket bog	3.11	0.25
Buildings	2.96	0.23
Arable	2.80	0.22
Scattered bracken	1.70	0.13
Unimproved acid grassland	1.14	0.09
Poor semi-improved grassland	0.98	0.08
Broad-leaved plantation woodland	0.78	0.06
Acid dry dwarf shrub heath	0.35	0.03
Standing water	0.25	0.02
Scattered coniferous trees	0.19	0.01
Dense / continuous scrub	0.06	0.00
Acid / neutral flush	0.05	0.00

8.3.2.4.1 Coniferous Plantation

1 The majority of the route of the proposed OHL in this Section passes through commercial conifer plantation. At the northern end of the section is Forestry Commission Scotland owned plantation associated with the Carse of Dundeugh and Dundeugh Hill. This is a relatively diverse plantation with a mixed age-class structure. There are sections of mature long-term retention plantation, recent replanted areas (including some broadleaved plantation) and thicket and pre-thicket stages of Sitka spruce dominated plantation.

2 The Margree Forest is privately owned and managed and extends from Glenshimmeroch Hill to the A702, which is adjacent to the Corriedoo plantation. The majority of this is Sitka spruce-dominated thicket stage plantation, with few other species and a very sparse ground layer due to dense shading from the trees. There are also several blocks which have recently been clear-felled and future use is not known.

3 The Corriedoo Forest, at the southern end of this Section, is owned by Forestry Commission Scotland and is managed for commercial timber production. The plantation is predominantly comprised of Sitka spruce. The route of the proposed OHL passes through blocks of pole stage and some thicket Sitka spruce. There are some areas of clear-fell. Further details on the age class structure and other aspects of this and other conifer plantation and woodland within the Study Area are provided in the Effects on Forestry Chapter (Chapter 6).

8.3.2.4.2 Semi-natural Broadleaved Woodland

1 Mature broadleaved woodland is not extensive in this or any section of the project Study Area but this section has the largest extent and best examples of this habitat with the Study Area for the project as a whole. Semi-natural broadleaved woodland accounts for c. 2.8% of habitats in the Section 4 survey area. Such woodlands tend to be associated with ravines where woods have been protected from felling and agricultural use. There are also a number of small stands of wood pasture in the vicinity of this section of the project (e.g. at Dalshangan and Glenhoul). The majority of the semi-natural woodland occurs along the banks of the Water of Ken and Water of Deugh.

2 The Carse of Deugh wood, which is on the Ancient Woodland Inventory as a wood of ancient semi-natural origin, is located close to the proposed route (i.e. under 1km) of the OHL. Tree species include Scots pine, pedunculate oak (*Quercus robur*) and sycamore (*Acer pseudoplatanus*), while the ground flora includes wood avens (*Geum urbanum*), creeping buttercup, common nettle, cleavers (*Galium aparine*), cock's-foot, bluebell (*Hyacinthoides non-scripta*), meadowsweet, bramble (*Rubus fructicosus* agg.), broad-leaved dock, greater stitchwort (*Stellaria holostea*), bugle (*Ajuga reptans*), wood-sorrel (*Oxalis acetosella*) and ivy (*Hedera helix*).

3 Silver birch is often dominant in areas of this habitat type within the survey area, mostly young but occasional very mature specimens, with frequent to locally dominant mature oak, locally abundant ash, occasional to locally abundant beech and occasional wild cherry (*Prunus avium*) and Scots pine. Rhododendron is frequent in the understorey around Kendoon Power Station and hazel (*Corylus avellana*) is occasional in the understorey north of Dalshangan, while goat willow (*Salix caprea*) and grey willow are occasional associates along the river banks themselves.

4 The ground layer contains a variety of species including sweet vernal-grass, tufted hair-grass, Yorkshire-fog, bluebell, tormentil, heath bedstraw, wild strawberry (*Fragaria vesca*), curled dock (*Rumex crispus*), broadleaved dock, common cow-wheat (*Melampyrum pratense*), thyme-leaved speedwell (*Veronica serpyllifolia*) and foxglove, some of which suggest fairly acidic ground conditions.

8.3.2.4.3 Semi-Improved Neutral Grassland

1 Several areas of species-rich semi-improved neutral grassland can be found in the fields south of Dalshangan, to the west of the Carse of Deugh. The majority of this grassland is used for cattle grazing and forms a mosaic with marshier areas. Yorkshire-fog is dominant with abundant crested dog's-tail, frequent hawkweed sp. (*Hieracium* sp.), occasional creeping buttercup, wild thyme (*Thymus polytrichus*) and red clover (*Trifolium pratense*). In drier areas species such as harebell and yellow-rattle are also occasionally present. Towards the southern end of the field there are frequent areas of marshy grassland and these are dominated by jointed rush and soft-rush, with a number of species more typical of wet heath / bog habitats, such as bog asphodel and common butterwort, occurring in the more waterlogged areas.

2 There are also several areas of semi-improved neutral grassland to the west of the B7000 as it passes through the survey area. These are also grazed and Yorkshire-fog is dominant with frequent to abundant perennial rye-grass, frequent creeping buttercup, timothy and white clover and occasional common nettle, soft-rush, self-heal (*Prunella vulgaris*), hop trefoil (*Trifolium campestre*), white clover and broadleaved dock.

3 An area of neutral grassland was found to the north-west of Hog Hill. Crested dog's-tail and sweet vernal-grass are frequent with occasional red fescue, sheep's fescue,

pignut (*Conopodium majus*) and common mouse-ear. There are also extensive stands of bracken and of soft-rush in places, giving a mosaic appearance to this area.

8.3.2.4.4 Semi-improved Acid Grassland

1 Semi-improved acid grassland accounts for c. 9% of the habitats within Section 4 of the survey area and is scattered throughout the Section.

2 The field to the north of Dalshangan is fairly species-rich and is mainly acidic in character but will some apparent mesotrophic influence. With abundant Yorkshire-fog, common bent, sheep's-fescue and sweet vernal-grass and frequent tormentil and heath bedstraw. Other species include occasional red clover, meadow buttercup, harebell (*Campanula rotundifolia*), ribwort plantain, common bird's-foot-trefoil, common sorrel, germander speedwell (*Veronica chamaedrys*), crested dog's-tail, wavy hair-grass and devils-bit scabious (*Succisa pratensis*), and rare whorled caraway (*Carum verticillatum*), pignut, field wood-rush (*Luzula campestris*), heath grass (*Dathonia decumbens*) and a hawkweed sp.

3 Also of particular note are areas of semi-improved acid grassland between the B7000 and the Glenshimmeroch plantation. These have been noted by the BSBI Vice-country recorder, along with the surrounding mosaic of habitats, as being particularly species-rich. The species composition varies somewhat in the different patches of grassland but mat-grass, wavy hair-grass, red fescue and Yorkshire-fog are all frequent, with tormentil, heath rush, deergrass, purple moor-grass, heath bedstraw, sheep's fescue and sweet vernal-grass.

8.3.2.4.5 Improved Grassland

1 There are several heavily grazed fields to the west of the Water of Ken which have relatively low species diversity. Dominance varies between perennial rye-grass and crested dog's-tail, with abundant white clover and Yorkshire-fog, frequent creeping buttercup, locally abundant creeping thistle and occasional daisy (*Bellis perennis*) and common mouse-ear.

2 The remainder of the improved grassland within Section 4 occurs in a mosaic with marshy grassland along the north bank of the Black Water, just west of the B7000. These areas are again heavily grazed, with locally abundant red fescue, locally abundant crested dog's-tail, frequent sweet vernal-grass, white clover and creeping buttercup and stands of soft-rush.

8.3.2.4.6 Marsh / Marshy Grassland

1 Marshy grassland accounts for c. 16.5% of the habitats by area recorded within the Section 4 survey area.

2 In the fields at Dalshangan the marshy grassland is fairly species-rich and forms a mosaic with drier acid and neutral grassland habitats. This is mainly dominated by sharp-flowered rush with locally abundant meadowsweet, frequent soft-rush, tormentil, occasional carnation sedge, marsh cinquefoil (*Potentilla palustris*), devils-bit scabious, common bent and sweet vernal-grass and rare self-heal, wild angelica (*Angelica sylvestris*), marsh thistle, marsh willowherb, whorled caraway, marsh violet (*Viola palustris*) and Sphagnum palustre.

3 Marshy grassland is also frequent in a mosaic with other habitats between the B7000 and Glenshimmeroch Plantation. This area has been noted by the BSBI Vice-country recorder as being species-rich. The majority of these patches are dominated by purple moor-grass with frequent tormentil, locally frequent hare's-tail cottongrass, blaeberry, cross-leaved heath and occasional tufted hair-grass, Sphagnum spp., heather and heath rush. Jointed and sharp-flowered rush can also be frequent in this habitat, and some patches are dominated by these with little or no purple moor-grass.

4 In addition, many of the rides and open spaces within the Sitka spruce plantations are marshy grassland, dominated by either purple moor-grass or rush species, with frequent marsh thistle, tormentil and Yorkshire-fog.

8.3.2.4.7 Dry Heath

1 There is little dry heath within this Section and it all occurs in a mosaic with acid grassland. Heather and bell heather are frequent, with red fescue, wavy hair-grass, mat-grass, sweet vernal-grass and bracken forming the main components of the habitat.

8.3.2.4.8 Wet Heath

1 Wet heath is occasional within the area east of the B7000 identified as particularly species rich by the local BSBI Recorder. Heather is generally dominant with abundant purple moor-grass, frequent deergrass and heath rush and occasional cross-leaved heath, bog asphodel, blaeberry, common lousewort (*Pedicularis sylvatica*) and tormentil.

2 It also occurs within this area in a mosaic with acid grassland. Species composition for the heath component is similar to that above, with frequent sheep's fescue and red fescue.

8.3.2.4.9 Blanket Bog - Wet Modified Bog

1 Relatively small areas of wet modified blanket bog were recorded in this Section, the largest at NX 638 878 and NX 657 867. The bog has been modified by sheep grazing and the installation of drainage ditches. This habitat is characterised by species such as dominant purple moor-grass, abundant deergrass, occasional hare's-tail cottongrass, *Sphagnum* spp., tormentil, heath rush and wavy hair-grass.

8.3.2.4.10 Bracken

1 There are frequent stands of continuous bracken within Section 4, the majority in the open ground between the B7000 and Glenshimmeroch Plantation. This shades out nearly all other species in the area and is encroaching on the surrounding habitats.

8.3.2.4.11 Notable Flora

1 Surveys carried out for this project identified the presence of spignel in several locations (NX 59568 88747, NX 59231 87917, NX 59144 87729, NX 59071 87724, NX 67497 86000). The vice-county recorder also provided records of spignel in many locations in the area. See Appendix C.3 for details. Spignel is a Nationally Scarce species.

2 Populations of fragrant orchid were found in several locations during the Phase I habitat survey (NX 59815 88827, NX 59843 88809, NX 59873 88740). It is associated with dry and moist chalk and limestone grasslands, limestone pavement, less acidic heaths, and wetter habitats such as base-rich fens. It also grows in quarries and railway banks. It has declined throughout its range, probably due to habitat destruction, ploughing of pastures and drainage (Preston et al. 2002).

3 Field gentian (*Gentianella campestris*) has been recorded at Dalshangan Also of note, from vice-county Recorder records within the Study Area, are mountain pansy (*Viola lutea*) at Knockman Hill to the north of Corriedoo, pale butterwort (*Pinguicula lusitanica*) in the Barlaes-Mackilston Hills and Nether Cleugh. This general area is noted for its mineral enriched strata, and associated variability in soil conditions, resulting in an unusual mosaic of species-rich grassland including species associated with acid, mesotrophic and calcareous grassland communities.

4 The nearby Cleugh SSSI, to the northwest of Carsfad Loch, is an area of unimproved grassland that supports a number of species of relatively high conservation concern such as frog orchid (*Coeloglossum viride*), lesser butterfly-orchid (*Platanthera bifolia*) and greater butterfly-orchid (*Platanthera chlorantha*).

8.3.3 Watercourses, Waterbodies and Fish

8.3.3.1 Study Area Overview

1 The route of the proposed OHL passes through the catchments of the Dee (within Dumfries & Galloway) and the River Doon (in East Aryshire). The principle watercourses within the Study Area for the proposed OHL route are, from north to south, the River Doon, Cummock Burn, Muck Water (tributaries of the River Doon), the Water of Deugh and the Water of Ken, Black Water and Margree Burn (all of which are within the River Dee catchment). There are a large number of minor tributary streams within the Study Area associated with each of these main watercourses. The main waterbodies within or near to the proposed OHL route, are Bogton Loch, Loch Doon, Loch Muck, Carsfad Loch, Lochinvar and Loch Howie. Further details on the characteristics of these waterbodies are provided in the Chapter 11 (Hydrology).

2 The River Doon catchment, particularly downstream of the dam for the Galloway hydro-electric station at Loch Doon, supports Atlantic salmon and sea trout populations and has been designated as important for salmonids under the EC Freshwater Fish Directive (Council Directive 78/659/EEC on the quality of fresh waters needing protection or improvement in order to support fish life). The main tributaries of the River Doon within the Study Area for the proposed OHL have also been noted as important for salmonids (e.g. the Cummock Burn and Muck Water).

3 Loch Doon is designated as a SSSI with one of the main qualifying interests being an important population of Arctic charr (*Salvelinus alpinus*). This is the last known population in south-west Scotland and it is thought to be genetically distinct from other populations in the UK, the nearest of which are in Argyll and Cumbria (SSSI citation). Arctic charr is a salmonid and similarly to salmon and trout they spawn in late autumn and winter. They generally lay eggs in the gravel along the shores of lochs, but will occasionally spawn in burns and streams flowing into lochs. Arctic charr is a priority species in the UK BAP, with an unfavorable conservation status

due to a range of factors including global warming, land use changes and species introductions.

4 In addition to the salmonid interest, freshwater pearl mussels (FWPM) are known to have been common in the Doon catchment in the historical past. FWPM are of high conservation concern (as a priority species in the UK BAP and species of European conservation interest) and are legally protected in the UK. As part of a national survey the River Doon was surveyed in five locations, and it was concluded at that time that the FWPM population was functionally extinct with little or no recruitment occurring (SNH, 1997). A more recent survey of the River Doon was undertaken in 2007 and 2008 by Ayrshire Rivers Trust. FWPM populations were found at several locations on the River Doon, all of which are several kilometres downstream from the proposed OHL route and are believed to be downstream of the points at which the existing OHL to be dismantled crosses the River Doon. The surveys completed to date also indicate that there is limited or no recruitment of juvenile mussels and that these populations are reproductively defunct.

5 SEPA has implemented a new water monitoring and classification system for all rivers, lochs, transitional, coastal and groundwater bodies in Scotland. The system has been developed to monitor the primary objective of the EC Water Framework Directive (Directive 2000/60/EC), which is for all waterbodies to be of 'good ecological status', or similar, by 2015. The monitoring methods include measuring a range of biological quality indicators, along with measurements of chemistry, hydrology (changes to levels and flows) and morphology (changes to the shape and function of water bodies). The ecological status of all waterbodies within the Study Area, where there is data available, was obtained from SEPA's online Interactive Map for the draft River Basin Management Plans (http://gis.sepa.org.uk/rbmp/ - accessed in November 2009).

6 The ecological condition of the River Doon and the Muck Water is considered to be generally poor (classified by SEPA as 'bad' or 'poor' ecological potential in the Draft River Basin Management Plan) due to a range of issues, principally associated with pollution from diffuse agricultural run-off, acidification, artificial river modification, flow regulation (e.g. hydro-electric dams) and abstraction. The Cummock Burn has been classified by SEPA as being in 'good' condition (see Appendix C.8 for further details).

7 Within the Dee catchment, the Water of Ken and the Water of Deugh have also been designated as important for salmonids under the EC Freshwater Fish Directive. Although the Water of Ken is a tributary the Dee catchment is often termed the 'Dee-Ken system' due to the important influence of the Ken within the catchment. Similarly to the River Doon, much of the Dee-Ken system is affected by flow regulation for hydro-electric generation. Although migratory salmonids have been recorded within Loch Ken the watercourses upstream from Ken Doon are noted particularly for their important resident brown trout populations (in particular the Water of Deugh).

8 The ecological condition of the Dee-Ken watercourses along the route of the proposed OHL is considered to be 'bad' to 'poor' under SEPA's current classification system. The primary reasons are similar to the factors affecting the Doon catchment, i.e. flow regulation for hydro-electric generation, diffuse agricultural pollution, acidification, abstraction and artificial modification (including weirs and dams that prevent free movement of migratory fish species).

9 Details of commercial fishery and angling interests within the Study Area are provided in Chapter 11 (Hydrology) and Chapter 12 (Tourism & Recreation).

10 Details of all proposed watercourse crossings (including temporary crossings proposed for access to the existing and proposed OHL towers / pole positions) are provided in Appendix C.9 along with further desk study derived information on ecological condition.

8.3.3.2 Salmonids

1 The following is a general summary of information on salmonid fish populations in the Study Area and wider connected catchments. The focus is on Atlantic salmon, sea and brown trout, because of the high conservation status of these species (both a priority UK BAP species) and their importance as indicators of favorable ecological condition of waterbodies (Arctic charr, another salmonid fish species, are mentioned briefly in the preceding section and are not covered further here). Information is drawn from the published Fisheries Management Plans for the River Doon catchment and Dee-Ken system.

8.3.3.2.1 Juvenile Salmon

1 An account of GFT surveys of the Dee catchment is provided in the Dee Fisheries Management Plan (2007). This shows that suitable available habitat for juvenile salmon is present, which is not currently being used by juvenile salmon at present, particularly in the upper catchment. The number of surveyed sites with high densities (i.e. available habitat nearly saturated, > 20 fry and > 10 parr per 100 m^2 of water) is limited to four sampled sites within the Dee catchment. These four sites / areas are sections of the Coom Burn, Craigshinnie Burn, lower River Dee and Glenlee Burn. All other areas of the catchment accessible to salmon (up to Kendoon) are at a moderate density or less, with salmon in low densities or absent in substantial areas, particularly in the west of the catchment.

2 A habitat survey of the upper Doon catchment undertaken by ART, and corresponding water quality data, suggests that the upper catchment does not currently provide ideal habitat for juvenile salmon due to low pH levels and the slow flow of some of the major tributaries. In order to boost the potential of the Upper Doon as a fishery, ongoing stocking of salmon fry is thought to be necessary (ART Habitat Survey, 2004). ART have reported finding wild spawned salmon juveniles upstream of the Loch Doon dam but also that the upper catchment does not currently provide ideal habitat for juvenile salmon (ART Newsletter, October 2007).

8.3.3.2.2 Adult Salmon

1 Atlantic salmon is a species of high conservation concern. It is listed on Annexes II and IV of the EC habitats Directive and on Schedule 3 to UK Habitats Regulations 1994. It is a priority species for conservation within the UK BAP and is also on the Scottish Biodiversity List. Atlantic salmon is a qualifying interest of the River Spey SAC.

2 The recorded angling catches of all adult salmon (including grilse) from Fisheries Research Services (FRS) catch data for the Dee are very low over the last few years, being below 100 per year in all of the last 6 years (lowest was 20 in 2003, data up to 2007). Also, according to this data, many were retained (however this was less the case in 2007 – 39% of salmon and grilse retained) and therefore did not remain in the river to spawn. Salmon fishing is now limited to the lower River Dee fishing beats within the Dee catchment (Dee Plan, 2007).

3 The Dee Plan (2007) provides figures over the last five years of upstream migration, based on data from Tongland fish pass (NX 70 54), which indicate over 300 fish (not all necessarily salmon) in all years and a maximum of 621 in 2006. The 2007 total for salmon ascending the fish ladder was 1048, although this was after the installation of a new counter which complicates comparisons with earlier data. Overall, these are relatively low total numbers of salmon returning to spawn, particularly given a further adjustment for the number which are caught and retained by anglers. Further details are available in the Dee Plan (2007).

4 In the River Doon, salmon fishing is more widespread than in the Dee, along the length of the river, but particularly in the lower to middle sections. The Upper Doon catchment's salmon population is low and probably limited by a variety of current issues (e.g. acidification associated with commercial forestry land management). The largest proportion of salmon production in the Doon is thought to be from the main river channel. Data from a fish counter at Loch Doon dam is collected by ART. The total number of fish going upstream from October 2004 to March 2006 was 336, though not all of them may be salmon. This figure is also thought to be inaccurate due to some counts not being genuine (due to e.g. debris or otters) and problems with the counter. These numbers are particularly low but, as a proportion, the numbers of spawned and returning fish moving back downstream in the same period is good (91). In 2007, a new fish counter was installed by Scottish Power Generation Ltd at Loch Doon dam which is likely to be significantly more accurate. With the new counter, from end of June 2007 to end of September 2008 a total of 49 adult salmon were recorded moving upstream through the dam and 17 downstream. During the same period, the total up was 242 and down was 110; these totals include trout and possible sea trout as well as salmon.

8.3.3.2.3 Trout

1 Brown (*Salmo trutta fario*) and sea trout (*Salmo trutta trutta*) is a priority species in the UK BAP. The Dee Plan (2007) notes that there is a lack of data on sea trout, other than historical information which suggests good sea trout stocks in the past in parts of the Dee catchment, particularly the Black Water of Dee. Numbers of sea trout caught in the Dee catchment are now extremely low.

2 Brown trout populations in the Dee catchment are thought to be fairly healthy with populations present in most watercourses. However, parts of the upper catchment have low densities, thought to be due to the effects of acidification. Further information on brown trout fisheries is provided in the Dee Plan (2007).

3 Trout populations in the Doon Catchment can be virtually separated into two locations, downstream of the Loch Doon Dam and the upper catchment. The cause for this division is the number of obstacles deterring migratory fish from reaching the

upper catchment. The largest, most productive tributaries for trout (mainly thought to remain as brown trout) in the upper Doon catchment are the Culroy Burn, Muck Water and Cumnock Burn (ART electrofishing report, 2007). These tributaries of Loch Doon support healthy densities of adult trout and support trout spawning.

8.3.3.2.4 Lamprey Species

1 Sea lamprey (*Petromyzon marinus*) are present in the River Doon and are likely to breed in suitable aquatic habitats within the catchment. Sea lamprey is included on Annex II of the EC Habitats Directive as such this is a species of community interest whose conservation requires the designation of special areas of conservation. Sea lamprey are also listed in Appendix III to the Bern Convention, whereby parties are prohibited from using indiscriminate means of capture and killing capable of causing the disappearance of, or serious disturbance to, the species. Sea lamprey is also UK BAP priority species.

2 River and / or brook lamprey (*Lampetra fluviatilis* and *L. planeri*, respectively) are present within the River Doon and are recorded as "common". River lamprey is a priority UK BAP species and is listed on Annex V of the EC Habitats Directive, as a species of community interest its taking in the wild and exploitation may be subject to management measures.

3 No information has been found relating to the presence of lamprey within the Dee catchment, although they are known to be present in nearby catchments.

8.3.3.3 Section 1 (Smithston to Glenmuck)

1 The existing OHL crosses a number of watercourses within the River Doon catchment. These include the River Doon (at 4 locations), the Smithston Burn, Polnessan Burn, Meikleholm Burn, Kiers Burn, Red Burn, the Muck Water and a number of smaller un-named watercourses. The River Doon enters the Study Area at Smithston (Grid Ref. NS 410 126) and flows in a southern direction through this section. It passes through areas of semi-improved grassland used principally for sheep grazing. The river passes through one urban environment at Patna, before entering Bogton Loch SSSI at NS 465 057. The river emerges from Loch Doon, outwith the Study Area.

2 The River Doon enters the survey area at NS 411 126 and empties into Bogton Loch at NS 464 058. The NBN Gateway provided records for brown trout, sea trout, rainbow trout (*Oncorhynchus mykiss*), pike (*Esox lucius*), common eel (*Anguilla anguilla*), beared stoneloach (*Barbatulla barbatulla*), perch (*Perca fluviatilis*), minnow (*Phoxinus phoxinus*), three-spined stickleback (*Gasterosteus aculaetus*) and salmon (*Salmo salar*) within this area (i.e. within 10km squares NS 41 and NS 40).

3 This section includes the most important area of interlinked wetland habitats within the project Study Area. Wetland habitat is centred on Bogton Loch, within the floodplain of the River Doon. Bogton Loch is designated as a SSSI and is one of only two open water transition fens in Ayrshire. Bogton Loch SSSI includes an area of open freshwater and associated wetland plant communities to the south (i.e. comprising swamp, tall-herb fen, mire and willow carr communities). The existing OHL passes approximately 200m to the north of the northern edge of Bogton Loch. Although it is outside of the SSSI boundary it passes through habitats that are hydrologically linked to Bogton Loch and also to the associated area of raised bog within the Dalmellington Moss SSSI, which is approximately 200m to the north of the OHL.

4 Dalmellington Moss SSSI comprises of an area of raised bog with a lagg fen. The raised bog is one of the best examples of its type in East Ayrshire, supporting a number of locally rare or uncommon bog plant species, notably great sundew (*Drosera anglica*), bog rosemary (*Andromeda polifolia*), and white beak-sedge (*Rhynchospora alba*). Adjacent to the raised bog, outside of the SSSI boundary, is an area of mesotrophic (i.e. neither nutrient-poor nor nutrient-rich) valley mire with stands of reed canary-grass (*Phalaris arundinacea*) and sedges, and areas of willow-birch carr.

8.3.3.4 Section 2 (Meikle Hill to Glenmuck)

1 The principle watercourses within this section of the project are the Cummock Burn and the Muck Water, both are considered to be particularly productive for brown trout. The Cummock Burn is the only watercourse within the Study Area for the proposed OHL currently with a 'good' ecological condition classification (SEPA classification). The Muck Water rises in the hills to the east of Glenmuck and flows in a north-westerly direction through the town of Dalmellington, passing through Dalmellington Moss before joining with the River Doon. The Cummock Burn rises in hills within South Kyle Forest, passes to the north of the settlement of Dalmellington and joins the Muck Water just before the confluence with the River Doon (at NS 467 061).

2 The proposed OHL route crosses a number of minor watercourses within this Section, all of which are within the River Doon catchment, including several minor tributaries of the Cummock Burn, and the Parrie Burn, Mossdale Burn and the Muck Water at Glenmuck.

3 The Parrie Burn rises within the survey area at NS 502 058 and empties into the Muck Water at NS 488 053. The NBN Gateway provided records for brown trout, sea trout, common eel, salmon, within this area (i.e. within square NS 50). There are no specific records from the GFT Survey 1997-2004 for this watercourse.

4 The Mossdale Burn rises within the survey area at NS 522 061 and empties into the Muck Water at NS 493 040. The GFT have historic records of brown trout, pike, stoneloach, minnow and three-spined stickleback. The NBN Gateway provided records for brown trout, sea trout, common eel, salmon, within the area (i.e. within square NS 50). There are no specific records from the GFT Survey 1997-2004 for this watercourse.

5 The Muck water enters the survey area at NS 476 057 and empties into the Loch Muck at NS 512 012. The NBN Gateway provided records for brown trout, sea trout, common eel and Atlantic salmon for this area (i.e. within square NS 50).

6 Corbie Craig Reservoir (NS 501 047) is the only notable area of standing water within this section of the project.

8.3.3.5 Section 3 (Glenmuck to Dalshangan)

1 This Section of the Study Area is primarily within the catchment of the Ken (within the Dee-Ken system). A small part of the northern end of the section is routed through an area that is within the catchment of the River Doon (between Glenmuck and Lamford), however, there are no notable watercourses crossed by the route in this area. The main watercourse in this Section is the Water of Deugh. The proposed and existing OHLs cross this watercourse twice, to the north and south of Carsphairn. The Polquhanity Burn is also crossed, by the route of the existing and proposed OHLs, close to the southern end of this Section at Dalshangan.

2 Carsphairn Lane enters the survey area at Drumjohn Power Station and empties into the Water of Deugh at the town of Carsphairn. Despite providing salmonid fish habitat this watercourse is not accessible to salmon or sea trout due to the weir at Earlstoun Power station. There are no specific records from the GFT Survey 1997-2004 for this watercourse.

3 The Water of Deugh enters the survey area at the Green Well of Scotland and terminates at the Kendoon Reservoir. The river, with deeper substrates and higher energy flows, offers good habitat for parr-aged fish. The GFT have historic records of brown trout, pike, stoneloach, minnow and three-spined stickleback. In addition to this the GFT electrofishing survey of 1997-2004 found salmon present in the upper stretches of the Water of Deugh at six locations. Both adult and parr trout were found at the same locations. One parr trout was found at a location near the Bow Burn and Brownhill Burn. Trout parr were recorded at one location on the Shalloch Burn, one of the tributaries of the Water of Deugh outwith the survey area. The NBN Gateway provided records for brown trout, sea trout, rainbow trout, pike, common eel, beared stoneloach, perch, minnow, carp bream (*Abramis brama*), brook charr (*Salvelinus fontinalis*) and three-spined stickleback within this area (i.e. within square NX 69).

4 The Benloch Burn enters the survey area at NX 578 954 and empties into the Water of Deugh at NX 561 951. The NBN Gateway provided records for brown trout, sea trout, rainbow trout, pike, common eel, beared stoneloach, perch, minnow, three-spined stickleback and salmon within squares NX 59. The Galloway Fisheries Trust (GFT) Survey 1997-2004 has records for adult trout and trout parr at one location on the Benloch Burn, however there are no records of salmon.

8.3.3.6 Section 4 (Dalshangan to Blackcraig Windfarm substation)

1 This section of the project is within the Ken catchment. The proposed route crosses the Water of Deugh (this is the third crossing of this watercourse by the proposed OHL route within the project as a whole), the Water of Ken, and the Margree burn (as well as several small un-named watercourses). Flows on both the Water of Ken and the Water of Deugh are regulated as part of the Galloway Hydro-electric Scheme.

2 The Water of Ken runs through the survey area from Arndarroch to Cleughbrae. The waters above the Kendoon Reservoir offer suitable gravel habitats for spawning or juvenile fish however the dam at Kendoon does not have a fish pass thus preventing migratory salmon from entering the upper reaches of the Water of Ken. The area between Kendoon and Carsfard Loch also provides good spawning habitat for fish and the Earlstoun Dam has a fish pass allowing salmon to migrate into this stretch. The GFT have historic records of brown trout, pike, stoneloach, minnow and three-spined stickleback in this area and Artic charr have been recorded in Carsfard Loch.

The GFT Survey 1997-2004 recorded trout parr at one location with the confluence of Nethercleugh Burn. In addition to this the NBN Gateway provided records for brown trout sea trout, rainbow trout, pike, common eel, beared stoneloach, perch, minnow, carp bream, brook charr, three-spined stickleback and salmon within square NX 68.

3 The Polmaddy Burn enters the survey area at NX 581 883 and empties into the Water of Deugh at the Carse of Dundeugh. Despite the presence of waterfalls and a significant temperature change between lower and upper reaches migratory fish may be able to access upper areas. The watercourse is described as having good in-stream habitats however due to the creation of dense forest the watercourse may suffer from acidification. The GFT have historic records of brown trout, pike, stoneloach, minnow and three-spined stickleback in this area. The GFT Survey 1997 recorded adult trout in five locations on the Polmaddy Burn and trout parr at six locations. In addition to this salmon was recorded at one location.

4 The Black Water enters the survey area the Achenshimmeoch Bridge and empties into the Water of Deugh at Glenhoul Gorge. The burn is characterised by steep waterfalls, which would present a natural barrier to migratory fish, although the burn does provide good juvenile salmon habitat. The GFT have historic records of brown trout, pike, stoneloach, minnow and three-spined stickleback in this area. The GFT Survey 1997-2004 recorded both adult trout and trout parr at one location on the Black Water. In addition to this the NBN Gateway provided records for brown trout, sea trout, rainbow trout, pike, common eel, beared stoneloach, perch, minnow, carp bream, brook, three-spined stickleback and salmon within square NX 68 (some of these species will be associated with lochs within this 10km grid square).

5 A small section of the Garple Burn (named the Margree Burn in its upper reaches) lies within the survey area in section four. It enters the Study Area at NX 675 833 and leaves at NX 669 820. Access to the upper reaches off the stream is prevented by the waterfall at Holy Linn. The GFT have historic records of brown trout, pike, stoneloach, minnow, three-spined stickleback and roach in this area. The GFT electrofishing survey 1997-2004 recorded trout (both adult and parr) in three locations along the Garple Burn. No salmon was recorded in this survey.

8.3.4 Non-avian Protected Fauna

8.3.4.1 Section 1 (Smithston to Glenmuck)

1 For this section of the project, which relates to the dismantling of the existing transmission line from Glenmuck to Smithston, no field surveys were undertaken. All information on terrestrial fauna has therefore been drawn from desk study. Prior to undertaking any dismantling works walk over surveys will be undertaken to identify any protected species.

8.3.4.1.1 Badger

1 No records of badger were obtained for this Section of the project. However, the presence of extensive suitable habitat within the largely low-lying agricultural landscape of Section 1 indicates that populations are likely to be present.

8.3.4.1.2 Otter

1 The NBN Gateway includes historical records of otter for this Section, at 10km square resolution (NS 40) and 100m square resolution (NS 434 088 and NS 462 060), although the most recent records are from 1991. Details of non-confidential desk study records are provided in Appendix C.3. In summary, historical desk study records of otter in the area (associated with the River Doon, Cummock Burn and Mossdale Burn) and the general presence of good quality habitats for otter generally in the River Doon catchment, suggest it is likely that otter are currently active within suitable habitats in this section of the project.

8.3.4.1.3 Bat Species

1 The NBN Gateway provided bat records for 10km square NS 40, NS 41 and NS 42. Common pipistrelle (*Pipistrellus pipistrellus*) bats have been identified within Square NS 41 however the exact location at Croyton and Hillhead are just outwith the Study Area. Common pipistrelle have also been identified near Dalmelington and Patna. There are records of soprano pipistrelle (*Pipistrellus pygmaeus*) at 1km resolution (NS 48 05). Of particular note are records of Natterer's bat (*Myotis nattereri*) at 10km resolution (NS 40) and 100m resolution (NS 446 083) near Dunaskin Bridge, which is c. 1km north of the existing OHL which is to be dismantled. In summary, historical desk study data suggest the presence of common pipistrelle, soprano pipistrelle and Natterer's bat populations within this section.

8.3.4.1.4 Water Vole

1 The NBN Gateway holds a record of water vole for 10km square NS 40, although this is a historical record from between 1736 and 1959.

2 This area is considered to include some suitable habitat for this species, in particular areas associated with the floodplain wetlands and marshy grasslands of the River Doon valley. Water vole habitat requirements, in lowland situations, typically include appreciable areas if riparian vegetation, as foraging habitat, adjacent to slow flowing relatively deep watercourses with suitable soft banks for burrowing (Strachan and Moorhouse 2006).

8.3.4.1.5 Red Squirrel

1 The proposed OHL passes through a region of Scotland where both red and grey squirrels are present. The current general position is that the grey squirrel population is far more established towards the northern end of the Study Area (including Section 1 of this proposal) with red squirrels maintaining a stronger presence towards the southern end. There is a very wide 'interface zone' where both species are present, approximately located at the boundary between South Ayrshire and Dumfries and Galloway.

2 The NBN Gateway provided no recent records of red squirrels in this Section. The Scottish Squirrel survey has reported red and grey squirrels within the approximate location of this section (www.scottishsquirrelsurvey.co.uk). However, the existing OHL does not pass through or adjacent to any notable areas of woodland. The existing OHL does not pass through or adjacent to any identified Red Squirrel Priority Woodlands.

8.3.4.1.6 Pine Marten

1 The NBN Gateway holds no records of pine marten in Section 1. There is considered to be very limited suitable habitat for this species within this section. The nearest known population is in the Galloway Forest, although this population and populations to the north of central Scotland appear to be expanding (Harris & Yalden 2008).

8.3.4.1.7 Reptiles

1 Historical records from the NBN Gateway indicate the possible presence of adder (*Vipera berus*), common lizard (*Zootoca vivipara*), and slow worm (*Anguis fragilis*) all within 10km square NS 40.

8.3.4.1.8 Amphibians

1 Historical records from the NBN Gateway website indicate the possible presence of common toad (in 10km square NS 40) in this Section.

2 The existing OHL does not cross over or adjacent to any important areas of potential breeding habitat for newt species.

8.3.4.1.9 Freshwater Pearl Mussel (Margaritifera margaritifera)

1 Freshwater pearl mussels are known to have been common in the Doon catchment in the historical past but extant populations are now considered to be functionally extinct due to a lack of recruitment.

8.3.4.2 Section 2 (Meikle Hill Sub-Station to Glenmuck)

8.3.4.2.1 Badger

1 No records of badger were found on the NBN Gateway and no records were provided by the local Badger Group for this Section.

2 Badger signs such as setts, latrines and runs were searched for during walkover surveys within Section 2. No signs were found but the habitats in this Section are mostly unsuitable for badger occupation, with large areas covered by dense conifer plantation and there is a general paucity of deciduous woodland and cultivated land that typically provide better quality habitats for badger.

8.3.4.2.2 Bat Species

1 The NBN Gateway provided records for bats within two 10km squares associated with the Study Area. Natterer's bat has been recorded within the whole of the 10km square NS40. Common pipistrelle has been recorded north of Dalmellington.

2 The majority of the woodland habitat in this Section was assessed to have a relatively Low potential for bat roosting (see Figure 8.13 and Appendix C.7). This is due to the uniform age of the planted conifers which provide few opportunities for roosting, such as holes, cracks in the bark and broken branches. However, small areas at Mossdale Burn and north of Lock Muck were considered to have 'Moderate' potential and two locations at Meadowhead were considered to have 'High' roost potential. No definite tree roosts were identified within this section.

3 Two of the static detectors returned reactively high bat activity levels (north of Mossdale and Glenmuck). The majority of activity was from pipistrelle species and occasional Daubenton's bat (*Myotis daubentonii*) close to water. Possible noctule (*Nyctalus noctula*) activity was also identified, from weak static detector recordings, from the opposite side of the road to the northern entrance to Kyle Forest, the burn west of Glenmuck and the forest edge north of Mossdale.

8.3.4.2.3 Otter

1 The NBN Gateway provided historical records of otter for Section 2 (e.g. NBN Gateway 10km squares NS 50 and at 100m resolution (NS 515 006 and NS 512 074) associated with e Cummock Burn and the Mossdale Burn. Full NBN Gateway record details are provided in Appendix C.3.

2 Several spraints were found in Section 2, on the Mossdale Burn, at Polnaskie Bridge, on the Muck Burn to the south and at Lamford Bridge. No confirmed resting sites were identified within this section of the survey area. For full results of the otter walkover survey see Figure 8.10 and Appendix C.7.

8.3.4.2.4 Water Vole

1 No water vole records were found during the desk study for this Section.

2 Water vole signs were searched for during walkover surveys of all watercourses within Section 2. No signs were found although sections of some watercourses, for example Mossdale Burn, are considered to provide suitable habitat for this species.

8.3.4.2.5 Red Squirrel

1 The NBN Gateway provided records of red squirrel within square NS60 located in a 1km area around Blackcraig Hill. Red squirrel has also been recorded north of Dalmellington within square NS 40 and square NX 59 near Carsphairn.

2 Red Squirrels in Southern Scotland provided boundaries of Red Squirrel Priority Woodlands, which includes all of the large blocks of plantation woodland within this Section, i.e. Kyle Plantation, Bellsbank Plantation, Brown Hill and Glen Muck.

3 All woodland within this Section was classified for red squirrel habitat quality (see Figure 8.16, a description of the habitat classification criteria is provided in Appendix C.2). The majority of the woodland is considered to have a low habitat quality for red squirrel due to its uniform age of thicket-stage Sitka spruce, with very few other species.

4 During transect surveys 'squirrelled' cones were found in several locations – Clawfin Hill, Glenmuck Craig and south of Glenmuck Bridge, just outside the Study Area. No animals were sighted and no dreys located. The overall level of red squirrel activity in this section is considered to be relatively low reflecting low habitat quality.

8.3.4.2.6 Pine Marten

1 No desk study records of pine marten were found for Section 2.

2 No signs indicating the presence of pine marten were found during walkover surveys of this Section.

8.3.4.2.7 Reptiles

1 Historical records obtained from the NBN Gateway indicate the possible presence of adder (in 10km square NS40, NS50 and NX59), slow worm (in square NS40, NS60 and NX59) and common lizard (square NS40, NS50 and NX 59) within the Study Area.

8.3.4.2.8 Amphibians

1 Historical records obtained from the NBN Gateway indicate the presence of common toad (in 10km square NS40).

8.3.4.2.9 Other Terrestrial Fauna

1 Signs of roe deer (*Capreolous capreolus*), and fox (*Vulpes vulpes*) were frequently noted throughout the Study Area.

8.3.4.3 Section 3 (Glenmuck to Dalshangan)

8.3.4.3.1 Otter

1 The NBN Gateway provided records of otter activity within 10km square NX 59. There are records associated with six sites including Loch Doon, Lambford Bridge, Garryhorn, and the Water of Deugh.

2 Few signs of otter were found during walkover surveys in this Section. Spraints were the only signs recorded and these were on the Polquhanity Burn just north of Polquhanity. Two otter spraints were recorded at Lamford Bridge. No active resting sites were identified. No otter activity was recorded anywhere else in this Section of the Study Area. For details of non-confidential results of the otter walkover survey in this Section see Appendix C.7 and Figures 8.11 & 8.12.

8.3.4.3.2 Bat Species

1 Pipistrelle species records within square NX68 at Glenhoul and at two sites north of St John's Town of Dalry were obtained from the NBN gateway. There were no other bat records located for this section during the desk study.

2 The majority of the woodland habitat in this Section was assessed to have a relatively low potential for bat roosting (see Appendix C.2 for potential bat roosts classifications). This is due to the uniform age of the planted conifers which provide few opportunities for roosting bats such as holes, cracks, bark slabs, broken branches etc.

3 Small areas of broadleaved woodland / individual mature broadleaved trees around the Green Well of Scotland were classified as having relatively high potential for bat roosting.

4 There were also individual trees in some places, with a particularly high concentration around Carsphairn, identified as having a relatively high roost potential. These trees, classified as 2A or 2B, and are mainly mature broadleaved trees with holes in the trunk, cracks and crevices in the branches and broken branches.

5 Bat activity transects identified area of relatively high bat activity near to the trees at the Green Well of Scotland and along the Water of Deugh just south-east of Carsphairn. Both areas had a high number of soprano pipistrelle passes and foraging activity. Surveys at the Green Well of Scotland also recorded frequent Daubenton's passes and occasional foraging activity, associated with the Water of Deugh.

6 Static detector recordings from the Green Well of Scotland confirmed the presence of common pipistrelle and soprano pipistrelle in this area.

8.3.4.3.3 Water Vole

1 No desk study water vole records were found for this Section.

2 Water vole signs were searched for during walkover surveys of all watercourses within Section 3. No signs were found although parts of some watercourses, for example the Water of Deugh, do provide suitable habitat for this species.

8.3.4.3.4 Badger

1 No records of badger were found on the NBN Gateway in this Section.

2 See Confidential Appendix C.11 for details of badger records provided by the local badger group.

3 Badger signs such as setts, latrines and runs were searched for during walkover surveys within Section 3. No signs were found during this survey.

8.3.4.3.5 Red Squirrel

1 The NBN Gateway provided one record of red squirrel within Section 3 at NX 553 946. However this record is from 1905.

2 Red Squirrels in Southern Scotland provided boundaries of Red Squirrel Priority Woodlands for the Study Area, which includes all of the large blocks of plantation woodland within this Section i.e. the plantations around Brockloch, Drumjohn, Laird's Hill and north of Polmaddy.

3 All woodland within this Section was assessed for red squirrel habitat quality. The majority was classified as 'B2' (see Appendix C.2 for an explanation of red squirrel habitat quality classifications) due to the fairly uniform age of Sitka spruce plantation blocks. Some areas were classified as 'C' (i.e. negligible). These were mainly small isolated stands of conifer plantation and broadleaved woodland.

4 Squirrel transects in this section revealed frequent foraging activity in the plantation south of Drumjohn Knowe and some activity in the plantation at Laird's Hill. There were no sightings of animals or dreys.

8.3.4.3.6 Pine Marten

1 From the NBN Gateway (10km grid squares NX 58) there is one historical record of Pine Marten near Section 3.

2 No signs of pine marten were found during walkover surveys of this Section.

8.3.4.3.7 Reptiles

1 Historical records obtained from the NBN Gateway indicate possible the presence of adder (in 10km square NX 59, NX 58), slow worm (in square NX 59, NX 58) and common lizard (square NX 59) within the Study Area.

2 Dumfries and Galloway Ecological Records Centre provided several adder records close to the survey area for this Section. See Figure 8.08 and Appendix C.3.

8.3.4.3.8 Amphibians

1 The NBN Gateway provided no records for amphibians within this Section.

8.3.4.3.9 Other Terrestrial Fauna

1 Signs of roe deer and red fox were frequently noted throughout this part of the Study Area.

8.3.4.4 Section 4 (Dalshangan to Blackcraig Sub-Station)

8.3.4.4.1 Otter

1 The NBN Gateway provided historical records of otter for the area at NX 617 884 on the Black Water and just outside the Study Area on Graple Burn near Corriedoo (NX 680 830). In addition to this there are three sites listed within square NX 58; west of Carsfad Loch, Knocknalling and Garroch. Details of non-confidential desk study results are provided in Appendix C.3.

2 The majority of otter signs recorded during surveys were found in this Section. Spraints were found on several of the watercourses, with a particularly high concentration on the Black Water at Butterhole Bridge, on a small tributary north of Glenshimmeroch farm, along the tributary to Lochinvar, on a small burn along the forestry edge at Isle Rig and on the Regland Burn, which runs through plantation woodland. Occasional potential otter runs and couches were also identified in this Section. Non-confidential results of the otter walkover survey are provided in Appendix C.7 and illustrated on Figure 8.12.

8.3.4.4.2 Bat Species

1 Pipistrelle sp. have been recorded by the NBN Gateway within 10km square NX68. In particular they have been noted south of Glenhoul and in two area north of St John's Town of Dalry.

2 The majority of woodland within this Section was classified as having a relatively low potential in terms of bat roosting opportunities due to the uniform age of the planted conifers, which typically lack features that bats may use such as holes, cracks in the bark, bark slabs, and broken branches. However the mature broadleaved woodland along the banks of the Water of Ken and Water of Deugh have been classified as having moderate potential, with many individual trees identified as having either 2A or 2B roost potential.

3 Bat activity recorded during activity transects and from static detectors was relatively high in this Section, particularly around the Carse of Dundeugh but with frequent activity throughout the plantation woodlands. The majority of bat passes were from soprano pipistrelle with occasional common pipistrelle, Daubenton's activity was also recorded around the Carse of Dundeugh.

8.3.4.4.3 Water Vole

1 No water vole records were found during the desk study for this Section.

2 Water vole signs were searched for during walkover surveys of all watercourses within Section 4. No signs were found although sections of some watercourses, through Glenshimmeroch Plantation were identified as having good potential water vole habitat.

8.3.4.4.4 Badger

1 See Confidential Appendix C.11 for details of badger records provided by the local badger group.

2 Badger signs such as setts, latrines and runs were searched for during walkover surveys within Section 3. No signs were found during this survey.

8.3.4.4.5 Red Squirrel

1 No desk study records of red squirrel were found for this section of the project Study Area.

2 Red Squirrels in Southern Scotland provided boundaries of Red Squirrel Priority Woodlands for the Study Area, which includes Dundeugh Hill plantation but not the Glenshimmeroch plantation.

3 Several records of red squirrel sightings were provided by the Dumfries and Galloway Ecological Records Centre. Three of these were around the Carse of Dundeugh, with a further sighting outside the Study Area to the south of Carsfad Loch. See Appendix C.3 for exact locations.

4 All woodland within this Section was classified for red squirrel habitat quality. Sections of pre-thicket plantation and broadleaved woodland were classified as having a relatively low quality (see Appendix C.2 for details of the red squirrel habitat classification method). The majority of plantation in this section was classified as between low to moderate. In addition a section of the Glenshimmeroch Plantation to the southwest of Shield Willie Hill was classified as having a relatively higher habitat quality due to a greater variety of species and woodland age class structure.

5 Several squirrel sightings were made during the course of surveys in this Section – at Kendoon, at Craigencorr Hill and just outside the survey area northeast of Shield Willie Hill.

6 Walked transects in this section revealed a particular abundance of squirrel activity around Kendoon and the Carse of Dundeugh, with a high numbers of 'squirreled' cones noted. Occasional activity was also recorded to the south of the area in the Glenshimmeroch Plantation.

8.3.4.4.6 Pine Marten

1 The NBN Gateway holds one record of pine marten in Section 4 at 10km resolution (NX 68). However this record is from before 1980. Pine marten scats were reported within the Blackcraig Hill windfarm ES in the area of conifer plantation to the east of Loch Howie. Showing that there is a population of this species present in the wider area.

2 No evidence of pine marten activity was recorded during all walkover protected species and habitat surveys.

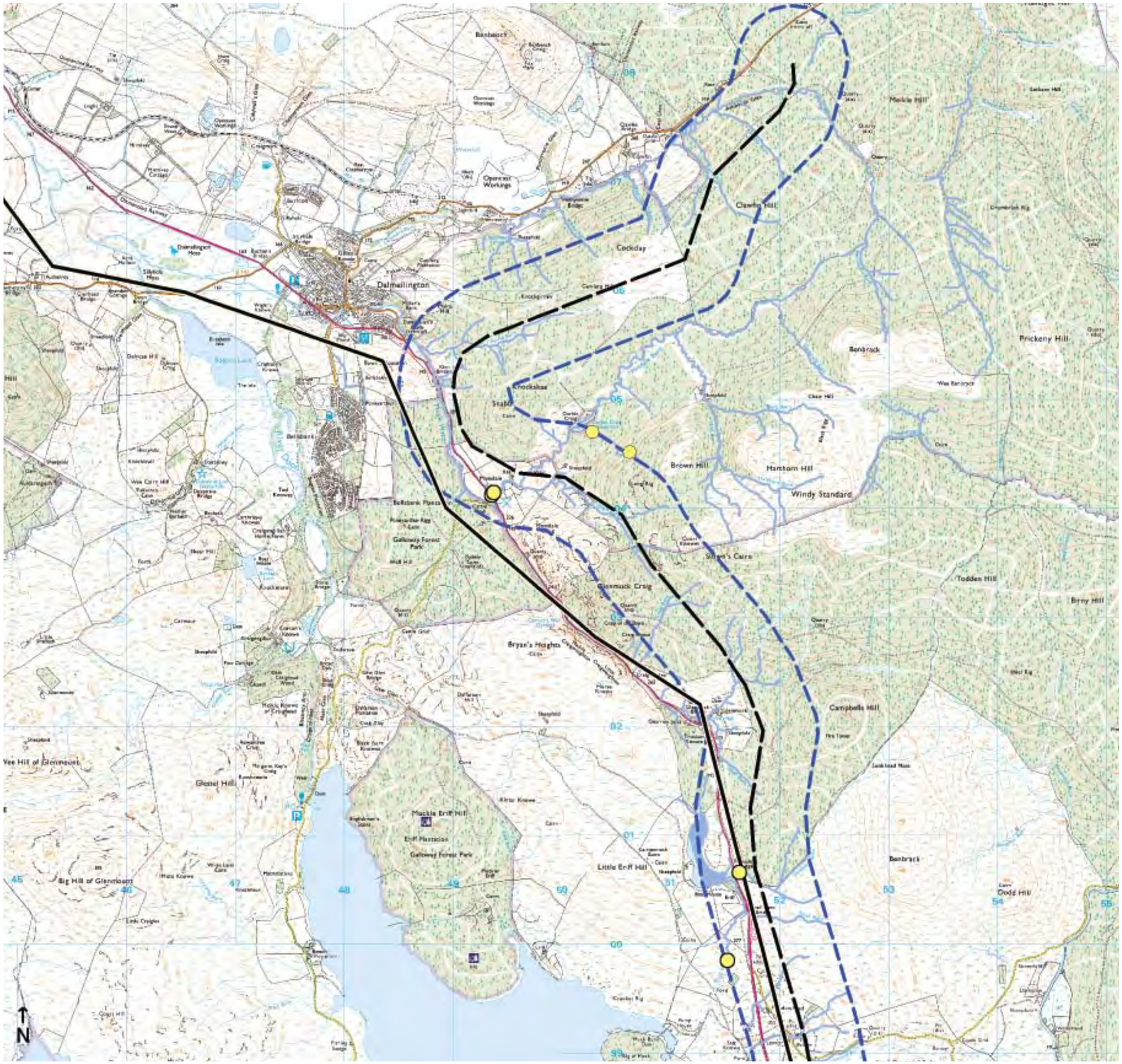
8.3.4.4.7 Reptiles

1 Historical records obtained from the NBN Gateway indicate possible the presence of adder, slow worm and common lizard within the Study Area (10km square NX 68).

2 Dumfries and Galloway Ecological Records Centre provided several adder records close to the survey area and within the survey area at the Carse of Dundeugh and Butterhole Bridge. See Confidential Appendix C.11 for locations.

8.3.4.4.8 Amphibians

1 The NBN Gateway provided a record for smooth newt for this section of the project, associated with Lochinvar (NX 6585) the record is dated 1960.



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Legend

Otter & water vole survey results - Area B

- Existing N-Route
- Proposed L7 Tower route
- Proposed Wood Pole line route
- 500m buffer

Otter walkover survey

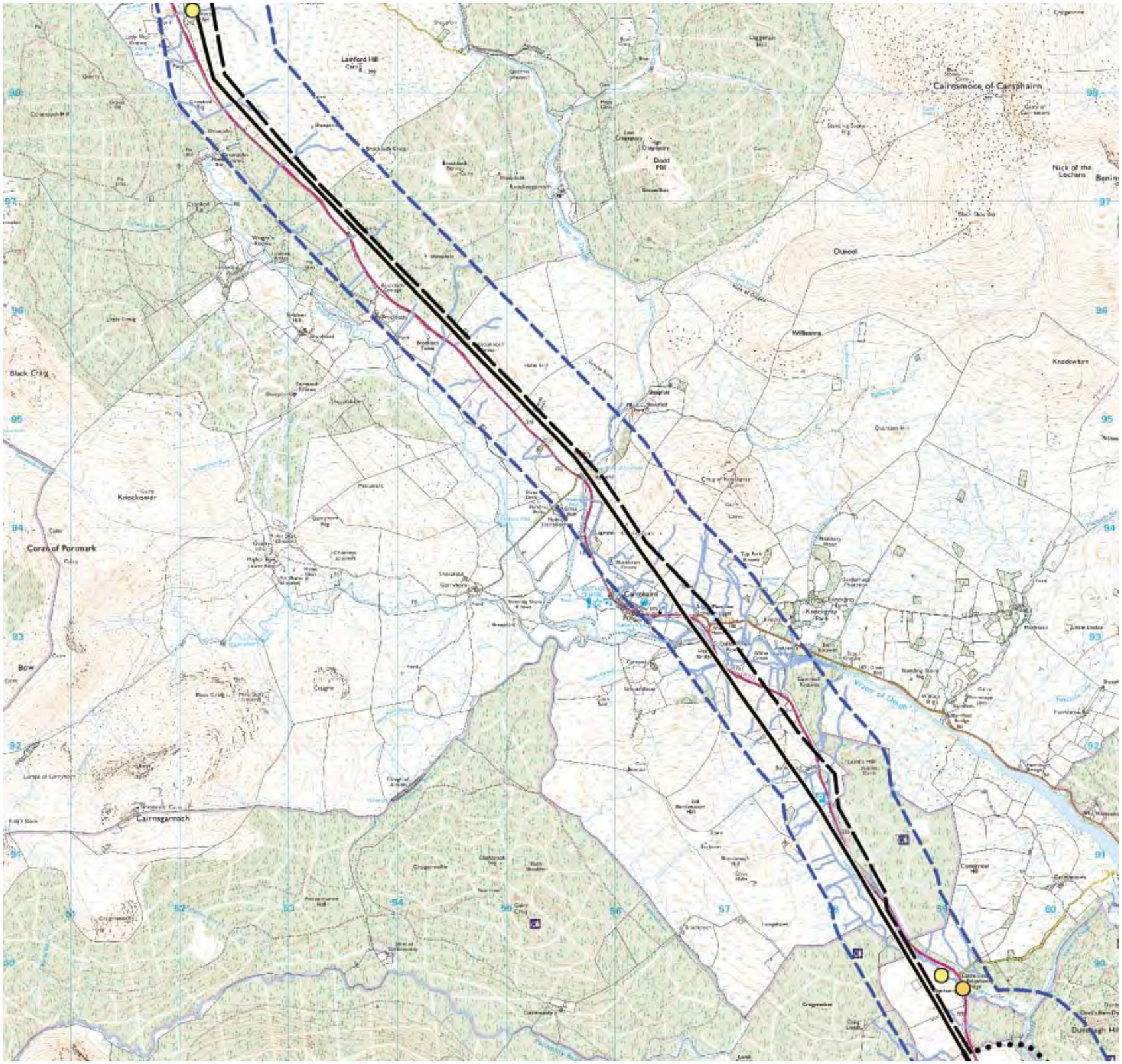
Number of spraints recorded

- 5 to 6
- 4 to 5
- 3 to 4
- 2 to 3
- 1 to 2

- Watercourse
- Waterbody

0m 0.5km 1km 1.5km 2km

Figure 8.10 - Otter Survey - Area B



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Legend

Otter & water vole survey results - Area C

- Existing N-Route
- Proposed L7 Tower route
- Proposed Wood Pole line route
- 500m buffer

Otter walkover survey

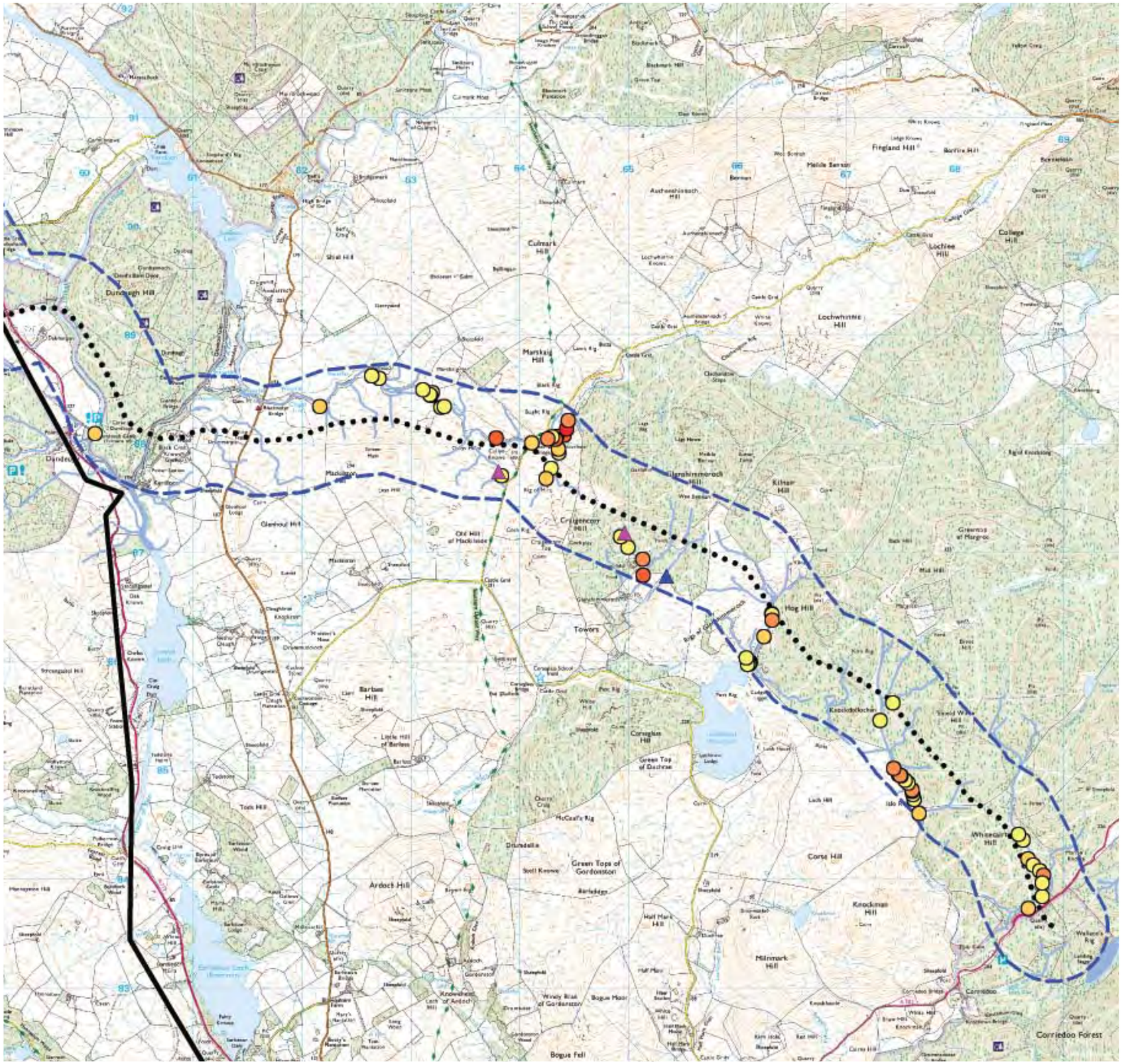
Number of spraints recorded

- 5 to 6
- 4 to 5
- 3 to 4
- 2 to 3
- 1 to 2

- Watercourse
- Waterbody

0m 0.5km 1km 1.5km 2km

Figure 8.11 - Otter Survey - Area C



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Legend

Otter & water vole survey results - Area D

- Existing N-Route
- Proposed L7 Tower route
- Proposed Wood Pole line route
- 500m buffer

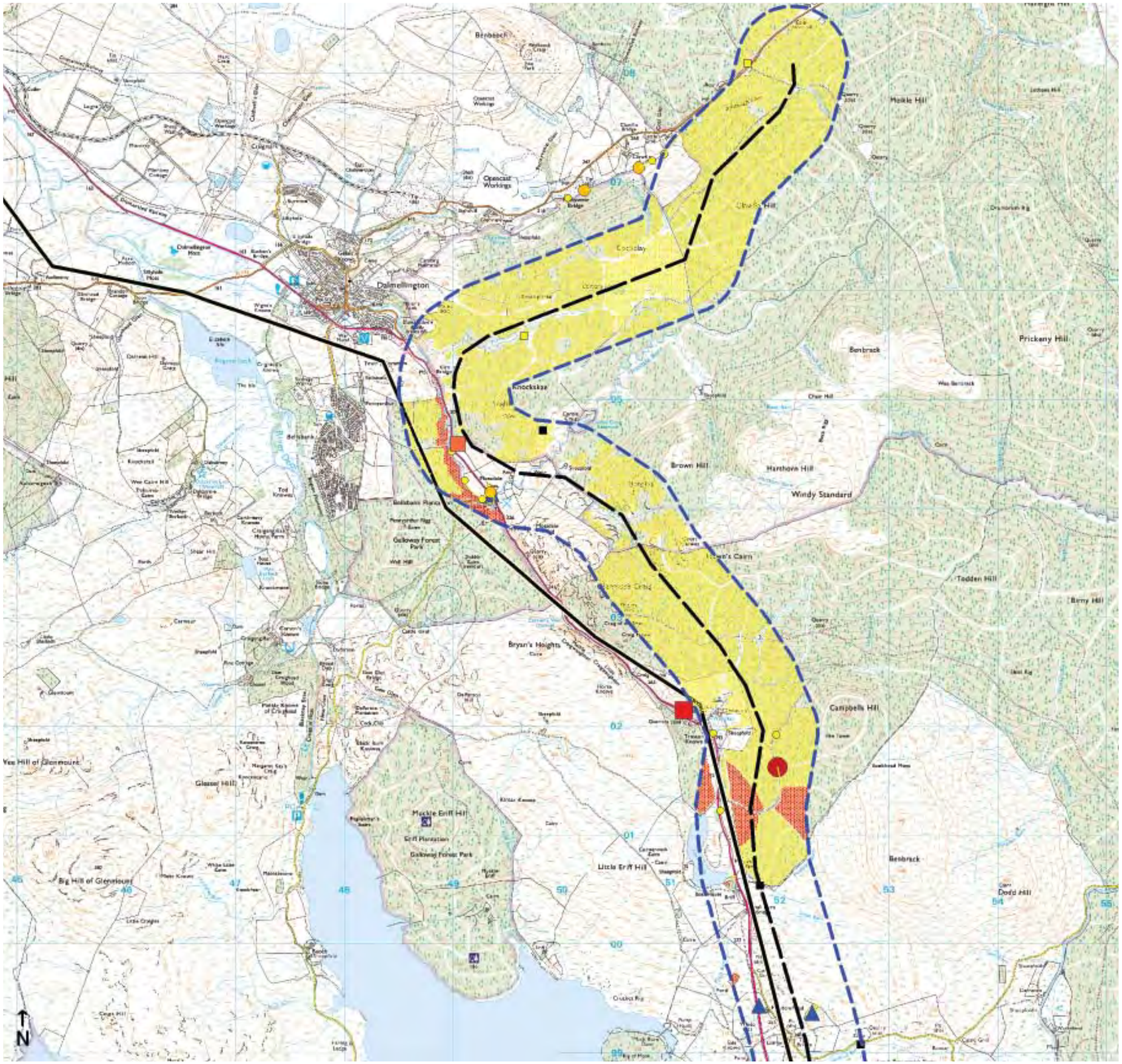
Otter walkover survey

Number of spraints recorded

- 5 to 6
- 4 to 5
- 3 to 4
- 2 to 3
- 1 to 2
- Run
- Resting sites
- Watercourse
- Waterbody

0m 0.5km 1km 1.5km 2km

Figure 8.12 - Otter Survey - Area D



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Legend

Bat survey results - Area B

- Existing N-Route
- Proposed L7 Tower route
- Proposed Wood Pole line route
- 500m buffer

Bat roost potential survey

- High roost potential (tree/building)
- 2A High potential (woodland)
- 2B Moderate potential (woodland)
- C Low potential (woodland)

Bat activity survey

Number of bat passes (stationary points):

- 20 to 100
- 15 to 20
- 10 to 15
- 5 to 10
- 1 to 5

Number of bat passes (transects):

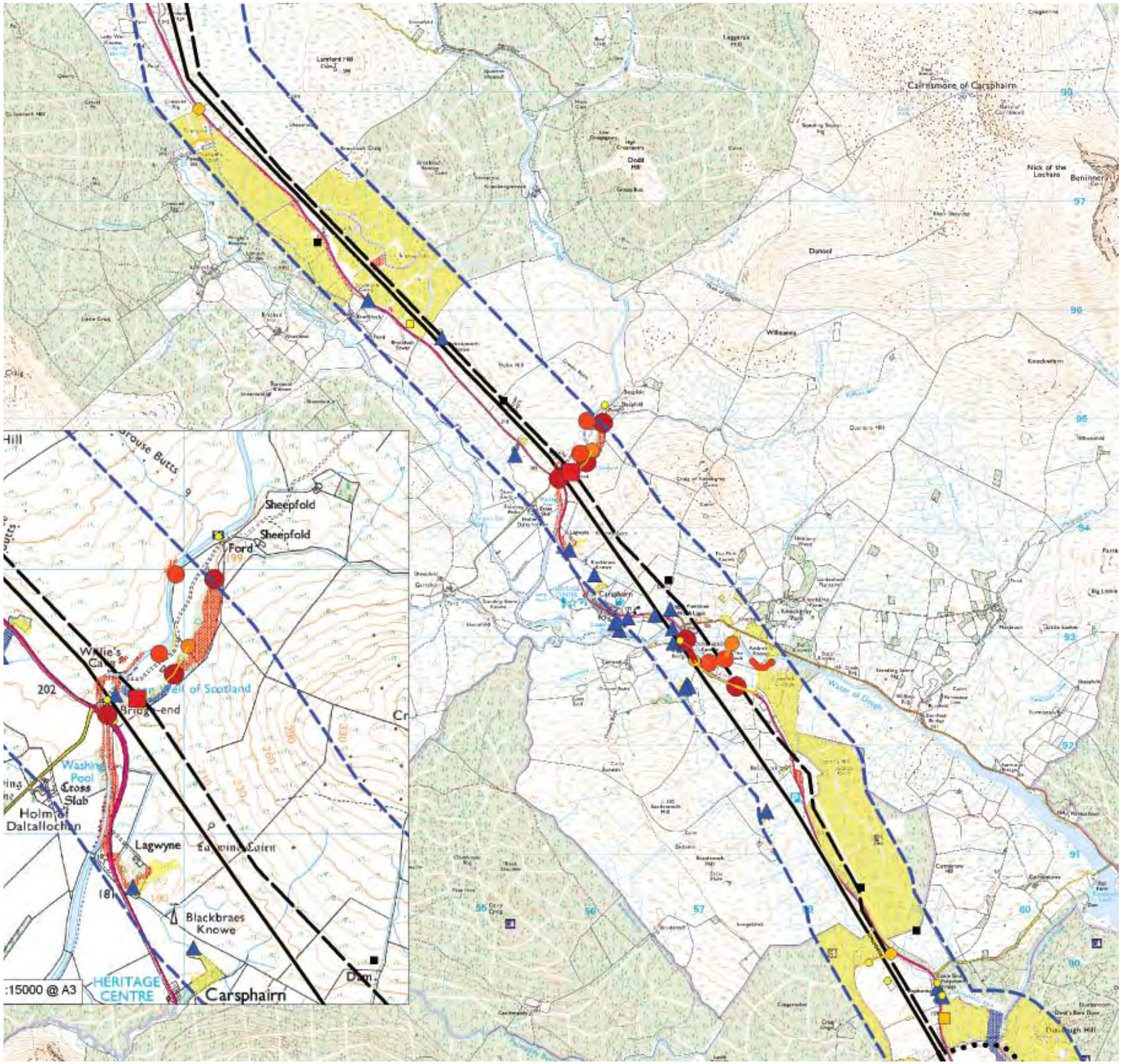
- 20 to 100
- 15 to 20
- 10 to 15
- 5 to 10
- 1 to 5

Bat static box survey (level of activity)

- Continuous
- High
- Moderate
- Sporadic
- Low
- None

0m 0.5km 1km 1.5km 2km

Figure 8.13 - Bat Survey - Area B



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Legend

Bat survey results - Area C

- Existing N-Route
- Proposed L7 Tower route
- Proposed Wood Pole line route
- 500m buffer

Bat roost potential survey

- High roost potential (tree/building)
- 2A High potential (woodland)
- 2B Moderate potential (woodland)
- C Low potential (woodland)

Bat activity survey

Number of bat passes (stationary points):

- 20 to 100
- 15 to 20
- 10 to 15
- 5 to 10
- 1 to 5

Number of bat passes (transects):

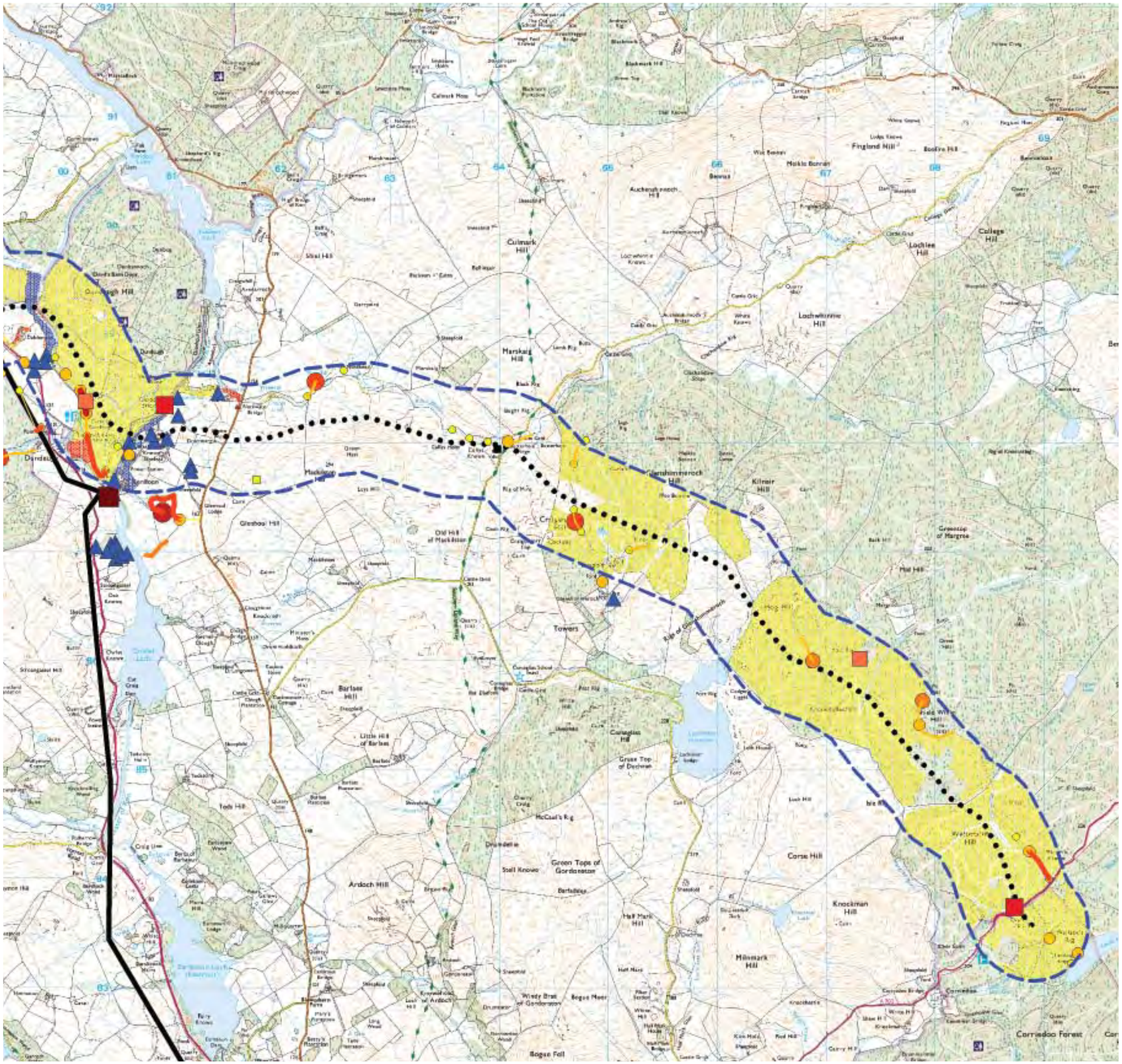
- 20 to 100
- 15 to 20
- 10 to 15
- 5 to 10
- 1 to 5

Bat static box survey (level of activity)

- Continuous
- High
- Moderate
- Sporadic
- Low
- None

0m 0.5km 1km 1.5km 2km

Figure 8.14 - Bat Survey - Area C



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Legend

Bat survey results - Area D

- Existing N-Route
- Proposed L7 Tower route
- Proposed Wood Pole line route
- 500m buffer

Bat roost potential survey

- High roost potential (tree/building)
- 2A High potential (woodland)
- 2B Moderate potential (woodland)
- C Low potential (woodland)

Bat activity survey

Number of bat passes (stationary points):

- 20 to 100
- 15 to 20
- 10 to 15
- 5 to 10
- 1 to 5

Number of bat passes (transects):

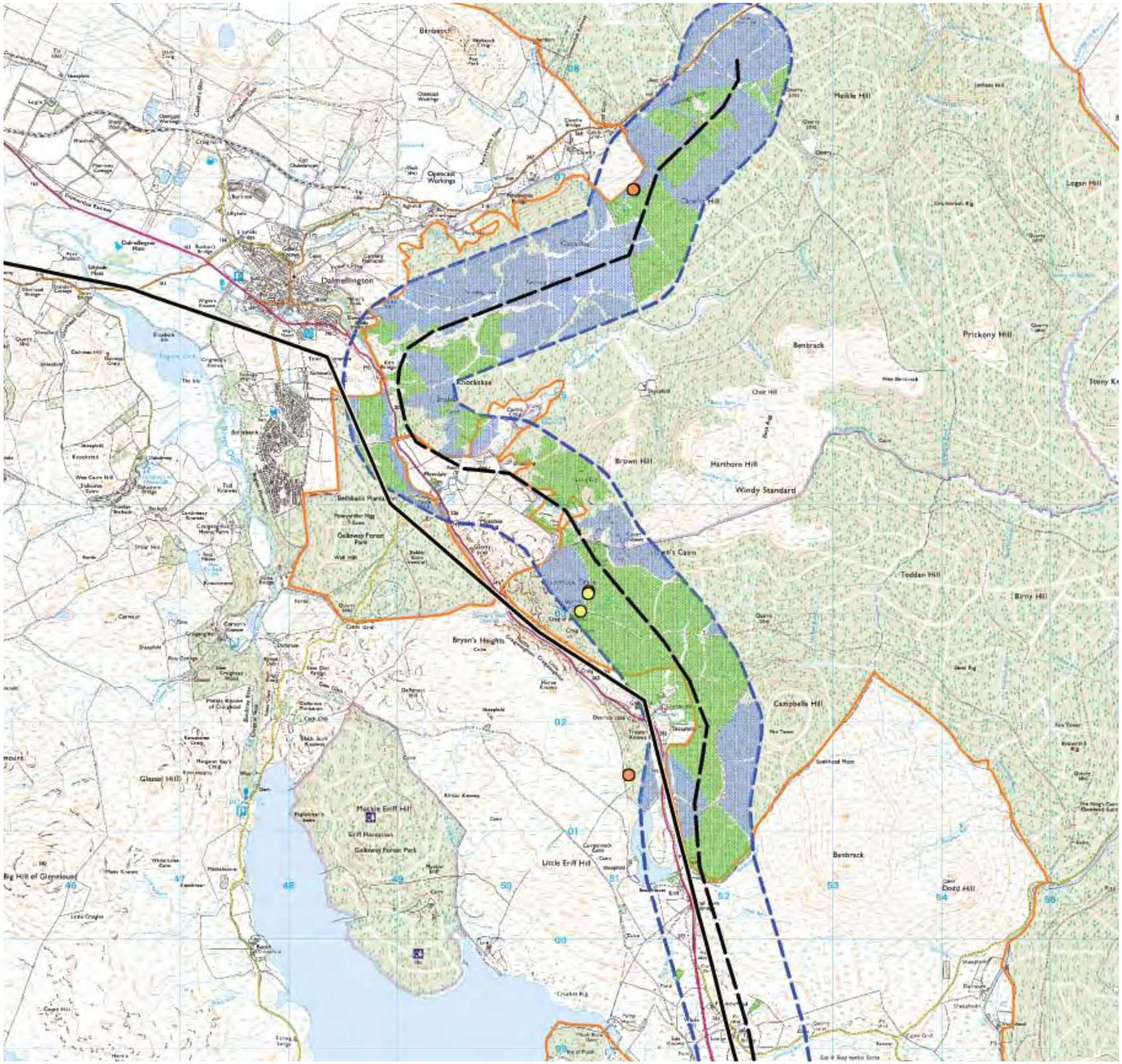
- 20 to 100
- 15 to 20
- 10 to 15
- 5 to 10
- 1 to 5

Bat static box survey (level of activity)

- Continuous
- High
- Moderate
- Sporadic
- Low
- None

0m 0.5km 1km 1.5km 2km

Figure 8.15 - Bat Survey - Area D



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Legend

Red squirrel survey results - Area B

- Existing N-Route
- Proposed L7 Tower route
- Proposed Wood Pole line route
- 500m buffer
- Red squirrel sighting
- red squirrel priority woodland (source: Red Alert South West Scotland

Red squirrel habitat potential

	A	(Mix of trees, variety of ages, many cone bearing trees, blocks not isolated, south facing)
	B1	(Less variety of species, less variety of age structure, tree blocks isloated, south facing)
	B1 / B2	(Between B1 and B2)
	B2	(Mostly Sitka spruce, few cone bearing trees, all thicket stage, not south-facing)
	C	(Clearfell / early 2nd rotation / large seeded broadleaves / grey squirrel present)

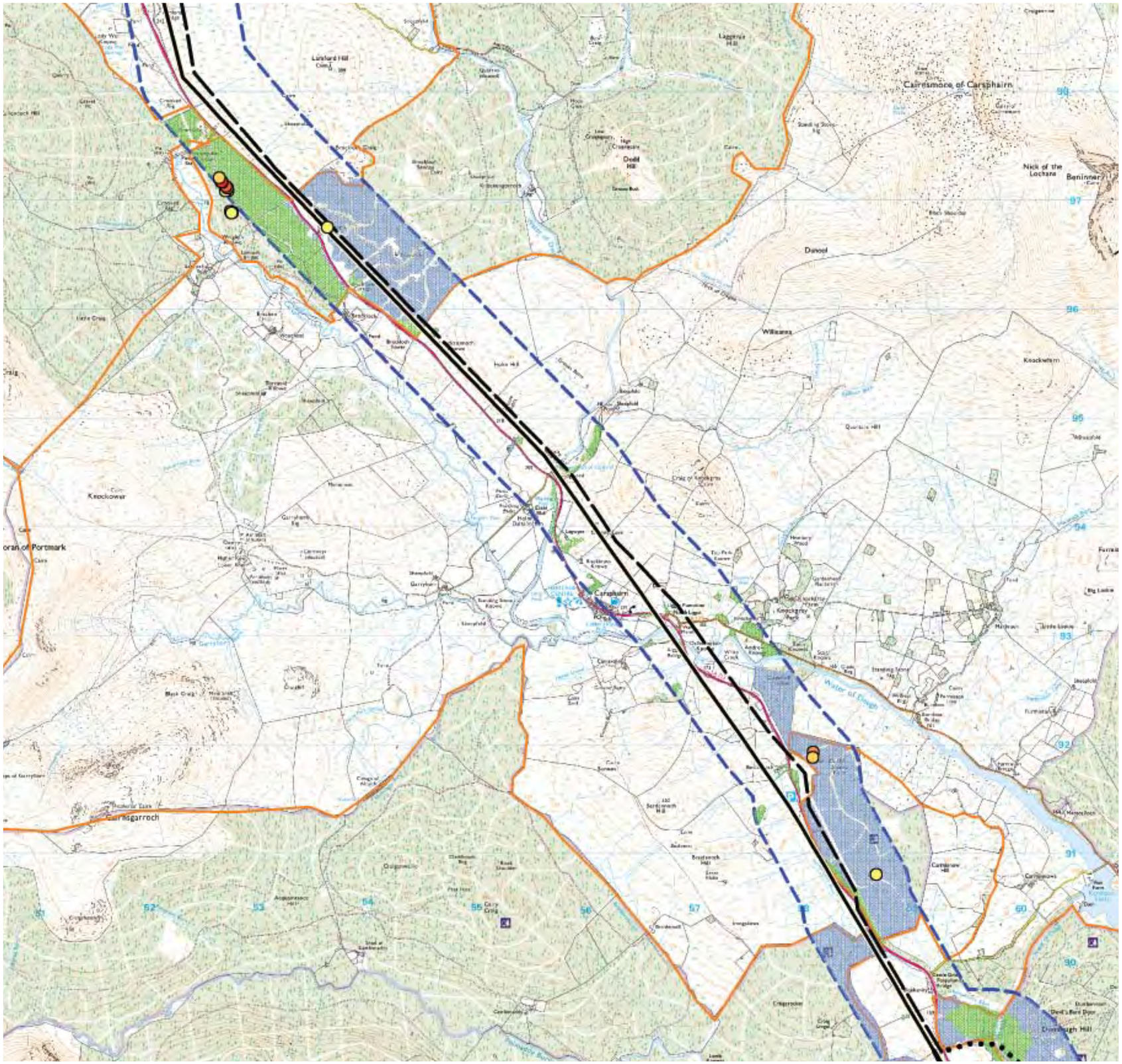
Red squirrel cone survey

Number of cones (eaten by squirrels):

- 25 to 50
- 10 to 25
- 5 to 10
- 2 to 5
- 1 to 2

0m 0.5km 1km 1.5km 2km

Figure 8.16 - Red Squirrel Survey - Area B



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Legend

Red squirrel survey results - Area C

- Existing N-Route
- Proposed L7 Tower route
- Proposed Wood Pole line route
- 500m buffer
- Red squirrel sighting
- red squirrel priority woodland (source: Red Alert South West Scotland

Red squirrel habitat potential

	A	(Mix of trees, variety of ages, many cone bearing trees, blocks not isolated, south facing)
	B1	(Less variety of species, less variety of age structure, tree blocks isloated, south facing)
	B1 / B2	(Between B1 and B2)
	B2	(Mostly Sitka spruce, few cone bearing trees, all thicket stage, not south-facing)
	C	(Clearfell / early 2nd rotation / large seeded broadleaves / grey squirrel present)

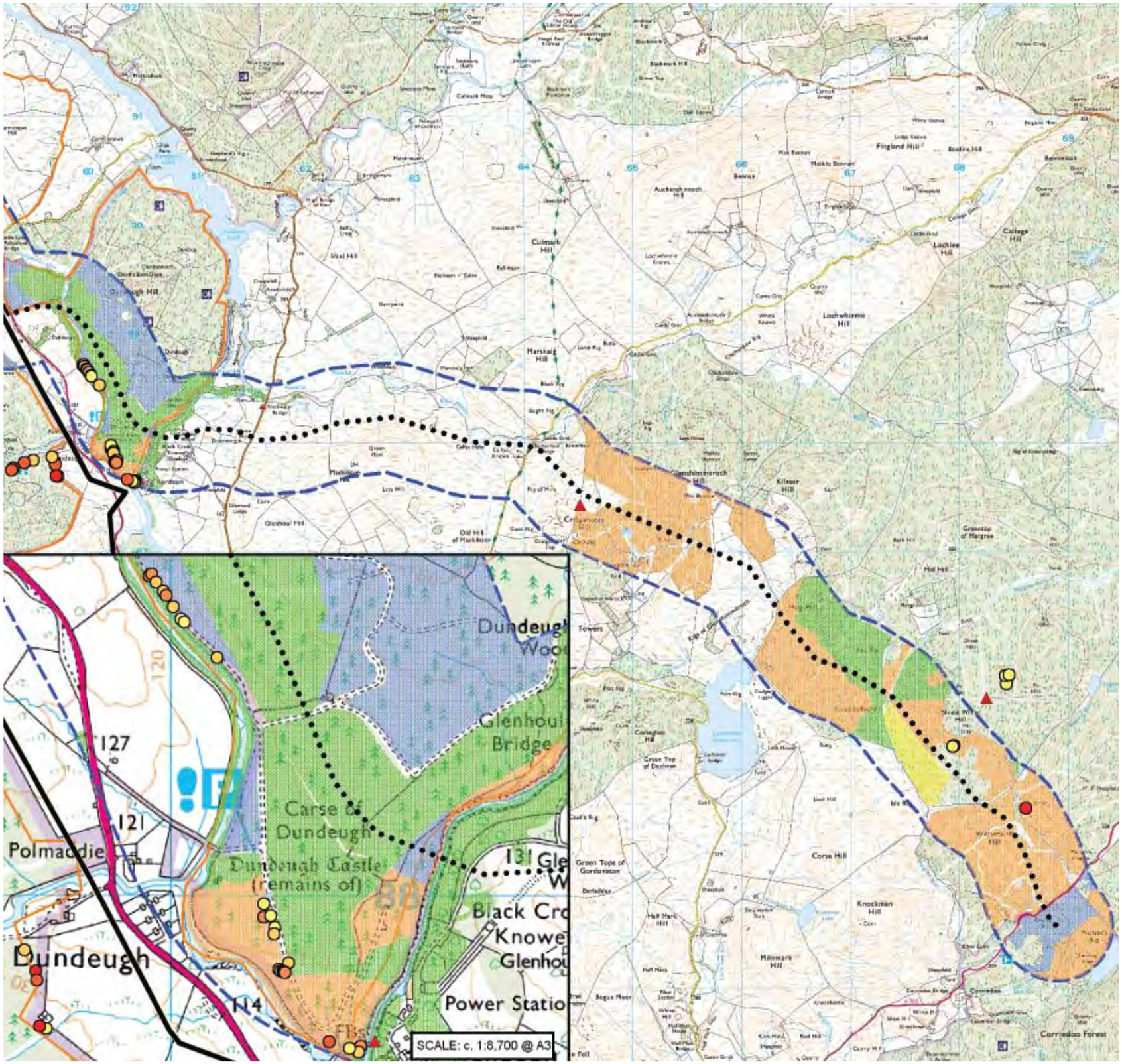
Red squirrel cone survey

Number of cones
(eaten by squirrels):

- 25 to 50
- 10 to 25
- 5 to 10
- 2 to 5
- 1 to 2

0m 0.5km 1km 1.5km 2km

Figure 8.17 - Red Squirrel Survey - Area C



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Legend

Red squirrel survey results - Area D

- Existing N-Route
- Proposed L7 Tower route
- Proposed Wood Pole line route
- 500m buffer
- Red squirrel sighting
- red squirrel priority woodland (source: Red Alert South West Scotland

Red squirrel habitat potential

	A	(Mix of trees, variety of ages, many cone bearing trees, blocks not isolated, south facing)
	B1	(Less variety of species, less variety of age structure, tree blocks isloated, south facing)
	B1 / B2	(Between B1 and B2)
	B2	(Mostly Sitka spruce, few cone bearing trees, all thicket stage, not south-facing)
	C	(Clearfell / early 2nd rotation / large seeded broadleaves / grey squirrel present)

Red squirrel cone survey

Number of cones (eaten by squirrels):

- 25 to 50
- 10 to 25
- 5 to 10
- 2 to 5
- 1 to 2

0m 0.5km 1km 1.5km 2km

Figure 8.18 - Red Squirrel Survey - Area D

8.4 Nature Conservation Evaluation

8.4.1 Introduction

1 The following provides a summary assessment of the nature conservation value of the ecological receptors (habitats and species) described in the baseline section above. An assessment of the nature conservation value of receptors within each of the four main sections of the project (as defined in Section 8.2) is provided with a combined evaluation for the project as a whole, in table form, at the end of this section.

2 The assessment of nature conservation value is based on a systematic evaluation of the importance of each of the receptors in an international, national, regional and local context, based on information available at the time of this assessment. Explanation of the criteria used to assigning values is provided in Table 8.03. A summary of the assessment and combined evaluations are provided in Table 8.15 at the end of this section.

8.4.2 Designated Sites

1 All of the statutory designated sites (i.e. SSSI) within the Study Area for the project are considered to be of at least High nature conservation value. The proposed OHL does not pass through or adjacent to (i.e. within 500m) any statutory designated sites for nature conservation. The nearest statutory designated sites to the proposed OHL are Cleugh SSSI, which is c. 800m south of the proposed route and Loch Doon SSSI is c. 1km west of the existing and proposed routes at their closest approach. There are no proposed access tracks or temporary construction compounds (etc.) that could directly affect any SSSI or SAC. Potential / theoretical indirect effects relating to water pollution during construction / dismantling works are discussed in Section 8.5 below.

2 The existing transmission line to be dismantled does pass within c. 200m of Dalmellington Moss SSSI and Bogton Loch SSSI. For the purposes of this assessment these designated areas are also considered to be of High nature conservation value.

3 Unless stated otherwise all non-statutory nature conservation designated sites (with the exception of Galloway Forest Park Important Bird Area, see Chapter 9) are considered to be of at least Low (Local High) nature conservation value.

8.4.3 Terrestrial Habitats

8.4.3.1 Section 1 (Smithston to Glenmuck)

1 The evaluation of habitats within Section 1 is considered to be provisional as this is based solely on information that derived from desk study. As this section involves the dismantling of the existing N-Route transmission line from Smithston to Glenmuck, effects on habitat receptors will be localised and short-term. Pre-works ecological assessment, in relation to the dismantling operations, has been proposed along with various outline mitigation measures. Further discussion of this issue is provided in Section 8.5 and 8.6 of this Chapter and Section 5.2.5 of Chapter 5.

8.4.3.1.1 Broad-leaved Semi-natural Woodland

1 Although the existing OHL does not pass directly through any areas of mature semi-natural woodland there are several areas of semi-natural broadleaved woodland within this section of the project. These have been identified on the Ancient Woodland Inventory database. Boreland Glen Wood (the southern end of which enters the study are of Section 1, Keir's Wood and Grimmet Glen are all small but notable areas of semi-natural woodland within the core Study Area). Taking into account the nature conservation importance of this habitat, its condition and extent, a nature conservation value of Low (Local High) is considered appropriate.

8.4.3.1.2 Coniferous Plantation

1 In Section 1 there is one main area of commercial conifer plantation that the existing OHL passes through at Bellsbank Plantation. Such plantation woodland is generally of low nature conservation value, although it can provide critical supporting habitats for species of regional and national conservation interest (e.g. red squirrel). Taking into consideration the extent and quality of this habitat within this section, and the value of this habitat to some species of high conservation concern, this habitat type is considered to be of Low (Local Low) conservation value within this Section.

8.4.3.1.3 Improved Grassland

1 Taking into account the relatively species-poor nature of this habitat (which only has limited range of grasses and a few common forbs) and the extent of similar habitat in the Study Area and surrounding area, the conservation value of this habitat within this section is considered to be Negligible.

8.4.3.1.4 Semi-improved Acid Grassland

1 Considering the importance of the less improved more species-rich grasslands at a regional level and the relatively sparse extent of this habitat type within this section, the nature conservation value is classified as Low (Local Medium).

8.4.3.1.5 Marshy grassland

1 In view of the extent of this habitat within the Study Area the conservation value of this habitat is considered to be Low (Local Medium).

8.4.3.2 Section 2 (Meikle Hill Substation to Glenmuck)

8.4.3.2.1 Coniferous Plantation

1 Commercial conifer plantation is the largest habitat type by area within Section 2 of the project. Although such plantation woodland is generally of low nature conservation value it can provide critical supporting habitats for species of regional and national conservation interest (e.g. red squirrel). There can also be considerable variability in the conservation value of such woodlands depending on the age-class (growth stage) of the plantation and the extent to which semi-natural habitat (within unplanted 'open space' and rides, or fire breaks) and native tree species have been incorporated into the planting design. Within Section 2 there are two main plantations, South Kyle Forest (owned and managed by the Forestry Commission Scotland) and Brownhills Forest (privately owned and managed). There is some variability in age-class composition, open space and diversity of non-commercial trees across these plantations, but the dominant tree species is Sitka spruce planted at the typical density adopted for commercial plantations of this type. Taking into consideration the extent and quality of this habitat within this section, and the value of this habitat to some species of high conservation concern, this habitat type is considered to be of Low (Local Medium) conservation value within this Section.

8.4.3.2.2 Improved Grassland

1 Section 2 includes a relatively extensive large area of improved grassland at Mossdale. The species-poor nature of this habitat (which supports a limited range of common grasses and a few common forbs) and the extent of similar habitat in the wider area. The conservation value of this habitat is considered to be Negligible.

8.4.3.2.3 Semi-improved Acid Grassland

1 Within Section 2 there is a small area of semi-improved acid grassland at Bryan's Heights. Again, taking into account the area and the importance of acid grassland at a regional level the nature conservation value is considered to be Low (Local Medium).

8.4.3.2.4 Marshy grassland

1 Considering the extent of this habitat within the Study Area the conservation value of this habitat is considered to be Low (Local Medium).

8.4.3.2.5 Dry Dwarf Shrub Heath

1 There is a relatively small area of dry dwarf shrub heath to the north of Bryan's Heights. Taking into account the small extent of habitat in the Study Area, its importance as an Annex 1 habitat and as a UK BAP priority habitat, the nature conservation value is considered to be Low (Local High).

8.4.3.3 Section 3 (Glenmuck to Dalshangan)

8.4.3.3.1 Coniferous Plantation

1 Section 3 includes areas of commercial coniferous plantation at Campbells Hill, Brockloch Craig, and Bardennoch. The nature conservation value of this habitat is classified as Low (Local Medium).

8.4.3.3.2 Broad-Leaved Semi-Natural Woodland

1 Section 3 includes a few small areas of semi-natural broad-leaved woodland, principally at Green Well of Scotland, which is classified as Ancient Woodland of semi-natural origin. Taking account of the status of this woodland and its importance in a local context, the nature conservation value of this habitat is considered as Low (Local High).

8.4.3.3.3 Semi-improved Acid Grassland

1 Section 3 contains some areas of semi-improved acid grassland such as west of Craig of Knockgray Hill and at Bardennoch Hill. Taking into account the importance of acid grassland at a regional level the nature conservation value is considered to be Low (Local High).

8.4.3.3.4 Marsh / Marshy Grassland

1 Section 3 includes large areas of marsh / marshy grassland particularly around Brockloch. Taking into account the status of this habitat in the local and UK BAP, its suitability as habitat for water vole and the extent within the Study Area, the conservation value of this habitat is considered to be Low (Local High).

8.4.3.3.5 Unmodified and Wet Modified Blanket Bog

1 Relatively extensive areas of unmodified and wet modified blanket bog are found outside of conifer plantation areas within Section 3, particularly on the west facing slopes of Benbrack, Lamford Hill, and Holm Hill and the eastern slopes of Bardenoch Hill. Taking into account the importance of blanket bog as a Annex 1 and UK BAP priority habitat, the relatively small amount present within the survey area and the condition of the blanket bog (modified to varying extents due to afforestation, drainage and sheep grazing), the nature of conservation value of this habitat is considered to be Medium.

8.4.3.4 Section 4 (Dalshangan to Blackcraig Hill Substation)

8.4.3.4.1 Coniferous Plantation

1 A significant portion of Section 4 is comprised of commercial conifer plantation, at the Carse of Dundeugh, Margree Forest and Corriedoo Forest. Surveys of these areas indicate the importance of these plantations for red squirrel. On the basis of its current land use (i.e. for commercial forestry) and the large area of similar afforested habitat out with the Study Area, the nature conservation value of this habitat is considered to be Low (Local Medium).

8.4.3.4.2 Broadleaved Woodland

1 The Carse of Dundeugh contains the largest area of mature semi-natural broadleaved woodland (much of it classified as being ancient of semi-natural origin) in Section 4 and the wider project. Taking account of the wider nature conservation importance of this habitat, its condition and extent, the nature conservation value of is considered to be Medium.

8.4.3.4.3 Improved Grassland

1 Taking into account the relatively species-poor nature of this habitat and the extent of similar habitat in the Study Area and surrounding area, the conservation value is considered to be Negligible.

8.4.3.4.4 Semi-improved Acid Grassland

1 Section 4 contains several areas of semi-improved acid grassland, principally concentrated around Mackilston Hill. Taking into consideration the relative rarity of this habitat and its importance at a regional level the nature conservation value is considered to be Medium.

8.4.3.4.5 Semi-improved Neutral Grassland

1 A locally important area of relatively species-rich semi-improved neutral grassland is located at Dalshangan. There are also other areas of this habitat within this section such as is found at Kilnair Hill. This habitat, often in an associated mosaic of marshy and acid grasslands reflecting heterogeneous topography, geology and soil conditions in some areas, is considered to be of Medium nature conservation value.

2 An area of neutral grassland alongside the Polmaddy Burn in this section, to the west of Dundeugh, supports a number of notable species, including wood bitter-vetch, which is a rare species in the county, the scarce species of hawkweed and a large colony of the nationally-scarce spignel. (BSBI Dumfries & Galloway county recorder, 2008).

8.4.3.4.6 Marsh / Marshy Grassland

1 Taking into account the suitability of habitat for water vole, the relatively small amount present within the Study Area and the floral diversity of this habitat, the conservation value is considered to be Low (Local High).

8.4.3.4.7 Wet Dwarf Shrub Heath

1 Section 4 includes various areas of wet dwarf shrub heath, particularly associated with the Black Water at Mackilston Hill. Taking into consideration the quality and extent of this habitat in the Study Area, listing on Annex 1 of the Habitats Directive and as a UK BAP national priority habitat, the nature conservation value is considered to be Medium.

8.4.3.4.8 Wet Modified Bog

1 There are some small areas of wet modified bog within the Study Area of Section 4 particularly at Glenshimmeroch. Considering the importance of blanket bog as an Annex 1 habitat and a UK BAP priority habitat, the quality and extent present within the survey area and the typical condition of the vegetation communities (i.e. modified due to drainage, afforestation and grazing), the nature of conservation value of this habitat is considered to be Medium.

8.4.4 Watercourses, Waterbodies and Fish

8.4.4.1 Section 1 (Smithston to Glenmuck)

8.4.4.1.1 River Doon

1 The River Doon provides important habitats for fish species of high conservation concern (i.e. Atlantic salmon, sea trout) that present as populations that are important at least at a regional spatial scale. The river also supports a wide range of other species of local to international conservation concern. Taking these and other factors into consideration, the nature conservation value of this watercourse within Section 1 is considered to be High.

8.4.4.1.2 Minor Watercourses

1 Section 1 includes several tributaries for the River Doon including; Polnessan Burn, Smithston Burn, Meickleholm Burn, Keir's Burn, Drumgrange Burn, Dunaskin Burn, Culter Burn and Grimmet Linns. The nature conservation value of these watercourses is considered to be Low (Local High).

8.4.4.1.3 Standing Water (associated Fen and Carr Habitats)

1 The mosaic of wetland habitats, including raised ombrotrophic mire, minerotrophic mire, fen and willow / birch carr associate with the floodplain of the River Doon (around Dalmellington Moss and Bogton Loch) these are considered to be of High nature conservation value.

8.4.4.1.4 Salmonid Fish Species

1 There are regionally important populations of migratory salmonid species within the River Doon catchment, which is within this section of the project. The nature conservation value is considered to be Medium.

8.4.4.2 Section 2 (Meikle Hill to Glenmuck)

8.4.4.2.1 Cummock Burn

1 Desk study records indicate that the Cummock Burn is particularly important for brown trout within this part of the Doon catchment and that migratory salmonids may also be present. The Cummock Burn is the only watercourse within the Study Area for the proposed OHL currently with a 'good' ecological condition classification (SEPA classification). Taking this and other factors into consideration, the nature conservation value of this habitat is considered to be Medium.

8.4.4.2.2 Muck Water

1 Desk study records indicate that the Muck Water is particularly important for brown trout and that migratory salmonids may also be present. Surveys in this part of Section 2 also indicate that the Muck Water is used by otter for foraging and commuting. Taking these and other factors into consideration, the nature conservation value of this habitat is considered to be Medium.

8.4.4.2.3 Mossdale Burn / Parrie Burn

1 Taking into consideration the presence of otter (e.g. otter spraints were found at Mossdale Burn's confluence with the Water of Muck) and the potential suitability of associated habitat for water vole, these watercourses are considered to have a nature conservation value of Low (Local High).

8.4.4.2.4 Loch Doon SSSI

1 Although Loch Doon is not within the immediate vicinity of the proposed / existing OHLs (it is c. 1km from the route of the existing OHL at its closest approach) it is considered to be a potential receptor for this assessment due to the need to cross minor watercourses that drain into the loch (e.g. in the vicinity of Lamford). As the largest and best example of an oligotrophic (nutrient-poor) water body in the region,

supporting a number of locally uncommon marginal plant species, and as a nationally important site for Arctic charr, the loch as a whole considered to have a High nature conservation value.

8.4.4.2.5 Salmonid Fish Species

1 Records from the desk study indicate that there are brown trout and salmon populations present in this section of the project Study Area. The Cummock Burn and Muck Water have been identified as important within the Doon catchment in relation to brown trout productivity. The nature conservation value for salmonid fish species collectively for this section is considered to be Medium.

8.4.4.3 Section 3 (Glenmuck to Dalshangan)

8.4.4.3.1 Water of Deugh

1 Although little evidence was found during surveys for this project it is considered likely, based on historical records and habitat suitability / quality, that the Water of Deugh is used by otter for foraging and commuting. The Water of Deugh is also an important watercourse for brown trout. In addition to this GFT electrofishing surveys found salmon present in the upper stretches of the Water of Deugh at six locations. The nature conservation value of the watercourse is considered to be Medium.

8.4.4.3.2 Carsphairn Lane

1 Although there are potentially suitable salmonid habitats present along this watercourse it is not accessible to salmon or sea trout due to the lack access upstream from Ken Doon Power station. It is considered to have a nature conservation value of Low (Local High).

8.4.4.3.3 Minor Watercourses

1 The Polquanity Burn, a tributary of the Water of Deugh, is located within Section 3 as is the Polnaskie Burn which flows into Loch Muck. Several otter spraints were found near to the confluence of the Polquanity Burn with the Water of Deugh. There are also several minor watercourses that drain the survey area and flow into Loch Doon SSSI (e.g. route of the proposed and existing OHLs at Lamford). The nature conservation value of minor watercourses collectively within this section is considered to be Low (Local High).

8.4.4.3.4 Salmonid Fish Species

1 Records indicate that there are populations of brown trout and sporadic salmon records within the watercourses that pass through this section. The nature conservation value is considered to be Low (Local High).

8.4.4.4 Section 4 (Dalshangan to Windfarm substations)

8.4.4.4.1 Water of Ken

1 Only a small section of the Water of Ken falls within the Section 4 Study Area. The area between Kendoon and Carsfad Loch provides good spawning habitat for fish and the Earlstoun Dam has a fish pass allowing salmon to migrate into this stretch. The nature conservation value of the watercourse is considered to be Medium.

8.4.4.4.2 Water of Deugh

1 The Water of Deugh is also an important watercourse for brown trout in particular. The nature conservation value of the watercourse is considered to be Medium.

8.4.4.4.3 Polmaddy Burn

1 The watercourse is described as having good in-stream habitats however due to the creation of dense forest the watercourse may suffer from acidification. It is believed to be accessible to migratory salmonids and support a good brown trout population. The nature conservation value of this watercourse is considered to be Low (Local High).

8.4.4.4.4 Minor Watercourses

1 Section 4 includes several minor tributaries such as the Black Water, Regland Burn, Garple Burn and the Margree Burn. Due to the suitability of the habitat for water vole, otter, brown trout etc. the combined nature conservation value of these watercourses is considered to be Low (Local High).

8.4.4.4.5 Salmonid Fish Species

1 Desk study records indicate that there is an important brown trout population, in particular, present in watercourses within this area and that some sections are used by migratory salmonids (i.e. up to the barrier of Ken Doon Reservoir Dam). The nature conservation value is considered to be Medium.

8.4.5 Non-avian Protected Fauna

8.4.5.1 Relevant Legislation and National / Regional Conservation Status

8.4.5.1.1 Badger (Meles meles)

1 Badger and their setts are strictly protected under the Protection of Badgers Act 1992 and by the Wildlife and Countryside Act 1981 (as amended). Both Acts have been updated by the Nature Conservation (Scotland) Act 2004. Badger are also listed on Appendix III of the Bern Convention. In summary, it is an offence to intentionally kill, persecute, or trap a badger and badger setts are protected from interference.

2 Historically, badgers have been heavily persecuted and hunted resulting in significant declines in the 19th Century. Following legal protection in the 1970s (which has since been made progressively more comprehensive under various Acts and amendments) populations have steadily increased, although illegal persecution remains a problem in parts of the UK. Road deaths may also be a significant cause of mortality, and habitat loss / fragmentation is also a concern. The Scottish population has been estimated at 25,000 (Harris & Yalden 2008). Badgers are mainly found within a mosaic landscape of woods and pasture, particularly favouring deciduous woods and clearings. Their distribution does not exceed the natural tree line (e.g. c. 700m in Scotland) (MacDonald & Barrett 2003).

8.4.5.1.2 Bat Species (Vespertilionidae)

1 All of Britain's bat species are listed on Annex IV of the EC Habitats Directive, and fully protected through the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended). It is an offence to intentionally or recklessly kill, injure or capture (take) bats; deliberately disturb bats (whether in a roost or not); damage, destroy or obstruct access to a roost, whether or not bats are present at the time, and disturb a hibernating or migrating bat. The UK is also a signatory to the Agreement on the Conservation of Bats in Europe (Bonn Convention), which extends the responsibility to the protection of their key feeding areas.

2 Within this part of the UK there are five bat species that are considered likely to be present within the general area (this does not exclude the potential for less common species to be present, for example the noctule. These are common pipistrelle, soprano pipistrelle, Daubenton's bat, Natterer's bat and the brown long-eared bat (*Plecotus auritus*). The brown long-eared bat, soprano pipistrelle and noctule bat are all priority species in the UK BAP.

3 Based on available data from national monitoring studies the UK populations of most of these species are currently considered to be either stable or increasing, although there remains some uncertainty with regards to an identified potential declining trend in colony counts for the soprano pipistrelle (National Bat Monitoring Programme Population Trends 2006, published by the Bat Conservation Trust).

8.4.5.1.3 Otter

1 The otter has been identified as requiring strict legal protection at a European level through its inclusion in Annex IV of the EC Habitats Directive. The otter is also listed on Annex II of the Directive as an animal species of community interest for which special areas of conservation may be designated. The otter is protected in UK law by the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended) though its inclusion on Schedule 2 (i.e. the list of 'European Protected Species'). It is an offence to intentionally or recklessly kill, take or injure an otter, intentionally or recklessly disturb an otter in its place of shelter and intentionally or recklessly damage, destroy or obstruct access to a place of shelter.

2 Historical population declines are related primarily to hunting for fur, sport and population control (as a perceived competitor for fish stocks). In the UK in 20th Century the otter suffered marked population declines, in the late 1950s and early 1960s due, primarily, to hunting, habitat loss and water pollution (Harris & Yalden 2008). Determining accurately the size of the Scottish population (or any otter population) is difficult because there is currently no reliable method for estimating numbers of otters from the density of their field signs. The most recent estimate for the UK population is 10,395 but this is considered an underestimate (Tracking Mammals Partnership, Mammal surveillance results to 2007 available online at www.jncc.gov.uk). Over recent decades the trend, inferred from national monitoring studies that have systematically surveyed for otter signs in sample sites, appears to be for increasing numbers and range consolidation / expansion. This trend has corresponded with significant general improvements in water quality, particularly in relation to lowland Scotland and the Central Belt, assisted by legal protection and bans on the use of organochlorine pesticides. However, there remain concerns about

non-natural threats to otter, such as mortality from road traffic accidents (Strachan 2007) and the protection of breeding sites. Otter is a priority species in the UK BAP.

8.4.5.1.4 Pine Marten

1 The pine marten and its dens are protected under the Wildlife and Countryside Act of 1981 (as amended), through its inclusion on Schedules 5 and 6 to the Act, and cannot be trapped, disturbed or sold without a specific licence. The pine marten is listed as a protected species in Appendix III of the 1979 Bern Convention on the Conservation of European Wildlife and Natural Habitats. It is also included in Annex V of the EC Habitats Directive, as a species "of community interest whose taking in the wild and exploitation may be subject to management measures".

2 Historically the pine marten was distributed across most of the British Isles. However, habitat loss, persecution to protect game species and hunting for fur have contributed to the decline of the species (Harris & Yalden 2008). Current threats include human disturbance and illegal poisoning and shooting due to martens attacking hens or being mistaken for mink. The Scottish population has been estimated at 3,500 (ibid.). The stronghold for this species in the UK is highland Scotland from where it is thought to be expanding (ibid.). A number were re-introduced to Galloway Forest in the early 1980's and there is thought to be a small but viable and potentially expanding population remaining. Pine marten is a priority species in the UK BAP

8.4.5.1.5 Red Squirrel

1 Red squirrel is listed on Schedules 5 and 6 to the Wildlife and Countryside Act 1981 (as amended). Under Section 9 of the Act it is an offence to intentionally or recklessly kill, injure, take or sell an animal, or damage, destroy or obstruct access to its place of shelter or protection. It is also an offence to intentionally or recklessly disturb a red squirrel while it is occupying a structure of place that it uses for that purpose. The red squirrel is also listed in Appendix III of the Bern Convention.

2 There has been a significant decline and range contraction in the UK red squirrel population over the last 50 years. The principle causes for this have been attributed to habitat loss and fragmentation of habitat and disease spread from the introduced grey squirrel (*Sciurus carolinensis*). Grey squirrels are not known to be aggressive towards reds but may out-compete them when food resources are limited (Harris & Yalden 2008). The Scottish population has been estimated at 121,000 (ibid.). Scotland is an important stronghold for this species in the UK. The red squirrel is a priority species in the UK BAP.

8.4.5.1.6 Water Vole

1 The water vole is listed on Schedule 5 to the Wildlife and Countryside Act 1981, as amended, and receives partial protection under Section 9 of the Act. It is an offence to intentionally or recklessly damage, destroy or obstruct access to any structure or place that water voles use for shelter or protection. In addition, it is an offence to intentionally or recklessly disturb water voles while they are using such a place. At present, water voles (i.e. the animals themselves) are not fully protected within Scotland, although this is under review.

2 Water vole populations in the UK have undergone significant declines over many decades, displaying one of the most dramatic declines in any British mammal in the 20th Century (Harris & Yalden 2008). Population decline and range contraction is due primarily to the loss and fragmentation of sensitive waterside habitats and pollution (Macdonald & Tattersall, 2001). Another factor has been the introduction of American mink (*Mustela vison*) to the UK which has resulted in localised extinctions in some areas. Currently, the UK population is considered to be in continued decline, there is no current national population estimate for this species (Tracking Mammals Partnership, Mammal surveillance results to 2007 available online at www.jncc.gov.uk). In Scotland there is a genetically distinct water vole population to the rest the British Isles (Strachan & Moorhouse 2006). Populations within upland Scotland also tend to have marked differences in habitat preferences and ecology to populations elsewhere in lowland UK. The water vole is a UK BAP priority species.

8.4.5.1.7 Great Crested Newt (Triturus cristatus)

1 Great crested newt is a European protected species and is listed on Annexes II and IV of the EC Habitats Directive and Appendix II of the Bern Convention. It is also fully protected in the UK through its inclusion on Schedule 2 to the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended).

2 The great crested newt is the UK's largest newt species and also it's most threatened, with the population suffering declines over the past 50 years (Beebee & Griffiths, 2000). The decline is due to a number of factors, including loss of breeding ponds, intensification of agriculture, stocking of suitable ponds with fish (which predate both eggs and larvae). The great crested newt is a priority species under the UK BAP.

3 Great crested newts use both terrestrial and aquatic habitats during different stages of their lifecycle and at different times of year (e.g. suitable ponds are used for mating, egg laying, and larval development). Focused survey for this species was not undertaken for this assessment. The NBN Gateway holds no records for this species within the Study Area for the proposed OHL and existing OHL to be dismantled. This does not exclude the potential for populations to be present in the area as it may be under-recorded in this region. Great crested newt surveys undertaken for the South West Scotland Renewables Connection Project EIA (SWS Project) (SP Transmission Ltd., 2008) identified a number of potentially suitable waterbodies within the survey area for that project (which partly overlaps with Section 1 and Section 2 of this project) however subsequent surveys for the presence of great crested newt did not record the presence of this species at any of the nine waterbodies surveyed.

8.4.5.1.8 Fresh Water Pearl Mussel (Margaritifera margaritifera)

1 The freshwater pearl mussel is protected under European and UK law. FWPM is listed under Annexes II and V of the EC Habitats Directive affording it Special Area of Conservation (SAC) qualifying status and whose 'taking in the wild and exploitation may be subject to management measures.' FWPM is fully protected in the UK through its inclusion on Schedule 2 to the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended).

2 Populations of fresh water pearl mussel are declining throughout its global range. In the UK they are now largely restricted to high quality rivers in highland Scotland and some sites in Northern Ireland. Scotland is considered an internationally important stronghold for this species, supporting a significant proportion of the remaining global population. The factors behind this decline are not fully understood but are considered likely to be related to river regulation, drainage, sewage disposal, dredging, and water pollution, including the introduction of excess nutrients. In addition, effects on the FWPM's host species populations have also affected the species. Due to the essential role salmonid fish play in the life of the freshwater pearl mussel, the conservation of salmon and trout is central in the survival of this species. The FWPM is a priority species in the UK BAP.

3 There are no known historical records of FWPM within the Study Area for the proposed OHL. However, surveys undertaken by Ayrshire Rivers Trust on the River Doon (and Girvan) have identified the presence of populations within and downstream of the section of the river which the existing OHL crosses (ART, 2008). Although there is no data showing extant populations at or near to points at which the existing line actually crosses the River Doon (Section 1 of the project) there is the potential for populations to be present. Current evidence indicates that these populations are moribund due to a lack of recruitment. However, further surveys are ongoing to determine whether there are juveniles present within suitable habitats in the catchment. This species is of high conservation interest, particularly given the very poor conservation status of this species in the region. A nature conservation value of High is considered appropriate for this species.

8.4.5.1.9 Reptiles

1 The adder (*Vipera berus*) is listed on Schedule 5 to the Wildlife and Countryside Act 1981 (as amended) and receives partial protection, from killing, injury and sale, under Section 9 of the Act. The adder is also a UK BAP priority species.

2 Common lizard (*Zootoca vivipara*) is listed on Schedule 5 to the Wildlife and Countryside Act 1981 (as amended) is protected from killing, injury and sale. The common lizard is also a UK BAP priority species.

3 Slow-worm (Anguis fragilis) is listed on Schedule 5 to the Wildlife and Countryside Act 1981 (as amended) and receives partial protection, from killing, injury and sale. The slow-worm is also a UK BAP priority species.

8.4.5.1.10 Other Amphibians

1 Common frog *(Rana temporaria)* is listed on Schedule 5 to the Wildlife and Countryside Act 1981 (as amended) and receives partial protection, from sale only, under Section 9 of the Act.

2 Common toad (*Bufo bufo*) is also listed on Schedule 5 to the Wildlife and Countryside Act 1981 (as amended) and receives partial protection, from sale only, under Section 9 of the Act. Common toad is also a UK BAP priority species.

8.4.5.2 Evaluation of Section 1 (Smithston to Glenmuck) Receptors

8.4.5.2.1 Badger

1 There are no records for badger for this section; however, this species can be under-recorded. There are suitable habitats within this section. On a conservative basis the nature conservation value of badgers within this section of the Study Area is considered to be Low (Local Medium).

8.4.5.2.2 Bat Species

1 Desk study records indicate that the Study Area within Section 1 includes habitats used by a variety of bat species. On a conservative basis given the absence of detailed survey information for this section, and taking into consideration national conservation status, the presence and apparent quality of suitable foraging and roosting habitats, all bat species populations present within this part of the Study Area are considered to be of potential Medium nature conservation value.

8.4.5.2.3 Otter

1 Available records from desk study indicate that the Study Area within Section 1 is used by otter (although no evidence of breeding or regular residence is indicated). On a conservative basis given the absence of detailed survey information for this section, and considering the international conservation status of otter, the population present in the area are considered to be of potential Medium nature conservation value.

8.4.5.2.4 Pine Marten

1 No records of pine marten were found for Section 1 of the Study Area and habitat extent and quality is considered to be very low for this section of the project. Consequently a conservative nature conservation value of Low (Local Low) is considered appropriate.

8.4.5.2.5 Red Squirrel

1 There are no recent records of red squirrel for this section of the survey area. There is very limited habitat for this species in this section, a conservative nature conservation value of Low (Local High) is considered appropriate.

8.4.5.2.6 Water Vole

1 Water vole records were found within Section 1. In particular water vole is noted to the west of Dalmellington, however elsewhere, available information indicates that the level of water vole activity is limited. The Ayrshire Local Action Plan has a specific target for water vole in this area. This includes protection and enhancement of water vole sites, enhancement of water vole habitat to encourage expansion, enhancement of corridors between water vole hot spots and action to reduce fragmentation of habitat. Considering the national conservation status of this species and the priority status of water voles in the UK and Ayrshire BAPs, a conservative nature conservation value of the water vole population in this Section is considered to be Medium.

8.4.5.2.7 Great Crested Newt

1 On the basis of the information available, although there is no evidence of any extant population within this section of the project, there are potentially suitable habitats within parts of Section 1. Therefore, on a precautionary basis, a evaluation of Low (Local High) is considered to be appropriate for locations where potentially suitable habitats are present.

8.4.5.2.8 Freshwater Pearl Mussel

1 There are populations of fresh water pearl mussel within the River Doon, which are believed to be present within the vicinity of Section 1 of this project. Taking into consideration the status of this species at an international, national and regional level these populations are considered to be of High nature conservation value.

8.4.5.3 Evaluation of Section 2 (Meikle Hill Substation to Glenmuck) Receptors

8.4.5.3.1 Badger

1 No evidence of badger activity was found during the walkover surveys. There is some limited suitable habitat within this section of the project. Therefore the nature conservation value of badgers within the Study Area has been classified as Low (Local Medium).

8.4.5.3.2 Bat Species

1 Levels of bat activity varied across Section 2. Relatively high levels of activity were detected along the Muck Water and lower levels within the South Kyle and Brownhill Plantations. No definite tree roosts were identified within this section. Generally potential roost habitat within Section 1 is poor, due to the age and condition of much of the conifer plantation woodland, although there are localised areas with mature broadleaved trees that provide a greater potential for roosting bats. All bat species populations present within the Study Area are considered collectively to be of Low (Local High) nature conservation value.

8.4.5.3.3 Otter

1 Relatively low levels of otter activity were recorded within Section 2, although there are a number of watercourses and waterbodies within this section that provide apparently good habitat. The population present in the area are considered to be of Low (Local High) nature conservation value.

8.4.5.3.4 Pine Marten

1 Although there is considered to be suitable habitat within this section no evidence of pine marten was found and no historical records were noted during the desk study. On a conservative basis the nature conservation value of pine marten within this section of the Study Area is considered to be Low (Local High).

8.4.5.3.5 Red Squirrel

1 Red squirrels are present in the South Kyle and Brownhill plantations although at relatively low densities due to habitat quality being sub-optimal. This plantation has been included within a red squirrel priority woodland area. Taking into account of the conservation status of the species, the nature conservation value of the red squirrel population in this part of the Study Area is considered to be Low (Local High).

8.4.5.3.6 Water Vole

1 No evidence of the presence of a water vole population within this section was found and there were no historical recorded noted during the desk study. However considering the presence of potentially suitable habitat, the priority status of water voles in the UK and Ayrshire BAP, the nature conservation value for water vole has been conservatively assessed as Low (Local High).

8.4.5.3.7 Great Crested Newt

1 On the basis of the information available, there is no evidence of any extant population within this section of the project and there does not appear to be any potentially suitable habitat within Section 2. Therefore an evaluation of Negligible is considered to be appropriate.

8.4.5.3.8 Freshwater Pearl Mussel

1 There are populations of fresh water pearl mussel within the River Doon, which are believed to be present downstream of Section 2 of this project. Taking into consideration the status of this species at an international, national and regional level these populations are considered to be of High nature conservation value.

8.4.5.4 Evaluation of Section 3 (Glenmuck to Dalshangan) Receptors

8.4.5.4.1 Badger

1 No signs of badger were found during the walkover surveys; however, the desk study did reveal records indicating that there is a population present within part of this section. The nature conservation value of the badger population within this section is considered to be Low (Local High).

8.4.5.4.2 Bat Species

1 Bat activity was noted to be relatively high in some parts of the section, particularly around the Green Well of Scotland. Taking into consideration the wider conservation status of many bat species and the presence of suitable foraging and roosting habitat, all bat species populations present within this part of the Study Area are collectively considered to be of Medium nature conservation value.

8.4.5.4.3 Otter

1 Otter activity from surveys within Section 3 was found to be relatively low. The evidence indicated that otter use the watercourses within this section occasionally for foraging and commuting. Given the wider conservation status of the species the

population present in this section is considered to be of Low (Local High) nature conservation value.

8.4.5.4.4 Pine Marten

1 Although there is considered to be suitable habitat within this section, no evidence of pine marten was found. However, there are old historical records for this section noted during the desk study. There are historical records of pine marten within this part of the Study Area. On a conservative basis the nature conservation value of pine marten within this section of the Study Area is considered to be Low (Local High).

8.4.5.4.5 Red Squirrel

1 Red squirrel activity was noted as relatively low in this section and there is relatively limited extent of suitable habitat. Taking into account the priority status of this species in the UK BAP, the nature conservation value of the red squirrel population in this section of the Study Area is considered to be Low (Local High).

8.4.5.4.6 Water Vole

1 There is no evidence of the presence of a water vole population within this part the Study Area. Although there is potentially suitable habitat.

8.4.5.5 Evaluation of Section 4 (Dalshangan to Blackcraig Hill Substation) Receptors

8.4.5.5.1 Badger

1 No signs of badger were found during the walkover surveys. However, the desk study did reveal historical records for this section. The nature conservation value of badgers within this section is considered to be Low (Local Medium).

8.4.5.5.2 Bat Species

1 Bat activity varied considerably throughout Section 4. The highest activity was at the Carse of Dundeugh and the lowest levels of activity were detected in the southern part of the survey area for this section. Although no specific tree roosts were identified, habitat quality for tree roosting bats is considered to be relatively high in this section due to the presence of a number of areas of riparian ancient woodland (i.e. due to the age and condition of many of the broadleaved tress and their position along watercourses that provide ideal foraging habitat and commuting routes for a number of bat species). Taking into consideration the conservation status of most bat species in the UK, and the presence, quality and extent of suitable foraging and roosting habitat, all bat species populations present within the Study Area are collectively considered to be of Medium nature conservation value.

8.4.5.5.3 Otter

1 Otter activity was found to be relatively high in within the survey area for Section 4. Although no active holt sites were noted during surveys, there are a number of watercourses that are considered very likely to form part of breeding territories. Given the wider conservation status of the species the population present in this section is considered to have a nature conservation value of Medium.

8.4.5.5.4 Pine Marten

1 Although there is considered to be suitable habitat within this section no evidence of pine marten was found during surveys. There are old historical records of pine marten within this part of the Study Area. On a conservative basis the nature conservation value of pine marten within this section of the Study Area is considered to be Low (Local High).

8.4.5.5.5 Red Squirrel

1 Red squirrel activity was noted within the Carse of Dundeugh and some activity was noted in the Margree and Corriedoo Forests. Generally, habitat quality for red squirrel is at it highest (in comparison with the other sections) within this section of the project Study Area. Taking account of their priority status in the UK and local BAPs, the nature conservation value of the red squirrel population in this part of the Study Area is considered to be Medium.

8.4.5.5.6 Water Vole

1 There was no evidence of the presence of a water vole population within this section of the project survey area. However there is apparently suitable habitat.

Table 8.15 - Summary table of nature conservation evaluation for sensitive terrestrial and aquatic ecological receptors

Receptor	Section 1	Section 2	Section 3	Section 4	Whole Project
Bogton Loch SSSI	High	n/a	n/a	n/a	High
Dalmellington Moss SSSI	High	n/a	n/a	n/a	High
Loch Doon SSSI	High	n/a	n/a	n/a	High
Non-statutory Designated Sites	Local High	n/a	n/a	Local High	Local High
Acid / neutral flush	n/a	Local Medium	Local Medium	Local Medium	Local Medium
Broadleaved semi-natural woodland	Local High	n/a	Local High	Medium	Medium
Broadleaved plantation woodland	Local Medium	Local Medium	Local Medium	Local Medium	Local Medium
Coniferous plantation woodland	Local Low	Local Medium	Local Medium	Local Medium	Local Medium
Scattered and Continuous bracken	n/a	n/a	Negligible	Negligible	Negligible
Dry dwarf shrub heath	n/a	Local High	Local High	Medium	Medium
Improved grassland	Negligible	Negligible	Negligible	Negligible	Negligible
Marsh / marshy grassland	Local Medium	Local Medium	Local High	Local High	Local High
Modified and Unmodified blanket bog	n/a	Local High	Medium	Medium	Medium
Raised bog	High	n/a	n/a	n/a	High
Scattered broad-leaved trees	Local High	n/a	Local High	Local High	Local High
Semi-improved / unimproved grasslands	Local Medium	Local Medium	Local High	Medium	Medium
Wet dwarf shrub heath	n/a	Local High	n/a	Medium	Medium
Nationally scarce plant species	Medium	Medium	Local Medium	Local Medium	Medium
Other standing waters	Local Medium	Local Medium	Local Low	Local Medium	Local Medium
Main Watercourses	High	Medium	Medium	Medium	High
Minor Watercourses	Local High	Local High	Local High	Local High	Local High
Salmonid fish species	Medium	High	Local High	Local High	Medium
Badger	Local Medium	Local Medium	Local High	Local Medium	Local High
Bat species	Medium	Local High	Medium	Medium	Medium
Otter	Medium	Local High	Local High	Medium	Medium
Pine Marten	Local Low	Local High	Local High	Local High	Local High
Red squirrel	Local High	Local High	Local High	Medium	Medium
Water vole	Medium	Local High	Negligible*	Negligible*	Medium
Great crested newt	Local High	Negligible	Negligible	Negligible	Local High
Fresh Water Pearl Mussel	High	High	Negligible*	Negligible*	High

**Although there is no evidence of populations present, based on available data at the time of writing, there is suitable habitat for these species within this section.*

2 The receptor evaluation for the 'whole project' Study Area has been used in completing the following assessment of effects of the proposed OHL project (i.e. the highest evaluation for any of the sub-sections has been used in assessing effects on that receptor).

8.5 Assessment of effects

8.5.1 Introduction

1 A summary of potential effects on important ecological receptors arising from the proposed OHL is provided in the Introduction to this Chapter. The following sections provide further detail on the specific effects associated with the construction and operation of the OHL and dismantling of the existing OHL and provide an assessment of the likely significance of those effects, prior to consideration of mitigation measures.

2 Where these potential effects have been assessed as being significant, mitigation management measures have been proposed to address them.

8.5.2 Design Mitigation

1 Prior to the EIA process, the route of the proposed OHL has undergone a selection process which considers a range of environmental issues, including ecological constraints. This process, including a discussion on the selection of the proposed route, is described in Chapter 3.

2 In relation to potential effects on mature broadleaved woodland, which has been identified as a high-level ecological constraints from an early stage in the routeing studies, considerable effort has been made to minimise the extent of this habitat affected by the proposal. However, it has not been possible to completely avoid all areas of broadleaved woodland, due to the wide range of consultee, landowner, environmental and technical considerations which must be taken account of in the development of the proposed route. Of particular concern is the area of broadleaved river gorge / riparian oak woodland associated with crossings of the Water of Ken and Water of Deugh near Ken Doon. Through the micro-siting of the wood pole positions relative to detailed topographic data and following information from an individual tree survey the number of mature broadleaved trees requiring felling has been substantially reduced (i.e. to one or two trees only). This would be achieved by maintaining the overhead cables well clear of the estimated maximum tree height likely to be attained, or crown reducing (topping) where appropriate (as described in the Forestry Chapter).

3 Description of further mitigation measures related to construction and operational effects of the proposed OHL, in order to reduce the magnitude of potentially significant effects on sensitive terrestrial ecological receptors, is provided below in Section 8.6 under the heading 'Mitigation and Management'.

8.5.3 Sensitive Ecological Receptors

1 Taking into consideration the results of the EIA scoping, desk study and subsequent site surveys, the following designated sites, habitats and notable flora have been identified as the sensitive receptors for the purpose of this assessment (nature conservation value for the receptor across the whole project is given in parentheses):

- Bogton Loch SSSI (High)
- Dalmellington Moss SSSI (High)
- Loch Doon SSSI (High)
- Blanket bog (Medium)
- Broadleaved semi-natural woodland (Medium)
- Broadleaved plantation woodland (Local Medium)
- Coniferous plantation woodland (Local Medium)
- Dry dwarf shrub heath (Local High)
- Fen and swamp habitats (High)
- Marsh / marshy grassland (Local High)
- Raised bog (High)
- Scattered broad-leaved trees (Local High)
- Semi-improved / unimproved grasslands (Medium)
- Other standing water (High)
- Watercourses (High)
- Wet dwarf shrub heath (Medium)
- Notable Flora (Medium)

2 The following non-avian fauna have been defined as sensitive receptors for the purposes of this assessment (nature conservation value for the receptor across the whole project is given in parentheses):

- Bat species (Medium)
- Otter (Medium)
- Red squirrel (Medium)
- Water vole (Medium)
- Salmonid fish species (Medium)
- Fresh Water Pearl Mussel (High)

3 Other habitats or species (including protected species, such as badger and pine marten) are not included above, as the survey area has been assessed as being of Negligible or Low nature conservation value or because significant adverse effects are considered to be highly unlikely (e.g. small mammals having a relatively low nature conservation value and small extent of potential habitat loss / degradation).

8.5.4 Elements of the Project Relevant to this Assessment

1 The following is a brief summary of the key elements of the scheme relevant to the assessment of effects on ecological receptors. The impact assessment considers the potential effects associated with the construction and operation of all towers/ poles associated with the proposed OHL (i.e. foundations for wood poles and steel lattice towers, access for tower / pole construction, access for conductor stringing, substation construction, temporary construction compounds and temporary storage areas). Details of the proposed construction methods are provided in Chapter 5.

8.5.4.1 Infrastructure Allowance

1 To ensure the final tower and pole positions on the proposed OHL works are not varied to such a degree as to cause a change in the magnitude or extent of any environmental effects to those assessed, compared with those identified on plans in the ES, an infrastructure location allowance (ILA) has been defined, as detailed in Chapter 5.

2 Table 8.16a provides estimates of the un-restorable permanent habitat loss as a result of the construction of the project (i.e. habitats permanently lost to tower / pole foundations, substation areas, new and upgraded access tracks in relation to areas of mature semi-natural woodland). These estimates do not include consideration of potential habitat gain from the dismantling of the existing transmission line. Table 8.16b provides estimates of habitats damaged during the construction process but that would be subject to reinstatement and restoration (where there is a reasonable expectation that the conditions that support the presence of these habitats can also be maintained / restored). Table 8.16c provides estimates of ombrotrophic mire (i.e. blanket bog) vegetation communities potentially affected in the long-term by localised changes in peat hydrology.

3 A detailed explanation of the calculations and assumptions made in arriving at these estimates is provided in Appendix C.10.

4 For forestry felling within the wayleave a c. 80m wide corridor has been assumed, although this will vary due to the particular sensitivities and conditions in some locations (i.e. in areas of mature broadleaved woodland felling would be reduced, as far as possible, and the 80m corridor width relaxed). For broadleaved semi-natural woodland (48.79ha with the survey area in total) it has been estimated that 4.47ha would be within the wayleave corridor. However, it is anticipated that through careful siting of poles, pole design and using crown reduction rather than felling, only a small number of mature trees will actually require to be felled. For coniferous plantation woodland (1392.69ha with the survey area in total) it has been estimated that 106.1ha of plantation within the 80m wayleave corridor will require harvesting, mulching or scrub cutting (see Chapter 6 for further details). This is approximately 15% of this habitat within the 1km wide survey corridor. In relation to felling to a wind-firm edge in commercial conifer plantations, is has not been possible to determine the extent of such felling as it is dependant on land-owner discussions and agreements that would not occur until after project consent. It has been estimated that 105.8ha of plantation would be affected by windthrow of mature conifer stands adjacent to the 80m wide wayleave felling corridor.

Table 8.16a: Estimates of the Area of Habitat Lost (permanent and long-term) as a Percentage of the Total Extent of each Habitat within 500m of the Proposed OHL

Phase 1 Habitat Type	Substation & 132 kV switchyard	L7 Towers (Turning)	L7 Towers (Suspension)	Wood Poles	Permanent Access Tracks	Total
Scattered broadleaved trees						0.0000%
Scattered coniferous trees						0.0000%
Recently felled coniferous woodland		0.0027%	0.0068%	0.0003%		0.0099%
Broad leaved wood-land - semi -natural					0.2678%	0.2678%
Broadleaved woodland - plantation						0.0000%
Coniferous woodland - semi-natural					0.9950%	0.9950%
Coniferous woodland - plantation	0.1089%	0.0039%	0.0065%	0.0042%		0.1234%
Mixed woodland - semi-natural					0.8772%	0.8772%
Mixed woodland - plantation			0.0038%			0.0038%
Improved grassland		0.0053%	0.0053%	0.0028%		0.0133%
Marsh/ Marshy Grassland		0.0017%	0.0050%	0.0040%		0.0107%
Poor semi-improved grassland						0.0000%
Acid grass-land - Semi-Improved		0.0019%	0.0046%	0.0017%		0.0082%
Neutral grassland - Semi-improved			0.0040%	0.0150%		0.0190%
Continuous bracken		0.0022%	0.0044%	0.0016%		0.0082%
Wet dwarf shrub heath				0.0118%		0.0118%
Wet heath/ acid grass-land				0.0184%		0.0184%
Wet modi-fied bog		0.0020%	0.0086%	0.0007%		0.0112%
Blanket Bog						0.0000%
Bare ground						0.0000%

Table 8.16b: Estimates of the Area of Habitat Damaged/Disturbed during Construction (i.e. habitats subject to reinstatement and restoration) as a Percentage of the Total Extent of each Habitat within 500m of the Proposed OHL

Phase 1 Habitat Type	Substation & 132 kV Switchyard	L7 Towers (Turning)	L7 Towers (Suspension)	Wood Poles	Access Tracks and underground cable section	Pulling Compounds	Construction Compounds	Total
Scattered broadleaved trees					1.8682%	5.2979%		7.1662%
Scattered coniferous trees					20.5882%			20.5882%
Recently felled coniferous woodland		0.2923%	0.7308%	0.0325%	3.1747%	0.8847%	0.4528%	5.5678%
Broad leaved woodland - semi -natural				0.2460%				0.2460%
Broadleaved woodland - plantation					0.5747%			0.5747%
Coniferous woodland - semi-natural				1.4925%				1.4925%
Coniferous woodland - plantation	0.1089%		0.6945%	0.4228%	2.4081%	0.9687%	0.1912%	4.7941%
Mixed woodland - semi-natural								0.0000%
Mixed woodland - plantation			0.4034%	0.8596%	3.5440%			4.8070%
Improved grassland		0.5642%	0.5642%	0.2756%	3.0035%			4.4075%
Marsh/Marshy Grassland		0.1858%	0.5342%	0.3920%	1.9972%	0.6092%		3.7184%
Poor semi-improved grassland					9.1837%	55.0714%		64.2551%
Acid grassland - Semi-Improved		0.2039%	0.4895%	0.1721%	1.2656%	0.1234%	0.1996%	2.4542%
Neutral grassland - Semi-improved			0.4310%	0.0575%	0.6283%	0.2174%	0.6676%	2.0018%
Continuous bracken		0.2372%	0.4745%	0.6369%	2.3413%	1.9145%		5.6044%
Wet dwarf shrub heath				1.1654%	3.5874%	1.5126%		6.2654%
Wet heath/acid grassland				1.8211%	3.5874%	1.5042%		6.9127%
Wet modified bog		0.2116%	0.9169%	0.0679%	1.1706%	0.0474%	0.3758%	2.7902%
Blanket Bog					2.8719%			2.8719%
Bare ground					16.3541%			16.3541%

Table 8.16c: Estimates of the Area of Peatland Habitats Potentially affected by Localised Hydrological Changes in the Long-term as a Percentage of the Total Extent of each Habitat within 500m of the Proposed OHL (NB this applies only to blanket bog (modified and unmodified) and acid / basic flush habitats, i.e. 'peatland' habitats that are considered to be particularly vulnerable to this effect)

Phase 1 Habitat Type	Substation & 132 kV Switchyard	L7 Towers (Turning)	L7 Towers (Suspension)	Wood Poles	Access Tracks and underground cable section	Pulling Compounds	Construction Compounds	Total
Wet modified bog	N/A	0.0474%	0.2087%	0.0157%	1.1706%	0.4605%	0.4668%	2.3697%
Blanket Bog	N/A	N/A	N/A	N/A	2.8719%	N/A	N/A	2.8719%

8.5.5 Terrestrial Habitats and Flora - Construction Phase Effects

1 In the following assessment, the magnitudes of potential effects associated with the construction phase of the OHL are given, along with effect levels. Effects and significance levels have been assessed according to the methods outlined under the heading 'Impact Assessment Methodology' (refer to Tables 8.05 & 8.06).

2 Proposed mitigation measures and residual effects are dealt with in a separate section, under the heading 'Mitigation and Management', see Section 8.6 below.

8.5.5.1 Damage During Construction

1 Damage and disturbance to sensitive habitats could occur through a number of activities during construction, access track construction, tree felling, heavy plant trafficking and trenching of the underground cable section. Damage could be caused by soil compaction and physical damage to tree roots whilst trafficking or excavating tower / pole bases.

2 Damage and / or disturbance can lead to the loss of vegetation and / or changes to vegetation communities in response to changes in environmental conditions. Blanket bog plant communities, in particular, can be affected through changes to hydrology related to the disturbance of soil and peat structure. The result of these changes can be the loss of plant species specifically adapted to the hydrological regime present within these habitats. Further discussion of this effect is provided, below, which deals with the effects of construction and blanket hydrology.

3 The terrestrial habitats which are considered particularly sensitive to damage during construction works include blanket bog, marshy grassland and semi-natural broadleaved woodland.

4 The effect magnitude and effects for each receptor are summarised below in Table 8.17, based on the estimated extent of habitats affected and their assessed nature conservation value. Consideration of notable flora is given within the assessment of the relevant individual broad habitat type.

Table 8.17 - Potential Unmitigated Effects Due to Construction Damage

Habitat Receptor	Conservation Value	Potential Magnitude	Effect Level	Duration	Significant/Not Significant
Blanket bog	Medium	Low-Medium	Moderate Adverse	Medium-term	Significant
Broadleaved semi-natural woodland	Medium	Low	Minor Adverse	Medium-term	Not Significant
Broadleaved plantation woodland	Low (M)	Low	Minor Adverse	Medium-term	Not Significant
Coniferous plantation woodland	Low (M)	Low	Minor Adverse	Medium-term	Not Significant
Dry dwarf shrub heath	Medium	Low	Minor Adverse	Medium-term	Not Significant
Marsh / marshy grassland	Low (H)	Low-Medium	Moderate Adverse	Short-term	Significant
Scattered broad-leaved trees	Low (H)	Low	Minor Adverse	Medium-term	Not Significant
Semi-improved / unimproved grasslands	Medium	Low-Medium	Moderate Adverse	Short-term	Significant
Wet dwarf shrub heath	Medium	Low-Medium	Moderate Adverse	Medium-term	Significant

8.5.5.2 Pollution of Terrestrial Habitats

1 Pollution can arise from the airborne mobilisation of fine sediments (dust) associated with earthworks (e.g. excavation of foundations, temporary storage of excavated spoil, upgrading existing or forming of new access tracks) and from release of environmentally hazardous chemicals such as fuels and oils from construction plant. This has the potential to result in the loss of vegetation and / or alteration of soil chemistry which can result in detrimental changes in the vegetation community in the longer-term (this can be a problem in particular for blanket bog plant species that are adapted to low nutrient, acidic conditions).

2 The assessment of potential unmitigated effects from pollution on terrestrial habitats is summarised in Table 8.18 below.

Table 8.18 - Potential Unmitigated Effects Due to Pollution - Construction Phase

Habitat Receptor	Conservation Value	Potential Magnitude	Effect	Duration	Significant/Not Significant
Blanket bog	Medium	Low-Medium	Moderate Adverse	Short-term	Significant
Broadleaved semi-natural woodland	Medium	Low	Minor Adverse	Short-term	Not Significant
Broadleaved plantation woodland	Low (M)	Low	Minor Adverse	Short-term	Not Significant
Coniferous plantation woodland	Low (M)	Low	Minor Adverse	Short-term	Not Significant
Dry dwarf shrub heath	Medium	Low	Minor Adverse	Short-term	Not Significant
Marsh / marshy grassland	Low (H)	Low	Minor Adverse	Short-term	Not Significant
Scattered broad-leaved trees	Low (H)	Low	Minor Adverse	Short-term	Not Significant
Semi-improved / unimproved grasslands	Medium	Low	Minor Adverse	Short-term	Not Significant
Wet dwarf shrub heath	Medium	Low	Minor Adverse	Short-term	Not Significant

8.5.5.3 Changes to Hydrology

1 Potential effects on the hydrology of surface waters are addressed in detail in Chapter 11 (Hydrology). This section of the assessment focuses on terrestrial habitats that are considered to be particularly sensitive to perturbation of surface hydrology resulting from construction activities associated with the proposed OHL. The blanket bog habitats present within the site are considered the most susceptible to changes in hydrology.

2 Water movement in blanket peat is complex. Unmodified blanket bog vegetation requires a permanently raised water level which is derived directly from rainfall and, in the case of peat deposits on slopes, also through lateral seepage of rainfall in the acrotelm. The high water level is maintained by high rainfall and the low hydraulic conductivity at lower levels within the peat profile (hydraulic conductivity, or permeability, is negatively correlated with the degree of peat humification, which decreases with peat depth). Blanket bogs often display complexes of hydrologically connected formations, or landforms, which develop primarily in response to underlying topography.

3 Hydrological changes could occur by the creation of cut faces through areas of deep peat as a result of excavation works for pole/tower foundations, underground cable trenching or the requirement of temporary drainage ditches for the temporary access track. This may result in a localised zone of drying behind the cut faces which may lead to the oxidisation and erosion of the peat if the area is left exposed to the elements. There is also the potential for poorly designed tracks and drainage provision (and their construction) to result in the erosion of peat (or exacerbation of existing active peat erosion) and the loss of the associated plant communities.

4 Changes in the local hydrology regime from the disturbance can be particularly accentuated if drainage ditches are placed in areas of deep peat. Although the area directly disturbed by the construction works is relatively localised, the nature of the peat is such that a wider zone of potential hydrological perturbation can occur where living bog vegetation is present. Longer-term, a change in surface water levels could result in a habitat dominated either by plant species that prefer drier conditions, such as grasses or by marginal or inundation species where water levels have increased.

5 The effect magnitude of potential changes in hydrology in relation to blanket bog habitats is assessed as Medium with a potential effect significance of Moderate Adverse (Significant).

8.5.6 Terrestrial Habitats and Flora - Dismantling Phase Effects

1 In the following assessment, the magnitudes of potential effects associated with the dismantling works of the existing N-Route transmission line from Dalshangan to Smithston are given, along with effect levels.

2 Proposed mitigation measures and residual effects are dealt with in a separate section, under the heading 'Mitigation and Management', in Section 8.6 below.

8.5.6.1 Damage due to Dismantling Works

1 Damage and disturbance to sensitive habitats could occur through the trafficking of vehicles associated with the proposed dismantling works. Damage and / or disturbance can lead to a similar set of ecological effects as outlined above in the assessment of potential effects arising from the construction works for the proposed OHL.

2 The terrestrial habitats which are considered particularly sensitive to damage during the proposed dismantling works include blanket bog, raised bog, marshy grassland, semi-natural broadleaved woodland.

3 The effect magnitude and effect for each receptor are summarised below in Table 8.19, based on the estimated extent of habitats affected and their assessed nature conservation value.

Table 8.19 - Potential Unmitigated Effects Due to Dismantling Damage

Habitat Receptor	Conservation Value	Potential Magnitude	Effect	Duration	Significant/Not Significant
Dalmellington Moss SSSI	High	Low	Moderate Adverse	Medium-term	Significant
Blanket bog	Medium	Low - Medium	Moderate Adverse	Medium-term	Significant
Broadleaved semi-natural woodland	Medium	Low	Minor Adverse	Medium-term	Not Significant
Coniferous plantation woodland	Low (M)	Low	Minor Adverse	Medium-term	Not Significant
Marsh / marshy grassland	Low (H)	Low	Minor Adverse	Short-term	Not Significant
Raised bog	High	Medium	Moderate Adverse	Medium-term	Significant
Scattered broad-leaved trees	Low (H)	Low	Minor Adverse	Medium-term	Not Significant
Semi-improved / unimproved grasslands	Medium	Low	Minor Adverse	Short-term	Not Significant

8.5.6.2 Pollution during Dismantling Works

1 Similar potential sources of pollution to terrestrial habitats as described above for the construction phase and are applicable to the dismantling phase. The effect magnitude and effects level for each receptor are summarised below in Table 8.20.

Table 8.20 - Potential Unmitigated Effects Due to Pollution - Dismantling Phase

Habitat Receptor	Conservation Value	Potential Magnitude	Effect Level	Duration	Significant/Not Significant
Blanket bog	Medium	Low	Minor Adverse	Short-term	Not Significant
Broadleaved semi-natural woodland	Medium	Low	Minor Adverse	Short-term	Not Significant
Broadleaved plantation woodland	Low (M)	Low	Minor Adverse	Short-term	Not Significant
Coniferous plantation woodland	Low (M)	Low	Minor Adverse	Short-term	Not Significant
Dry dwarf shrub heath	Medium	Low	Minor Adverse	Short-term	Not Significant
Marsh / marshy grassland	Low (H)	Low	Minor Adverse	Short-term	Not Significant
Raised bog	High	Low	Moderate Adverse	Short-term	Significant
Scattered broad-leaved trees	Low (H)	Low	Minor Adverse	Short-term	Not Significant
Semi-improved / unimproved grasslands	Medium	Low	Minor Adverse	Short-term	Not Significant
Wet dwarf shrub heath	Medium	Low	Minor Adverse	Short-term	Not Significant

8.5.7 Terrestrial Habitats and Flora - Operational Phase Effects

1 The potential significance of permanent effects from habitat loss due to the built 'footprint' of the proposed OHL (i.e. including tower/pole foundations, permanent / upgraded access tracks), and habitat change as a result of the required wayleave management, is considered in this section (e.g. from excavation for each wood pole or lattice tower placement, etc.). In addition, during operation there may be temporary effects from ongoing maintenance activities or emergency works, resulting in disturbance to sensitive habitats from the associated access works area.

8.5.7.1 Habitat Loss

1 Although some habitat loss effects will initially occur during the construction phase of the proposed OHL, some of this will be temporary due to the construction process (vehicle trafficking, temporary storage etc.) and also responses to habitat restoration techniques (e.g. the careful back-filling and restoration of the underground cable trench). Longer-term there will be some permanent habitat loss arising from the project associated with pole and tower bases and loss of mature woodland due to tree height restrictions with the OHL wayleave corridor.

2 There will be some long-term habitat gain as a result of the dismantling of the existing N-Route from Dalshangan to Smithston and the reinstatement of the tower bases. However, although a positive effect of these proposals, the total extent of the habitat 'gain' from this is not great enough to result in any significant benefit for any habitat type / ecological receptor.

3 The effect magnitude and effects for each receptor are summarised below in Table 8.21.

Table 8.21 - Potential Unmitigated Effects Due to Permanent Habitat Loss

Habitat Receptor	Conservation Value	Potential Magnitude	Effect	Duration	Significant/Not Significant
Blanket bog	Medium	Low	Minor Adverse	Long-term	Not Significant
Broadleaved semi-natural woodland	Medium	Low	Minor Adverse	Long-term	Not Significant
Broadleaved plantation woodland	Low (M)	Low	Minor Adverse	Long-term	Not Significant
Coniferous plantation woodland	Low (M)	Low	Minor Adverse	Long-term	Not Significant
Dry dwarf shrub heath	Medium	Low	Minor Adverse	Long-term	Not Significant
Marsh / marshy grassland	Low (H)	Low	Minor Adverse	Long-term	Not Significant
Scattered broad-leaved trees	Low (H)	Low	Minor Adverse	Long-term	Not Significant
Semi-improved / unimproved grasslands	Medium	Low	Minor Adverse	Long-term	Not Significant
Wet dwarf shrub heath	Medium	Low	Minor Adverse	Long-term	Not Significant

8.5.7.2 Indirect Habitat Loss/Degradation

1 During the operational phase of the OHL there is a potential for further loss and degradation of sensitive habitats as a result of changes to surface hydrology (i.e. ongoing perturbation of the pre-construction hydrology regime as discussed in Construction Effects, above). The effect magnitude of potential long-term changes in hydrology in relation to blanket bog habitats is assessed as Low with a potential effect significance of Minor Adverse (not significant).

8.5.7.3 Damage due to Maintenance Activities

1 During maintenance operations and emergency works, there may be temporary damage to the vegetation, thereby resulting in temporary habitat loss and / or permanent habitat degradation. Maintenance operations that require the use of machinery could result in a pollution incident adversely affecting surrounding terrestrial habitats. The details of the effected magnitude and effect level are provided in Table 8.22 below.

Table 8.22 - Potential Unmitigated Effects Due to Operational Related Damage

Habitat Receptor	Conservation Value	Potential Magnitude	Effect	Duration	Significant/Not Significant
Blanket bog	Medium	Low	Minor Adverse	Medium-term	Not Significant
Broadleaved semi-natural woodland	Medium	Negligible	Minor Adverse	Medium-term	Not Significant
Broadleaved planta-tion woodland	Low (M)	Negligible	Minor Adverse	Medium-term	Not Significant
Coniferous planta-tion woodland	Low (M)	Negligible	Minor Adverse	Medium-term	Not Significant
Dry dwarf shrub heath	Medium	Low	Minor Adverse	Medium-term	Not Significant
Marsh / marshy grassland	Low (H)	Low	Minor Adverse	Short-term	Not Significant
Scattered broad-leaved trees	Low (H)	Negligible	Minor Adverse	Medium-term	Not Significant
Semi-improved / unimproved grass-lands	Medium	Low	Minor Adverse	Short-term	Not Significant
Wet dwarf shrub heath	Medium	Low	Minor Adverse	Medium-term	Not Significant

8.5.8 Waterbodies, Wetlands and Fish - Construction Phase Effects

8.5.8.1 Damage Due to Construction

1 Physical damage and disturbance to sensitive aquatic habitats and associated flora could occur through a number of construction activities, including access track construction, tree felling, general plant trafficking. Waterbodies and associated wetland habitats are considered to be particularly sensitive to potential adverse effects of construction works.

2 The effect magnitude and effects for each receptor are summarised below in Table 8.23, based on the estimated extent of habitats affected and their assessed nature conservation value.

Table 8.23 - Potential Unmitigated Effects Due to Construction Damage

Habitat Receptor	Conservation Value	Potential Magnitude	Effect	Duration	Significant/Not Significant
Loch Doon SSSI	High	None	None	n/a	Not Significant
Other standing water	Low (M)	Low	Minor Adverse	Short-term	Not Significant
Watercourses	High	Low-Medium	Moderate Adverse	Short-term	Significant

8.5.8.2 Pollution of Habitats

1 Arguably one of the most important potential adverse effects from construction works is pollution. Water pollution can arise from the mobilisation of fine sediments into surface waters associated with earthworks (e.g. excavation of foundations, temporary storage of excavated spoil, upgrading existing or forming of new access tracks), particularly if this occurs during low flow conditions with subsequent settlement. The latter may affect fish and important fish habitats, aquatic flora and other aquatic species.

2 Various types of pollution incidents are possible during the construction of the proposed OHL. Assessing the risks of pollution in the aquatic environment is particularly important due to the potential for pollutants to be dispersed downstream and due to the particular sensitivity of aquatic species. Of primary concern is the potential for run-off from construction areas, storage compounds and engineering works associated with watercourse crossings to cause in-stream pollution through the generation of sediments and other particulate matter and / or accidental chemical pollution.

3 Fish are particularly vulnerable to changes in oxygen levels, pH and fine sediments. Such pollution can arise due to disturbed soil and peat material on the banksides and in small tributaries being washed into the river and down the sub-catchments. The fish species of greatest concern, in relation to potential adverse effects from construction of the OHL are Atlantic salmon and brown trout. Construction phase effects could affect various stages in the salmon life-cycle by causing e.g. direct injury or mortality of eggs, juveniles and adults (i.e. through pollution), although of important habitats, hindering or prevention of free movement to and from spawning habitat, and physical damage of in stream / riparian habitat.

4 Increased levels of suspended sediments can reduce dissolved oxygen levels, resulting in the suffocation of fish or damage to gills through abrasion. As there is also spawning habitat present, there is potential for fine sediment to settle and inhibit oxygen transfer for eggs present within gravel beds downstream of the works. There is also the possibility of disturbance to fish in the vicinity of construction activities, for example, through the use of lights and vibration from construction processes.

5 There is the potential for particulate-laden run-off and nutrient release from the proposed tree felling with the potential to result in deleterious changes in water quality for waterbodies in the vicinity. Large-scale tree felling also increases the risk of acidification of watercourses downstream from the works.

6 Surface water acidification, primarily resulting from the deposition of atmospheric sulphur and nitrogen compounds through fossil fuel combustion, is an important problem for upland watercourses and lochs. The rate and extent of acidification of watercourses is dependent on a number of factors, including catchment geology and the inherent capacity of water to neutralise acidifying inputs. Acidification causes changes in freshwater invertebrate and diatom communities and reduced salmonid populations in areas with acid-sensitive bedrock geology. Generally, soft waters are at greater risk from acidification due to their poor acid neutralising capacity. However, due to the temporary nature of the construction process and the relatively narrow linear corridor of proposed tree felling, the potential for long-term acidification from construction is considered to be low. The effect magnitude and effects for each receptor are summarised below in Table 8.24.

7 There is the theoretical potential for indirect effects on the Loch Doon SSSI resulting from uncontrolled pollution / run-off associated with construction work on the proposed line and dismantling work on the existing line (both lines are within c. >1km from the eastern shore of Loch Doon at Lambford (c. NX 52 99) and pass over minor watercourses just to the north of this that drain into Loch Doon).

Table 8.24 - Potential Unmitigated Effects Due to Pollution - Construction Phase

Habitat Receptor	Conservation Value	Potential Magnitude	Effect	Duration	Significant/Not Significant
Loch Doon SSSI	High	Low	Moderate Adverse	Short-term	Significant
Other standing water	Low (M)	Low	Minor Adverse	Short-term	Not Significant
Watercourses	High	Medium	Major Adverse	Short-term	Significant
Salmonid fish	High	Medium	Major Adverse	Short-term	Significant

8.5.9 Waterbodies, Wetlands and Fish - Dismantling Phase Effects

1 In the following assessment, the magnitudes of potential effects on aquatic habitats and fish associated with the dismantling works of the existing N-Route transmission line from Dalshangan to Smithston are given, along with effect levels.

2 Proposed mitigation measures and residual effects are dealt with in a separate section, under the heading 'Mitigation and Management', in Section 8.6 below.

8.5.9.1 Damage due to Dismantling Works

1 Damage and disturbance to sensitive aquatic habitats could occur through the trafficking of vehicles associated with the proposed dismantling works and the dismantling of the towers, conductors, earthwire and foundations. Damage and / or disturbance can lead to a similar set of ecological effects as outlined above in the assessment of potential effects arising from the construction works for the proposed OHL.

2 The aquatic habitats which are considered particularly sensitive to damage during the proposed dismantling works include standing water and riverine habitats.

3 The effect magnitude and effect for each receptor are summarised below in Table 8.25, based on the estimated extent of habitats affected and their assessed nature conservation value.

Table 8.25 - Potential Unmitigated Effects Due to Dismantling Damage

Habitat Receptor	Conservation Value	Potential Magnitude	Effect	Duration	Significant/ Not Significant
Bogton Loch SSSI	High	Low	Moderate Adverse	Short-term	Significant
Other standing water	Low (M)	Low	Minor Adverse	Short-term	Not Significant
Watercourses	High	Low - Medium	Moderate Adverse	Short-term	Significant

8.5.9.2 Pollution of Habitats during Dismantling Works

1 Similar potential sources of pollution as described above for the construction phase and are applicable to the dismantling phase. However the risk of pollution from excavation is reduced as in sensitive locations much of the tower foundations will be left in situ (Chapter 5). The effect magnitude and effects for each receptor are summarised below in Table 8.26.

Table 8.26 - Potential Unmitigated Effects Due to Pollution - Dismantling Phase

Habitat Receptor	Conservation Value	Potential Magnitude	Effect	Duration	Significant/ Not Significant
Bogton Loch SSSI	High	Low	Moderate Adverse	Short-term	Significant
Loch Doon SSSI	High	Low	Moderate Adverse	Short-term	Significant
Standing water	Low (M)	Low - Medium	Moderate Adverse	Short-term	Significant
Watercourses	High	Low - Medium	Moderate -Major Adverse	Short-term	Significant
Salmonid fish	High	Medium	Major Adverse	Short-term	Significant

8.5.10 Waterbodies, Wetlands and Fish - Operational Phase Effects

1 The potential for permanent aquatic habitat loss due to the built 'footprint' of the proposed OHL (i.e. including tower/pole foundations, permanent / upgraded access tracks), is considered in this section (e.g. from excavation for each wood pole or lattice tower placement, etc.). In addition, during operation there may be temporary effects from ongoing maintenance activities or emergency works, resulting in disturbance to sensitive habitats from the associated access works area.

8.5.10.1 Habitat Loss

1 There is no appreciable aquatic habitat loss anticipated from the project. The effect magnitude and effects for each receptor are summarised below in Table 8.27.

Table 8.27 - Potential Unmitigated Effects Due to Permanent Habitat Loss

Habitat Receptor	Conservation Value	Potential Magnitude	Effect	Duration	Significant/Not Significant
Bogton Loch SSSI	High	Negligible	None	n/a	Not Significant
Loch Doon SSSI	High	Negligible	None	n/a	Not Significant
Standing water	Low (M)	Negligible	None	n/a	Not Significant
Watercourses	Medium	Negligible	None	n/a	Not Significant

8.5.10.2 Damage / Pollution due to Maintenance Activities

1 During maintenance operations and emergency works, there may be temporary damage to aquatic habitats resulting in temporary habitat loss and / or permanent habitat degradation. Maintenance operations that require the use of machinery could result in a pollution incident adversely affecting surrounding terrestrial habitats and watercourses. The details of the effected magnitude and effect are provided in Table 8.28 below.

Table 8.28: Potential Unmitigated Effects Due to Maintenance

Habitat Receptor	Conservation Value	Potential Magnitude	Effect	Duration	Significant/ Not Significant
Loch Doon SSSI	High	Low	Moderate Adverse	Short-term	Significant
Watercourses	High	Low - Medium	Moderate -Major Adverse	Short-term	Significant
Salmonid fish	High	Medium	Major Adverse	Short-term	Significant

8.5.11 Non-avian Protected Fauna - Construction Phase Effects

1 Potential construction-related effects on non-avian fauna have been identified as permanent and temporary disturbance to the habitats; and pollution of habitats and watercourses, indirectly or directly affecting sensitive receptors present within the Study Area.

8.5.11.1 Disturbance

1 Disturbance during construction activities can take a variety of forms, including: noise and vibration disturbance from working machines, generators, people accessing and exiting the construction sites; visual disturbance due to the presence of unnatural elements in an area, either at a near or far distance from the receptor; and olfactory disturbance due to the presence of human scent. The potential magnitude of disturbance will also vary depending on the location of the works relative to important sites, such as resting or breeding areas. The overall construction period has been estimated at a total of 39 months, whilst the working hours are anticipated to vary through the year, depending on day length, but will typically be 10 hours per day, 6 days a week. With respect to the susceptibility of the receptors to disturbance, bats are nocturnal, otters are mainly nocturnal, but also crepuscular and red squirrel, other mammals, reptiles and amphibians are generally diurnal. Early morning and late evening construction activities can affect the crepuscular and nocturnal species, especially during autumn, winter and early spring, when daylight hours are shorter.

2 It is also important to consider that potential sources of disturbance would be relatively localised (i.e. works would not be continuous throughout the length of the proposal) and that particularly disturbing activities, such as tree felling, would be restricted to an estimated 6 month period at the start of the construction programme (see Chapter 5). In addition, to some extent, the mammals present in the OHL study corridor (e.g. otter, red squirrel and water vole) are likely to be habituated to human disturbance, because of typical forestry operations that are ongoing over a large proportion of this area. Highly mobile species such as otter can move away from the immediate vicinity of construction works. Taking these levels of susceptibility into consideration and the site nature conservation value of each identified sensitive receptor, the effect magnitude and effect have been determined and summarised in Table 8.29, below.

Table 8.29: Non-avian fauna - Potential Unmitigated Effects Due to Construction Disturbance

Non-avian Fauna Receptor	Conservation Value	Potential Magnitude	Effect	Duration	Significant/ Not Significant
Bat species	Medium	Low - Medium	Moderate Adverse	Short-term	Significant
Otter	Medium	Low - Medium	Moderate Adverse	Short-term	Significant
Red squirrel	Medium	Low - Medium	Moderate Adverse	Short-term	Significant
Water vole	Medium	Low	Minor Adverse	Short-term	Not Significant

8.5.11.2 Pollution of Habitats

1 Various types of pollution incidents adversely affecting habitats supporting sensitive non-avian fauna receptors are possible during the construction phase of the proposed OHL. Assessing the risks of pollution in the aquatic environment is particularly important, due to the potential for pollutants to be dispersed rapidly and due to the particular sensitivity of aquatic species (potential effects on fish and aquatic habitats generally are dealt with in the preceding section of this chapter).

2 The potential run-off from construction areas, storage compounds and engineering works associated with watercourse crossings to cause in-stream pollution through the mobilisation of fine sediments and other particulate matter and / or accidental chemical pollution (e.g. from concrete, oils, fuels, etc.) could directly affect mammal receptors due to adverse effects on prey sources (e.g. water vole, otter and bats). In addition, there is the potential for fresh water pearl mussel populations in watercourses in the Study Area to be directly affected by a pollution incident or mobilisation of fine sediments (this species is considered to be particularly sensitive to such potential pollution).

3 The effect magnitude and effect levels relating to potential pollution of watercourses affecting bats, otters and FWPM (primarily) has been determined and are summarised in Table 8.30.

Table 8.30 - Non-avian fauna - Potential Unmitigated Effects Due to Pollution of Habitats During Construction

Non-avian Fauna Receptor	Conservation Value	Potential Magnitude	Effect	Duration	Significant/ Not Significant
Bat species	Medium	Low	Minor Adverse	Short-term	Not Significant
Otter	Medium	Low	Minor Adverse	Short-term	Not Significant
Red squirrel	Medium	Negligible	None	n/a	Not Significant
Water vole	Medium	Low	Minor Adverse	Short-term	Not Significant
FWPM	High	Medium	Major Adverse	Short-term	Significant

8.5.12 Non-avian Protected Fauna - Dismantling Phase Effects

1 Potential effects on non-avian protected fauna during the proposed dismantling of the exiting transmission line are broadly similar to those identified for the construction phase: permanent and temporary disturbance to the habitats and pollution of habitats and watercourses, indirectly or directly affecting sensitive receptors present within the Study Area.

8.5.12.1 Disturbance

1 Disturbance during line dismantling activities arise from a similar range of activities as during construction works, in addition there is the risk of disturbance from the 'felling' of the steel lattice towers. The potential magnitude of disturbance will also vary depending on the location of the works relative to important sites, such as watercourses, resting or breeding areas. The duration of the dismantling works has been estimated at a total of 18 months, whilst the working hours are anticipated to vary through the year, depending on day length, but will typically be 10 hours per day, 6 days a week. In relation to FWPM disturbance is assessed in relation to potential physical damage to habitats from dismantling operations near watercourses that support populations of this species (i.e. tower dismantling, de-stringing).

2 The potential effect magnitude and effect for dismantling disturbance are summarised in Table 8.31, below.

Table 8.31 - Non-avian fauna - Potential Unmitigated Effects Due to Dismantling Disturbance

Non-avian Fauna Receptor	Conservation Value	Potential Magnitude	Effect	Duration	Significant/ Not Significant
Bat species	Medium	Low	Minor Adverse	Short-term	Not Significant
Otter	Medium	Low - Medium	Moderate Adverse	Short-term	Significant
Red squirrel	Medium	Negligible - Low	None - Minor Adverse	Short-term	Not Significant
Water vole	Medium	Low	Minor Adverse	Short-term	Not Significant
FWPM	High	Low	Moderate Adverse	Short-term	Significant

8.5.12.2 Pollution of Habitats during Dismantling Works

1 As discussed in the construction phase effect assessments above, there are various types of pollution incident which have the potential to adversely affect habitats supporting sensitive non-avian fauna receptors during the dismantling phase of the project. However, as there is less requirement for earthworks in order to remove the towers the risk of pollution from the appreciable mobilisation of fines is less of a risk.

2 The effect magnitude and effect level of potential pollution of watercourses in relation to the relevant receptors has been summarised in Table 8.32.

Table 8.32 - Non-avian fauna - Potential Unmitigated Effects Due to Pollution of Habitats During Dismantling

Non-avian Fauna Receptor	Conservation Value	Potential Magnitude	Effect	Duration	Significant/Not Significant
Bat species	Medium	Low	Minor Adverse	Short-term	Not Significant
Otter	Medium	Low	Minor Adverse	Short-term	Not Significant
Red squirrel	Medium	Negligible	None	n/a	Not Significant
Water vole	Medium	Low	Minor Adverse	Short-term	Not Significant
FWPM	High	Medium	Major Adverse	Short-term	Significant

8.5.13 Non-avian Protected Fauna - Operational Phase Effects

8.5.13.1 Habitat Loss / Fragmentation / Degradation

1 The proposed OHL alone is not considered to present an potentially important barrier to movement of non-avian fauna receptors; however there is the potential for forestry clearance within the required wayleave in various areas to result in adverse effects on the supporting habitats for some species, in particular red squirrel.

2 Red squirrel is considered to be potentially vulnerable to habitat fragmentation as a result of felling of mature trees within the proposed wayleave areas, as well as the loss of drey sites and foraging habitat. The importance of this effect will vary across the project with particular concern for areas identified as potentially supporting relatively high densities of red squirrels and/or where habitat quality is considered to be relatively high. Principle areas of concern are Margree Forest and the Carse of Dundeugh. Bats are considered to be slightly less vulnerable to fragmentation, taking into consideration the scale of felling that is proposed, but will also lose foraging and potential roosting resources as a result of felling of mature trees. Consideration has to be given in this assessment to the context of the proposed felling. The felling within the majority of the woodland affected by this proposal would occur at some point in the future as part of the normal rotational cycle in commercial conifer plantations. In other words, this project would bring forward felling that, for the most part, would have occurred anyway, resulting in a corridor of former conifer plantation that will be managed to maintain a zone free of mature trees for the duration of the lifetime of the OHL (i.e. interrupting normal rotational forest felling practice). For the purposes of this assessment this is assumed to be a permanent effect.

3 Otter and water vole are not considered to be at risk of any significant effect from habitat fragmentation as a result of this proposal. The effect magnitude and significance for the mammalian receptors from habitat loss, degradation and fragmentation is summarised in Table 8.33, below.

Table 8.33 - Non-avian fauna - Potential Unmitigated Effects Due to Habitat Loss / Degradation or Fragmentation

Non-avian Fauna Receptor	Conservation Value	Potential Magnitude	Effect	Duration	Significant/Not Significant
Bat species	Medium	Low	Minor Adverse	Long-term	Not Significant
Otter	Medium	Low	Minor Adverse	Long-term	Not Significant
Red squirrel	Medium	Medium	Moderate Adverse	Long-term	Significant
Water vole	Medium	Negligible	None	n/a	Not Significant

8.5.13.2 Disturbance during Maintenance Works

1 The types of potential effects on sensitive non-avian fauna receptors from maintenance operations are broadly similar to those described for the assessment of construction-related disturbance. However, effect magnitudes would be expected to be lower during the operational phase, due to the reduced level of required activity within the OHL area. Effect magnitudes and effect levels for each sensitive receptor are summarised in Table 8.34, below.

Table 8.34 - Non-avian fauna - Potential Unmitigated Effects Due to Operational Disturbance

Non-avian Fauna Receptor	Conservation Value	Potential Magnitude	Effect	Duration	Significant/ Not Significant
Bat species	Medium	Low	Minor Adverse	Short-term	Not Significant
Otter	Medium	Low - Medium	Moderate Adverse	Short-term	Significant
Red squirrel	Medium	Low - Medium	Moderate Adverse	Short-term	Significant
Water vole	Medium	Low	Minor Adverse	Short-term	Not Significant

8.5.13.3 Pollution / Damage of Habitats during Maintenance Works

1 The potential risk of significant pollution effects occurring to habitats supporting non-avian fauna receptors during the operational phase of the OHL will be much lower than during the construction phases and only likely to potentially affect otter through the potential effects on their prey populations. The effect magnitude and effect level of potential pollution of watercourses affecting these species have been determined and are summarised in table 8.35 below.

Table 8.35 - Non-avian fauna - Potential Unmitigated Effects Due to Operational Pollution

Non-avian Fauna Receptor	Conservation Value	Potential Magnitude	Effect	Duration	Significant/Not Significant
Bat species	Medium	Low	Minor Adverse	Short-term	Not Significant
Otter	Medium	Low	Minor Adverse	Short-term	Not Significant
Red squirrel	Medium	Negligible	None	n/a	Not Significant
Water vole	Medium	Low	Minor Adverse	Short-term	Not Significant

8.5.13.4 Collision Risk to Bat Species

1 There is a theoretical collision risk for bats where the proposed OHL is routed adjacent to broadleaved woodland edges (e.g. at the Carse of Deugh and Dalshangan) that are used regularly by bats for commuting and / or foraging (e.g. commuting to and roost site to a foraging area between which the proposed OHL is located). Bats are extremely agile flyers and have highly developed echolocation systems which they use for close quarters navigation and capture of small insects in flight. The species present in the area are capable of negotiating complex environments on the wing, including foraging around tree canopies and within dense woodland. Therefore, due to their highly developed flight skills and the relatively static nature of the lines (including guy wires supporting poles), there is considered to be a negligible collision risk posed by the proposed OHL.

8.5.13.5 Electrocution Risk

1 Due to the dimensions and distance between the OHL conductors (See Chapter 9 ((Ornithology Chapter)), there is considered to be no appreciable risk of electrocution to any bat species or to red squirrel.

8.6 Mitigation, Management and residual effects

1 Effects on all species and habitats will be limited through the use of pre-construction surveys in order to allow avoidance and reduction of any potential effects. This will also be used to identify any need for special licenses.

8.6.1 Terrestrial Habitats and Flora - Construction Phase Mitigation

8.6.1.1 Damage due to Construction

1 There is the potential for appreciable adverse effects arising form the construction works to affect sensitive habitats (in particular broadleaf woodland and blanket bog). The following section outlines the committed mitigation measures proposed to address these effects and reports the residual effects taking into consideration the proposed mitigation measures.

2 Advice from suitably experienced ecologists was sought during the routeing design of the proposed OHL and will be sought (e.g. through an ecological advisor or clerk of works) for the micro-siting of wood poles and lattice towers in sensitive habitats, temporary access tracks and other site infrastructure (e.g. temporary construction compounds and storage areas), thereby further reducing the potential construction and disturbance effects on sensitive habitats/species (e.g. blanket bog, areas of deep peat, smaller areas of species-rich unimproved grassland, stands of notable plant species).

3 The habitat damage associated with the disturbance caused by the proposed OHL will be mitigated by maintaining the required work area to a strict minimum. This would include demarcating sensitive habitats near to working areas and ensuring construction staff operate within agreed working limits.

4 Detailed method statements, relating to all activities that have the potential to adversely affect sensitive habitats, will be developed and agreed, in consultation with an ecologist and relevant regulators (e.g. SNH and SEPA), in advance of construction works commencing. Designs detailing specific pollution control measures, tailored to the risk identified from the proposed works within each area of the site, are also proposed to be developed in advance of construction works.

5 Vegetated turves and soil horizons / peat removed during excavations will be carefully segregated and stored in small piles along the working corridor, and in a manner that minimises further damage to sensitive habitats (e.g. away from watercourses, temporarily placed on geotextile or similar protective matting, protected from rainfall and wind). Soils and turves will be carefully replaced, in the correct order, once construction work is completed. Any excess peat will also be used in site re-instatement, wherever possible. Best practice measures to encourage rapid stabilisation and regeneration of exposed peat will be implemented where required (e.g. use of biodegradable geotextiles or if necessary an appropriate nurse seed mix to stabilise bare peat and prevent erosion under the direction of the site ecologist) and with the longer-term aim of restoring the original vegetation cover.

6 In summary, proposed mitigation measures relevant to identified construction effects on habitats and flora are as follows:

- Development and implementation of method statements detailing best practice procedures for all relevant construction and re-instatement works (e.g. relating to vegetation and peat / soil stripping, storage of waste peat; protection and storage of soil horizons and vegetated turves; effective vegetation re-instatement; storage of construction materials; pollution control measures);
- Development of an Environmental Management Plan (EMP) to embrace all of the aspects and stages of the proposed OHLs as detailed in the different chapters and the set out in the Mitigation Technical Appendix;
- During the detailed design stage, details and locations of elements of the proposed OHLs and all construction areas and locations will be designed / sited to further reduce effects on habitats of highest sensitivity, as far as practicably possible;
- Final locations of site infrastructure will be micro-sited to minimise effects on sensitive habitats, after consultation with an ecological advisor, and with particular reference to blanket bog, deep peat, wetter areas and watercourses; and
- Demarcation of sensitive habitats close to working areas and procedures to ensure construction workers operate within theses limits.

7 Taking into consideration the successful implementation of the proposed outline mitigation the residual effect magnitudes and effect levels for each receptor are summarised below in Table 8.36.

Table 8.36 - Mitigated Effects Due to Construction Damage

Habitat Receptor	Conservation Value	Potential Magnitude	Effect Level	Duration	Significant/ Not Significant
Blanket bog	Medium	Low	Minor Adverse	Medium-term	Not Significant
Broadleaved semi-natural woodland	Medium	Low	Minor Adverse	Medium-term	Not Significant
Broadleaved plantation woodland	Low (M)	Low	Minor Adverse	Medium-term	Not Significant
Coniferous plantation woodland	Low (M)	Low	Minor Adverse	Medium-term	Not Significant
Dry dwarf shrub heath	Medium	Low	Minor Adverse	Medium-term	Not Significant
Marsh / marshy grassland	Low (H)	Low	Minor Adverse	Short-term	Not Significant
Scattered broad-leaved trees	Low (H)	Low	Minor Adverse	Medium-term	Not Significant
Semi-improved / unimproved grasslands	Medium	Low	Minor Adverse	Short-term	Not Significant
Wet dwarf shrub heath	Medium	Low	Minor Adverse	Medium-term	Not Significant

8.6.1.2 Pollution of Terrestrial Habitats

1 There is a potential for significant adverse effects arising from a pollution incident occurring during construction activities. General mitigation measures are proposed in the Waterbodies, Wetland and Fish section below.

2 The assessment of potential mitigated effects from pollution on terrestrial habitats is summarised in Table 8.37 below.

Table 8.37 - Mitigated Effects Due to Pollution - Construction Phase

Habitat Receptor	Conservation Value	Potential Magnitude	Effect Level	Duration	Significant/ Not Significant
Blanket bog	Medium	Low	Minor Adverse	Short-term	Not Significant
Broadleaved semi-natural woodland	Medium	Low	Minor Adverse	Short-term	Not Significant
Broadleaved plantation woodland	Low (M)	Low	Minor Adverse	Short-term	Not Significant
Coniferous plantation woodland	Low (M)	Low	Minor Adverse	Short-term	Not Significant
Dry dwarf shrub heath	Medium	Low	Minor Adverse	Short-term	Not Significant
Marsh / marshy grassland	Low (H)	Low	Minor Adverse	Short-term	Not Significant
Scattered broad-leaved trees	Low (H)	Low	Minor Adverse	Short-term	Not Significant
Semi-improved / unimproved grasslands	Medium	Low	Minor Adverse	Short-term	Not Significant
Wet dwarf shrub heath	Medium	Low	Minor Adverse	Short-term	Not Significant

8.6.1.3 Changes to Hydrology

1 There is a potential for adverse effects to blanket bog habitats, in particular, as a result of changes to surface hydrology arising from the construction of the proposed OHL. The primary method of mitigation for potential changes to blanket bog hydrology is to design the layout of the OHL (e.g. the routeing of the temporary access tracks, location of wood poles / towers, temporary construction compounds, etc.), in consultation with an ecological advisor, in order to avoid, where possible, deep peat and areas of 'better quality' blanket bog (i.e. less modified and degraded blanket bog). This will aid in minimising the amount of peat removed and thereby minimise changes to the hydrology of the bog (e.g. by minimising the need for temporary drainage ditches). With the implementation of the mitigation proposed in outline there would be a Low effect magnitude and Minor Adverse and not significant residual effect on blanket bog habitats.

8.6.2 Terrestrial Habitats and Flora - Dismantling Phase (redundant N-Route)

8.6.2.1 Damage due to Dismantling Works

1 The terrestrial habitats which are considered particularly sensitive to damage during the proposed dismantling works include blanket bog, raised bog, marshy grassland, semi-natural broadleaved woodland. Adverse effects on these habitats would be minimised through the proposed pre-works assessment approach detailed in Chapter 5. This approach includes a commitment to assess potential ecological sensitivities / risks prior to works commencing through pre-work site survey (by suitably experienced ecologists) and assessment of appropriate mitigation (e.g. selection of access route, approach to tower dismantling in relation to proximity of sensitive habitats) and detailed procedures to follow during the dismantling work on a site-by-site basis.

2 The residual effect magnitude and effect for each receptor are summarised below in Table 8.38, based on the proposed mitigation.

Table 8.38 - Mitigated Effects Due to Dismantling Damage

Habitat Receptor	Conservation Value	Potential Magnitude	Effect	Duration	Significant/Not Significant
Dalmellington Moss SSSI	High	None	Negligible	n/a	Not Significant
Blanket bog	Medium	Low	Minor Adverse	Medium-term	Not Significant
Broadleaved semi-natural woodland	Medium	Low	Minor Adverse	Medium-term	Not Significant
Coniferous plantation woodland	Low (M)	Low	Minor Adverse	Medium-term	Not Significant
Marsh / marshy grassland	Low (H)	Low	Minor Adverse	Short-term	Not Significant
Raised bog	High	Low-None	Minor Adverse	Medium-term	Not Significant
Scattered broad-leaved trees	Low (H)	Low	Minor Adverse	Medium-term	Not Significant
Semi-improved / unimproved grasslands	Medium	Low	Minor Adverse	Short-term	Not Significant

8.6.2.2 Pollution during Dismantling Works

1 There is a potential for significant adverse effects on terrestrial habitats arising from pollution during dismantling activities. General mitigation measures are proposed in the Waterbodies, Wetland and Fish section below.

2 The assessment of the mitigated effects on terrestrial habitats is summarised in Table 8.39 below.

Table 8.39 - Mitigated Effects Due to Pollution - Dismantling Phase

Habitat Receptor	Conservation Value	Potential Magnitude	Effect Level	Duration	Significant/ Not Significant
Blanket bog	Medium	Low-None	Minor Adverse	Short-term	Not Significant
Broadleaved semi-natural woodland	Medium	Low-None	Minor Adverse	Short-term	Not Significant
Broadleaved plantation woodland	Low (M)	Low-None	Minor Adverse	Short-term	Not Significant
Coniferous plantation woodland	Low (M)	Low-None	Minor Adverse	Short-term	Not Significant
Dry dwarf shrub heath	Medium	Low-None	Minor Adverse	Short-term	Not Significant
Marsh / marshy grassland	Low (H)	Low-None	Minor Adverse	Short-term	Not Significant
Raised bog	High	Low-None	Minor Adverse	Short-term	Not Significant
Scattered broad-leaved trees	Low (H)	Low-None	Minor Adverse	Short-term	Not Significant
Semi-improved / unimproved grasslands	Medium	Low-None	Minor Adverse	Short-term	Not Significant
Wet dwarf shrub heath	Medium	Low-None	Minor Adverse	Short-term	Not Significant

8.6.3 Terrestrial Habitats and Flora - Operational Phase

8.6.3.1 Indirect habitat Loss / Degradation

1 In combination with direct habitat loss and due to the uncertainty of the extent of the effect, there is a potential for adverse effects to blanket bog plant communities and other sensitive plant communities, as a result of the indirect effects of the OHL infrastructure (e.g. long-term changes to hydrology resulting in the erosion of peat; and changes to vegetation communities on restored habitats surrounding the wood poles). However, no significant effects were identified during the assessment.

2 However, reduction in effect magnitude will be possible in the refinements made to the detailed design and the careful construction of temporary access tracks and other structures to minimise perturbation of the natural peat hydrology following the proposed method statements.

8.6.3.2 Damage due to Operational Activities

1 Occasionally there will be a requirement to carry out general maintenance on the proposed OHL. All access will be confined to areas previously used for construction activities. No significant effects were identified during the assessment.

2 To reduce potential adverse effects, method statements for scheduled maintenance and emergency maintenance works will be developed in accordance with best practice. The method statements will cover all potential maintenance activities and set out best practice procedures and measures to follow such that the potential for damage to sensitive habitats is minimised. Procedures identified for the minimisation of construction effects would be applied to minimise the potential damage to habitats during maintenance operations.

8.6.4 Waterbodies, Wetlands and Fish - Construction Phase

8.6.4.1 Damage Due to Construction

1 Physical damage and disturbance to sensitive aquatic habitats and associated flora during construction would be mitigated with the proposed approach to site access and construction (as detailed in Chapter 5). See also 'Terrestrial Habitats and Flora - Construction Phase Mitigation' above.

2 In order to avoid damage to aquatic habitats tower/pole foundations would be located and excavated wherever possible in the driest locations with well consolidated superficial geology. Using flexibility with the infrastructure allowance, areas of wet and deep peat would be avoided where possible; towers/poles would not be located within 30m of waterbodies or within 10m of other watercourses.

3 Best practice would be followed in relation to minimising adverse effects on watercourses at temporary and permanent access crossings. Bridges would be used to cross significant watercourses wherever possible (see Chapter 5 for further details). Vehicles and plant would not ford waterbodies. Where sensitive routeing of access tracks can not be implemented, bridges would be used in preference to culverts to avoid the crossing of a water body by vehicle and plant. The precise location of these bridges would be determined in consultation with the site ecologist, and would be designed and installed in a manner as to minimise erosion. Where culverting has to be used, they would present no barrier to fish migration or lead to erosion.

4 The residual effect magnitude and effect levels for each receptor are summarised below in Table 8.40.

Table 8.40 - Mitigated Effects Due to Construction Damage

Habitat Receptor	Conservation Value	Potential Magnitude	Effect	Duration	Significant/Not Significant
Loch Doon SSSI	High	None	None	n/a	Not Significant
Other standing water	Low (M)	Low	Minor Adverse	Short-term	Not Significant
Watercourses	High	Low	Minor Adverse	Short-term	Not Significant

8.6.4.2 Pollution of Habitats

1 In planning and carrying out any work in or near a water body (defined as any land feature that holds water; e.g. loch, pond, river, burn etc.) precautions would be taken to ensure their complete protection against pollution, silting and erosion. All works would be undertaken in compliance with the relevant SEPA Pollution Prevention Guidelines.

2 All waterbodies likely to be affected by works would be identified in the detailed construction planning stage. Agreement would be sought with SEPA on pollution

and siltation prevention measures, strategy and emergency procedures for all construction stages. This would involve the protection of waterbodies by planning all drainage including the run-off from construction sites, borrow pits, spoil heaps, access tracks and water crossings.

3 Drainage would not directly enter waterbodies but be directed into vegetated drainage channels to attenuate flow and treat sediment loads and pollutants. These would be of shallow gradient to maximise attenuation and prevent scour and erosion. Where the use of vegetated channels is not possible, sediment traps would be used. These would be subject to a maintenance programme.

4 Access tracks would be constructed of material which would not create water pollution or affect the chemical or nutrient status of adjacent waterbodies. The material would be of sufficient coarse grain so as not to be washed off into waterbodies. Materials would be delivered, stored and handled so as to minimise dust emissions - for example, by dampening or covering.

5 Mobile fuel and lubricant servicing units would be provided with appropriate quality delivery hoses with trigger-type nozzles. These vehicles, when not in use would be parked in a secure area within an impermeable bund. Vehicles and plant would not be refuelled near drains or waterbodies/watercourses. Oil powered pumps, generators etc. would be positioned an impervious drip trays surrounded by earth or sand bunds and located at least 30m from any waterbody and 10m from any watercourse.

6 The transportation of fuel and oil across a particular working area site in drums or other containers would be avoided as far as practicable. Where this is unavoidable, extreme caution would be taken to avoid spillages or leaks. Adequate stocks of oil absorbent and containment materials would be retained on site. All relevant staff would be familiar with the use of these materials.

7 Oil would be stored at least 30m from any waterbody and 10m from any watercourse. Oil storage tanks would be located on an impermeable base and be surrounded by an impervious bund with no surface water outlet. The bund would be capable of retaining at least 110% of the volume of the tanks. Valves and couplings connected to oil storage tanks would be located within the bund and delivery hoses would be fitted with trigger-type handles suspended back within the bund after use. Valves and trigger filler handles would be kept padlocked when not in use. Reasonable measures (e.g. temporary security fencing) would be implemented to ensure the security of oil storage facilities from acts of wilful damage or vandalism.

8 Temporary topsoil and subsoil heaps and stockpiles created after land stripping would be located at reasonable distances from drains or watercourses to prevent any collected materials from either falling or being integrated with run-off caused by rain into any waterbody. They shall be seeded or bound as soon as practicable after deposition to ensure quick stabilisation. Cut-off drains shall be provided to intercept run-off from the stockpiles.

9 Only inert and non-toxic material would be used to backfill drainage trenches, infill areas of standing water and infill areas where contact with groundwater is probable.

10 Dewatering of waterbodies would be avoided where practicable. Where dewatering is necessary, agreement would be sought with SEPA and SNH. Discharges would not be permitted directly into waterbodies but passed through buffer areas of vegetation.

11 A policy of dust containment and arrestment would be implemented for materials with the potential to lead to wind-blown pollution. Bulk cement and other cementitious materials would not be stored or mixed at any site but would be delivered ready-mixed. Concrete transfers and washouts would only be undertaken in suitably bunded areas which would be sited well away from any drainage and waterbodies. Liquid concrete and wash-out liquids would be contained within these areas and removed to a licensed disposal site.

12 Where significant tree felling is to be undertaken, best practice guidance to mitigate the effects of increased run-off and associated sedimentation would be sought from the Forestry Commission. All felling works would follow current best practice to minimise effects on surface waters (e.g. full adherence to the measures detailed in the current version, at the time of the works, of the Forestry Commission Forest and Water Guidelines).

13 The measures outlined above would be detailed in an Environmental Management Plan (EMP) will be developed, in advance of works commencing and in consultation with SEPA, that would include details of site specific measures and procedures (in the form of individual method statements where appropriate) to be adopted to protect sensitive environmental receptors (principally surface waters, sensitive habitats and species) during every phase of the works. This would include the identification of any surface waters within or adjacent to each tower or pole base site that could be at risk of pollution from the works. This would also include identification of the least environmentally damaging route for heavy plant access to the construction area.

14 The following method statements will be developed, in accordance with best practice guidance, in advance of construction works:

- Water quality - details of sedimentation control plan;
- Tracks and drainage management;
- Water crossings;
- Management and restoration of peat and soil areas; and
- Water quality - oil and fuel and chemical contamination.

15 The residual effect magnitude and effect levels for each receptor are summarised below in Table 8.41.

Table 8.41 - Mitigated Effects Due to Pollution - Construction Phase

Habitat Receptor	Conservation Value	Potential Magnitude	Effect	Duration	Significant/Not Significant
Loch Doon SSSI	High	Negligible	None	n/a	Not Significant
Other standing water	Low (M)	Negligible	None	n/a	Not Significant
Watercourses	High	Low	Minor Adverse	Short-term	Not Significant
Salmonid fish	High	Low	Minor Adverse	Short-term	Not Significant

8.6.5 Waterbodies, Wetlands and Fish - Dismantling Phase (redundant N-Route)

8.6.5.1 Damage due to Dismantling Works

1 A similar approach to avoiding and minimising aquatic habitat damage effects proposed for the construction of the OHL would be applied during dismantling works (see above and Chapter 5).

2 The residual effect magnitude and effect level for each receptor are summarised below in Table 8.42.

Table 8.42 - Mitigated Effects Due to Dismantling Damage

Habitat Receptor	Conservation Value	Potential Magnitude	Effect	Duration	Significant/Not Significant
Bogton Loch SSSI	High	Negligible	None	n/a	Not Significant
Other standing water	Low (M)	Negligible	None	n/a	Not Significant
Watercourses	High	Low	Minor Adverse	Short-term	Not Significant

8.6.5.2 Pollution of Habitats during Dismantling Works

1 A similar approach to avoiding and minimising pollution risk on aquatic habitats proposed for the construction of the OHL would be applied during dismantling (see above and Chapter 5).

2 The residual effect magnitude and effect level for each receptor are summarised below in Table 8.43.

Table 8.43 - Mitigated Effects Due to Pollution - Dismantling Phase

Habitat Receptor	Conservation Value	Potential Magnitude	Effect	Duration	Significant/Not Significant
Bogton Loch SSSI	High	Negligible	None	n/a	Not Significant
Loch Doon SSSI	High	Negligible	None	n/a	Not Significant
Standing water	Low (M)	Low	Minor Adverse	Short-term	Not Significant
Watercourses	High	Low	Minor Adverse	Short-term	Not Significant
Salmonid fish	High	Low	Minor Adverse	Short-term	Not Significant

8.6.6 Waterbodies, Wetlands and Fish - Operational Phase

8.6.6.1 Damage / Pollution due to Maintenance Activities

1 During maintenance operations and emergency works, there may be temporary damage to aquatic habitats resulting in temporary habitat loss and / or permanent habitat degradation. Maintenance operations that require the use of machinery could result in a pollution incident adversely affecting surrounding terrestrial habitats and watercourses. Proposed mitigation approached is outline above in the section dealing with Terrestrial habitats. The details of the residual effect magnitude and effect levels are provided in Table 8.44 below.

Table 8.44 - Mitigated Effects Due to Maintenance

Habitat Receptor	Conservation Value	Potential Magnitude	Effect	Duration	Significant/Not Significant
Loch Doon SSSI	High	Negligible	None	n/a	Not Significant
Watercourses	High	Low	Minor Adverse	Short-term	Not Significant
Salmonid fish	High	Low	Minor Adverse	Short-term	Not Significant

8.6.7 Non-avian Protected Fauna - Construction Phase

8.6.7.1 Disturbance

1 Although no confirmed breeding / resting sites of any specially protected species have been identified in the immediate vicinity of the proposed OHL, there is a potential for the baseline situation to change before construction / dismantling works commence. In order to address this, pre-construction surveys will be undertaken to minimise the risk of disturbance to resting sites of any protected species potentially present in the vicinity of the construction works. These surveys will provide up-to-date information on the use of the area by species with statutory protection otter, water vole, red squirrel, pine marten, badger and bats, to direct specific mitigation measures to avoid disturbance of these species.

2 For example, otter use a large number of holts and resting sites within their ranges and may establish a new breeding holt in the period between baseline otter survey and OHL construction. Otter breeding is largely non-seasonal and a holt may contain a nursing female and young at any time of the year. A targeted survey will therefore be carried out immediately prior to the commencement of construction works, within a c. 250m zone upstream and downstream along watercourses where there are proposed construction works, temporary access tracks and any other infrastructure within 50m of the watercourse.

3 All works (including access tracks) would be located where possible at least 50m beyond identified resting sites for otter, bats, pine marten, badger, red squirrel, and water vole.

4 Where works are within 50m of a resting up/shelter site of a protected species, work would only be carried out after consultation with the appropriate body and with appropriate licences.

5 Ramps or an alternative exit route will be placed in any steep-sided excavations allowing otters (and other animals) to exit should they enter.

6 Suitable mitigation measures for pine marten, water vole and red squirrel would be defined in consultation with SNH to ensure that there is no long-term loss of or damage to their habitat or long-term effects on the maintenance of their populations.

7 All site workers will be fully inducted on habitat and species types to ensure they are fully aware of their potential presence and any actions to be taken should these be identified. An emergency procedure would be in place for site workers to follow should protected species be encountered during the course of the works. All works would be stopped within 50m of the area. Appropriate specialist advice obtained from the project ecological advisor and SNH and Scottish Government.

8 Trees to be felled would be surveyed prior to felling for potential bat use. Potential bat roost trees would be marked and subsequently checked by a tree surgeon under the supervision of a licensed bat worker prior to felling. Surveys would be timed to take account of when roost sites were most likely to be present and surveys may be required at several periods throughout the year (e.g. maternity, autumn/winter roosts). If any evidence of bats was identified SNH and the Scottish Government would be consulted and appropriate mitigation measures identified. All necessary licences would be obtained.

9 Specific trees or areas of woodland identified as providing high potential for bat roosting would wherever possible only be felled outside the hibernation and nursery seasons (when pregnant mothers or non-flying bats may occupy the roosts) i.e. between March to May and September to October. Felling between September and October would also avoid potential problems with any nesting birds. Best practice recommendations would be followed in relation to tree felling (e.g. checking for bats, cutting and lowering branches/limbs with bat roost potential).

10 Any bats encountered during the course of the works would not be handled. They would be left in situ and SNH or a licensed bat worker contacted for immediate advice.

11 Woodland with red squirrel interest would be surveyed prior to any felling works. Reasonable measures would be taken to identify any red squirrel dreys through pre-construction surveys. A five-point scale would be used to asses the level of activity, with 1 being a drey clearly in use and 5 being a drey clearly not in use. If an active red squirrel drey is identified that could be affected by any proposed felling works a disturbance-free buffer of at least 30m would be retained around site until the drey can be definitely confirmed as no longer active

12 Any permanent bridge structures would have suitable access for otter along at least one river bank that should be accessible at high water level.

13 On a precautionary basis, pre-construction surveys for FWPM are proposed to ensure that the risk of any adverse effects on this species is fully assessed and avoided prior to any works commencing. It is proposed that prior to the dismantling works commencing a survey would be undertaken at these crossing points and if there is the potential for FWPM to be affected by any aspect of the dismantling work then specific additional mitigation measures would be agreed in consultation with SNH to ensure that there are no adverse effects on this species.

14 Avoidance measures would be adopted for areas within 500m of any ponds found to support great crested newt. Where works cannot be avoided in these areas, an exclusion programme, agreed in consultation with SNH and undertaken under licence, would be implemented.

15 On a precautionary basis, pre-construction surveys are proposed (including all off-road site access routes) for great crested newts to ensure that the risk of any effect on this species is fully assessed and avoided prior to any works commencing that could affect potentially suitable ponds and associated terrestrial habitats.

16 Mitigation measures concerning reptiles would centre around protection of individuals in order to comply with relevant legislation and best practice procedures. All construction workers would be briefed upon the potential presence of reptiles. If a reptile is encountered during any construction activity, works within the immediate area would be ceased and the site ecologist sought. The site ecologist would then remove the reptile to an area of suitable habitat outwith the construction corridor. Once the site ecologist is satisfied that there are no more reptiles within the immediate working area works would recommence. Additional measures, such as the avoidance of refugia, creation and removal of refugia that would be unavoidably affected by the works, may be required. This would be considered in detailed prior to construction and in liaison with the construction contractor in relation to detailed design decisions within the infrastructure allowance / micro-siting process.

17 Taking into consideration the proposed mitigation outlined above the residual effect magnitude and effect level have been determined and summarised in Table 8.45, below.

Table 8.45 - Non-avian fauna - Mitigated Effects Due to Construction Disturbance

Non-avian Fauna Receptor	Conservation Value	Potential Magnitude	Effect	Duration	Significant/Not Significant
Bat species	Medium	Low	Minor Adverse	Short-term	Not Significant
Otter	Medium	Low	Minor Adverse	Short-term	Not Significant
Red squirrel	Medium	Low	Minor Adverse	Short-term	Not Significant
Water vole	Medium	Low	Minor Adverse	Short-term	Not Significant

8.6.7.2 Pollution of Habitats

1 Measures proposed to protected surface waters and all sensitive aquatic and terrestrial habitats from pollution, as outlined in the preceding sections, will also address potential pollution effects on protected species.

2 The residual effect magnitude and effect levels have been determined and are summarised in Table 8.46.

Table 8.46 - Non-avian fauna - Mitigated Effects Due to Pollution of Habitats During Construction

Non-avian Fauna Receptor	Conservation Value	Potential Magnitude	Effect	Duration	Significant/ Not Significant
Bat species	Medium	Negligible - Low	Minor Adverse	Short-term	Not Significant
Otter	Medium	Negligible - Low	Minor Adverse	Short-term	Not Significant
Red squirrel	Medium	Negligible	None	n/a	Not Significant
Water vole	Medium	Negligible - Low	Minor Adverse	Short-term	Not Significant
FWPM	High	Negligible - Low	Minor Adverse	Short-term	Not Significant

8.6.8 Non-avian Protected Fauna - Dismantling Phase (redundant N-Route)

8.6.8.1 Disturbance

1 Measures proposed to address disturbance during the construction phase would be applied to the proposed dismantling of the existing OHL (see above).

2 The residual effect magnitude and effect level for dismantling disturbance are summarised in Table 8.47, below.

Table 8.47 - Non-avian fauna - Mitigated Effects Due to Dismantling Disturbance

Non-avian Fauna Receptor	Conservation Value	Potential Magnitude	Effect	Duration	Significant/Not Significant
Bat species	Medium	Negligible - Low	None-Minor Adverse	Short-term	Not Significant
Otter	Medium	Negligible - Low	None-Minor Adverse	Short-term	Not Significant
Red squirrel	Medium	Negligible - Low	None-Minor Adverse	Short-term	Not Significant
Water vole	Medium	Low	Minor Adverse	Short-term	Not Significant
FWPM	High	Negligible - Low	None-Minor Adverse	Short-term	Not Significant

8.6.8.2 Pollution of Habitats during Dismantling Works

1 Measures proposed to address pollution risk during the construction phase would be applied to the proposed dismantling of the existing OHL (see above).

2 The residual effect magnitude and effect level for the relevant receptors has been summarised in Table 8.48.

Table 8.48 - Non-avian fauna - Mitigated Effects Due to Pollution of Habitats During Dismantling

Non-avian Fauna Receptor	Conservation Value	Potential Magnitude	Effect	Duration	Significant/ Not Significant
Bat species	Medium	Negligible - Low	None - Minor Adverse	Short-term	Not Significant
Otter	Medium	Low	Minor Adverse	Short-term	Not Significant
Red squirrel	Medium	Negligible	None	n/a	Not Significant
Water vole	Medium	Low	Minor Adverse	Short-term	Not Significant
FWPM	High	Negligible - Low	Minor Adverse	Short-term	Not Significant

8.6.9 Non-avian Protected Fauna - Operational Phase

8.6.9.1 Habitat Loss / Fragmentation / Degradation

1 Any watercourse crossings (e.g. for temporary access tracks) would be designed to minimise disruption to free movement of all relevant species (including otter) and habitat fragmentation; appropriately designed structures (i.e. that minimise the effect on the watercourse and potential disruption to wildlife movement) would be installed, in accordance with best practice.

2 In order to address potentially detrimental habitat loss and fragmentation effects from the proposed tree felling, in particular on red squirrel populations, it is proposed that in red squirrel priority woodland areas that a wayleave management plan would be developed that would include specific measures to reduce potential fragmentation effects. Specifically, this would entail the retention (where possible) and regeneration of scrub in these wayleave areas that would be allowed to develop and maintained up to the maximum allowable height for vegetation within a wayleave corridor (accounting for distance from the OHLs and line height). This would help to encourage movement by red squirrel between areas of woodland that the wayleave would pass between by allowing some continuity of tall scrub cover. The management plan would be agreed in consultation with the forest owners/ mangers to ensure that the proposed management corresponds, for maximum benefit, with other management for red squirrel that may have been agreed for the wider forest.

3 The residual effect magnitude and effect level for non-avian fuana receptors is summarised in Table 8.49, below.

Table 8.49 - Non-avian fauna - Mitigated Effects Due to Habitat Loss / Degradation or Fragmentation

Non-avian Fauna Receptor	Conservation Value	Potential Magnitude	Effect	Duration	Significant/ Not Significant
Bat species	Medium	Low	Minor Adverse	Long-term	Not Significant
Otter	Medium	Negligible - Low	None - Minor Adverse	Long-term	Not Significant
Red squirrel	Medium	Minor	Minor Adverse	Long-term	Not Significant
Water vole	Medium	Negligible	None	n/a	Not Significant

8.6.9.2 Disturbance during Maintenance Works

1 The mitigation measures proposed to address construction disturbance will also apply to operational activities and for brevity will not be repeated here. Method Statements will be developed for all routine maintenance activities that incorporate appropriate measures (as outlined in the mitigation proposed to address disturbance to protected species during the construction phase of the project). A Method Statement covering emergency procedures will also be developed so that potential effects on protected species can be taken into consideration, where possible, prior to, during or subsequent to such works.

2 Residual effect magnitudes and effect levels for each sensitive receptor are summarised in Table 8.50, below.

Table 8.50 - Non-avian fauna - Potential Mitigated Effects Due to Operational Disturbance

Non-avian Fauna Receptor		Potential Magnitude	Effect	Duration	Significant/Not Significant
Bat species	Medium	Low	Minor Adverse	Short-term	Not Significant
Otter	Medium	Low	Minor Adverse	Short-term	Not Significant
Red squirrel	Medium	Low	Minor Adverse	Short-term	Not Significant
Water vole	Medium	Low	Minor Adverse	Short-term	Not Significant

8.6.9.3 Pollution / Damage of Habitats during Maintenance Works

1 The mitigation measures proposed to address construction pollution and habitat damage will also apply to operational activities and for brevity will not be repeated here. Method Statements will be developed for all routine maintenance activities that incorporate appropriate measures (as outlined in the mitigation proposed to address disturbance to protected species during the construction phase of the project). A Method Statement covering emergency procedures will also be developed so that potential effects on protected species can be taken into consideration, where possible, prior to, during or subsequent to such works.

2 The residual effect magnitude and effect level have been determined and are summarised in table 8.51 below.

Table 8.51 - Non-avian fauna - Mitigated Effects Due to Operational Pollution / Damage

Non-avian Fauna Receptor	Conservation Value	Potential Magnitude	Effect	Duration	Significant/Not Significant
Bat species	Medium	Low	Minor Adverse	Short-term	Not Significant
Otter	Medium	Low	Minor Adverse	Short-term	Not Significant
Red squirrel	Medium	Negligible	None	n/a	Not Significant
Water vole	Medium	Low	Minor Adverse	Short-term	Not Significant

8.7 Potential Cumulative Effects

8.7.1 Methodology

1 Cumulative effects relate to the potential for identified effects to act additively (that is to operate on the same ecological receptors so that the summed total of the cumulative effects result in a greater total effect magnitude and potentially greater effect level). The potential effects of existing development, affecting the same receptor considered in this assessment, are considered to have been incorporated into this assessment through the baseline data gathering phase of the EIA (i.e. it is assumed that significant ecological effects would be manifest in the baseline data). This assessment therefore focuses on proposed development / plans in the Study Area that are considered to have the potential to affect the same habitats and species identified as sensitive receptors for this assessment. Only those proposals that have been subject to a formal ecological assessment have been considered in any detail.

2 The method used to assess cumulative effects is designed to determine what effects on species and habitats have been predicted (with reference to published Environmental Impact Assessments where available) and to assess the potential for the predicted effects (whether they are reported as significant or not for the separate proposals) to interact additively (both in terms of construction and operational effects). This assessment relies heavily on professional judgement to assess the potential interactions between the effects identified for the different proposals.

8.7.2 Assessment

1 The following proposals have been identified as potentially relevant for this assessment (from north to south along the Study Area) in light of the development of this OHL being dependent upon them being consented:

- SWS Project;
- Margree Windfarm; and
- Blackcraig Hill Windfarm.

2 Environmental Statements have been reviewed for all of these proposals. The following receptors, identified in this assessment, are considered to have the potential to be subject to cumulative adverse effects in combination with the above proposals:

- Bogton Loch SSSI;
- Dalmellington Moss SSSI;
- Blanket bog habitats;
- River Doon and Tributaries;
- Margree Burn and Tributaries;
- Otter;
- Red Squirrel; and
- Fresh Water Pearl Mussel.

3 The potential cumulative effects for all receptors, apart from red squirrel, are associated with construction works and the potential for works on one or more of the above projects to coincide in time with the works on this OHL (and dismantling work in relation to Section 1 of the project). There is the potential for simultaneous impacts on the same waterbody, for example, to cumulatively exceed the capacity of the proposed mitigation measures of the individual project to reduce the effects of construction works to non-significant residual levels. In order to address this risk, it is proposed that ongoing or impending works associated with other projects are fully considered as part of the pre-works detailed development of the EMP and related method statements (including all relevant protected species measures) for this project. Appropriate measures will be taken (e.g. timing of work stages, additional monitoring or pollution control measures) in consultation with SEPA, in relation to pollution control, and SNH, in relation to protected species, to ensure that the proposed mitigation remains adequate to effectively address potential cumulative effects.

4 In relation to red squirrel there is considered to be a potentially significant cumulative effect from habitat change (loss and fragmentation) associated with felling proposals for Margree Windfarm. Habitat management to address effects on red squirrel from conifer plantation felling are proposed for this proposal and for Margree Windfarm. In order to address this, it is proposed that in the development of detailed management plan and prescriptions for red squirrel for this project that the Margree Proposals will be considered in detail. SPT can only control operations and management measures within the 80m wide wayleave corridor. However, opportunities will be taken to ensure that the habitat management proposals for this project take into account the Margree Windfarm management objectives so that, where possible, a greater combined benefit might be achieved and that proposed management which would be counter-productive to the aims of the Margree Windfarm management plan are avoided.

8.8 Conclusion and Summary Effects Table

1 The Blackcraig & Margree grid connection is a c. 36.5km OHL running from substations at Meikle Hill in East Ayrshire and Blackcraig in Dumfries & Galloway. The proposal will provide a connection to the transmission network for the proposed Margree and Blackcraig Hill windfarms. Additionally, it will provide an upgrade of the existing transmission line infrastructure allowing the dismantling of c. 32km of existing OHL to be dismantled. The Study Area for the proposal includes a range of habitats, statutory designated sites, flora and fauna. The dominant habitats are commercial conifer plantation, moorland habitat mosaics (i.e. comprising blanket bog, wet dwarf shrub heath, marshy grassland, semi-improved acid grassland), improved enclosed pasture, and scattered areas of semi-improved species-rich neutral / calcareous grassland. For the purpose of the assessment the development has been split into four sections relating to the specific OHL type (e.g. steel lattice tower, wood pole) and section where the routes of the existing line to be dismantled and the proposed OHL follow a very similar alignment.

2 A specific methodology was applied to the assessment of the potential effects of this proposal on ecological receptors. This included the collation of relevant available baseline data, through desk study and field survey, determination of important ecological receptors, assessment of receptor nature conservation value, assessment of possible effects during construction, operation and decommissioning (including potential cumulative effects with other plans or projects), identification of mitigation measures, and finally, an assessment of residual effects.

3 Important ecological constraints (protected / sensitive sites, habitats and species of national conservation concern), along with other environmental constraints, were carefully considered during the determination of the proposed route for the OHL. This has helped considerably in avoiding and reducing potential adverse effects from this proposal on sensitive ecological receptors.

4 A scoping opinion was requested from relevant statutory and non-statutory consultees. These included Scottish Natural Heritage, Scottish Wildlife Trust, Scottish Environment Protection Agency, Ayrshire and Galloway Rivers Trust. Desk study information was also requested from the local biological record centres, Botanical Society of the British Isles local recorder, Forestry Commission Scotland, local badger and bat groups, Red Squirrel Group, and information from the South Ayrshire and Dumfries & Galloway Biodiversity Officers.

5 Various field surveys were carried out including an extended Phase 1 habitat survey and a range of protected species surveys (i.e. water vole, otter, red squirrel, badger and bats).

6 The nature conservation value of each receptor across the Study Area for the proposed OHL, and proposed section of the existing transmission line to be dismantled, was assessed using a standard methodology. The nature conservation value of habitats and flora ranged from High (e.g. Bogton Loch SSSI, Dalmellington Moss SSSI, main watercourses), Medium (e.g. broadleaved semi-nature woodland, blanket bog, semi-improved species-rich grasslands) to Low (e.g. conifer plantation woodland). All fauna considered in the evaluation was assessed as Medium or Local High apart from fresh water pearl mussels which were assessed as High.

7 An assessment of possible effects of the proposed OHL was carried out. Potentially significant effects, before consideration of additional mitigation, were identified for blanket bog, marsh, marshy grassland, semi-improved grasslands and wet dwarf shrub heath. Potentially significant effects were also noted for Dalmellington Moss SSSI, blanket bog and raised bog in relation to the proposed dismantling works for the existing OHL. In addition to this, potentially significant effects on watercourses, salmonid fish, Bogton Loch SSSI, Loch Doon SSSI and standing waters were identified, principally in relation to pollution risk during construction works. For non-avian fauna potentially significant effects during the construction phase were identified for bat species, otter, red squirrel and fresh water pearl mussel. Potentially significant effects on fresh water pearl mussel were identified during the dismantling phase and for red squirrel and otter during the operational phase.

8 A range of additional mitigation measures have been proposed including pre-works surveys / assessments (followed by appropriate measures where necessary to prevent significant adverse effects on any protected species), ecological micro-siting of all works, use of best practice pollution control measures, habitat management of the wayleave corridor to address adverse effects on red squirrel etc. Providing that the proposed mitigation measures are successfully implemented the overall effect on all habitats and species of conservation interest would not be significant in the long-term.

Table 8.52 - Summary Effects Assessment for Ecology (significant effects are highlighted in bold text)

Receptor Group & Phase	Potential Effect	Receptor	Nature Conservation Value	Pre-mitigation Effects Assessment			Summary of Relevant Mitigation Measures	Residual Effects Assessment		
				Potential Magnitude	Effect Level (significance)	Effect Duration		Potential Magnitude	Effect Level / Significance	Effect Duration
Terrestrial Habitats & Flora - Construction Phase	Effects due to construction damage	Blanket Bog	Medium	Low-Medium	**Moderate Adverse (Significant)**	Medium-term	Development and implementation of method statements detailing best practice procedures for all relevant construction and re-instatement works (e.g. relating to vegetation and peat / soil stripping, storage of waste peat; protection and storage of vegetated turves; effective vegetation re-instatement; storage of construction materials; pollution control measures); During the detailed design stage, site infrastructure will be designed / sited to further reduce effects on habitats of highest sensitivity, as far as practicably possible; Final locations of site infrastructure will be micro-sited to minimise effects on sensitive habitats, after consultation with an ecological advisor, and with particular reference to blanket bog, deep peat, wetter areas and watercourses; and Demarcation of sensitive habitats close to working areas and procedures to ensure construction workers operate within theses limits. These items will all be incorporated in the EMP and CMS to be agreed with SNH.	Low	Minor Adverse (Not Significant)	Medium-term
		Broadleaved semi-natural woodland	Medium	Low	Minor Adverse (Not Significant)	Medium-term		Low	Minor Adverse (Not Significant)	Medium-term
		Broadleaved plantation woodland	Low (M)	Low	Minor Adverse (Not Significant)	Medium-term		Low	Minor Adverse (Not Significant)	Medium-term
		Coniferous plantation woodland	Low (M)	Low	Minor Adverse (Not Significant)	Medium-term		Low	Minor Adverse (Not Significant)	Medium-term
		Dry dwarf shrub heath	Medium	Low	Minor Adverse (Not Significant)	Medium-term		Low	Minor Adverse (Not Significant)	Medium-term
		Marsh / marshy grassland	Low (H)	Low-Medium	**Moderate Adverse (Significant)**	Short-term		Low	Minor Adverse (Not Significant)	Short-term
		Scattered broad-leaved trees	Low (H)	Low	Minor Adverse (Not Significant)	Medium-term		Low	Minor Adverse (Not Significant)	Medium-term
		Semi-improved / unimproved grasslands	Medium	Low-Medium	**Moderate Adverse (Significant)**	Short-term		Low	Minor Adverse (Not Significant)	Short-term
		Wet dwarf shrub heath	Medium	Low-Medium	**Moderate Adverse (Significant)**	Medium-term		Low	Minor Adverse (Not Significant)	Medium-term
	Pollution due to construction	Blanket Bog	Medium	Low-Medium	**Moderate Adverse (Significant)**	Short-term	See Waterbodies, Wetlands and Fish Section	Low	Minor Adverse (Not Significant)	Short-term
		Broadleaved semi-natural woodland	Medium	Low	Minor Adverse (Not Significant)	Short-term		Low	Minor Adverse (Not Significant)	Short-term
		Broadleaved plantation woodland	Low (M)	Low	Minor Adverse (Not Significant)	Short-term		Low	Minor Adverse (Not Significant)	Short-term
		Coniferous plantation woodland	Low (M)	Low	Minor Adverse (Not Significant)	Short-term		Low	Minor Adverse (Not Significant)	Short-term
		Dry dwarf shrub heath	Medium	Low	Minor Adverse (Not Significant)	Short-term		Low	Minor Adverse (Not Significant)	Short-term
		Marsh / marshy grassland	Low (H)	Low	Minor Adverse (Not Significant)	Short-term		Low	Minor Adverse (Not Significant)	Short-term
		Scattered broad-leaved trees	Low (H)	Low	Minor Adverse (Not Significant)	Short-term		Low	Minor Adverse (Not Significant)	Short-term
		Semi-improved / unimproved grasslands	Medium	Low	Minor Adverse (Not Significant)	Short-term		Low	Minor Adverse (Not Significant)	Short-term
		Wet dwarf shrub heath	Medium	Low	Minor Adverse (Not Significant)	Short-term		Low	Minor Adverse (Not Significant)	Short-term
	Changes to Hydrology	Blanket Bog	Medium	Medium	**Moderate - Adverse (Significant)**	Medium - term	Detailed design of all project elements (e.g. the routeing of the temporary access tracks, location of Wood Poles / towers, temporary construction compounds, etc.), in consultation with an ecological advisor, in order to avoid, where possible, areas of deeper peat deposits and areas of better quality blanket bog (i.e. less modified and degraded blanket bog). To minimise the need for peat excavation and changes to the hydrology of the bog.	Low	Minor Adverse (Not Significant)	Short-term

Receptor Group & Phase	Potential Effect	Receptor	Nature Conservation Value	Pre-mitigation Effects Assessment			Summary of Relevant Mitigation Measures	Residual Effects Assessment		
				Potential Magnitude	Effect Level (significance)	Effect Duration		Potential Magnitude	Effect Level / Significance	Effect Duration
Terrestrial Habitats & Flora - Dismantling Phase	Damage due to dismantling works	Dalmellington Moss SSSI	High	Low	**Moderate Adverse (Significant)**	Medium-term	Assessment potential ecological sensitivities / risks prior to works commencing through pre-work site survey (by suitably experienced ecologists) and assessment of appropriate mitigation (e.g. selection of access route, approach to tower dismantling in relation to proximity of sensitive habitats) and detailed procedures to follow during the dismantling work on a site-by-site basis.	None	Negligible (Not Significant)	n/a
		Blanket bog	Medium	Low - Medium	**Moderate Adverse (Significant)**	Medium-term		Low	Minor Adverse (Not Significant)	Medium-term
		Broadleaved semi-natural woodland	Medium	Low	Minor Adverse (Not Significant)	Medium-term		Low	Minor Adverse (Not Significant)	Medium-term
		Coniferous plantation woodland	Low (M)	Low	Minor Adverse (Not Significant)	Medium-term		Low	Minor Adverse (Not Significant)	Medium-term
		Marsh / marshy grassland	Low (H)	Low	Minor Adverse (Not Significant)	Short-term		Low	Minor Adverse (Not Significant)	Short-term
		Raised Bog	High	Medium	**Moderate Adverse (Significant)**	Medium-term		Low-None	Minor Adverse (Not Significant)	Medium-term
		Scattered broad-leaved trees	Low (H)	Low	Minor Adverse (Not Significant)	Medium-term		Low	Minor Adverse (Not Significant)	Medium-term
		Semi-improved / unimproved grassland	Medium	Low	Minor Adverse (Not Significant)	Short-term		Low	Minor Adverse (Not Significant)	Short-term
	Pollution due to dismantling works	Blanket Bog	Medium	Low	Minor Adverse (Not Significant)	Short-term	See Waterbodies, Wetlands and Fish Section below	Low-None	Minor Adverse (Not Significant)	Short-term
		Broadleaved semi-natural woodland	Medium	Low	Minor Adverse (Not Significant)	Short-term		Low-None	Minor Adverse (Not Significant)	Short-term
		Broadleaved plantation woodland	Low (M)	Low	Minor Adverse (Not Significant)	Short-term		Low-None	Minor Adverse (Not Significant)	Short-term
		Coniferous plantation woodland	Low (M)	Low	Minor Adverse (Not Significant)	Short-term		Low-None	Minor Adverse (Not Significant)	Short-term
		Dry dwarf shrub heath	Medium	Low	Minor Adverse (Not Significant)	Short-term		Low-None	Minor Adverse (Not Significant)	Short-term
		Marsh / marshy grassland	Low (H)	Low	Minor Adverse (Not Significant)	Short-term		Low-None	Minor Adverse (Not Significant)	Short-term
		Raised Bog	High	Low	**Moderate Adverse (Significant)**	Short-term		Low-None	Minor Adverse (Not Significant)	Short-term
		Scattered broad-leaved trees	Low (H)	Low	Minor Adverse (Not Significant)	Short-term		Low-None	Minor Adverse (Not Significant)	Short-term
		Semi-improved / unimproved grassland	Medium	Low	Minor Adverse (Not Significant)	Short-term		Low-None	Minor Adverse (Not Significant)	Short-term
		Wet dwarf shrub heath	Medium	Low	Minor Adverse (Not Significant)	Short-term		Low-None	Minor Adverse (Not Significant)	Short-term
Terrestrial Habitats & Flora - Operational Phase	**Habitat loss**	Blanket Bog	Medium	Low	Minor Adverse (Not Significant)	Long-term	Use of microsting / detailed design and the careful construction of temporary access tracks and other structures to minimise perturbation of the natural peat hydrology following the proposed method statements.	Low	Minor Adverse (Not Significant)	Short-term
		Broadleaved semi-natural woodland	Medium	Low	Minor Adverse (Not Significant)	Long-term		Low	Minor Adverse (Not Significant)	Short-term
		Broadleaved plantation woodland	Low (M)	Low	Minor Adverse (Not Significant)	Long-term		Low	Minor Adverse (Not Significant)	Short-term
		Coniferous plantation woodland	Low (M)	Low	Minor Adverse (Not Significant)	Long-term		Low	Minor Adverse (Not Significant)	Short-term
		Dry dwarf shrub heath	Medium	Low	Minor Adverse (Not Significant)	Long-term		Low	Minor Adverse (Not Significant)	Short-term
		Marsh / marshy grassland	Low (H)	Low	Minor Adverse (Not Significant)	Long-term		Low	Minor Adverse (Not Significant)	Short-term
		Scattered broad-leaved trees	Low (H)	Low	Minor Adverse (Not Significant)	Long-term		Low	Minor Adverse (Not Significant)	Short-term
		Semi-improved / unimproved grassland	Medium	Low	Minor Adverse (Not Significant)	Long-term		Low	Minor Adverse (Not Significant)	Short-term
		Wet dwarf shrub heath	Medium	Low	Minor Adverse (Not Significant)	Long-term		Low	Minor Adverse (Not Significant)	Short-term

Receptor Group & Phase	Potential Effect	Receptor	Nature Conservation Value	Pre-mitigation Effects Assessment			Summary of Relevant Mitigation Measures	Residual Effects Assessment		
				Potential Magnitude	Effect Level (significance)	Effect Duration		Potential Magnitude	Effect Level / Significance	Effect Duration
Terrestrial Habitats & Flora - Operational Phase	**Damage due to maintenance related damage**	Blanket Bog	Medium	Low	Minor Adverse (Not Significant)	Medium-term	Method statements for scheduled maintenance and emergency maintenance works will be developed in accordance with best practice. Method statements will cover all potential maintenance activities and set out best practice procedures and measures such that the potential for damage to sensitive habitats is minimised. Procedures identified for the minimisation of construction effects will be applied to minimise the potential damage to habitats during maintenance operations.	Low	Minor Adverse (Not Significant)	Short-term
		Broadleaved semi-natural woodland	Medium	Negligible	Minor Adverse (Not Significant)	Medium-term		Low	Minor Adverse (Not Significant)	Short-term
		Broadleaved plantation woodland	Low (M)	Negligible	Minor Adverse (Not Significant)	Medium-term		Low	Minor Adverse (Not Significant)	Short-term
		Coniferous plantation woodland	Low (M)	Negligible	Minor Adverse (Not Significant)	Medium-term		Low	Minor Adverse (Not Significant)	Short-term
		Dry dwarf shrub heath	Medium	Low	Minor Adverse (Not Significant)	Medium-term		Low	Minor Adverse (Not Significant)	Short-term
		Marsh / marshy grassland	Low (H)	Low	Minor Adverse (Not Significant)	Short-term		Low	Minor Adverse (Not Significant)	Short-term
		Scattered broad-leaved trees	Low (H)	Negligible	Minor Adverse (Not Significant)	Medium-term		Low	Minor Adverse (Not Significant)	Short-term
		Semi-improved / unimproved grassland	Medium	Low	Minor Adverse (Not Significant)	Short-term		Low	Minor Adverse (Not Significant)	Short-term
		Wet dwarf shrub heath	Medium	Low	Minor Adverse (Not Significant)	Medium-term		Low	Minor Adverse (Not Significant)	Short-term
Waterbodies, Wetlands & Fish - Construction Phase	**Effects due to construction damage**	Loch Doon SSSI	High	None	None (Not Significant)	n/a	Tower/pole foundations would be located and excavated wherever possible in the driest locations with well consolidated superficial geology. Using flexibility with the infrastructure allowance, areas of wet and deep peat will be avoided where possible; towers/poles would not be located within 30m of waterbodies or within 10m of other watercourses. Best practice will be followed in relation to minimising adverse effects on watercourses at temporary and permanent access crossings. Bridges will be used to cross significant watercourses wherever possible. Vehicles and plant will not ford waterbodies Where sensitive routeing of access tracks can not implemented, bridges will be used in preference to culverts to avoid the crossing of a water body by vehicle and plant. The precise location of bridges will be determined in consultation with the project ecologist, and will be designed and installed in a manner as to minimise erosion. Where culverting has to be used, they should present no barrier to fish migration or lead to erosion.	None	None (Not Significant)	n/a
		Other standing water	Low (M)	Low	Minor Adverse (Not Significant)	Short-term		Low	Minor Adverse (Not Significant)	Short-term
		Watercourses	High	Low-Medium	**Moderate Adverse (Significant)**	Short-term		Low	Minor Adverse (Not Significant)	Short-term

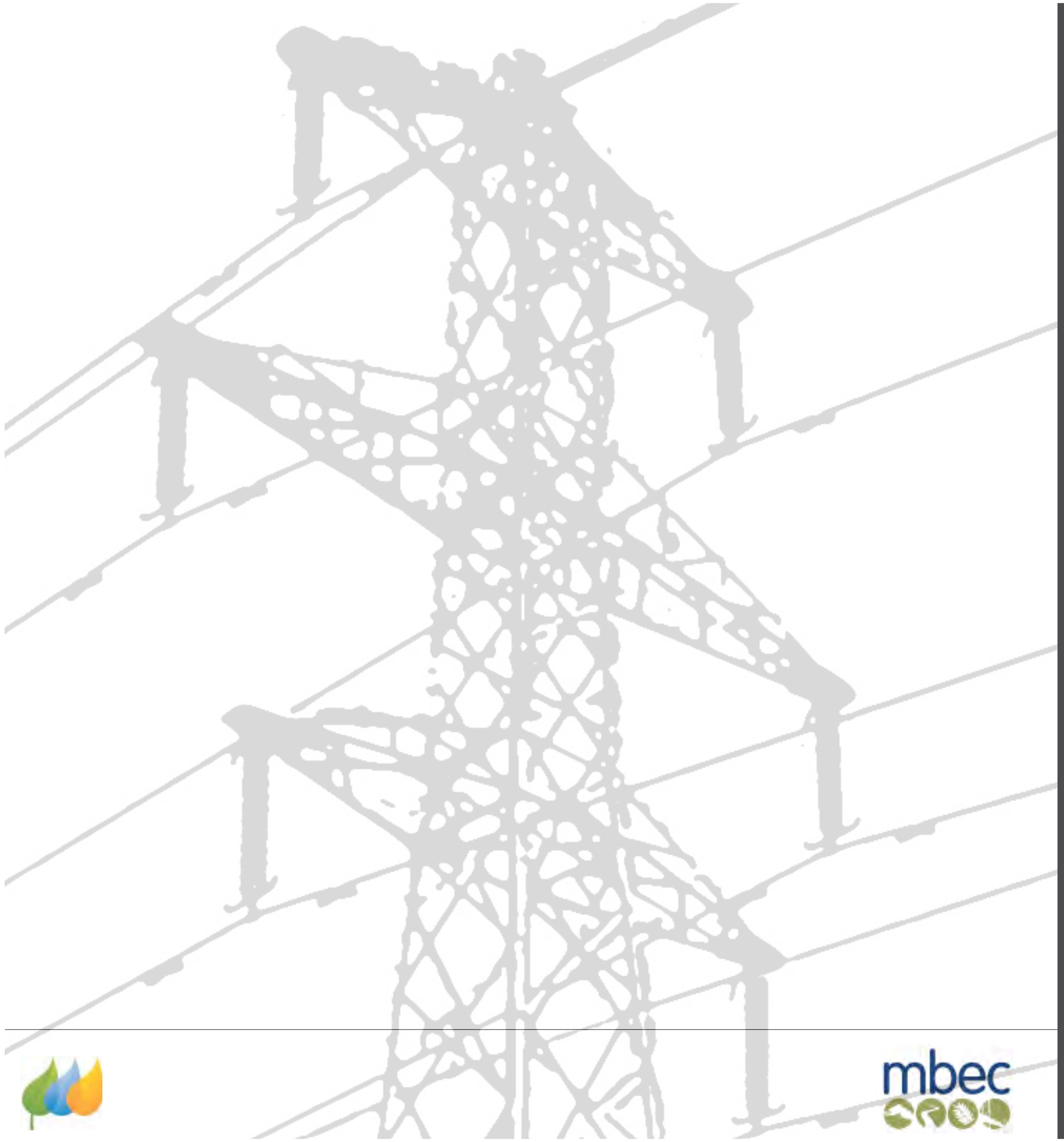
Receptor Group & Phase	Potential Effect	Receptor	Nature Conservation Value	Pre-mitigation Effects Assessment			Summary of Relevant Mitigation Measures	Residual Effects Assessment		
				Potential Magnitude	Effect Level (significance)	Effect Duration		Potential Magnitude	Effect Level / Significance	Effect Duration
Waterbodies, Wetlands & Fish - Construction Phase	**Effects of pollution due to construction**	Loch Doon SSSI	High	Low	**Moderate Adverse (Significant)**	Short-term	In planning and carrying out any work in or near a water body (defined as any land feature that holds water; e.g. loch, pond, river, burn etc.) precautions will be taken to ensure their complete protection against pollution, silting and erosion. All works will be undertaken in compliance with the relevant SEPA Pollution Prevention Guidelines. All waterbodies likely to be affected by works will be identified in the detailed construction planning stage. Agreement will be sought with SEPA on pollution and siltation prevention measures, strategy and emergency procedures for all construction stages. Drainage will not directly enter waterbodies but be directed into vegetated drainage channels to attenuate flow and treat sediment loads and pollutants. These will be of shallow gradient to maximise attenuation and prevent scour and erosion. Where the use of vegetated channels is not possible, sediment traps will be used. These will be subject to a maintenance programme. Access tracks will be constructed of material which will not create water pollution or affect the chemical or nutrient status of adjacent waterbodies. The material will be of sufficient coarse grain so as not to be washed off into waterbodies. Mobile fuel and lubricant servicing units would be provided with appropriate quality delivery hoses with trigger-type nozzles. Vehicles and plant will not be refuelled near drains or waterbodies/watercourses. Oil powered pumps, generators etc. will be positioned an impervious drip trays surrounded by earth or sand bunds and located at least 30m from any waterbody and 10m from any watercourse. The transportation of fuel and oil across a particular working area site in drums or other containers will be avoided as far as practicable. Where this is unavoidable, extreme caution would be taken to avoid spillages or leaks. Adequate stocks of oil absorbent and containment materials would be retained on site. All relevant staff would be familiar with the use of these materials. Oil will be stored at least 30m from any waterbody and 10m from any watercourse. Oil storage tanks would be located on an impermeable base and be surrounded by an impervious bund with no surface water outlet. The bund will be capable of retaining at least 110% of the volume of the tanks. Temporary topsoil and subsoil heaps and stockpiles created after land stripping will be located at reasonable distances from drains or watercourses to prevent any collected materials from either falling or being integrated with run-off caused by rain into any waterbody. They shall be seeded or bound as soon as practicable after deposition to ensure quick stabilisation. Cut-off drains shall be provided to intercept run-off from the stockpiles. Only inert and non-toxic material will be used to backfill drainage trenches, infill areas of standing water and infill areas where contact with groundwater is probable. Dewatering of waterbodies will be avoided where practicable. Where dewatering is necessary, agreement would be sought with SEPA and SNH. Discharges will not be permitted directly into waterbodies but passed through buffer areas of vegetation. A policy of dust containment and arrestment will be implemented for materials with the potential to lead to wind-blown pollution. Bulk cement and other cementitious materials will not be stored or mixed at any site but would be delivered ready-mixed. Concrete transfers and washouts will only be undertaken in suitably bunded areas which would be sited well away from any drainage and waterbodies. Liquid concrete and wash-out liquids will be contained within these areas and removed to a licensed disposal site. Where significant tree felling is to be undertaken, best practice guidance to mitigate the effects of increased run-off and associated sedimentation will be sought from the Forestry Commission. The measures outlined above will be detailed in an Environmental Management Plan (EMP) will be developed, in advance of works commencing and in consultation with SEPA, that will include details of site specific measures and procedures (in the form of individual method statements where appropriate) to be adopted to protect sensitive environmental receptors (principally surface waters, sensitive habitats and species) during every phase of the works. This will include the identification of any surface waters within or adjacent to each tower or pole base site that could be at risk of pollution from the works. This will also include identification of the least environmentally damaging route for heavy plant access to the construction area.	Negligible	None (Not Significant)	n/a
		Other standing water	Low (M)	Low	Minor Adverse (Not Significant)	Short-term		Negligible	None (Not Significant)	n/a
		Watercourses	High	Medium	**Major Adverse (Significant)**	Short-term		Low	Minor Adverse (Not Significant)	Short-term
		Salmonid fish	High	Medium	**Major Adverse (Significant)**	Short-term		Low	Minor Adverse (Not Significant)	Short-term

Receptor Group & Phase	Potential Effect	Receptor	Nature Conservation Value	Pre-mitigation Effects Assessment			Summary of Relevant Mitigation Measures	Residual Effects Assessment		
				Potential Magnitude	Effect Level (significance)	Effect Duration		Potential Magnitude	Effect Level / Significance	Effect Duration
Waterbodies, Wetlands & Fish - Dismantling Stage	**Effects due to dismantling damage**	Bogton Loch SSSI	High	Low	**Moderate Adverse (Significant)**	Short-term	See Construction Phase and Chapter 5	Negligible	None (Not Significant)	n/a
		Other standing water	Low (M)	Low	Minor Adverse (Not Significant)	Short-term		Negligible	None (Not Significant)	n/a
		Watercourses	High	Low - Medium	**Moderate Adverse (Significant)**	Short-term		Low	Minor Adverse (Not Significant)	Short-term
	Pollution due to dismantling works	Bogton Loch SSSI	High	Low	**Moderate Adverse (Significant)**	Short-term	See Construction Phase and Chapter 5	Negligible	None (Not Significant)	n/a
		Loch Doon SSSI	High	Low	**Moderate Adverse (Significant)**	Short-term		Negligible	None (Not Significant)	n/a
		Standing water	Low (M)	Low - Medium	**Moderate Adverse (Significant)**	Short-term		Low	Minor Adverse (Not Significant)	Short-term
		Watercourses	High	Low - Medium	**Moderate - Major Adverse (Significant)**	Short-term		Low	Minor Adverse (Not Significant)	Short-term
		Salmonid fish	High	Medium	**Major Adverse (Significant)**	Short-term		Low	Minor Adverse (Not Significant)	Short-term
Waterbodies, wetlands & Fish - Operational Stage	**Effects due to permanent habitat loss**	Bogton Loch SSSI	High	Negligible	None (Not Significant)	n/a		Negligible	None (Not Significant)	n/a
		Loch Doon SSSI	High	Negligible	None (Not Significant)	n/a		Negligible	None (Not Significant)	n/a
		Standing water	Low (M)	Negligible	None (Not Significant)	n/a		Negligible	None (Not Significant)	n/a
		Watercourses	Medium	Negligible	None (Not Significant)	n/a		Negligible	None (Not Significant)	n/a
	Effects due to maintenance	Loch Doon SSSI	High	Low	**Moderate Adverse (Significant)**	Short-term	See Terrestrial Habitats	Negligible	None (Not Significant)	n/a
		Watercourses	High	Low - Medium	**Moderate - Major Adverse (Significant)**	Short-term		Low	Minor Adverse (Not Significant)	Short-term
		Salmonid fish	High	Medium	**Major Adverse (Significant)**	Short-term		Low	Minor Adverse (Not Significant)	Short-term

Receptor Group & Phase	Potential Effect	Receptor	Nature Conservation Value	Pre-mitigation Effects Assessment			Summary of Relevant Mitigation Measures	Residual Effects Assessment		
				Potential Magnitude	Effect Level (significance)	Effect Duration		Potential Magnitude	Effect Level / Significance	Effect Duration
Non-Avian Protected Fauna - Construction Phase	**Effects due to construction disturbance**	Bat species	Medium	Low - Medium	**Moderate Adverse (Significant)**	Short-term	Pre-construction surveys will be undertaken to minimise the risk of disturbance to resting sites of any protected species potentially present in the vicinity of the construction works. These surveys will provide up-to-date information on the use of the area by species with statutory protection otter, water vole, red squirrel, pine marten, badger and bats, to direct specific mitigation measures to avoid disturbance of these species. A targeted survey will therefore be carried out immediately prior to the commencement of construction works, within a c. 250m zone upstream and downstream along watercourses where there are proposed construction works, temporary access tracks and any other infrastructure within 50m of the watercourse. All works (including access tracks) would be located where possible at least 50m beyond identified resting sites for otter, bats, pine marten, badger, red squirrel, and water vole. Where works are within 50m of a resting up/shelter site of a protected species, work would only be carried out after consultation with the appropriate body and with appropriate licences. Ramps or an alternative exit route will be placed in any steep-sided excavations allowing otters (and other animals) to exit should they enter. Suitable mitigation measures for pine marten, water vole and red squirrel would be defined in consultation with SNH to ensure that there is no long-term loss of or damage to their habitat or long-term effects on the maintenance of their populations. An emergency procedure would be in place for site workers to follow should protected species be encountered during the course of the works. All works would be stopped within 50m of the area. Appropriate specialist advice obtained from the project ecological advisor and SNH and Scottish Government. Trees to be felled would be surveyed prior to felling for potential bat use. Potential bat roost trees would be marked and subsequently checked by a tree surgeon under the supervision of a licensed bat worker prior to felling. Surveys would be timed to take account of when roost sites were most likely to be present and surveys may be required at several periods throughout the year (e.g. maternity, autumn/winter roosts). If any evidence of bats was identified SNH and the Scottish Government would be consulted and appropriate mitigation measures identified. All necessary licences would be obtained. Specific trees or areas of woodland identified as providing high potential for bat roosting would wherever possible only be felled outside the hibernation and nursery seasons (when pregnant mothers or non-flying bats may occupy the roosts) i.e. between March to May and September to October. Felling between September and October would also avoid potential problems with any nesting birds. Best practice recommendations would be followed in relation to tree felling (e.g. checking for bats, cutting and lowering branches/limbs with bat roost potential). Any bats encountered during the course of the works would not be handled. They would be left in situ and SNH or a licensed bat worker contacted for immediate advice. Woodland with red squirrel interest would be surveyed prior to any felling works. Reasonable measures would be taken to identify any red squirrel dreys through pre-construction surveys. A five-point scale would be used to asses the level of activity with 1 being a drey clearly in use and 5 being a drey clearly not in use. If a active red squirrel drey is identified that could be affected by any proposed felling works a disturbance-free buffer of 30m would be retained around site until the drey can be definitely confirmed as no longer active. Any permanent bridge structures would have suitable access for otter along at least one river bank that should be accessible at high water level. On a precautionary basis, pre-construction surveys for FWMP are proposed to ensure that the risk of any adverse effects on this species is fully assessed and avoided prior to any works commencing. On a precautionary basis, pre-construction surveys of ponds capable of supporting great crested newts are proposed within 500m of any of the proposed works (including all off-road site access routes). Avoidance measures would be adopted for areas within 500m of any ponds found to support great crested newt. Where works cannot be avoided in these areas, an exclusion programme, agreed in consultation with SNH and undertaken under licence, would be implemented. assessed and avoided prior to any works commencing that could affect potentially suitable ponds and associated terrestrial habitats. Mitigation measures concerning reptiles would centre around protection of individuals in order to comply with relevant legislation and best practice procedures. All construction workers would be briefed upon the potential presence of reptiles. If a reptile is encountered during any construction activity, works within the immediate area would be ceased and the project ecologist sought. The project ecologist would then remove the reptile to an area of suitable habitat outwith the construction corridor. Once the project ecologist is satisfied that there are no more reptiles within the immediate working area works would recommence.	Low	Minor Adverse (Not Significant)	Short-term
		Otter	Medium	Low - Medium	**Moderate Adverse (Significant)**	Short-term		Low	Minor Adverse (Not Significant)	Short-term
		Red squirrel	Medium	Low - Medium	**Moderate Adverse (Significant)**	Short-term		Low	Minor Adverse (Not Significant)	Short-term
		Water vole	Medium	Low	Minor Adverse (Not Significant)	Short-term		Low	Minor Adverse	Short-term

Receptor Group & Phase	Potential Effect	Receptor	Nature Conservation Value	Pre-mitigation Effects Assessment			Summary of Relevant Mitigation Measures	Residual Effects Assessment		
				Potential Magnitude	Effect Level (significance)	Effect Duration		Potential Magnitude	Effect Level / Significance	Effect Duration
Non-Avian Protected Fauna - Construction Phase	**Effects of pollution due to construction**	Bat species	Medium	Low	Minor Adverse (Not Significant)	Short-term	See Terrestrial habitats & Flora - Construction Phase - Pollution due to construction	Negligible - Low	Minor Adverse (Not Significant)	Short-term
		Otter	Medium	Low	Minor Adverse (Not Significant)	Short-term		Negligible - Low	Minor Adverse (Not Significant)	Short-term
		Red squirrel	Medium	Negligible	None (Not Significant)	n/a		Negligible	None (Not Significant)	n/a
		Water vole	Medium	Low	Minor Adverse (Not Significant)	Short-term		Negligible - Low	Minor Adverse (Not Significant)	Short-term
		FWPM	High	Medium	**Major Adverse (Significant)**	Short-term		Negligible - Low	Minor Adverse (Not Significant)	Short-term
Non-Avian Fauna -Dismantling Phase	**Effects due to dismantling disturbance**	Bat species	Medium	Low	Minor Adverse Not Significant)	Short-term	See Terrestrial habitats & Flora - Dismantling Phase	Negligible - Low	None-Minor Adverse (Not Significant)	Short-term
		Otter	Medium	Low - Medium	**Moderate Adverse (Significant)**	Short-term		Negligible - Low	None-Minor Adverse (Not Significant)	Short-term
		Red squirrel	Medium	Negligible - Low	None - Minor Adverse (Not Significant)	Short-term		Negligible - Low	None-Minor Adverse (Not Significant)	Short-term
		Water vole	Medium	Low	Minor Adverse (Not Significant)	Short-term		Low	Minor Adverse (Not Significant)	Short-term
		FWPM	High	Low	**Moderate Adverse (Significant)**	Short-term		Negligible - Low	None-Minor Adverse (Not Significant)	Short-term
	Effects of pollution due to dismantling	Bat species	Medium	Low	Minor Adverse (Not Significant)	Short-term	See Terrestrial habitats & Flora - Dismantling Phase	Negligible - Low	None - Minor Adverse (Not Significant)	Short-term
		Otter	Medium	Low	Minor Adverse (Not Significant)	Short-term		Low	Minor Adverse (Not Significant)	Short-term
		Red squirrel	Medium	Negligible	None (Not Significant)	n/a		Negligible	None (Not Significant)	n/a
		Water vole	Medium	Low	Minor Adverse (Not Significant)	Short-term		Low	Minor Adverse (Not Significant)	Short-term
		FWPM	High	Medium	**Major Adverse (Significant)**	Short-term		Negligible - Low	Minor Adverse (Not Significant)	Short-term
Non-Avian Protected Fauna - Operational Phase	**Effects due to habitat loss, degradation or fragmentation**	Bat species	Medium	Low	Minor Adverse (Not Significant)	Long-term	Any watercourse crossings (e.g. for temporary access tracks) would be designed to minimise disruption to free movement of all relevant species (including otter) and habitat fragmentation; appropriately designed structures (i.e. that minimise the effect on the watercourse and potential disruption to wildlife movement) would be installed, in accordance with best practice. In order to address potentially detrimental habitat loss and fragmentation effects from the proposed tree felling, in particular on red squirrel populations, it is proposed that in red squirrel priority woodland areas that a wayleave management plan would be developed that would include specific measures to reduce potential fragmentation effects. The management plan would be agreed in consultation with the forest owners/ mangers to ensure that the proposed management corresponds, for maximum benefit, with other management for red squirrel that may have been agreed for the wider forest.	Low	Minor Adverse (Not Significant)	Long-term
		Otter	Medium	Low	Minor Adverse (Not Significant)	Long-term		Negligible - Low	None - Minor Adverse (Not Significant)	Long-term
		Red squirrel	Medium	Medium	**Moderate Adverse (Significant)**	Long-term		Minor	Minor Adverse (Not Significant)	Long-term
		Water vole	Medium	Negligible	None (Not Significant)	n/a		Negligible	None (Not Significant)	n/a

Receptor Group & Phase	Potential Effect	Receptor	Nature Conservation Value	Pre-mitigation Effects Assessment			Summary of Relevant Mitigation Measures	Residual Effects Assessment		
				Potential Magnitude	Effect Level (significance)	Effect Duration		Potential Magnitude	Effect Level / Significance	Effect Duration
Non-Avian Protected Fauna - Operational Phase	**Effects due to operational disturbance**	Bat species	Medium	Low	Minor Adverse (Not Significant)	Short-term	Method Statements will be developed and implemented for all routine maintenance activities that incorporate appropriate measures (as outlined in the mitigation proposed to address disturbance to protected species during the construction phase of the project). A Method Statement covering emergency procedures will also be developed so that potential effects on protected species can be taken into consideration, where possible, prior to, during or subsequent to such works.	Low	Minor Adverse (Not Significant)	Short-term
		Otter	Medium	Low - Medium	Moderate Adverse (Significant)	Short-term		Low	Minor Adverse (Not Significant)	Short-term
		Red squirrel	Medium	Low - Medium	**Moderate Adverse (Significant)**	Short-term		Low	Minor Adverse (Not Significant)	Short-term
		Water vole	Medium	Low	Minor Adverse (Not Significant)	Short-term		Low	Minor Adverse (Not Significant)	Short-term
	Effects due to operational pollution	Bat species	Medium	Low	Minor Adverse (Not Significant)	Short-term	Method Statements will be developed and implemented for all routine maintenance activities that incorporate appropriate measures (as outlined in the mitigation proposed to address disturbance to protected species during the construction phase of the project). A Method Statement covering emergency procedures will also be developed so that potential effects on protected species can be taken into consideration, where possible, prior to, during or subsequent to such works.	Low	Minor Adverse (Not Significant)	Short-term
		Otter	Medium	Low	Minor Adverse (Not Significant)	Short-term		Low	Minor Adverse (Not Significant)	Short-term
		Red squirrel	Medium	Negligible	None (Not Significant)	n/a		Negligible	None (Not Significant)	n/a
		Water vole	Medium	Low	Minor Adverse (Not Significant)	Short-term		Low	Minor Adverse (Not Significant)	Short-term
	Collision Risk	Bat Species	Medium	Negligible	None (Not Significant)	n/a	n/a	Negligible	None (Not Significant)	n/a
	Electrocution Risk	Bat Species	Medium	Negligible	None (Not Significant)	n/a	n/a	Negligible	None (Not Significant)	n/a
		Red Squirrel	Medium	Negligible	None (Not Significant)	n/a		Negligible	None (Not Significant)	n/a



09

Ornithology

Blackcraig and Margree Windfarms
Grid Connection
Environmental Statement

Table of Contents

9.1 Introduction ... 76
9.1.1 Background ... 76
9.1.2 The Proposal ... 76
9.1.3 Summary of Potential Effects ... 76
9.1.3.1 Construction / Dismantling Phase ... 76
9.1.3.2 Operational Phase ... 76
9.1.4 Relevant Legislation, Policy and Guidance ... 76
9.1.4.1 Biodiversity Action Plans and the Scottish Biodiversity Strategy ... 78
9.1.4.2 Local Authority Development Plan Policies ... 78

9.2 Assessment Methodology ... 78
9.2.1 Summary of the Project Approach ... 78
9.2.2 Consultation and Scoping ... 79
9.2.3 Desk Study ... 79
9.2.4 Survey Methods ... 79
9.2.4.1 Breeding and Wintering Bird Surveys ... 79
9.2.4.2 Flight Activity Survey Methodology and Collision Risk Analysis ... 80
9.2.4.3 Data and Survey Limitations ... 81
9.2.5 Effects Assessment ... 81

9.3 Baseline Conditions and Evaluation ... 125
9.3.1 Summary Description of the Study Area ... 125
9.3.2 Do Nothing Scenario ... 125
9.3.3 Designated Sites ... 125
9.3.3.1 Statutory Designations ... 126
9.3.3.2 Non-Statutory Designations ... 126
9.3.3.3 Evaluation ... 126
9.3.4 Summary of Flight Activity Recorded in all Sections ... 126
9.3.5 Summary of Breeding Bird Survey Results ... 127
9.3.6 Target Species Accounts ... 140
9.3.6.1 Whooper Swan (Cygnus cygnus) ... 140
9.3.6.2 Pink-footed Goose (Anser brachyrhynchus) ... 140
9.3.6.3 Greenland White-fronted Goose (Anser albifrons flavirostris) ... 141
9.3.6.4 Greylag Goose (Anser anser) ... 141
9.3.6.5 Red Kite (Milvus milvus) ... 142
9.3.6.6 Hen Harrier (Circus cyaneus) ... 143
9.3.6.7 Goshawk (Accipiter gentiles) ... 144
9.3.6.8 Merlin (Falco columbarius) ... 145
9.3.6.9 Peregrine (Falco peregrinus) ... 146
9.3.6.10 Black Grouse (Tetrao tetrix) ... 146
9.3.6.11 Golden Plover (Pluvialis apricaria) ... 147
9.3.6.12 Barn Owl (Tyto alba) ... 148
9.3.6.13 Short-eared Owl (Asio flammeus) ... 149
9.3.6.14 Nightjar (Carprimulgus europaeus) ... 149
9.3.7 Notable Secondary Species / Species of Conservation Concern ... 150
9.3.7.1 Ducks, Geese and Swans ... 150
9.3.7.2 Other Raptors ... 150
9.3.7.3 Waders ... 151
9.3.7.4 Gulls ... 151
9.3.7.5 Forest Owls ... 151
9.3.7.6 Passerines ... 151
9.3.8 Conclusions to Nature Conservation Evaluation ... 152

9.4 Assessment of Effects ... 152
9.4.1 Introduction ... 152
9.4.2 Sensitive Avian Receptors ... 152
9.4.3 Elements of the Scheme Relevant to this Assessment ... 153
9.4.3.1 Wood Pole Line ... 153
9.4.3.2 L7H Tower ... 153
9.4.4 Construction Phase Effects ... 153
9.4.4.1 Introduction ... 153
9.4.4.2 Disturbance to Birds ... 153
9.4.5 Dismantling Phase Effects ... 154
9.4.5.1 Disturbance to Birds ... 154
9.4.6 Operational Phase Effects ... 154
9.4.6.1 Habitat Loss ... 154
9.4.6.2 Displacement and Increased Predation Risk ... 155
9.4.6.3 Collision Risk from the Overhead Line ... 155
9.4.6.4 Collision Risk from Supporting Structures ... 157
9.4.6.5 Operational Maintenance and Emergency Works ... 157
9.4.6.6 Electrocution Risk ... 157

9.5 Proposed Mitigation Measures and Residual Impacts ... 158
9.5.1 Introduction ... 158
9.5.2 Construction Phase Mitigation and Residual Impacts ... 158
9.5.2.1 Construction Disturbance ... 158
9.5.3 Dismantling Phase Effects ... 159
9.5.3.1 Disturbance to Birds ... 159
9.5.4 Operation Phase Mitigation and Residual Impacts ... 159
9.5.4.1 Habitat Loss ... 159
9.5.4.2 Collision Risk ... 159
9.5.4.3 Electrocution Risk ... 160
9.5.4.4 Operational Maintenance and Emergency Works ... 160
9.5.5 Summary of Mitigation Measures ... 160
9.5.5.1 Construction ... 160
9.5.5.2 Operation ... 161

9.6 Cumulative Assessment ... 161
9.6.1 Methodology ... 161
9.6.2 Assessment ... 161

9.7 Assessment Conclusion ... 161

Table of Figures

Figure 9.01 - Proposed OHL route - Overview ... 77
Figure 9.02 - Survey Area - Area B ... 83
Figure 9.03 - Survey Area - Area C ... 84
Figure 9.04 - Survey Area - Area D ... 85
Figure 9.05 - Flight Activity Survey Effort - Period 01 - Area B ... 86
Figure 9.06 - Flight Activity Survey Effort - Period 01 - Area C ... 87
Figure 9.07 - Flight Activity Survey Effort - Period 01 - Area D ... 88
Figure 9.08 - Flight Activity Survey Effort - Period 02 - Area B ... 89
Figure 9.09 - Flight Activity Survey Effort - Period 02 - Area C ... 90
Figure 9.10 - Flight Activity Survey Effort - Period 02 - Area D ... 91
Figure 9.11 - Flight Activity Survey Effort - Period 03 - Area B ... 92
Figure 9.12 - Flight Activity Survey Effort - Period 03 - Area C ... 93
Figure 9.13 - Flight Activity Survey Effort - Period 03 - Area D ... 94
Figure 9.14 - Raptor Flights - Period 01 - Area B ... 95
Figure 9.15 - Raptor Flights - Period 01 - Area C ... 96
Figure 9.16 - Raptor Flights - Period 01 - Area D ... 97
Figure 9.17 - Raptor Flights - Period 02 - Area B ... 98
Figure 9.18 - Raptor Flights - Period 02 - Area C ... 99
Figure 9.19 - Raptor Flights - Period 02 - Area D ... 100
Figure 9.20 - Raptor Flights - Period 03 - Area B ... 101
Figure 9.21 - Raptor Flights - Period 03 - Area C ... 102
Figure 9.22 - Raptor Flights - Period 03 - Area D ... 103
Figure 9.23 - Goose and Swan Flights - Period 01 - Area B ... 104
Figure 9.24 - Goose and Swan Flights - Period 01 - Area C ... 105
Figure 9.25 - Goose and Swan Flights - Period 01 - Area D ... 106
Figure 9.26 - Goose and Swan Flights - Period 02 - Area B ... 107
Figure 9.27 - Goose and Swan Flights - Period 02 - Area C ... 108
Figure 9.28 - Goose and Swan Flights - Period 02 - Area D ... 109
Figure 9.29 - Goose and Swan Flights - Period 03 - Area B ... 110
Figure 9.30 - Goose and Swan Flights - Period 03 - Area C ... 111

Figure 9.31 - Goose and Swan Flights - Period 03 - Area D 112

Figure 9.32 - Other Waterbirds Flights - Period 01 - Area B 113

Figure 9.33 - Other Waterbirds Flights - Period 01 - Area C 114

Figure 9.34 - Other Waterbirds Flights - Period 01 - Area D 115

Figure 9.35 - Other Waterbirds Flights - Period 02 - Area B 116

Figure 9.36 - Other Waterbirds Flights - Period 02 - Area C 117

Figure 9.37 - Other Waterbirds Flights - Period 02 - Area D 118

Figure 9.38 - Other Waterbirds Flights - Period 03 - Area B 119

Figure 9.39 - Other Waterbirds Flights - Period 03 - Area C 120

Figure 9.40 - Other Waterbirds Flights - Period 03 - Area D 121

Figure 9.41 - Black Grouse Flights - Area B 122

Figure 9.42 - Black Grouse Flights - Area C 123

Figure 9.43 - Black Grouse Flights - Area D 124

Figure 9.44 - Moorland and Woodland Breeding Bird Results - 1 of 12 128

Figure 9.45 - Moorland and Woodland Breeding Bird Results - 2 of 12 129

Figure 9.46 - Moorland and Woodland Breeding Bird Results - 3 of 12 130

Figure 9.47 - Moorland and Woodland Breeding Bird Results - 4 of 12 131

Figure 9.48 - Moorland and Woodland Breeding Bird Results - 5 of 12 132

Figure 9.49 - Moorland and Woodland Breeding Bird Results - 6 of 12 133

Figure 9.50 - Moorland and Woodland Breeding Bird Results - 7 of 12 134

Figure 9.51 - Moorland and Woodland Breeding Bird Results - 8 of 12 135

Figure 9.52 - Moorland and Woodland Breeding Bird Results - 9 of 12 136

Figure 9.53 - Moorland and Woodland Breeding Bird Results - 10 of 12 137

Figure 9.54 - Moorland and Woodland Breeding Bird Results - 11 of 12 138

Figure 9.55 - Moorland and Woodland Breeding Bird Results - 12 of 12 139

List of Tables

Table 9.01 - Priority UK BAP Species, Species on the Scottish Biodiversity List and Local BAP Species of Potential Relevance to the Assessment of Effects for this Proposal 78

Table 9.02 - Summary of Scoping Responses Relevant to the Assessment of Effects on Ornithological Receptors 79

Table 9.03 - Summary of Flight Activity Survey Effort by Survey Period 80

Table 9.04 - Nature Conservation Value of Ornithological Interests (habitats and populations) .. 81

Table 9.05 - Categorisation of Effect Magnitude (inc. consideration of effect duration) 82

Table 9.06 - Matrix Illustrating the Relationship between Effect Magnitude and Nature Conservation Value in the Determination of the Significance of Effects 82

Table 9.07 - Bird Species (breeding, passage or wintering) of Conservation Concern and Sensitivity to OHL Development Present / Potentially Present in the Study Area. 125

Table 9.08 - Recorded Flights by Target and Selected Secondary Species within the Proposed OHL Survey Area and Transits, all Heights Bands, Across the Routes of the Proposed and Existing OHLs (target species highlighted in bold) 126

Table 9.09 - Transits per hour at all Flight Height Recording Bands by Target and Selected Secondary Species Across the Routes of the Proposed OHL within the three Flight Activity Survey Periods (target species highlighted in bold, target species which were not observed during flight activity surveys crossing the proposed or existing OHLs are not listed). 126

Table 9.10 - Estimated Breeding Pairs / Territories of Birds of Conservation Concern Recorded within the Breeding Bird Survey Area and within each Section of Project. 127

Table 9.11 - Summary of the Nature Conservation Values of Features / Bird Species / Grouped Species Present within the OHL Route Study Area 152

Table 9.12 - Construction Phase - Pre-mitigation Assessment of Disturbance for Breeding and Wintering Birds 154

Table 9.13 - Dismantling Phase - Pre-mitigation Assessment of Disturbance for Breeding and Wintering Birds 154

Table 9.14 - Operational Phase - Pre-mitigation Assessment of Habitat Loss for Breeding Birds 155

Table 9.15 - Collision Rates (%) Adopted for the Estimates of Collision Mortality for Target Species in the Study Area. 156

Table 9.16 - Estimated Annual Collisions for the Proposed OHL and Existing OHLs from Flights within all Height Bands for Target and Selected Secondary Species (using data from all surveys) 156

Table 9.17 - Operational Phase - Pre-mitigation Assessment of Collision Risk for Bird Receptors 157

Table 9.18 - Operational Phase - Pre-mitigation Assessment of Maintenance and Emergency Works Disturbance for Bird Receptors 157

Table 9.19 - Estimated Wing Span of Selected Target Species within Proposed OHL Route Survey Area (Cramp and Simmons 1980) 158

Table 9.20 - Operational Phase – Pre-mitigation Assessment of Electrocution Risk for Each Bird Receptor 158

Table 9.21 - Construction Phase – Residual Effects Assessment of Disturbance for Breeding and Wintering Birds 158

Table 9.22 - Dismantling Phase – Residual Effects Assessment of Disturbance for Breeding and Wintering Birds 159

Table 9.23 - Operational Phase – Residual Effects Assessment of Habitat Loss for Breeding Birds 159

Table 9.24 - Operational Phase - Residual Effects Assessment of Collision Risk for Bird Receptors 160

Table 9.25 - Operational Phase - Residual Effects Assessment of Maintenance and Emergency Works Disturbance for Bird Receptors 160

Table 9.26 Summary Effects Assessment for Ecology (significant effects are highlighted in bold text) 163

9.0 Ornithology

9.1 Introduction

9.1.1 Background

1 This chapter includes an assessment of the potential effects of the proposed overhead line (OHL) connection on birds of conservation concern and their supporting habitats (i.e. key avian receptors). The wider potential effects on other fauna, habitats and flora are dealt with in Chapter 8 (Terrestrial & Aquatic Ecology). A summary of the methods used to obtain and collate baseline data, evaluate the various ornithological receptors and assess the significance of the identified potential effects is provided.

2 This assessment includes consideration of potential effects associated with the construction, operation and maintenance of the proposed OHL connection (including potential cumulative effects associated with other plans or projects) and also includes an assessment of residual effects once mitigation measures, where appropriate, have been taken into account. Consideration is also given to the potential effects of the proposed dismantling of the existing 132 kV N-Route OHL from Dalshangan, in Dumfries & Galloway, to just north of Smithston in East Ayrshire.

3 The assessment is supported by the following Appendices:

- Further Description of Ornithological Survey Methodologies (Appendix D.1);
- Results of the Ornithological Desk Study (Appendix D.2);
- Details of Flight Activity Survey Effort and Weather Conditions During Surveys (Appendix D.3);
- All Bird Species Recorded During all Surveys and their Status (Appendix D.4);
- Flight Activity Survey Results (Appendix D.5);
- Details of Collision Risk Assessment for Target Species (Appendix D.6);
- Collated Observations of Species of Conservation Concern (Appendix D.7);
- Woodland Point Count Survey Results (Appendix D.8);
- Carcass Search Study at Kendoon and Carsphairn (Appendix D.9); and
- Confidential Ornithological Appendix (Appendix D.10).

4 The Confidential Ornithological Appendix provides details of the locations of nest sites or breeding attempts of species listed on Schedule 1 to the Wildlife and Countryside Act 1981 and at risk of disturbance and / or persecution. This appendix has only been provided to Scottish Natural Heritage (SNH) and the Royal Society for the Protection of Birds (RSPB).

5 This chapter and the accompanying reported ornithological survey work was completed by MBEC ecological consultants and associate specialist ornithologists. MBEC is grateful to all individuals and organisations that provided information for this assessment, a full acknowledgment is provided in Appendix D.2 to this chapter

9.1.2 The Proposal

1 The proposed OHL will be approximately 36.5km in length, connecting new substations at Blackcraig (Grid Reference NX 689 835) and Margree windfarms (Grid Reference NX 679 850) to the electricity grid at a new substation, not part of this proposal, at Meikle Hill (Grid Reference NS 520 080).

2 The route of the proposed OHL is located in Dumfries & Galloway and East Ayrshire. A detailed description of the proposed and existing electricity grid infrastructure is given in Chapter 5 and the route is shown in Figure 9.01.

3 The section of the proposed OHL from Blackcraig Hill to Dalshangan (GR 259415, 589221) will be supported on wooden poles (a single circuit flat formation wood "H" pole design). A short underground section will then link the wood pole section accross the A713. From this location, northwards to Meikle Hill substation, the OHL will be supported on steel lattice towers (L7H type). In addition, a section of 33 kV underground power cable, approximately 2.7km in length, will be laid within an existing forest track (at Corriedoo Forest) to connect Blackcraig Hill windfarm to the Blackcraig substation. Details of tower / pole dimensions and line heights are provided in Chapter 5.

4 The installation of the new L7H towers will allow 132 kV conductors that are part of the existing high voltage transmission network (N-Route) to be transferred from their existing towers. This will result in the dismantling of the towers between Dalshangan and the vicinity of Bellsbank (Grid Reference NS 483 053) and the N-Route conductors placed on one side of the new L7H towers. It is also proposed that all of the N-Route towers and lines from Bellsbank to Smithston (Grid Reference NS 241 613), giving a total length of approximately 32km (i.e. from Dalshangan to Smithston), will be dismantled. The removal of the N-Route north of Bellsbank will take place once the proposed OHL is operational.

9.1.3 Summary of Potential Effects

1 The main potential adverse effects to birds resulting from the construction, operation and decommissioning of the proposed OHL connection can be summarised as follows:

9.1.3.1 Construction / Dismantling Phase

- Potential disturbance to breeding and wintering birds arising from the construction works for the proposed OHL connection and dismantling works for the existing OHL (e.g. through human presence, vehicle movements, noise, vibration, light);
- Potential / degradation (direct and indirect) of habitats through construction / dismantling-related habitat damage (e.g. from plant trafficking);
- Potential for pollution of watercourses by construction materials, chemicals and silt generated from earthworks reducing the quality of foraging habitat for birds associated with watercourses, etc.; and
- Potential cumulative effects arising from other existing and proposed developments within the vicinity of the proposed OHL route.

9.1.3.2 Operational Phase

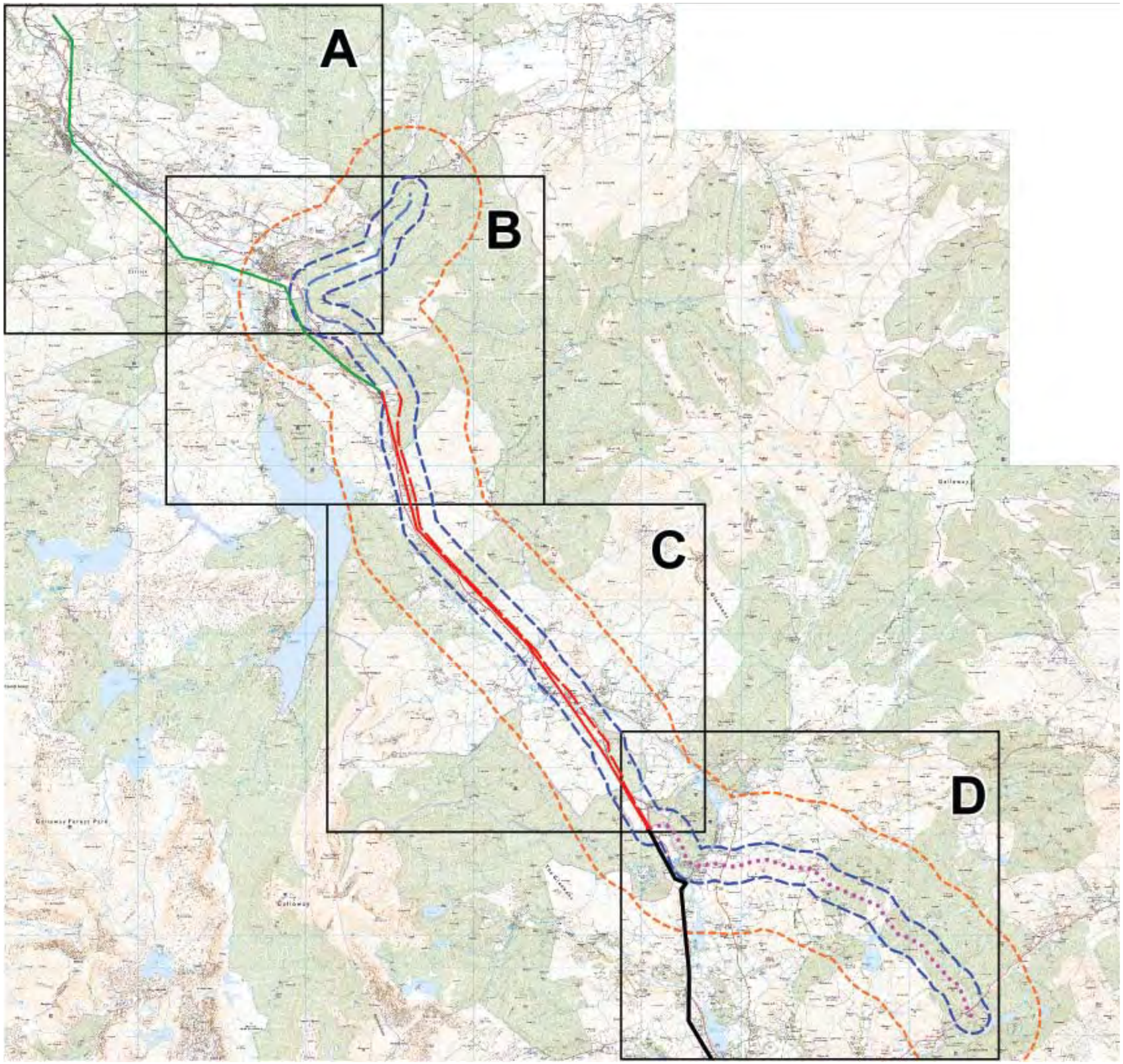
- Potential loss / degradation (direct or indirect) of habitats through the construction of the permanent OHL structures (towers and poles), temporary access tracks, temporary storage areas and construction compounds;
- Risk of electrocution with the OHL conductors and/or collision (e.g. conductors, earth wires, stay-wires);
- Increased potential for predation (OHL acting as perching site / vantage point for predatory species such as corvids and raptors) and displacement (i.e. birds avoiding using suitable habitats in the vicinity of a new OHL);
- Indirect effects due to wayleave management (e.g. forest corridor management to maintain vegetation / tree heights within acceptable safety limits);
- The potential for disturbance from routine and emergency works; and
- Potential cumulative effects arising from other existing and proposed developments within the vicinity of the proposed OHL route.

1 Where these potential effects have been assessed as being potentially significant, mitigation management measures have been proposed to address them.

9.1.4 Relevant Legislation, Policy and Guidance

1 This assessment has been carried out in compliance with the Environmental Impact Assessment (Scotland) Regulations 1999, the Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2000 and following current best practice. Consideration has also been given to the following legislation, policy and guidance:

- Annex 1 bird species listed in Council Directive 79 / 409 / ECC on the conservation of wild birds (the 'Birds Directive');
- The Wildlife and Countryside Act 1981 (as amended);
- The Nature Conservation (Scotland) Act 2004;
- The Conservation (Nature Habitats &c.) Regulations 1994 (the 'Habitats Regulations');
- The Scottish Biodiversity Strategy;
- Relevant Local and National Biodiversity Action Plans (BAP) (see below);
- Relevant local authority structure and local plan policies (see Appendix C.1 for a summary of relevant policies considered in this assessment);
- The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2000;
- SPP (particularly paras 125-148);
- Planning Advice Note 60: Planning for Natural Heritage;
- Planning Advice Note 45: Renewable Energy Technologies (Scottish Executive revised 2002).



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Legend

Route of Proposed OHL - Overview

- 500m buffer (breeding bird survey area)
- 2km buffer (raptor survey area)
- Figure sub divisions
- **Section 1**
  Existing N-Route to be removed
- **Section 2**
  Proposed L7 Tower route
- **Section 3**
  Existing N-Route to be removed
- Proposed L7 Tower route
- **Section 4**
  Proposed Wood Pole line route
- Existing N-Route to be retained

0m 0.5km 1km 1.5km 2km 2.5km 3km

Figure 9.01 - Proposed OHL route - Overview

- Birds and Powerlines (Ferrer & Janss, eds., 1999);
- Protecting Birds from Powerlines (Haas *et al*. 2005); and
- Other relevant literature and survey / assessment guidance (e.g. Survey Methods for use in Assessing the Effects of Onshore Windfarms on Bird Communities, SNH 2005; Guidance on assessing the significance of effects from onshore windfarms on birds outwith designated areas, SNH 2006)[1].

9.1.4.1 Biodiversity Action Plans and the Scottish Biodiversity Strategy

1 The UK Biodiversity Action Plan (BAP) priority species, and species identified within the Dumfries & Galloway BAP and Joint Ayrshire BAP, which are potentially present within the Study Area and are considered particularly susceptible to the potential adverse effects of OHLs are listed in Table 9.01, below (see Appendix C.1 for a summary of relevant BAP objectives). The Scottish Biodiversity Strategy, "Scotland's Biodiversity: It's in Your Hands", was published by the Scottish Government in May 2004. It aims to conserve biodiversity for the health, enjoyment and wellbeing of the people of Scotland. The Scottish Biodiversity List (2005) details species considered by the Scottish Ministers to be of principal importance for biodiversity conservation. The key species which were viewed as likely to be relevant to the assessment of this proposal are listed in Table 9.01. Under the Nature Conservation (Scotland) Act 2004 all public bodies have a duty to further biodiversity where consistent with their functions, in ways which are guided by the Scottish Biodiversity Strategy.

1 - Currently in the UK there is no widely accepted specific guidance for the assessment of the effects of proposed OHLs on birds, in lieu of this the well-established methodological guidance for windfarm EIA was referred to where relevant.

Table 9.01 - Priority UK BAP Species, Species on the Scottish Biodiversity List and Local BAP Species of Potential Relevance to the Assessment of Effects for this Proposal

Species		UK BAP	Scottish Biodiversity List	Ayrshire BAP	Dumfries & Galloway BAP
Common name	Scientific Name				
Whooper swan	*Cygnus cygnus*		x		x
Greenland white-fronted goose	*Anser albifrons flavirostris*	x	x		x
Hen harrier	*Circus cyaneus*		x	x	x
Red kite	*Milvus milvus*		x		x
Kestrel	*Falco tinnunculus*		x		
Merlin	*Falco columbarius*		x		x
Peregrine falcon	*Falco peregrinus*		x		x
Red grouse	*Lagopus lagopus scoticus*	x			
Black grouse	*Tetrao tetrix*	x	x	x	x
Golden plover	*Pluvialis apricaria*		x		x
Lapwing	*Vanellus vanellus*	x	x		x
Woodcock	*Scolopax rusticola*		x		
Curlew	*Numenius arquata*	x	x		x
Black-headed gull	*Larus ridibundus*		x		
Herring gull	*Larus argentatus*	x	x		
Cuckoo	*Cuculus canorus*	x			
Barn owl	*Tyto alba*		x		x
Short-eared owl	*Asio flammeus*		x		
Nightjar	*Caprimulgus europaeus*	x	x		

9.1.4.2 Local Authority Development Plan Policies

1 Details of relevant nature conservation related planning policy for the Dumfries & Galloway and East Ayrshire local authority areas are summarised in Chapter 8 and provided in full in Appendix C.1.

9.2 Assessment Methodology

9.2.1 Summary of the Project Approach

1 This section of the chapter summarises the methods adopted for the ornithological desk study, field surveys, receptor evaluation and effect assessment. Further detail on survey methods is provided in Appendix D.1.

2 The EIA Regulations provide broad guidelines on what is to be considered when determining the effects of development proposals. In combination with expert professional judgement and guidance from governmental agencies (e.g. SNH) and professional bodies (e.g. Institute of Ecology and Environmental Management (IEEM)) EIA practitioners assess potential effects and determine the likely level of significance.

3 The approach to this project and the assessment of effects is summarised as the following main stages:

- Determination of the important receptors within the Study Area based on available data derived from desk study and field surveys;
- Data collated and interpreted to identify important ornithological constraints for the OHL preferred and proposed route selection process;
- Identification of the potential effects, based on the nature of the proposal including consideration of potential effects during construction, operation and decommissioning (where relevant) of the proposed development (informed by the Scoping Study);
- Determination of the scale and magnitude of the effects, including consideration of effect duration and any potential cumulative effects arising from other development proposals;
- Determination of the significance of potential effects, based on the interaction between effect magnitude and duration and the nature conservation value / sensitivity of the receptor affected;
- Identification of further mitigation measures required to address significant adverse effects; and
- Assessment of residual effect significance.

4 In recognition of the potential for OHLs to result in adverse effects on birds, particularly in relation to species of high conservation concern and relatively high risk of collision with OHLs, the potential effects on ornithological receptors have been considered from an early stage in the routeing process.

5 Preliminary ornithological surveys and a desk study (see below for further information on the desk study) were undertaken so that key constraints could be identified (i.e. those that had a potential bearing on route selection) within a wide route Study Area (see Figure 9.01). At this stage, important constraints included statutory designated sites, known important wildfowl roosting or feeding areas, black grouse lek sites / concentrations of black grouse records, Schedule 1 raptor breeding sites and important roost sites. The identified constraints were carefully considered in decisions on the alignment for the preferred route. For example, in relation to ornithological receptors, the preferred route was modified to avoid areas of historical importance for black grouse (i.e. in South Kyle Forest) and also to avoid an area where a hen harrier winter roost was identified during initial surveys in 2007.

6 Once the preferred route had been identified it became the focus for more detailed field surveys. The survey areas were defined and based on the assumed maximum distance where potentially detectable effects on ornithological receptors could conceivably occur. The potential for variation in the exact placement of infrastructure was also a consideration in the selection of the boundaries of the survey area.

7 Where potential effects of the proposed route have been assessed as being potentially significant, or where current best practice suggests it should be considered, further mitigation has been proposed. For example, the use of bird diverters (to increase the visibility of the OHLs to birds and thereby reduce collision risk) is proposed along certain sections of the route where relatively high levels of flight activity are anticipated based on field survey findings. Ornithological input to the construction

management and detailed design process (e.g. of access tracks and tower positions) is also proposed to ensure that potential disturbance to important locations for breeding or wintering birds is minimised.

9.2.2 Consultation and Scoping

1 Consultation with SNH was carried out in 2008 at a relatively early stage in the project. An ecological survey methodology for the project was agreed with SNH in advance of the majority of EIA field survey work commencing.

2 The consultation process for the preferred route of the OHL is described in full in Chapter 2. Specific consultation with RSPB and FCS was undertaken in relation to options for routeing the OHL within the South Kyle Forest in order to minimise potential adverse effects on black grouse.

3 A summary of the results of the EIA Scoping process, detailing responses from consultees in relation to the assessment of the potential ornithological effects from the proposed OHL, are provided in Table 9.02 below. These responses have been taken into consideration in the planning and implementation of the EIA baseline survey work and the preparation of this assessment.

Table 9.02 - Summary of Scoping Responses Relevant to the Assessment of Effects on Ornithological Receptors

Subject	Summary of Points Raised
General Points	All ecological survey methods conform to the best available standard methods for each habitat and species, and follow guidance published by SNH where this is available. Where standard methodologies do not exist, developers should propose and agree an appropriate methodology with SNH specialist advisers. All ecological survey data collected during ES survey work should be made available by the applicant to SG and SNH, in a form which would enable them to make future analysis of the effects of overhead power lines if appropriate.
Designated Sites	The ES should address the likely impacts on the nature conservation interests of all the designated sites in the vicinity of the proposed development. It should provide proposals for any mitigation that is required to avoid these impacts or to reduce them to a level where they are not significant. In the event that detailed survey or analysis is required in order to reach a view, the survey and analysis should be regarded as information contributing to that assessment. Note that such information should be provided for the overhead line itself together with any ancillary works, and cumulatively in combination with any other overhead line consented or formally proposed in the vicinity.
Protected Species (general)	The ES needs to show that the applicants have taken account of the relevant wildlife legislation and guidance namely, Council Directives on The Conservation of Natural Habitats and of Wild Flora and Fauna, and on Conservation of Wild Birds (commonly known as the Habitats and Birds Directives), the Wildlife & Countryside Act 1981, the Nature Conservation (Scotland) Act 2004, the Protection of Badgers Act 1992, the 1994 Conservation Regulations, Scottish Government Interim Guidance on European Protected Species, Development Sites and the Planning System and the Scottish Biodiversity Strategy and associated Implementation Plans. It needs to be categorically established which species are present on the site, and where, before the application is considered for consent. The presence of protected species such as Schedule 1 Birds or European Protected Species must be included and considered as part of the application process, not as an issue which can be considered at a later stage. An Annex of environmentally sensitive information may be required to provide information on nest locations or other environmentally sensitive information related to specially protected species. However, the annex should not include any information that is not confidential, or if it does this information should be contained elsewhere within the text of the Environmental Statement.
Birds	The ES should provide an assessment of the impact of the overhead power line on birds. A baseline survey of the species and number of birds present on the site throughout the year should be undertaken. Particular attention should be paid to specially protected and/or vulnerable species.

9.2.3 Desk Study

1 Ornithological desk study data were requested from a range of organisations including the Scottish Ornithologists Club (SOC), RSPB, British Trust for Ornithology (BTO) and the South Strathclyde and Dumfries & Galloway Raptor Study Groups. Records were initially sought within a wider Study Area for species of high conservation concern and a relatively high risk of collision (and/or electrocution) with OHLs. This information was used to help identify areas outside of designated sites that were considered to be of great enough sensitivity to warrant consideration in route selection decisions (data from initial flight activity surveys was also used to identify ornithological constraints for the route selection process).

2 The Scottish bird sensitivity map (Bright et al. 2006), which was developed to provide locational guidance on areas of greater ornithological sensitivity to onshore windfarm development, was also consulted during the initial desk study to assist in identifying areas of constraint in relation to breeding birds.

3 Following determination of the preferred route a further desk study was completed, focusing on a Study Area that extended 2km from the route and included all available species records. Desk study results are provided in Appendix D.2. Detailed records relating to species considered to be at particular risk of persecution or disturbance are restricted to a Confidential Ornithological Appendix which has been provided to RSPB and SNH (Appendix D.10).

4 As part of the desk study, relevant ornithological data from the following published Environmental Statements (ES) were also considered:

- Blackcraig Hill windfarm - ES published in 2005, ornithological surveys completed March 2004 to April 2005;
- Margree windfarm - ES published in 2006, ornithological surveys completed March 2004 to April 2005;
- Kyle Forest windfarm - ES published in 2005, ornithological surveys completed March 2004 to April 2005; and
- the South West Scotland (SWS) Overhead Power Line project (SWS Project) - ES published in 2008, ornithological surveys completed March 2006 - August 2008.

9.2.4 Survey Methods

1 Various field surveys were undertaken to assess and quantify the use of the survey area by breeding, wintering and migratory birds, with a particular focus on species of high conservation interest and recognised susceptibility to OHL development (i.e. collision / electrocution risk). Species identified as being of particular concern for this project, (given the locations and habitat types that the route passes through) include: whooper swan, Greenland white-fronted goose and greylag goose. This region of south-west Scotland also holds nationally important populations of black grouse (a species that is also considered to be a relatively high risk of colliding with OHLs), hen harrier and red kite.

2 For the purposes of the EIA, once the preferred route had been established, a number of survey boundaries were defined. 'Breeding bird survey area' and 'core survey area' refer to the preferred route of the OHL with a 500m wide buffer either side of the proposed route; 'raptor survey area' refers to the proposed OHL route with a 2km buffer either side (see Figure 9.01); and 'black grouse survey area' refers to the proposed route with a 1.5km buffer either side of the line. In addition to this, waterbody counts and watches to assess wildfowl flight activity to and from roosting and foraging sites, relative to the proposed route of the OHL, were undertaken within a wider Study Area.

3 The following is a summary of the field survey methods. Full details are provided in Appendix D.1.

9.2.4.1 Breeding and Wintering Bird Surveys

1 Breeding bird surveys were carried out within the core survey area, defined by the preferred route as it was at that the time, during 2008 and 2009. Various changes to the preferred route arose in 2009. These included minor route deviations at Glenmuck, Green Well of Scotland, North Liggat, Bardendoch and a larger change at Dalshangan (see Chapter 5 for details of the development of the proposed route). Additional breeding bird surveys were conducted in 2009 to take account of these route changes.

2 Surveys followed current relevant guidance where applicable and methods that have been used in other OHL EIAs and which have been agreed in consultation with SNH.

3 Woodland breeding bird surveys were carried out for all areas of suitable habitat within 500m of the proposed OHL route. The point count method (Bibby *et al.* 2000) was used to sample breeding activity within the coniferous plantations, broadleaved woodlands and mixed plantations. All point count surveys were carried out between dawn and dawn plus five hours. Isolated trees, scrub-patches, hedgerows and copses were surveyed as part of the open moorland surveys (see below). In addition, transects were walked (i.e. following rides and open space adjacent to watercourses) and all breeding activity was recorded on at least two separate visits. The woodland survey was completed over two years (2008 and 2009) with FCS owned woodland primarily surveyed in 2008 and privately owned woodland surveyed in 2009.

4 Moorland breeding bird surveys followed an adapted version of the method described by Brown and Shepherd (1993) to census upland breeding waders. Survey was undertaken of all suitable habitats within 500m of the proposed OHL route between 29/04/2009 and 12/08/2009.

5 Breeding raptor surveys were undertaken (supplementing records obtained during the woodland, moorland walkover surveys and flight activity surveys) following an adapted method for various relevant raptor species described in Gilbert *et al.* (1998) and Hardy *et al.* (2006). Suitable habitat in the survey area (i.e. up to 2km either side of the proposed route) was searched and scanned from suitable vantage points for

the presence or signs of breeding Schedule 1 / Annex 1 raptors, including goshawk, red kite, merlin, hen harrier, short-eared owl, peregrine falcon and barn owl. The survey was completed between 27/03/2009 and 10/07/2009.

6 Forest owl surveys were undertaken in suitable habitat within 1km of the proposed route. Following the methods described in Gilbert *et al.* (1998), three separate visits were carried out in woodland habitats, timed between sunset and plus three hours after sunset, between 25/03/2009 and 28/06/2009.

7 Black grouse lek reconnaissance surveys, following the methods described in Gilbert *et al.* (1998), were undertaken within potentially suitable habitats up to 1.5km from the proposed OHL route. Dawn surveys for all suitable habitats were carried out in calm weather between 03/04/209 and 14/05/2009.

8 A breeding nightjar survey was undertaken in suitable habitats within 1km of the proposed route. The survey followed the methods described in Gilbert *et al.* (1998), with survey visits completed between 25/03/2009 and 28/06/2009.

9 A focal hen harrier winter roost survey was also undertaken in one location during winter 2008-09 following the methodology described in Gilbert *et al.* (1998).

10 Counts of waterbirds (principally ducks, geese and swans) were completed at a number of waterbodies from December 2007 to April 2008 and November 2008 to March 2009. These waterbodies were included within the baseline survey work as part of a much wider routeing Study Area and are the following distances from the proposed route (distances are the closest point to the proposed route; grid references relate to the approximate centre point of the waterbody):

- Bogton Loch (a.k.a Loch William) - c. 1.7km from proposed OHL (NS 468 054);
- Loch William (Burnton) - c. 2.2km from proposed OHL (NS 470 065);
- Carsfad Loch - c. 2.0km from proposed OHL (NX 607 860);
- Earlston Loch - c. 5.4km from proposed OHL (NX 613 829);
- Kendoon Loch - c. 1.2km from proposed OHL (NX 607 906);
- Knockman Loch - c. 1.7km from proposed OHL (NX 665 836);
- Lochinvar Reservoir - c. 0.4km from proposed OHL (NX 659 853);
- Loch Brack - c. 1.3km from proposed OHL (NX 683 821);
- Loch Doon - c. 1.0km from proposed OHL (NX 498 974);
- Loch Howie - c. 0.5km from proposed OHL (NX 697 834);
- Loch Muck - c. 0.3km from proposed OHL (NS 512 007);
- Loch Skae - c. 2.0km from proposed OHL (NX 710 837);
- Regland Loch - c. 1.3km from proposed OHL (NX 691 857); and
- Wee Berbeth Loch - c. 2.2km from proposed OHL (NS 471 034).

11 In addition, regular daytime searches from public roads were also completed during the winter of 2008/9 to look for grazing and roosting flocks of geese and swans in the vicinity of the proposed OHL route (e.g. carse land at the Holm of Dalry, NX 61 80, and Holm of Daltallochan, NX 55 93).

9.2.4.2 Flight Activity Survey Methodology and Collision Risk Analysis

1 Winter assessment of bird activity (winter flight activity survey) was initially completed between October 2007 and April 2008 for the routeing Study Area (see Figures 9.14-9.55). Timed flight activity surveys were undertaken from 23 vantage points (VPs) to determine the presence of regular bird 'flight corridors', concentrations of birds, or the presence of particularly sensitive species during the winter period. The aim of the survey was to record the use of the area by all flying birds but, in particular, activity by target species / groups (e.g. wildfowl, waders and raptors). The data was used to inform the positioning and routeing of the OHL and to determine estimates of the potential bird collision risk presented by the proposal.

2 Further flight activity surveys were carried out of the route corridor (with minor amendments to VP locations reflecting changes to the route during the consultation process) between April 2008 and May 2009. Vantage points were positioned just outside of the route of the proposed OHL, wherever possible, to reduce the influence of 'observer effect'. Each vantage point was located relative to its neighbours, so that the majority of the Study Area was visible (see Appendix D.1 and Figures 9.02 to 9.04 for VP locations). Between c. 6-9 hours of watches were completed each month (divided approximately into three-hour bouts timed to occur within the hours of dawn, daytime and dusk). The data was used to inform detailed routeing and to determine estimates of the potential bird collision risk for the assessment of the proposal (see Appendix D.5). The flight activity survey effort for this project is summarised in Table 9.03, below, and has been mapped in Figures 9.05 to 9.13.

Table 9.03 - Summary of Flight Activity Survey Effort by Survey Period

Period	No. Vantage Points	Total hours	Mean hours per VP
Oct 2007 - Apr 2008 (Autumn / Winter / Spring)	23	1505	65.43
Apr 2008 - Sep 2008 (Summer)	21	839	39.95
Sep 2008 - May 2009 (Autumn / Winter / Spring)	24	1751	72.96

3 For the flight activity survey species were divided into two groups of 'target' and 'secondary' species. Target species are considered to be of relatively high conservation concern and sensitivity to OHL development. Observers preferentially recorded target species when both target and secondary species were present in their field of view. The two groups are as follows:

- Target Species / Groups - red kite, hen harrier, goshawk, golden eagle, osprey, merlin, peregrine falcon, wildfowl (i.e. whooper swan, greylag goose, pink-footed goose, Greenland white-fronted goose), golden plover, barn owl, short-eared owl and black grouse; and
- Secondary Species / Groups - all other raptors not listed above (excluding common buzzard), cormorant, grebes, divers, and all other waders and wildfowl.

4 The majority of flight activity surveys involved watches during daylight hours between dawn and dusk. A limited number of watches were completed on clear nights, with a full or gibbous moon, so that potential nocturnal movements of wildfowl could be recorded during the 2008 autumn passage period (geese may also feed on moonlit nights). For these surveys it was frequently only possible to identify movements of wildfowl from sound alone, such that accurate species identification, estimates of numbers, flight height and direction could not always be made.

5 Surveys were undertaken in varying weather conditions, only being curtailed when weather conditions or poor visibility prevented data collection (e.g. wind speed at Beaufort Scale 5 and visibility less than 500m). Each watch normally lasted three hours, unless inclement weather prevented completion of the watch. During each watch the area in view was scanned constantly by eye and using binoculars until a target species (as described above) was detected in flight. Once detected, the target birds were followed (using a telescope when necessary) until they ceased flying or were lost to view. The time the bird(s) was first detected, the approximate height (in pre-defined height bands, see below) and the duration of the flight, while in view, were recorded on standardised recording forms. The routes followed by the birds (flight lines) were plotted in the field onto a relevant scale map.

6 Flight height categories were recorded for every bird observed, corresponding to flights below, within and above the proposed OHL conductor and earth-wire heights. There are two proposed OHL designs:

- L7H-type towers from Dalshangan to Meikle Hill; and
- A 4-wire heavy duty wood pole OHL from Blackcraig substation (also connecting to Margree windfarm substation) to Dalshangan.

7 At any given location the exact height above ground level that the conductors and earth wires sit will vary in response to a number of factors including topography, elevation, span length, line sag and conductor type. Height bands were therefore selected to encompass the potential range of heights that the OHLs will be positioned and also to account for observer recording accuracy.

8 The L7H towers will support three sets of paired conductors attached at c. 15.5m, 20.1m and 24.9m above ground level with the earth wire at up to c. 29.5m. For the 4-wire heavy duty wood pole OHL, the conductors will typically be attached at between 14 to 16m above ground level. The statutory minimum ground clearance for a 132 kV OHL is 6.7m. It has therefore been assumed that the conductors on the L7H tower section of the OHL could range in height above ground level from 6.7m to 24.9m with the earth wire at a top height of 29.5m. The proposed wood pole OHL wires are assumed to range between 6.7 to 14.0m in potential height above ground level (the earth wire is slung below the conductors on the wood pole OHL). In both cases (i.e. L7H tower and wood pole) there is the potential for the highest point to be exceeded in some limited locations. These dimensions are based on standard tower heights and these may increase or decrease dependent on the outcome of final technical surveys.

9 The height bands used in flight activity surveys were classified as follows:

- Low (L) = <5m (below the minimum 132 kV ground clearance threshold);
- Medium (M1) = 5-20m (the max vertical range in line position for the wood pole sits within this band);
- Medium (M2) = 20-30m (up to the maximum height of the L7H towers);
- High (H) = 30–100m; and
- Very high (VH) = >100m.

10 The flight activity data was used to derive estimates of total annual 'transits' by target species over the proposed OHL route (i.e. flights that pass across the route of the proposed OHL, within the 'collision risk zone'). To assist with the estimates of collision risk, the proposed route of the OHL was divided into 250 x 200m sections (see Appendix D.6). Flights within the collision risk zone were defined as those that were recorded at the medium height bands (i.e. between 5 to 30m) and that passed within 100 horizontal meters either side of the OHL route. Data were adjusted for the observation period for each relevant vantage point and for any overlap in visibility between VPs (taking into account any watches that were undertaken simultaneously from adjacent VPs, in order to avoid any potential 'double-counting' of survey effort).

11 Collision rates, derived from published studies that have quantified estimates of bird collision rates with OHLs, were then used to estimate the number of collisions per section per year for each target species, which were then summed to provide an estimate of collision risk for the proposed OHL as a whole. A similar approach was adopted to estimate collision risk for the existing OHL (proposed for dismantling). The estimate for the existing OHL was subtracted from the estimate for the proposed OHL to determine the net effect of the proposal. The two figures were summed to provide and estimate of collision risk for the period when the proposed OHL is strung and before the conductors and earth wire on the existing OHL are removed.

12 The mapped flight lines of target species for each of the three main survey periods are shown on Figures 9.14 to 9.43.

9.2.4.3 Data and Survey Limitations

1 The breeding bird survey methods adopted for this study are considered to be appropriate and provide sufficient information to inform a robust assessment of the potential impacts of the proposed OHL.

2 The breeding bird survey methods are primarily designed to provide information on approximate breeding density and dispersion of species of conservation interest. The methods provide data which are comparable with other sites where similar methods have been adopted, but are not designed to provide a full population census or detailed territory maps for the survey area.

3 All bird surveys were undertaken during appropriate times of the year and times of day for the range of species that were considered potentially present within the survey area and that were identified as key species for the assessment of effects of the proposed OHL.

4 The proposed route of the OHL was modified subsequent to some of the bird surveys and additional survey was undertaken to address these changes.

5 Tree felling operations were ongoing in many of the conifer plantations within the survey area during 2008 and 2009. This regular source of disturbance is likely to have suppressed breeding activity by woodland species in some areas.

6 There were a small number of locations where access for walkover surveys was restricted, either due to difficulties in obtaining landowner consent or due to safety restrictions. For example, the landholding at Carminnows was not accessible due to lack of owner consent (this is an area of predominantly mature conifer plantation of 15.65 ha in extent). The area around Benbeoch was not accessible due to safety restrictions associated with an operational opencast coal site. For restricted access areas, surveys, such as breeding raptor surveys, were conducted from nearby suitable vantage points and supplemented by data obtained from desk study.

7 The objective of the breeding raptor and owl surveys was to provide sufficient information, as a minimum, to determine occupancy and potential breeding attempts. A conservative approach was taken such that a relatively low threshold was adopted for ascribing breeding occupancy to raptor records. In addition, the level of survey effort was considered appropriate in the context of the type and quality of habitats present and information derived from the other surveys (e.g. flight activity surveys, in particular).

8 No breeding bird surveys were completed for Section 1, i.e. the proposed dismantling of the N-Route from Smithston to Glen Muck. However, a desk study was completed for this area and some of the flight activity survey viewsheds included part of the southern portion of this Section from Glen Muck to Bogton Loch. In addition, the core breeding bird survey area and wider raptor survey area for the proposed OHL overlapped with part of this southern portion of Section 1.

9.2.5 Effects Assessment

1 The EIA process involves the application of specific criteria to evaluate and rank effects and features; however, because of the complexity of ecosystems and their associated ornithological interest, and the potential uncertainty of the magnitude of some effects from development on the receptors, the use of experienced professional judgement in the evaluation of features and in the determination of effects significance, is an important element of the process.

2 Assigning a nature conservation value to bird populations and supporting habitats involves the consideration of a range of criteria. In practice, rarity / conservation status is often the most important criterion; the values described in Table 9.04 (see below) are therefore primarily defined by rarity within different geographical units particularly in relation to the region within which the proposal sits. A region can be defined in numerous ways but the preferred approach recommended by SNH involves consideration of the population within the Natural Heritage Zone (NHZ). SNH has identified 21 NHZs for Scotland, based on a range of biogeographic criteria that cover the Scottish mainland and islands (NHZ, SNH 1998). The Study Area for this proposal is located within the Western Southern Uplands and Inner Solway Natural Heritage Zone.

3 Outside of designated sites evaluations of regional importance are often hindered by a lack of reliable and contemporary data on the population status of most species. Where regional-scale population information is available it is considered in the evaluation. However, in practice such evaluations are frequently heavily dependant on professional judgement informed by limited available information at the regional scale.

Table 9.04 - Nature Conservation Value of Ornithological Interests (habitats and populations)

Value	Examples
Very High (e.g. International Importance)	Habitats or species that form part of the cited interest of an internationally protected species site or candidate site (e.g. SPA, pSPA, SAC, cSAC, pSAC, Ramsar Site) Bird Species listed on Annex 1 of the EC Birds Directive of present in qualifying numbers / proportions of national / international population
High (e.g. national importance)	A Nationally designated site (SSSI, ASSI, NNR, MNR) and the habitats and species that form its cited interest Regularly occurring rare bird species (e.g. <300 breeding pairs in the UK). Birds present in nationally important numbers (e.g. >1% of the UK population) A site that provides critical habitat for any regularly occurring bird population of national importance which is rare in the UK
Medium (e.g. regional / NHZ level importance)	Any regularly occurring population of a nationally important bird species which is threatened or rare in the region (e.g. >1% of the regional population) Regularly occurring, regionally important population of bird species listed on the current UK red list; presence of regionally important habitats critical to such species Regionally important populations of National and Local Biodiversity Action Plan species
Low (e.g. local importance)	High Local: Sites with an identified ornithological interest meeting the criteria for Scottish Council area designation (such as Site of Importance for Nature Conservation), Wildlife Sites, which may include amenity band educational criteria in urban areas. Designated Local Nature Reserves. Site supporting viable breeding populations of species known to be Scottish Council rarities (e.g. included in the LBAP) and / or supplying critical elements of third habitat requirements. Any regularly occurring, locally significant population of bird species.
	Moderate Local: A population of a species or assemblage of species which are not considered to qualify for non-statutory designation but which are considered locally important (i.e. approx, 10km radius from the site). Populations and supporting habitats of any bird species conservation importance in the context of the local area (i.e. approx. 10km radius from the site)
	Low Local: A population of a species or assemblage of species which are not considered to qualify for non-statutory designation but which are considered locally important in the context of the immediate surrounding area. Populations and supporting habitats of nay bird species of conservation importance in the context of the immediate surrounding area.
Negligible	A commonplace bird population of little or no conservation importance at a local scale. Habitats of negligible value to any bird population of local or lower importance.

4 The effects (both adverse and beneficial) of the construction and operation of the proposals, and any effects associated with other proposals for the wider area that have the potential to result in cumulative effects, are assessed for their potential effects on the bird receptors. The effect magnitude is determined by the interaction

between the scale of the effect in time, area and intensity and the nature conservation value and sensitivity of the species affected. Guideline criteria for different levels of effect magnitude are given in Table 9.05.

Table 9.05 - Categorisation of Effect Magnitude (inc. consideration of effect duration)

Magnitude	Description
Total / Near Total	Would cause the loss of a major proportion of a regional population, or cause sufficient damage to a feature to immediately affect its viability / conservation status.
High	Major effects on the population, which would have a sufficient effect to alter the nature of the feature in the short-long term and affect its long-term viability / conservation status (e.g. detectable long-term effects on the regional population).
Medium	Effects that are detectable in short and medium-term, but which should not alter the long-term viability of the population (e.g. detectable short to medium-term effects on the regional population).
Low	Minor effects, either of sufficiently small-scale or short duration to cause no long-term harm to the population (e.g. no long-term detectable effect on the regional population).
Negligible / Neutral	A potential impact that is not expected to affect the population in any way (or to have no measurable effect); therefore no effects are predicted.
Duration	Long-term (15-25 years or longer) Medium-term (5-15 years) Short-term (<5years)

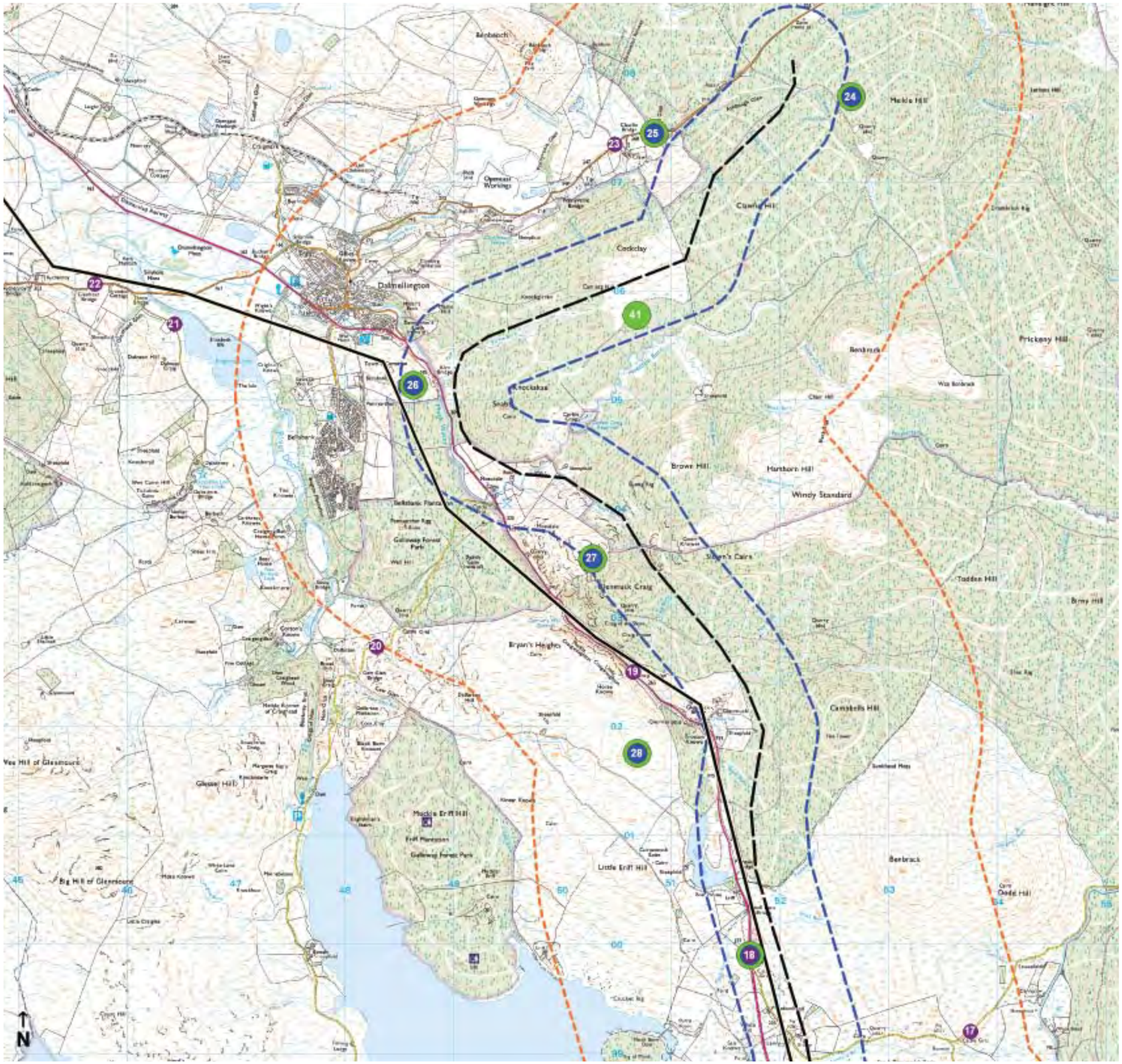
5 The effects are determined following the identification of nature conservation value and effect magnitude for each receptor, as illustrated in Table 9.06. This table is for guidance only, as in practice the assessment of effect significance also involves professional judgement based on the nature of the potential effects and detailed understanding of the sensitivity of the species / habitats affected.

Table 9.06 - Matrix Illustrating the Relationship between Effect Magnitude and Nature Conservation Value in the Determination of the Significance of Effects

Effect Magnitude	Nature Conservation Value of Receptor				
	Very High	High	Medium	Low	Negligible
Total/Near Total	Major	Major	Major	Moderate	Minor
High	Major	Major	Major-Moderate	Moderate	Minor
Medium	Major	Major-Moderate	Moderate	Moderate-Minor	Minor
Low	Moderate - Minor	Moderate - Minor	Moderate - Minor	Minor	Minor
Negligible / Neutral	Negligible / None				

6 Effects are categorised as Major, Moderate, Minor & None through the combination of sensitivity, and magnitude using professional judgement.

7 Only those effects identified as major or moderate are considered to be significant (i.e. considered to be “likely significant effects” in terms of the EIA Regulations). Only significant effects require mitigation, although lesser effects may be addressed, depending on specific circumstances. The proposed mitigation measures are then assessed for their realistic capability to reduce or avoid the adverse effects. Following this, the residual effect and its significance is determined.



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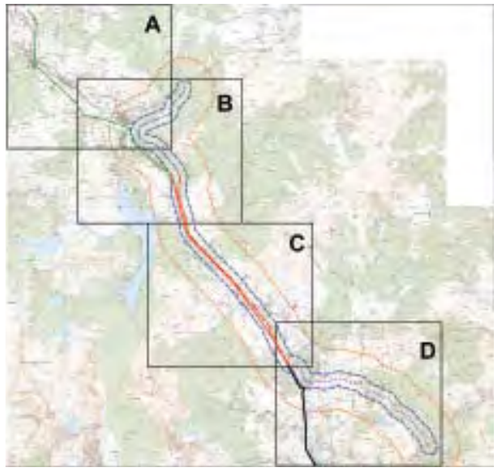
Legend

Survey & vantage points for ornithology assessment - Area B

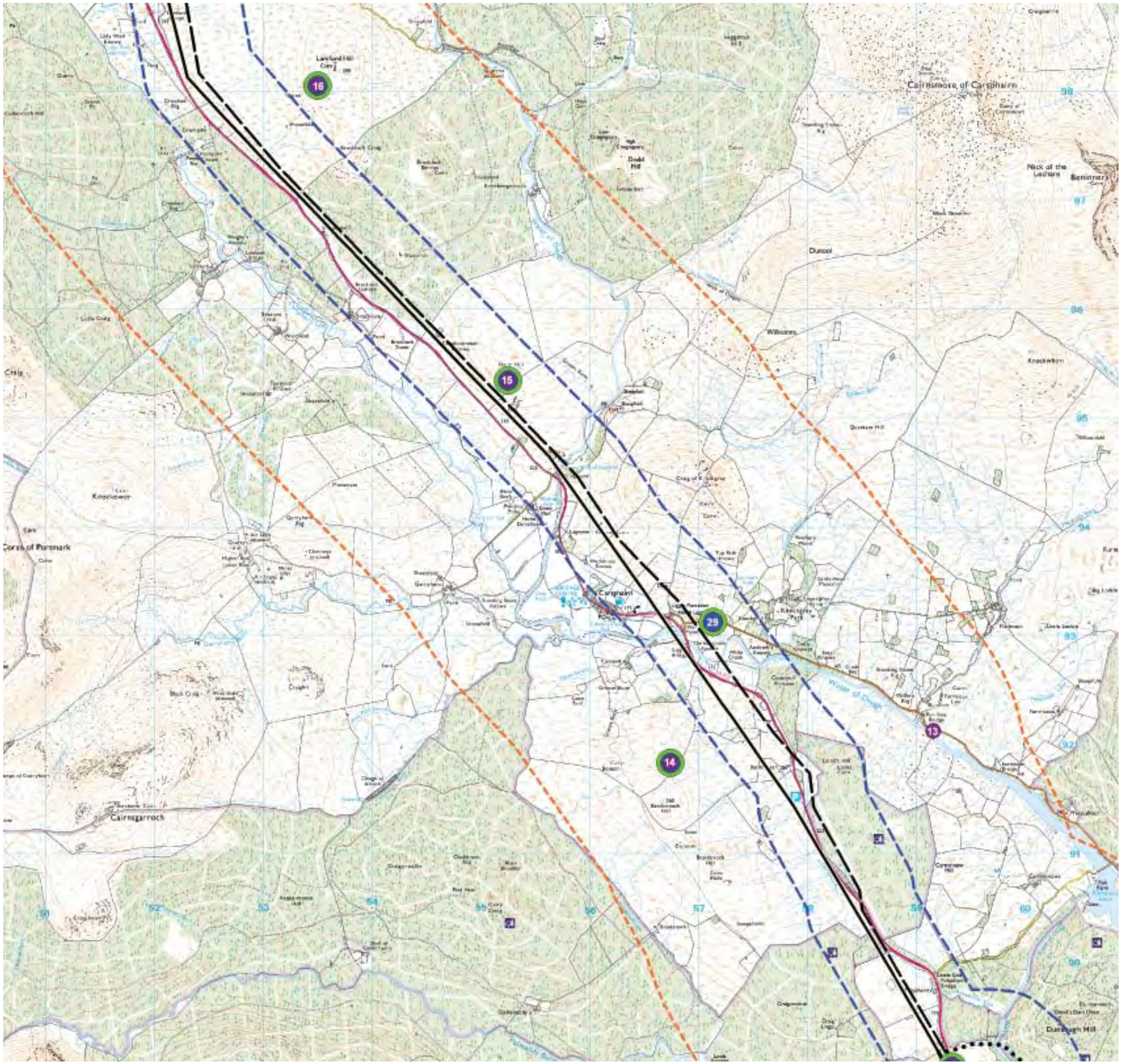
- 500m buffer
- 2km buffer
- Existing N-Route
- Proposed L7 Tower route
- Proposed Wood Pole line route

- 1 — Vantage point location survey period 01 (Oct 2007 to mid April 2008)
- 24 — Vantage point location survey period 02 (Mid April 2008 to August 2008)
- 41 — Vantage point location survey period 03 Sept 2008 to May 2009)



0m 0.5km 1km 1.5km 2km

Figure 9.02 - Survey Area - Area B



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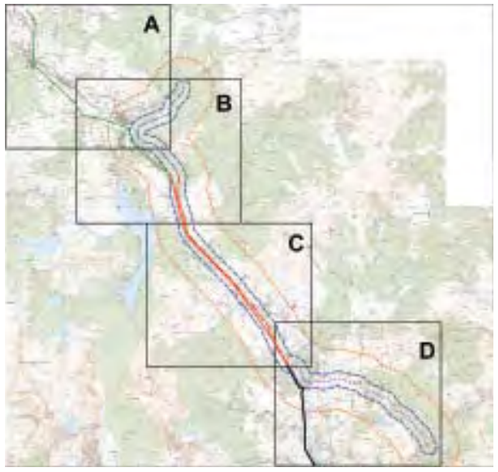
Legend

Survey & vantage points for ornithology assessment - Area C

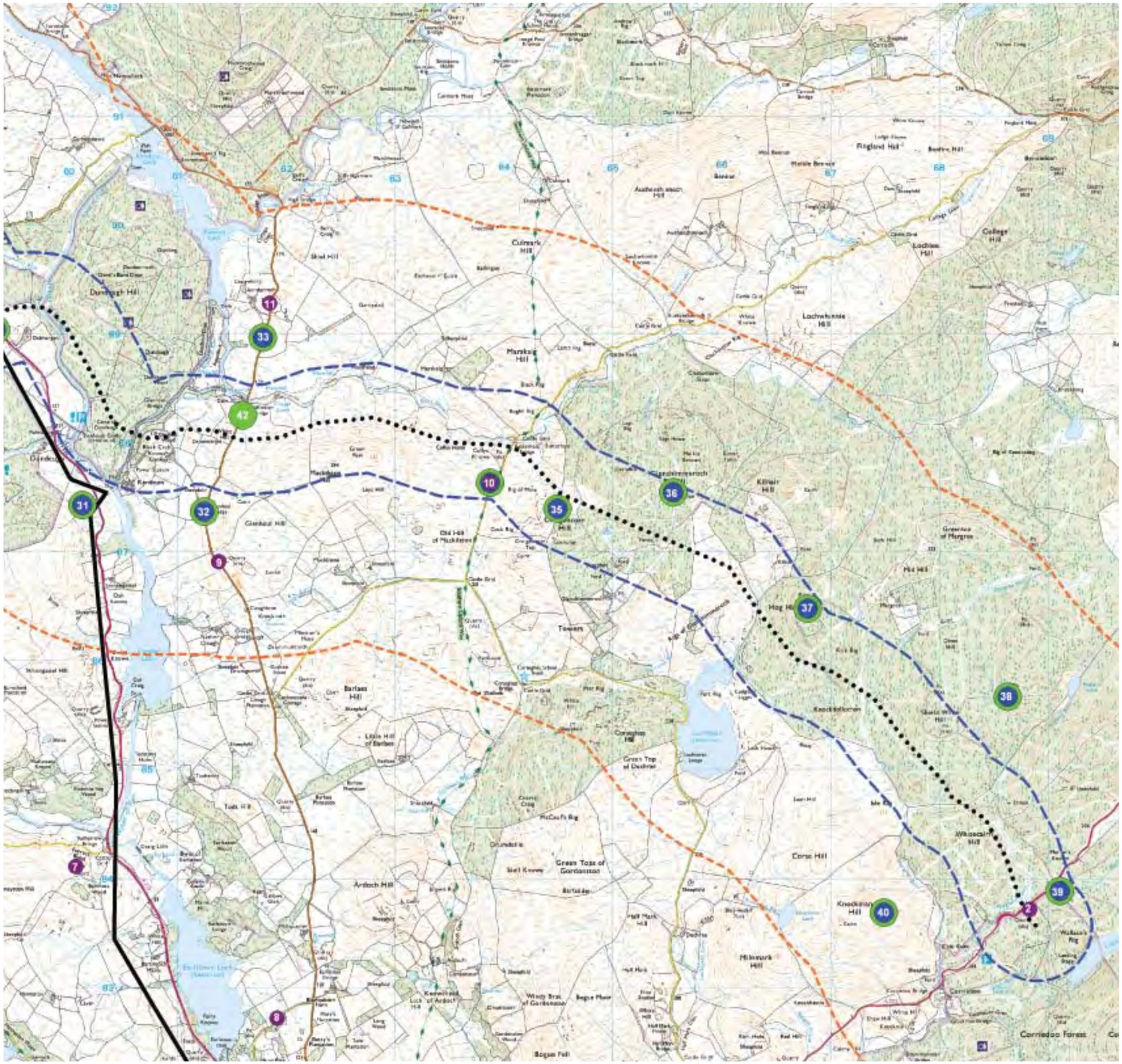
- 500m buffer
- 2km buffer
- Existing N-Route
- Proposed L7 Tower route
- Proposed Wood Pole line route

- 1 — Vantage point location survey period 01 (Oct 2007 to mid April 2008)
- 24 — Vantage point location survey period 02 (Mid April 2008 to August 2008)
- 41 — Vantage point location survey period 03 Sept 2008 to May 2009)



0m 0.5km 1km 1.5km 2km

Figure 9.03 - Survey Area - Area C



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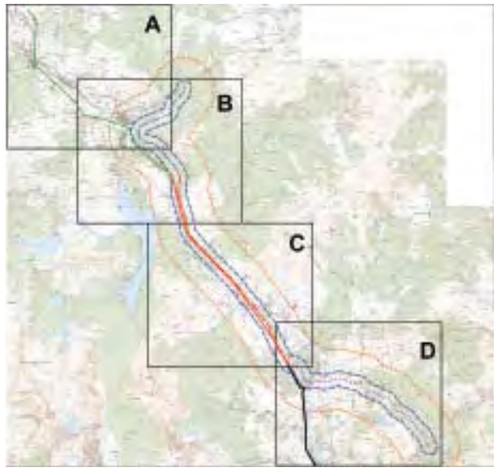
Legend

Survey & vantage points for ornithology assessment - Area D

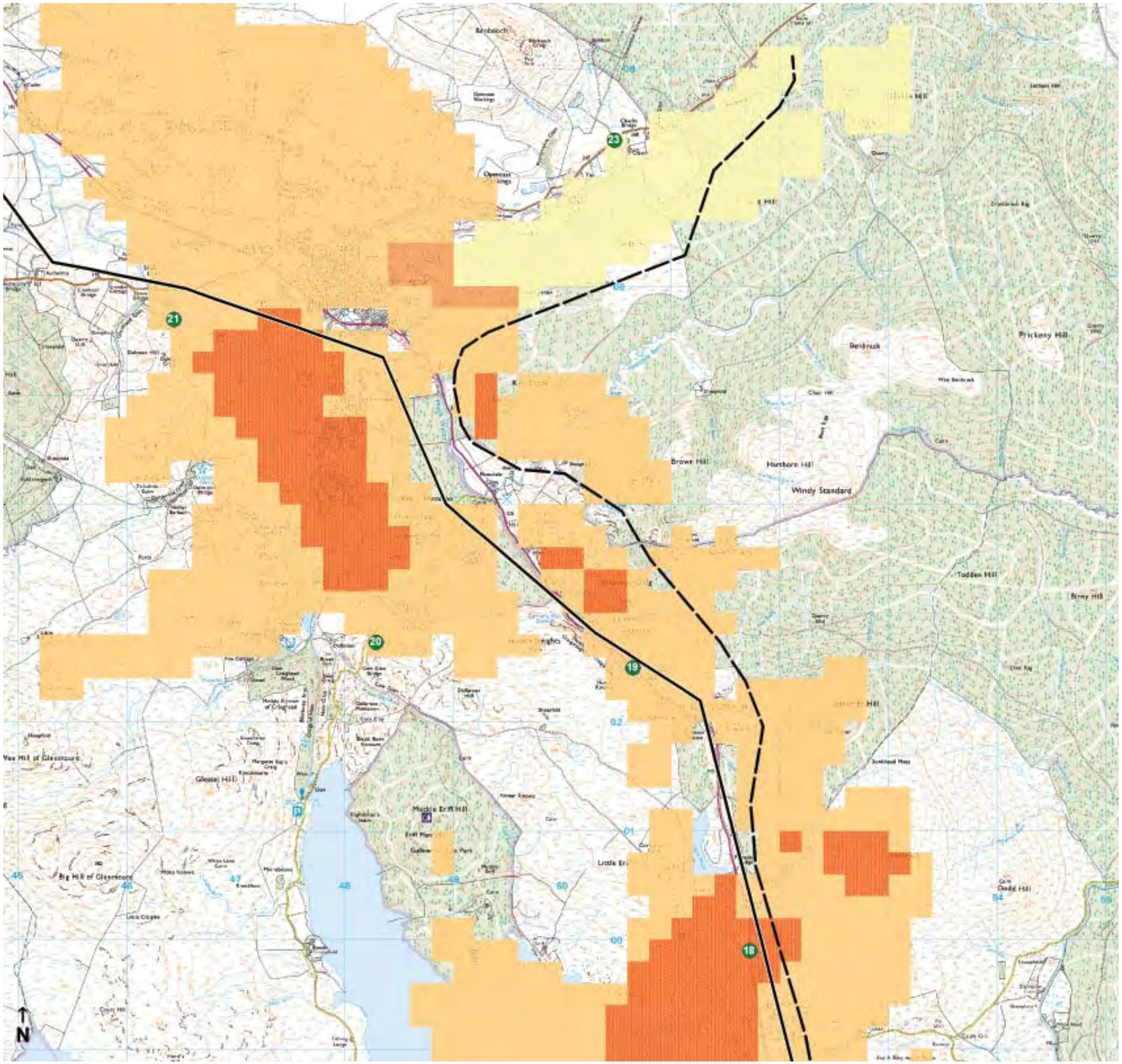
- 500m buffer
- 2km buffer
- Existing N-Route
- Proposed L7 Tower route
- Proposed Wood Pole line route

- 1 — Vantage point location survey period 01 (Oct 2007 to mid April 2008)
- 24 — Vantage point location survey period 02 (Mid April 2008 to August 2008)
- 41 — Vantage point location survey period 03 Sept 2008 to May 2009)



0m 0.5km 1km 1.5km 2km

Figure 9.04 - Survey Area - Area D



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Legend

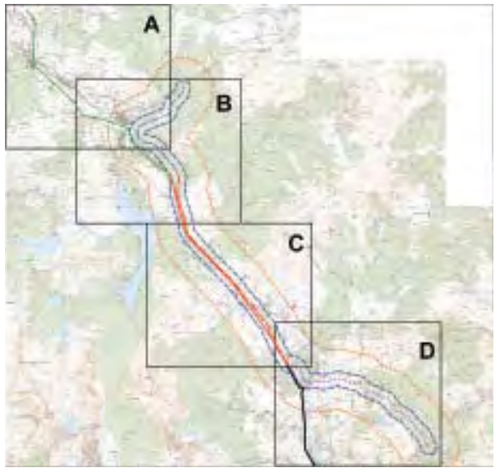
Viewsheds - survey period 01 (Oct 2007 to mid April 2008) - Area B

- Existing N-Route
- Proposed L7 Tower route
- Proposed Wood Pole line route

Hours of observation

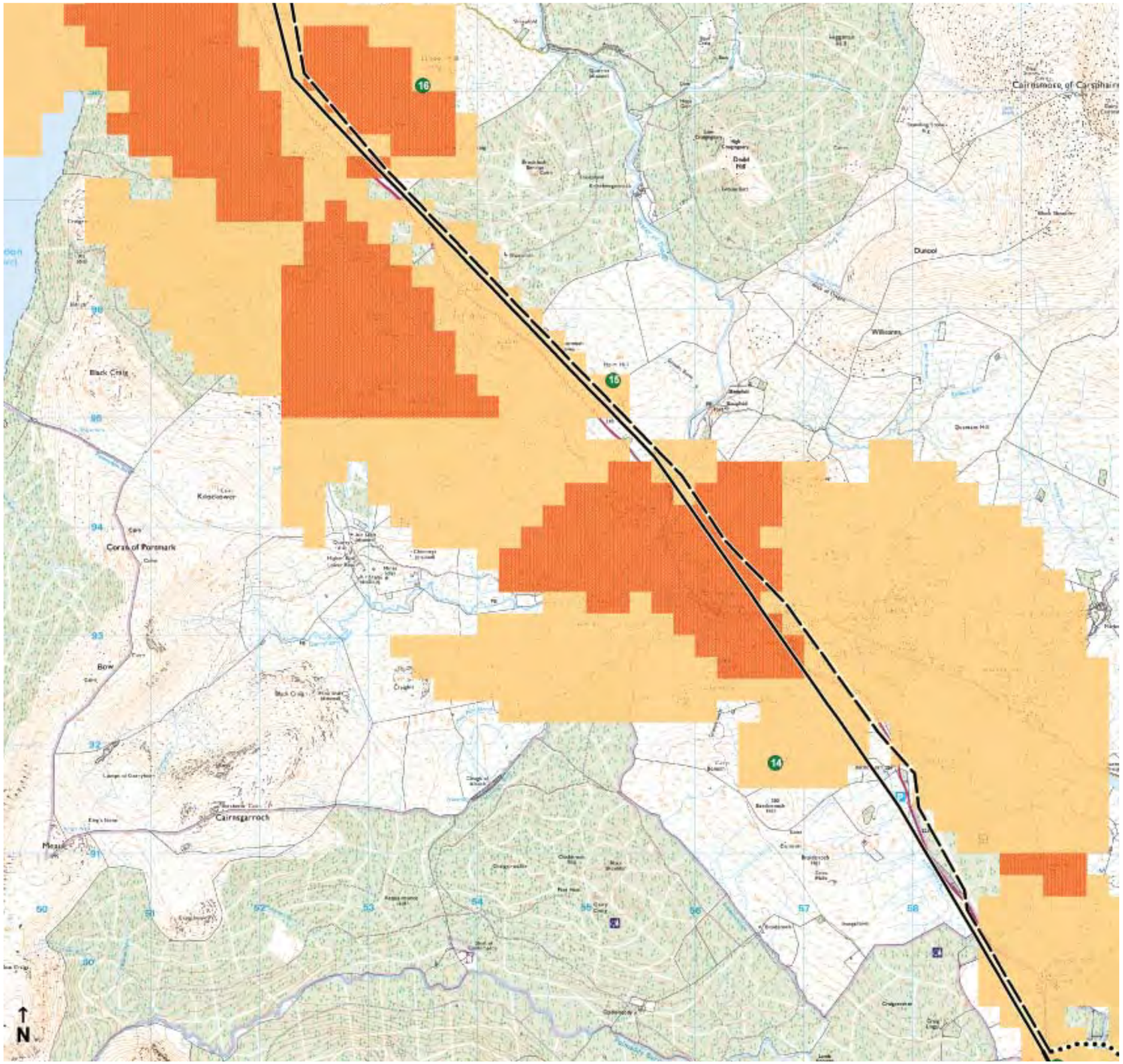
- 240 to 356
- 180 to 240
- 120 to 180
- 72 to 120
- 36 to 72
- < 36

- Vantage point location



0m 0.5km 1km 1.5km 2km

Figure 9.05 - Flight Activity Survey Effort - Period 01 - Area B



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Legend

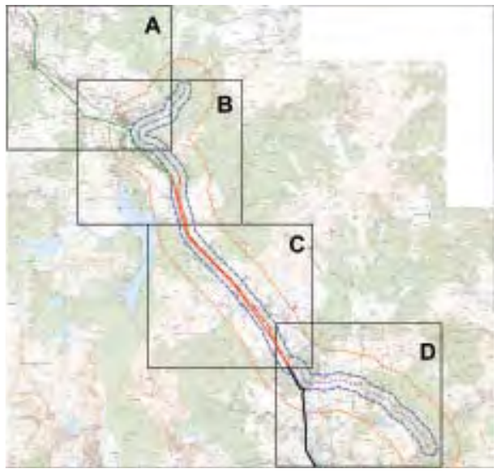
Viewsheds - survey period 01 (Oct 2007 to mid April 2008) - Area C

- Existing N-Route
- Proposed L7 Tower route
- Proposed Wood Pole line route

Hours of observation

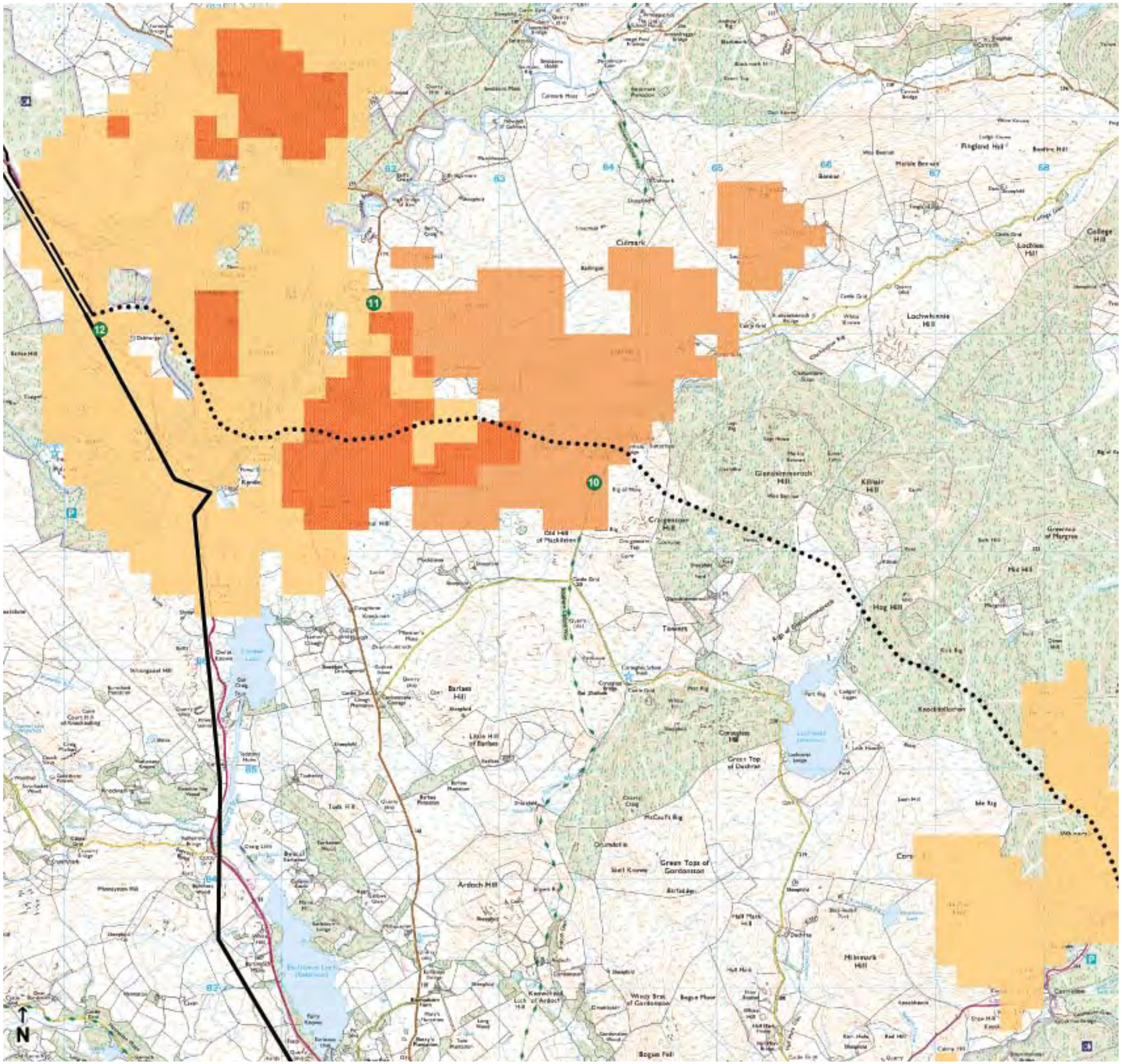
- 240 to 356
- 180 to 240
- 120 to 180
- 72 to 120
- 36 to 72
- < 36

- Vantage point location



0m 0.5km 1km 1.5km 2km

Figure 9.06 - Flight Activity Survey Effort - Period 01 - Area C



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Legend

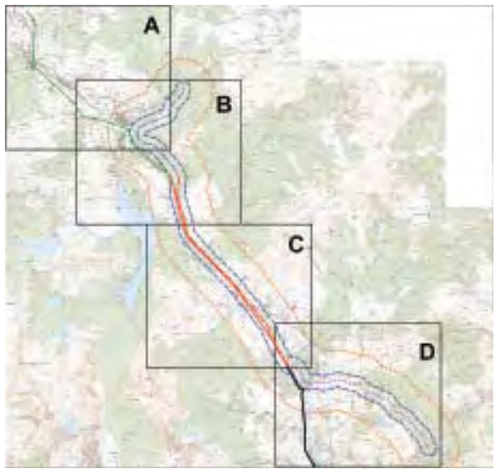
Viewsheds - survey period 01 (Oct 2007 to mid April 2008) - Area D

- Existing N-Route
- Proposed L7 Tower route
- Proposed Wood Pole line route

Hours of observation

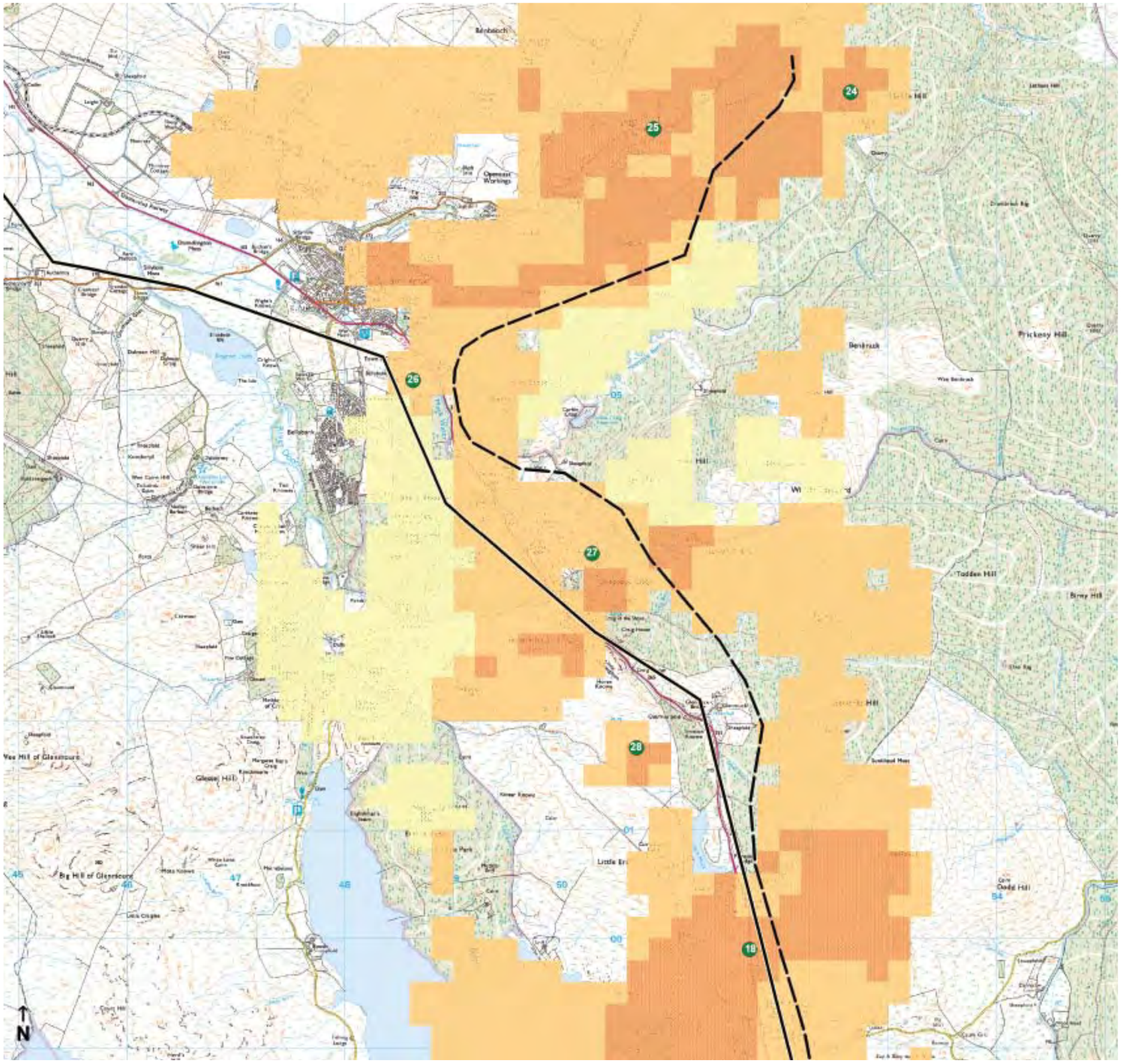
- 240 to 356
- 180 to 240
- 120 to 180
- 72 to 120
- 36 to 72
- < 36

- Vantage point location



0m 0.5km 1km 1.5km 2km

Figure 9.07 - Flight Activity Survey Effort - Period 01 - Area D



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Legend

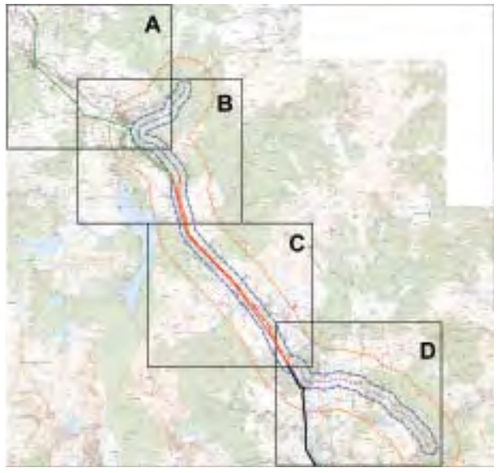
Viewsheds - survey period 02 (mid April 2008 to Aug 2008) - Area B

- Existing N-Route
- Proposed L7 Tower route
- Proposed Wood Pole line route

Hours of observation

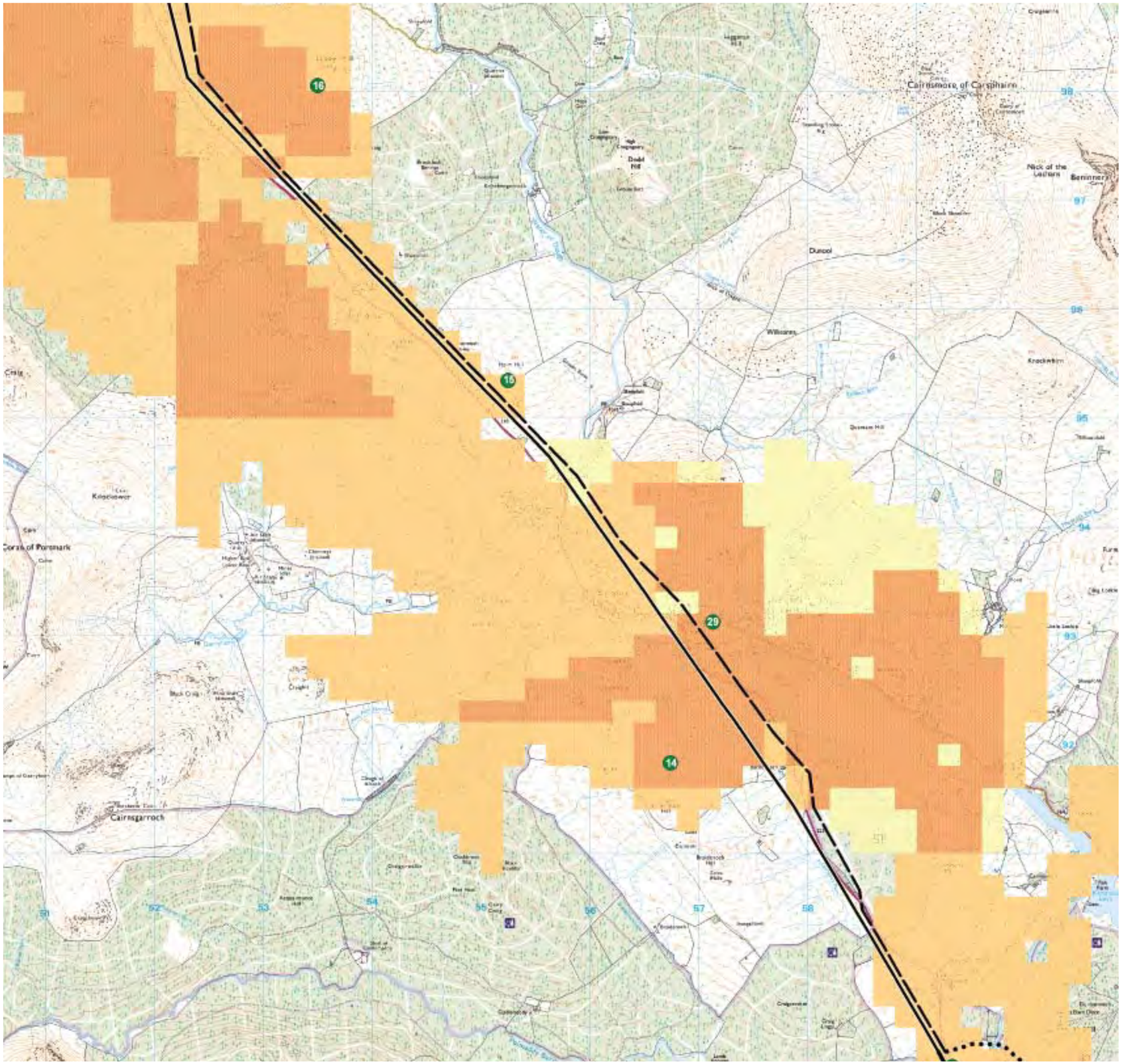
- 240 to 356
- 180 to 240
- 120 to 180
- 72 to 120
- 36 to 72
- < 36

- Vantage point location



0m 0.5km 1km 1.5km 2km

Figure 9.08 - Flight Activity Survey Effort - Period 02 - Area B



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Legend

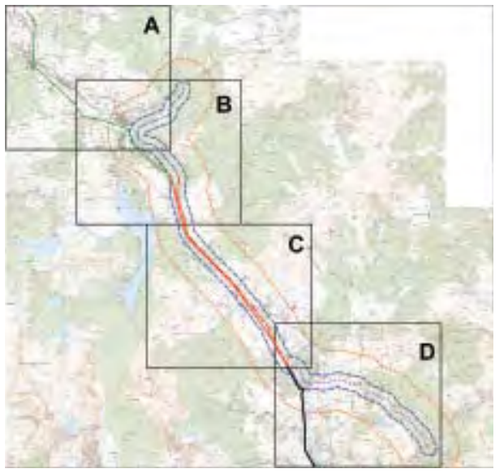
Viewsheds - survey period 02 (mid April 2008 to Aug 2008) - Area C

- Existing N-Route
- Proposed L7 Tower route
- Proposed Wood Pole line route

Hours of observation

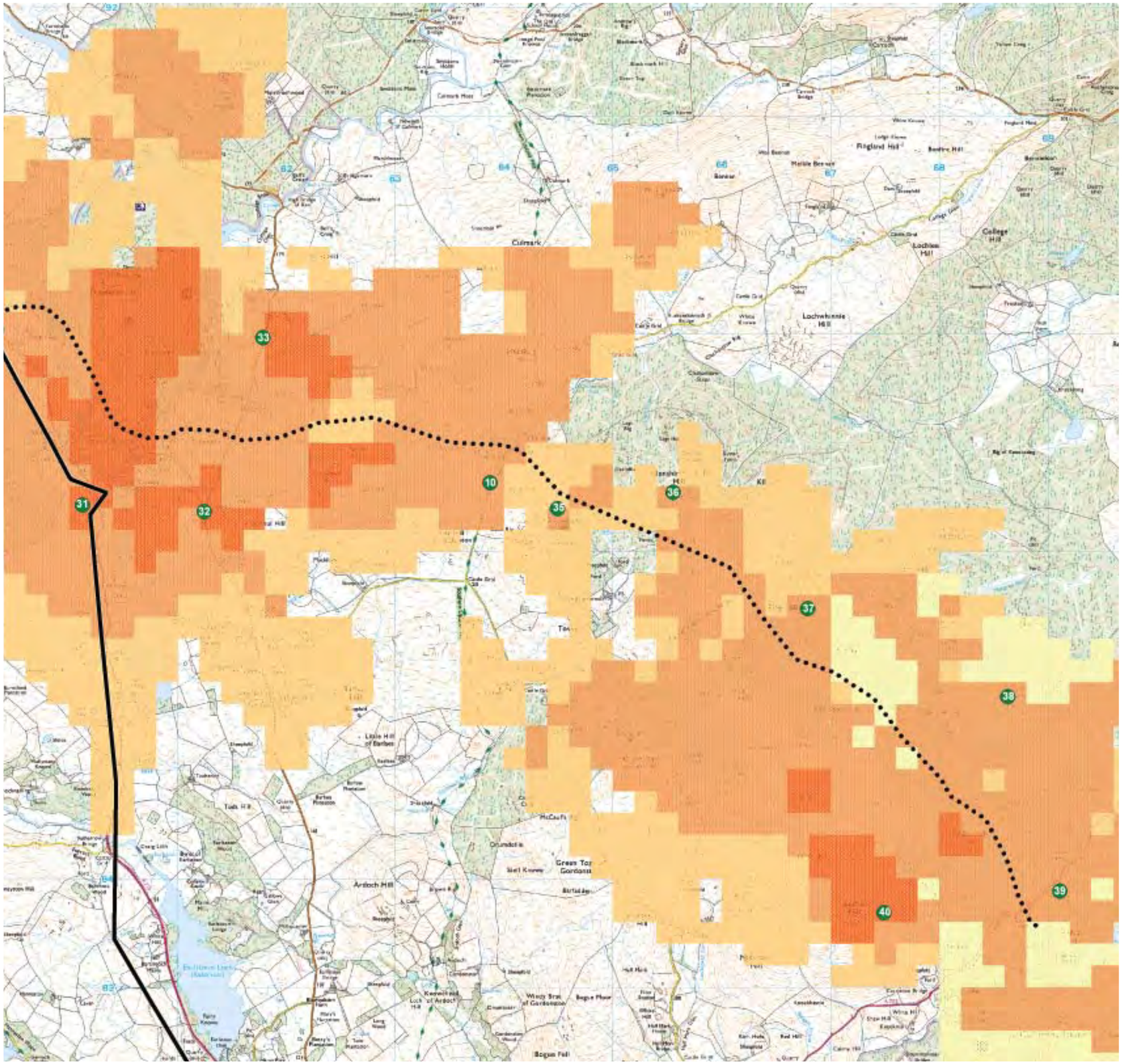
- 240 to 356
- 180 to 240
- 120 to 180
- 72 to 120
- 36 to 72
- < 36

- Vantage point location



0m 0.5km 1km 1.5km 2km

Figure 9.09 - Flight Activity Survey Effort - Period 02 - Area C



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Legend

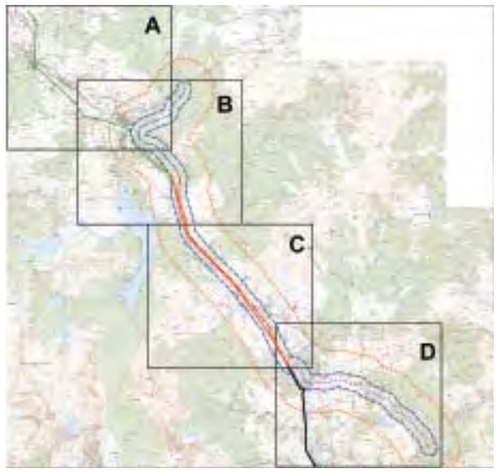
Viewsheds - survey period 02 (mid April 2008 to Aug 2008) - Area D

- Existing N-Route
- Proposed L7 Tower route
- Proposed Wood Pole line route

Hours of observation

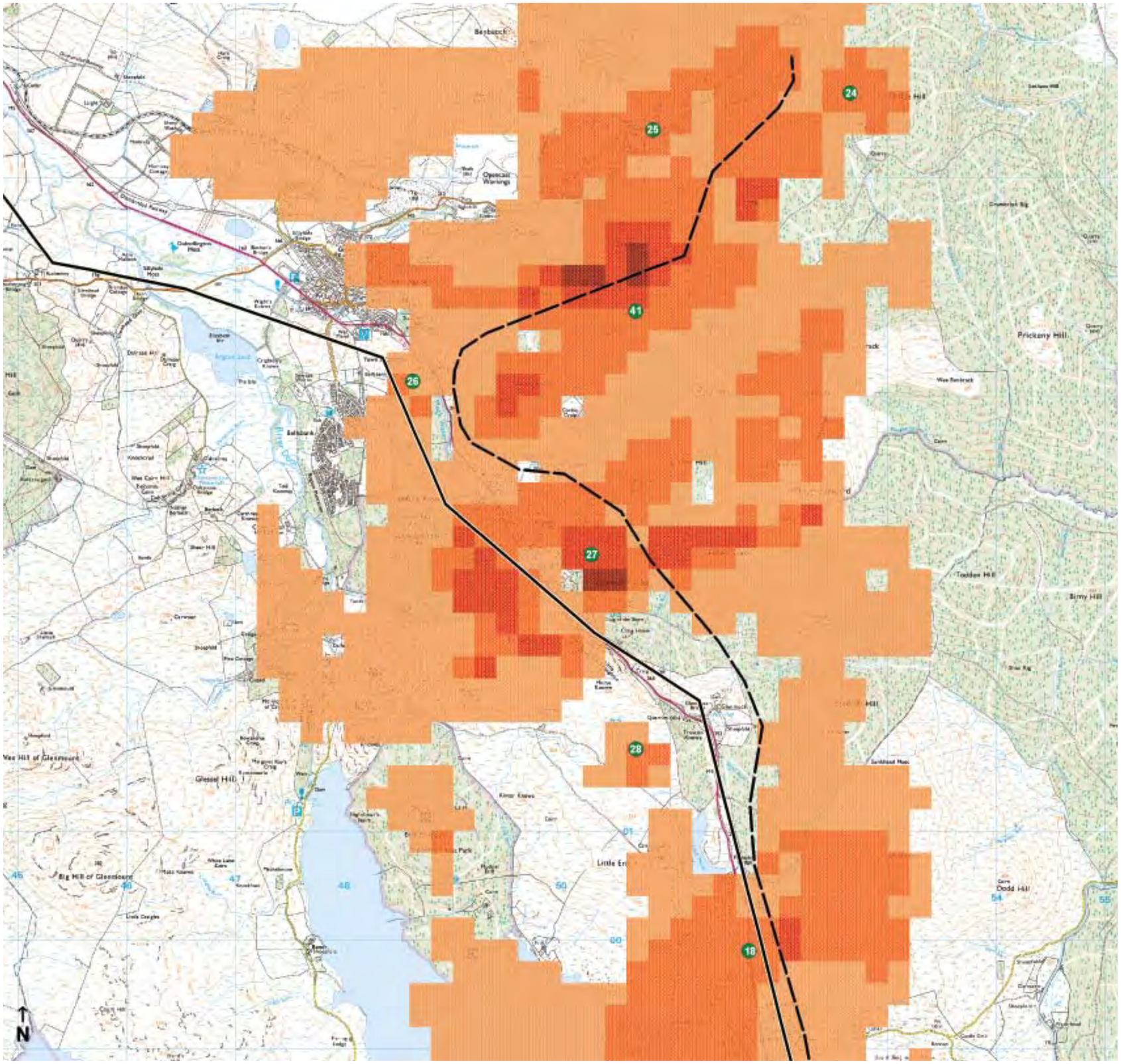
- 240 to 356
- 180 to 240
- 120 to 180
- 72 to 120
- 36 to 72
- < 36

- Vantage point location



0m 0.5km 1km 1.5km 2km

Figure 9.10 - Flight Activity Survey Effort - Period 02 - Area D



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Legend

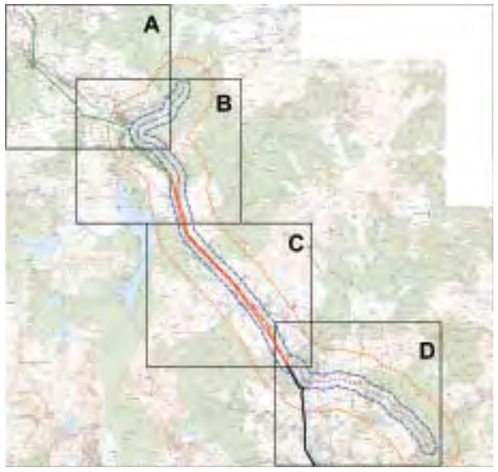
Viewsheds - survey period 03 (Sept 2008 to May 2009) - Area B

- Existing N-Route
- Proposed L7 Tower route
- Proposed Wood Pole line route

Hours of observation

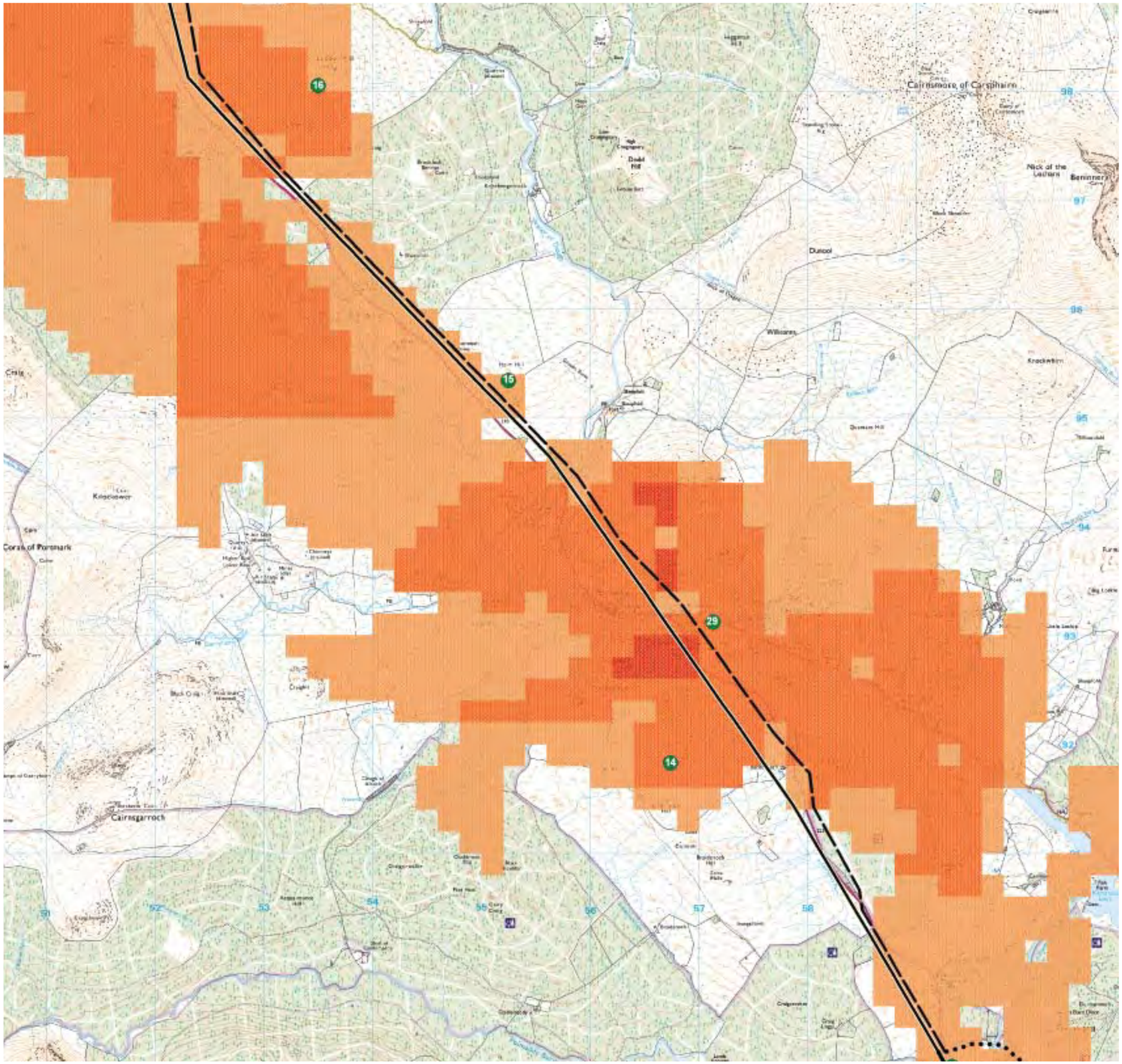
- 240 to 356
- 180 to 240
- 120 to 180
- 72 to 120
- 36 to 72
- < 36

- Vantage point location



0m 0.5km 1km 1.5km 2km

Figure 9.11 - Flight Activity Survey Effort - Period 03 - Area B



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Legend

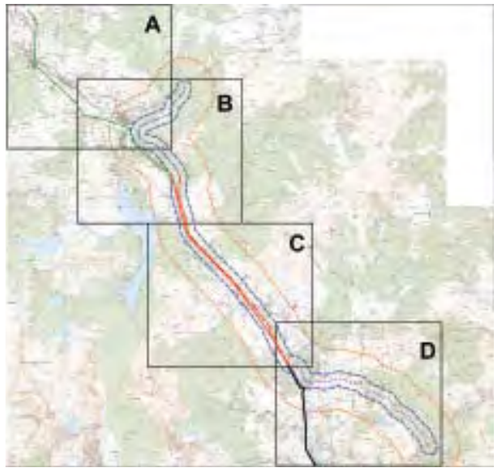
Viewsheds - survey period 03 (Sept 2008 to May 2009) - Area C

- Existing N-Route
- Proposed L7 Tower route
- Proposed Wood Pole line route

Hours of observation

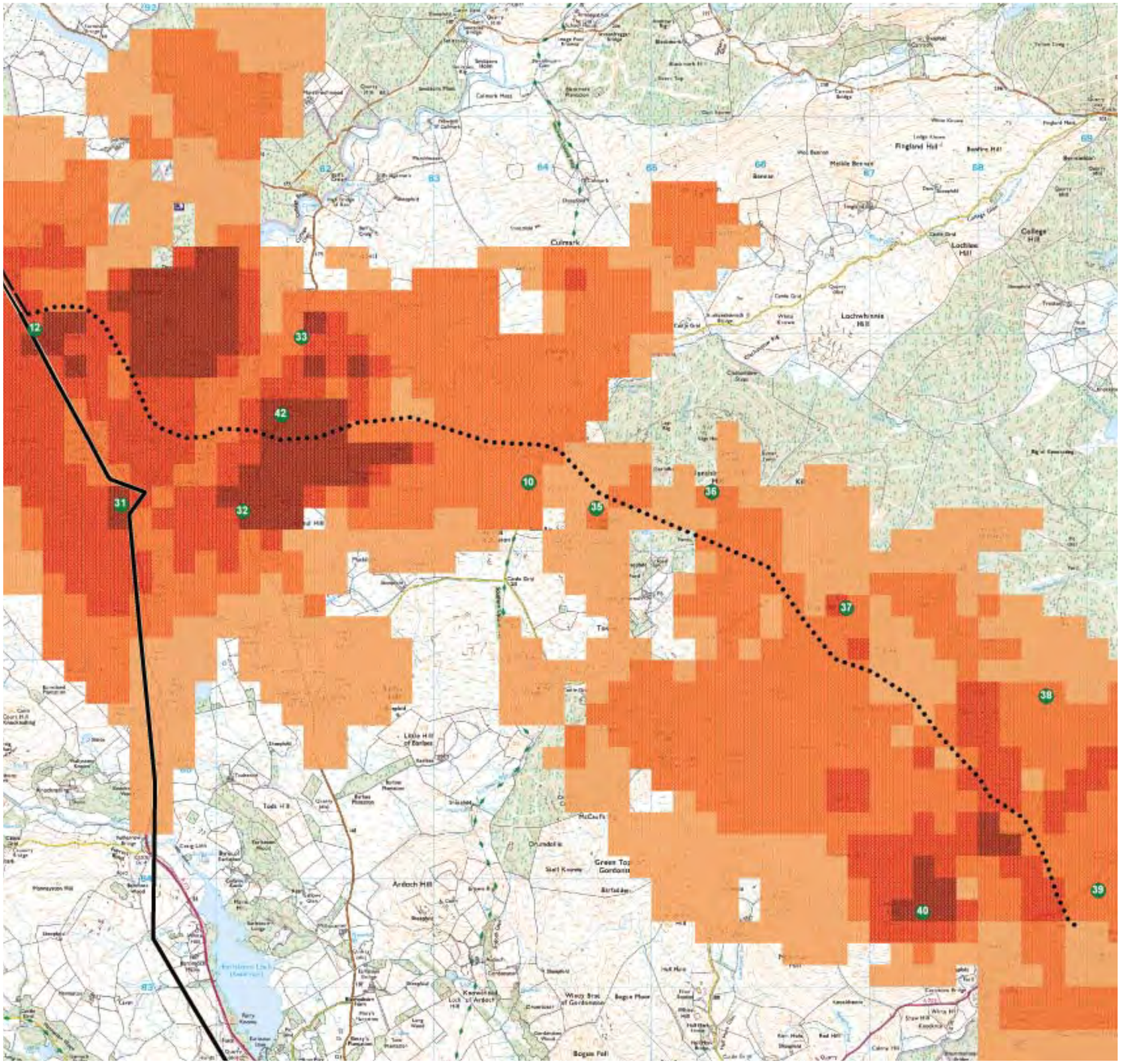
- 240 to 356
- 180 to 240
- 120 to 180
- 72 to 120
- 36 to 72
- < 36

- Vantage point location



0m 0.5km 1km 1.5km 2km

Figure 9.12 - Flight Activity Survey Effort - Period 03 - Area C



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Legend

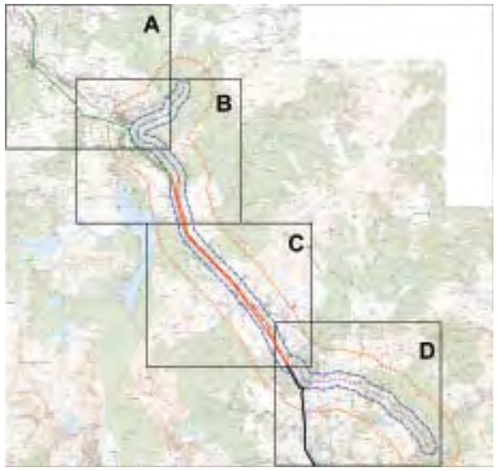
Viewsheds - survey period 03 (Sept 2008 to May 2009) - Area D

- Existing N-Route
- Proposed L7 Tower route
- Proposed Wood Pole line route

Hours of observation

- 240 to 356
- 180 to 240
- 120 to 180
- 72 to 120
- 36 to 72
- < 36

- Vantage point location



0m 0.5km 1km 1.5km 2km

Figure 9.13 - Flight Activity Survey Effort - Period 03 - Area D

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Legend

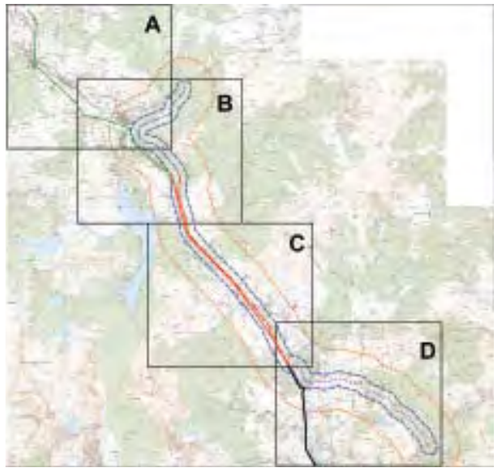
Schedule 1/Annex 1 raptor and owl flight lines - survey period 01 (Oct 2007 to mid April 2008) - Area B

- Existing N-Route
- Proposed L7 Tower route
- Proposed Wood Pole line route

- Red kite
- Hen harrier
- Goshawk
- Merlin
- Peregrine
- Short-eared owl
- Osprey

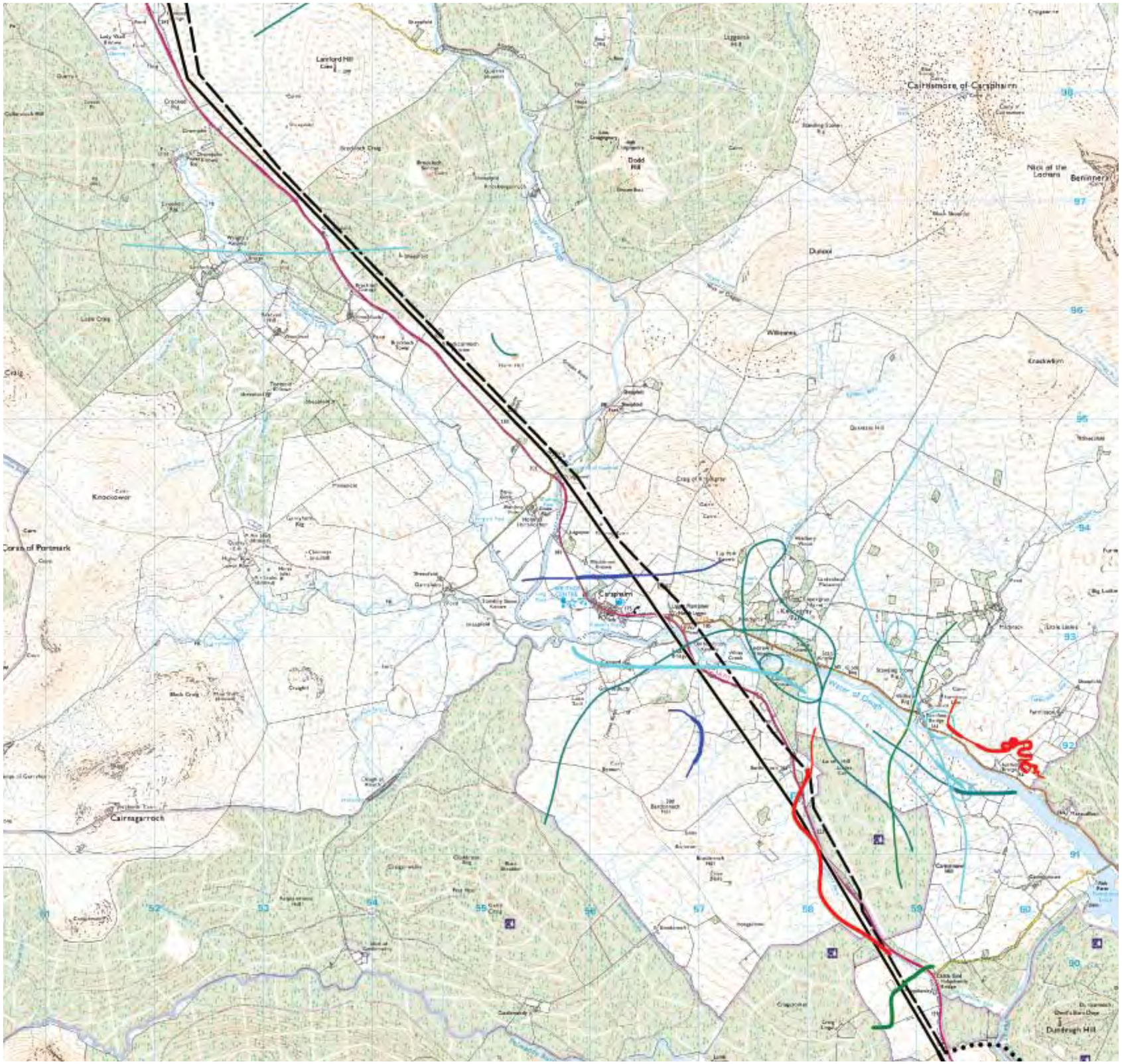
2 Number of birds per flight line (where >1)

Thicker line indicates flight at risk height



0m 0.5km 1km 1.5km 2km

Figure 9.14 - Raptor Flights - Period 01 - Area B



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Legend

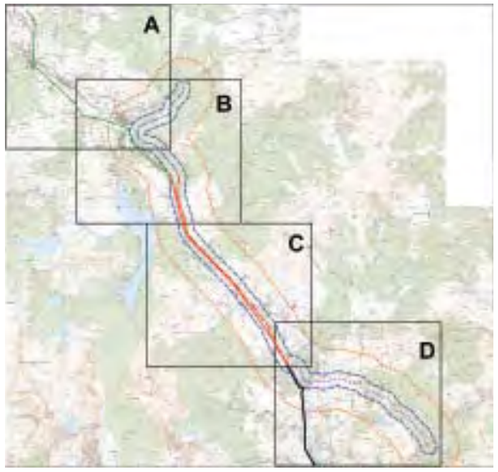
Schedule 1/Annex 1 raptor and owl flight lines - survey period 01 (Oct 2007 to mid April 2008) - Area C

- Existing N-Route
- Proposed L7 Tower route
- Proposed Wood Pole line route

- Red kite
- Hen harrier
- Goshawk
- Merlin
- Peregrine
- Short-eared owl
- Osprey

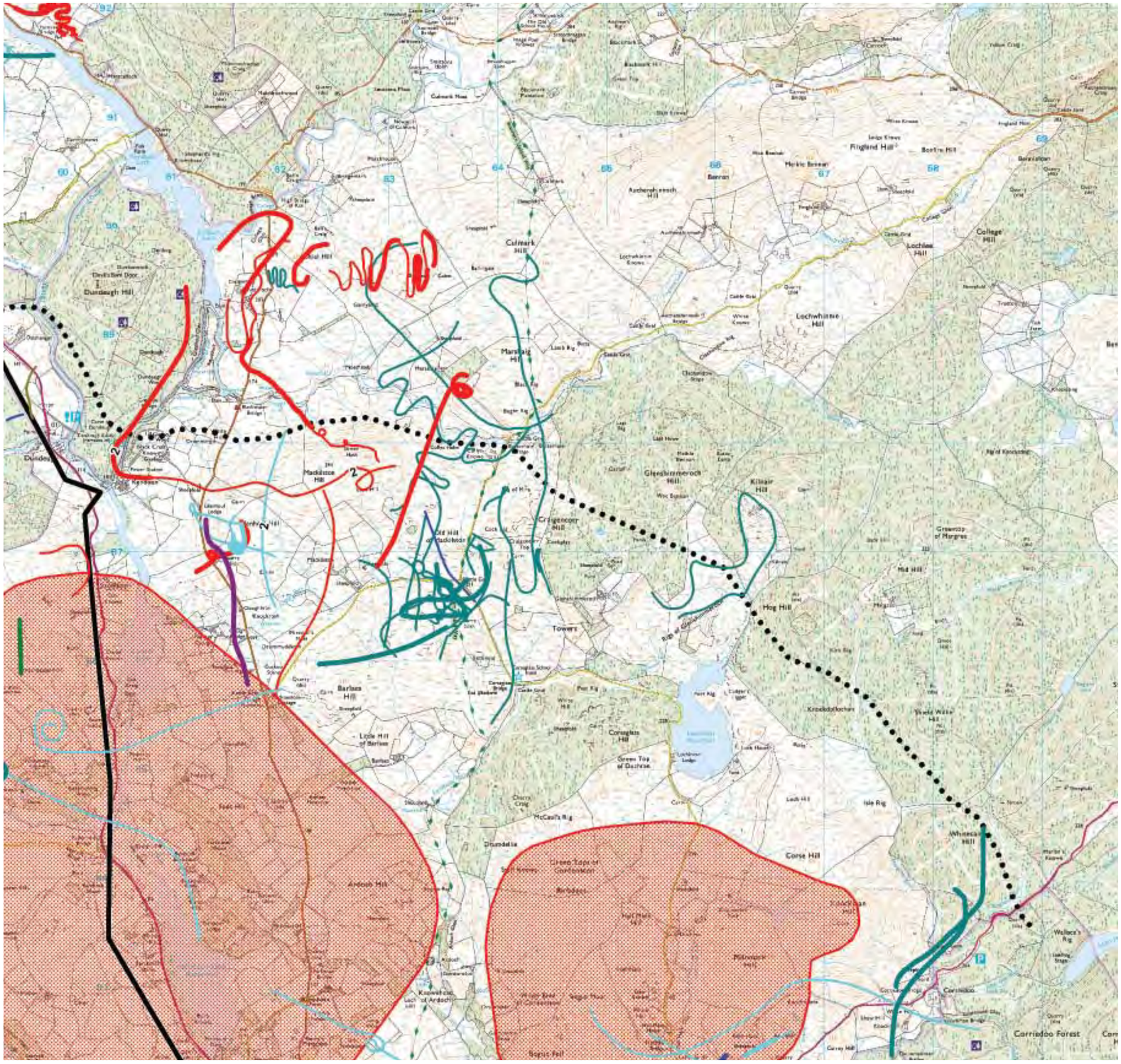
2 Number of birds per flight line (where >1)

Thicker line indicates flight at risk height



0m 0.5km 1km 1.5km 2km

Figure 9.15 - Raptor Flights - Period 01 - Area C



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Legend

Schedule 1/Annex 1 raptor and owl flight lines - survey period 01 (Oct 2007 to mid April 2008) - Area D

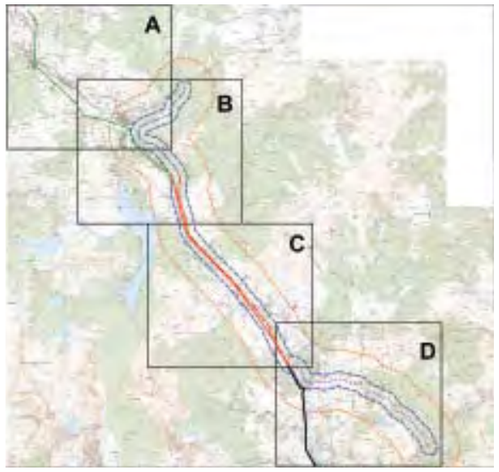
- Existing N-Route
- Proposed L7 Tower route
- Proposed Wood Pole line route

- Red kite
- Hen harrier
- Goshawk
- Merlin
- Peregrine
- Short-eared owl
- Osprey

2 Number of birds per flight line (where >1)

Thicker line indicates flight at risk height

Area of high red kite activity



0.5km 1.5km
0m 1km 2km

Figure 9.16 - Raptor Flights - Period 01 - Area D

Legend

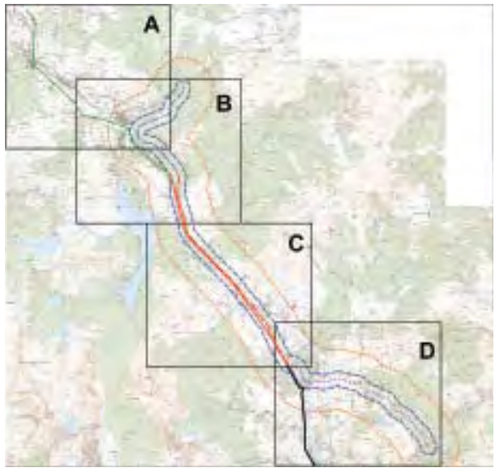
Schedule 1/Annex 1 raptor and owl flight lines - survey period 02 (mid April 2008 to Aug 2008) - Area B

- Existing N-Route
- Proposed L7 Tower route
- Proposed Wood Pole line route

- Red kite
- Hen harrier
- Goshawk
- Osprey
- Peregrine
- Barn owl
- Area of Peregrine activity

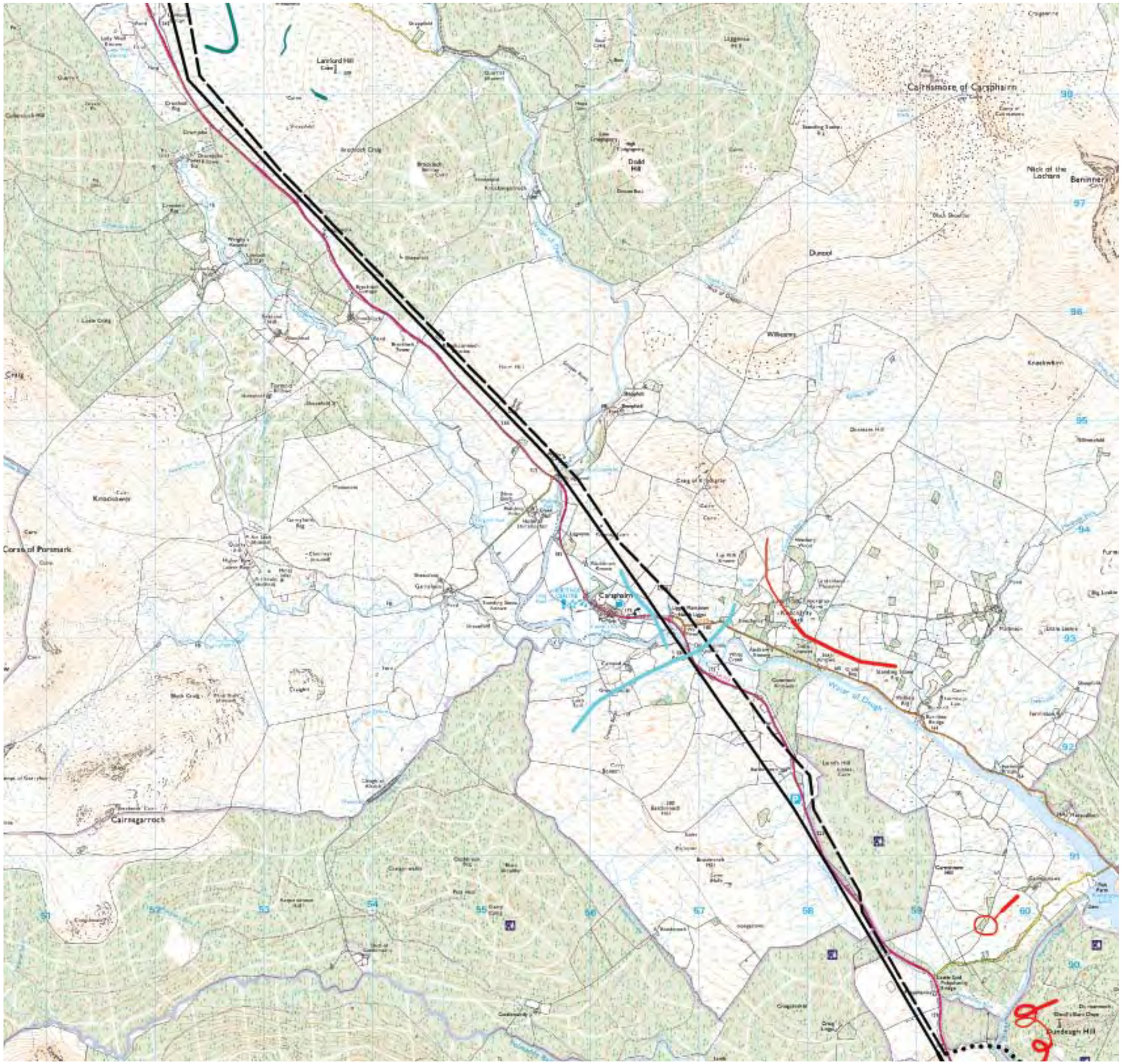
2 Number of birds per flight line (where >1)

Thicker line indicates flight at risk height



0m 0.5km 1km 1.5km 2km

Figure 9.17 - Raptor Flights - Period 02 - Area B



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Legend

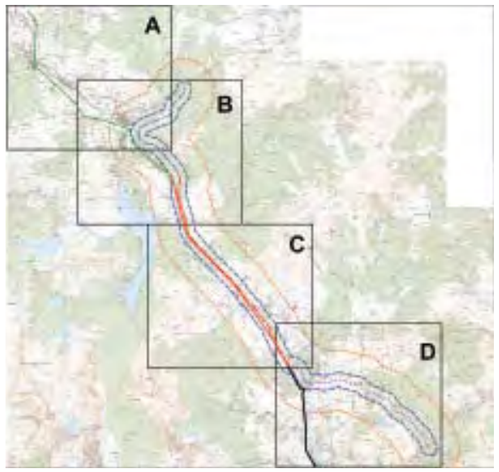
Schedule 1/Annex 1 raptor and owl flight lines - survey period 02 (mid April 2008 to Aug 2008) - Area C

- Existing N-Route
- Proposed L7 Tower route
- Proposed Wood Pole line route

- Red kite
- Hen harrier
- Goshawk
- Osprey
- Peregrine
- Barn owl

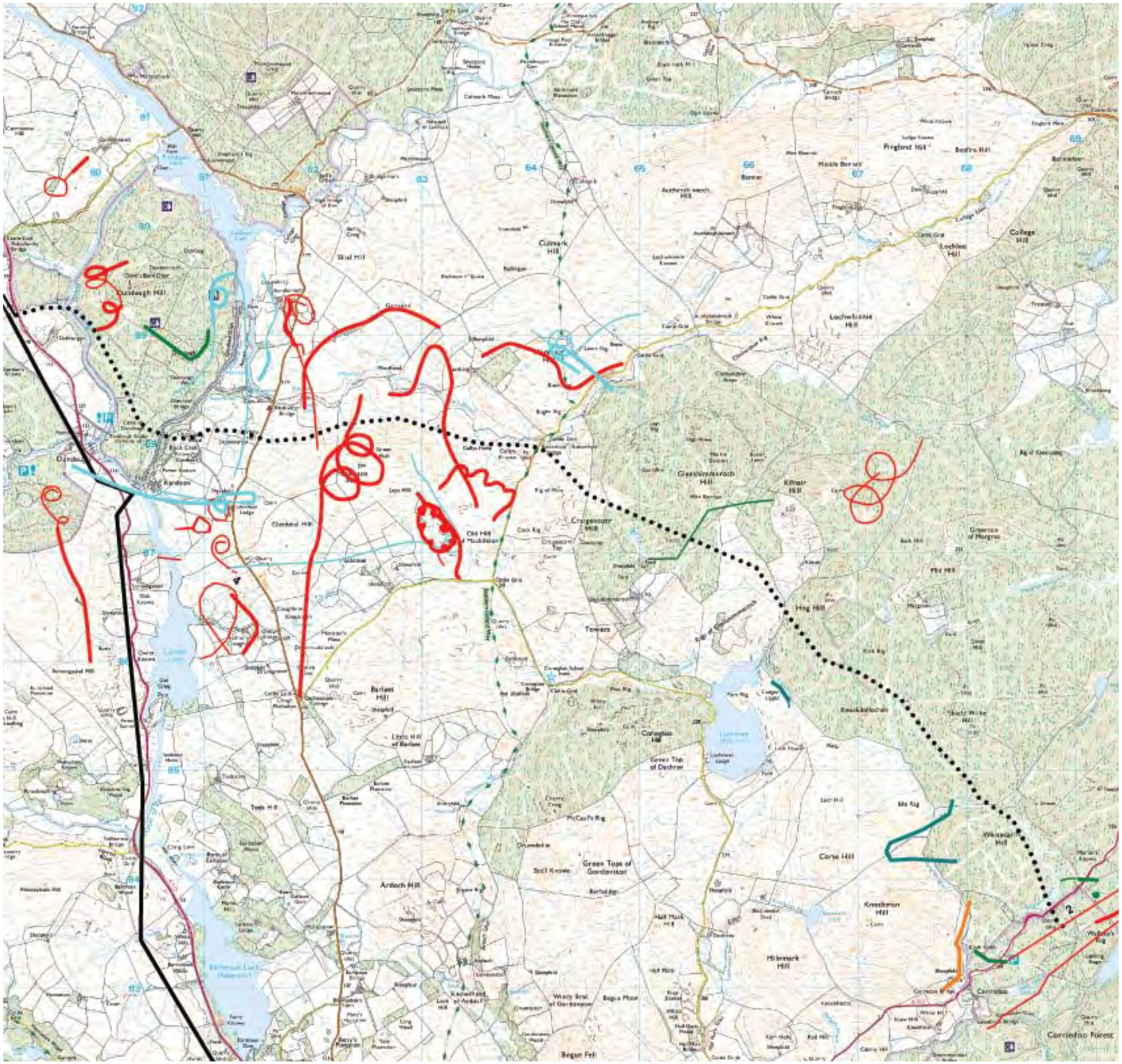
2 Number of birds per flight line (where >1)

Thicker line indicates flight at risk height



0m 0.5km 1km 1.5km 2km

Figure 9.18 - Raptor Flights - Period 02 - Area C



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Legend

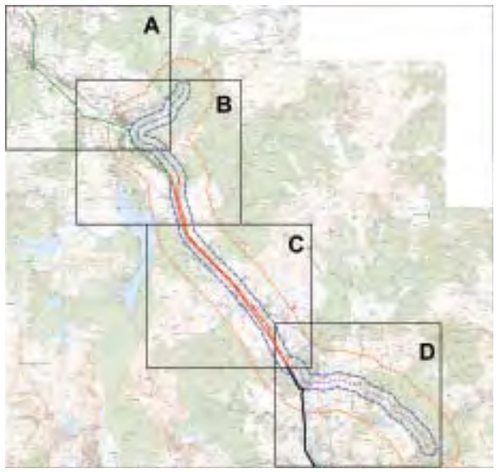
Schedule 1/Annex 1 raptor and owl flight lines - survey period 02 (mid April 2008 to Aug 2008) - Area D

- Existing N-Route
- Proposed L7 Tower route
- Proposed Wood Pole line route

- Red kite
- Hen harrier
- Goshawk
- Osprey
- Peregrine
- Barn owl

2 Number of birds per flight line (where >1)

Thicker line indicates flight at risk height



0.5km 1.5km
0m 1km 2km

Figure 9.19 - Raptor Flights - Period 02 - Area D

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Legend

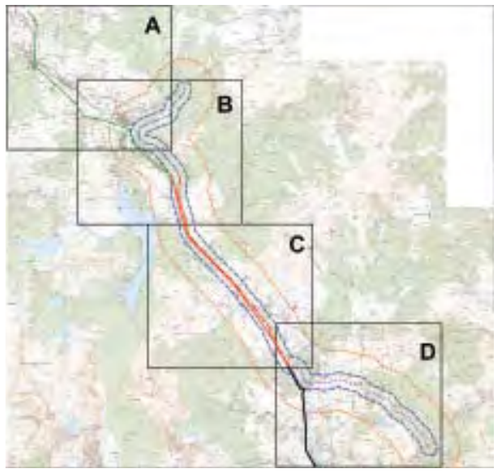
Schedule 1/Annex 1 raptor and owl flight lines - survey period 03 (Sept 2009 to May 2009) - Area B

- Existing N-Route
- Proposed L7 Tower route
- Proposed Wood Pole line route

- Red kite
- Hen harrier
- Goshawk
- Golden eagle
- Peregrine
- Barn owl
- Short-eared owl

2 Number of birds per flight line (where >1)

Thicker line indicates flight at risk height



0m 0.5km 1km 1.5km 2km

Figure 9.20 - Raptor Flights - Period 03 - Area B

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Legend

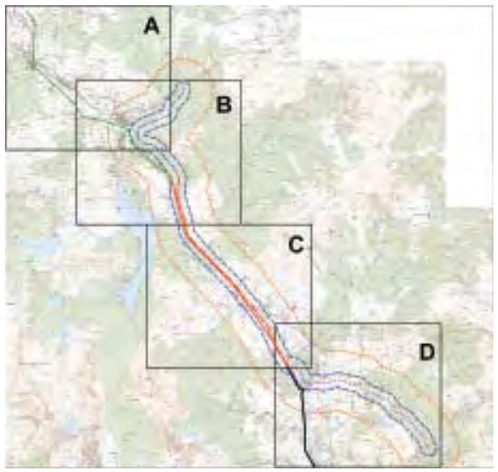
Schedule 1/Annex 1 raptor and owl flight lines - survey period 03 (Sept 2008 to May 2009) - Area C

- Existing N-Route
- Proposed L7 Tower route
- Proposed Wood Pole line route

- Red kite
- Hen harrier
- Goshawk
- Golden eagle
- Merlin
- Peregrine
- Barn owl
- Short-eared owl

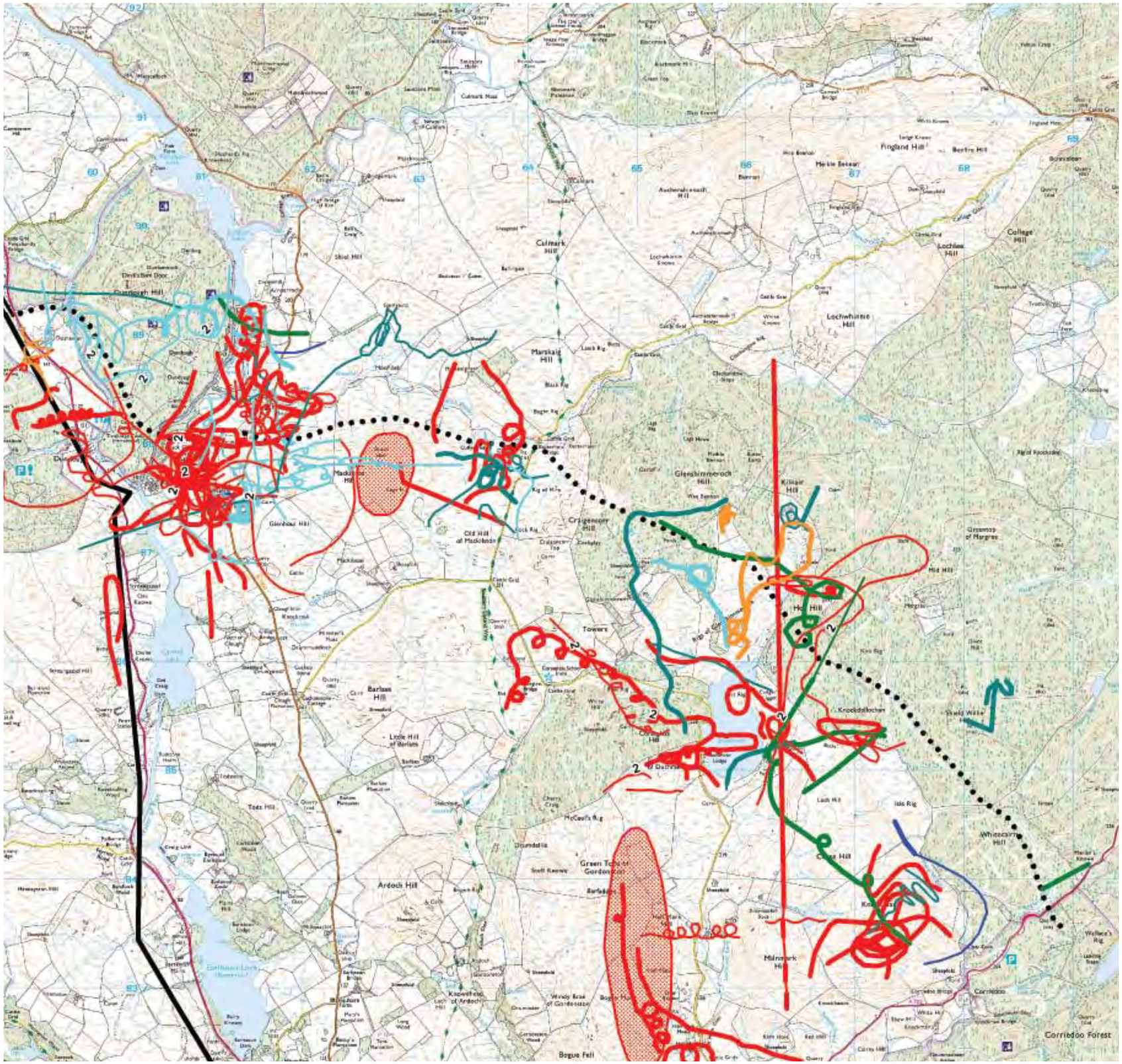
2 Number of birds per flight line (where >1)

Thicker line indicates flight at risk height



0m 0.5km 1km 1.5km 2km

Figure 9.21 - Raptor Flights - Period 03 - Area C



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Legend

Schedule 1/Annex 1 raptor and owl flight lines - survey period 03 (Sept 2008 to May 2009) - Area D

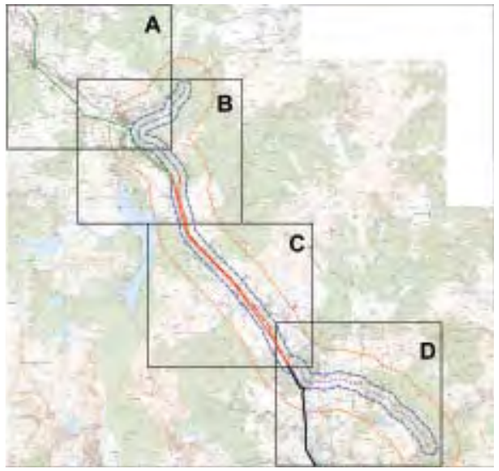
- Existing N-Route
- Proposed L7 Tower route
- Proposed Wood Pole line route

- Red kite
- Hen harrier
- Goshawk
- Golden eagle
- Peregrine
- Barn owl
- Short-eared owl

2 Number of birds per flight line (where >1)

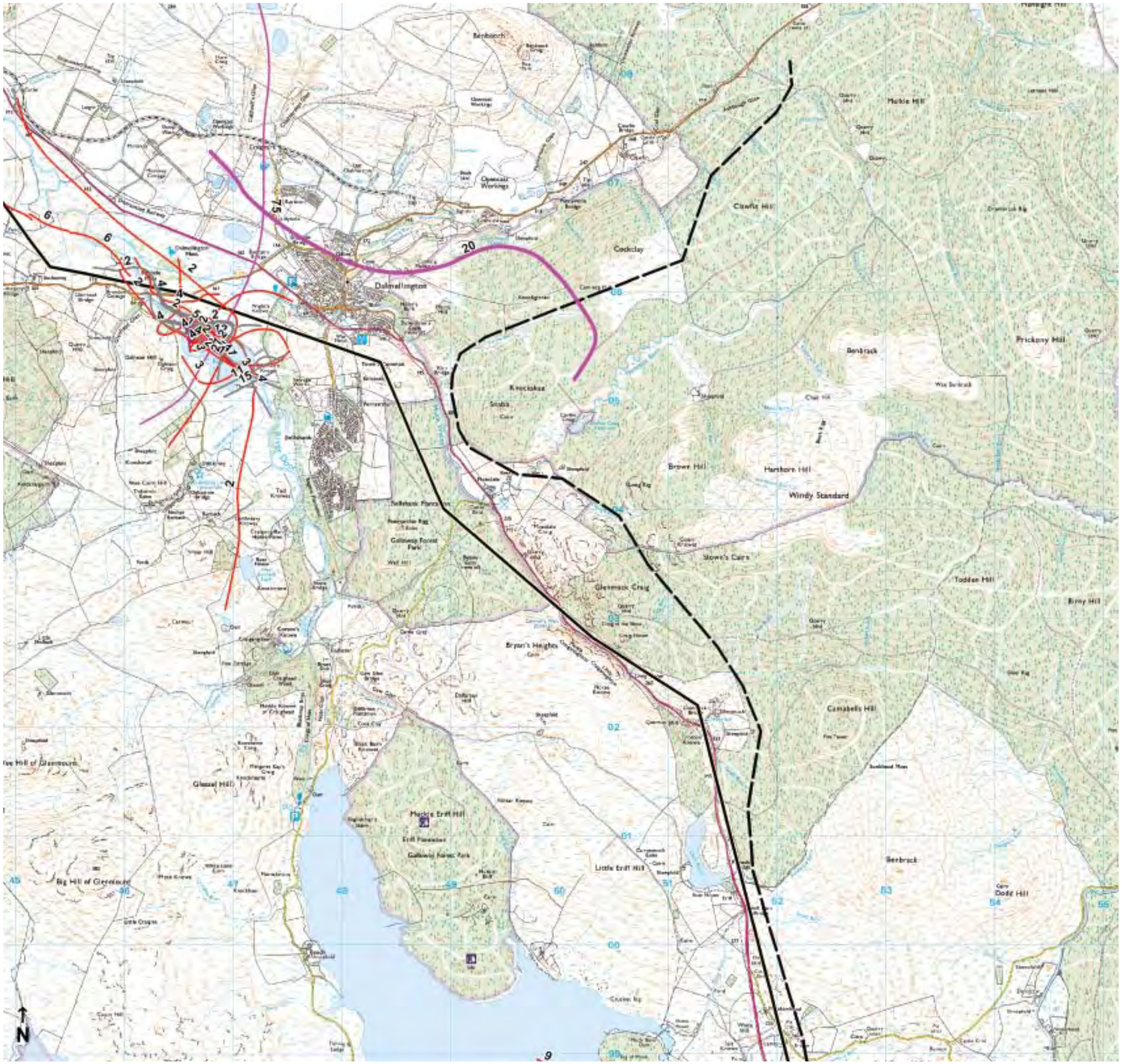
Thicker line indicates flight at risk height

Area of high red kite activity



0m 0.5km 1km 1.5km 2km

Figure 9.22 - Raptor Flights - Period 03 - Area D



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Legend

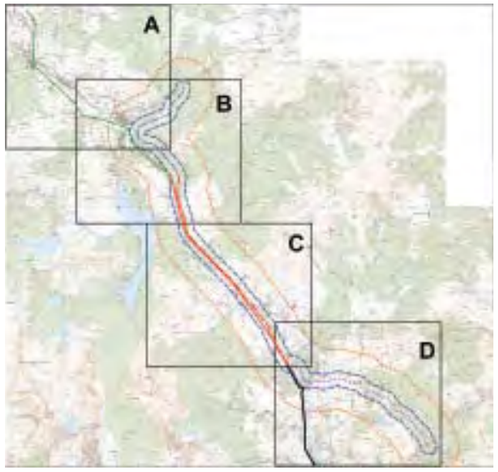
Goose & swan flight lines - survey period 01 (Oct 2007 to mid April 2008) - Area B

- Existing N-Route
- Proposed L7 Tower route
- Proposed Wood Pole line route

- Mute swan
- Whooper swan
- Pink-footed goose
- Greylag goose

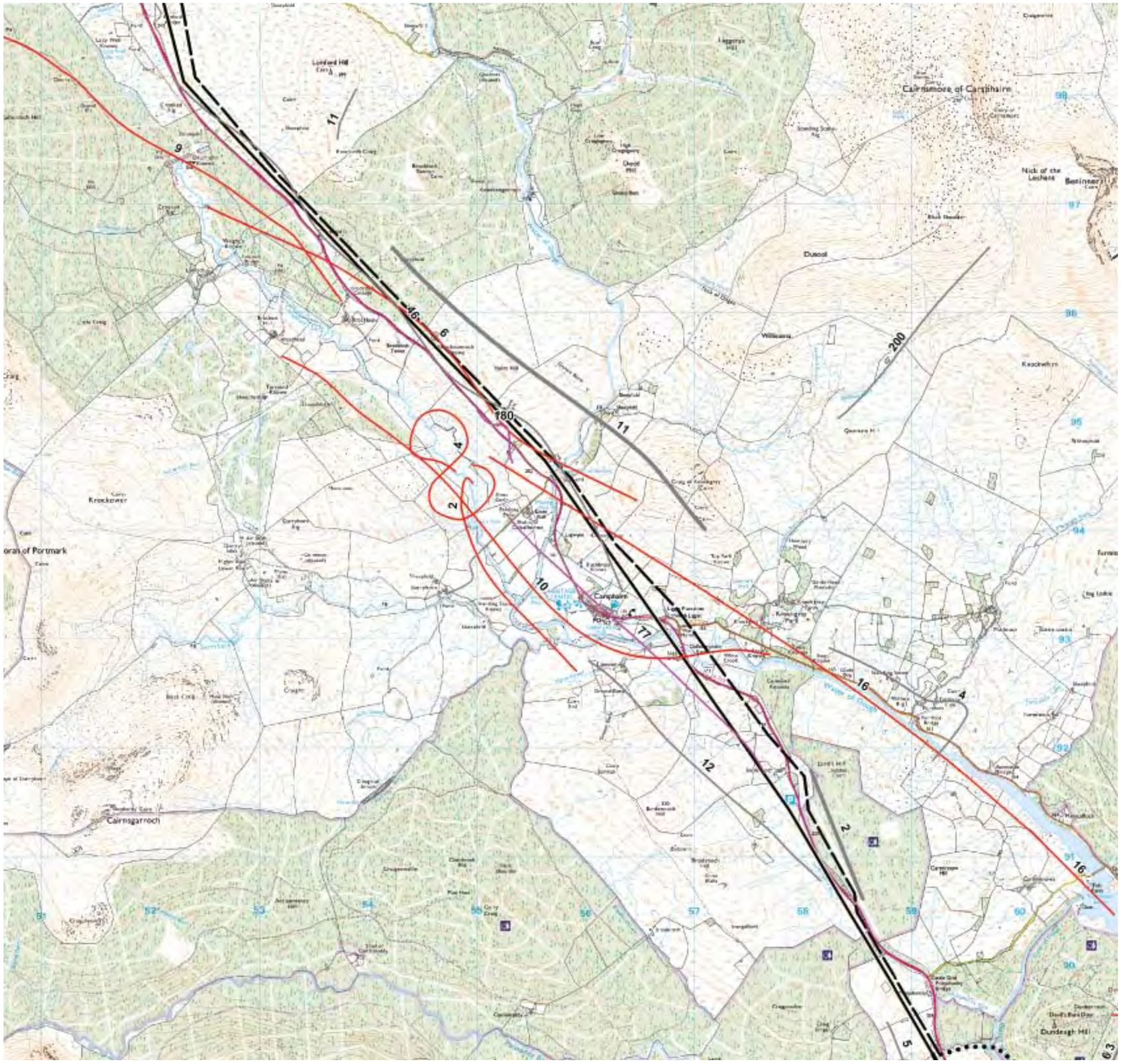
Thicker line indicates flight at risk height

2 Number of birds per flight line (where >1)



0m 0.5km 1km 1.5km 2km

Figure 9.23 - Goose and Swan Flights - Period 01 - Area B



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Legend

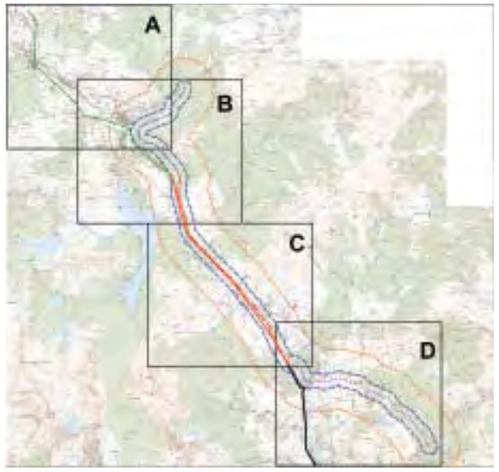
Goose & swan flight lines - survey period 01 (Oct 2007 to mid April 2008) - Area C

- Existing N-Route
- Proposed L7 Tower route
- Proposed Wood Pole line route

- Mute swan
- Whooper swan
- Pink-footed goose
- Greylag goose

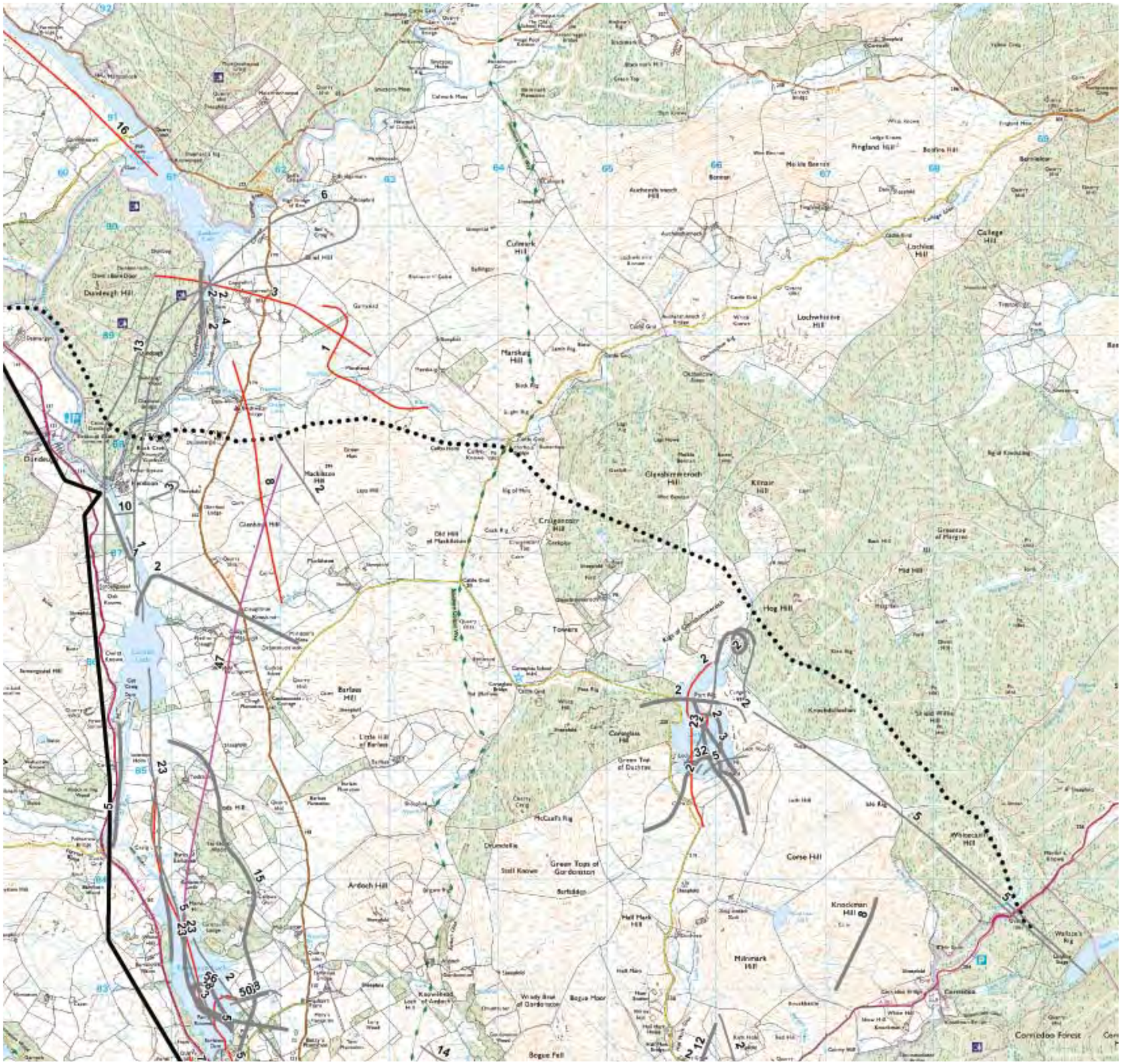
Thicker line indicates flight at risk height

2 Number of birds per flight line (where >1)



0m 0.5km 1km 1.5km 2km

Figure 9.24 - Goose and Swan Flights - Period 01 - Area C



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Legend

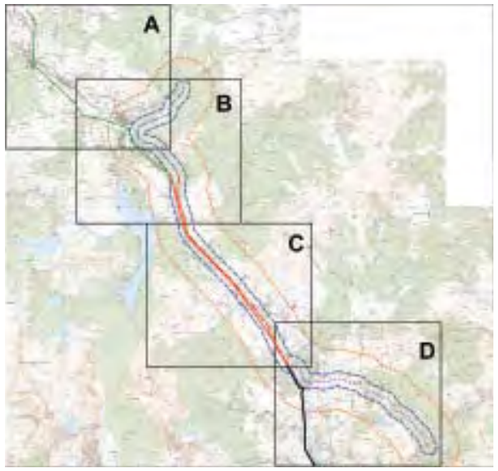
Goose & swan flight lines - survey period 01 (Oct 2007 to mid April 2008) - Area D

- Existing N-Route
- Proposed L7 Tower route
- Proposed Wood Pole line route

- Mute swan
- Whooper swan
- Pink-footed goose
- Greylag goose

Thicker line indicates flight at risk height

2 Number of birds per flight line (where >1)



0m 0.5km 1km 1.5km 2km

Figure 9.25 - Goose and Swan Flights - Period 01 - Area D

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Legend

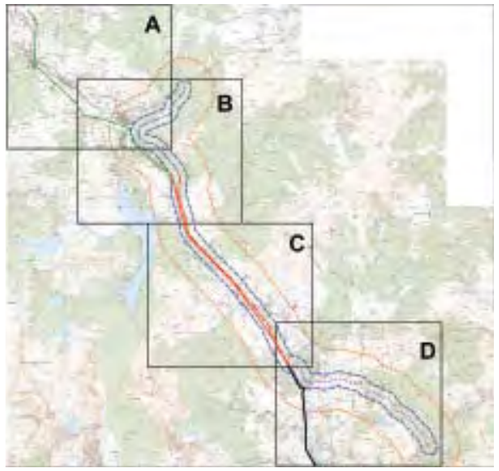
Goose & swan flight lines - survey period 02 (mid April 2008 to Aug 2008) - Area B

- Existing N-Route
- Proposed L7 Tower route
- Proposed Wood Pole line route

- Canada goose
- Greylag goose

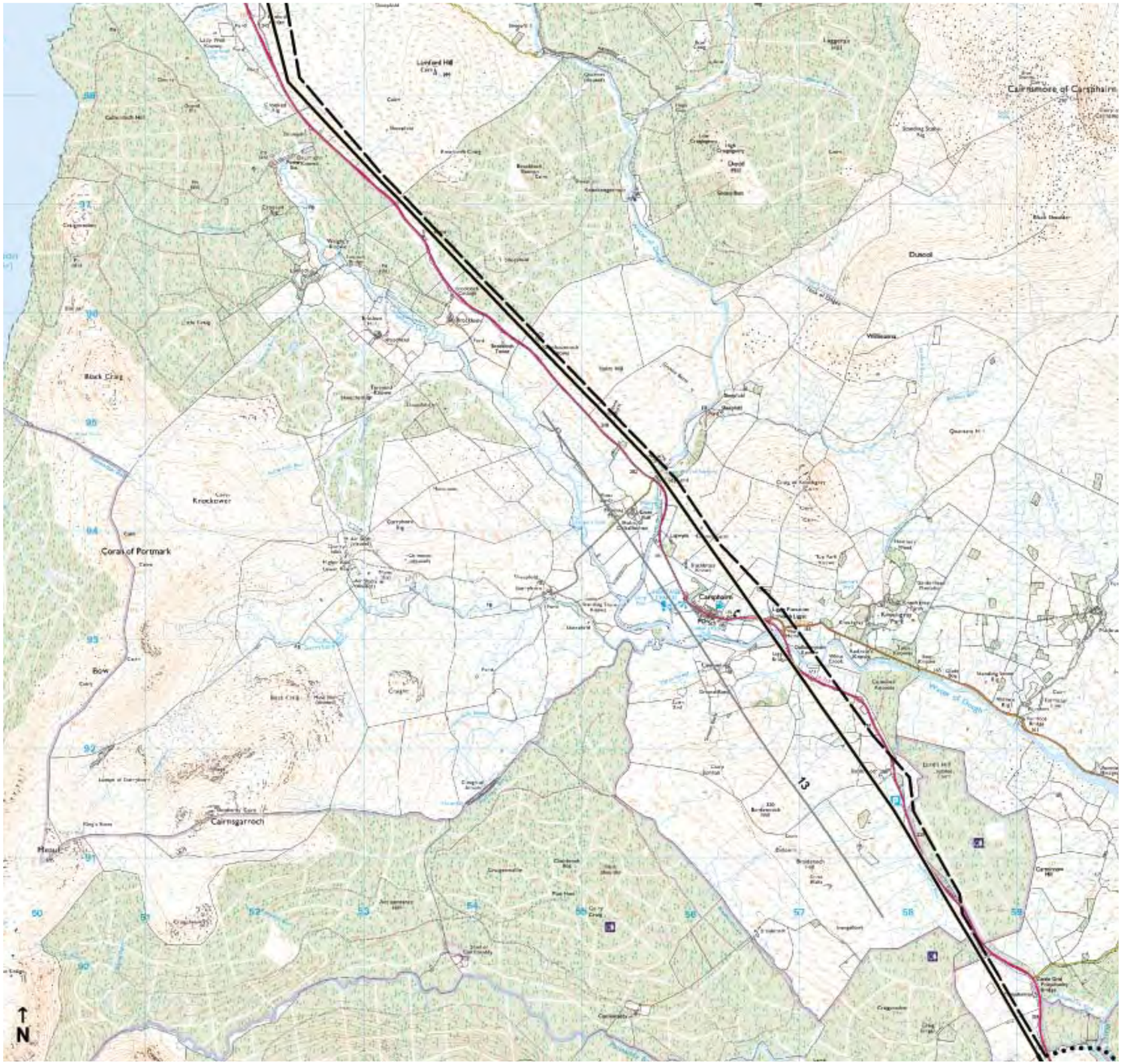
Thicker line indicates flight at risk height

2 Number of birds per flight line (where >1)



0m 0.5km 1km 1.5km 2km

Figure 9.26 - Goose and Swan Flights - Period 02 - Area B



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Legend

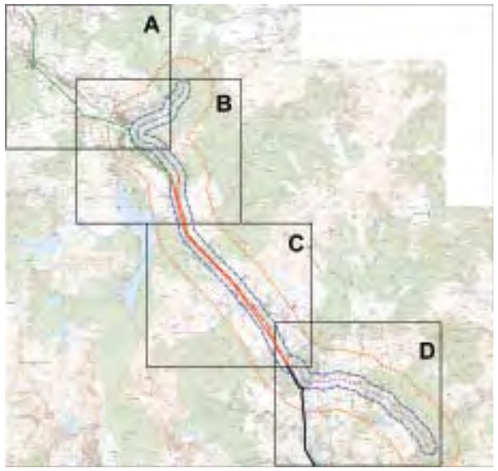
Goose & swan flight lines - survey period 02 (mid April 2008 to Aug 2008) - Area C

- Existing N-Route
- Proposed L7 Tower route
- Proposed Wood Pole line route

- Canada goose
- Greylag goose

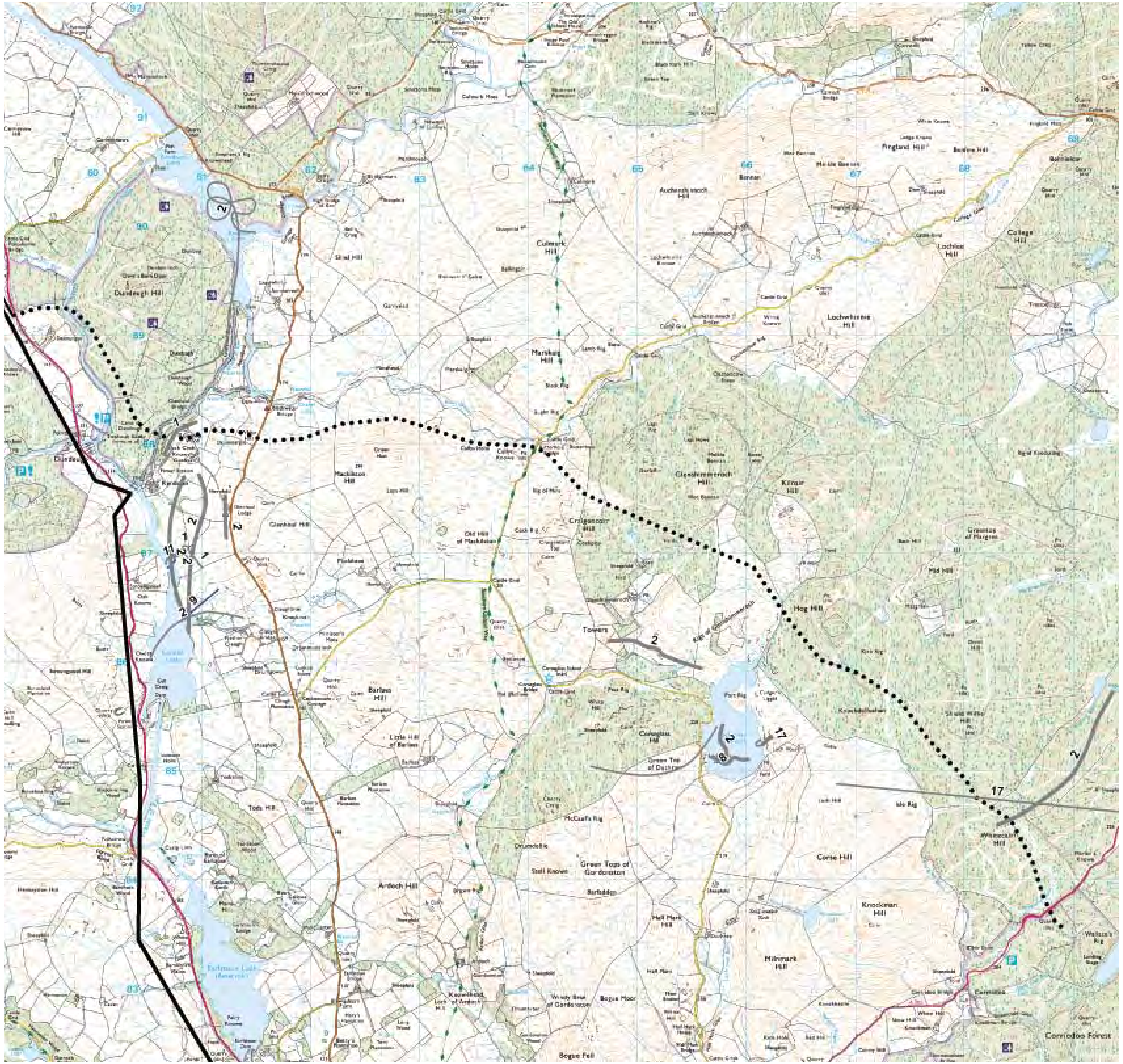
Thicker line indicates flight at risk height

2 Number of birds per flight line (where >1)



0m 0.5km 1km 1.5km 2km

Figure 9.27 - Goose and Swan Flights - Period 02 - Area C



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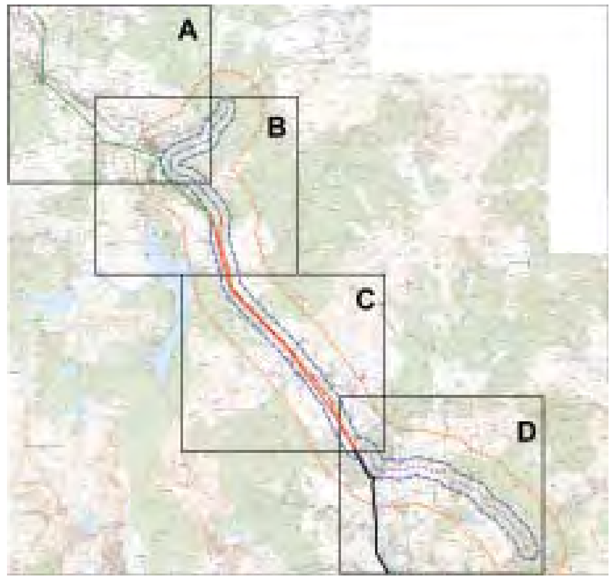
Legend

Goose & swan flight lines - survey period 02 (mid April 2008 to Aug 2008) - Area B

- Existing N-Route
- Proposed L7 Tower route
- Proposed Wood Pole line route
- Canada goose
- Greylag goose

Thicker line indicates flight at risk height

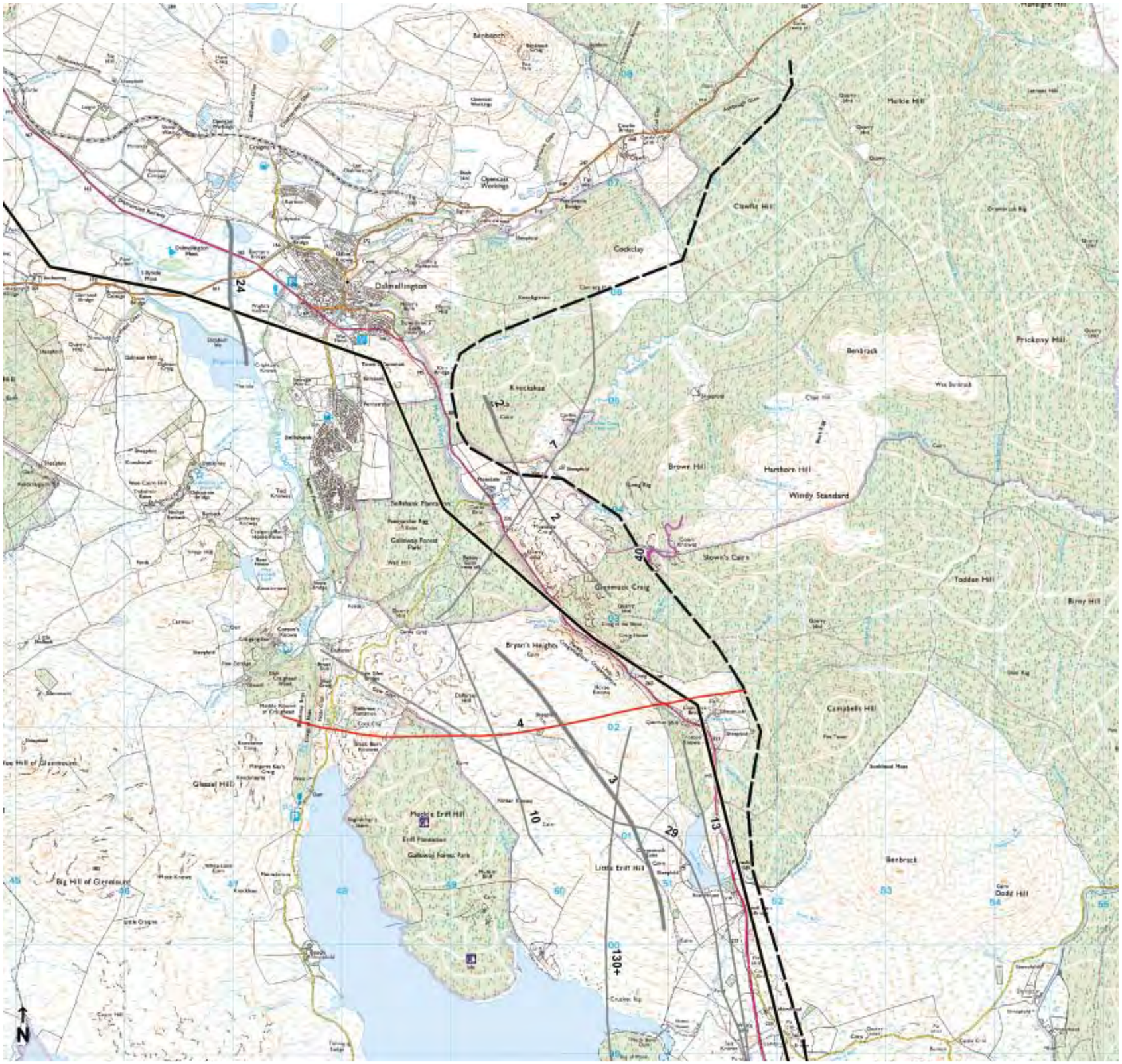
2 Number of birds per flight line (where >1)



0m 0.5km 1km 1.5km 2km

N

Figure 9.28 - Goose and Swan Flights - Period 02 - Area D



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Legend

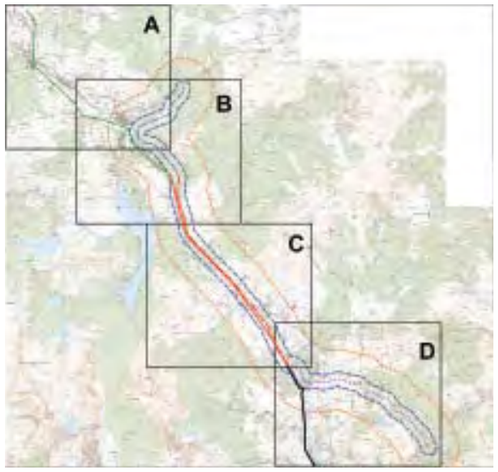
Goose & swan flight lines - survey period 03 (Sept 2008 to May 2009) - Area B

- Existing N-Route
- Proposed L7 Tower route
- Proposed Wood Pole line route

- Mute swan
- Whooper swan
- Pink-footed goose
- Greylag goose
- Canada goose

Thicker line indicates flight at risk height

2 Number of birds per flight line (where >1)



0m 0.5km 1km 1.5km 2km

Figure 9.29 - Goose and Swan Flights - Period 03 - Area B

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Legend

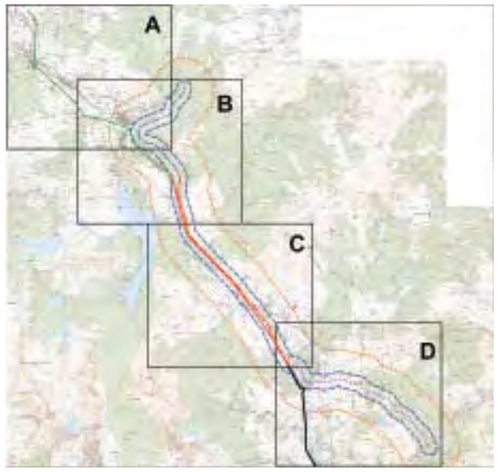
Goose & swan flight lines - survey period 03 (Sept 2008 to May 2009) - Area C

- Existing N-Route
- Proposed L7 Tower route
- Proposed Wood Pole line route

- Mute swan
- Whooper swan
- Pink-footed goose
- Greylag goose
- Canada goose

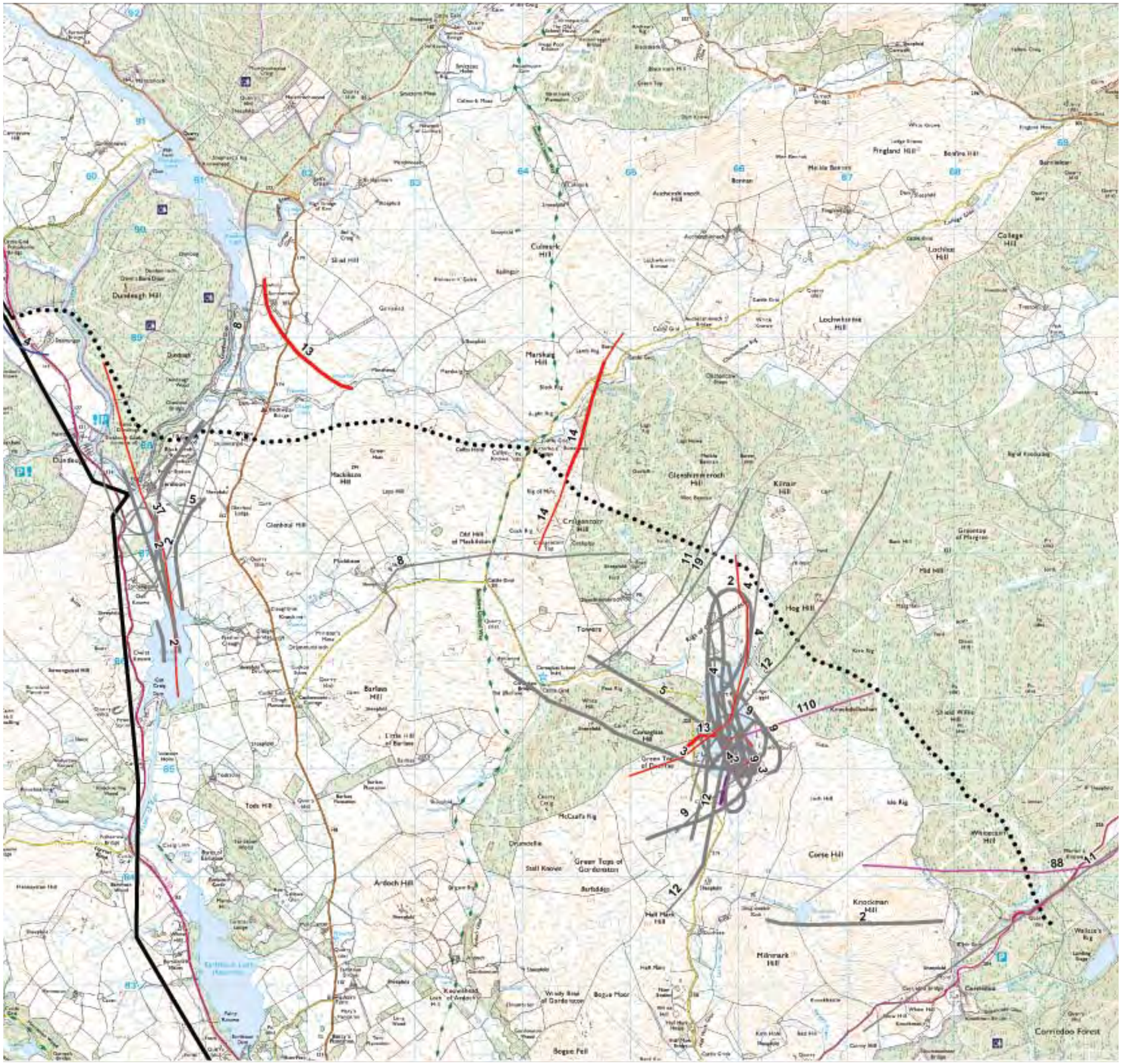
Thicker line indicates flight at risk height

2 Number of birds per flight line (where >1)



0m 0.5km 1km 1.5km 2km

Figure 9.30 - Goose and Swan Flights - Period 03 - Area C



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Legend

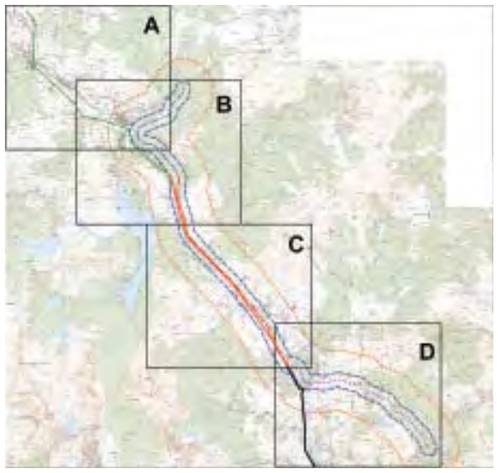
Goose & swan flight lines - survey period 03 (Sept 2008 to May 2009) - Area D

- Existing N-Route
- Proposed L7 Tower route
- Proposed Wood Pole line route

- Mute swan
- Whooper swan
- Pink-footed goose
- Greylag goose
- Canada goose

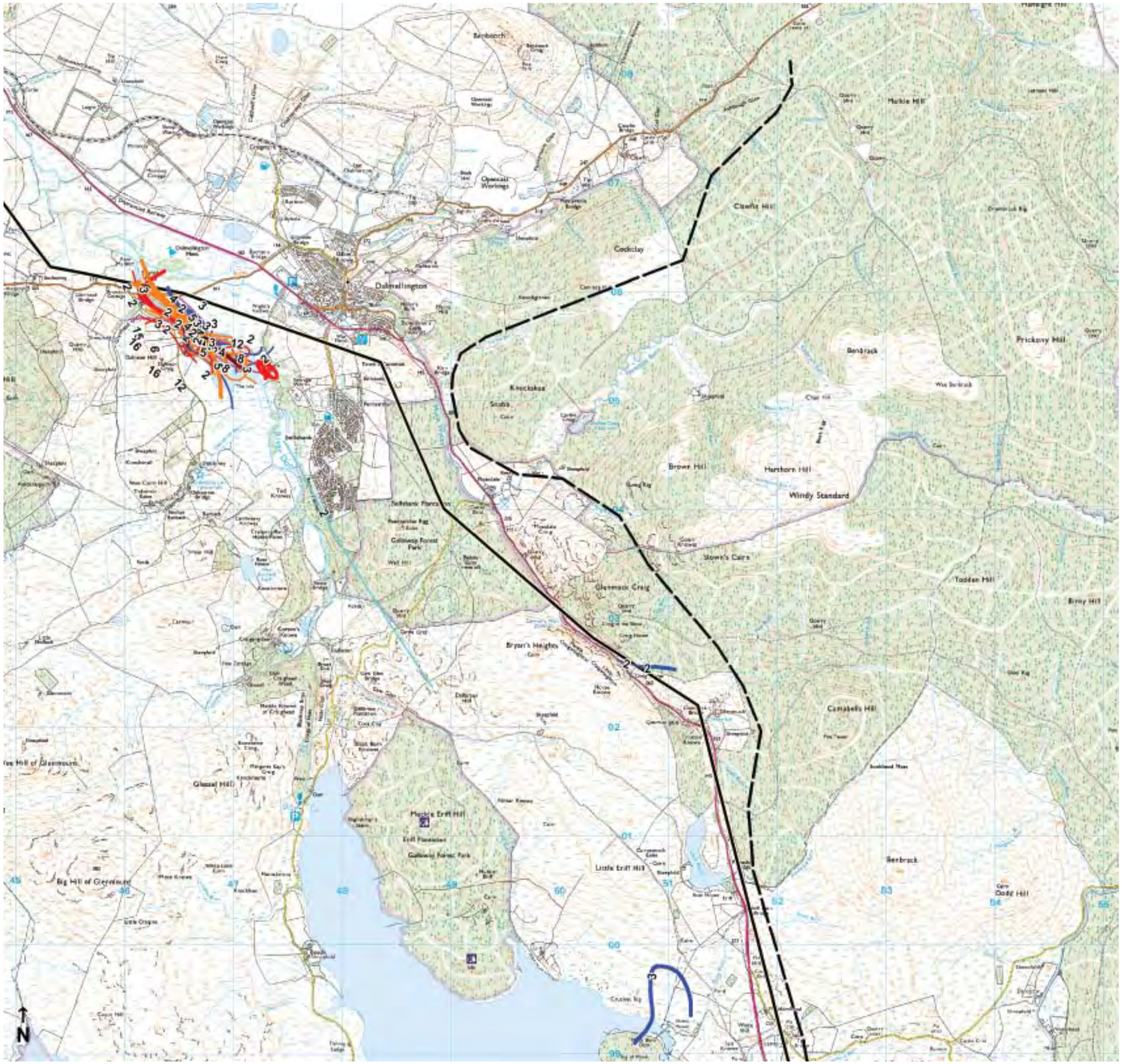
Thicker line indicates flight at risk height

2 Number of birds per flight line (where >1)



0m 0.5km 1km 1.5km 2km

Figure 9.31 - Goose and Swan Flights - Period 03 - Area D



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Legend

Waders, Ducks and other water bird flight lines - survey period 01 (Oct 2007 to mid April 2008) - Area B*

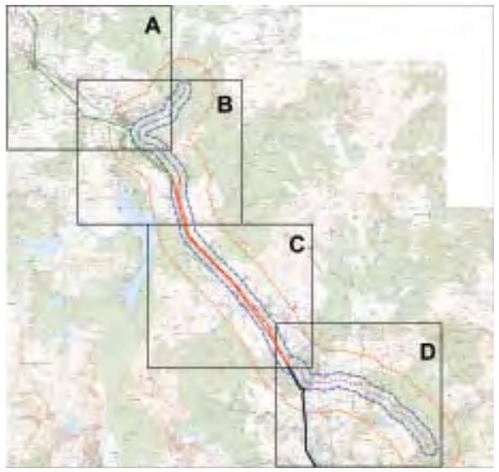
- Existing N-Route
- Proposed L7 Tower route
- Proposed Wood Pole line route

- Wigeon
- Gadwall
- Teal
- Mallard
- Tufted duck
- Goldeneye
- Oystercatcher
- Golden plover
- Lesser black-backed gull

Thicker line indicates flight at risk height

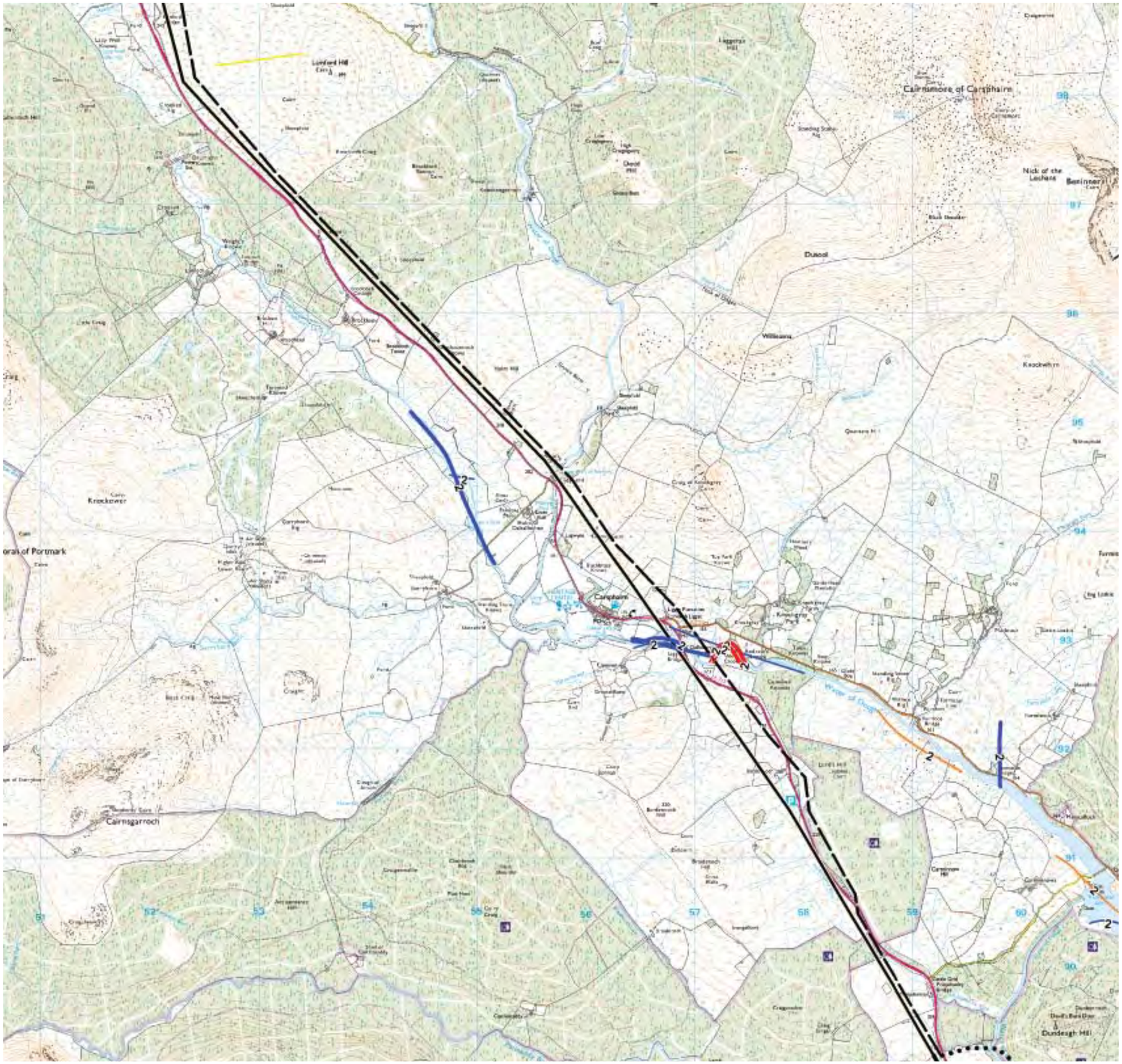
2 Number of birds per flight line (where >1)

*Includes species of conservation concern only (eg. Those species on the Red or Amber lists of the UK birds of conservation concern, Eaton et al. 2009)



0m 0.5km 1km 1.5km 2km

Figure 9.32 - Other Waterbirds Flights - Period 01 - Area B



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Legend

Waders, Ducks and other water bird flight lines - survey period 01 (Oct 2007 to mid April 2008) - Area C*

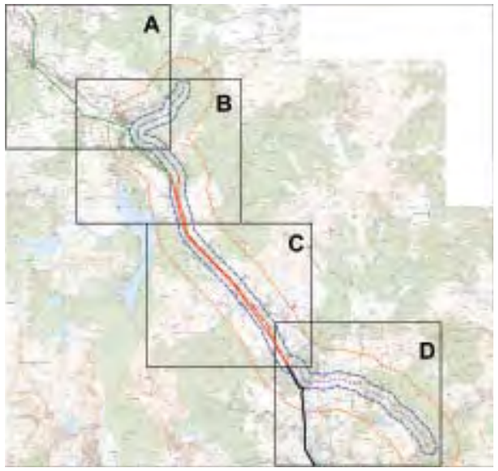
- Existing N-Route
- Proposed L7 Tower route
- Proposed Wood Pole line route

- Wigeon
- Gadwall
- Teal
- Mallard
- Tufted duck
- Goldeneye
- Oystercatcher
- Golden plover
- Lesser black-backed gull

Thicker line indicates flight at risk height

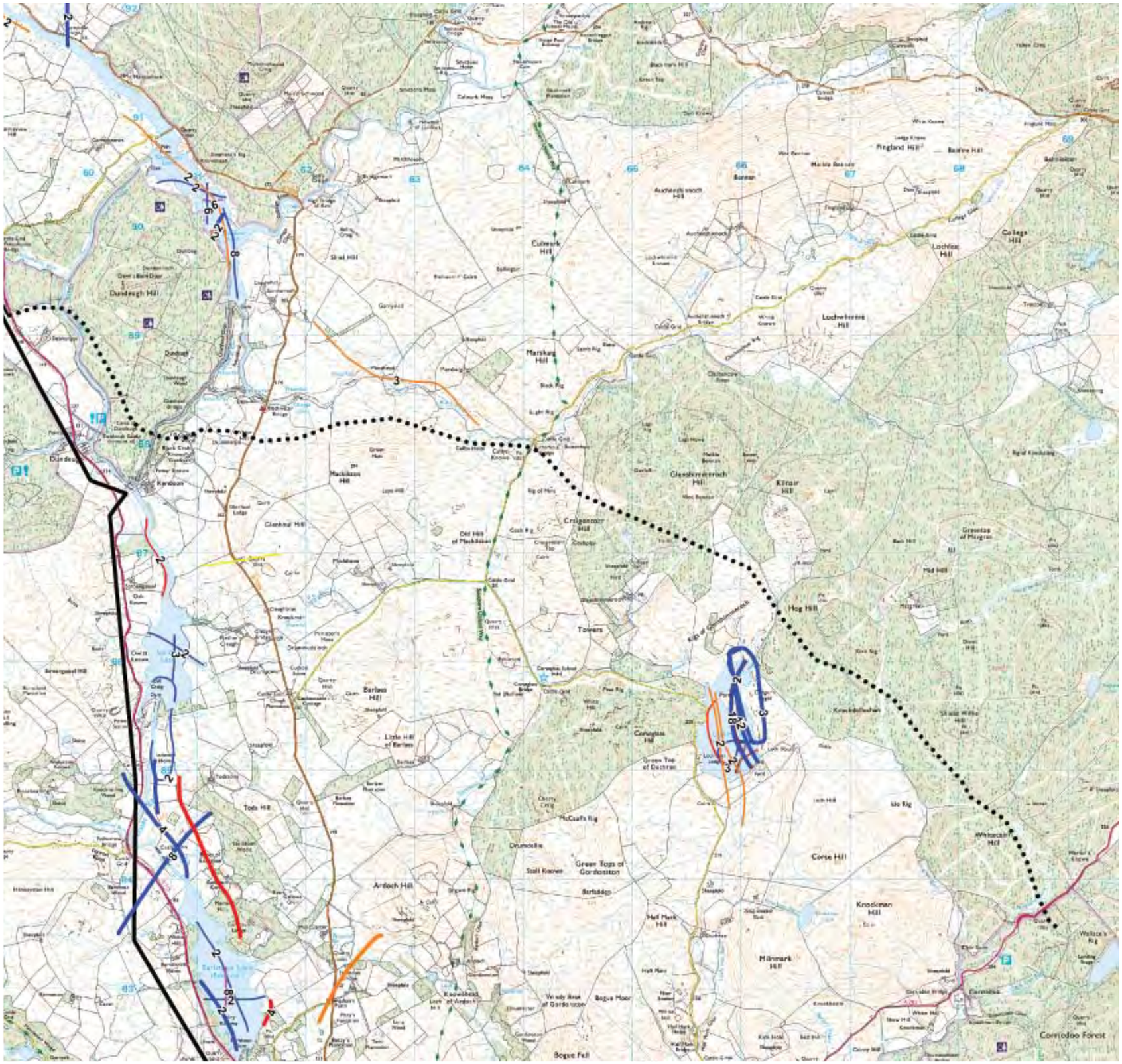
2 Number of birds per flight line (where >1)

*Includes species of conservation concern only (eg. Those species on the Red or Amber lists of the UK birds of conservation concern, Eaton et al. 2009)



0m 0.5km 1km 1.5km 2km

Figure 9.33 - Other Waterbirds Flights - Period 01 - Area C



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Legend

Waders, Ducks and other water bird flight lines - survey period 01 (Oct 2007 to mid April 2008) - Area D*

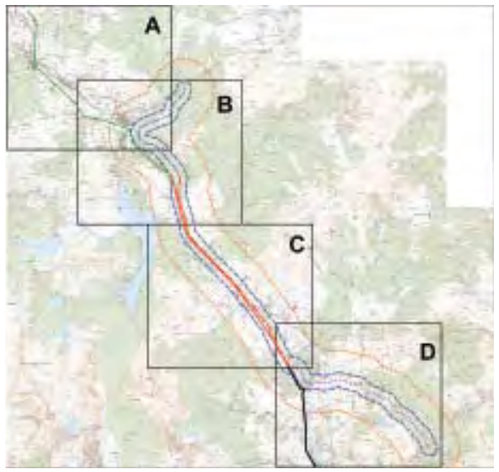
- Existing N-Route
- Proposed L7 Tower route
- Proposed Wood Pole line route

- Wigeon
- Gadwall
- Teal
- Mallard
- Tufted duck
- Goldeneye
- Oystercatcher
- Golden plover
- Lesser black-backed gull

Thicker line indicates flight at risk height

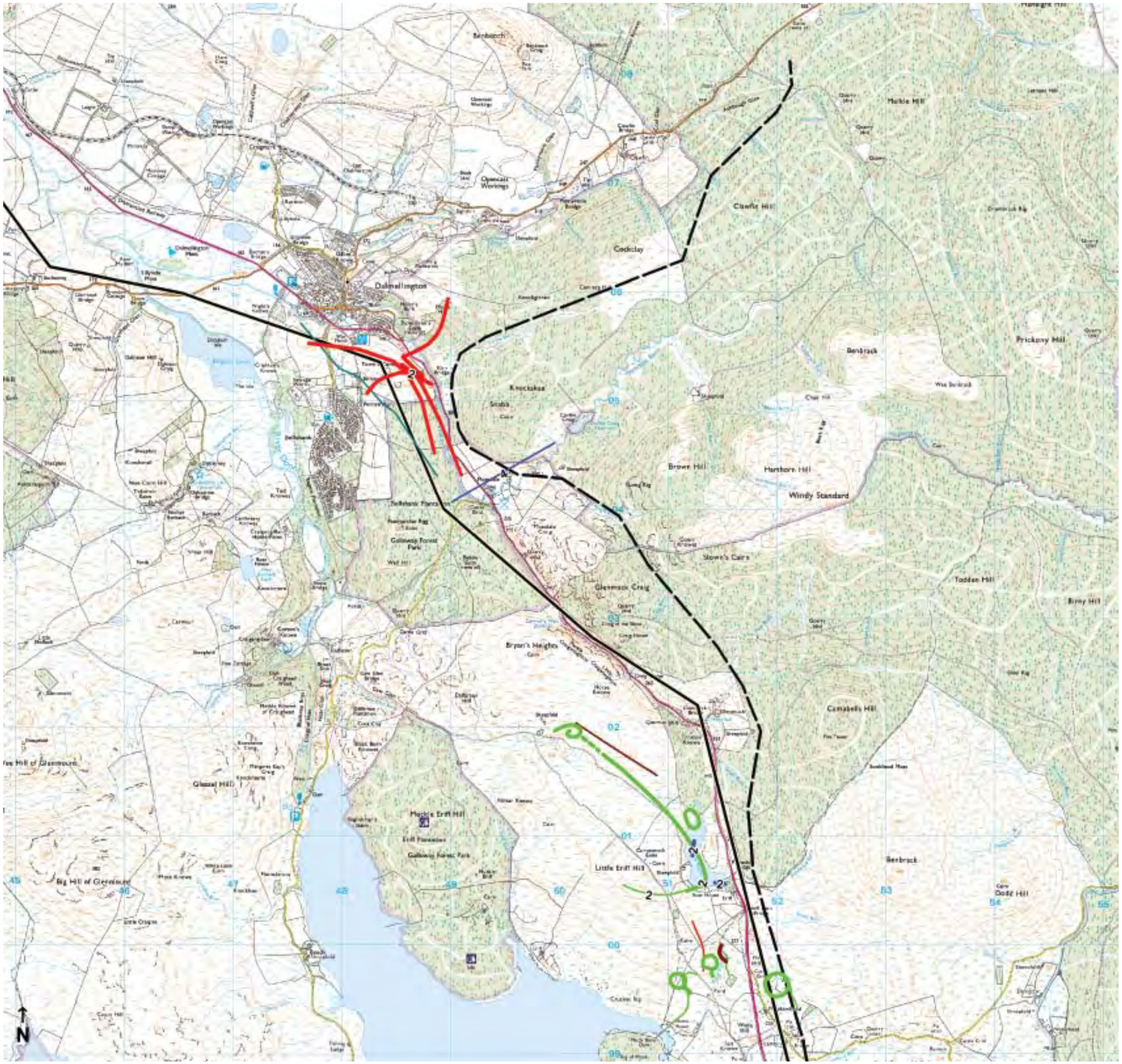
2 Number of birds per flight line (where >1)

*Includes species of conservation concern only (eg. Those species on the Red or Amber lists of the UK birds of conservation concern, Eaton et al. 2009)



0.5km 1.5km
0m 1km 2km

Figure 9.34 - Other Waterbirds Flights - Period 01 - Area D



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Legend

Waders, Ducks and other water bird flight lines - survey period 02 (mid April 2008 - Aug 2008) - Area B*

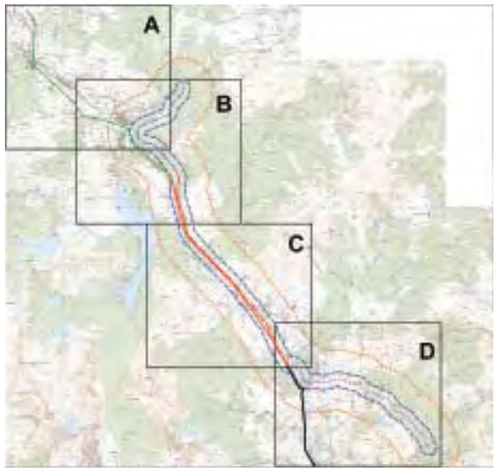
- Existing N-Route
- Proposed L7 Tower route
- Proposed Wood Pole line route

- Teal
- Mallard
- Oystercatcher
- Common snipe
- Curlew
- Lesser black-backed gull
- Great black-backed gull

Thicker line indicates flight at risk height

2 Number of birds per flight line (where >1)

*Includes species of conservation concern only (eg. Those species on the Red or Amber lists of the UK birds of conservation concern, Eaton et al. 2009)



0m 0.5km 1km 1.5km 2km

Figure 9.35 - Other Waterbirds Flights - Period 02 - Area B

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Legend

Waders, Ducks and other water bird flight lines - survey period 02 (mid April 2008 - Aug 2008) - Area C*

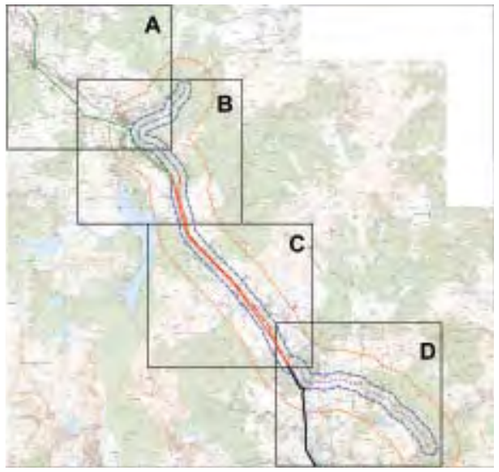
- Existing N-Route
- Proposed L7 Tower route
- Proposed Wood Pole line route

- Teal
- Mallard
- Oystercatcher
- Common snipe
- Curlew
- Lesser black-backed gull
- Great black-backed gull

Thicker line indicates flight at risk height

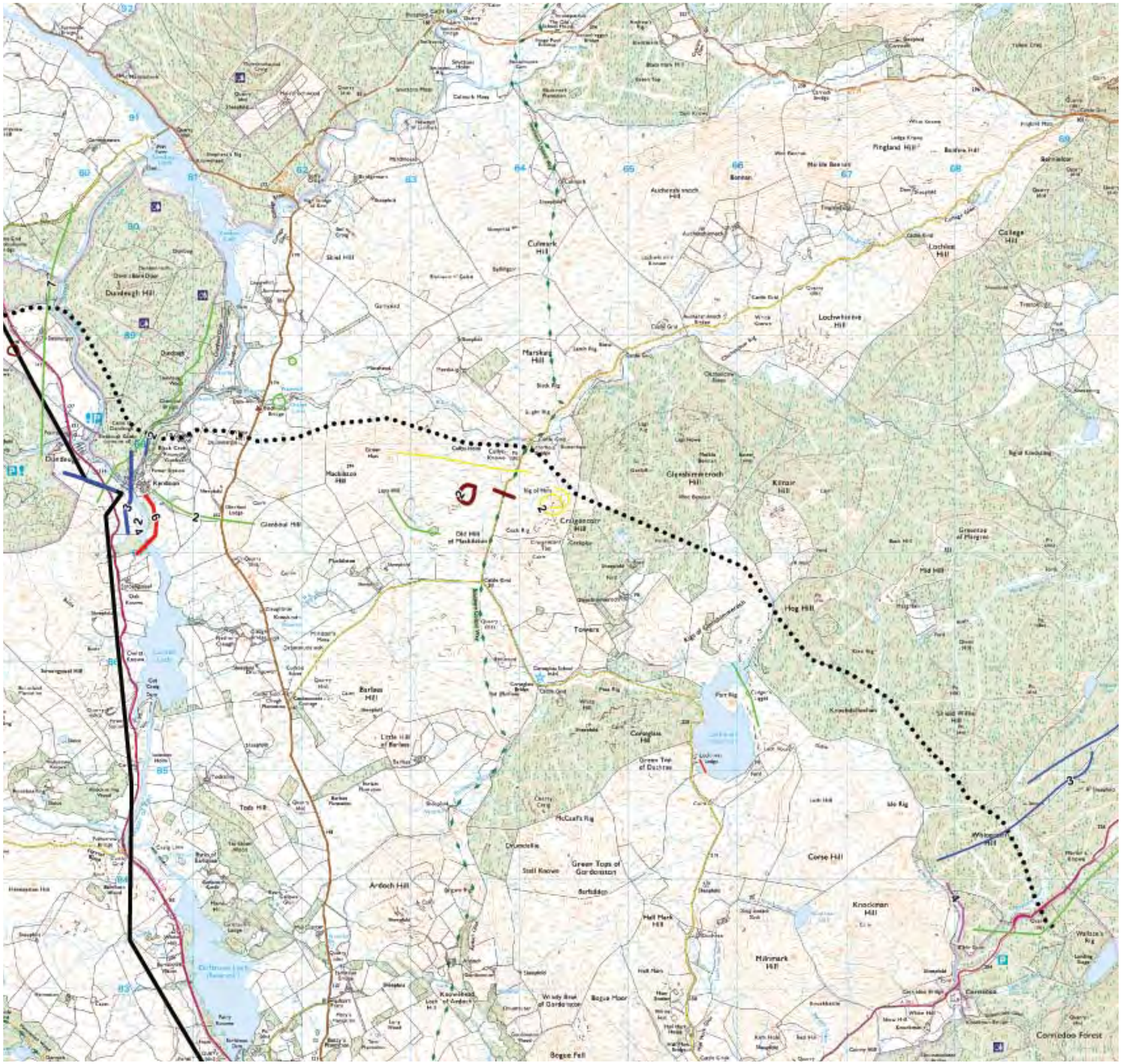
2 Number of birds per flight line (where >1)

*Includes species of conservation concern only (eg. Those species on the Red or Amber lists of the UK birds of conservation concern, Eaton et al. 2009)



0m 0.5km 1km 1.5km 2km

Figure 9.36 - Other Waterbirds Flights - Period 02 - Area C



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Legend

Waders, Ducks and other water bird flight lines - survey period 02 (mid April 2008 - Aug 2008) - Area D*

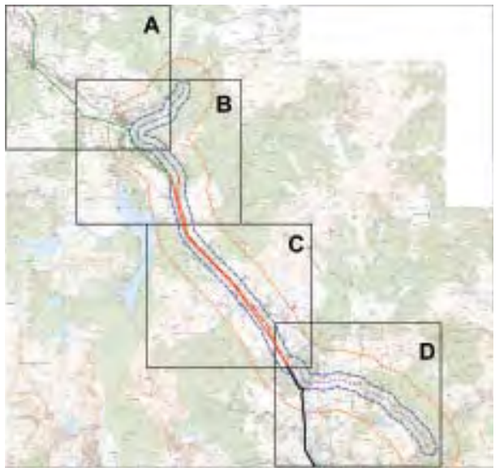
- Existing N-Route
- Proposed L7 Tower route
- Proposed Wood Pole line route

- Teal
- Mallard
- Oystercatcher
- Common snipe
- Curlew
- Lesser black-backed gull
- Great black-backed gull

Thicker line indicates flight at risk height

2 Number of birds per flight line (where >1)

*Includes species of conservation concern only (eg. Those species on the Red or Amber lists of the UK birds of conservation concern, Eaton et al. 2009)



0m 0.5km 1km 1.5km 2km

Figure 9.37 - Other Waterbirds Flights - Period 02 - Area D

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Legend

Waders, Ducks and other water bird flight lines - survey period 03 (Sept 2008 to May 2009) - Area B*

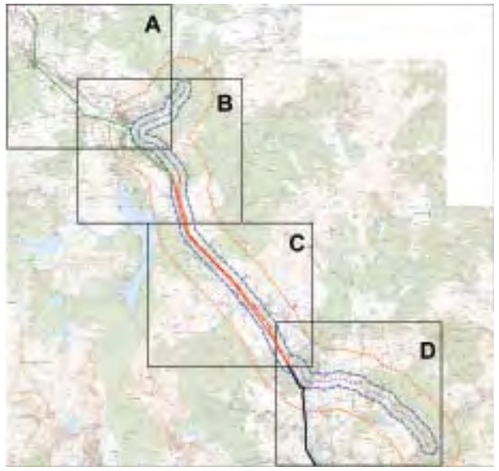
- Existing N-Route
- Proposed L7 Tower route
- Proposed Wood Pole line route

- Wigeon
- Teal
- Mallard
- Goldeneye
- Oystercatcher
- Lapwing
- Common snipe
- Woodcock
- Curlew

Thicker line indicates flight at risk height

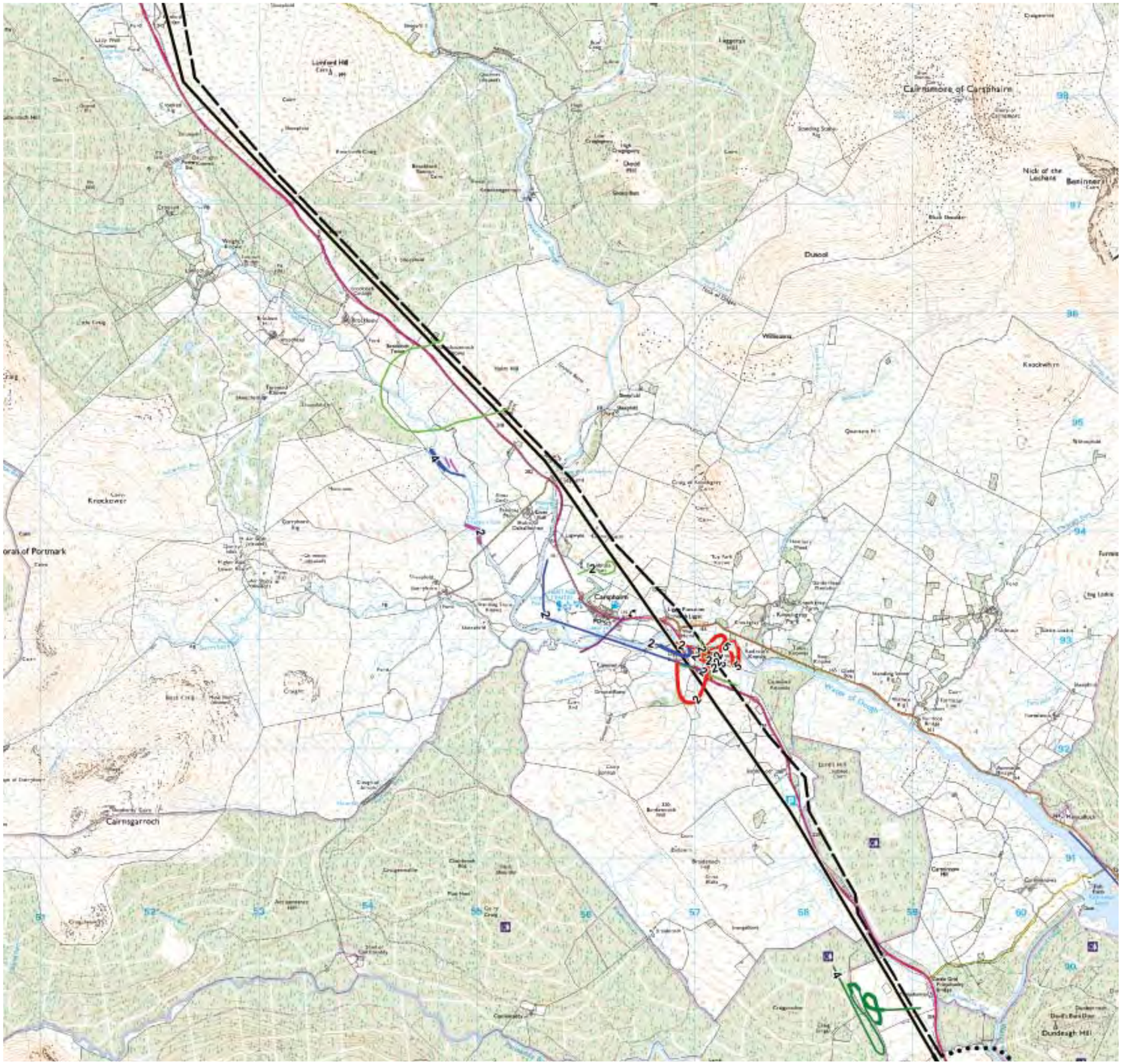
2 Number of birds per flight line (where >1)

*Includes species of conservation concern only (eg. Those species on the Red or Amber lists of the UK birds of conservation concern, Eaton et al. 2009)



0m 0.5km 1km 1.5km 2km

Figure 9.38 - Other Waterbirds Flights - Period 03 - Area B



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Legend

Waders, Ducks and other water bird flight lines - survey period 03 (Sept 2008 to May 2009) - Area C*

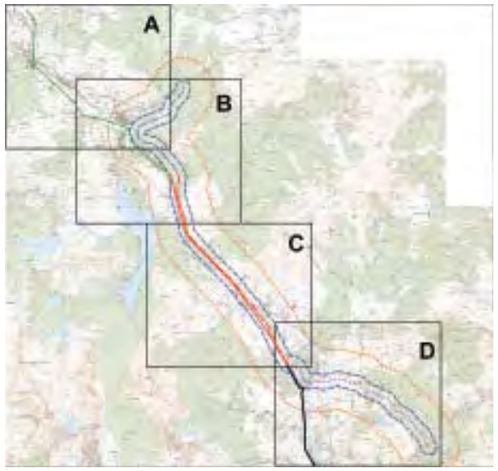
- Existing N-Route
- Proposed L7 Tower route
- Proposed Wood Pole line route

- Wigeon
- Teal
- Mallard
- Goldeneye
- Oystercatcher
- Lapwing
- Common snipe
- Woodcock
- Curlew

Thicker line indicates flight at risk height

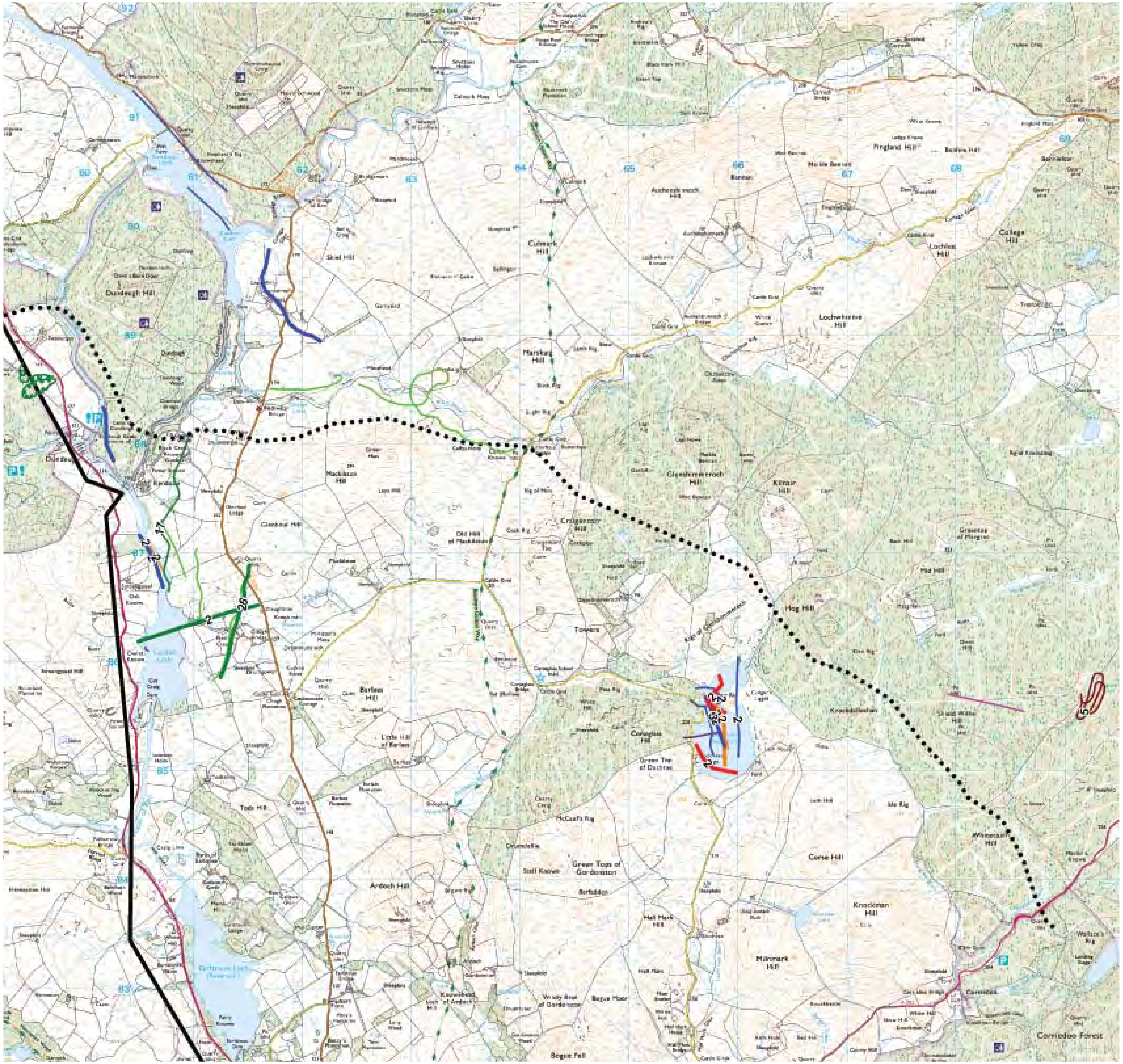
2 Number of birds per flight line (where >1)

*Includes species of conservation concern only (eg. Those species on the Red or Amber lists of the UK birds of conservation concern, Eaton et al. 2009)



0m 0.5km 1km 1.5km 2km

Figure 9.39 - Other Waterbirds Flights - Period 03 - Area C



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Legend

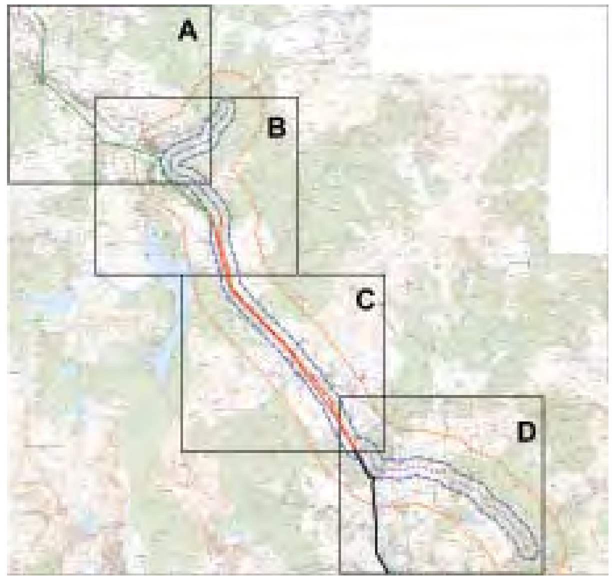
Waders, Ducks and other water bird flight lines - survey period 03 (Sept 2008 to May 2009) - Area D*

Line style	Meaning
solid black line	Existing N-Route
black dashed line	Proposed L7 Tower route
black dotted line	Proposed Wood Pole line route
maroon line	Wigeon
pink line	Teal
light blue line	Mallard
orange line	Goldeneye
red line	Oystercatcher
green line	Lapwing
dark blue line	Common snipe
purple line	Woodcock
bright green line	Curlew

Thicker line indicates flight at risk height

2 Number of birds per flight line (where >1)

*Includes species of conservation concern only (eg. Those species on the Red or Amber lists of the UK birds of conservation concern, Eaton et al. 2009)

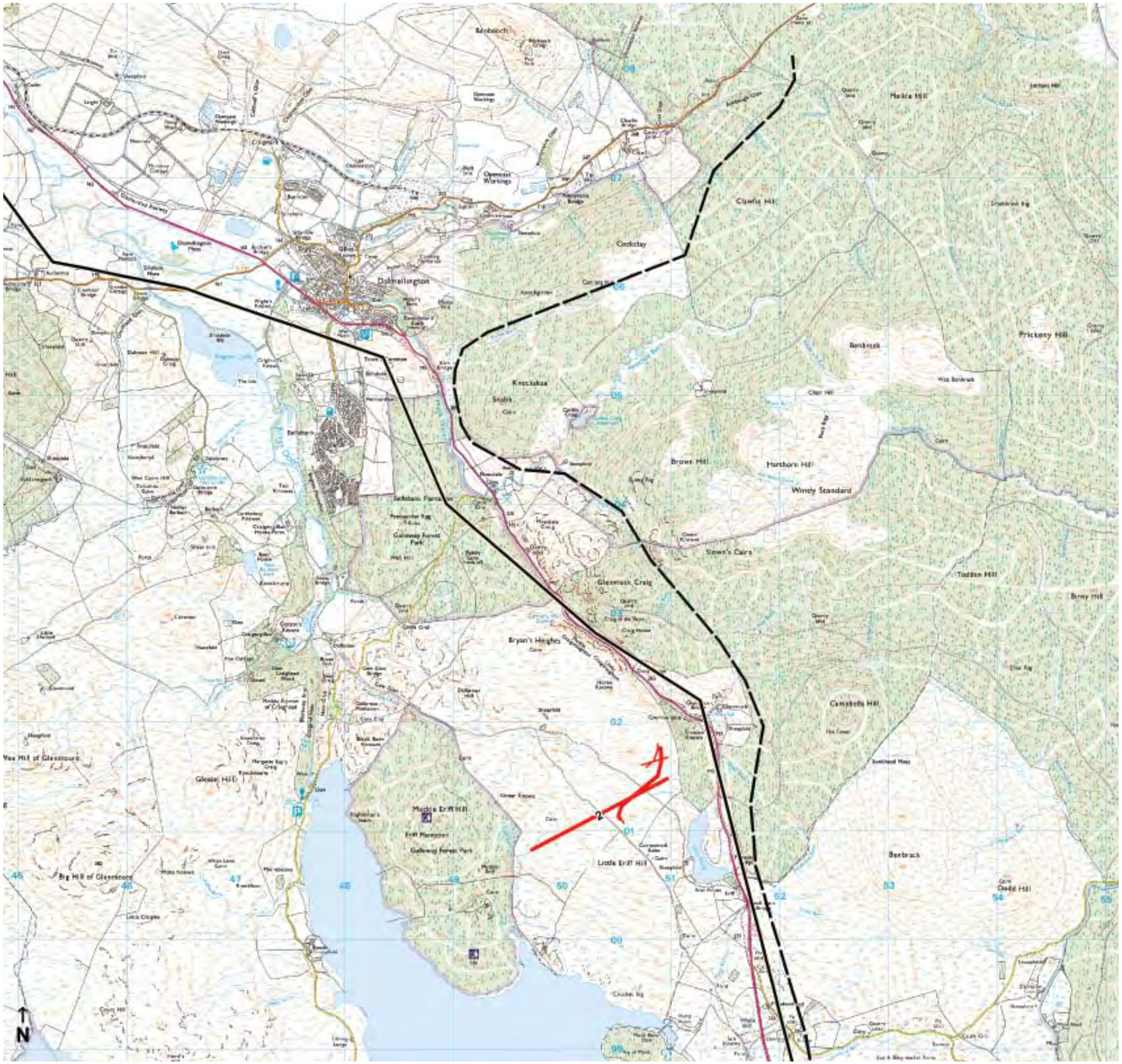


0.5km 1.5km

0m 1km 2km

N

Figure 9.40 - Other Waterbirds Flights - Period 03 - Area D



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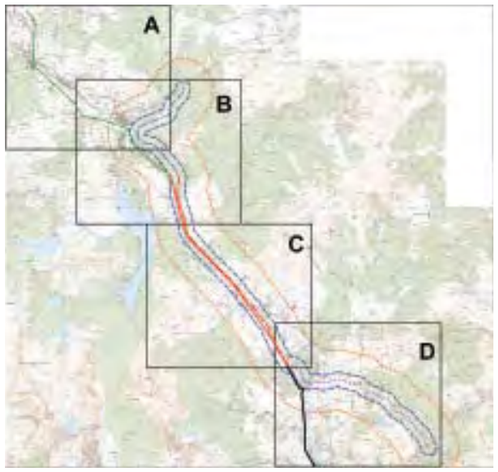
Legend

Black grouse flight lines - survey period 01 (Oct 2007 to May 2009) - Area B

- Existing N-Route
- Proposed L7 Tower route
- Proposed Wood Pole line route
- Black grouse

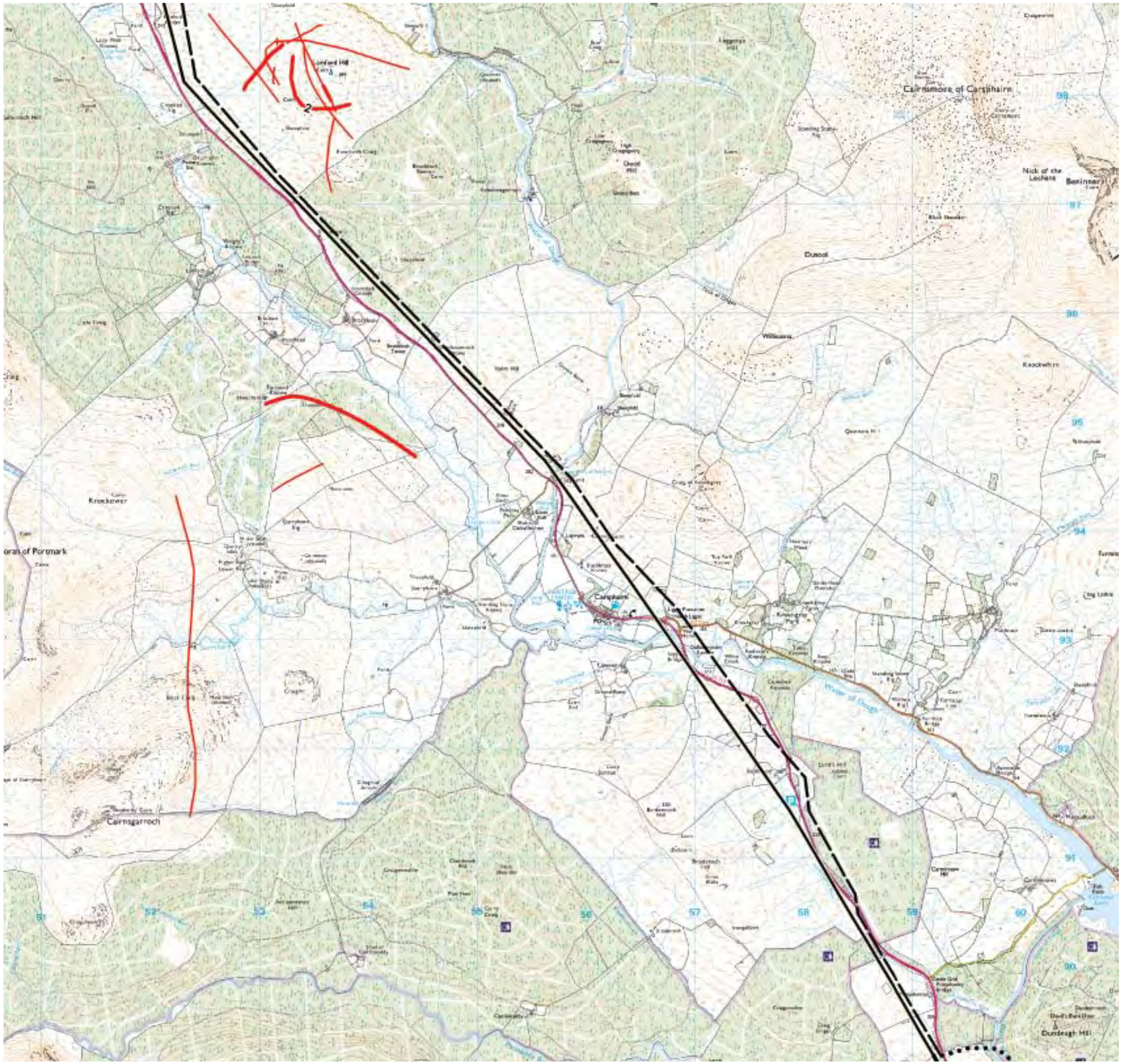
Thicker line indicates flight at risk height

2 Number of birds per flight line (where >1)



0m 0.5km 1km 1.5km 2km

Figure 9.41 - Black Grouse Flights - Area B



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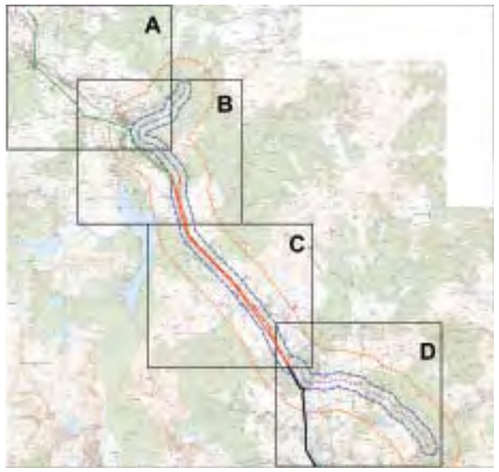
Legend

Black grouse flight lines - survey period 01 (Oct 2007 to May 2009) - Area C

- Existing N-Route
- Proposed L7 Tower route
- Proposed Wood Pole line route
- Black grouse

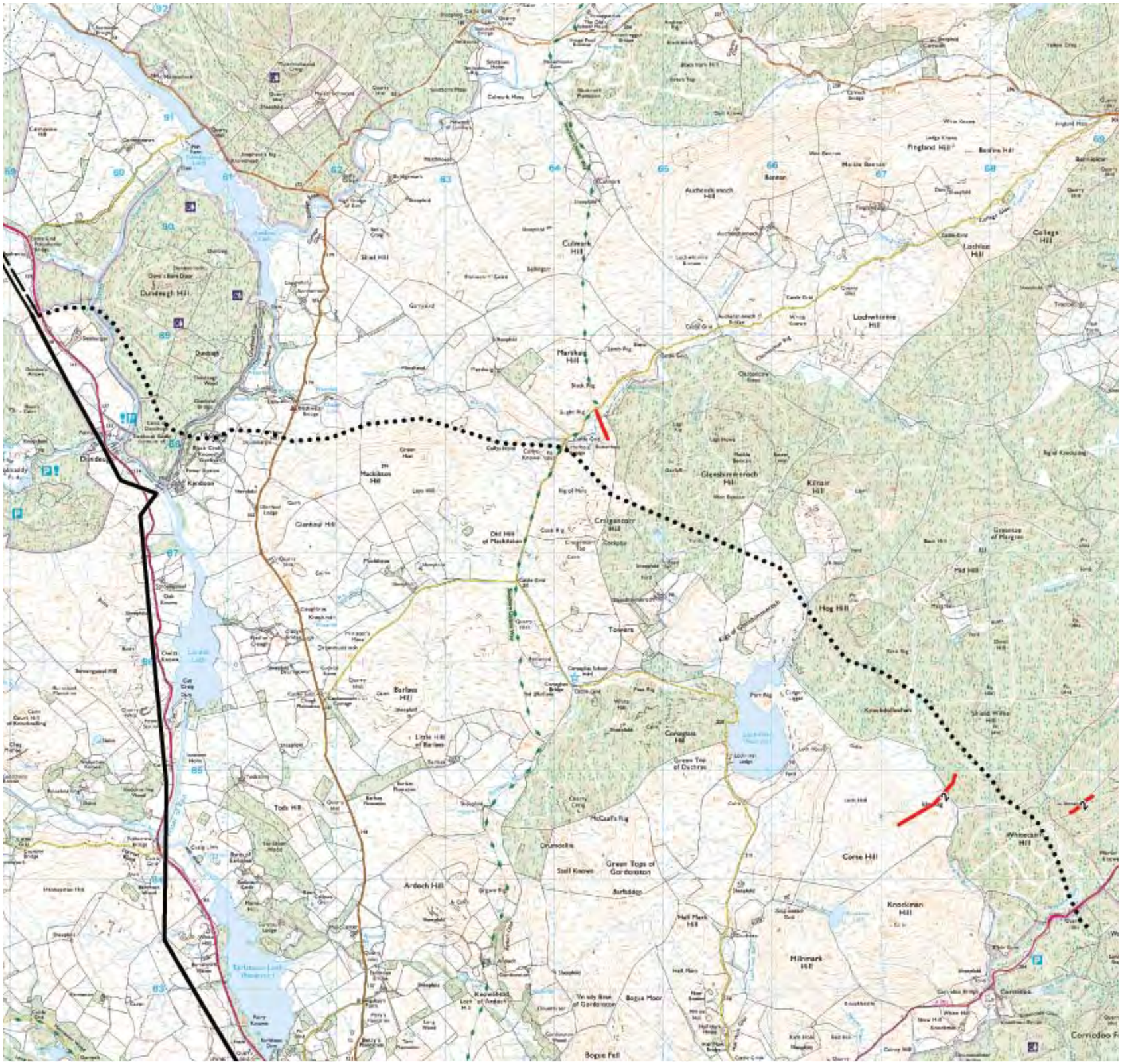
Thicker line indicates flight at risk height

2 Number of birds per flight line (where >1)



0m 0.5km 1km 1.5km 2km

Figure 9.42 - Black Grouse Flights - Area C



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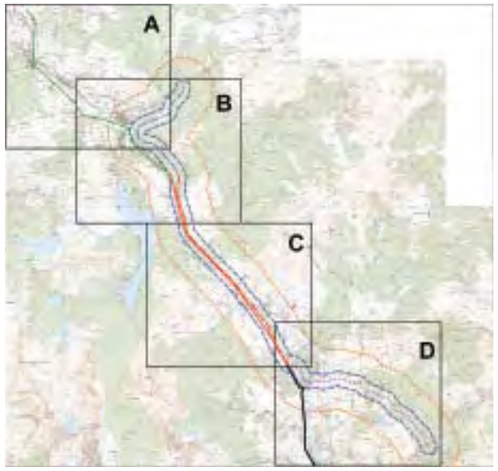
Legend

Black grouse flight lines - survey period 01 (Oct 2007 to May 2009) - Area D

- Existing N-Route
- Proposed L7 Tower route
- Proposed Wood Pole line route
- Black grouse

Thicker line indicates flight at risk height

2 Number of birds per flight line (where >1)



0m 0.5km 1km 1.5km 2km

Figure 9.43 - Black Grouse Flights - Area D

9.3 Baseline Conditions and Evaluation

9.3.1 Summary Description of the Study Area

1 The Study Area for the proposed grid connection extends for c. 30km in a broadly north-west / south-east alignment. The proposed decommissioning and dismantling of the existing 132 kV OHL from Dalshangan in the south to Smithston in the north extends the desk Study Area by some 10km further north (see Figure 9.01). For the purposes of this assessment, the project has been divided into four Sections, due to the large linear scale of the project, which are referred to throughout the baseline section of this chapter. The project sub-sections are defined as follows, from north to south:

- Section 1: Existing N-Route OHL from Smithston to Glenmuck, to be dismantled (c. 16.4km);
- Section 2: Proposed L7H tower-supported OHL from Glenmuck to the proposed substation at Meikle Hill (c. 8.8km);
- Section 3: Proposed L7H tower-supported OHL from Glenmuck to Dalshangan (c. 15.7km) and the approximately parallel section of the existing N-Route OHL from Glenmuck to Dalshangan to be dismantled (c. 15.5km); and
- Section 4: Proposed heavy duty wood pole OHL Dalshangan to the proposed Margree and Blackcraig Hill windfarm substations (c. 12.4km).

2 Only desk study information is available for Section 1, i.e. the existing OHL to be dismantled, as no field surveys were undertaken for this Section.

3 A relatively large proportion of the proposed OHL (c. 15.7km of the 36.9km total length) is routed in a broadly similar alignment to the existing 132 kV OHL (the N-Route), with the major watercourse crossings in similar locations. Sections at the northern (Section 2, c. 8.8km) and southern (Section 4, c. 12.4km) end of the proposed route, which do not 'parallel' the existing N-Route, pass through areas where there are no existing transmission OHLs and, primarily, through commercial conifer plantations. Approximately 8.4km of Section 2 (c. 95% of the total length) is routed within conifer plantation and approximately 6.9km of Section 4 (c. 56%) is routed within conifer plantation.

4 The elevation across the Study Area ranges from 454m above sea level within the Blackcraig Plantation to c. 100m at Kendoon. Generally, the landscape is more rugged and elevated towards the south, with more rounded hills in the central section and wide lowland valleys to the north. The Study Area is large and therefore comprises a wide range of habitats, however by area it is dominated by mature conifer plantation, unenclosed modified moorland vegetation communities and improved grassland. Predominant land uses are lowland beef and sheep rearing, extensive upland moorland sheep rearing and commercial forests. Habitats of particular conservation interest present within the survey area include semi-natural broadleaved woodland, wet modified blanket bog, wet and dry dwarf shrub heath, marsh / marshy grassland, unimproved neutral grassland, valley mire, fen and carr. Chapter 8 provides a more detailed description of the habitats present within the proposed OHL Study Area.

5 The primary ornithological interest within the Study Area, in relation to populations of taxonomic groups that are of conservation interest and also considered to be a relatively high risk of adverse effects from OHL development, are wintering wildfowl, breeding and wintering raptor species and breeding and wintering black grouse.

6 The route of the proposed OHL passes through a region of southwest Scotland that attracts nationally important populations of wintering swans and geese, in particularly whooper swan, greylag and Greenland white-fronted geese. Greenland white-fronted goose and greylag goose are qualifying species for the Loch Ken and River Dee Marshes Special Protection Area (SPA), which lies c. 9km to the south of the proposed OHL route. Although no direct effects on this SPA would arise from this project the potential for geese associated with the populations that are the qualifying interest of the SPA to be affected by the project was an important consideration from the route selection process onwards. These populations are known to pass through the Study Area during migration periods, although there are roosting and feeding sites within the Study Area that can occasionally support significant numbers of these species. Due to the relative importance of this part of south-west Scotland for these species, and their known relatively high susceptibility to collision with OHLs, they have been carefully considered from an early stage.

7 South-west Scotland, including parts of the area that the proposed OHL passes through, is also a nationally important wintering area for moorland raptor species, such as hen harrier. There are also scattered breeding records within the Study Area, although the important breeding sites are outside of this area. There is also a nationally important population of breeding red kite, which was reintroduced at sites to the south of the proposed OHL route, present towards the southern end of the Study Area. Osprey breed within the region, although well to the south of the proposed OHL route; this species may occur in the vicinity of the proposed OHL route on migration though southern Scotland to and from key breeding areas to the north.

8 Scattered throughout the Study Area, but in within the southern part in particular, are areas that support important populations of black grouse, a species of high national and regional conservation concern.

9 Bird species of conservation concern that are known or considered likely to be present in the general area, and with relatively greater sensitivity to OHL development, are listed in Table 9.07, below.

Table 9.07 - Bird Species (breeding, passage or wintering) of Conservation Concern and Sensitivity to OHL Development Present / Potentially Present in the Study Area.

Common Name	Scientific Name	Sch. 1 (ii)	Ann. I (iii)	BoCC (iii)
Little grebe	*Tachybaptus ruficollis*			amber
Whooper swan	*Cygnus cygnus*	x	x	amber
Pink-footed goose	*Anser brachyrhynchus*			amber
Greenland white-fronted goose	*Anser albifrons flavirostris*		x	red
Greylag goose	*Anser anser*	x(iv)		amber
Goldeneye	*Bucephala clangula*	x		amber
Red kite	*Milvus milvus*	x	x	amber
Hen harrier	*Circus cyaneus*	x	x	red
Goshawk	*Accipiter gentilis*	x		green
Osprey	*Pandion haliaetus*	x	x	amber
Merlin	*Falco columbarius*	x	x	amber
Peregrine	*Falco peregrinus*	x	x	green
Black grouse	*Tetrao tetrix*			red
Oystercatcher	*Haematopus ostralegus*			amber
Golden plover	*Pluvialis apricaria*		x	amber
Lapwing	*Vanellus vanellus*			red
Common snipe	*Gallinago gallinago*			amber
Woodcock	*Scalopax rusticola*			amber
Redshank	*Tringa totanus*			amber
Curlew	*Numenius arquata*			amber
Cuckoo	*Cuculus canorus*			red
Barn owl	*Tyto alba*	x		amber
Short-eared owl	*Asio flammeus*		x	amber
Nightjar	*Caprimulgus europaeus*		x	red

i. Species listed on Schedule 1 to the Wildlife and Countryside Act 1981 (as amended).
ii. Species listed on Annex 1 of the Council Directive 79/409/EEC on the conservation of wild birds.
iii. UK Birds of Conservation Concern status (Eaton et al. 2009).
iv. Schedule 1 within native breeding range only (i.e. Outer Hebrides, Caithness, Sutherland and Wester Ross, only during the close season).

9.3.2 Do Nothing Scenario

1 Due to the complex range of potential influencing factors it is difficult to predict with any certainty what would occur to the status of key bird species populations and supporting habitats in the Study Area should the proposed OHL (and dismantling of the N-Route) not go ahead. However, should current land use and management practice continue it is considered likely that, for most species of conservation concern, excluding black grouse and red kite, that regional population status will remain broadly similar to the current situation; with the exception of fluctuations in some raptor and owl species in response to natural cyclical variability in prey species density. In relation to black grouse, this species has undergone severe declines, both nationally and regionally, over recent decades. Declines are likely to continue although ongoing focused conservation efforts in Dumfries & Galloway to increase the extent and quality of habitats for this species will hopefully help to halt and potentially reverse this trend. In addition, potential inadvertent benefits for black grouse may arise from the rotational cropping of forest plantations which will temporarily increase habitat availability,. In relation to red kite, evidence from surveys for this project suggests that the breeding population may in the near future begin to colonise areas of suitable habitat to the north of the current core range (which is towards the southern end of the proposed OHL Study Area).

9.3.3 Designated Sites

1 Full details of all relevant designations are given in Appendix C.4 of Chapter 8. The following is a summary of the statutory designated sites in the general vicinity of the proposed / existing OHLs.

9.3.3.1 Statutory Designations

1 The proposed route of the OHL does not pass through, nor is it adjacent to, any statutory sites designated for ornithological interest. However, several sites with ornithological interest (i.e. specific mention has been made to bird species in the citation) are situated within 10km of the proposed route. These include:

9.3.3.1.1 East Ayrshire

- Bogton Loch SSSI (NS 470 052) is approximately 0.2km south of the N-Route to be dismantled and approximately 1.5km west of the proposed OHL route. Noted features including the fen and open water habitats and the breeding bird assemblage that the site supports, which includes grasshopper warbler (*Locustella certhiola*), spotted flycatcher (*Muscicapa striata*), willow tit (*Poecile montana*), reed bunting (*Emberiza schoeniclus*) and black-headed gull (*Chroicocephalus ridibundus*).

9.3.3.1.2 Dumfries & Galloway

- Loch Ken and River Dee Marshes SPA / Ramsar site is approximately 9km south-west of the southern end of the proposed OHL route. This is an internationally important area for wintering and passage wild geese, in particularly Greenland white-fronted goose (*Anser albifrons flavirostris*) and greylag goose (*Anser anser*).
- Merrick-Kells SAC / SSSI (NX 450 840) is approximately 6km south-west of the proposed and existing OHL routes. This site is the most extensive upland area in Galloway unaffected by afforestation and has been designated as a SSSI due to the important blanket bog habitats within the site and the associated upland breeding bird assemblage, particularly raptors and waders.
- Kenmure Holms SSSI (NX 638 765) is approximately 8km to the south-west of the proposed substation for Blackcraig Hill windfarm. This site is noted as a good post-hatching refuge for breeding waterbirds, it is also part of a RSPB reserve.

9.3.3.2 Non-Statutory Designations

1 There are RSPB Reserves at Kenmure Holms and Ken-Dee Marshes (see above for location details).

2 A number of wildlife sites, including Provisional Wildlife Sites lie within 3km (at their nearest point) of the proposed route of the OHL, with a number of these having ornithological interest. These are listed in Appendix C.4 of Chapter 8.

9.3.3.3 Evaluation

1 There are no statutory sites designated for ornithological interest (i.e. SPAs, SSSIs, NNRs) within or adjacent to the route of the proposed OHL. Although direct effects on such sites are therefore not predicted it is necessary to assess the potential for any bird populations that are the qualifying / cited interest of any statutory designated site in the wider area to be adversely affected by this proposal whilst outside of the designated site. For this assessment consideration has been given to the potential for adverse effects on goose species (greylags in particular) which are the qualifying interest of Loch Ken and River Dee Marshes SPA and Ramsar Site. This site supports internationally important numbers of wintering Greenland white-fronted goose and greylag goose. Consequently, it is considered to be of Very High nature conservation value.

2 A section of the existing N-Route OHL that is due to be dismantled as part of this proposal passes within 500m of Bogton Loch SSSI and Dalmellington Moss SSSI. The citation for Bogton Loch includes a number of breeding bird species as a notified natural feature of the SSSI. For the purposes of this assessment this site is considered to be of High nature conservation value.

9.3.4 Summary of Flight Activity Recorded in all Sections

1 The total number of flight lines recorded for all target species (and selected secondary species), at all heights, within the proposed OHL survey area and the number of recorded flights that passed over the route of the proposed and existing OHLs (i.e. transits) are given in Table 9.08, below. The estimated annual number of flights across the proposed OHL and existing OHL to be dismantled for each of the target species are given in Appendix D.5. Table 9.09 provides a comparison of total flights across the existing and proposed OHLs between the thee flight activity survey periods.

Table 9.08 - Recorded Flights by Target and Selected Secondary Species within the Proposed OHL Survey Area and Transits, all Heights Bands, Across the Routes of the Proposed and Existing OHLs (target species highlighted in bold)

Common name	Scientific name	No of flights (tot. birds recorded)	% of flight lines at collision risk height	No of transits proposed OHLi	No of transits existing OHLii
Little grebe	*Tachybaptus ruficollis*	3	0	0	0
Cormorant	*Phalacrocorax carbo*	431	37.73	58	38
Grey heron	*Ardea cinerea*	327	40.19	101	58
Mute swan	*Cygnus olor*	30	41.66	2	5
Whooper swan	***Cygnus cygnus***	**227**	**30.23**	**79**	**79**
Pink-footed goose	***Anser brachyrhynchus***	**657**	**10.00**	**438**	**167**
Greylag goose	***Anser anser***	**1353**	**41.73**	**343**	**381**
Wigeon	*Anas penelope*	65	28.57	0	0
Teal	*Anas crecca*	38	13.33	0	3
Mallard	*Anas platyrhynchos*	204	37.83	17	17
Goldeneye	*Bucephala clangula*	97	28.12	0	10
Goosander	*Mergus merganser*	74	59.25	15	6
Red kite	***Milvus milvus***	**326**	**46.64**	**45**	**3**
Hen harrier	***Circus cyaneus***	**99**	**33.33**	**14**	**6**
Goshawk	***Accipiter gentilis***	**22**	**76.19**	**8**	**1**
Golden eagle	***Aquila chrysaetos***	**1**	**0**	**0**	**0**
Osprey	***Pandion haliaetus***	**2**	**50.00**	**0**	**0**
Kestrel	*Falco tinnunculus*	785	54.20	192	214
Merlin	***Falco columbarius***	**23**	**52.00**	**5**	**5**
Peregrine	***Falco peregrinus***	**72**	**38.35**	**42**	**4**
Black grouse	***Tetrao tetrix***	**35**	**40.90**	**0**	**0**
Oystercatcher	*Haematopus ostralegus*	74	40.90	33	18
Golden plover	***Pluvialis apricaria***	**22**	**33.33**	**0**	**0**
Lapwing	*Vanellus vanellus*	144	36.84	54	20
Common snipe	*Gallinago gallinago*	18	47.36	1	4
Woodcock	*Scolopax rusticola*	7	0	0	0
Redshank	*Tringa totanus*	12	30.00	0	0
Curlew	Numenius arquata	131	38.67	34	30
Lesser black-backed gull	*Larus fuscus*	3	0	0	0
Great black-backed gull	*Larus marinus*	3	0	2	0
Barn owl	***Tyto alba***	**8**	**62.50**	**3**	**0**
Short-eared owl	***Asio flammeus***	**7**	**42.80**	**0**	**0**

i - 'transits at all heights' are flight lines (multiplied by the number of birds, if flocks were recorded as single flight lines) that passed within 100m of the proposed or existing OHLs within any of the flight height recording bands.
ii - flight activity surveys were not undertaken for the entire length of the existing OHL to be dismantled, the survey included c. 6.5km of the southern end of Section 1 (i.e. c. 9.9km of the 31.9km of OHL to be dismantled was not covered by the flight activity survey).

Table 9.09 - Transits per hour at all Flight Height Recording Bands by Target and Selected Secondary Species Across the Routes of the Proposed OHL within the three Flight Activity Survey Periods (target species highlighted in bold, target species which were not observed during flight activity surveys crossing the proposed or existing OHLs are not listed).

Species	Transits hr-1 of observation Oct 2007 to mid-Apr 2008	Transits hr-1 of observation mid-Apr 2008 to Aug 2008	Transits hr-1 of observation Sep 2008 to May 2009	Transits hr-1 of observation for all Survey Periods
Cormorant	0.11	0.16	0.19	0.46
Grey heron	0.23	0.68	0.36	1.27
Mute swan	0.00	0.00	0.01	0.01
Whooper swan	**0.51**	**0.00**	**0.24**	**0.76**
Pink-footed goose	**4.97**	**0.00**	**1.46**	**6.43**
Greylag goose	**2.70**	**0.18**	**0.80**	**3.69**
Mallard	0.04	0.28	0.03	0.35
Goosander	0.01	0.00	0.10	0.11
Red kite	**0.08**	**0.06**	**0.18**	**0.32**
Hen harrier	**0.07**	**0.00**	**0.05**	**0.12**
Goshawk	**0.01**	**0.00**	**0.05**	**0.06**
Kestrel	0.98	1.29	0.47	2.74
Merlin	**0.01**	**0.00**	**0.05**	**0.06**
Peregrine	**0.04**	**0.11**	**0.15**	**0.30**
Oystercatcher	0.06	0.07	0.17	0.30
Lapwing	0.48	0.00	0.23	0.71
Common snipe	0.02	0.00	0.00	0.02
Curlew	0.09	0.26	0.10	0.45
Great black-backed gull	0.00	0.04	0.00	0.04
Barn owl	**0.00**	**0.00**	**0.03**	**0.03**

9.3.5 Summary of Breeding Bird Survey Results

1 A total of 36 species were confirmed or suspected of breeding within the OHL survey area based on surveys completed in 2008 and 2009 (see Appendix D.4 for a full species list). Figures 9.44 to 9.55 show the collated results of the breeding bird surveys apart from the results of the breeding raptor and owl surveys which are provided in a separate Confidential Ornithological Appendix. Apparent territories of species of notable local, regional or national conservation concern, recorded within the breeding bird survey area are shown.

2 The survey area, as a whole, supports breeding bird assemblages typically associated with the dominant habitat types of commercial conifer plantation, enclosed lowland pasture and the mosaic of upland habitats (e.g. wet modified bog, marsh / marshy grassland, wet heath and semi-improved acid grassland). Relatively diverse, in the context of the survey area, breeding assemblages of songbirds were associated with the small areas of mature broadleaved woodland (particularly at the Carse of Dundegh). Breeding waders were recorded in relatively localised areas of enclosed wet pasture and less modified areas of unenclosed moorland. Breeding raptors occur throughout the survey area although with ground nesting moorland species of conservation concern being poorly represented given the extent of potentially suitable habitats.

3 A total of eight raptor / owl species were recorded as breeding with 2km of the proposed OHL route. Species of conservation concern include: goshawk, peregrine, merlin and barn owl. Further details are provided in the individual species accounts below and in the Confidential Ornithological Appendix.

4 A total of five wader species were recorded as breeding within 500m of the proposed OHL route. Species of conservation concern include: curlew, lapwing, oystercatcher and common snipe.

5 Occasional black grouse flight activity was recorded in Sections 3 and 4 of the OHL Study Area. No lekking activity or evidence of breeding activity was recorded during surveys along the proposed OHL route in 2008 or 2009 (further information is also provided in the black grouse species account below).

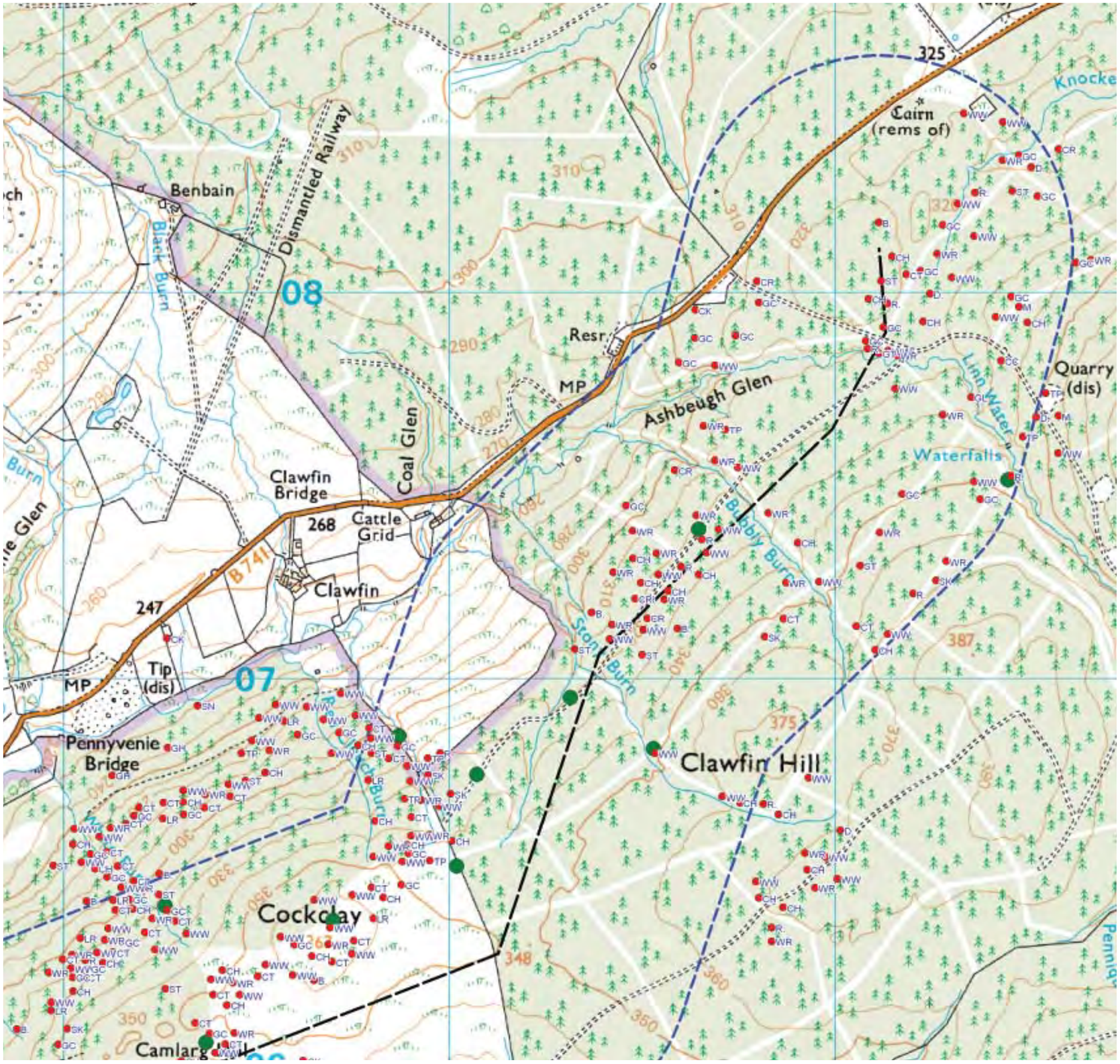
6 A total of 20 songbird species were confirmed as breeding within the survey area: nine species (grasshopper warbler, (*Locustella naevia)*; house sparrow, (*Passer domesticus*); lesser redpoll, (*Carduelis flammea)*; skylark, (*Alauda arvensis*); song thrush, (*Turdus philomelos)*; spotted flycatcher, (*Muscicapa striata)*; starling, (*Sturnus vulgaris*); cuckoo, (*Cuculus canorus)* and tree Pipit, (*Anthus trivialis)*) are on the UK red list (Eaton *et al*. 2009); whilst 10 species recorded are on the UK amber list: common redstart, (*Phoenicurus phoenicurus)*; common whitethroat, (*Sylvia communis*); dunnock, (*Prunella modularis*); grey wagtail, (*Motacilla cinerea)*; meadow pipit, (*Anthus pratensis)*; mistle thrush, (*Turdus viscivorus)*; northern wheatear, (*Oenanthe oenanthe)*; reed bunting, (*Emberiza schoeniclus*); whinchat, (*Saxicola rubetra)*; and willow warbler, (*Phylloscopus trochilus)*. All of the amber listed bird species of conservation concern are not uncommon in this part of Scotland, although their UK populations have undergone substantial declines over the past 25 years. Song thrush, dunnock, skylark, spotted flycatcher, lesser redpoll, grasshopper warbler, curlew, reed bunting and cuckoo, are listed in the UK Biodiversity Action Plan as priority species.

7 The estimated apparent territories for all species of conservation concern recorded during the breeding bird surveys are given in Table 9.10. This number will be an underestimate of the total in the whole survey area, as the breeding bird survey was not designed to census all actual territories. Data from point counts is excluded apart from breeding registrations of cuckoo and song thrush. The bird species and number of breeding registrations at each woodland point count is given in Appendix D.8. The complete list of records (i.e. of all species recorded during breeding bird surveys) including species of conservation interest and their local (i.e. survey area), regional, national and international status is given in Appendix D.4.

Table 9.10 - Estimated Breeding Pairs / Territories of Birds of Conservation Concern Recorded within the Breeding Bird Survey Area and within each Section of Project.

Common Name	Scientific Name	No. of pairs / territories i				Sch. 1 ii	Ann. 1 iii	SBL/ BAP iv	BoCC v
		S2	S3	S4	Tot.				
Little grebe	*Tachybaptus ruficollis*	0	1	0	1				amber
Mallard	*Anas platyrhynchos*	0	2	0	2				amber
Goshawk	*Accipiter gentilis*	1	0	2	3	x			green
Common kestrel	*Falco tinnunculus*	7	5	5	17			BL	amber
Merlin	*Falco columbarius*	2	1	0	3	x	x	BL / L	amber
Peregrine falcon	*Falco peregrinus*	2	0	1	3	x	x	BL / L	green
Oystercatcher	*Haematopus ostralegus*	0	8	1	9				amber
Lapwing	*Vanellus vanellus*	0	2	0	2			BL / N / L	red
Common snipe	*Gallinago gallinago*	1	9	2	12				amber
Common redshank	*Tringa totanus*	0	0	1	1				amber
Curlew	*Numenius arquata*	0	7	0	7			BL / N / L	amber
Common sandpiper	*Actitis hypoleucos*	0	2	0	2				amber
Cuckoo	*Cuculus canorus*	4	1	0	5			N	red
Barn owl	*Tyto alba*	2	3	5	10	x		BL	amber
Nightjar	*Caprimulgus europaeus*	0	0	1	1		x	BL / N	red
Swallow	*Hirundo rustica*	0	8	0	8				amber
House martin	*Delichon urbica*	0	5	0	5				amber
Skylark	*Alauda arvensis*	2	64	37	103			BL / N	red
Meadow pipit	*Anthus pratensis*	N/A							amber
Tree pipit	*Anthus trivialis*	9	5	10	24			N	red
Grey wagtail	*Motacilla cinerea*	1	7	7	15				amber
Starling	*Sturnus vulgaris*	0	8	0	8			N	red
Dunnock	*Prunella modularis*	6	17	15	38			N	amber
Grasshopper warbler	*Locustella naevia*	2	6	1	9			N	red
Common whitethroat	*Sylvia communis*	1	1	5	7				amber
Wood warbler	*Phylloscopus sibilatrix*	0	0	1	1			BL / N	red
Willow warbler	*Phylloscopus trochilus*	95	87	117	299				amber
Pied flycatcher	*Ficedula hypoleuca*	0	0	1	1				amber
Spotted flycatcher	*Muscicapa striata*	0	4	3	7			BL / N	red
Whinchat	*Saxicola rubetra*	0	22	6	28				amber
Northern wheatear	*Oenanthe oenanthe*	0	7	3	10				amber
Common redstart	*Phoenicurus phoenicurus*	0	2	3	5				amber
Song thrush	*Turdus philomelos*	13	20	19	52			BL / N	red
Mistle thrush	*Turdus viscivorus*	3	4	2	9				amber
House sparrow	*Passer domesticus*	0	6	0	6			N	red
Lesser redpoll	*Carduelis cabaret*	11	2	4	17			N	red
Bullfinch	*Pyrrhula pyrrhula*	0	0	1	1			BL / N	amber
Reed bunting	*Emberiza schoeniclus*	0	4	4	8			BL / N	amber

i - No specific breeding surveys were undertaken for Section 1, i.e. the existing OHL to be dismantled from near Smithston to Dalmellington. Figures in italics (for raptors and owls) refer to estimated occupied breeding territories in the wider survey area (i.e. up to 2km from the proposed OHL) and include records from third parties for recent breeding records. Meadow pipit territories were not systematically recorded.
ii - Species listed on Schedule 1 to the Wildlife and Countryside Act 1981, as amended.
iii - Annex 1 of Council Directive 79/409/EEC on the conservation of wild birds (the 'EC Birds Directive').
iv - Scottish Biodiversity List (BL) species and Biodiversity Action Plan (National, N or Local, L) Priority species.
v – UK Birds of Conservation Concern (BoCC) (Eaton et al. 2009).



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Legend

Moorland and Woodland Breeding Bird Survey Results

- 500m buffer (breeding bird survey area)
- Existing N-Route
- Proposed L7 Tower route
- Proposed Wood Pole line route
- Woodland point count locations

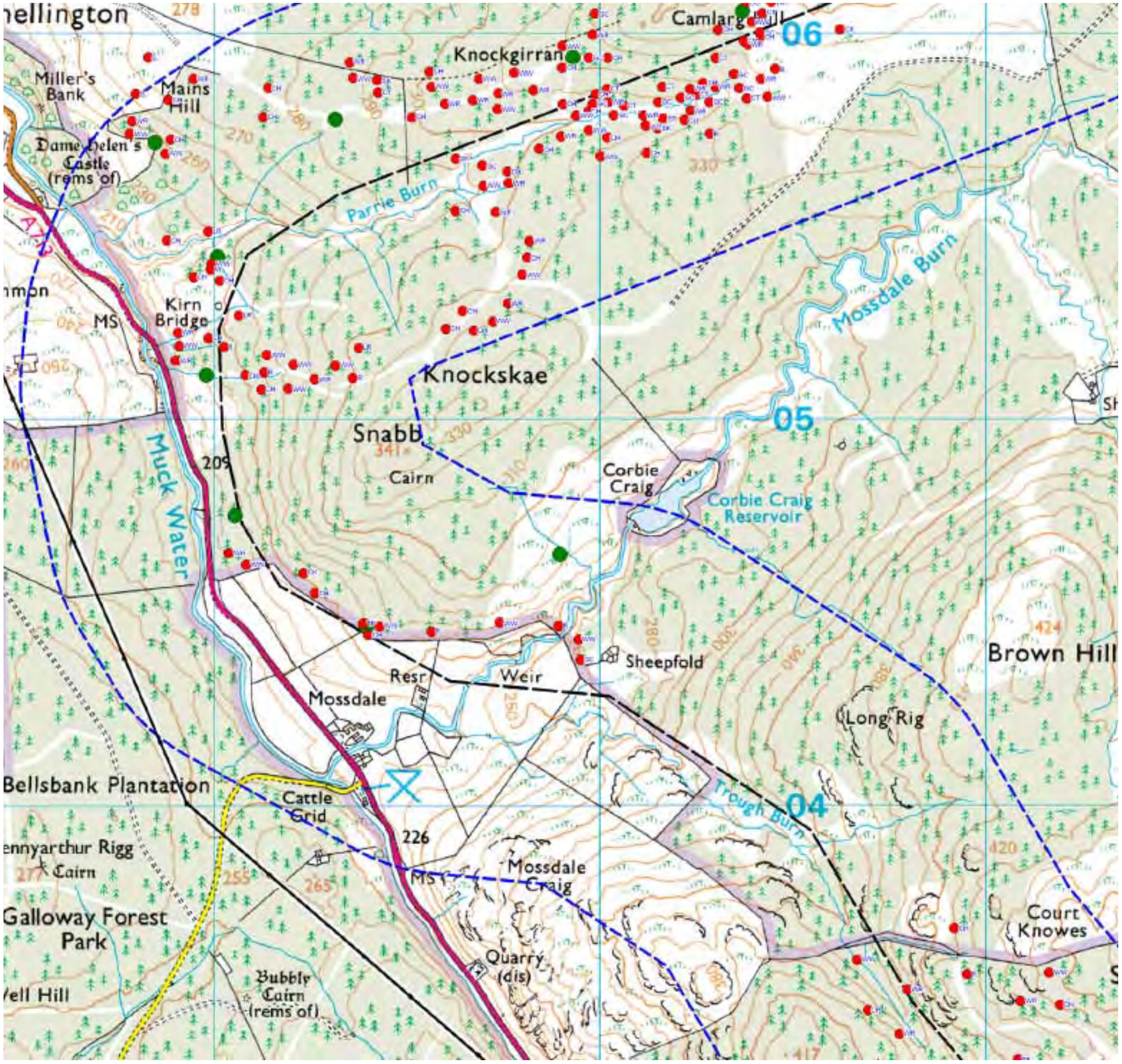
NB. results of breeding raptor and owl surveys are provided separately in Confidential Appendix D.10. Meadow pipit registrations were not mapped

B	Blackbird	M.	Mistle thrush
BC	Blackcap	MA	Mallard
BF	Bullfinch	MG	Magpie
BT	Bluetit	MP	Meadow pipit
C.	Carrion crow	OC	Oystercatcher
CC	Chiffchaff	PF	Pied flycatcher
CH	Chaffinch	PH	Pheasant
CK	Cuckoo	PW	Pied wagtail
CR	Crossbill	R.	Robin
CS	Common sandpiper	RB	Reed bunting
CT	Coal tit	RS	Red start
CU	Curlew	S.	Skylark
D.	Dunnock	SC	Stonechat
DI	Dipper	SF	Spotted flycatcher
GC	Goldcrest	SG	Starling
GH	Grasshopper warbler	SK	Siskin
GL	Grey wagtail	SL	Swallow
GO	Gold finch	SM	Sand martin
GR	Green finch	SN	Common snipe
GS	Great spotted woodpecker	ST	Song thrush
GT	Great tit	SW	Sedge warbler
GW	Garden warbler	TC	Tree creeper
H.	Grey heron	TP	Tree pipit
HM	House martin	W.	Wheatear
HS	House sparrow	WC	Whinchat
JD	Jackdaw	WH	Whitethroat
L.	Lapwing	WO	Wood warbler
LG	Little grebe	WP	Woodpigeon
LR	Lesser redpoll	WR	Wren
LT	Long-tailed tit	WW	Willow warbler

0.25km

0m 0.5km

Figure 9.44 - Moorland and Woodland Breeding Bird Results - 1 of 12



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Legend

Moorland and Woodland Breeding Bird Survey Results

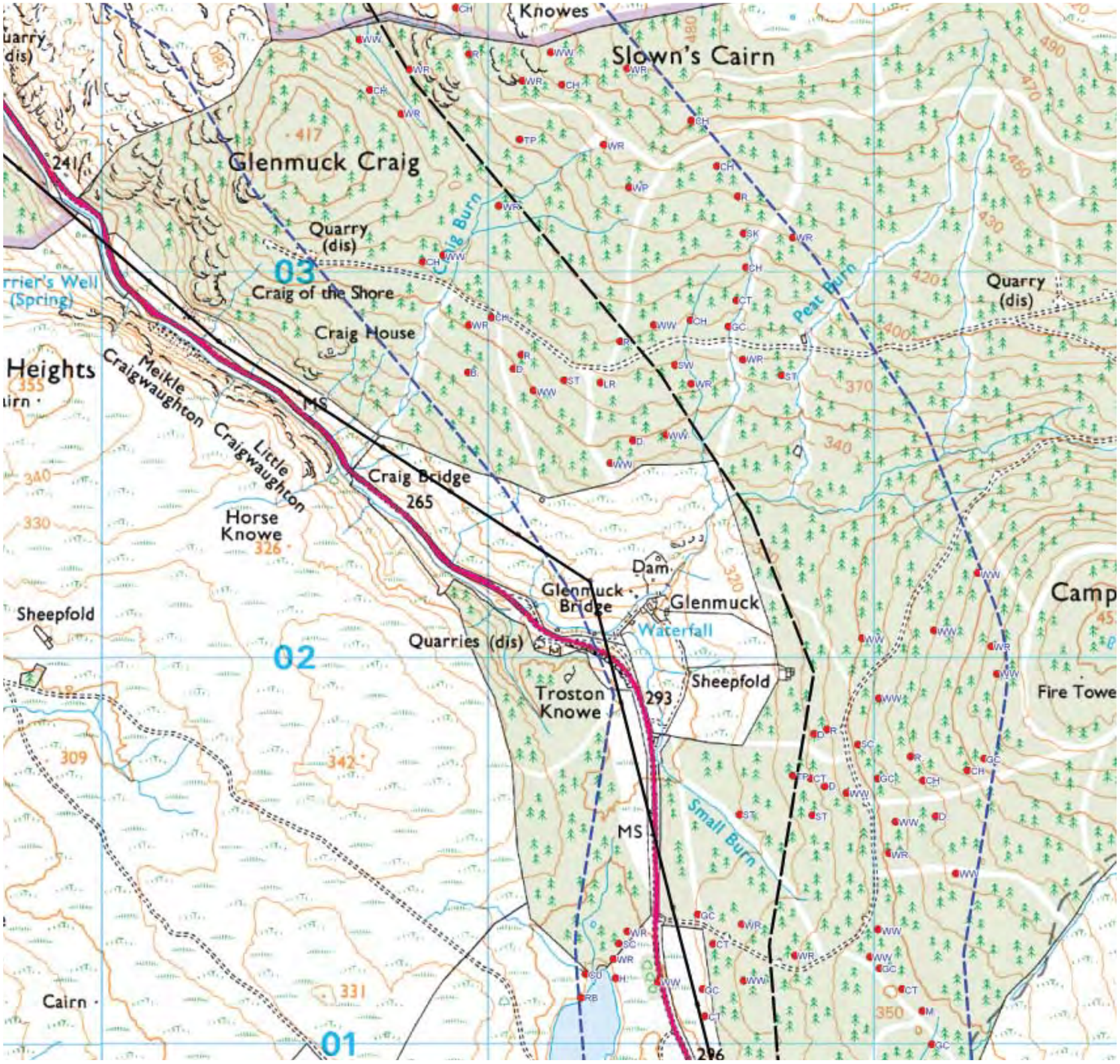
- 500m buffer (breeding bird survey area)
- Existing N-Route
- Proposed L7 Tower route
- Proposed Wood Pole line route
- Woodland point count locations

NB. results of breeding raptor and owl surveys are provided separately in Confidential Appendix D.10. Meadow pipit registrations were not mapped

B	Blackbird	M.	Mistle thrush
BC	Blackcap	MA	Mallard
BF	Bullfinch	MG	Magpie
BT	Bluetit	MP	Meadow pipit
C.	Carrion crow	OC	Oystercatcher
CC	Chiffchaff	PF	Pied flycatcher
CH	Chaffinch	PH	Pheasant
CK	Cuckoo	PW	Pied wagtail
CR	Crossbill	R.	Robin
CS	Common sandpiper	RB	Reed bunting
CT	Coal tit	RS	Red start
CU	Curlew	S.	Skylark
D.	Dunnock	SC	Stonechat
DI	Dipper	SF	Spotted flycatcher
GC	Goldcrest	SG	Starling
GH	Grasshopper warbler	SK	Siskin
GL	Grey wagtail	SL	Swallow
GO	Gold finch	SM	Sand martin
GR	Green finch	SN	Common snipe
GS	Great spotted woodpecker	ST	Song thrush
GT	Great tit	SW	Sedge warbler
GW	Garden warbler	TC	Tree creeper
H.	Grey heron	TP	Tree pipit
HM	House martin	W.	Wheatear
HS	House sparrow	WC	Whinchat
JD	Jackdaw	WH	Whitethroat
L.	Lapwing	WO	Wood warbler
LG	Little grebe	WP	Woodpigeon
LR	Lesser redpoll	WR	Wren
LT	Long-tailed tit	WW	Willow warbler

0m — 0.25km — 0.5km

Figure 9.45 - Moorland and Woodland Breeding Bird Results - 2 of 12



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Legend

Moorland and Woodland Breeding Bird Survey Results

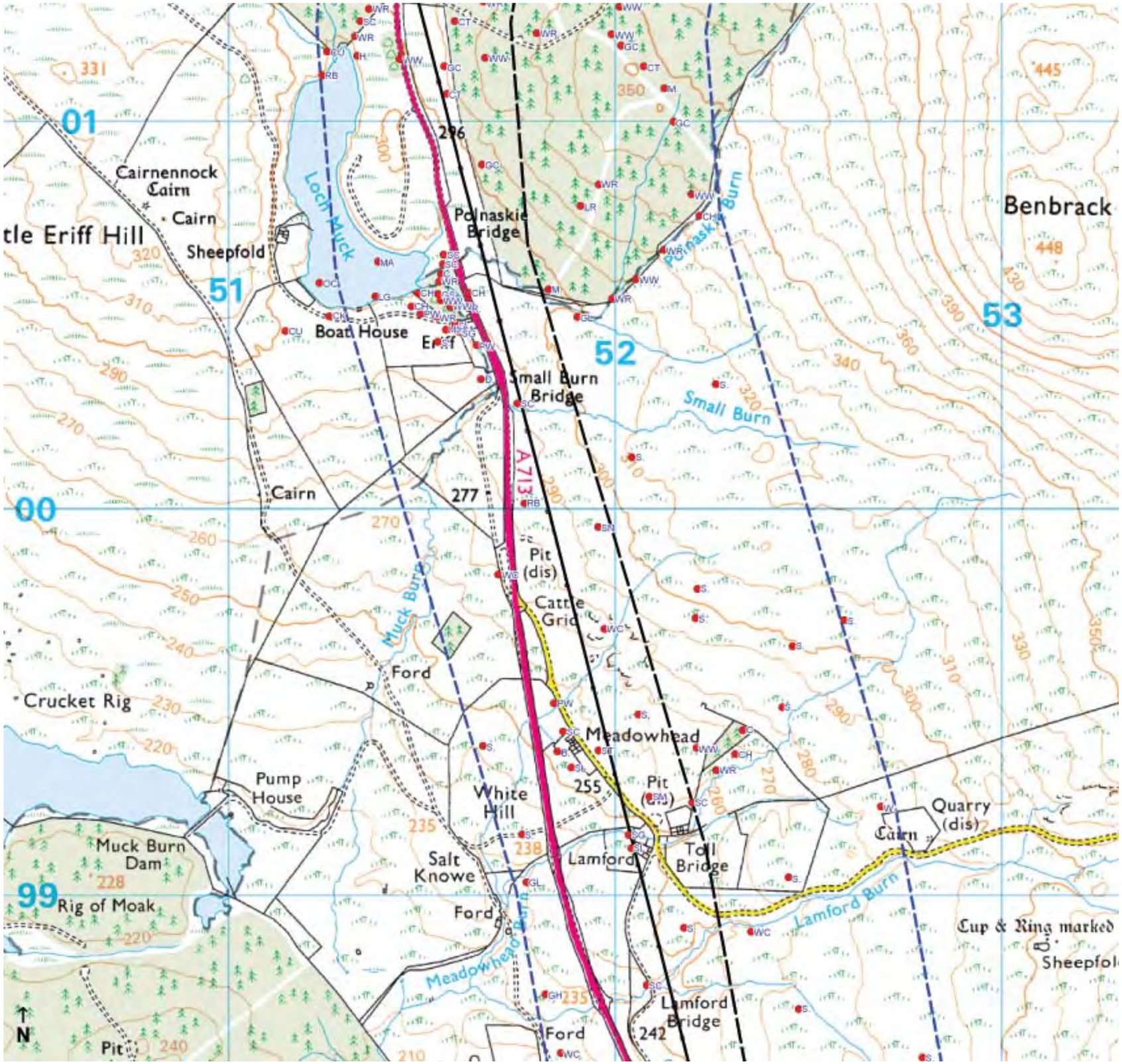
- 500m buffer (breeding bird survey area)
- Existing N-Route
- Proposed L7 Tower route
- Proposed Wood Pole line route
- Woodland point count locations

NB. results of breeding raptor and owl surveys are provided separately in Confidential Appendix D.10. Meadow pipit registrations were not mapped

B	Blackbird	M.	Mistle thrush
BC	Blackcap	MA	Mallard
BF	Bullfinch	MG	Magpie
BT	Bluetit	MP	Meadow pipit
C.	Carrion crow	OC	Oystercatcher
CC	Chiffchaff	PF	Pied flycatcher
CH	Chaffinch	PH	Pheasant
CK	Cuckoo	PW	Pied wagtail
CR	Crossbill	R.	Robin
CS	Common sandpiper	RB	Reed bunting
CT	Coal tit	RS	Red start
CU	Curlew	S.	Skylark
D.	Dunnock	SC	Stonechat
DI	Dipper	SF	Spotted flycatcher
GC	Goldcrest	SG	Starling
GH	Grasshopper warbler	SK	Siskin
GL	Grey wagtail	SL	Swallow
GO	Gold finch	SM	Sand martin
GR	Green finch	SN	Common snipe
GS	Great spotted woodpecker	ST	Song thrush
GT	Great tit	SW	Sedge warbler
GW	Garden warbler	TC	Tree creeper
H.	Grey heron	TP	Tree pipit
HM	House martin	W.	Wheatear
HS	House sparrow	WC	Whinchat
JD	Jackdaw	WH	Whitethroat
L.	Lapwing	WO	Wood warbler
LG	Little grebe	WP	Woodpigeon
LR	Lesser redpoll	WR	Wren
LT	Long-tailed tit	WW	Willow warbler

0m 0.25km 0.5km

Figure 9.46 - Moorland and Woodland Breeding Bird Results - 3 of 12



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Legend

Moorland and Woodland Breeding Bird Survey Results

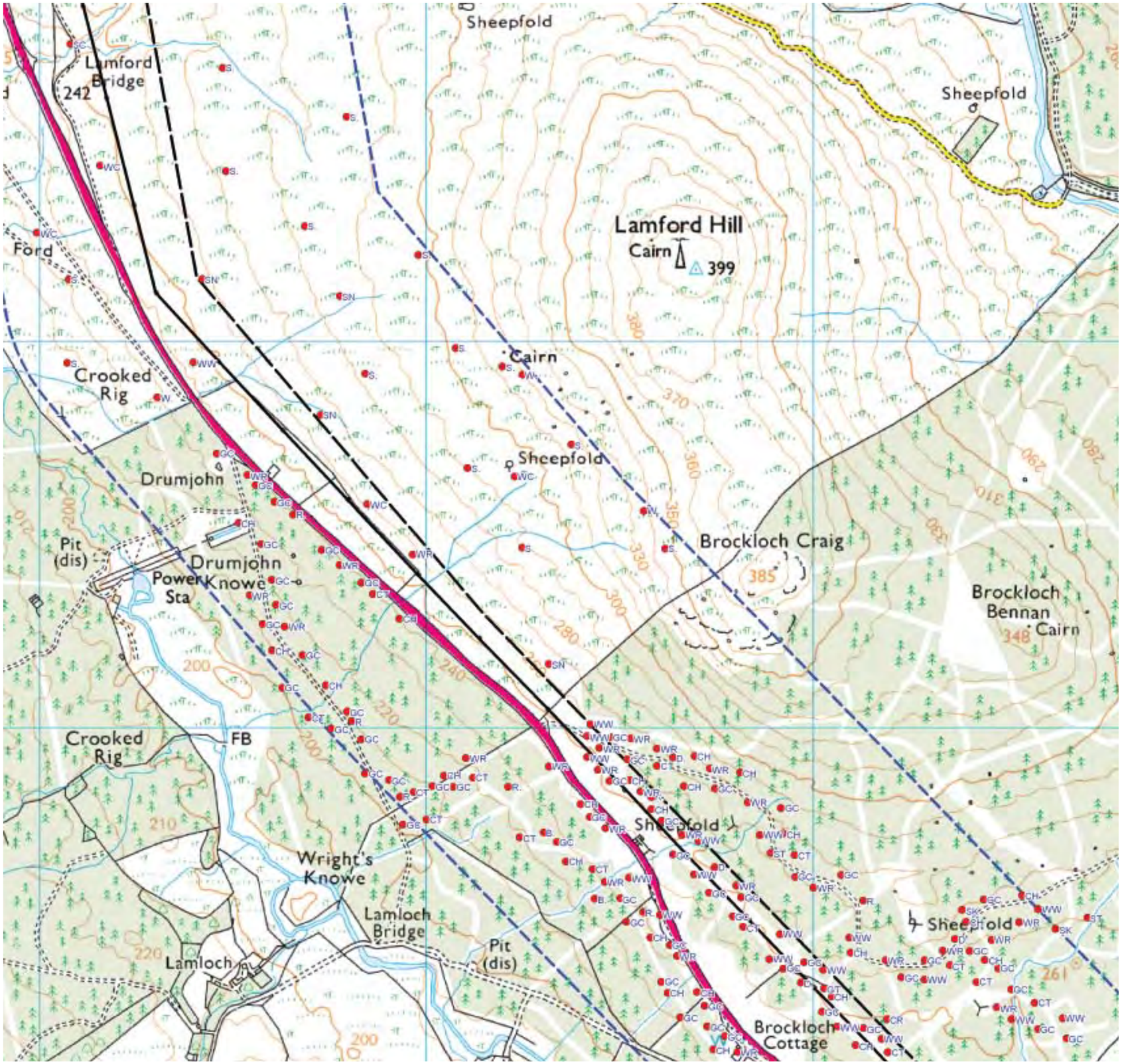
- 500m buffer (breeding bird survey area)
- Existing N-Route
- Proposed L7 Tower route
- Proposed Wood Pole line route
- Woodland point count locations

NB. results of breeding raptor and owl surveys are provided separately in Confidential Appendix D.10. Meadow pipit registrations were not mapped

B	Blackbird	M.	Mistle thrush
BC	Blackcap	MA	Mallard
BF	Bullfinch	MG	Magpie
BT	Bluetit	MP	Meadow pipit
C.	Carrion crow	OC	Oystercatcher
CC	Chiffchaff	PF	Pied flycatcher
CH	Chaffinch	PH	Pheasant
CK	Cuckoo	PW	Pied wagtail
CR	Crossbill	R.	Robin
CS	Common sandpiper	RB	Reed bunting
CT	Coal tit	RS	Red start
CU	Curlew	S.	Skylark
D.	Dunnock	SC	Stonechat
DI	Dipper	SF	Spotted flycatcher
GC	Goldcrest	SG	Starling
GH	Grasshopper warbler	SK	Siskin
GL	Grey wagtail	SL	Swallow
GO	Gold finch	SM	Sand martin
GR	Green finch	SN	Common snipe
GS	Great spotted woodpecker	ST	Song thrush
GT	Great tit	SW	Sedge warbler
GW	Garden warbler	TC	Tree creeper
H.	Grey heron	TP	Tree pipit
HM	House martin	W.	Wheatear
HS	House sparrow	WC	Whinchat
JD	Jackdaw	WH	Whitethroat
L.	Lapwing	WO	Wood warbler
LG	Little grebe	WP	Woodpigeon
LR	Lesser redpoll	WR	Wren
LT	Long-tailed tit	WW	Willow warbler

0m — 0.25km — 0.5km

Figure 9.47 - Moorland and Woodland Breeding Bird Results - 4 of 12



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Legend

Moorland and Woodland Breeding Bird Survey Results

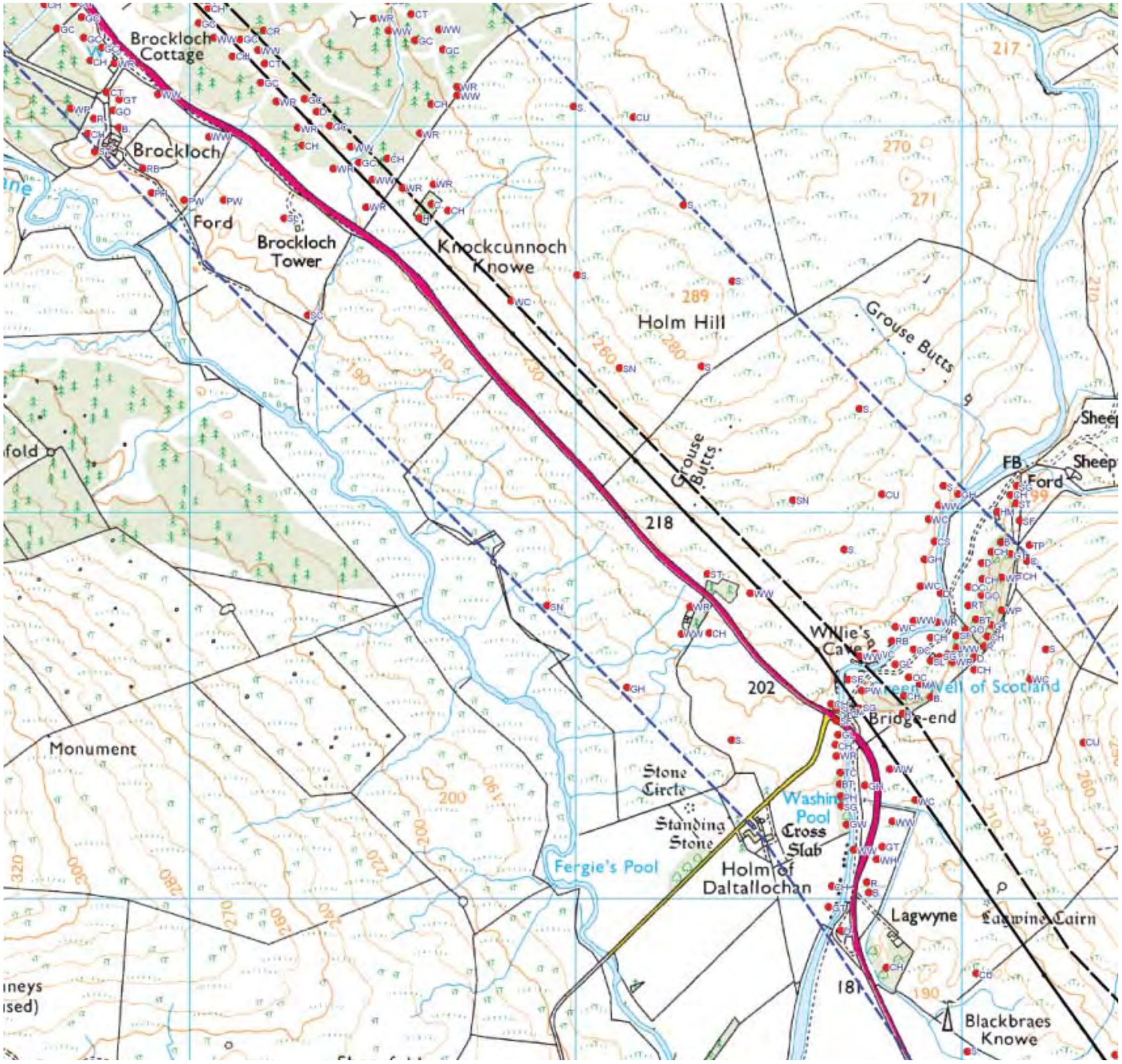
- 500m buffer (breeding bird survey area)
- Existing N-Route
- Proposed L7 Tower route
- Proposed Wood Pole line route
- Woodland point count locations

NB. results of breeding raptor and owl surveys are provided separately in Confidential Appendix D.10. Meadow pipit registrations were not mapped

B	Blackbird	M.	Mistle thrush
BC	Blackcap	MA	Mallard
BF	Bullfinch	MG	Magpie
BT	Bluetit	MP	Meadow pipit
C.	Carrion crow	OC	Oystercatcher
CC	Chiffchaff	PF	Pied flycatcher
CH	Chaffinch	PH	Pheasant
CK	Cuckoo	PW	Pied wagtail
CR	Crossbill	R.	Robin
CS	Common sandpiper	RB	Reed bunting
CT	Coal tit	RS	Red start
CU	Curlew	S.	Skylark
D.	Dunnock	SC	Stonechat
DI	Dipper	SF	Spotted flycatcher
GC	Goldcrest	SG	Starling
GH	Grasshopper warbler	SK	Siskin
GL	Grey wagtail	SL	Swallow
GO	Gold finch	SM	Sand martin
GR	Green finch	SN	Common snipe
GS	Great spotted woodpecker	ST	Song thrush
GT	Great tit	SW	Sedge warbler
GW	Garden warbler	TC	Tree creeper
H.	Grey heron	TP	Tree pipit
HM	House martin	W.	Wheatear
HS	House sparrow	WC	Whinchat
JD	Jackdaw	WH	Whitethroat
L.	Lapwing	WO	Wood warbler
LG	Little grebe	WP	Woodpigeon
LR	Lesser redpoll	WR	Wren
LT	Long-tailed tit	WW	Willow warbler

0m 0.25km 0.5km

Figure 9.48 - Moorland and Woodland Breeding Bird Results - 5 of 12



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Legend

Moorland and Woodland Breeding Bird Survey Results

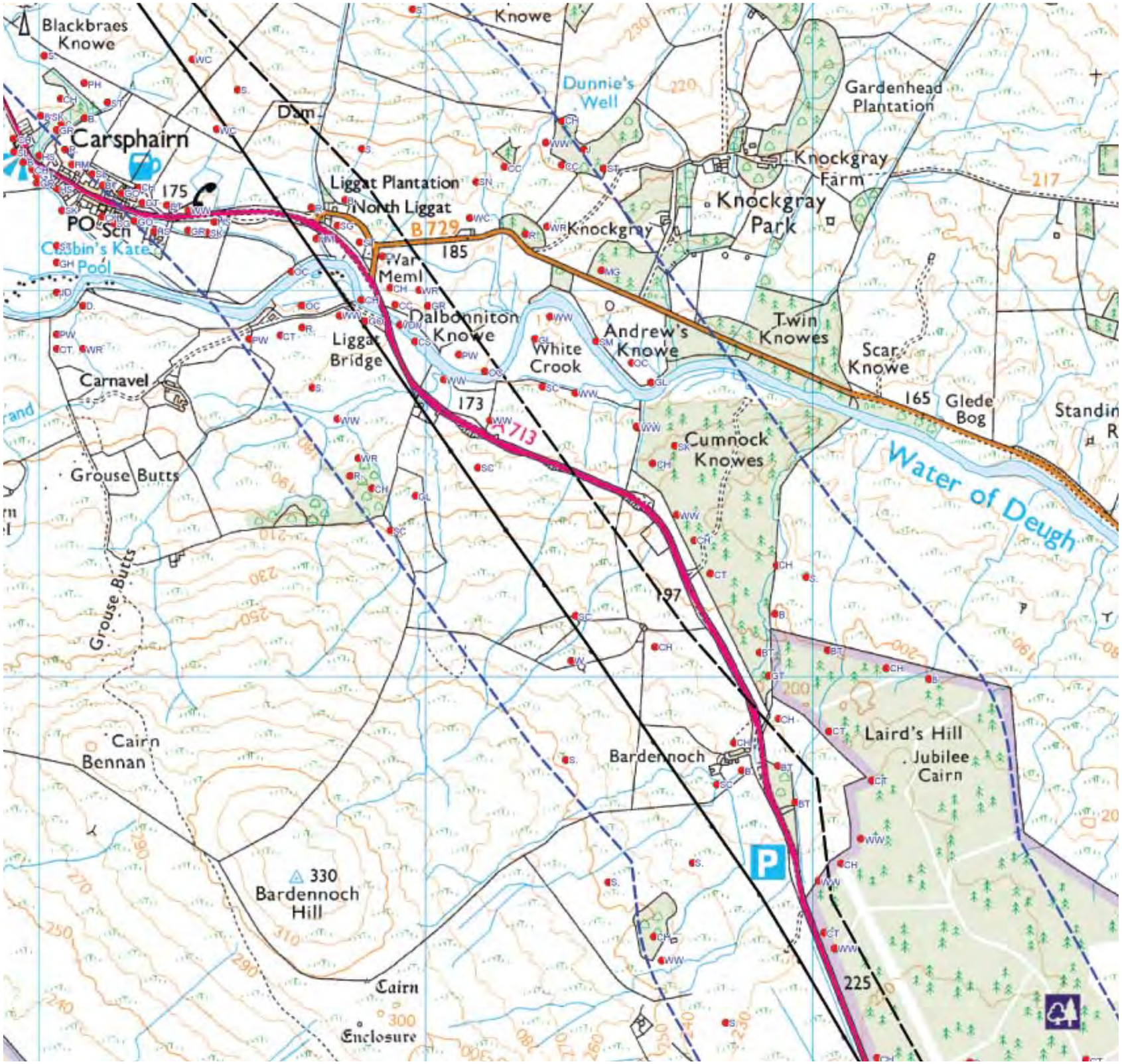
- 500m buffer (breeding bird survey area)
- Existing N-Route
- Proposed L7 Tower route
- Proposed Wood Pole line route
- Woodland point count locations

NB. results of breeding raptor and owl surveys are provided separately in Confidential Appendix D.10. Meadow pipit registrations were not mapped

B	Blackbird	M.	Mistle thrush
BC	Blackcap	MA	Mallard
BF	Bullfinch	MG	Magpie
BT	Bluetit	MP	Meadow pipit
C.	Carrion crow	OC	Oystercatcher
CC	Chiffchaff	PF	Pied flycatcher
CH	Chaffinch	PH	Pheasant
CK	Cuckoo	PW	Pied wagtail
CR	Crossbill	R.	Robin
CS	Common sandpiper	RB	Reed bunting
CT	Coal tit	RS	Red start
CU	Curlew	S.	Skylark
D.	Dunnock	SC	Stonechat
DI	Dipper	SF	Spotted flycatcher
GC	Goldcrest	SG	Starling
GH	Grasshopper warbler	SK	Siskin
GL	Grey wagtail	SL	Swallow
GO	Gold finch	SM	Sand martin
GR	Green finch	SN	Common snipe
GS	Great spotted woodpecker	ST	Song thrush
GT	Great tit	SW	Sedge warbler
GW	Garden warbler	TC	Tree creeper
H.	Grey heron	TP	Tree pipit
HM	House martin	W.	Wheatear
HS	House sparrow	WC	Whinchat
JD	Jackdaw	WH	Whitethroat
L.	Lapwing	WO	Wood warbler
LG	Little grebe	WP	Woodpigeon
LR	Lesser redpoll	WR	Wren
LT	Long-tailed tit	WW	Willow warbler

0m — 0.25km — 0.5km

Figure 9.49 - Moorland and Woodland Breeding Bird Results - 6 of 12



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Legend

Moorland and Woodland Breeding Bird Survey Results

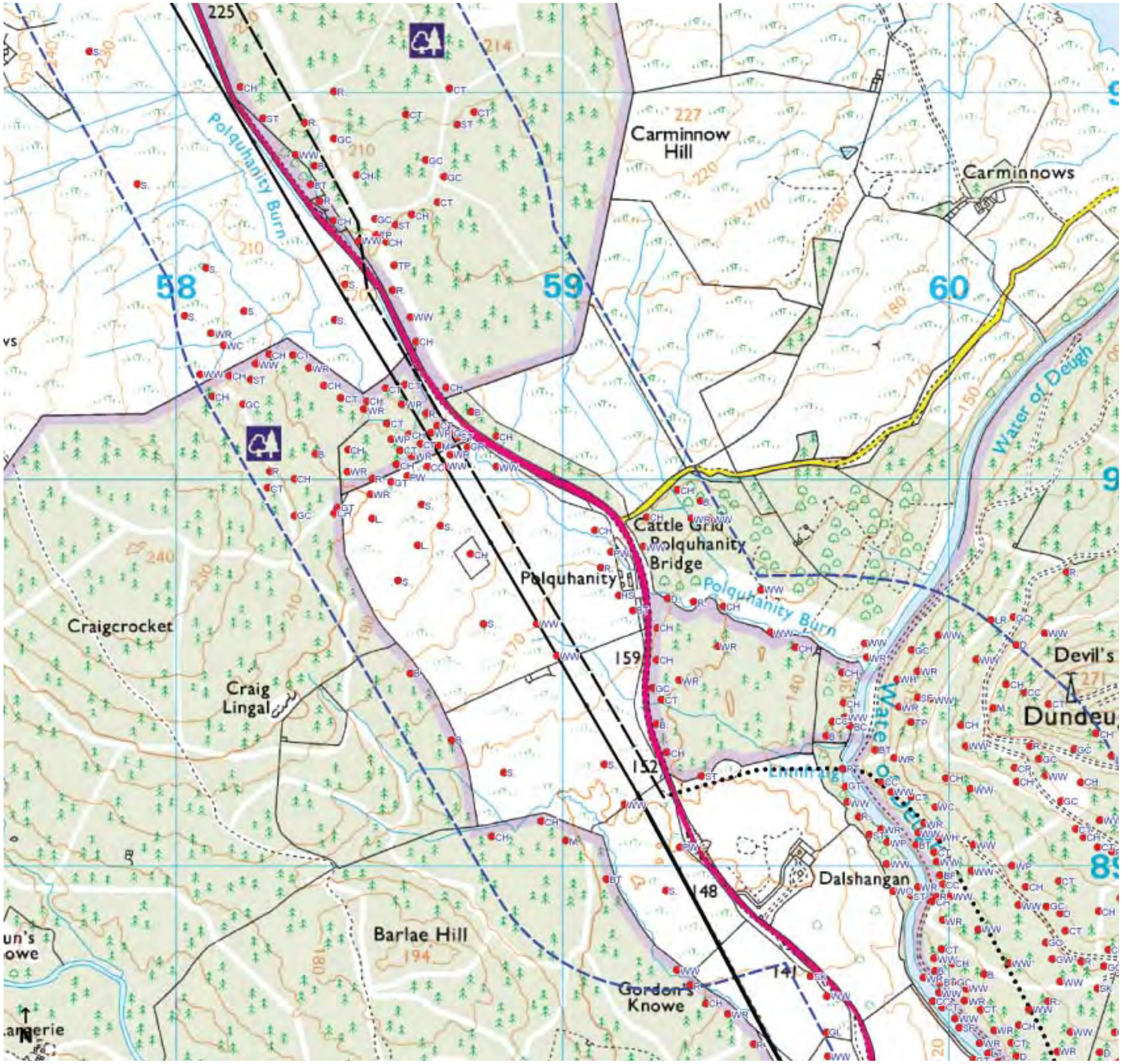
- 500m buffer (breeding bird survey area)
- Existing N-Route
- Proposed L7 Tower route
- Proposed Wood Pole line route
- Woodland point count locations

NB. results of breeding raptor and owl surveys are provided separately in Confidential Appendix D.10. Meadow pipit registrations were not mapped

B	Blackbird	M.	Mistle thrush
BC	Blackcap	MA	Mallard
BF	Bullfinch	MG	Magpie
BT	Bluetit	MP	Meadow pipit
C.	Carrion crow	OC	Oystercatcher
CC	Chiffchaff	PF	Pied flycatcher
CH	Chaffinch	PH	Pheasant
CK	Cuckoo	PW	Pied wagtail
CR	Crossbill	R.	Robin
CS	Common sandpiper	RB	Reed bunting
CT	Coal tit	RS	Red start
CU	Curlew	S.	Skylark
D.	Dunnock	SC	Stonechat
DI	Dipper	SF	Spotted flycatcher
GC	Goldcrest	SG	Starling
GH	Grasshopper warbler	SK	Siskin
GL	Grey wagtail	SL	Swallow
GO	Gold finch	SM	Sand martin
GR	Green finch	SN	Common snipe
GS	Great spotted woodpecker	ST	Song thrush
GT	Great tit	SW	Sedge warbler
GW	Garden warbler	TC	Tree creeper
H.	Grey heron	TP	Tree pipit
HM	House martin	W.	Wheatear
HS	House sparrow	WC	Whinchat
JD	Jackdaw	WH	Whitethroat
L.	Lapwing	WO	Wood warbler
LG	Little grebe	WP	Woodpigeon
LR	Lesser redpoll	WR	Wren
LT	Long-tailed tit	WW	Willow warbler

0m — 0.25km — 0.5km

Figure 9.50 - Moorland and Woodland Breeding Bird Results - 7 of 12



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Legend

Moorland and Woodland Breeding Bird Survey Results

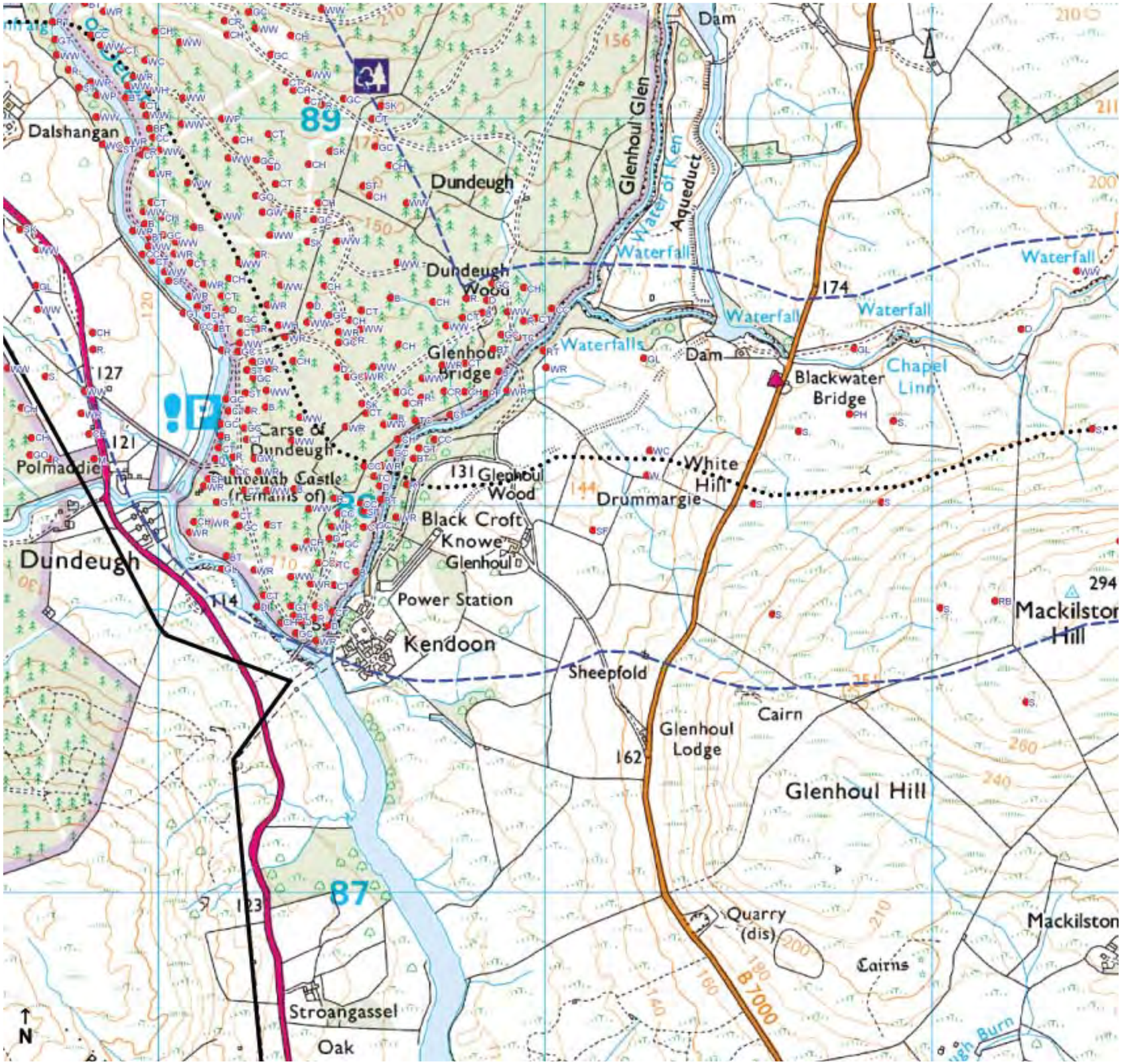
- 500m buffer (breeding bird survey area)
- Existing N-Route
- Proposed L7 Tower route
- Proposed Wood Pole line route
- Woodland point count locations

NB. results of breeding raptor and owl surveys are provided separately in Confidential Appendix D.10. Meadow pipit registrations were not mapped

B	Blackbird	M.	Mistle thrush
BC	Blackcap	MA	Mallard
BF	Bullfinch	MG	Magpie
BT	Bluetit	MP	Meadow pipit
C.	Carrion crow	OC	Oystercatcher
CC	Chiffchaff	PF	Pied flycatcher
CH	Chaffinch	PH	Pheasant
CK	Cuckoo	PW	Pied wagtail
CR	Crossbill	R.	Robin
CS	Common sandpiper	RB	Reed bunting
CT	Coal tit	RS	Red start
CU	Curlew	S.	Skylark
D.	Dunnock	SC	Stonechat
DI	Dipper	SF	Spotted flycatcher
GC	Goldcrest	SG	Starling
GH	Grasshopper warbler	SK	Siskin
GL	Grey wagtail	SL	Swallow
GO	Gold finch	SM	Sand martin
GR	Green finch	SN	Common snipe
GS	Great spotted woodpecker	ST	Song thrush
GT	Great tit	SW	Sedge warbler
GW	Garden warbler	TC	Tree creeper
H.	Grey heron	TP	Tree pipit
HM	House martin	W.	Wheatear
HS	House sparrow	WC	Whinchat
JD	Jackdaw	WH	Whitethroat
L.	Lapwing	WO	Wood warbler
LG	Little grebe	WP	Woodpigeon
LR	Lesser redpoll	WR	Wren
LT	Long-tailed tit	WW	Willow warbler

0m — 0.25km — 0.5km

Figure 9.51 - Moorland and Woodland Breeding Bird Results - 8 of 12



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Legend

Moorland and Woodland Breeding Bird Survey Results

- 500m buffer (breeding bird survey area)
- Existing N-Route
- Proposed L7 Tower route
- Proposed Wood Pole line route
- Woodland point count locations

NB. results of breeding raptor and owl surveys are provided separately in Confidential Appendix D.10. Meadow pipit registrations were not mapped

B	Blackbird	M.	Mistle thrush
BC	Blackcap	MA	Mallard
BF	Bullfinch	MG	Magpie
BT	Bluetit	MP	Meadow pipit
C.	Carrion crow	OC	Oystercatcher
CC	Chiffchaff	PF	Pied flycatcher
CH	Chaffinch	PH	Pheasant
CK	Cuckoo	PW	Pied wagtail
CR	Crossbill	R.	Robin
CS	Common sandpiper	RB	Reed bunting
CT	Coal tit	RS	Red start
CU	Curlew	S.	Skylark
D.	Dunnock	SC	Stonechat
DI	Dipper	SF	Spotted flycatcher
GC	Goldcrest	SG	Starling
GH	Grasshopper warbler	SK	Siskin
GL	Grey wagtail	SL	Swallow
GO	Gold finch	SM	Sand martin
GR	Green finch	SN	Common snipe
GS	Great spotted woodpecker	ST	Song thrush
GT	Great tit	SW	Sedge warbler
GW	Garden warbler	TC	Tree creeper
H.	Grey heron	TP	Tree pipit
HM	House martin	W.	Wheatear
HS	House sparrow	WC	Whinchat
JD	Jackdaw	WH	Whitethroat
L.	Lapwing	WO	Wood warbler
LG	Little grebe	WP	Woodpigeon
LR	Lesser redpoll	WR	Wren
LT	Long-tailed tit	WW	Willow warbler

0m — 0.25km — 0.5km

Figure 9.52 - Moorland and Woodland Breeding Bird Results - 9 of 12

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Legend

Moorland and Woodland Breeding Bird Survey Results

- 500m buffer (breeding bird survey area)
- Existing N-Route
- Proposed L7 Tower route
- Proposed Wood Pole line route
- Woodland point count locations

NB. results of breeding raptor and owl surveys are provided separately in Confidential Appendix D.10. Meadow pipit registrations were not mapped

B	Blackbird	M.	Mistle thrush
BC	Blackcap	MA	Mallard
BF	Bullfinch	MG	Magpie
BT	Bluetit	MP	Meadow pipit
C.	Carrion crow	OC	Oystercatcher
CC	Chiffchaff	PF	Pied flycatcher
CH	Chaffinch	PH	Pheasant
CK	Cuckoo	PW	Pied wagtail
CR	Crossbill	R.	Robin
CS	Common sandpiper	RB	Reed bunting
CT	Coal tit	RS	Red start
CU	Curlew	S.	Skylark
D.	Dunnock	SC	Stonechat
DI	Dipper	SF	Spotted flycatcher
GC	Goldcrest	SG	Starling
GH	Grasshopper warbler	SK	Siskin
GL	Grey wagtail	SL	Swallow
GO	Gold finch	SM	Sand martin
GR	Green finch	SN	Common snipe
GS	Great spotted woodpecker	ST	Song thrush
GT	Great tit	SW	Sedge warbler
GW	Garden warbler	TC	Tree creeper
H.	Grey heron	TP	Tree pipit
HM	House martin	W.	Wheatear
HS	House sparrow	WC	Whinchat
JD	Jackdaw	WH	Whitethroat
L.	Lapwing	WO	Wood warbler
LG	Little grebe	WP	Woodpigeon
LR	Lesser redpoll	WR	Wren
LT	Long-tailed tit	WW	Willow warbler

0m — 0.25km — 0.5km

Figure 9.53 - Moorland and Woodland Breeding Bird Results - 10 of 12

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Legend

Moorland and Woodland Breeding Bird Survey Results

- 500m buffer (breeding bird survey area)
- Existing N-Route
- Proposed L7 Tower route
- Proposed Wood Pole line route
- Woodland point count locations

NB. results of breeding raptor and owl surveys are provided separately in Confidential Appendix D.10. Meadow pipit registrations were not mapped

B	Blackbird	M.	Mistle thrush
BC	Blackcap	MA	Mallard
BF	Bullfinch	MG	Magpie
BT	Bluetit	MP	Meadow pipit
C.	Carrion crow	OC	Oystercatcher
CC	Chiffchaff	PF	Pied flycatcher
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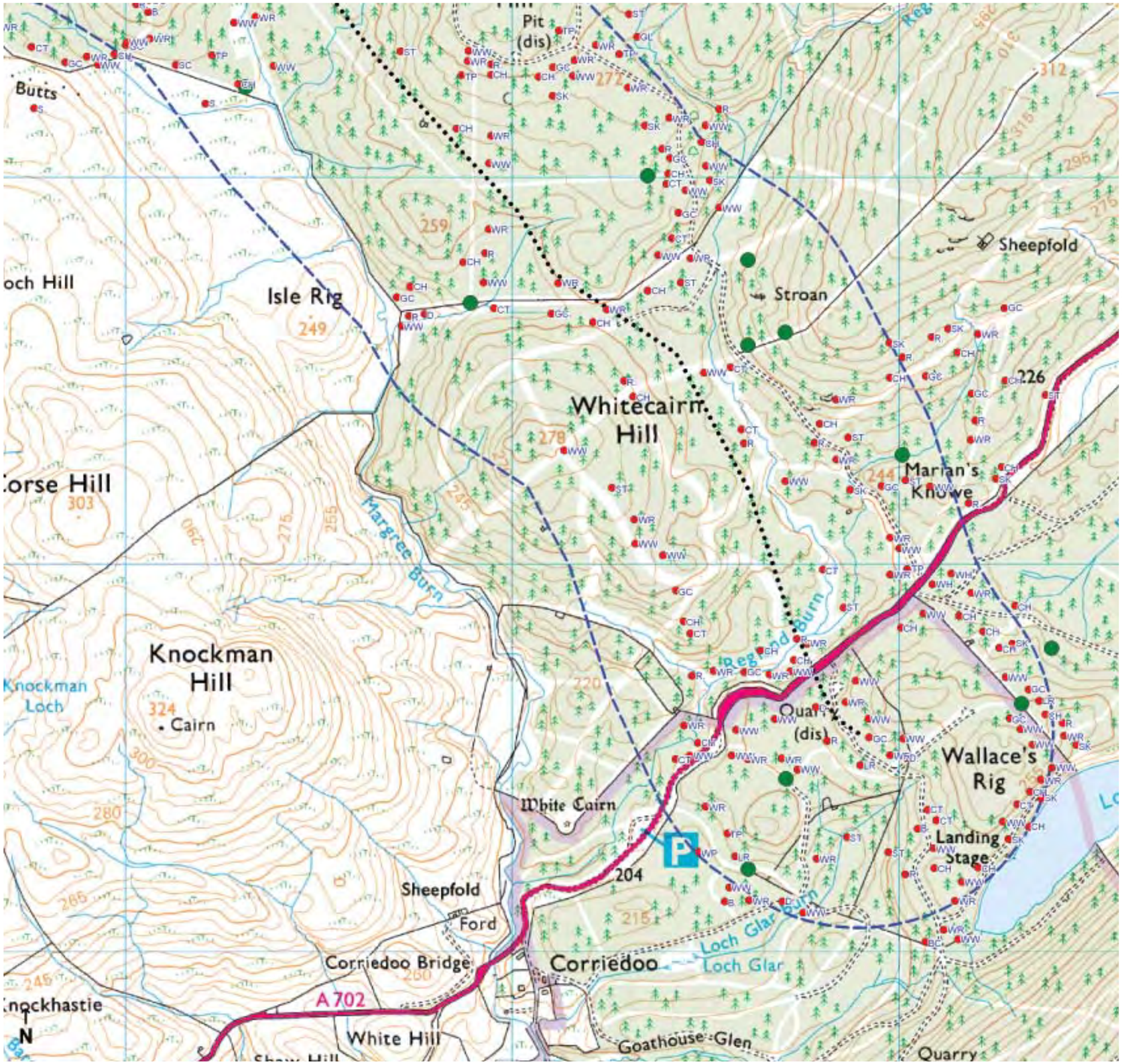
CK	Cuckoo	PW	Pied wagtail
CR	Crossbill	R.	Robin
CS	Common sandpiper	RB	Reed bunting
CT	Coal tit	RS	Red start
CU	Curlew	S.	Skylark
D.	Dunnock	SC	Stonechat
DI	Dipper	SF	Spotted flycatcher
GC	Goldcrest	SG	Starling
GH	Grasshopper warbler	SK	Siskin
GL	Grey wagtail	SL	Swallow
GO	Gold finch	SM	Sand martin
GR	Green finch	SN	Common snipe
GS	Great spotted woodpecker	ST	Song thrush
GT	Great tit	SW	Sedge warbler
GW	Garden warbler	TC	Tree creeper
H.	Grey heron	TP	Tree pipit
HM	House martin	W.	Wheatear
HS	House sparrow	WC	Whinchat
JD	Jackdaw	WH	Whitethroat
L.	Lapwing	WO	Wood warbler
LG	Little grebe	WP	Woodpigeon
LR	Lesser redpoll	WR	Wren
LT	Long-tailed tit	WW	Willow warbler

0m — 0.25km — 0.5km

Figure 9.54 - Moorland and Woodland Breeding Bird Results - 11 of 12



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Legend

Moorland and Woodland Breeding Bird Survey Results

- 500m buffer (breeding bird survey area)
- Existing N-Route
- Proposed L7 Tower route
- Proposed Wood Pole line route
- Woodland point count locations

NB. results of breeding raptor and owl surveys are provided separately in Confidential Appendix D.10. Meadow pipit registrations were not mapped

B	Blackbird	M.	Mistle thrush
BC	Blackcap	MA	Mallard
BF	Bullfinch	MG	Magpie
BT	Bluetit	MP	Meadow pipit
C.	Carrion crow	OC	Oystercatcher
CC	Chiffchaff	PF	Pied flycatcher
CH	Chaffinch	PH	Pheasant
CK	Cuckoo	PW	Pied wagtail
CR	Crossbill	R.	Robin
CS	Common sandpiper	RB	Reed bunting
CT	Coal tit	RS	Red start
CU	Curlew	S.	Skylark
D.	Dunnock	SC	Stonechat
DI	Dipper	SF	Spotted flycatcher
GC	Goldcrest	SG	Starling
GH	Grasshopper warbler	SK	Siskin
GL	Grey wagtail	SL	Swallow
GO	Gold finch	SM	Sand martin
GR	Green finch	SN	Common snipe
GS	Great spotted woodpecker	ST	Song thrush
GT	Great tit	SW	Sedge warbler
GW	Garden warbler	TC	Tree creeper
H.	Grey heron	TP	Tree pipit
HM	House martin	W.	Wheatear
HS	House sparrow	WC	Whinchat
JD	Jackdaw	WH	Whitethroat
L.	Lapwing	WO	Wood warbler
LG	Little grebe	WP	Woodpigeon
LR	Lesser redpoll	WR	Wren
LT	Long-tailed tit	WW	Willow warbler

0.25km
0m 0.5km

Figure 9.55 - Moorland and Woodland Breeding Bird Results - 12 of 12

9.3.6 Target Species Accounts

1 The following section provides a summary of information collated from field survey and desk study for target bird species (i.e. species of national conservation concern and relatively high potential susceptibility to adverse effects from OHL development) within the four defined survey area sub-sections. Summary information for any other notable species is provided at the end of this Section. Further information for all species of conservation concern is provided in Appendix D.7.

2 Also included is a brief summary of the legal protection and population / conservation status of each species at a European, national and regional level (where regional information is available). The conservation status of regularly occurring birds in the UK undergoes periodic review by conservation organisations with the most recent assessment being published in 2009 (Eaton *et al.* 2009). Each species is placed on one of three lists. Species placed on the 'Red List' are those which are Globally Threatened, whose population or range have declined rapidly in recent years, or that have declined historically and not shown a substantial recent recovery. 'Amber List' species are those which have an unfavourable conservation status in Europe, whose population or range has declined moderately in recent years or those whose population has declined historically but made a substantial recent recovery. Species on the 'Green List' are currently of least conservation concern.

3 The conservation status of birds in Europe has been assessed most recently in 2004 (BirdLife International 2004). Species of European Conservation Concern (SPEC) are divided into three groups. SPEC 1 species are those which are of global conservation concern. SPEC 2 species are those which have an unfavourable conservation status in Europe and are concentrated in Europe. SPEC 3 species are those which have an unfavourable conservation status in Europe (see above), but which are not concentrated in Europe. Species which do not fulfil these criteria are regarded as non-SPEC species and are of least conservation concern.

9.3.6.1 Whooper Swan (*Cygnus cygnus*)

9.3.6.1.1 National and Regional Status

1 Whooper swan is listed on Schedule 1 to the Wildlife and Countryside Act 1981 (as amended) and Annex 1 of the EC Birds Directive. It is on the UK amber list due to the UK breeding population being less than 300 pairs and at least 50% of the UK non-breeding population being found in 10 or fewer sites (Eaton *et al.* 2009). Census counts completed in 2005 provide an estimate of the Scottish population of 4,142 and 10,716 for Britain (Worden *et al.* 2006). The 2006/7 peak count for over-wintering whooper swans in Great Britain was 7,439 (Austin *et al*. 2008). A very small number breed in the UK, normally in Scotland, rarely exceeding single figures (Forester *et al.* 2007). The thresholds for internationally important and nationally important (i.e. Great Britain) sites, based on the BTO analysis of 2006/07 WeBS data, is 210 and 57 respectively (Austin *et al*. 2008).

2 South-west Scotland is an important wintering area for this species, including several internationally important sites. Important whooper swan roost sites in the region are located in the Solway Estuary c. 31km south-east of the proposed OHL route at its nearest point (mean annual count of 424, from 2002/3 to 2006/7), Wigtown Bay, c. 33km south of the proposed OHL route at its nearest point (mean annual count of 230, from 2002/3 to 2006/7). The River Nith - Keltonbank to Nunholm, c. 24km south of the proposed OHL at its nearest point is considered a nationally important site for this species (mean annual count of 165, from 2002/3 to 2006/7) (Austin *et al.* 2008).

9.3.6.1.2 Section 1 - Summary Desk Study and Survey Results

1 There are historical records of whooper swan within a 10km area (e.g. 10km squares NX 40, NX 41 and NS 50) on the NBN Gateway database. The BTO provided five-years of counts of Bogton Loch from the UK Wetland Bird Survey (WeBS). Between 2001 and 2006 the mean whooper swan count was 5 (n = 35) and the peak count was 35 (in January 2003).

2 Fourteen records of whooper swan were recorded during the first phase of the flight activity survey (October 2007 to mid-April 2008) all associated with Bogton Loch. Of these records, one was a single bird, five records were of pairs and one record was of three individuals. Several small flocks were recorded; one of four individuals, one of five, one of six and one of 12.

3 During waterbody counts for this project whooper swans were recorded at Bogton and Burnton Lochs, with two peak counts of 12 birds in December 2007 and January 2008, both recorded at Bogton Loch.

9.3.6.1.3 Section 2 - Summary Desk Study and Survey Results

1 Whooper swan is recorded on the NBN Gateway at a 10km resolution (NS 50 and NS 40). Other desk study sources did not provide any records for whooper swan for this Section.

2 There were no records from any period of the survey of whooper swans in this Section

9.3.6.1.4 Section 3 - Summary Desk Study and Survey Results

1 The NBN Gateway holds records for whooper swan for each 10km square in this Section (i.e. squares NS 50, NX 59 and NX 58). Records are from the Ayrshire Species database and the BTO Atlas of Wintering Birds in Britain and Ireland (1962-1983). Other desk study sources did not provide any records for whooper swan for this Section.

2 There were six records of whooper swan during the first period of the flight activity survey in Section 3. These were all noted between Loch Doon to Kendoon Loch, predominantly orientated North to South. Number of birds in these records varied from pairs up to a flock of 16 individuals. There were no records in period two of the survey of whooper swans flying over Section three. During period three of the survey only one whooper swan flight line was note within Section three. Four birds were observed flying east to west from Glenmuck and across the northern side of Muckle Eriff Hill..

3 Whooper swans were periodically recorded during winter waterbody counts at Loch Doon, with a clear peak in counts in March. The peak count during the whole survey period was of 88 birds in March 2009. In 2008 the peak count was 28, also in March.

4 Two flocks of whooper swan were noted on two occasions in March and April 2008 at Carsphairn Lane with a peak count of 27 birds (see Appendix D.7 for further details).

9.3.6.1.5 Section 4 - Summary Desk Study and Survey Results

1 The NBN gateway database holds historic records for whooper swan to a 10km resolution, in square NX 68. Data comes from the BTO Atlas of Wintering Breeding Birds in Britain and Ireland (1981-1984). Other desk study sources did not provide any records for whooper swan for this Section.

2 There were six records from period one of the survey around Earlstoun Loch, Lochinvar reservoir and to the south of Kendoon Loch. The numbers of birds noted varied from pairs up to seven individual swans. There were no records from period two for whooper swans flying near Section 4 of the OHL Study Area. There were six records from period three of the flight activity survey with numbers varying from a single swan and up to a flock of 13.

3 Whooper swans were periodically recorded during winter waterbody counts at Knockman Loch (count of 4 in November 2008), Loch Howie (peak count of 12 in March 2009) and Loch Skae (2 in March 2009).

9.3.6.1.6 Conclusion and Evaluation

1 The most important roost sites for whooper swan in the Study Area are Bogton Loch and Loch Doon. Flight activity was noted but was relatively infrequent during the whole survey period. Evidence from the surveys completed and from desk study records suggests that nationally important numbers within the Study Area are occasionally present at Loch Doon. Peak counts suggest that Bogton Loch (also Lochinvar, based on anecdotal information) regularly support what could be considered regionally important numbers. Therefore the Study Area as a whole is considered to support a wintering population of High nature conservation value (see Table 9.11 for the evaluation of the Study Area sub-sections).

9.3.6.2 Pink-footed Goose (*Anser brachyrhynchus*)

9.3.6.2.1 National and Regional Status

1 Pink-footed goose is a UK amber-listed species due to at least 50% of the UK wintering population being found in 10 or fewer sites; and at least 20% of the European wintering population being found in the UK (Eaton *et al.* 2009). The national population estimate, based on co-ordinated roost site counts, for winter 2006/7 was 229,123 (Austin *et al.* 2008). On six occasions between 1990 and 2003 counts of over 200,000 birds were made in Scotland (Forrester *et al.* 2007), this represents a majority of the world population which is estimated to be over 290,000 (BirdLife International 2004). The thresholds for internationally important and nationally important (i.e. Great Britain) sites, based on the BTO analysis of 2006/07 WeBS data, is 2,700 and 2,400 respectively (Austin *et al*. 2008).

2 The majority of internationally and nationally important roost sites for this species in the UK are concentrated in eastern Scotland and England. Internationally important roost sites in south-west Scotland include: Solway Estuary c. 31km south-east of the

proposed OHL route at its nearest point (mean annual count of 12,963, from 2002/3 to 2006/7); Wigton Bay, c. 33km south of the proposed OHL route at its nearest point (mean annual count of 5,625, from 2002/3 to 2006/7) and the River Nith - Keltonbank to Nunholm (mean annual count of 3,710 based on data from 2002/3 to 2004/5 and 2006/7) (Austin *et al.* 2008).

9.3.6.2.2 Section 1 - Summary Desk Study and Survey Results

1 The NBN Gateway database has one record of pink-footed goose at a 10km resolution (square NS 41). BTO WeBS count data for Bogton Loch between 2003 and 2007 included no counts of this species. No other desk study records were obtained for this Section of the project for this species.

2 There was one record of pink-footed goose over Section 1 during the first period of the flight activity survey, with a flock of 75 geese flying over Bogton Loch. There were no records over Section 1 during periods two or three of the survey.

3 No records of pink-footed goose were made during the waterbody counts within this Section.

9.3.6.2.3 Section 2 - Summary Desk Study and Survey Results

1 There are no historic records held on the NBN Gateway for pink-footed goose in this Section.

2 A single record noted during period one of the flight activity survey was of 20 pink-footed geese flying from south-east to north-west across the proposed OHL route and towards Dalmellington. No records of pink-footed geese were noted in period two of the survey for Section 2. One record in period three of the survey was of 40 pink-footed geese flying very high, from north to south between Brown Hill and Glenmuck Craig.

3 No records of this species were obtained for this Section during winter waterbody counts.

9.3.6.2.4 Section 3 - Summary Desk Study and Survey Results

1 There are no records held on the NBN Gateway for pink-footed goose in this Section of the Study Area.

2 Two records from period one of the survey in Section 3 were noted, one of over 180 geese flying north to south south-west just south of Holm Hill. The second record was of 77 individuals flying very high, north-west over Carsphairn. No Pink-footed geese were recorded in the second and third period of the flight activity survey.

3 No pink-footed geese were recorded during the waterbody counts in this Section.

9.3.6.2.5 Section 4 - Summary Desk Study and Survey Results

1 There were no desk study records obtained for pink-footed goose for this Section.

2 Only one record from period one of the survey was noted, 47 pink-footed geese were observed flying north north-east from Earlstoun Loch past Mackilston Hill. No pink-footed goose records from period two of the survey were noted. Two records from period three of the survey for Section four were noted. The first record was of 110 pink-footed geese flying high, travelling north-east, observed over Lochinvar reservoir and Knockdollachan. The second one noted 88 geese flying very high from west to east over Corse Hill then over the proposed route.

3 No records of this species were obtained for this Section during winter waterbody counts.

9.3.6.2.6 Conclusion and Evaluation

1 No apparent roost sites or regularly used foraging sites were identified for pink-footed goose during surveys of the Study Area. Flight activity was noted in most Sections of the Study Area although the majority of flights (c. 90%) within the vicinity of the proposed OHL route were above the collision risk height bands. Evidence from the surveys completed and from desk study records suggests that the survey area does not provide any nationally important roosting/feeing sites, although there is the potential for regionally important numbers to occasional use suitable fields within the Study Area in some years (e.g. depending on weather conditions). The Study Area as a whole is therefore considered to support a wintering population of Medium nature conservation value (see Table 9.11 for the evaluation of the Study Area sub-sections).

9.3.6.3 Greenland White-fronted Goose (*Anser albifrons flavirostris*)

9.3.6.3.1 National and Regional Status

1 Greenland white-fronted goose (one of two sub-species of greater white-fronted goose that winter in Britain and Ireland) is listed on Annex 1 of the EC Birds Directive. It is on the UK red list as it is assessed as being globally threatened (Eaton *et al.* 2009). The winter range of the population is located solely within Britain and Ireland, principally Argyll (Islay and Kintyre), south-west Scotland and western Ireland.. The annual census of this species by the Greenland White-fronted Study in winter 2006/7 estimated a total British over-wintering population of c. 12,500 with the majority located in Scotland (Austin *et al.* 2008). The thresholds for internationally important and nationally important (i.e. Great Britain) sites, based on the BTO analysis of 2006/07 WeBS data, is 270 and 209 respectively (Ibid.).

2 South-west Scotland (Argyll and Dumfries & Galloway) is an important wintering area for this species with by far the largest concentration on the island of Islay (c. 75% of the estimated British population). There are also important roost / feeding sites on mainland south-west Scotland, for example, associated with Loch Ken and the River Dee Marshes SPA, this site is designated as an SPA for this species. The SPA citation gives a population estimate of 350, which is based on counts from the late 1990's. More recent mean counts, based on five winters of data from 2002/3 to 2006/7, give an estimate of 243, which reflects on going recent declines in the population as a whole. In autumn 2006 hunting of this species was banned in Greenland in order to try to stem the decline (Austin *et al.* 2008).

9.3.6.3.2 Summary Desk Study and Survey Results

1 No desk study, field survey or *ad hoc* records of Greenland white-fronted goose were obtained for any Section of the Study Area.

2 The nearest desk study records to the proposed OHL route were associated with Loch Ken, c. 9km to the south.

9.3.6.3.3 Conclusion and Evaluation

1 There was no evidence from desk study or field survey of use of the Study Areas by this species, although there is the potential for occasional use of suitable fields / waterbodies within the Study Area in some years (e.g. depending on weather conditions). Therefore the Study Area as a whole is considered to support a wintering population of Low (Local High) nature conservation value.

9.3.6.4 Greylag Goose (*Anser anser*)

9.3.6.4.1 National and Regional Status

1 Greylag goose is on the UK amber list of birds of conservation concern due to at least 50% of the UK non-breeding population found in 10 or fewer sites and at least 20% of the European non-breeding population being found in the UK (Eaton *et al.* 2009). The majority of the Icelandic breeding population winters in the northern Britain. The national population estimate for over-wintering Icelandic greylag goose, based on counts in 2006/07, is 82,339 (Austin *et al.* 2008). The thresholds for internationally important and nationally important (i.e. Great Britain) sites, based on the BTO analysis of 2006/07 WeBS data, is 870 and 819 respectively (Ibid.).

2 The majority of important wintering sites for Icelandic greylags are located in the north and east of Scotland. There are few important sites for this species in south-west Scotland. Greylag goose is a qualifying species of the Loch Ken and River Dee Marshes SPA, which is c. 9km south-east of the OHL at its nearest point. The SPA citation gives a population estimate of 1,000 greylag geese for the site. More recent counts provide a mean of 800, based on data from 2002/3 to 2006/7 (Austin *et al.* 2008). This summary statistic hides a significant decline in counts at Loch Ken between the winters 2004/5 and 2005/6, when counts declined from c. 1,000 to c. 300 birds (Ibid.).

9.3.6.4.2 Section 1 - Summary Desk Study and Survey Results

1 The NBN gateway has historic records for greylag goose at a 10km resolution (squares NS 41 and NS 40). BTO WeBS counts of Bogton Loch between 2001 and 2006 provide a mean greylag goose count of 3.6 (n = 35) with a peak count of 36 (in February 2004). Six flight lines for greylag goose were recorded in this Section of the Study Area during flight activity surveys for the SWS Project EIA.

2 There were seven records of greylag goose within Section 1 of the OHL Study Area during period 1 the flight activity surveys, all concentrated around Bogton Loch. Numbers ranged from single birds up to a flock of 27 geese.

3 No records of greylag geese were noted in period two of the survey. The only record of greylag geese in period three of the survey consisted of 24 geese flying to Bogton Loch from the north.

4 There were six records of greylag sightings made during the waterbody counts at Bogton Loch for this section of the project. The numbers varied from one individual bird (February 2008) to a peak of 18 birds recorded foraging in mid-January (2008).

9.3.6.4.3 Section 2 - Summary Desk Study and Survey Results

1 The NBN Gateway holds records for greylag goose within a 10km resolution north of Dalmellington (NS 40). Other desk study sources did not include any records for greylag goose for this Section.

2 There were no records of greylag geese from periods one and two of the survey in Section 2. Two records of greylag geese were noted in period three of the survey, one of two individuals, one of seven, all recorded flying high.

3 No greylag geese were recorded during the waterbody counts within this Section.

9.3.6.4.4 Section 3 - Summary Desk Study and Survey Results

1 There is one NBN Gateway record for greylag goose in this Section of the OHL Study Area (square NX 59). Other desk study sources did not provide any records for greylag goose for this Section.

2 There were eight records of greylag geese from period one of the survey, noted in flocks of up to 200 individuals, mostly flying high and north up the valley. One exception was the largest flock, of several skeins flying south south-west from Cairnsmore of Carsphairn. One record from period two of the survey was of 13 greylag geese flying high in a north north-west direction up the valley past Carsphairn. There were eight records of greylag geese from period three of the survey, mostly flying north or south through the valley. Various sized flocks were observed, varying from two birds up to over 130 individuals.

3 There were a number of greylag goose records from this section during the waterbody counts. There were three records from Loch Doon, which varied in numbers from eight birds (recorded 17/03/09) to a peak of 53 birds (03/04/2008). Other records from 2008 showed greylags using Kendoon (one to three birds) and Holm of Daltallochan (six birds).

9.3.6.4.5 Section 4 - Summary Desk Study and Survey Results

1 The NBN gateway database holds historic records for greylag goose at a 10km resolution, in square NX 68. Data comes from the BTO Atlas of Wintering Breeding Birds in Britain and Ireland (1981-1984). Four sightings of greylag goose were made during the Margree Windfarm ES, 2007. All sightings were made within the vicinity of Glenshimeroch and ranged from flocks of 2 to 6 (see Appendix D.4.).

2 There were 24 flight line records of greylag geese in the first period of the flight activity survey. The majority were noted over Lochinvar reservoir, Earlstoun Loch and from Carsfad Loch up to Kendoon Loch. Numbers varied from singles up to a flock of 56 individuals.

3 Fifteen records noted in the second period of the survey, were again mainly over and around Lochinvar reservoir, Carsfad Loch and along the Water of Ken up to Kendoon Loch. The majority of these records were of single birds or pairs, except two instances of flocks of 17 birds.

4 There were 29 records in period three of the survey of greylag geese, the majority concentrated around Lochinvar reservoir. These were mainly small flocks of between two and 12 birds. Several of the records are from Carsfad Loch and along the Water of Ken, including a record of 37 greylag geese flying high and south from Dundeugh to Carsfad Loch.

5 A number of greylag geese were recorded during waterbody counts in this Section at Carsfard Loch and Lochinvar. Greylags were most frequently recorded at Lochinvar (December to April), with a peak count of 25 birds foraging in April 2008. At Carsfard Loch there were two records from the winter of 2007 - 2008 with a peak count of four birds (in December 2007).

9.3.6.4.6 Conclusion and Evaluation

1 Several regularly used roost sites, although used by relatively small numbers of geese (none achieving national importance thresholds), were identified during surveys of the Study Area. Flight activity was noted in most Sections of the Study Area. Evidence from the surveys completed and from desk study records suggests that the survey area does not provide any nationally important roosting/feeing sites. In the context of the Study Area the most important sites are Loch Doon and Lochinvar. Occasional use of suitable fields within the Study Area in some years (e.g. depending on weather conditions) by larger numbers of geese is possible was not noted during the survey period or indicated by the desk study data. The Study Area as a whole (this excludes Loch Ken and River Dee Marshes SPA which is outside of the survey area) is considered to support a wintering population of not more than Medium nature conservation value (see Table 9.11 for the evaluation of the Study Area sub-sections).

9.3.6.5 Red Kite (*Milvus milvus*)

9.3.6.5.1 National and Regional Status

1 Red kite is listed on Annex 1 of the EC Birds Directive, Appendix III of the Bern Convention and Appendix II of the Bonn Convention. It has enhanced legal protection in Britain through its inclusion on Schedule 1 to the Wildlife and Countryside Act 1981 (as amended). It is a UK BAP Priority Species and is on the UK Amber List, due to its unfavourable conservation status in Europe (SPEC 2).

2 The European population is estimated at 19,000 to 25,000 pairs, with a relatively high proportion of the total western European population in Germany, France and Spain (BirdLife International, 2004). The British population is currently in slow recovery following near extinction in the 19th Century (a small native population survived in Wales) and legal protection in the second half of the 20th Century and an extensive re-introduction programme starting in the late 20th Century. Expansion of the re-introduced populations in Scotland has not been as successful as the reintroductions in England. The primary reason for this is believed to be poor post-fledging survival linked to continued persecution and illegal poisoning (Forrester *et al.* 2007). The British population was estimated to be between 372 - 490 pairs in 2000 (Wotton *et al.* 2002), whilst the Scottish population was estimated at 60 pairs in 2004 (Forrester *et al.*, 2007). There are three main reintroduction areas in Scotland where this species has re-established. The population in south-west Scotland was re-introduced starting in 2001 (c. 100 birds were released), with the first successful breeding (by four pairs) reported in 2003 (Ibid.).

3 The core range of the re-introduced population in south-west Scotland is to the south of the proposed OHL route. However, Section 4 of the project is within the northern fringe of the current breeding population core range and there was evidence of a potential future northward extension of breeding activity, i.e. into the Study Area, during surveys for this EIA.

9.3.6.5.2 Section 1- Summary Desk Study and Survey Results

1 No desk study records were obtained for this Section.

2 No red kite flight activity was recorded in this Section of the Study Area. There was no evidence to suggest any breeding activity within the survey area for this Section in 2008 or 2009.

9.3.6.5.3 Section 2 - Summary Desk Study and Survey Results

1 No desk study records were obtained for this Section.

2 No red kite activity was recorded in this Section of the Study Area during any surveys.

9.3.6.5.4 Section 3 - Summary Desk Study and Survey Results

1 No desk study records were obtained for this Section, however, the Dumfries & Galloway Raptor Study Group suggest that it is likely that adults nesting outwith the Study Area, or immature birds, may use this area for foraging, particularly in the winter.

2 Three red kite flight lines (all single birds) were recorded in the first period of the flight activity survey at collision risk height, in the vicinity of the Water of Deugh; one around Bardunnoch and two sightings of a wing-tagged juvenile around Furmiston Farm. Two flight lines were recorded in the second period, two adults, one of which was wing-tagged were noted flying at risk height near the Water of Deugh and the other west of Kendoon Loch. Three adult birds were recorded in the third period of the flight activity survey.

9.3.6.5.5 Section 4 - Summary Desk Study and Survey Results

1 No desk study records were obtained for this Section, however, similarly to Section 3 it is likely that adults nesting outwith the Study Area, or immature birds, may use this area for foraging, particularly during the winter. One record of red kite was recorded in this Section of the Study Area during surveys for the Blackcraig Hill Windfarm EIA. Red kite was also recorded as present in this area during the Margree Windfarm EIA surveys.

2 Red kite flight activity was highest within this section in comparison to the rest of Study Area. During the first survey period 139 records were made, the majority of which, were of single birds, 25 were confirmed as adults, 3 were possibly adults and four were confirmed as juveniles. Relatively intensive flight activity was noted in the vicinity of Carsfad and Earlston Loch. The majority of this activity was recorded to the south of the proposed OHL route. Another area of activity was noted to the west of Corriedoo. Other flight lines were recorded in the vicinity of Loch Ken, Mackilston Hill and Marksaig Hill.

3 Appreciably fewer flight lines were recorded in the second period of the flight activity survey. A total of 23 records were made in this section, 22 records were of single birds and one record was of a pair, one of the eight confirmed adults was identified as a male and eight were identified as juveniles. The greatest number of flights were picked up in an area from Dundeugh to Markskaig Hill.

4 Red kite activity was relatively high during the third period of the flight activity survey. Intensive activity was recorded between Kendoon and Kendoon Loch and another significant, but sparser concentration was noted .to the south of the Carse of Dundeugh and Lochinvar Reservoir. Many of these flight lines were recorded at collision risk height (c. 47% of all flights that crossed the proposed OHL route for the Study Area as a whole where within the collision risk height band). All 19 records were for single birds, with one repeat sighting of an individual, 10 of the birds were identified as adults.

5 During the breeding raptor survey in 2009 territorial red kite activity was recorded in this Section but breeding was not confirmed (further details are provided in the Confidential Ornithological Appendix D.10).

9.3.6.5.6 Conclusion and Evaluation

1 Red kite was the third most frequently recorded target species during the flight activity surveys. Activity was highest outside of the breeding season and the vast majority of flights were recorded in Section 4 of the project Study Area, which was expected given its proximity to the known core range of the established population in Dumfries & Galloway.

2 Vantage points were used in early spring in order to record any breeding display by territorial pairs, or single un-paired birds over mature woodland areas with potential for nesting. Based on the 2000 National survey of Britain, a range of behaviours were used to identify birds occupying territories (Wotton *et al.* 2002). None of the range of flight or perching behaviours were recorded in the survey corridor though hunting behaviour and occasional flight interactions by tagged adults and / or untagged juveniles (last years young in dispersal) were recorded during vantage points or as ad-hoc records during the breeding season. The vast majority of this activity was to the south of Carminnows and Kendoon Loch (Section 4 of the Study Area). No synchronised flying, chasing, calling or aggression toward other raptors or corvid species, indicative of breeding activity, was observed within the Study Area. In addition, woodland surveys for raptor nests and moulted feathers, faeces, pellets or other prey remains did not indicate the presence of roosts. This included thorough searches of mature conifer blocks and sheltered valley broadleaf woodland where winter flight activity and perching had been recorded.

3 In this general area the red kite population is rapidly expanding and it may be that dispersed non-breeding birds observed in summer 2009 will establish breeding territories in suitable habitat within the survey corridor in the near future.

4 There are no feeding stations, abattoirs, refuse tips or other reliable food sources within or immediately adjacent to the proposed OHL route. Feeding stations well to the south and west of the survey area (Loch Ken, River Dee, Lauriston area) encourage the build-up of large communal roosts including migrant birds.

5 In summary, breeding activity was not recorded within the survey area in 2009. There is potentially suitable nesting / breeding habitat present within Section 4 of the proposed OHL Study Area and observations in 2009 suggest that breeding could occur in this general area in future years. The nearest known current breeding activity is c. 5km from the proposed OHL route. Red kite use communal roosts, particularly during the winter months. There was increased activity in the Study Area during the winter period but no roost sites were located.

6 Taking into consideration the population size and national conservation status of this species and on the basis of the level of flight activity within the area that Section 4 of the project passes through and the potential for breeding to occur in this general area in the near future, the Study Area as a whole is considered to be of High nature conservation value for red kite, in the context of the Scottish population, Medium in terms of the British population (see Table 9.11 for a breakdown of the evaluation for the separate sections of the project).

9.3.6.6 Hen Harrier (*Circus cyaneus*)

9.3.6.6.1 National and Regional Status

1 Hen harrier is listed on Schedule 1 to the Wildlife and Countryside Act (1981), as amended. It is also listed in Annex I, of the EC Birds Directive, Appendix III of the Bern Convention and Appendix II of the Bonn Convention. It is a species with unfavourable conservation status in Europe (SPEC 3). The hen harrier is on the Scottish Biodiversity List and is on the UK Red List (Eaton *et al.* 2002). This species has also been identified within the SNH Species Action Framework as one of 32 species that are the focus of new conservation action for five years from 2007.

2 The European population is estimated at 22,000 to 32,000 pairs, with the majority found mainly in Russia and, to a lesser extent, France, Sweden, Finland, Britain and Ireland (Brown and Grice 2005). The UK population (i.e. including Northern Ireland) was estimated at 570 (500–640) territorial pairs in 1998 (Sim *et al.* 2001) and 806 (732–889) territorial pairs following a national survey completed in 2004 (Sim *et al.* 2007). Scotland supports the majority of the UK breeding population. The Scottish population was estimated at 633 pairs, based on the findings of the 2004 survey and the wintering population has been estimated at 1,540 individuals following autumn migration (Forrester *et al.* 2007). Significant concern remains over the conservation status of this species in the UK, with human persecution continuing to be one of the primary factors limiting the range and productivity of hen harriers.

3 The most recent breeding population estimate for the region (i.e. Southern Uplands) is 64 territorial pairs (Sim *et al.* 2007). The south-west of Scotland is one of the main wintering areas for hen harriers in the UK (Clarke & Watson 1990), where adults that have bred in other areas in Scotland converge. Hen harriers are much more wide-ranging in their habitats during the post-breeding and winter period, in comparison to the breeding period. They are considered to be partial migrants, with some populations being more sedentary than others, as is the case with the breeding population in south-west Scotland (Etheridge 2002). There is a general dispersal to lower-lying ground following the breeding season, with juveniles and males tending to disperse further than adult females (Marquiss 1980). However, Scottish hen harriers and juvenile males, in particular, can undertake more 'typical' migratory movements, moving south during the winter to southern England and as far south as the Iberian Peninsula (Etheridge 2002).

9.3.6.6.2 Section 1 - Summary Desk Study and Survey Results

1 The NBN Gateway holds historic records of hen harrier at a 10km resolution for this part of the Study Area (squares NS 40, NS 41 and NS 50). Three records of hen harrier were reported for this Section of the Study Area during the SWS Project EIA surveys. One record was made in the vicinity of Grimmet Hill, one in the vicinity of Auchenroy and one in the vicinity of Burnton. There is a historical winter roost site in Section 1 of the Study Area (see the Confidential Ornithological Appendix D.10 for further information).

2 Two adult males were recorded in during the first flight activity survey period in the vicinity of Bogton Loch.

3 No flight lines were recorded in the second or third period of the flight activity survey. There was no evidence to suggest any breeding activity within the survey area in 2008 or 2009.

9.3.6.6.3 Section 2 - Summary Desk Study and Survey Results

1 The NBN Gateway has historic records of Hen harrier to a 10km resolution (squares NS 50, NS 40 and NX 59). Dumfries & Galloway Raptor Study Group have two records of at least one pair of hen harrier using parts of section two of the OHL survey area, no other desk study records for hen harrier were received for this Section.

2 Three males, one ringtail and one bird of unknown sex / age were recorded on the flight activity surveys. Two harrier flight lines were recorded in the first period of the flight activity survey within this section. One flight line of a single bird to the north of Loch Doon and the second was noted between Craighead Wood and the Galloway Forest Park. No flight lines were noted in the second survey period. Three hen harrier flight lines were recorded in the third period of the flight activity survey. These were all single birds and were recorded in the vicinity of Pennyvennie Bridge, Meikle Hill and Trough Burn.

3 No breeding hen harrier activity was recorded during the breeding raptor survey 2008-2009 within this Section. There were however, late spring / early summer records of hen harrier in parts of Section 2 which suggested possible breeding in the area (see the Confidential Ornithological Appendix D.10 for further information).

4 The heath and mire communities on the plateau and upper flanks of Windy Standard and Hawthorn Hill and the plateau and slopes of extensive heather cover on and surrounding Bryan's Heights provide potentially good nesting habitat for this species

9.3.6.6.4 Section 3 - Summary Desk Study and Survey Results

1 The NBN Gateway holds historic records for Hen harrier at a 10km resolution (NS 50) for the northern area of this Section and records at a 10km resolution for the southern area of this Section (NX 59 and NX 58). Record sources are from the Ayrshire Species database and the BTO Atlas of Wintering Birds in Britain and Ireland (1962-1983). No other records for hen harrier were received for this Section.

2 Twelve hen harrier flight lines were recorded in the first period of the flight activity survey there was one sighting of a female and eleven sightings of males, although three of these were repeat sightings (confirmed as the same bird). Concentrations occurred around the Water of Deugh, Loch Muck and the western shore of Ken Doon reservoir. Three hen harrier flight lines were noted in the northern area of this Section during the second period of the survey in the vicinity of Lamford Hill, all were male. Fourteen hen harrier flight lines were recorded in the third period of the flight activity survey, 8 males and a female was sighted twice in same survey at Bardennoch Hill. Concentrations of flight lines were north-west of Loch Muck, in the vicinity of Meadowhead, Holm Hill and south of Carsphairn. One flight line was recorded in the very southern end of this Section.

3 During the breeding raptor survey completed in 2009 hen harrier activity was noted at Benbrack and Little Eriff Hill in the late spring-early summer period, suggesting possible breeding. Observations from other vantage points north of Carsphairn (Section 3) also included infrequent winter hen harrier flight activity associated with late or early foraging and commuting to near-by roosts. A mix of both male and 'ringtail' birds typically flew under the existing power line, crossing the A713, on passage to or from roost sites. The timing and pattern of flight activity suggested that the wintering harrier population in this area may be more widely dispersed with single bird movements and less evidence of "communal" roost behaviour potentially using suitable tall vegetation habitats in parts of this Section of the study area (see Confidential Ornithological Appendix D.10, for further information).

9.3.6.6.5 Section 4 - Summary Desk Study and Survey Results

1 The NBN gateway database holds historic records for hen harrier to a 10km resolution (in square NX 68). Data comes from the BTO First Atlas of Wintering Breeding Birds in Britain and Ireland (1981-1984) and BTO Second Atlas of Wintering Breeding Birds in Britain (1988-1991). The SOC provided two records of hen harrier within the Study Area for section four, in one instance a lone male in the other a pair. Hen harrier was recorded as present in this Section of the Study Area during the Margree Windfarm EIA surveys. Six sightings of hen harrier were recorded in the section during surveys for the Blackcraig Hill Windfarm EIA surveys.

2 Relatively intensive hen harrier activity was noted in the first period of the flight activity survey (October 2007 to mid-April 2008). A total of 28 records were made of individual birds in this period: 17 males, eight females and three ringtails. Flight lines were recorded around Barlaes Hill and Craigencorr Hill and some of these were at collision risk height. One flight line was recorded east of the Carse of Dundeugh and one flight line, at collision risk height, was recorded at Knocknalling. Two flights at collision risk height were recorded in the extreme southern part of the section, at Corriedoo. Two flight lines were recorded during the second survey period and fifteen flights were recorded in the third survey period.

3 Hen harrier activity was recorded in this Section during the 2009 breeding raptor survey but breeding was not suspected during the survey area at this time. Breeding habitat quality is considered to be relatively good for this species towards the southern end of the Section in the area associated with Troquhain Hill and the heather-rich slopes falling to Loch Brack to the west and Blackcraig Hill to the east. Also in Section 4, the remnant blanket mire to the east of Barlaes Hill and toward the old hill of Mackilston.

4 A winter roost site was identified within this Section and a specific vantage point survey was carried out involving dusk monitoring (as per the methodology described in Gilbert *et al.* 1998). A maximum of four adult males were recorded using the roost (see Confidential Ornithological Appendix D.10 for further information), this site was taken into consideration in the routeing of the proposed OHL.

5 Vantage points covering the Margree and Glenshimmeroch forests and open grass hill margins regularly recorded male harrier flight activity frequently late or early in the day, suggesting links to the known roost in the survey area and an area outside the survey area to the north-east.

9.3.6.6.6 Conclusion and Evaluation

1 No evidence of breeding activity was noted for any section of the Study Area during field surveys in 2008 or 2009. There were no observations of displaying birds either individually or as pairs observed during the survey period. However, late spring / early summer records of hen harrier in parts of Section 2 suggested possible breeding in the area. Future sporadic breeding attempts within areas of forest (particularly pre-thicket plantation) adjacent to open moorland is possible almost anywhere within the Study Area. However, potentially good quality breeding habitat was found in Sections 2 and 4.

2 There was infrequent but regular hen harrier flight activity recorded during the vantage point surveys. Activity was recorded throughout the entire survey period but with a greater level of activity outside of the main breeding season. A winter roost was located in Section 4 (there is also a known historical roost site in Section 1 of the Study Area). Flight activity data suggested that additional roost sites used sporadically by single or very small numbers of birds may be present in Section 3 of the Study Area.

3 The proposed OHL passes through an appreciable proportion of south-west Scotland, a region that supports relatively large numbers of birds that breed within the wider region, and other parts of Scotland, and which congregate here during the winter. There is no evidence of current breeding activity within the Study Area, although there is suitable breeding habitat present. Taking into consideration the conservation status of the population in Scotland (and the UK) the wintering population within the proposed OHL Study Area as a whole (or that are supported at least in part by foraging habitats within the Study Area) is considered to be of Medium-High nature conservation value.

9.3.6.7 Goshawk (*Accipiter gentiles*)

9.3.6.7.1 National and Regional Status

1 Goshawk is listed on Schedule 1 to the Wildlife and Countryside Act 1981 (as amended). Historically, goshawk was an extremely rare breeder in the UK, due to the effects of deforestation and persecution, but over the past c. 40 years this species is in recovery and the population has expanded into parts of its former breeding range (Parkin & Knox 2010). It is currently ion the UK green list and is not a species of conservation concern in Europe (Eaton *et al.* 2009). The UK population was estimated at 400 pairs in 1995 (Baker *et al.* 2006) and 272 confirmed pairs were reported in 2006, although this is likely to be an underestimate (Parkin & Knox 2010). There are estimated to be at least 130 breeding pairs of goshawk in Scotland (Forrester *et al.* 2007) with a winter population estimated at 350-450 individuals. Goshawk remains a scarce breeder in Scotland, with most pairs located in the Borders and north-east Scotland.

9.3.6.7.2 Section 1- Summary Desk Study and Survey Results

1 No desk study records for goshawk were received for this Section.

2 No goshawk flight lines were recorded during flight activity surveys in this Section over the whole study period.

9.3.6.7.3 Section 2 - Summary Desk Study and Survey Results

1 Four records of individual female goshawks were recorded in this Section of the Study Area during surveys for the EIA of the Kyle Forest Windfarm. All four records were in the vicinity of the South Kyle Forest.

2 No goshawk flight lines were recorded for this Section during the flight activity survey.

3 The raptor survey carried out in 2009 noted goshawk display behaviour in the vicinity of the South Kyle Forest although breeding was not confirmed. Plunging display flight by a single male (as described by Cramp and Simmons 1980) was observed. Also, on another occasion both a male and a female were observed in flight at the same time in the South Kyle Forest area. Although the presence of birds, including single birds displaying, may not be linked to an occupied nest site the weight of evidence (from survey and desk study) indicates that there may be one breeding territory within Section 2.

9.3.6.7.4 Section 3 - Summary Desk Study and Survey Results

1 No desk study records for goshawk were received for this Section.

2 Two males, one adult female and a bird of unknown sex / age were recorded during the flight activity surveys. Two goshawk flight lines were recorded in the first period, one over the Water of Deugh and the other to the extreme south of the section,

flying over the existing and proposed line at risk height. No flight lines were noted in the second period of the flight activity survey. Two flight lines were noted in the last period of the flight activity survey, one over the Water of Deugh the other over Lamford Hill.

3 Goshawk activity (prey remains) was recorded during the breeding raptor survey in 2009 in the vicinity of Little Eriff Hill and Brockloch Hill.

9.3.6.7.5 Section 4 - Summary Desk Study and Survey Results

1 Five records of goshawk were recorded in this Section of the Study Area during surveys for the Blackcraig Hill Windfarm EIA. Three goshawk records were made in this Section of the Study Area during surveys for the Margree Windfarm EIA. Two sightings were of individual birds in the vicinity of Stroan Hill and Regland Burn. The third was of two birds within the Margree Forest.

2 Eight males, three adult females, one juvenile and eight of unknown sex / age were recorded during the flight activity surveys. One goshawk flight line was recorded in the first period west of Casfad Loch. Seven records were made during the second period of surveying, however, three flight lines, to the extreme south of the proposed OHL, were of the same bird on the same day. Two were recorded in a similar location flying over the A702, and the others over Glenshimmeroch Hill and Dundeugh Hill. Nine flight lines were recorded in the third period of surveying, one flight was recorded south of the Kendoon Loch, another to the extreme south of the proposed OHL, two goshawks flew south together in the vicinity of Hoghill toward Lonchinvar reservoir, the five others were recorded in a similar area.

3 During the breeding raptor surveys in 2008 and 2009, goshawk activity was noted in the vicinity of Corriedoo, Glenshimmeroch and Dalshangan. Breeding activity was recorded at two locations in Section 4 of the survey area in 2008 with presence of a successful nest and fledging of 3 young (juveniles hunger-calling was noted near this site in July) confirmed for one site. A breeding attempt was also noted in this same location in 2009, this nest was subsequently found to have failed (see the Confidential Ornithological Appendix D.10 for further details).

9.3.6.7.6 Conclusion and Evaluation

1 The majority of the 4km wide survey corridor comprises commercial conifer plantation including significant areas of mature pole stage forest (and smaller areas of long-term retention and mature broadleaved woodland) that provides potential breeding habitat for goshawk. All of these “preferred” habitats were systematically searched on foot and using vantage point for evidence of goshawk occupancy and breeding activity.

2 Successful breeding was confirmed in one location Section 4 in 2008 (see the Confidential Ornithological Appendix D.10 for further details) and suspected in another location in Section 4 in 2008.

3 Flight activity surveys along the route corridor and collision risk walked transects along existing OHL wayleave provided additional evidence of occupancy with flight activity observations and fresh kill pluckings recorded within or adjacent to the woodlands at Margree, Glenshimmeroch, Dalshangan, Brockloch, Muckle, Eriff Hill, Clawfin Hill and finally the Nith west of Maneight Hill. There were additional flight activity records in the plantation forests adjacent to the northern end of the survey corridor, together with some pluckings.

4 The paucity of territorial and breeding display behaviour observations, combined with a low number of pluckings and feather moult records suggest a low breeding population across the Study Area as a whole (c. 3 pairs).

5 The population with the Study Area as a whole is considered to be of Medium nature conservation value based on an assumed total of 3 breeding territories and a national population of c. 400 pairs. This evaluation takes into consideration the level of disturbance from forestry operations during the survey period which may have affected goshawk prey species and suppressed, or masked, to some extent breeding activity.

9.3.6.8 Merlin (*Falco columbarius*)

9.3.6.8.1 National and Regional Status

1 Merlin is listed on Annex 1 of the EC Birds Directive and is afforded enhanced protection in Britain through its inclusion on Schedule 1 to the Wildlife and Countryside Act 1981 (as amended). Merlin is on the UK amber list due to a historical population decline from 1800–1995 but with substantial recent recovery (Eaton *et al.* 2009). The UK population is recovering having more than doubled over last 25 years and was estimated at 1,300 based on a national survey in 1993-94 and the Scottish breeding population was estimated, from the same data, to be 800 pairs (Rebecca & Bainbridge 1998),

2 Similarly to elsewhere in Scotland, merlin is a scarce breeder in Dumfries & Galloway. The OHL Study Area passes through a known breeding population range (Forrester *et al.* 2007).

9.3.6.8.2 Section 1 - Summary Desk Study and Survey Results

1 No desk study records for merlin were received for this Section.

2 There were no records of merlin in this Section of the survey area during any of the bird surveys.

9.3.6.8.3 Section 2 - Summary Desk Study and Survey Results

1 There are two records of merlin on the NBN Gateway database for this area. Merlin is recorded within a 10km resolution (NS 60) in the far north of this Section and at a 10km resolution (NX 69) in the far south of the section. The Dumfries & Galloway Raptor Study Group provided one merlin breeding record within this Section of the survey area. Seven records of merlin were made during flight activity surveys for the Kyle Forest Windfarm EIA. Two records in the vicinity of Court Knowes and Harthorn Hill. Three records of individual females were made in the vicinity of Benbain Hill and Craignane Hill. Two records of other individuals were made in the vicinity of the South Kyle forest. Breeding was suspected to be up to two territories within South Kyle.

2 One merlin flight line was recorded in this area during the first period of the flight activity survey, north of Loch Doon reservoir. No others flight lines were recorded in this section.

9.3.6.8.4 Section 3 - Summary Desk Study and Survey Results

1 The NBN Gateway holds records for merlin for two 10km squares in this Section (NX 59 and NX 58). Record sources are from the Ayrshire Species database and the BTO Atlas of Wintering Birds in Britain and Ireland (1962-1983). No other records for merlin were received for this Section.

2 Four merlin flight lines were recorded in the first period of the flight activity survey, three were identified as females (two were records of the same bird). No merlin flight lines were recorded in the second period of the flight activity survey. Two flight lines were recorded north of Green Well of Scotland and one to the west of Carsfairn during the third period of the flight activity survey. Of these, two records were of single birds, one identified as a male, and one record was for two birds.

3 Some merlin activity was recorded in the vicinity of Lambford Bridge during the breeding raptor survey in 2009 breeding was suspected but not confirmed.

9.3.6.8.5 Section 4 - Summary Desk Study and Survey Results

1 The NBN gateway database holds historic records for merlin to a 10km resolution, in square NX 68. Data comes from the BTO First Atlas of Wintering Breeding Birds in Britain and Ireland (1968-1972), BTO Second Atlas of Wintering Breeding Birds in Britain (1988-1991) and First Atlas of Wintering Breeding Birds in Britain (1981-1984). Two records of merlin were reported from surveys for the Blackcraig Hill Windfarm EIA. Three records were reported in the Margree Windfarm ES. Sightings were in the vicinity of the Margree and Regland Burns and one sighting within the Margree Forest.

2 Five records of merlin were made in this Section in the first period of surveying, four were identified as female. Three merlins were recorded to the extreme south of the survey around Barcobe Loch. One was picked up to the north of Dundeugh and another to the north of Old Hill Mackilston. No records were made during the second survey period. One record of a female bird was made during the third period, west of Whitecairn Hill.

3 No breeding merlin activity was recorded during the 2009 raptor survey for this Section of the survey area.

9.3.6.8.6 Conclusions and Evaluation

1 There are several historical records of breeding merlin within the Study Area (i.e. within the survey area for Sections 2, 3, and 4).

2 Habitats surveyed for merlin were rank heather and grass moorland, bracken, young pre-thicket conifer plantations, mature plantations edge and rides including deer glades, open birch / alder / conifer stands and finally, old corvid and raptor nests. In addition, fence lines and dykes were also walked as these features are frequently used by merlin as plucking posts, as are prominent rocks, tree stumps, peat hag margins

and other low promontories (Brown *et al.* 2003). No early display aerial or vocal was recorded within the 4km wide survey corridor and few flesh plucking remains were recorded. Corvid and other old nest checks did not return nesting merlin, faecal droppings, pellets or moult feathers.

3 Flight activity surveys in late spring and summer moorland breeding bird survey did record both male and female merlin hunting near Lamford. However, there was considered to be insufficient evidence to confirm the presence of a breeding attempt in the survey corridor in 2009.

4 Taking into consideration the known difficulty in accurately surveying this species the presence of suitable breeding habitat and the location, timing and number of records during the flight activity survey, the Study Area as a whole is considered to be of Medium nature conservation value for merlin.

9.3.6.9 Peregrine (*Falco peregrinus*)

9.3.6.9.1 National and Regional Status

1 Peregrine is listed on Schedule 1 to the Wildlife and Countryside Act (1981, as amended) and consequently has enhanced protection. Peregrine is currently on the UK green list. The UK population has most recently (2002) been estimated at 1,400 pairs (Banks *et al.* 2003). The Scottish breeding population was estimated at 592 occupied territories with an increase in the estimated number of occupied territories in the south-west of Scotland between 1991 and 2003 (Ibid.). The population of peregrine in the region (i.e. Dumfries & Galloway) was estimated at 66 breeding pairs in 2004 (Chris Rollie, pers. comm.).

9.3.6.9.2 Section 1- Summary Desk Study and Survey Results

1 The NBN Gateway database has two historic records for peregrine falcon in this Section (squares NS 50 and NX 59). There are two known peregrine breeding sites within the survey area for this Section of the project (see Confidential Ornithological Appendix D.10 for further information).

2 Peregrine flight activity was only recording during the second period of the flight activity survey. Four males (two confirmed as adults) and a pair of juveniles were identified.

9.3.6.9.3 Section 2 - Summary Desk Study and Survey Results

1 The Dumfries & Galloway Raptor Study Group hold two records for this Section of the OHL indicating one breeding pair within section two of the survey area (see Confidential Ornithological Appendix D.10 for further information). Four records of peregrine were recorded in this Section of the Study Area during surveys for the Kyle Forest Windfarm EIA. One record was of an individual female in the vicinity of Benbain Hill, two records were of one individual female and one pair in the vicinity of Mossdale and the final record was of an individual in the same area. Ten records of individual peregrine falcons were made during the SWS Project EIA surveys. All records were made in the vicinity of Cocklay Hill, Clawfin, Benbeoch Hill, Pennyvenie Bridge etc.

2 There was one flight line recorded for the first period of the flight activity survey where the bird flew east to the plantation north of Bryan's Heights. Seven flight lines were recorded in the second period of the flight activity survey, a concentration of flight lines were noted at the north of the proposed line with one flight line to the west of Snabb. Six flight lines were recorded in the third period of the flight activity survey, two in the vicinity of Clawfin, two west of Snabb and two to the west of Dalfarson Hill. Four were identified as adult males.

3 Breeding activity was recorded during the breeding raptor survey in 2009 within the survey area relevant to this Section (see Confidential Ornithological Appendix D.10 for further details).

9.3.6.9.4 Section 3 - Summary Desk Study and Survey Results

1 The NBN Gateway holds records for Peregrine falcon for two 10km squares in this Section (squares NX 59 and NX 58). Record sources are from the Ayrshire Species database and the BTO Atlas of Wintering Birds in Britain and Ireland (1968-1981). The Dumfries & Galloway Raptor Study Group hold one record for this Section of the OHL and it indicates one pair using the area within section three.

2 Six peregrine flight lines were recorded in the first period of the flight activity survey in this Section, of which two were male and two were identified as adult females. The majority of these flight lines were noted in a large area around Burntfoot Bridge. Three flight lines were recorded in the second period of the flight activity survey, all at collision risk height, a single male north of Lamford Hill and a male and a female, sighted on different days, east of Carsphain. Two flight lines were recorded the final period of surveying.

3 During the breeding raptor survey in 2009 breeding display behaviour was noted in the survey area for this Section. However, breeding was not thought to have occurred (see Confidential Ornithological Appendix D.10, for further information).

9.3.6.9.5 Section 4 - Summary Desk Study and Survey Results

1 The NBN gateway database holds historic records for peregrine at a 10km resolution, in square NX 68. Data comes from BTO Second Atlas of Wintering Breeding Birds in Britain (1988-1991) and First Atlas of Wintering Breeding Birds in Britain (1981-1984). Five records of peregrine falcon were reported for this Section in the Margree Windfarm ES. Two sightings were in the vicinity of Regland Burn, two sightings were in the vicinity of Margree Burn and one sighting was in the vicinity of the Rig of Knocksting.

2 Nine peregrine flight lines were recorded within this Section in the first period of the flight activity survey. Two males, two females, four birds of undetermined sex / age and a pair of birds were noted north-west and east of Dundeugh, south of Carsfad Loch, east of Earlstoun Loch and south of Milnmark Hill.

3 Seven flight lines, all of individual birds of which four were identified as adult males, were recorded in the second period of the flight activity survey. Flight lines at collision risk height were recorded at Lamb Rigs, Glenhoul Glen and south of the Carse of Dundeugh, one other flight line was recorded west of Old Hill of Mackilston.

4 Five flight lines were recorded in the in the third period of the flight activity survey, three were identified as male, two as female adults and one as a juvenile. A concentration of flight lines occurred in an area north of Carsfad Loch and south of Kendoon Loch with several birds flying at risk height over or in the vicinity of the proposed OHL. A flight line at risk height was also recorded close to the proposed OHL south of Glenshimmeroch Hill.

5 Breeding peregrine activity (one occupied site) was recorded during the breeding raptor survey in 2009 in this section (further information is provided in the Confidential Ornithological Appendix D.10).

9.3.6.9.6 Conclusion and Evaluation

1 During flight activity surveys peregrine was recorded throughout the survey area and in all survey periods.

2 Scoping visits to confirm likely (suitable) breeding habitat were carried out along the route in early March 2009 within the 4km wide survey corridor. Three visits to confirm occupancy were carried out between late March and early July. In addition, vantage point survey was carried out in early spring and mid summer to monitor flight activity as part of occupancy confirmation.

3 Peregrine do not hold exclusive home ranges and are surveyed by locating occupied nesting territories which may have been used for many years. Cliffs and rock crags are the typical nesting site location. In addition, peregrine will use steep banks, rank heather, buildings and man made structures including steel lattice towers and elevated masts.

4 Within the survey corridor there are four historical nesting sites (two in Section 1, one in Section 2 and one in Section 4). In addition, are a number of other feature / habitat locations which could serve as nest sites. These include the existing OHL towers within the corridor, isolated tree nests previously used by species such as raven, buzzard, heron, old quarry faces, and isolated rock crags within plantation forests, fire towers and dam walls.

5 In early spring, breeding display was recorded at two of the historic sites. One pair successfully fledged three young. In addition, flight activity survey over late winter and early spring recorded peregrine activity around Carsphairn, although none of this flight activity was associated with breeding display. No other occupied sites were found and no fresh plucks, active roosts sites, pellets or moult feathers recovered during survey.

6 The peregrine population that is present within the OHL Study Area as a whole is considered to be of Medium nature conservation value (see Table 9.11 for the evaluation of the separate Study Area sections).

9.3.6.10 Black Grouse (*Tetrao tetrix*)

9.3.6.10.1 National and Regional Status

1 Black grouse is on the UK red list, Scottish Biodiversity List and is a priority species in the UK BAP and the Ayrshire and Dumfries & Galloway Local BAPs. It qualifies for UK

red list status is due to a historical population decline in the UK between 1800 and 1995; the rapid (≥50%) decline in the UK breeding population over the last 25 years and having unfavourable conservation status in Europe (Eaton *et al.* 2009). Black grouse has also been identified within the SNH Species Action Framework as one of 32 species that are the focus of new conservation action for five years from 2007.

2 The decline and fragmentation of the British black grouse population started at the end in the 19th century and continued through the 20th century and into the 21st century. There have been particularly concerning decreases in the past 20 years. The population in Britain dropped from 25,000 displaying males in 1990 to 5,100 by 2005 (Parkin & Knox 2010). The Scottish population was estimated at 3,344 males in 2005 (Forrester *et al.* 2007). Approximately 800 (c. 24% of the Scottish total) were estimated to be located in south-west Scotland (comprising Dumfries & Galloway, Ayrshire, Argyll and most of Clyde and Upper Forth).

3 Dumfries & Galloway is estimated to support a population of only 200 lekking males (Dumfries & Galloway Black Grouse Project, 2007). Similarly to populations in most of the rest of Scotland, there has been a huge reduction in numbers over recent decades in Dumfries & Galloway (c. 49% between 1995 and 2005). This is primarily a result of detrimental changes to moorland habitats (e.g. changes in grazing and muirburn management and the loss of habitat from maturing conifer plantations). There is a specific Recovery Project and Action Plan for black grouse for this region with a particular focus on important lek sties and encouraging the management and enhancement of forest plantations for the benefit of this species (source: http://www.blackgrouse.info/). A significant proportion of the recovery effort (until 2012) is being directed towards Galloway Forest District, which lies to the west of the proposed OHL route.

9.3.6.10.2 Section 1- Summary Desk Study and Survey Results

1 RSPB provided one casual black grouse record for this section of the study area relating to a male observed in flight in 2004 approximately 3km from the proposed OHL and 1km from the existing OHL. Four records of black grouse were recorded in this Section of the study area during the SWS Overhead Power Line EIA surveys. Three records of single males were made in the vicinity of Kiers Hill and Grimmet Hill. Two females were recorded in the same area.

2 No flight lines were recorded for black grouse in this Section.

9.3.6.10.3 Section 2 - Summary Desk Study and Survey Results

1 Historic RSPB records include the presence of black grouse at Cocklay Hill and Clawfin Hill. There are more recent RSPB records of black grouse at Windy Standard Hill, Brown Hill, High Chang Hill, Bryan's Heights and Mossdale Burn. A main lek of up to c. 6 males was present in this area in the 1990's, but more recent data indicate a much smaller population in this area (e.g. count of 2 males in 2007).

2 Six records were made of black grouse in this Section of the Study Area during the SWS Project EIA surveys. Four records were made of males in the vicinity of Harthorn Hill, Windy Standard Hill, Pennyvennie Bridge and Parrie Burn. One record of two females was made in the vicinity of Campbell's Hill and one individual was recorded in the vicinity of Mossdale Burn.

3 During surveys for the Kyle Forest Windfarm EIA lekking activity was reported in the Mossdale / Clawfin area.

4 Historical lek site locations are included within the Confidential Ornithological Appendix D.10.

5 No records of black grouse were made in any of the surveying periods for this area. No evidence of lekking activity was recorded during spring lek reconnaissance surveys in 2008 or 2009. This included repeat surveys of known historical lek sites in South Kyle Forest.

6 Available data indicates a fragmented and declining population in South Kyle Forest, which is most likely due to the progressive loss of habitat as a result the maturing conifer plantation. The Mossdale Burn, upstream from Corbie Craig Reservoir, is the main locus for the majority of historical records within the area that Section 2 of the proposed OHL passes through. All historical RSPB records are to the south and east of the proposed OHL route (not closer than c. 300m, and most being more than 500m from the route of the proposed OHL) as a result of routeing decisions, made in consultation with FCS and RSPB, to help reduce potential fragmentation and collision risk effects on this population.

9.3.6.10.4 Section 3 - Summary Desk Study and Survey Results

1 RSPB records indicate the presence of black grouse near Lamford Hill, with single males noted in 2007, Holm Hill (2 males in 1999) and several lek records in the vicinity of Garryhorn. There are a small number of scattered old and / or single bird records elsewhere within this section of the Study Area.

2 Black grouse flight activity was recorded in the part of the Study Area that Section 3 of the project passes through. Activity was concentrated around Little Eriff Hill and Lamford Hill (see Figures 9.41 and 9.42). Some activity was also noted to the west of the proposed and existing OHLs in the general vicinity of Garryhorn Rig.

9.3.6.10.5 Section 4 - Summary Desk Study and Survey Results

1 The second main concentration of historical records within the project Study Area, after South Kyle forest, is associated with Corriedoo Forest (in Section 4 of the project Study Area). A lek count of seven males was made in 2002 with most other records in this area of much lower numbers. The main concentration of records within Corriedoo Forest are more than c. 750m from the proposed substation. However, the proposed underground cable route does pass much closer to some of the recent historical lek count locations. There are also relatively old RSPB records (from 1997) of single males in the vicinity of Butterhole Bridge and the north-facing slopes of Glenshimmeroch Hill.

2 Twelve sightings of black grouse were made in this Section of the Study Area during the Blackcraig Windfarm ES, 2007. In addition, three sightings of black grouse were made in this Section during the Margree Windfarm ES, 2007. All sightings were of individual birds and were recorded in the vicinity of Regland Burn and Regland Loch.

3 No black grouse were recorded in the first and second period of the flight activity survey for this Section. One flight line was recorded in the third period of the flight activity survey within the Rigs of Glenshimmeroch area and two flight lines (of two birds each) were recorded within or on the edge of Margree Forest.

9.3.6.10.6 Conclusion and Evaluation

1 The majority of the Study Area is located within an area of southern Ayrshire and Dumfries & Galloway that supports a fragmented and relatively low density black grouse population. Evidence from surveys and recent desk study data indicates that there are no active lek sites in the immediate vicinity of the proposed OHL route (the route has been designed to avoid known areas with concentrations of black grouse records, in particular at South Kyle Forest).

2 Considerable efforts in relation to monitoring, research, modifications to forest deign plans and active management have been made in recent years, coordinated by RSPB, to reverse long-term declines in this species in the region. This, coupled with the maturation and felling of large areas of plantation forests in the OHL Study Area, should help to improve habitat quality for black grouse in the near future. Evidence from black grouse recovery projects elsewhere in the UK indicates that population recoveries are possible following the successful implementation of such plans.

3 Taking this into consideration, the extent of the OHL survey area within potentially suitable (and occupied) black grouse habitat, the conservation status of the species in the region and nationally, a nature conservation evaluation for the OHL Study Area as a whole of Medium is considered appropriate (see Table 9.11 for the evaluation of the separate Study Area sections).

9.3.6.11 Golden Plover (*Pluvialis apricaria*)

9.3.6.11.1 National and Regional Status

1 Golden plover is a species of 'least concern' globally and is considered 'secure' at a European level (BirdLife International, 2004). It is on the amber list of UK Birds of Conservation Concern due to at least 20% of the non-breeding European population being found in the UK (Eaton *et al.* 2009). Golden plover is on Annex 1 of the EC Birds Directive. Although the population as a whole in Europe is currently considered to be stable there is evidence of historical declines and range contractions in the UK and the southern subspecies, which is restricted to the UK, Ireland, Denmark and Germany, is considered to be in decline (Stroud *et al.* 2004). A large proportion of the UK breeding population is located within Scotland, with concentrations in the Central and Western Highlands and the north of Scotland.

2 The European breeding population has been estimated at >460,000 pairs, with northern Europe containing >50% of the golden plover global breeding range (BirdLife International 2004). The UK breeding population has been estimated to range between 38,400 and 59,400 pairs (BirdLife International 2004). The Scottish breeding population has been estimated at 15,000 pairs (Forrester *et al.* 2007). 'Regional' breeding population estimates, based on Natural Heritage Zone boundaries (SNH 1998) which divide Scotland into a number of distinct biogeographical areas, have been published (Pearce-Higgins *et al.* 2008). However, the proposed OHL Study Area

lies outside of the current breeding range of this species in Scotland (although there are breeding sites elsewhere in south-west Scotland).

3 The British wintering population has not been subject to accurate census due to the difficulties of assessing the use of inland farmland sites. In 2005 the winter population was estimated at 250,000 (excluding farmland), more systematic survey during winter 2006-07, which included inland areas, indicated a population of c. 400,000 birds (Parkin & Knox 2010). For Scotland, the coastal wintering population was estimated at 16,376 birds in 1997 with an additional 15,000 to 20,000 birds estimated to be using inland areas (Forrester *et al.* 2007). The combined mean BTO WeBS count for Dumfries & Galloway and Ayrshire for the period 1992 to 2002 is 5,530 birds (Ibid). Dumfries & Galloway is generally considered to be an important passage / wintering area for this species in Scotland, with birds using both coastal and inland sites (particularly areas of lowland enclosed pasture and marshy grassland). The Solway Estuary and Wigtown Bay are two of only a small number of sites in Scotland that exceed the threshold for national importance for this species; the threshold is 2,500 birds based on 2006-07 WeBS counts data (Austin *et al.* 2008).

9.3.6.11.2 Section 1- Summary Desk Study and Survey Results

1 No desk study records for golden plover were received for this Section of the Study Area.

2 No golden plover flight lines were recorded in this Section.

9.3.6.11.3 Section 2- Summary Desk Study and Survey Results

1 Two records of golden plover were made during the Kyle Forest Windfarm ES, 2007. One record was of a flock of three hundred individuals in the vicinity of Mossdale and one record was of one male heard calling in the same area. There are also historical breeding records for Windy Standard (prior to afforestation).

2 No observations of golden plover were made during the survey period.

9.3.6.11.4 Section 3- Summary Desk Study and Survey Results

1 No desk study records for golden plover were received for this Section of the Study Area.

2 One golden plover flight line was recorded in the vicinity of Lamford Hill in the first period of the flight activity survey. No golden plover activity was recorded in the second or third period of recording.

9.3.6.11.5 Section 4- Summary Desk Study and Survey Results

1 No desk study records for golden plover were received for this Section of the Study Area.

2 There were two records of golden plover from the first period of the survey, one record of an individual bird flying over the B7000 and one of 44 birds flying east to west over the fields south of the A702. No records were made of golden plover in the second and third periods of the survey.

9.3.6.11.6 Conclusion and Evaluation

1 Observations of golden plover were restricted to winter flight activity surveys in Section 3 and Section 4 (where a flock of 44 birds was observed on one occasion). There was no evidence of breeding activity recorded in 2008 or 2009. However there is some suitable breeding habitat located within the Study Area and there are historical records of breeding in Section 2, associated with the hill tops in South Kyle Forest.

2 During the winter golden plover can spend much of their time inland (in contrast to most wintering waders) feeding and roosting in areas of earthworm-rich enclosed grassland and ploughed fields in lowland areas, although they also frequent coastal sites (Byrkjedal & Thompson 1998). However, numbers appear to fluctuate markedly in response to the severity of the weather. The region as a whole may form part of a broad migratory corridor for birds that breed in Scotland, Iceland and Scandinavia.

3 The Study Area principally provides areas of suitable wintering habitat for golden plover although there was no evidence from surveys in 2008-09 of any regularly used areas or combined numbers of birds that could be considered significant at a national level. Consequently, and on a conservative basis given the presence of suitable wintering habitat and the potential for wide variation in use of the Study Area from year to year, a Medium nature conservation value for the Study Area as a whole is considered appropriate (see Table 9.11 for separate evaluations for each of the Study Area sections).

9.3.6.12 Barn Owl (*Tyto alba*)

9.3.6.12.1 National and Regional Status

1 Barn owl is on the UK amber list due its unfavourable conservation status in Europe (SPEC 3) (Eaton *et al.* 2009). It is listed on Schedule 1 to the Wildlife and Countryside Act (1981 as amended). The UK population was estimated at 4,000 pairs for the period 1995–97 with a population estimate of c. 480 pairs for Scotland (Toms *et al.* 2001). From more recent intensive fieldwork the Scottish population has been estimated at closer to 1,000 pairs with the population in Ayrshire & Galloway estimated at 500 pairs (c. 10% of the British population), which is the largest regional population in Scotland (Forrester *et al.* 2007). Southwest Scotland in a UK context has a high barn owl density, with a number of nest monitoring schemes and organisations ringing and monitoring populations in various parts of the region.

9.3.6.12.2 Section 1 - Summary Desk Study and Survey Results

1 No desk study records for barn owl were received for this Section.

2 No flight lines were recorded during flight activity serves, which only had limited overage of are that Section 1 of the proposed OHL passes through.

9.3.6.12.3 Section 2- Summary Desk Study and Survey Results

1 One record of barn owl was reported for this Section of the Study Area during the Kyle Forest Windfarm EIA surveys, in the vicinity of Cocklay Hill.

2 There were no records for barn owl during period one or two of the flight activity survey. There were two records of hunting barn owl in the third period of the survey, both just east of the proposed OHL route, north of Glenmuck Craig .

3 Barn owl was recorded during breeding raptor surveys in 2009 in the vicinity of Mossdale and Clawfin (details are provided in the Confidential Ornithological Appendix D.10). Two confirmed and two possible breeding territories were identified in this Section.

9.3.6.12.4 Section 3- Summary Desk Study and Survey Results

1 No desk study records for barn owl were received for this Section.

2 There were no records of barn owl from any of the flight activity survey periods for Section 3.

3 Breeding barn owl activity was recorded during the 2009 breeding raptor survey at Brockloch (further details are provided in the Confidential Ornithological Appendix D.10).

9.3.6.12.5 Section 4- Summary Desk Study and Survey Results

1 One barn owl was recorded in the vicinity of Margree Burn during surveys for the Margree Windfarm EIA. No other desk study records for barn owl were received for this Section.

2 There were no records of barn owl from period one of the flight activity survey in this Section.

3 One record of a barn owl hunting along the boundary between the eastern edge of Knockman Hill and Margree plantation, then out of view into the trees, was noted in period two of the survey. Four barn owl records were noted during period three of the survey. Two of these were around Dalshangan, possibly the same individual. A further record of an owl quartering rough ground to the south of Glenshimmeroch Hill, then landing on a fence post. The final record is of a barn owl hunting along the sheltered margins of Glenshimmeroch Rigg and around the ruins at Kilnair.

4 Barn owl nesting was recorded in the breeding raptor survey in 2009, in the vicinity of Glenshimmeroch and a further two sites, one confirmed, in the general vicinity of Lochinvar (further details are provided in the Confidential Ornithological Appendix D.10).

9.3.6.12.6 Conclusion and Evaluation

1 Barn owl pellets, feathers and faecal streaks were recorded at hunters high seats within forestry areas at Glenshimmeroch Hill and Divot Hill (Section 4) with pairs having laid clutches but deserted at some point in 2008. In 2009, breeding occurred at two separate farm buildings in Section 4. An owl carcass was recorded at Kendoon during carcass searches under the existing OHL in winter 2008-09. Although due to the condition of the carcass it was not possible to ascertain if the bird had died following collision with the OHLs.

2 In the 2008 and 2009 seasons breeding was confirmed at one other site in Section 4, two sites in Section 3 and two sites in Section 2 of the OHL survey area.

3 Taking into consideration the number of breeding territories, indicated by survey and desk study, and the conservation status of the population in the region and nationally a nature conservation evaluation of Medium is considered appropriate for barn owl within the Study Area as a whole (see Table 9.11 for separate evaluations for each of the Study Area sections).

9.3.6.13 Short-eared Owl (*Asio flammeus*)

9.3.6.13.1 National and Regional Status

1 Short-eared owl is on the UK amber list due its unfavourable conservation status in Europe (SPEC 3) (Eaton *et al.* 2009). It is listed on Annex 1 of the EC Birds Directive.

2 The British population was estimated to be 1,000-3,500 pairs based on data from 1988-1991 and a population estimate of 780-2,700 pairs for Scotland was indicated from this data (Greenwood *et al.* 2003). More recently the breeding population in Scotland has been estimated to be between 125 - 1,250 pairs with an estimated range of 300 - 3,000 individuals wintering (Forrester *et al.* 2007). Breeding numbers vary widely from year to year in response to population cycles of key prey species. Detailed regional population estimates are not available but data from casual breeding records indicates that Dumfries & Galloway supports a relatively low density of breeding short-eared owl in comparison to other regions of mainland Scotland (e.g. Borders, Caithness, Ayrshire) (Forrester *et al.* 2007).

9.3.6.13.2 Section 1 - Summary Desk Study and Survey Results

1 The NBN gateway provided two records for short-eared owl in section one at NS40 and NS41. No other desk study records for short-eared owl were received for this Section.

2 There were no survey records for this species within this Section of the survey corridor.

9.3.6.13.3 Section 2- Summary Desk Study and Survey Results

1 The NBN gateway provided two records for short-eared owl in section two at NS50 and NS60. No other records for short-eared owl were received for this Section.

2 There were no survey records for this species within this Section of the survey corridor.

9.3.6.13.4 Section 3- Summary Desk Study and Survey Results

1 The NBN gateway provided one record for short-eared owl in section three at NX 59. No other records for short-eared owl were received for this Section.

2 There was one record of short-eared owl in the first period of the flight activity survey, observed flying down the slope of Little Eriff Hill. There were no records of short-eared owl in period two of the survey period. There were three records in the third period, all around the track to the north of Lamford Hill. The first two records were probably of the same bird, quartering the area at low to medium height. The third record is a second bird joining the first, which circled with the first and moved off north with it.

3 No evidence of breeding activity was recorded during breeding raptor surveys in 2009. However, evidence from flight activity surveys suggests that breeding attempts may have occurred in the wider area in Section 3 in 2009, there is suitable nesting habitat for this species in the general area.

9.3.6.13.5 Section 4 - Summary Desk Study and Survey Results

1 The NBN gateway provided one record for short-eared owl in section four at NX 68. The SOC local recorder provided four records of short-eared owl and the RSPB one record. Two records of short-eared owl were made in this Section during surveys for the Margree Windfarm EIA. Both records are of individual birds in the vicinity of the Margree Forest.

2 There were no observations of this species recorded for this Section of the survey area during any of the bird surveys from 2007 to 2009.

9.3.6.13.6 Conclusion and Evaluation

1 Observations of short-eared owl were restricted to Section 3 of the Study Area. There was no direct evidence of breeding recorded in 2008 or 2009, however there is suitable breeding habitat located within the Study Area and flight activity was noted close to the post-breeding period. Breeding activity by this species can vary widely from year to year in response to population cycles of short-tailed field vole (*Microtus agrestis*), their main prey species. Consequently, it is very difficult to predict future numbers.

2 Taking into consideration the presence of suitable habitat, the potential for considerable inter-annual variation in breeding activity and the conservation status of the species at a regional and national level, the Study Area is considered, on a conservative basis, to be of Medium nature conservation value for this species (see Table 9.11 for separate evaluations for each of the Study Area sections).

9.3.6.14 Nightjar (*Carprimulgus europaeus*)

9.3.6.14.1 National and Regional Status

1 Nightjar is listed on Annex 1 of the EC Birds Directive. It is on the UK red list, due to a severe decline in the UK range, of more than 50% over the longer-term, its categorisation as a species with unfavourable conservation status in Europe concentrated in Europe (SPEC 2), and at least 50% of the UK breeding population being found in 10 or fewer sites. It is also a priority species in the UK BAP. The UK breeding population was estimated in 2004 as between 3,700 to 5,500 males (Conway *et al.* 2006). Nightjar is a scarce summer visitor to Scotland with an estimated population of only c. 27 territorial males (Forrester *et al.* 2007). Breeding is confined to the south-west of Scotland, which is at the northern limit of this species range in the UK, with Dumfries & Galloway supporting the majority of the population. The core breeding range is mostly to the south of OHL Study Area although parts of Section 4 are considered to be on the fringe of one of the main concentrations of breeding activity in Dumfries & Galloway.

9.3.6.14.2 Section 1 - Summary Desk Study and Survey Results

1 The NBN Gateway has records for nightjar from the RSPB National Nightjar Survey of 1992. Nightjar was recorded within at a 10km resolution in the vicinity of Dalmellington (square NS 40). There are no other records of nightjar from any other desk study source for this Section of the Study Area.

2 Nightjar was not recorded in this Section during any of the flight activity surveys.

9.3.6.14.3 Section 2- Summary Desk Study and Survey Results

1 One record of nightjar (non-breeding) was recorded during the Kyle Forest Windfarm ES, 2007 in the vicinity of Bellsbank.

2 No records of nightjar were made during surveys of this Section of the OHL Study Area.

9.3.6.14.4 Section 3- Summary Desk Study and Survey Results

1 No desk study records for nightjar were received for this Section of the Study Area.

2 No records for nightjar were made during surveys for this Section of the Study Area.

9.3.6.14.5 Section 4- Summary Desk Study and Survey Results

1 Nightjar was recorded as 'breeding - unconfirmed' in this area during the Margree Windfarm ES, 2007. There is a RSPB record of a nightjar observed in the Corridoo Forest in August 2007.

2 One occupied nightjar breeding territory was recorded during survey for this proposal in 2009 in the Corriedoo Forest (further details are provided in the Confidential Ornithological Appendix D.10).

9.3.6.14.6 Conclusion and Evaluation

1 Records of nightjar were restricted to Section 4 of the Study Area where a male was recorded displaying breeding behaviour ("churring" and wing clapping display) in the same location within plantation forests on more than one occasion. With a large proportion of plantation forests in the OHL Study Area currently (or over the next few years) achieving harvesting age it is likely that the availability of suitable breeding habitat for this species is going to increase over coming decades.

2 Taking into consideration the population size and conservation status of this species at a national and regional level the OHL Study Area as a whole is considered to be of Medium nature conservation value in relation to the British population estimate and High in relation to the Scottish population, on the assumption of one breeding territory within the OHL survey area (see Table 9.11 for separate evaluations for each of the Study Area sections).

9.3.7 Notable Secondary Species / Species of Conservation Concern

1 The following section provides brief details of observations of other notable species or species of conservation concern which are also considered to be at relatively greater risk of collision with OHLs. Further details, from field surveys and desk study, are provided in Appendix D.7.

2 Little grebe (*Tachybaptus ruficollis*) is on the UK Amber List. A breeding pair was noted on Loch Muck (Section 3) during breeding bird surveys in 2009. This species was also recorded in low numbers, in winter, during waterbody counts at Bogton Loch, Carsfard Loch, Loch Doon, Loch Muck and Lochinvar. The highest count of six birds was recorded at Lochinvar in December 2007. The Study Area, as a whole, is considered to be of Low (Local High) nature conservation value for this species.

3 Great crested grebe (*Podiceps cristatus*), which is on the UK Green List, was not recorded as a breeding species within the survey area, but is known to breed on Loch Ken (to the south of the OHL study area). During waterbody counts a number of observations were made, concentrated on one key area. The majority of activity was at Lochinvar, where two birds were recorded on seven instances. A displaying pair was also recorded at this location on three occasions in 2008. Other observations were recorded at Carsfad Loch, where two birds were noted on one occasion and single bird sightings on various other occasions. Sightings of up to four birds were recorded at Kendoon Loch. During the August 2008 summer flight activity surveys, one flight line was recorded for great crested grebe in Section 1. This was of an individual bird heading north, past Bogton Loch, and landing on the River Doon. The study area, as a whole, is considered to be of Low (Local Low) nature conservation value for this species.

4 Cormorant (*Phalacrocorax carbo*), on the UK Green List, was frequently recorded during flight activity surveys in all survey periods. Activity was concentrated along the main watercourses within the survey area, particularly the Water of Ken and Water of Deugh (Sections 3 and 4 of the study area). Small numbers were recorded at a number of sites during waterbody counts in winter 2008-09, with the peak count, of 14 birds, recorded at Kendoon Loch during the winter of 2008. The study area, as a whole, is considered to be of Low (Local Medium) nature conservation value for this species.

5 Grey heron (*Ardea cinerea*) is on the UK Green List. It was also a frequently recorded species during flight activity surveys across the Study Area and in all survey periods, typically associated with flight corridors along the main watercourses. Small numbers were recorded during winter counts of waterbodies (including Bogton Loch, Kendoon Loch, Loch Muck and Wee Berbeth Loch). The Study Area, as a whole, is considered to be of Low (Local Low) nature conservation value for this species.

9.3.7.1 Ducks, Geese and Swans

9.3.7.1.1 Summary of Survey Findings

1 Mute swan (*Cygnus olor*) was recorded during flight activity surveys and waterbody counts (e.g. Bogton Loch and Lochinvar). The peak counts observed was seven birds and three records from early 2008 included juveniles. Flight activity was recorded in Sections 3 and 4.

2 Wigeon (*Anas penelope*), a UK Amber List species, were recorded at a number of Lochs within the study area including Bogton Loch, Burnton Pool, Lochinvar and Knockman Loch during waterbody counts with winter numbers peaking at 25 individuals (on more than one occasion). This species was also recorded during winter flight activity surveys in Section 2.

3 Teal (*Anas Castanea*), a UK Amber List species, was recorded during winter flight activity surveys in Sections 2, 3 and 4 of the study area. Teal were recorded during waterbody counts at a number of sites, including Bogton Loch, Carsfard Loch , Kendoon Loch, Loch Howie, Lochinvar, Regland Loch and Loch Doon. Peak counts of ten birds or more occurred at Kendoon Loch and Bogton Loch .

4 Mallard (*Anas platyrhynchos*), a UK Amber List species, was recorded in all Sections of the OHL survey area during flight activity surveys, breeding bird surveys and waterbody counts. Two breeding records were made during surveys of the core survey area in 2009, although this is likely to be an underestimate. Carsfad Loch and Lochinvar were the only sites to record peak counts of 20 birds or more (maximum of 23 at Carsfad in November 2008).

5 Tufted Duck (*Aythya fuligula*), a UK Amber List species, was present in the OHL study area as a wintering species. Counts were made at a number of Lochs including Bogton Loch, Kendoon Loch and Loch Howie. The highest counts were consistently made at Kendoon Loch, with a peak count of 48 recorded at the end of January 2009.

6 Goldeneye (*Bucephala clangula*), a UK Amber listed species, was present in the winter and was recorded during waterbody counts in a number of locations throughout the study area, including Bogton Loch, Carsfard Loch, Kendoon Loch, Knockman Loch, Loch Brack, Loch Doon, Loch Howie, Loch Muck, Loch Skae and Lochinvar. The highest count was of 45 birds at Bogton Loch, at the end of February 2008.

7 Goosander (*Mergus merganser*) were recorded during flight activity surveys in all four sections (e.g. at Bogton Loch in Section 1). A number of records of female birds were made in Section 3, the birds observed along both the Water of Deugh and Carsphairn Lane, and a group of seven birds were recorded on Loch Doon in August 2008. Seven birds were counted on Lochinvar in November 2008, three females at Carsfad Loch in January 2009 and a pair on the Water of Deugh and Carsfad Loch in January 2009. Goosander were also recorded at Kendoon (a single bird in December 2008) and Carminnows (a single bird foraging in April 2008). During the waterbody counts a total of 50 records were noted across eight Lochs including Kendoon, Bogton Loch, Lochinvar and Carsfad Loch. The peak count recorded was 22 birds on Lochinvar in January 2009. Peaks for other lochs within the study area were generally lower than Lochinvar (not more than 6 birds).

9.3.7.1.2 Evaluation

1 The Study Area, as a whole, is considered to be of Low (Local High) nature conservation value for duck species (a breakdown of the evaluation for each of the survey area sub-sections in provided in Table 9.11, below).

9.3.7.2 Other Raptors

9.3.7.2.1 Summary of Survey Findings

1 An adult golden eagle (*Aquila chrysaetos*) was observed during the third period of surveying (September 2008 to May 2009), in Section 3 of the OHL Study Area. This was over unforested upland moorland, well outside of the proposed OHL route (see Figure 9.21). There are no records of breeding golden eagle within or adjacent to the OHL Study Area. Occasional movements by wide-ranging non-breeding birds are expected to occur in the general area. Golden eagle is on the UK Amber List, due to its unfavourable conservation status in Europe (SPEC 3) (Eaton *et al.* 2009). The national breeding population at present appears to be relatively stable, although there have been marked changes in different parts of the range, with increases in breeding pairs in the Outer Hebrides and declines in the eastern Cairngorms and parts of Tayside (Forrester *et al.* 2007). According to the latest available estimates, the Scottish golden eagle population is 442 pairs (based on an RSPB co-ordinated survey in 2003). Golden eagle is listed on Annex 1 of the EC Birds Directive and is afforded enhanced protection through listing on Schedule 1 to the Wildlife and Countryside Act 1981 (as amended).

2 Three rough-legged buzzard (*Buteo lagopus*) records were made in the first period of the flight activity survey (October 2007 to mid-April 2008) in Section 4 of the OHL Study Area, assumed to be the same individual recorded over two dates (13 November and 28 December). The first record was in the vicinity of Marskaig, the second was in the vicinity of Hog Hill and the third in the vicinity of Glenshimmeroch. Rough-legged buzzard breeds in northern Norway and Siberia and is a rare migrant in Scotland, with most records occurring in the spring and autumn (Forrester *et al.* 2007). Between 1968 and 2004 there have been on average c. 10 records per year. Rough-legged buzzard is considered to be 'secure' in Europe (BirdLife International 2004).

3 One osprey (*Pandion haliaetus*) was recorded in the vicinity of Bryan's Heights (Section 2) in the second period of the flight activity survey, in June 2008. One osprey flight was recorded paralleling the B7000, east of Carsfad Loch, in August 2008 (Section 4). Both flights were above the collision risk height band and did not cross the proposed OHL route. Osprey is listed on Schedule 1 to the Wildlife and Countryside Act 1981 (as amended), Annex 1 of the EC Birds Directive, Appendix II of the Bern Convention and Appendix II of the Bonn Convention. It is on the UK Amber List, due to an unfavourable conservation status in Europe (SPEC 3). The breeding population in Scotland is estimated to be c. 182 - 200 pairs, which accounts for over 97% of the British total (Forrester *et al.* 2007). There is at least one breeding pair in Dumfries & Galloway, located outside and to the south of the OHL Study Area.

4 Other, relatively abundant, raptor species recorded during flight activity surveys and breeding bird surveys in many locations within the survey area, included sparrowhawk (*Accipiter nisus*), buzzard (*Buteo buteo*) and kestrel (*Falco tinnunculus*). A total of five sparrowhawk and 22 buzzard territories (including both possible and confirmed sites) were recorded within the OHL survey area in 2009. Kestrel has suffered population declines in the UK, although it remains one of the most commonly occurring and wide-spread breeding raptors in Scotland and the region (Dumfries & Galloway supports a significant percentage of the Scottish population; Forrester *et al.* 2007). Kestrel is on the UK Amber List, due to its unfavourable status

in Europe (SPEC 3) (Eaton *et al.* 2009) and is also on the Scottish Biodiversity List. A total of 9 kestrel breeding territories (including both possible and confirmed records) were identified during surveys in 2009.

9.3.7.2.2 Evaluation

1 The Study Area as a whole is considered to be of Low (Local High) nature conservation value for other raptor species (a breakdown of the evaluation for each of the survey area sub-sections in provided in Table 9.11 below).

9.3.7.3 Waders

9.3.7.3.1 Summary of Survey Findings

1 A total of nine oystercatcher (*Haematopus ostralegus*) breeding territories were recorded in 2009, in sections 3 and 4 of the OHL survey area, within marshy grassland and enclosed pasture habitats around Carsphairn, Loch Muck and the northern shore of Lochinvar. Oystercatcher is on the UK Amber List. There are an estimated 93,500 breeding pairs in Scotland (Forester et al. 2007). Oystercatcher was recorded in all periods of the flight activity survey and in most sections. Oystercatcher were recorded on the shores of a number of lochs within the study area including Loch Doon, Lochinvar and Bogton Loch. Peak numbers (and generally a higher average) occurred at Loch Doon with a maximum observed count of 19 birds.

2 Lapwing (*Vanellus vanellus*) is on the UK Red List, has an unfavourable conservation status in Europe (SPEC 2) and is a UK BAP priority species. A total of two breeding territories were estimated from surveys in 2009, both located in Section 2, in the vicinity of Polquanity. There are c. 92,200 breeding pairs of lapwing in Scotland (Forrester *et al.* 2007). It was the most frequently recorded wader species during flight activity surveys, which presumably reflects the typical prolonged aerial display of this species rather than a particularly high number of breeding birds. The majority of lapwing flight activity was recorded in Section 4, principally in the vicinity of the Carse of Dundeugh and Dalshangan. During the waterbody surveys lapwing were recorded at Bogton Loch, Loch Doon and Lochinvar, no more than two birds at a time were recorded at these sites.

3 Common snipe (*Gallinago gallinago*) is on the UK Amber List and has an unfavourable conservation status in Europe (SPEC 3). A total of 12 breeding territories were recorded during surveys in the 2009, with the majority located in Section 3, in the vicinity of Lambford Hill and Carsphairn. The most recent estimates put the Scottish population at c 34,000 pairs (Forrester et al. 2007). Most flight activity recorded was within Sections 3 and 4 of the OHL study area. Small number of snipe were recorded at three lochs during waterbody surveys including Loch Doon, Carsfad and Bogton & burnton Lochs.

4 Redshank (*Tringa totanus*) is on the UK Amber List and has an unfavourable conservation status in Europe (SPEC 2). A single breeding territory was recorded during surveys in 2009, located in Section 4 near to Lochinvar. The Scottish population has been estimated at c. 14,700 breeding pairs (Forrester *et al.* 2007).

5 Woodcock (*Scalopax rusticola*) was not confirmed as breeding within the OHL survey area, but there were records of territorial males (making 'roding' display flights) during woodland owl surveys in 2009. A total of six roding males were recorded in the following locations: near the Water of Deugh at Burnfoot (Section 3), near Polmaddy (Section 3), near Kilnair Hill (Section 4), near Divot Hill (Section 4) and near the Regland Burn to the west of Stroan Hill (Section 4). Woodcock is a UK Amber-listed species and has an unfavourable conservation status in Europe (SPEC 3). The Scottish population (males) has been estimated at 79,000 (Forrester *et al.* 2007). Several flight lines were also recorded in sections 3 and 4 of the survey area.

6 Curlew (*Numenius arquata*) is on the UK Amber List and has an unfavourable conservation status in Europe (SPEC 2). A total of seven breeding territories were identified during surveys in 2009; all were within Section 3, in the vicinity of Loch Muck and Carsphairn. There are estimated to be c. 58,000 breeding pairs of curlew in Scotland (Forrester et al. 2007). Curlew was the second most frequently observed wader during flight activity surveys. Flight activity was recorded during all survey periods in Sections 2, 3 and 4 of the OHL survey area. During waterbody counts curlew were recorded around a number of lochs including Loch Doon, Carsfad loch Bogton and Burnton Lochs. Peak numbers occurred at Bogton Loch, 28 birds roosting at the north west end of the loch.

7 Common sandpiper (*Actitis hypoleucos*) is a UK Amber listed species and has an unfavourable conservation status in Europe (SPEC 3). Two breeding territories were recorded during breeding bird surveys in 2009, in the vicinity of Carsphairn, associated with the Water of Deugh. The Scottish population has been estimated at c. 19,000 breeding pairs (Forrester *et al.* 2007).

9.3.7.3.2 Evaluation

1 A suite of breeding wader species, typical of the habitats present within the survey area, was recorded in 2009. No species was considered to be present in particularly high densities and none are present in large enough numbers to suggest that a population of significance at a regional level is present in the OHL survey area. Consequently, taking into consideration the numbers estimated and the conservation status of the species in the region and nationally, an overall evaluation of Low (Local High) is considered appropriate for the OHL survey area, as a whole (separate species and sub-section evaluations are provided in Table 9.11 below).

9.3.7.4 Gulls

9.3.7.4.1 Summary of Survey Findings

1 Common gull (*Larus canus*) is on the UK Amber List and has an unfavourable conservation status in Europe (SPEC 2). During waterbody counts in 2008-09, common gulls were frequently recorded on and around Bogton Loch, with over 80 birds recorded on one occasion (March 2009). A small colony of common gulls was recorded in the Clawfin and Pennyvenie area during surveys for the Kyle Forest Windfarm EIA. A breeding colony is present on Lochinvar Reservoir, with 18 pairs (apparently occupied nests) estimated in May 2008. The Scottish population was estimated at 48,100 pairs during the period 1998-2002 of which 27,600 were inland (Forrester *et al.* 2007). Waterbody counts show common gulls using a number of lochs including Bogton Loch, Loch Doon and Lochinvar. The peak count occurred at Loch Doon at the end of March 2009, where 50 birds were recorded.

2 Great black-backed gull (*Larus marinus*) is on the UK Amber List. There was one record of this species within Section 2, a high flight by a single bird during the flight activity survey. During the waterbody counts, in winter 2008-09, there were a small number of birds recorded within sections three and four of the survey corridor, associated with Kendoon Loch, Lochinvar, Loch Doon and Kendoon. Section 4 yielded the highest number of records for the species, the majority of which related to either flight lines or activity at Lochinvar Reservoir, where roosting and foraging birds were recorded.

3 Black-headed gull (*Larus ridibundus*) is on the UK Amber List. During waterbody counts in winter 2008-09, the majority of records for Section 2 were obtained from Bogton Loch. A roost of 20 birds was recorded here in April 2008, with other observations, involving fewer birds, recorded throughout the survey period. The highest number of birds recorded was a group of 28, in April 2008. A roost of 40 birds was recorded at Loch Doon, in March 2008, with other records involving fewer birds recorded throughout the survey period. Small numbers of birds were also recorded in flight during the surveys. Small numbers of black-headed gull were also noted during winter waterbody counts at Lochinvar.

9.3.7.4.2 Evaluation

1 An overall evaluation of Low (Local High) is considered appropriate for the OHL survey area, as a whole, for gull species (separate species and sub-section evaluations are provided in Table 9.11 below).

9.3.7.5 Forest Owls

9.3.7.5.1 Summary of Survey Findings

1 Tawny owl (*Strix aluco*) is on the UK Green List. A total of 10 breeding territories were identified during surveys in 2009. The distribution of breeding territories showed a clear concentration towards the southern end of the survey area, with records being much more scattered to the north of Kendoon. Tawny owl is the most abundant owl in Scotland. The Scottish population was estimated at 3,900 pairs in 2000 (Forrester *et al.* 2009).

2 Long-eared owl (*Asio otus*) is on the UK Green List. A total of two territories were identified during surveys 2009, one near Brockloch Craig (Section 3) and the other at Dundeugh Hill (Section 4). The Scottish population has been estimated at between 530 to 1,750 pairs (Forrester *et al.* 2007). An adult bird was seen in flight, during nocturnal owl surveys, near Butterhole Bridge (Section 4), in March 2009. No nest sites were found and no active roosts were found during the breeding season.

9.3.7.5.2 Evaluation

1 The OHL survey area, as a whole, is considered to be of Low (Local High) nature conservation value for forest owl species.

9.3.7.6 Passerines

1 Further information for songbird species on the UK Amber or Red lists, recorded during surveys, is provided in Appendix D.7. The nature conservation evaluation of songbirds (split between woodland and moorland passerines) is provided in Table

9.11, at the end of this section.

2 The woodland songbird community within the Study Area, as a whole, with a particular emphasis on species associated with mature broadleaved woodland, has been assessed to be of Medium nature conservation value. This is principally due to the presence of UK Red List and priority UK BAP species that are potentially present, as indicated by woodland transect and point counts survey results, in numbers that exceed 1% of the total 'regional population' (nominally Dumfries & Galloway and Ayrshire). These species include cuckoo (for convenience, included with true passerines in this assessment), tree pipit, spotted flycatcher and song thrush.

3 Also of note is the presence of common crossbill in several areas (i.e. primarily in South Kyle Forest, but also in the vicinity of Brockloch, Dundeugh Hill and Glenhoul); breeding was not confirmed, but is suspected in suitable mature conifer plantation throughout the Study Area. Survey methods adopted for this study were not designed to assess breeding activity by this species.

4 The moorland songbird community is also considered, collectively, to be of Medium nature conservation value, but this is essentially due to the estimated number of breeding skylark (a UK Red List and BAP priority species) within the whole survey area.

5 At least one pair of breeding raven was located within the OHL survey area (Section 3). This species is widespread and relatively common and is currently not of conservation concern, but has suffered population declines in the past.

9.3.8 Conclusions to Nature Conservation Evaluation

1 The assessment of nature conservation value for the bird populations present within the survey area is based on an evaluation of the importance of this area (populations and habitats) in an international, national, regional and local context. The methodology employed in this evaluation is outlined in Section 9.2 (see Table 9.4 for guidance on the assignment of nature conservation value / sensitivity levels).

2 Table 9.11, below, provides a summary of the nature conservation evaluations for each species of conservation concern recorded as breeding or probably breeding within the proposed OHL route survey area sections and for the project as a whole.

Table 9.11 - Summary of the Nature Conservation Values of Features / Bird Species / Grouped Species Present within the OHL Route Study Area

Species / Receptor	Nature Conservation Value				
	Section 1i	Section 2	Section 3	Section 4	Whole Project
Bogton Loch SSSI	High	n/a	n/a	n/a	High
Whooper swan	Medium	Low	High	Medium	High
Pink-footed goose	Medium	Low	Medium	Medium	Medium
Greylag goose	Medium	Low	Low	Medium	Medium
All other wildfowl	Low	Negligible	Low	Low	Low (LH)ii
Red kite	Low	Low	Medium	Medium-High	Medium-High
Hen harrier (winter)	Medium	Low	Medium	Medium-High	Medium-High
Goshawk	Low	Medium	Low	High	High
Peregrine	Medium	Medium	Low	Medium	Medium
Merlin	Low	Low	Medium	Low	Medium
All other raptors	Low	Low	Low	Low	Low (LH)
Black grouse	Low	Medium	Medium	Medium	Medium
Golden plover (winter)	Medium	Low	Medium	Low	Medium
All other waders	Low	Negligible	Low	Low	Low (LH)
Other waterbirds (inc. gulls)	Low	Negligible	Low	Low	Low (LH)
Barn owl	Low	Medium	Medium	Medium	Medium
Short-eared owl	Low	Low	Medium	Low	Medium
Forest owls	Low	Low	Low	Low	Low (LH)
Nightjar	Low	Low	Low	Medium-High	Medium-High
Moorland / wetland passerines	High	Low	Medium	Medium	High
Woodland passerines	Low	Low	Low	Medium	Medium

i - The nature conservation evaluations for Section 1 are preliminary as they are based almost exclusively on desk study data.
ii - Local High - LH (see Table 9.4 for an description of the criteria for a Low Local High evaluation)

9.4 Assessment of Effects

9.4.1 Introduction

1 A general description of potential ornithological effects is summarised in the introduction to this chapter. This section details the specific effects which the construction, operation and decommissioning of the OHL is likely to have on bird populations, the mitigation required and the likely residual effects, where relevant. The assessment methodology follows that detailed in Appendix D.1. Most of the potentially significant effects are associated with the operation of the proposed OHL (i.e. collision and electrocution risk). The main components of the proposed OHL are detailed in Chapter 5.

9.4.2 Sensitive Avian Receptors

1 Certain species, considered to be of greater sensitivity to the construction and operation of the OHL, have been the focus of this assessment. These include:

- Species listed on Annex1 of European Council Directive 79 / 409 / ECC on the conservation of wild birds (i.e. 'Annex 1' species);
- Species listed in Schedule 1 to the Wildlife and Countryside Act 1981, as amended (i.e. 'Schedule 1' species);
- Species occurring within the Study Area in regionally or nationally important numbers; and
- Species of national conservation concern, not included within the above categories, but that are present within the Study Area and at potentially significant risk.

2 The assessment includes careful consideration of the potential effects on bird species which are of conservation concern and considered vulnerable to adverse effects (such as electrocution and collision risk) from OHLs. These species were defined using professional judgement and from the scientific literature (e.g. Mayer 1979; APLIC 1994; Rose and Baillie 1989; Ferrier and Jass 1999; Haas *et al.*, 2005) and include species belonging to the following bird families / orders: Grebes (*Podicipedidae*); Herons (*Ardeidae*); Ducks / geese / swans / mergansers (*Antidae*); Partridges / quails / grouse (*Galliformes*); waders (*Charadriidae*).

3 Raptor species are also included in the assessment, due to the conservation status of many populations, their vulnerability to additional sources of mortality and because, as a group, they are considered to be relatively susceptible to electrocution (and to a lesser extent collision) with OHLs (Lehman 2007). Many raptor species of conservation concern also tend to be susceptible to disturbance (e.g. during construction and operation activities, such as maintenance and emergency works) and, because of their relatively low reproductive rate, any additional mortality (i.e. mortality that is not compensatory and that effects overall juvenile or adult survival rates) can be important for the long-term maintenance / conservation of the population being considered.

4 The list of species whose populations are considered as sensitive receptors and their nature conservation values for the various sections of the proposal, and for

the project as a whole, are provided in Table 9.11 above. The evaluation for the OHL project Study Area, as a whole, has been used for the purposes of the following assessment.

9.4.3 Elements of the Scheme Relevant to this Assessment

1 The proposed OHL project is described in detail in Chapter 5. The following is a brief summary of the key elements of the scheme relevant to the assessment of effects on ornithological receptors. For brevity, only those elements that present an electrocution or collision risk to birds are described. Other components of the proposed OHL (e.g. wood pole / tower erection working areas, temporary access tracks) relevant to the assessment of effects on ornithological receptors are described elsewhere (e.g. in Chapter 8 and Chapter 5).

9.4.3.1 Wood Pole Line

1 From Blackcraig substation to Dalshangan the aluminium conductors, operating at 132 kV, will be supported on heavy duty wood poles, with galvanised steelwork. The single-circuit comprises three separate phase conductors, 24mm in diameter, all at the same height, with a horizontal separation distance of 3m. The conductors are attached to the pole top structure on insulators (c. 2m tall). Insulators are fastened to the pole top steelwork. At intermediate supports, the conductors sit on top of insulators. At other supports, the conductors are cut and terminated on both sides of the pole, with insulators placed on top of the steelwork. For section / angle sections, rigid jumpers (to decrease the tension on the conductors) are fitted to the top of the insulators and are connected to the conductors below. The jumpers are spaced 3m apart. A fourth wire is carried underneath the cross arm as an earth conductor (c. 14mm diameter). The earth conductor would be c. 3m below the steel work.

2 The height of the supporting poles is dependent on a number of factors, including geographical location, topography, height above sea level, wind and ice loading, span length and conductor type. The typical height to the top of the structure would be 16m and the maximum height would be 19m (this under exceptional circumstances). The conductors will typically be attached at 14m above ground level and will vary in height below this, in relation to distance from the pole support, due to line sag, down to a minimum of 6.7m (which is the statutory minimum ground clearance for a 132 kV OHL).

3 Chapter 5 describes in detail the design of the four support types (i.e. pole types). In this section only the dimensions of the supports that are relevant to the assessment of bird electrocution and collision risk are described. The line comprises a combination of four types of support:

- Intermediate;
- Section / angle;
- Terminal; and
- Failure containment.

4 Intermediate structures are used where the OHL follows a straight line. Options include single pole or 'H' pole structures. Both types of structure support steelwork and insulators to carry the conductors. In some situations, the 'H' pole structure can be secured further with stays, allowing span lengths to increase.

5 Angle section structures are used to enable changes of direction in the OHL; they comprise 'H' pole structures, supported by a minimum of four stays (two per pole).

6 Terminal structures are used at either end of the OHL. The terminal structure allows the OHL to be connected either to a cable, or directly to a substation. The cable termination structure comprises a terminal pole with two smaller poles in front to support the cable termination.

7 Failure containment provision for conductor failure ('broken wire') situations is a requirement of European / UK standard document BS EN 50431 specifying the design of OHLs above 33 kV. The failure containment structure is an 'H' pole configuration, with poles set at 6m apart and stayed.

9.4.3.2 L7H Tower

1 From Dalshangan to Miekle Hill substation the OHL will be supported on L7H towers. The towers will carry twelve conductors and an earth wire, with the conductors in pairs on each side of the towers' three cross-arms. The conductors will be aluminium and 24mm in diameter, in order to provide the required capacity. The earth wire is carried at the top of the towers, with a diameter of c. 14mm, and will incorporate a fibre optic communication wire for control purposes.

2 On the suspension towers, the insulators are carried vertically below the arms, with paired conductors on each insulator. At the turning and terminal towers the insulators are broadly horizontal (in line with the conductors in both directions), to hold the line tension, and a loop of conductors links the ends of the insulators.

3 Span lengths (distance between supports) also depend on the same criteria as line height and will vary from 164m to 353m, with an average span of 243m between supports. The line comprises a combination of types of steel lattice towers:

- Suspension tower D;
- Turning tower D30 (for up to 30^0 deviations);
- Turning tower D60 (for up to 60^0 deviations); and
- Terminal Tower DT.

4 For each tower type there are a number of permutations of potential heights and support leg length to allow for ground conditions and to ensure that the minimum ground clearances are achieved mid-span. The statutory minimum ground clearance for a 132 kV L7H line is 6.7m. The L7H towers will support three pairs of conductors on each side, at c. 15.5m, 20.1m and 24.9m above ground level, with the earth wire at up to c. 29.5m.

9.4.4 Construction Phase Effects

9.4.4.1 Introduction

1 Chapter 5 describes, in detail, the construction process and schedule for the proposed OHL. Construction effects include the potential disturbance to breeding / foraging birds (including dependent young) or sensitive sites, such as nests or roost sites, and the direct / indirect, temporary / permanent loss of habitat as a result of the works. Permanent habitat loss or degradation, as a result of the development, is assessed under 'Operational Effects', below.

9.4.4.2 Disturbance to Birds

1 The construction phase of the project is anticipated to be 21 months in total. Tree clearance would occur from the being of the works programme and is estimated to take six months (see Section 5.2.6.1 of Chapter 5).

2 Assuming that there is the potential for the least favourable timing of works in relation to the bird breeding season, disturbance to breeding birds arising from tree felling and vegetation / ground clearance, general construction noise, vehicles, vibration, lighting, presence of construction workers, etc., would have an adverse effect on breeding success and potentially cause displacement of birds from the affected areas.

3 Noise from construction works may affect birds in a number of ways, including the ability of birds to select, establish and defend a territory, foraging and breeding sites and song learning (Larkin 1996; Reijnen *et al.* 1995, 1996 & 1997). The degree of distance effect would be dependent on a range of variables, including the time of year (i.e. the potential magnitude of the effect may vary depending on the stage of the breeding season), the species affected, the duration and the variability of suitable habitat for birds to be displaced into.

4 Breeding raptors are particularly sensitive to disturbance at the nest site, where repeated disturbance can cause adults to cease egg incubation or, in extreme cases, knock chicks out of the nest if the disturbance is sudden and intense. Flushing of the adult birds from the nest site is also likely to increase the risk of predation of chicks or eggs abandoned at the nest. In a study of marsh harriers (*Circus aeruginosus*) in Spain, human disturbance was reported as a factor in reducing breeding success, by reducing chick provision rates (Fernandez and Akzona 1993).

5 The extent of the zone of disturbance effect would vary depending on species, time of year (phase in the breeding season), the type and scale of the source of disturbance and the degree of screening effect from any surrounding topography / vegetation cover. Studies into the effects of noise from road traffic have demonstrated that there can be significant displacement or adverse effects on wader and passerine breeding success (Reijnen *et al.* 1995 and Reijnen *el al.* 1997), however, this was in relation to major roads and the level of vehicular activity for the proposal would be markedly lower. Disturbance from construction workers on foot may present a greater risk of disturbance to some species (e.g. nesting raptor species). Black grouse are also considered to be sensitive to disturbance, particularly at lek sites.

6 In a review of the issue of bird disturbance, Ruddock & Whitfield (2007) analysed all available data on disturbance to key bird species: for hen harrier, the expert survey distance range of values suggested a maximum buffer of 500 - 750m (for breeding birds at nest site); for breeding goshawk an upper value of 300 - 500m disturbance distance, gathered from expert opinion, was recommended; for merlin, the expert survey revealed a very wide range of opinions on typical distance at which nesting birds may be disturbed by approaching humans: from <10m to 300 - 500m. For breeding peregrine, disturbance distance revealed by the expert survey was 500 - 750m.

7 For most bird species, construction-related effects are considered to be only potentially significant during the main breeding season (i.e. March to August inclusive) and, in the case of black grouse, during the main lekking season (c. March to May inclusive). However, for geese and swans, the winter and passage periods are the more sensitive times of year, although evidence from surveys undertaken for this project indicate that there are few areas, in the vicinity of the proposed works, that are likely to attract appreciable numbers of wild geese or swans. Raptor species, such as hen harrier, are also likely to be present in the vicinity of the proposed OHL route in greater numbers during the autumn / winter than in the spring / summer. There are several known hen harrier roost sites in the wider area, though not directly adjacent to the proposed route. Other raptor species of high conservation concern are present in the area (particularly in the vicinity of Section 4 in the case of red kite) throughout the year.

8 In this assessment it has been assumed that works would be carried out at the least favourable time for birds (i.e. throughout the breeding season); however, it is also assumed that no nesting Schedule 1 species, or their dependent young, would be disturbed by the construction works and that active nest sites of any bird species are protected (i.e. in compliance with Wildlife and Countryside Act 1981, as amended). The mitigation proposals at 9.5.2 detail how these issues would be dealt with.

9 A summary of potential construction phase disturbance and displacement effects for each breeding and non-breeding receptor, prior to mitigation and management, is given in Table 9.12, below.

Table 9.12 - Construction Phase - Pre-mitigation Assessment of Disturbance for Breeding and Wintering Birds

Avian Receptor	Conservation Value	Effect Magnitude	Effect	Significance	Effect Duration
Whooper swan	High	Negligible - Low	Minor	Not Significant	Short-term
Pink-footed goose	Medium	Low	Minor	Not Significant	Short-term
Greylag goose	Medium	Low	Minor	Not Significant	Short-term
All other wildfowl	Low (LH)	Low	Minor	Not Significant	Short-term
Red kite	Medium-High	Low	Moderate	Significant	Short-term
Hen harrier	Medium-High	Low	Moderate	Significant	Short-term
Goshawk	High	Low - Medium	Moderate	Significant	Short-term
Peregrine	Medium	Negligible	Minor	Not Significant	Short-term
Merlin	Medium	Low	Minor	Not Significant	Short-term
All other raptors	Low (LH)	Low - Medium	Moderate	Significant	Short-term
Black grouse	Medium	Low	Moderate	Significant	Short-term
Golden plover	Medium	Negligible	Minor	Not Significant	Short-term
All other waders	Low (LH)	Low - Medium	Moderate	Significant	Short-term
All other waterbirds (inc. gulls)	Low (LH)	Low	Minor	Not Significant	Short-term
Barn owl	Medium	Low - Medium	Moderate	Significant	Short-term
Short-eared owl	Medium	Low	Minor	Not Significant	Short-term
Forest owls	Low (LH)	Medium	Moderate	Significant	Short-term
Nightjar	Medium-High	Medium	Moderate-Major	Significant	Short-term
Moorland / wetland passerines	Medium	Medium	Moderate	Significant	Short-term
Woodland passerines	Medium	Medium	Moderate	Significant	Short-term

9.4.5 Dismantling Phase Effects

9.4.5.1 Disturbance to Birds

1 The proposed dismantling of the existing N-Route will result in beneficial effects on birds in the long-term, due to the removal of a collision hazard (this is particularly the case for the area around Bogton Loch). However, as is the case for the construction of the proposed OHL, there is the potential for disturbance to breeding and wintering birds arising from the operations required to decommission the lines and dismantle the supporting towers. This process is anticipated to take 18 months and to occur following the completion and energising of the conductors on the proposed OHL. The exact timing of this work, relative to the more sensitive periods of the year for wintering or breeding birds, is not known at this time; it has therefore been assumed that work may occur at the least favourable time relative to the relevant sensitive receptors within the works corridor.

2 Broadly similar potential sources of disturbance and effects on birds to the construction phase could arise during the dismantling works. These effects are discussed in the previous section and are therefore not be repeated here.

3 A summary of potential construction phase disturbance and displacement effects for each breeding and non-breeding receptor, prior to mitigation, is given in Table 9.13, below.

Table 9.13 - Dismantling Phase - Pre-mitigation Assessment of Disturbance for Breeding and Wintering Birds

Avian Receptor	Conservation Value	Effect Magnitude	Effect	Significance	Effect Duration
Whooper swan	High	Low	Moderate	Significant	Short-term
Pink-footed goose	Medium	Low	Minor	Not Significant	Short-term
Greylag goose	Medium	Low	Minor	Not Significant	Short-term
All other wildfowl	Low (LH)	Low	Minor	Not Significant	Short-term
Red kite	Medium-High	Low	Moderate	Significant	Short-term
Hen harrier	Medium-High	Low	Moderate	Significant	Short-term
Goshawk	High	Low - Medium	Moderate	Significant	Short-term
Peregrine	Medium	Negligible	Minor	Not Significant	Short-term
Merlin	Medium	Low	Minor	Not Significant	Short-term
All other raptors	Low (LH)	Low - Medium	Moderate	Significant	Short-term
Black grouse	Medium	Low	Moderate	Significant	Short-term
Golden plover	Medium	Negligible	Minor	Not Significant	Short-term
All other waders	Low (LH)	Low - Medium	Moderate	Significant	Short-term
All other waterbirds (inc. gulls)	Low (LH)	Low	Minor	Not Significant	Short-term
Barn owl	Medium	Low	Minor	Not Significant	Short-term
Short-eared owl	Medium	Low	Minor	Not Significant	Short-term
Forest owls	Low (LH)	Low	Minor	Not Significant	Short-term
Nightjar	Medium-High	Negligible	Minor	Not Significant	Short-term
Moorland / wetland passerines	Medium	Medium	Moderate	Significant	Short-term
Woodland passerines	Medium	Medium	Moderate	Significant	Short-term

9.4.6 Operational Phase Effects

9.4.6.1 Habitat Loss

1 Direct habitat loss, arising from the installation of the poles and towers for the proposed OHL, is considered unlikely to be significant for any species, due to the small areas involved relative to the extent of these habitats in the Study Area and given that direct habitat loss to the individual structures is small and highly localised. Direct habitat loss estimates for the project are provided in Chapter 8, Table 8.20.

2 Loss of woodland, as a result of felling within the wayleave corridor for the proposed OHL, has a greater potential to adversely affect some key receptors (i.e. in particular goshawk and woodland passerines). The majority of felling would be of commercial conifer plantation, which would have been felled at some future point as part of the normal cycle of harvesting for such forests. Approximately 106.1 ha of conifer plantation felling is estimated for the 80m wide wayleave corridor and to accommodate access tracks to pole / tower positions. A total of 4.47 ha of mature broadleaved woodland is estimated to be affected, although felling within the wayleave corridor will be restricted through the use of crown reduction. An estimated 216 ha of conifer plantation is considered to be susceptible to wind-throw.

3 Table 9.14 summarises the potential operational phase habitat loss effects, prior to mitigation (only relevant receptors are shown).

Table 9.14 - Operational Phase - Pre-mitigation Assessment of Habitat Loss for Breeding Birds

Avian Receptor	Conservation Value	Effect Magnitude	Effect	Significance	Effect Duration
Goshawk	High	Low	Minor	Not Significant	Long-term
Peregrine falcon	Medium	Negligible	Minor	Not Significant	Long-term
Merlin	Medium	Negligible	Minor	Not Significant	Long-term
All other breeding raptors	Low (LH)	Low	Minor	Not Significant	Long-term
Black grouse	Medium	Low	Minor	Not Significant	Long-term
Breeding waders	Low (LH)	Negligible	Minor	Not Significant	Long-term
Barn owl	Medium	Negligible	Minor	Not Significant	Short-term
Forest owls	Low (LH)	Low	Minor	Not Significant	Long-term
Nightjar	Medium-High	Negligible	Minor	Not Significant	Long-term
Moorland / wetland passerines	Medium[i]	Negligible	Minor	Not Significant	Long-term
Woodland passerines	Medium	Low	Minor	Not Significant	Long-term

i - This assessment excludes Section 1 of the project which is the dismantling of the N-Route, the evaluation refers to Sections 2 to 4 only.

9.4.6.2 Displacement and Increased Predation Risk

1 The wood pole and steel tower structures supporting the OHL conductors could potentially increase the number of vantage points for raptors and corvids, thereby increasing the risk of predation for some breeding birds, particularly for sections of the OHL passing over open moorland (e.g. potentially affecting breeding waders and songbirds). The presence of the OHL, particularly for sections that are distant from the existing OHL that would be dismantled, could also displace geese from foraging or roosting sites. However, winter and passage period surveys undertaken within the survey area have not identified any significant areas near to the proposed route that are used with any regularity by geese or swans (potentially important areas were considered at the route selection stage of the project). The carse land associated with the floodplain of the Water of Deugh, at Carsphairn, is occasionally used by geese (although this was not noted during surveys for this assessment). The route of the OHL is, for the most part, on a very similar alignment to the existing route / OHL within this Section and also slightly further from these fields than the existing OHL.

2 There is the potential for the proposed OHL to act as a barrier, or constraint, on movement for black grouse, should it be routed between important habitats that this species regularly commutes between (e.g. between main and satellite lek sites; between lek sites, roosts and feeding areas). There is also the potential for displacement from important feeding and lekking areas as a result of the proximity of the OHL. These effects are speculative, as there is little evidence in the scientific literature to indicate that they occur and experience from surveys of black grouse near to existing OHLs indicates that they do not always result in displacement. However, as the route of the proposed OHL has been designed to avoid areas identified during desk study and field survey as important for this species, this potential effect has been appreciably reduced.

3 Overall, the potential magnitude of displacement effects are considered to be not greater than Low for any receptor and with an effect significance of not greater than Minor in the long-term.

9.4.6.3 Collision Risk from the Overhead Line

1 Mortality due to collision is considered to represent one of the most important adverse effects of OHLs on birds. Collisions with OHLs occur due to the relatively thin lines being difficult to perceive in-flight; when they are seen, birds have insufficient time to react and take evasive action. The degree of collision risk depends on a number of factors relating to the species and their behaviour, manoeuvrability, visual acuity, various environmental factors and the type and design of the OHLs. Collisions are not thought to be random, but are often concentrated at relatively short sections of OHL where the various factors interact to create a collision problem or 'hotspot' (e.g. Morkill & Anderson 1991; Brown & Drewien 1995; Guyonne *et al.* 1998).

2 Collision with OHLs for populations of some rare and susceptible species has been identified as contributing appreciably to annual mortality, for example, in the USA the Californian condor, *Gamboges californicus* (APLIC 1994), whooping crane, *Grus americanus* (Morkill & Anderson 1991), Sandhill cranes (Schaub and Pradel 2004); and in Europe, the eagle owl, *Bubo bubo* (Herren 1990). None of theses species, or any known similarly susceptible species / populations, occur in Scotland. Electrocution risk is assessed below.

3 Although there have been large estimates determined for bird OHL collisions for some more common species at a national scale (e.g. forest grouse in Scandinavia, Bevanger 1999), for the majority of species, this represents a relatively small fraction of non-natural death. OHL collision is not considered to be a significant mortality source for national populations that are stable or increasing, with some possible exceptions, for example great bittern (*Botarus stellaris*). However, potentially significant effects on local populations of relatively common species can result from OHL collision (e.g. as has been reported for mute swans in some locations).

4 The location of the OHL, relative to landscape feature / landform, also influences collision risk. For example, OHLs running perpendicular to a river valley which is a well-used flight corridor, where large numbers of birds that are particularly susceptible to collision regularly undertake commuting flights. An increased risk of collision may also occur where an OHL is located close to a forest edge, making it difficult for birds to perceive the conductor or the earth wire against a visually disruptive background. Distant wires have an almost one-dimensional geometry and it is possible that birds, particularly those lacking binocular vision, find it difficult to accurately judge how far they are from such wires. As they approach a wire, its relative size does not markedly increase, as it would for a thicker more complex object, until the distance to the wire is very small. This effect, coupled with a low-contrast background, is likely to increase the collision risk of wires in comparison with other man-made structures.

5 In the 'typical' wire arrangement for steel lattice-supported high voltage lines, it is the relatively thin earth wire, rather than the thicker conductors, that is thought to present the greatest collision risk to birds (e.g. Scott *et al.* 1972, Meyer 1978, Beulaurier 1981, Brown *et al.* 1987, Alonso *et al.* 1994). There are two main reasons for this: the diameter of the earth wire is typically 60% smaller than the conductors; and the conductors are also bundled closer together, which further increases their visibility in comparison to the earth wire. There is the potential, particularly in poor visibility or windy conditions, for birds flying at the height of the conductors to react to this more visible wire by 'flaring' (i.e. rapidly slowing flight speed) and gaining height to avoid the conductors and thereby altering their direction towards the less visible earth wire. This behaviour has been noted for geese and cormorants during flight activity observations in a previous study undertaken by the authors (MBEC 2007). The birds seem to be generally capable of recognising the supporting towers, poles and conductors, but the earth wire can, in certain situations, appear almost invisible (APLIC 1994).

6 The collision risk estimates undertaken for this assessment are based on collision rates that were sourced from the available literature (see Tables 9.15 and 9.16). Detailed empirical studies from the UK quantifying OHL collision mortality rates for most of the species of interest are not available. In order to improve estimates of collision rates for species of specific interest to this assessment, two sections of the existing N-Route were searched for bird carcasses on a regular basis during the autumn and early winter of 2008, along sections of the existing OHL that were within vantage point viewsheds of the flight activity surveys ongoing for the EIA of the proposed OHL. The sections were at Carsphairn (fields on either side of the Water of Deugh) and at Kendoon, selected because of the anticipated relatively high level of bird flight activity associated with these watercourses. However, no carcasses[2] were found during the study period, which indicates that collision rates for these sections of the existing OHL are low and by implication (given the similarity of the proposed L7H towers and conductor / earth wire arrangement) that rates for the proposed OHL in this area would also be low. Due to the absence of confirmed collision victims, a collision rate has not been calculated (see Appendix D.9 for further details). This may also reflect the non-random nature of OHL collisions in that collision events are likely to be 'clumped' relative to weather conditions and other environmental factors. These factors may act cumulatively to greatly increase collision risk such that studies over relatively short timescales are more likely to coincide with a period when this relatively rare combination of conditions does not occur.

7 Data from the available literature suggests that collision rates, relative to exposure (i.e. degree of flight activity in the vicinity of OHL), are usually very low. For example, Meyer (1978) recorded collisions occurring in 0.03% of total flights through or over OHLs. In the absence of species-specific collision rates for most species in this assessment, collision rates were taken from species that are as close as possible in relation to size, wing morphology, flight capability and behaviour (see Table 9.15 below).

8 Only species that were observed flying across the proposed and / or existing OHL routes (within any height band) are included in the analysis (e.g. black grouse were recorded during flight activity surveys but were not noted flying over the proposed or existing OHL routes).

2 - One heavily decomposed barn owl carcass was found during this study but due to its condition it was not possible to determine if it had died as a result of collision with the OHL, as a result of collision with a vehicle on the nearby A713 (a relatively common cause of mortality for barn owls) or from natural causes.

Table 9.15 - Collision Rates (%) Adopted for the Estimates of Collision Mortality for Target Species in the Study Area.

Species	Collision rate (flights at all heights)	Source	Comment
Whooper swan	0.07 - 0. 4 %	Anderson & Murphy (1988)	Used goose collision rate
Pink-footed goose	0.07 - 0. 4 %	Anderson & Murphy (1988)	
Greylag goose	0.07 - 0. 4 %	Anderson & Murphy (1988)	
Red kite	0.01 %	Alonso & Alonso (1999)	Used black kite collision rate
Hen harrier	0.072 %	Alonso & Alonso (1999)	Used buzzard collision rate
Goshawk	0.034 %	Alonso & Alonso (1999)	Used average of black kite and buzzard
Merlin	0.012 - 0.02 %	Alonso & Alonso (1999)	Used kestrel collision rate
Peregrine	0.041 %	Alonso & Alonso (1999)	Used average of black kite and kestrel
Oystercatcher	0.1 - 0. 67 %	Meyer (1978)	Derived from waders; long-billed dowitcher and western sandpiper
Lapwing	0.146 - 0. 059 %	Alonso & Alonso (1999)	Different rates from two Study Areas
Common snipe	0. 1 - 0. 67 %	Meyer (1978)	Derived from waders; long-billed dowitcher and western sandpiper
Curlew	0. 1 - 0. 67 %	Meyer (1978)	Derived from waders; long-billed dowitcher and western sandpiper
Barn owl	0. 072 %	Alonso & Alonso (1999)	Used buzzard collision rate

9 It is important to recognise that there are a number of limitations and assumptions that have to be made in assessing the risk of collision to birds from a proposed OHL. Due to the various biases which are difficult to control, accurate mortality rates are difficult to obtain. Estimates of bird 'exposure' to collision risk (i.e. the number of birds that fly close enough to the OHL to be at risk of collision) by their nature are subject to a number of sources of error. Observations of flight activity and behaviour by birds in the proposed OHL corridor only allow a very crude estimation of the future exposure of birds to collision risk from the proposed OHL. For example, the estimates of collision mortality do not take into account the influence of avoidance / displacement behaviour (i.e. which would reduce the level of flight activity near to a newly installed OHL) and therefore reduce collision risk. Additionally, observations, by necessity, can only be accurately recorded under conditions of reasonably good visibility; under such conditions when the risk of collisions or 'risky' flights occurring would be expected to be much lower than in periods of poor visibility.

10 The estimated annual transits and collisions for each species (based on data from the combined survey period, i.e. October 2007 to May 2009) for the proposed and existing OHL are shown in Table 9.16, below. Where two estimates are given for any species the higher of the two estimates is used in the assessment. The operational assessment considers the net effect of the removal of the existing OHL (taking into consideration that flight activity data not available for the entire length of the OHL) and the installation of the proposed OHL.

Table 9.16 - Estimated Annual Collisions for the Proposed OHL and Existing OHLs from Flights within all Height Bands for Target and Selected Secondary Species (using data from all surveys)

Species	Estimated number of annual transits		Collision rates (flights at all heights)	Estimated number of annual collisions		
	Proposed OHL	Existing OHL		Proposed OHL	Existing OHL	'Net Effect'
Whooper swan	1223	5024	0.07 - 0.4 %	0.9-4.9	3.5-20.1	-2.6- -15.2
Pink-footed goose	8317	4786	0.07 - 0.4 %	8.8-33.3	3.4-19.1	5.4-14.2
Greylag goose	5709	8353	0.07 - 0.4 %	4.0-22.8	5.9-33.4	-1.9- -10.6
Red kite	551	24	0.01 %	0.06	0.002	0.058
Hen harrier	212	146	0.072 %	0.15	0.11	0.04
Goshawk	156	24	0.034 %	0.05	0.008	0.042
Merlin	114	76	0.012 - 0.02 %	0.014-0.023	0.009-0.015	0.005-0.008
Peregrine	535	75	0.041 %	0.22	0.031	0.189
Oystercatcher	348	1213	0.1 - 0.67 %	0.35-2.33	1.2-8.1	-0.85- -5.77
Lapwing	1062	484	0.146 - 0.059 %	0.63-1.55	0.29-0.71	0.34-0.84
Common snipe	25	70	0. 1 - 0. 67 %	0.025-0.17	0.07-0.47	-0.045- -0.3
Curlew	411	1242	0. 1 - 0. 67 %	0.41-2.76	1.24-8.33	-0.83- -5.57
Barn owl	64	0	0. 072 %	0.06	0	0.06

11 The proposed OHL L7H towers are slightly taller than the existing N-Route towers and are therefore assumed to present a slightly increased inherent collision risk to birds. However, collision risk analysis is not sufficiently detailed and accurate to discriminate and quantify such relatively small differences. A conservative approach has been adopted in this assessment, through the use of flight activity data from all height recording bands in the analysis, and this is considered sufficient to address any relative potentially increased risk in the design of the proposed OHL.

12 In this assessment the beneficial effect of the removal of the existing N-Route OHL, where it is not on a similar alignment to the proposed OHL, has not been fully quantified (i.e. there is c. 10km of existing OHL that will be removed which is to the north of the flight activity survey area for the proposed OHL). Consequently, the figures provided in Table 9.16 will be overestimates of the net effect of the removal of the OHL.

13 There will be a relatively short period (estimated to be not longer than 18 months) when both the existing and proposed OHLs will be in place simultaneously (i.e. the overlap period before the existing OHL is dismantled). During the overlap period the estimated annual collisions could be taken as the combined total for both OHLs, as shown in Table 9.15. However, for this assessment the estimates for the proposed OHL are the increased risk to birds during the overlap period, treating the N-Route OHL as a collision hazard which is part of the existing baseline (i.e. birds in the Study Area are already exposed to the risk of collision with this OHL). The proposed and existing OHLs run parallel for a relatively large proportion of the length of the proposed OHL route, such that both sets of OHLs and towers will be in the field of view of birds flying near to either OHL (i.e. the area that Section 3 of the project passes through). Consequently, this is considered unlikely to increase the collision risk as much as the calculations might indicate, as the perceptibility of the OHLs together would be expected to be higher than where the OHLs are separated by a greater distance. It is therefore concluded that on the basis that the overlap period will be not more than 18 months, and taking into consideration the permanent benefit from the removal of the N-Route OHL north of Glenmuck (i.e. where is does not closely parallel the proposed OHL route), there will be no long-term significant adverse effects to any receptor as a result of the overlap period.

9.4.6.3.1 Schedule I/Annex I Raptors

1 The estimated 'net effect' annual mortality for all Schedule 1 / Annex I raptor species, apart from peregrine, is considered unlikely to be of concern in terms of appreciable additive mortality to the 'regional' populations of any of these species. Localised effects on the population within the Study Area are possible, although the estimated annual collision rates are considered unlikely to generate sufficient additional mortality to result in long-term population decline, unless mortality was to selectively fall on the most productive adult birds. However, there is no evidence in the literature to indicate that this is likely. The proposed OHL is considered to have an effect magnitude of Low for these species, resulting in an overall effect of no greater than **Minor Adverse** in the long term and **not significant**.

2 The net effect estimated collision rate for peregrine is higher than other raptor species of conservation concern. This is due to the presence of regularly occupied breeding sites in the vicinity of the proposed OHL (although all are >500m from the proposed OHL route). There is the potential for additive mortality, from the annual collision rate estimated in this assessment, to result in locally significant effects (i.e. appreciably affecting productivity for the small population within the OHL Study Area). The loss / abandonment of breeding territories would be exceptional and is not anticipated.

3 The estimated 'net effect' annual collision rate for pink-footed goose ranges from 5.4 to 14.2. Assuming the worst case, this is the equivalent of 0.1% of the mean five-year count of this species for the Solway Estuary. Consequently, this is not considered to be of concern in relation to additional mortality, except at a very localised population level.

4 The estimated 'net effect' annual collision rate for lapwing ranges from 0.34 to 0.84. This is very unlikely to exceed 1% of the regional breeding population and is

considered to be of concern only in relation to additional mortality at a very localised population level (i.e. in relation to the Study Area). This species has a relatively low productivity and may be vulnerable in the long-term to relatively small increases in morality rates. However, if, as an extreme scenario, the local population were to be eventually lost as a result of increased mortality associated with the proposed OHL, this effect would remain localised and not significant in relation to the wider / regional population.

5 In summary, based on the results of the collision risk analysis none of the estimated annual collision rates are considered to be significant for any species population at a national or regional level. Local level adverse effects are predicted for pink-footed goose and lapwing. The magnitude and effect of the unmitigated project is summarised in Table 9.17, below.

Table 9.17 - Operational Phase - Pre-mitigation Assessment of Collision Risk for Bird Receptors

Avian Receptor	Conservation Value	Effect Magnitude	Effect	Significance	Effect Duration
Whooper swan	High	Low +	Minor +	Not Significant	Long-term
Pink-footed goose	Medium	Low	Minor	Not Significant	Long-term
Greylag goose	Medium	Low +	Minor +	Not Significant	Long-term
Red kite	Medium-High	Low	Minor	Not Significant	Long-term
Hen harrier	Medium-High	Low	Minor -	Not Significant	Long-term
Goshawk	High	Low	Minor	Not Significant	Long-term
Merlin	Medium	Low	Minor	Not Significant	Long-term
Peregrine	Medium	Low-Medium	Minor-Moderate	Significant (local level)	Long-term
Waders	Low (LH)	Low	Minor	Not Significant	Long-term
Barn owl	Medium	Low	Minor	Not Significant	Long-term

9.4.6.4 Collision Risk from Supporting Structures

1 The lattice steel struts and supporting struts between the two wood pole (H pole) structures are unlikely to cause a collision risk to bird species, as it is highly likely that birds will take avoiding action to evade the structures. The stay wires, required to support some wood poles, potentially present a greater collision risk but the relatively limited extent of these wires and proximity to the relatively visible poles reduces the risk. For all species, the risk of collision with wires / structures, other than the conductors and earth wires, is considered to be not greater than a Low magnitude adverse effect of **Minor Adverse** in the long-term and not significant.

9.4.6.5 Operational Maintenance and Emergency Works

2 There is the potential for disturbance to birds arising from human and vehicular access and use of machinery during line maintenance, wayleave management and emergency works to repair the line (e.g. following storm damage). The effects (i.e. disturbance) would be similar (albeit at a reduced overall magnitude) to those described under construction effects, above. Potential unmitigated effects from operational and emergency works, assuming potential worst case in relation to the timing of works relative to the bird breeding season, are considered to be not greater than a Low magnitude adverse effect of **Minor Adverse** significance for any species apart from goshawk, black grouse and nightjar for which a potential Moderate Adverse and significant un-mitigated effect is considered to be possible. The assess of this effect for each receptor is summarised in Table 9.18, below.

Table 9.18 - Operational Phase - Pre-mitigation Assessment of Maintenance and Emergency Works Disturbance for Bird Receptors

Avian Receptor	Conservation Value	Effect Magnitude	Effect	Significance	Effect Duration
Whooper swan	High	Negligible - Low	Minor	Not Significant	Short-term
Pink-footed goose	Medium	Low	Minor	Not Significant	Short-term
Greylag goose	Medium	Low	Minor	Not Significant	Short-term
All other wildfowl	Low (LH)	Negligible - Low	Minor	Not Significant	Short-term
Red kite	Medium-High	Negligible - Low	Minor	Not Significant	Short-term
Hen harrier	Medium-High	Negligible - Low	Minor	Not Significant	Short-term
Goshawk	High	Low - Medium	Moderate	Significant	Short-term
Peregrine falcon	Medium	Low	Minor	Not Significant	Short-term
Merlin	Medium	Low	Minor	Not Significant	Short-term
All other raptors	Low (LH)	Low	Minor	Not Significant	Short-term
Black Grouse	Medium	Low - Medium	Moderate	Significant	Short-term
Golden Plover	Medium	Negligible	Minor	Not Significant	Short-term
All other waders	Low (LH)	Low	Minor	Not Significant	Short-term
All other waterbirds (inc. Gulls)	Low (LH)	Low	Minor	Not Significant	Short-term
Barn owl	Medium	Low	Minor	Not Significant	Short-term
Short-eared owl	Medium	Low	Minor	Not Significant	Short-term
Forest owls	Low (LH)	Low	Minor	Not Significant	Short-term
Nightjar	Medium-High	Low-Medium	Moderate	Significant	Short-term
Moorland / lowland passerines	Medium	Low	Minor	Not Significant	Short-term
Woodland passerines	Medium	Low	Minor	Not Significant	Short-term

9.4.6.6 Electrocution Risk

1 Birds, as is the case with most animals, are primarily composed of water, which is an excellent conductor of electricity. As a consequence, there is a risk of electrocution from contact with unprotected wires and associated metal infrastructure. OHL electrocution can occur when a bird simultaneously touches (i.e. in effect completes a circuit between) two phase conductors, such as a conductor and earth wire (or other earthed structure) or spans across an insulator, thereby creating a route of least resistance between these elements. Large birds are generally more vulnerable to electrocution by OHLs, than small species, because of the greater risk of spanning between two phase conductors or energised and earthed structures with outreached wings or other body parts (Leham et al. 2007). Other factors include specific habitat requirements, behaviour (e.g. raptor species that link talons during courtship display greatly increase their effective wingspans and thereby increase their electrocution risk [Dickerman, 2003; cited in Leman et al. 2007]) and hunting techniques of each species. In addition, age, experience, weather (e.g. wet feathers can subsequently increase conductivity and have been shown to be ten times more likely to cause an electrocution than contacts involving dry feathers [Nelson, 1980; cited in Lehman et al. 2007]), topography and season, can also influence the susceptibility of raptors to electrocution (Lehman et al. 1999, 2007).

2 Many bird species (particularly raptors) are attracted to OHLs and their supports, especially in open un-forested areas, as they provide useful lookout posts, as well as being used generally for perching, nesting and roosting. Ground-nesting species (such as hen harrier) rarely use OHL supports for perching / hunting and are therefore at less risk from electrocution (Leman et al. 1999; Haas et al. 2005). However, for those species that regularly use power lines for perching / hunting, the electrocution risk can be relatively high, particularly if the OHL design is unfavourable relative to the behaviour or size of the species.

3 In parts of Europe, a commonly used construction design (e.g. conductor cables attached via relatively sort insulators to poles constructed of conducting materials) of medium voltage poles (e.g. 1 kV to 59 kV) became known as 'killer poles', because of the high bird losses associated with them (e.g. field investigations on storks, vultures, eagles and eagle owls showed that the mortality from electrocution can have serious effects on the population, leading to a decline in the species). For example, under a single power line, in Southern Germany, the remains of 28 birds were found on a single inspection; species included four eagle owls and three kites (Milvus milvus) (Haas et al. 2005). Through a combination of the design parameters of insulators and conductors coupled with the attractiveness of power line poles, the proposed OHL could therefore present a significant risk of electrocution for some species.

4 Janss and Ferrer (1999) examined avian electrocution in Europe, associated with wooden poles, and concluded that wingspan was the key biometric associated with the possibility of being electrocuted. If the distance between conductor phases is small, if only short upright insulators are used or if protective gaps (e.g. arcing horns for lighting strikes) are installed on a wood poles, even small birds can be electrocuted (Haas et al. 2005). In addition, if jumpers are fitted to the top of the insulators and then to the conductors, an electrocution risk would arise from a bird touching a jumper and an insulator (if close together), or a jumper and the cross arm, or the two jumpers.

5 Table 9.19 shows the wingspans of species present in the study area (where sexual dimorphism occurs in the species, the largest wing span of either sex is provided; estimates are taken from Cramp and Simmons 1980).

Table 9.19 - Estimated Wing Span of Selected Target Species within Proposed OHL Route Survey Area (Cramp and Simmons 1980)

Species	Estimated wing span (cm)
Whooper swan	218-243
Pink-footed goose	135-170
Greylag goose	147-180
Red kite	175-195
Hen harrier	100-120
Goshawk	135-165
Merlin	50-62
Peregrine	95-110
Oystercatcher	80-86
Lapwing	82-87
Common snipe	44-47
Curlew	77-85
Barn owl	85-93

6 Chapter 5 provides details of the dimensions of the OHL components for the two OHL designs proposed for this project. Distances between all conductors and conductors and earth wires for both OHL designs are greater than the wingspan of the largest bird (e.g. whooper swan) and therefore are considered to present a negligible risk to birds in flight. All distances between the energised elements of the OHL that could pose an electrocution risk to perching birds are also greater than the wingspan of the largest such bird (e.g. red kite). The distance between two phase conductors, or a conductor and earth wire is greater than 2.5m; insulators are c. 2m in height and 3m apart; jumpers (on angle towers only), are 3m apart and greater than 2.5m from the cross-arm, insulators or conductors. A bird flying through the conductors or between the earth wire and the conductors would therefore be at an extremely low risk of electrocution. In addition, a perching bird, such as a large raptor, even on take-off, would be at minimum risk of electrocution from contact with the cross-arm and insulators, conductors or jumpers, because of the spacing between components.

7 For this proposal, the jumpers on the wooden poles are held in position by metal tubes through which they are inserted (see Chapter 5). There should therefore be no risk of electrocution due to jumper wires moving over time to settle closer to an earthed structure.

8 The assessment of potential effect of electrocution for each receptor is provided in Table 9.20, below.

Table 9.20 - Operational Phase – Pre-mitigation Assessment of Electrocution Risk for Each Bird Receptor

Avian Receptor	Conservation Value	Effect Magnitude	Effect	Significance	Effect Duration
Whooper swan	High	Negligible	Minor	Not Significant	Long-term
Pink-footed goose	Medium	Negligible	Minor	Not Significant	Long-term
Greylag goose	Medium	Negligible	Minor	Not Significant	Long-term
Red kite	Medium-High	Negligible - Low	Minor	Not Significant	Long-term
Hen harrier	Medium-High	Negligible - Low	Minor	Not Significant	Long-term
Goshawk	High	Negligible - Low	Minor	Not Significant	Long-term
Merlin	Medium	Negligible - Low	Minor	Not Significant	Long-term
Peregrine	Medium	Negligible - Low	Minor	Not Significant	Long-term
Waders	Low (LH)	Negligible	Minor	Not Significant	Long-term
Barn owl	Medium	Negligible - Low	Minor	Not Significant	Long-term

9.5 Proposed Mitigation Measures and Residual Impacts

9.5.1 Introduction

1 A range of mitigation measures are proposed to address the potential construction and operation-related impacts on ornithological receptors. The following section summarises the proposed mitigation measures and provides a residual impact significance assessment.

9.5.2 Construction Phase Mitigation and Residual Impacts

9.5.2.1 Construction Disturbance

1 Prior to any construction works being undertaken during the bird breeding season (including peak lekking period for black grouse), surveys would be undertaken to identify any areas sensitive to disturbance and to update information that has been collated for this EIA.

2 The preference will be to complete all tree felling / vegetation clearance required to accommodate the construction and operation of the proposed OHL outside of the main bird breeding season (i.e. March to August inclusive). However, if some felling or vegetation clearance was necessary within this period, then it would only be carried out following a breeding bird nest survey by a suitably experienced ecologist / ornithologist, to ensure that active nest sites were adequately protected from damage / disturbance, in compliance with the Wildlife and Countryside Act (1981), as amended. In addition, surveys to locate active black grouse lek sites would be undertaken in advance of felling / construction work (in particular focused in the areas of South Kyle Forest and Corriedoo Forest).

3 Construction works would be programmed to avoid areas of known sensitivity during sensitive periods. Buffer zones would be established that were appropriate to the specific circumstances. Disturbance-free zones around any active Schedule 1 species nest sites would be determined in consultation with a suitably experienced ecologist / ornithologist, following current best practice guidance (e.g. Ruddock & Whitfield 2007). In general, a set-back of at least 500m from active Schedule 1 species nest sites would be required (depending on the specific circumstances). Where possible, particularly disturbing operations would be programmed to avoid starting within the main breeding season. In addition, appropriate disturbance-free buffer zones would be established around any active black grouse lekking areas (this includes areas in the vicinity of the proposed underground cabling works in Corriedoo Forest).

4 Any works that have the potential to damage active bird nests (see above in respect of Schedule 1 species) would be carried out under the supervision of a suitably experienced ecologist / ornithologist, to ensure compliance with the Wildlife and Countryside Act (1981), as amended. Works would be restricted to the agreed and clearly defined working corridor, to ensure that ground nesting species outside the proposed route corridor were not disturbed. The use of bright tape and ropes would be considered in certain areas where construction works are proposed during the bird breeding season, in order to discourage breeding by ground-nesting birds. If, during the pre-construction survey, or during the construction works, any nests are found, all works would cease in the area and advice would be sought, from a suitably experienced ecologist / ornithologist, on the most appropriate course of action.

5 Human activity would generate noise and visual disturbance over extended periods through the construction programme, such that some level of disturbance to raptors hunting within the area would be unavoidable.

9.5.2.1.1 Residual Effect

1 With the implementation of the above mitigation measures and consideration of the availability of similar habitat in the local area for any disturbed / displaced birds, then the residual effect is considered to be Negligible - Low with a residual effect magnitude of **Minor** for the short-term (i.e. one breeding season) and **not significant**.

2 A summary of residual construction phase disturbance effects for each breeding and non-breeding receptor is given in Table 9.21, below.

Table 9.21 - Construction Phase – Residual Effects Assessment of Disturbance for Breeding and Wintering Birds

Avian Receptor	Conservation Value	Effect Magnitude	Effect	Significance	Effect Duration
Whooper swan	High	Negligible	Minor	Not Significant	Short-term
Pink-footed goose	Medium	Negligible - Low	Minor	Not Significant	Short-term
Greylag goose	Medium	Negligible - Low	Minor	Not Significant	Short-term
All other wildfowl	Low (LH)	Negligible - Low	Minor	Not Significant	Short-term
Red kite	Medium-High	Negligible - Low	Minor	Not Significant	Short-term
Hen harrier	Medium-High	Negligible - Low	Minor	Not Significant	Short-term
Goshawk	High	Negligible - Low	Minor	Not Significant	Short-term
Peregrine	Medium	Negligible	Minor	Not Significant	Short-term
Merlin	Medium	Negligible - Low	Minor	Not Significant	Short-term
All other raptors	Low (LH)	Negligible - Low	Minor	Not Significant	Short-term
Black grouse	Medium	Negligible - Low	Minor	Not Significant	Short-term
Golden plover	Medium	Negligible	Minor	Not Significant	Short-term

Avian Receptor	Conservation Value	Effect Magnitude	Effect	Significance	Effect Duration
All other waders	Low (LH)	Negligible - Low	Minor	Not Significant	Short-term
All other waterbirds (inc. gulls)	Low (LH)	Negligible - Low	Minor	Not Significant	Short-term
Barn owl	Medium	Negligible - Low	Minor	Not Significant	Short-term
Short-eared owl	Medium	Negligible - Low	Minor	Not Significant	Short-term
Forest owls	Low (LH)	Negligible - Low	Minor	Not Significant	Short-term
Nightjar	Medium-High	Negligible - Low	Minor	Not Significant	Short-term
Moorland / wetland passerines	Medium	Negligible - Low	Minor	Not Significant	Short-term
Woodland passerines	Medium	Negligible - Low	Minor	Not Significant	Short-term

9.5.3 Dismantling Phase Effects

9.5.3.1 Disturbance to Birds

1 Similar mitigation to the construction phase is proposed to address the risk of significant disturbance effects on birds.

2 A summary of residual dismantling phase disturbance effects for each breeding and non-breeding receptor is given in Table 9.22, below.

Table 9.22 - Dismantling Phase – Residual Effects Assessment of Disturbance for Breeding and Wintering Birds

Avian Receptor	Conservation Value	Effect Magnitude	Effect	Significance	Effect Duration
Whooper swan	High	Negligible - Low	Minor	Not Significant	Short-term
Pink-footed goose	Medium	Negligible - Low	Minor	Not Significant	Short-term
Greylag goose	Medium	Negligible - Low	Minor	Not Significant	Short-term
All other wildfowl	Low (LH)	Negligible - Low	Minor	Not Significant	Short-term
Red kite	Medium-High	Negligible - Low	Minor	Not Significant	Short-term
Hen harrier	Medium-High	Negligible - Low	Minor	Not Significant	Short-term
Goshawk	High	Negligible - Low	Minor	Not Significant	Short-term
Peregrine	Medium	Negligible	Minor	Not Significant	Short-term
Merlin	Medium	Negligible - Low	Minor	Not Significant	Short-term
All other raptors	Low (LH)	Negligible - Low	Minor	Not Significant	Short-term
Black grouse	Medium	Negligible - Low	Minor	Not Significant	Short-term
Golden plover	Medium	Negligible	Minor	Not Significant	Short-term
All other waders	Low (LH)	Negligible - Low	Minor	Not Significant	Short-term
All other waterbirds (inc. gulls)	Low (LH)	Negligible - Low	Minor	Not Significant	Short-term
Barn owl	Medium	Negligible - Low	Minor	Not Significant	Short-term
Short-eared owl	Medium	Negligible - Low	Minor	Not Significant	Short-term
Forest owls	Low (LH)	Negligible - Low	Minor	Not Significant	Short-term
Nightjar	Medium-High	Negligible	Minor	Not Significant	Short-term
Moorland / wetland passerines	Medium	Negligible - Low	Minor	Not Significant	Short-term
Woodland passerines	Medium	Negligible - Low	Minor	Not Significant	Short-term

9.5.4 Operation Phase Mitigation and Residual Impacts

9.5.4.1 Habitat Loss

1 Careful micrositing of poles / towers and access tracks, to further reduce works in more sensitive habitats (e.g. blanket bog and marsh / marshy grassland, minor watercourses and flushes, mature broadleaved trees) would help to further reduce impacts on any species that these habitats support and help to reduce changes to natural hydrological regime, which in the long-term would mean reduced indirect loss / degradation of these habitats. Within mature broadleaved woodland tree felling will be kept to the absolute minimum necessary to comply with safety regulations and techniques such as crown reduction would be used, where appropriate, in preference to felling.

9.5.4.1.1 Residual Effect

1 With the implementation of the above mitigation measures and consideration of the availability of similar habitat in the local area for foraging and any displaced birds, then the residual effect is considered to be Low with a residual effect magnitude of **Minor** in the long-term and **not significant**.

2 Table 9.23 summarises the residual assessment of the operational phase habitat loss effects (only relevant receptors are shown).

Table 9.23 - Operational Phase – Residual Effects Assessment of Habitat Loss for Breeding Birds

Avian Receptor	Conservation Value	Effect Magnitude	Effect	Significance	Effect Duration
Goshawk	High	Low	Minor	Not Significant	Long-term
Peregrine falcon	Medium	Negligible	Minor	Not Significant	Long-term
Merlin	Medium	Negligible	Minor	Not Significant	Long-term
All other breeding raptors	Low (LH)	Low	Minor	Not Significant	Long-term
Black grouse	Medium	Low	Minor	Not Significant	Long-term
Breeding waders	Low (LH)	Negligible	Minor	Not Significant	Long-term
Barn owl	Medium	Negligible	Minor	Not Significant	Short-term
Forest owls	Low (LH)	Low	Minor	Not Significant	Long-term
Nightjar	Medium-High	Negligible	Minor	Not Significant	Long-term
Moorland / wetland passerines	Mediumi	Negligible	Minor	Not Significant	Long-term
Woodland passerines	Medium	Low	Minor	Not Significant	Long-term

i - This assessment excludes Section 1 of the project which is the dismantling of the N-Route, the evaluation refers to Sections 2 to 4 only.

9.5.4.2 Collision Risk

1 The marking of OHLs to increase their visibility to birds has been shown to reduce bird collisions in the range of 57 to 89% (Koops & De Jong 1982), with some studies reporting even higher reductions. For example, in a recent study of a section of Transmission OHL in England, a 95% reduction in mute swan collisions was reported following the installation of swan flight diverters on the earth wire (Frost 2007). Haas *et al.* (2005) reported on the experience of mitigating bird collisions on the electricity transmission network in the Netherlands. Dutch high voltage supply network comprises 4,200km of OHL. There were an estimated 500,000 to 1,000, 000 bird collision casualties per year. Improvements in bird protection on 13% of the high voltage electricity supply network resulted in a reduction in casualties of 185,000 birds per year. Alonso and Alonso (1994) reported a 61% decrease in flight intensity and 60% decrease in collision frequency after earth wire markers (which were located above the conductors) had been fitted to a OHL in south-west Spain.

2 Mitigation, in the form of 'bird flight diverters' (e.g. PVC coated spiral designs, such as those manufactured by Tyco Electronics) are proposed to reduce the potential collision risk. This measure will primarily benefit target species in areas identified as being high risk (e.g. peregrine, red kite), but will also reduce the collision risk to secondary species that have a relatively high collision risk (e.g. mute swan, cormorant, grey heron). Bird flight diverters were developed in Britain in the 1970s and have proven effective when installed on the earth wires of OHLs in Europe and North America (APLIC 1994).

3 From the results of the flight activity surveys, relatively high levels of transits by collision-susceptible species across the route of the proposed OHL have been identified in some locations. Consideration has also been given to the proximity of regularly occupied breeding sites of Schedule 1 raptor species. The key sections of the proposed route are as follows (north to south):

- From Glenmuck Craig to Clawfin Hill (towers 3 to 30);
- Crossing of the Water of Deugh at Carsphairn (towers 82 to 87);
- Carse of Dundeugh (poles 2 to 35); and
- Rigs of Glenshimmeroch (poles 91R to 115).

4 The first section relates to an area with relatively high raptor flight activity and potential black grouse flight activity (no black grouse flight activity was recorded in this area during surveys for this EIA, but there is a population present in the general area and this is proposed partly in anticipation of an increased level of activity in the area following tree felling to accommodate the proposed OHL). The last three sections correspond to points at which the proposed route crosses over main watercourses, which are also regularly used commuting routes for a range of wader and wildfowl species. In addition, one of these areas, the crossing of the Water of Ken, corresponds to a location where relatively high levels of flight activity by red kite and peregrine were also recorded. The placement of bird flight diverters along these sections would help to reduce the risk of collision to all these species.

5 Most studies show a marked reduction in bird collision risk where OHLs have been fitted with bird flight diverters to the earth wire and thus reflect the typical position of the earth wire in relation to the conductors (i.e. positioned above the conductors). This is the arrangement proposed for the L7H tower section of the OHL. As previously stated, the earth wire is less visible than the conductors (as is also the case here) and as the birds adjust their flight behavior to avoid the conductors they may collide with the less visible earth wire above. The design of the wood pole OHL for this proposal (see Chapter 5) has the earth wire strung below the three parallel conductors. Thus, if a bird sees the earth wire below, the change in flight height may

result in a collision with the conductors, or if the bird does not see the earth wire there may be no change in flight behavior and the bird would collide with the earth wire. It is therefore recommended that both the earth wire and the conductors are fitted with bird flight diverters in the sections outlined above (all of which are on the wood pole section of the project). It is recommended that the bird flight diverters are spaced at intervals of no more than 5m apart on the earth wire and staggered between the three conductors, so that no diverter is greater than 5m apart from the inner or outer conductor. On an approach to the OHL, the markers would therefore appear to be 5m apart.

6 For the wood pole line the bird diverters will be located on the spans between 1-35 and 95-115. These bird diverters will be alternately fitted to the conductors and earth wires such that when viewed from the side, there is a diverter located every 5m along the length of the OHL. For the steel lattice tower section of the OHL, bird diverters will be fitted on the earth wire only at 5m intervals between towers 3-30 and 83-87 and between tower 103 and wood pole 1.

9.5.4.2.1 Residual Effect

1 The fitting of bird flight diverters to the earth wire and the conductors in the identified sections of OHL should result in a substantial reduction in collision risk for geese and swans. Placement of bird flight diverters on these sections of OHL will also reduce the collision risk to raptors of conservation concern, particularly red kite, as these sections of the proposed OHL also have a relatively high number of transits for this species.

2 Table 9.24 summarises the residual collision risk to bird receptors in the Study Area.

Table 9.24 - Operational Phase - Residual Effects Assessment of Collision Risk for Bird Receptors

Avian Receptor	Conservation Value	Effect Magnitude	Effect	Significance	Effect Duration
Whooper swan	High	Low +	Minor +	Not Significant	Long-term
Pink-footed goose	Medium	Low -	Minor -	Not Significant	Long-term
Greylag goose	Medium	Low +	Minor +	Not Significant	Long-term
Red kite	Medium-High	Low -	Minor -	Not Significant	Long-term
Hen harrier	Medium-High	Low -	Minor -	Not Significant	Long-term
Goshawk	High	Low -	Minor -	Not Significant	Long-term
Merlin	Medium	Low -	Minor -	Not Significant	Long-term
Peregrine	Medium	Low -	Minor -	Not Significant	Long-term
Waders	Low (LH)	Low -	Minor -	Not Significant	Long-term
Barn owl	Medium	Low -	Minor -	Not Significant	Long-term

9.5.4.3 Electrocution Risk

1 Due to the separation distances of the energised and earthed components being greater than the wing span of the largest bird species present within the Study Area, the potential risk of electrocution for all species is considered to be not greater than Negligible-Low. No specific mitigation to address electrocution risk is therefore deemed necessary, apart from monitoring. Mitigation to decrease the collision risk to target bird species (e.g. placement of bird flight diverters along specific sections of the OHL) will also discourage all birds flying close to the conductors in these locations, thereby also reducing electrocution risk.

9.5.4.3.1 Residual effect

1 The residual effect for all species is Negligible-Low, resulting in an effect magnitude of **None-Minor** and **not significant** in the long term.

9.5.4.4 Operational Maintenance and Emergency Works

1 Disturbance would be diminished by carrying out scheduled maintenance operations outside of the bird breeding season wherever possible. Where this is not possible, appropriate breeding bird survey would be undertaken in advance of the works and measures taken to ensure best practice is implemented so that the risk of disturbance to any Schedule 1 / Annex 1 breeding birds in the vicinity of the works is minimised. For emergency works every effort would be made to undertake breeding bird surveys in advance of the works and to implement measures to prevent disturbance to any Schedule 1 / Annex 1 breeding birds in the vicinity. Mitigation measures to minimise potentially disturbing activity would be similar to those outlined in the above section dealing with construction disturbance.

9.5.4.4.1 Residual Effect

1 With the implementation of the above mitigation measures, the residual effect is considered to be not greater than Minor with a residual effect magnitude of Low for the short-term (i.e. one breeding season) and therefore not significant. Table 9.25 summarises the residual collision risk to bird receptors in the study area.

Table 9.25 - Operational Phase - Residual Effects Assessment of Maintenance and Emergency Works Disturbance for Bird Receptors

Avian Receptor	Conservation Value	Effect Magnitude	Effect	Significance	Effect Duration
Whooper swan	High	Negligible - Low	Minor	Not Significant	Short-term
Pink-footed goose	Medium	Low	Minor	Not Significant	Short-term
Greylag goose	Medium	Low	Minor	Not Significant	Short-term
All other wildfowl	Low (LH)	Negligible - Low	Minor	Not Significant	Short-term
Red kite	Medium-High	Negligible - Low	Minor	Not Significant	Short-term
Hen harrier	Medium-High	Negligible - Low	Minor	Not Significant	Short-term
Goshawk	High	Low	Minor	Not Significant	Short-term
Peregrine falcon	Medium	Low	Minor	Not Significant	Short-term
Merlin	Medium	Low	Minor	Not Significant	Short-term
All other raptors	Low (LH)	Low	Minor	Not Significant	Short-term
Black Grouse	Medium	Low	Minor	Not Significant	Short-term
Golden Plover	Medium	Negligible	Minor	Not Significant	Short-term
All other waders	Low (LH)	Low	Minor	Not Significant	Short-term
All other waterbirds (inc. Gulls)	Low (LH)	Low	Minor	Not Significant	Short-term
Barn owl	Medium	Low	Minor	Not Significant	Short-term
Short-eared owl	Medium	Low	Minor	Not Significant	Short-term
Forest owls	Low (LH)	Low	Minor	Not Significant	Short-term
Nightjar	Medium-High	Low	Minor	Not Significant	Short-term
Moorland / lowland passerines	Medium	Low	Minor	Not Significant	Short-term
Woodland passerines	Medium	Low	Minor	Not Significant	Short-term

9.5.5 Summary of Mitigation Measures

1 The approach to the mitigation of potential significant effects to birds for the proposed scheme is summarised as follows:

9.5.5.1 Construction

- A pre-construction breeding bird survey would be competed by suitably experienced ecologists / ornithologists in order to update the data collated on key species of conservation concern for this assessment and to inform detailed mitigation measures, as required, in order to avoid disturbance to breeding birds listed on Schedule 1 to the Wildlife and Countryside Act (e.g. establishment of appropriate exclusion zones) and disturbance of active nests of all other wild birds (in compliance with the provisions of the Wildlife and Countryside Act 1981);
- All tree felling would be completed outside of the main bird breeding season (i.e. outside of April - August inclusive);
- If felling is necessary within the breeding season, then it would only be carried out following a nest survey by a suitably experienced ornithologist / ecologist, to ensure that potential effects on breeding birds are avoided;
- For ground-nesting bird species, mitigation includes conducting construction works outside the breeding season, as defined above. In addition, careful micro-siting of poles should be used to avoid the wetter areas of wet modified bog and marsh / marshy grassland (use of nesting deterrent materials would also be considered in areas where construction work has to be scheduled during the bird breeding season);
- All site workers would be briefed on the procedure to follow, should they encounter breeding birds / active nests during their work;
- Careful micro-siting of wood poles and access tracks should be used to avoid sensitive habitats and minimise the number of necessary watercourse crossings;
- To prevent pollution of watercourses during construction, a Construction Methods Statement (as part of a wider construction Environmental management Plan) will be agreed with SEPA and the local authority, in advance of construction works (mitigation measures are detailed in Chapter 8, Section 8.6 [see also Hydrology & Hydrogeology] and for brevity will not be repeated here); and
- Works would be restricted to the defined working corridor.

9.5.5.2 Operation

- Placement of bird flight diverters along sections of OHL that have been identified as a collision risk for a number of species; and
- Due to the separation distances of the energised and earthed components being greater than the wing span of the largest bird species present within the study, the risk of potential electrocution for all is considered to be very low and no specific mitigation is therefore deemed necessary. However, mitigation to decrease the collision risk for a range of species (e.g. placement of bird flight diverters along specific sections of the OHL) will also discourage all birds flying close to the conductors, thereby also further reducing electrocution risk; in the event of any bird-related power outages of the OHL, these will be investigated. If it is identified that a section of the proposed OHL poses a significant electrocution risk to birds, then in consultation with SNH, suitably designed perch guards would be retro-fitted on the identified pole(s) cross-arms that pose an electrocution risk.

9.6 Cumulative Assessment

9.6.1 Methodology

1 Cumulative effects relate to the potential for identified effects to act additively (i.e. to operate on the same ecological receptors such that the summed total of the cumulative impacts result in a greater total effect magnitude and potentially greater effect significance level). There are three types of cumulative effect:

- Those arising from the project being assessed (Type 1);
- Those arising from the project being assessed in combination with those arising from other proposed development projects (Type 2); and
- Those arising from the proposed project in combination with those that are predicted to arise from completed development projects (Type 3).

2 Type 1 effects are the principle focus of this Chapter. Type 3 effects include the combined effects of the proposed OHL coupled with any existing OHL in the Study Area. Consideration of Type 2 effects has been restricted to proposals that have the potential to interact with species for which the proposed OHL is considered to be of at least **Medium** conservation value and that are potentially sensitive to OHL development, unless there is evidence from any of the relevant studies that significant effects on local or regional populations of common species are possible.

3 The method used to assess cumulative impacts is to determine what effects on species and habitats have been predicted (with reference to published Environmental Impact Assessments, where available) and to assess the potential for the predicted effects (whether they are reported as significant or not for the separate proposals) to interact additively (both in terms of construction and operational effects).

4 This section provides an assessment of the potential for significant cumulative impacts on birds or bird habitats between the Blackcraig and Margree OHL project and the following proposals that are currently in the planning process or post-consent / pre-construction stage:

- South West Scotland OHL;
- Blackcraig Hill Windfarm; and
- Margree Windfarm.

5 Summary tables of the findings of the residual assessment for each of the the above proposal is provided in Appendix D.2. The Kyle Forest windfarm proposal was withdrawn following planning refusal in 2009 and is not considered in this assessment.

9.6.2 Assessment

1 There are published assessments of the potential effects on birds for each of the above proposals. No potentially significant residual effects were reported for any species. However, the primary concern, given the findings of the assessments, is a potential for cumulative adverse effects on the regional population of black grouse and peregrine.

2 In relation to Blackcraig Hill windfarm, potentially significant impacts on black grouse were identified and mitigation in the form of a habitat management plan has been proposed to offset adverse effects on this species from the construction and operation of the scheme. With the implementation of the proposed habitat enhancement, it was concluded that a significant effect on black grouse could be prevented.

3 In relation to collision risk, apart from peregrine, there is considered to be no species identified in any assessment where there is the potential for cumulative significant collision mortality from all of the proposals combined. Summary information from collision risk calculations for each project is provided in Appendix D.2.

4 The combined collision risk to peregrine from this proposal and the SWS OHL is a concern. However, taking into consideration the removal of the N-Route and the proposed OHL marking to reduce collision risk, the net effect of the proposals is broadly considered to be neutral in relation to the regional population and the risk of significant increased mortality (i.e. additive mortality that could appreciably affect population productivity and long-term population viability) is considered to be small.

5 Should all four proposals be constructed within the same period, there is the potential for significant cumulative disturbance effects on black grouse. However, measures to minimise disturbance in proximity to lek and nesting habitat (including tree felling) during sensitive periods should be adequate to effectively limit the potential for any medium to long-term effects on this species. No significant cumulative operational effects on black grouse are predicted, providing habitat mitigation measures, as outlined in all relevant ES documents, are implemented.

6 In relation to potential cumulative effects on peregrine, it is considered unlikely that construction disturbance would result in significant cumulative effects, providing that measures to avoid disturbance of this Schedule 1 species, during the breeding season, are successfully implemented for all schemes.

9.7 Assessment Conclusion

1 The Blackcraig & Magree OHL is a proposed c. 36.5km OHL development running from substations at Meikle Hill in East Ayrshire and Blackcraig in Dumfries & Galloway. The proposal will provide a connection to the electricity grid for the proposed Margree and Blackcraig Hill windfarms. Additionally, it will provide an upgrade of the existing OHL infrastructure allowing the dismantling of c. 32km of existing OHL to be dismantled. The Study Area for the proposal includes a range of habitats, statutory designated sites that support a number of wintering, passage and breeding bird species of conservation concern. The dominant habitats are commercial conifer plantation, moorland habitat mosaics, improved enclosed pasture, and scattered areas of semi-improved species-rich neutral / calcareous grassland. Species present in the Study Area identified as important for the assessment of the proposed OHL include species listed on Schedule 1 to the Wildlife & Countryside Act 1981 and/or Annex 1 of the EC Birds Directive, such as red kite, goshawk, merlin, peregrine, hen harrier, barn owl, nightjar and whooper swan. Also a number of UK Red List and/or UK BAP priority species are present such as black grouse, lapwing, cuckoo, skylark, and tree pipit. For the purpose of the assessment the development has been split into four Sections relating to the specific OHL type (e.g. steel lattice tower, wood pole) and section where the routes of the existing OHL to be dismantled and the proposed OHL follow a very similar alignment. .

2 A scoping opinion was requested from relevant statutory and non-statutory consultees including SNH and RSPB. Desk study records were requested from the Scottish Ornithological Society, British Trust for Ornithology, the Dumfries & Galloway Raptor Study Group and RSPB.

3 A specific methodology was applied to the assessment of the potential effects of this proposal on ornithological receptors. This included the collation of relevant available baseline data, through desk study and field survey, determination of important receptors, assessment of nature conservation value, assessment of possible effects during construction, operation and decommissioning (including potential cumulative effects with other plans or projects), identification of mitigation measures, and finally, an assessment of residual effects.

4 Important ornithological constraints (protected / sensitive sites, breeding / roosting sites of species of high conservation concern), along with other environmental constraints, were carefully considered during the determination of the proposed route for the OHL, in consultation with RSPB. For example, the route of the proposed OHL was modified to avoid areas that have concentrations of recent historical black grouse records. This has helped avoid and / or reduce potential adverse effects on sensitive ornithological receptors.

5 A range of field surveys were undertaken to establish baseline conditions within the OHL Study Area, including extensive flight activity surveys (over 4000 hours of observations between October 2007 and May 2009), wintering wildfowl surveys, woodland breeding bird surveys, moorland breeding bird surveys, breeding raptor surveys, black grouse lek surveys, forest owl surveys, breeding nightjar survey, and hen harrier roost survey.

6 Calculations based on the bird flight activity survey data were undertaken to assist in assessing collision risk. Species were divided into two groups: target and secondary

species. Target species are those of high conservation concern and also considered to be of relatively high susceptibility to collision with OHLs (e.g. whooper swan, greylag and pink-footed geese, Schedule 1 raptor species, black grouse). Flight activity data was used to determine estimates of total annual transits of the proposed and existing OHLs by target and secondary species. Collision rates, derived from published studies with quantified estimates of OHL collision rates were used to estimate the number of collisions per section per year for each species.

7 A total of 38 species of conservation concern (i.e. Schedule 1 / Annex 1 species, species listed on the UK amber or red lists) were confirmed or suspected of breeding within the OHL survey area. The survey area was found to support breeding bird assemblages typically associated with the dominant habitat types of commercial conifer plantation, enclosed lowland pasture and the mosaic of moorland habitats (e.g. wet modified bog, marsh / marshy grassland, wet heath and semi-improved acid grassland). A total of eight raptor / owl species were recorded as breeding with 2km of the proposed OHL route and a total of five wader species were recorded as breeding in the survey area. Occasional black grouse flight activity was recorded in Sections 3 and 4 of the OHL Study Area; however, no lekking activity or evidence of breeding activity was recorded. A total of 20 songbird species were confirmed as breeding within the survey area.

8 The nature conservation value of each species was assessed using a standard methodology for the four sub-sections of the project Study Area and for the Study Area as a whole. Evaluations ranged from High (e.g. whooper swan, goshawk), Medium-High (e.g. red kite, hen harrier and nightjar), Medium (e.g. pink-footed goose, greylag goose, peregrine, black grouse and barn owl) to Low (e.g. waders, forest owl species).

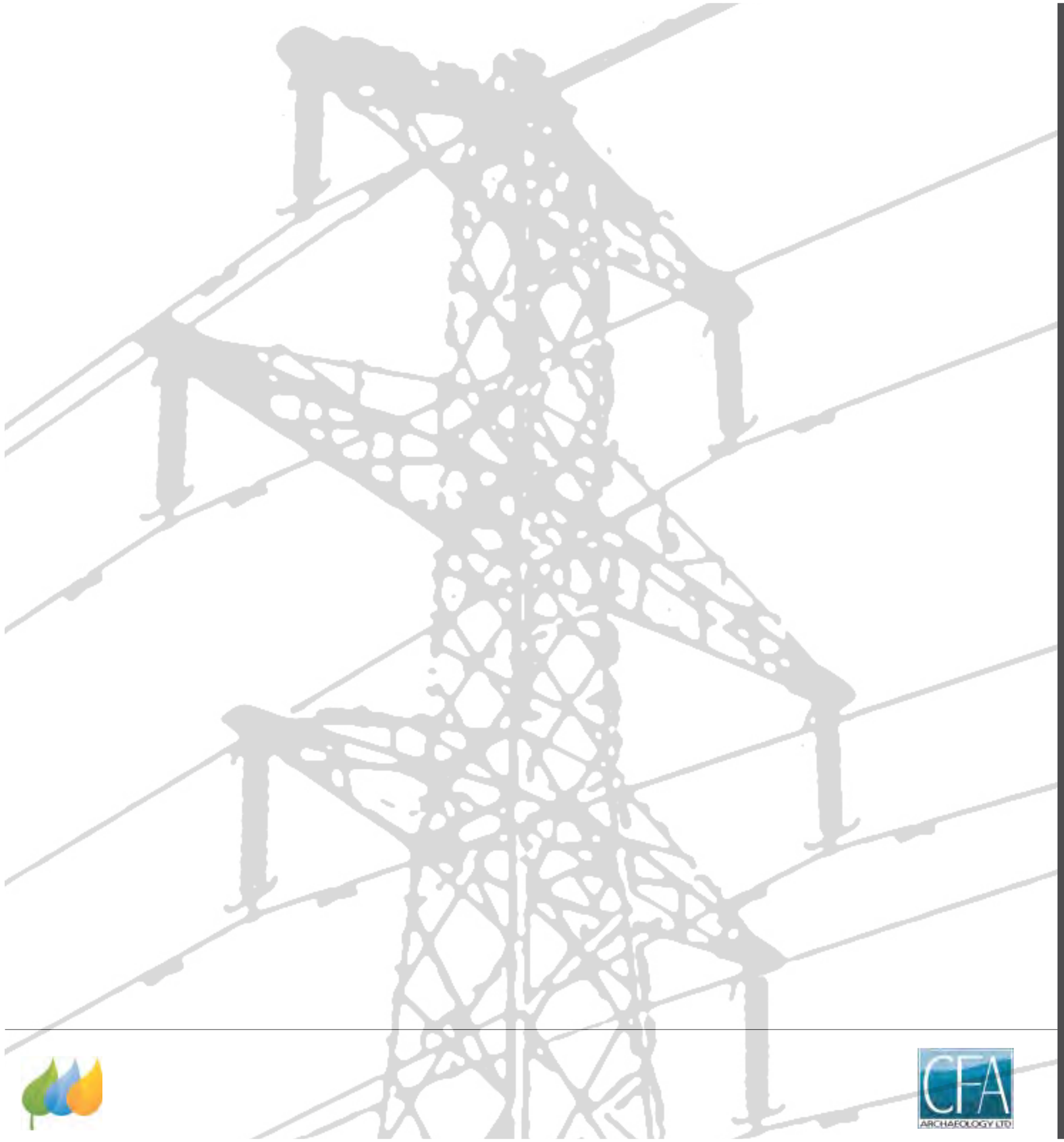
9 An assessment of the effects of the proposed OHL was carried out. Potentially significant effects, before consideration of additional mitigation (i.e. in addition to mitigation achieved through routeing), were identified for the construction phase for several species including red kite, hen harrier, goshawk, black grouse, barn owl and nightjar. A similar range of potentially significant effects were also identified during the proposed dismantling works. For whooper swan and greylag goose the net effect of the installation of the proposed OHL and removal of the existing OHL on annual collision mortality is considered to be positive in the long-term (although at a minor significance level only). No black grouse were observed in flight over the proposed of existing OHL and consequently a full collision risk analysis was not under taken for this species. However, black grouse considered to be at particular risk in certain areas of the project and further mitigation, with bird flight diverters, has been proposed to address this. Peregrine is the only species that is considered to be subject to a potentially significant effect from collation risk in the long-term, this is in relation to the local-regional population. Finally, potentially significant effects were identified for goshawk, black grouse and nightjar during operation maintenance or emergency works.

10 A range of additional mitigation measures have been proposed to address potentially significant impacts, as well as for impacts where there is considered to be uncertainty in relation to future risk following tree felling within the OHL wayleave (i.e. by the creation of more favourable foraging or nesting habitat in proximity to the proposed OHL), in particular for black grouse. These measures include pre-construction bird surveys, felling of trees out with the breeding season and use of bird diverters to reduce collision risk along several defined sections of the proposed OHL. Providing that the proposed mitigation measures are successfully implemented the overall residual effect on for all species of conservation interest would not be not greater than Minor adverse and not significant in the long-term.

Table 9.26 Summary Effects Assessment for Ecology (significant effects are highlighted in bold text)

Potential Effects	Receptor(s)	Nature Conservation Value	Effect Magnitude	Effect Level (significance)	Duration	Summary of Proposed Mitigation Measures	Residual Effect Magnitude	Residual Effect Level (significance)	Duration
Construction Phase - Disturbance & Displacement for Breeding and Wintering Birds	Whooper swan	High	Negligible - Low	Minor (Not Significant)	Short-term	Prior to construction works being undertaken during the bird breeding season, surveys would be undertaken to identify any areas sensitive to disturbance and to update information that has been collated for this EIA. All tree felling / vegetation clearance required to accommodate construction and operation of the proposed grid connection would new complete outside of the main bird breeding season (i.e. April to August inclusive.) If felling or vegetation clearance is necessary within this period, then it would only be carried out following a breeding bird nest survey by a suitably experienced ecologist / ornithologist to ensure that active nest sites are adequately protected from damage / disturbance in compliance with the Wildlife and Countryside Act (1981). Disturbance-free zones around any active Schedule 1 species nest sites would be determined in consultation with a suitably experienced ecologist/ ornithologist, following current best practice guidance. In general a set-back of at least 500m from active Schedule 1 species nest sites would be required (depending on the specific circumstances). Where possible particularly disturbing operations would be programmed to avoid starting within the main breeding season. Works will be restricted to the agreed and clearly defined working corridor to ensure that ground nesting species outside the proposed route corridor are not disturbed. The use of bright tape and ropes would be considered in certain areas where construction works are proposed during the bird breeding season in order to discourage breeding by ground-nesting birds. If during the pre-construction survey, or during the construction works, any nests are found, all works will cease in the area and advice would be sought from a suitably experienced ecologist/ ornithologist on the most appropriate course of action. Construction works would be programmed to avoid areas of known sensitivity during sensitive periods. Specific buffer zones would be established that were appropriate to the specific circumstances. Any works that have the potential to damage active bird nests would be carried out under the supervision of a suitably experienced ecologist	Negligible	Minor (Not Significant)	Short-term
	Pink-footed goose	Medium	Low	Minor (Not Significant)	Short-term		Negligible - Low	Minor (Not Significant)	Short-term
	Greylag goose	Medium	Low	Minor (Not Significant)	Short-term		Negligible - Low	Minor (Not Significant)	Short-term
	All other wildfowl	Low (LH)	Low	Minor (Not Significant)	Short-term		Negligible - Low	Minor (Not Significant)	Short-term
	Red kite	Medium-High	Low	**Moderate (Significant)**	Short-term		Negligible - Low	Minor (Not Significant)	Short-term
	Hen harrier	Medium-High	Low	**Moderate (Significant)**	Short-term		Negligible - Low	Minor (Not Significant)	Short-term
	Goshawk	High	Low - Medium	**Moderate (Significant)**	Short-term		Negligible - Low	Minor (Not Significant)	Short-term
	Peregrine falcon	Medium	Negligible	Minor (Not Significant)	Short-term		Negligible	Minor (Not Significant)	Short-term
	Merlin	Medium	Low	Minor (Not Significant)	Short-term		Negligible - Low	Minor (Not Significant)	Short-term
	All other raptors	Low (LH)	Low - Medium	**Moderate (Significant)**	Short-term		Negligible - Low	Minor (Not Significant)	Short-term
	Black Grouse	Medium	Low	**Moderate (Significant)**	Short-term		Negligible - Low	Minor (Not Significant)	Short-term
	Golden Plover	Medium	Negligible	Minor (Not Significant)	Short-term		Negligible	Minor (Not Significant)	Short-term
	All other waders	Low (LH)	Low - Medium	**Moderate (Significant)**	Short-term		Negligible - Low	Minor (Not Significant)	Short-term
	All other waterbirds (inc. Gulls)	Low (LH)	Low	Minor (Not Significant)	Short-term		Negligible - Low	Minor (Not Significant)	Short-term
	Barn owl	Medium	Low-Medium	**Moderate (Significant)**	Short-term		Negligible - Low	Minor (Not Significant)	Short-term
	Short-eared owl	Medium	Low	Minor (Not Significant)	Short-term		Negligible - Low	Minor (Not Significant)	Short-term
	Forest owls	Low (LH)	Medium	**Moderate (Significant)**	Short-term		Negligible - Low	Minor (Not Significant)	Short-term
	Nightjar	Medium-High	Medium	**Moderate - Major (Significant)**	Short-term		Negligible - Low	Minor (Not Significant)	Short-term
	Moorland / wetland passerines	Medium	Medium	**Moderate (Significant)**	Short-term		Negligible - Low	Minor (Not Significant)	Short-term
	Woodland passerines	Medium	Medium	**Moderate (Significant)**	Short-term		Negligible - Low	Minor (Not Significant)	Short-term
Dismantling Phase - Disturbance & Displacement for Breeding and Wintering Birds	Whooper swam	High	Low	**Moderate (Significant)**	Short-term	Disturbance would be diminished by carrying out scheduled maintenance operations outside of the bird breeding season wherever possible. See mitigation for Construction Phase	Negligible - Low	Minor (Not Significant)	Short-term
	Pink-footed swan	Medium	Low	Minor (Not Significant)	Short-term		Negligible - Low	Minor (Not Significant)	Short-term
	Greylag Goose	Medium	Low	Minor (Not Significant)	Short-term		Negligible - Low	Minor (Not Significant)	Short-term
	All other waterfowl	Low (LH)	Low	Minor (Not Significant)	Short-term		Negligible - Low	Minor (Not Significant)	Short-term
	Red kite	Medium-High	Low	**Moderate (Significant)**	Short-term		Negligible - Low	Minor (Not Significant)	Short-term
	Hen harrier	Medium-High	Low	**Moderate (Significant)**	Short-term		Negligible - Low	Minor (Not Significant)	Short-term
	Goshawk	High	Low - Medium	**Moderate (Significant)**	Short-term		Negligible - Low	Minor (Not Significant)	Short-term
	Peregrine falcon	Medium	Negligible	Minor (Not Significant)	Short-term		Negligible	Minor (Not Significant)	Short-term
	Merlin	Medium	Low	Minor (Not Significant)	Short-term		Negligible - Low	Minor (Not Significant)	Short-term
	All other raptors	Low (LH)	Low - Medium	Moderate (Significant)	Short-term		Negligible - Low	Minor (Not Significant)	Short-term
	Black grouse	Medium	Low	**Moderate (Significant)**	Short-term		Negligible - Low	Minor (Not Significant)	Short-term
	Golden plover	Medium	Negligible	Minor (Not Significant)	Short-term		Negligible	Minor (Not Significant)	Short-term
	All other waders	Low (LH)	Low - Medium	**Moderate (Significant)**	Short-term		Negligible - Low	Minor (Not Significant)	Short-term
	All other waterbirds (inc. Gulls)	Low (LH)	Low	Minor (Not Significant)	Short-term		Negligible - Low	Minor (Not Significant)	Short-term
	Barn owl	Medium	Low	Minor (Not Significant)	Short-term		Negligible - Low	Minor (Not Significant)	Short-term
	Short-eared owl	Medium	Low	Minor (Not Significant)	Short-term		Negligible - Low	Minor (Not Significant)	Short-term
	Forest owls	Low (LH)	Low	Minor (Not Significant)	Short-term		Negligible - Low	Minor (Not Significant)	Short-term
	Nightjar	Medium-High	Negligible	Minor (Not Significant)	Short-term		Negligible	Minor (Not Significant)	Short-term
	Moorland / wetland passerines	Medium	Medium	**Moderate (Significant)**	Short-term		Negligible - Low	Minor (Not Significant)	Short-term
	Woodland passerines	Medium	Medium	**Moderate (Significant)**	Short-term		Negligible - Low	Minor (Not Significant)	Short-term
Operational Phase - Habitat loss for breeding birds	Goshawk	High	Low	Minor (Not Significant)	Long-term	Careful micrositing of poles / towers and access tracks to further reduce works in more sensitive habitats (e.g. blanket bog and marsh/marshy grassland, minor watercourses and flushes, mature broadleaved trees) would help to further reduce impacts on any species that these habitats support and hep to reduce changes to natural hydrological regime, which in the long term would mean reduced indirect loss / degradation of these habitats.	Low	Minor (Not Significant)	Long-term
	Peregrine falcon	Medium	Negligible	Minor (Not Significant)	Long-term		Negligible	Minor (Not Significant)	Long-term
	Merlin	Medium	Negligible	Minor (Not Significant)	Long-term		Negligible	Minor (Not Significant)	Long-term
	All other breeding raptors	Low (LH)	Low	Minor (Not Significant)	Long-term		Low	Minor (Not Significant)	Long-term

Potential Effects	Receptor(s)	Nature Conservation Value	Effect Magnitude	Effect Level (significance)	Duration	Summary of Proposed Mitigation Measures	Residual Effect Magnitude	Residual Effect Level (significance)	Duration
Operational Phase - Habitat loss for breeding birds (cont'd)	Black grouse	Medium	Low	Minor (Not Significant)	Long-term	Careful micrositing of poles / towers and access tracks to further reduce works in more sensitive habitats (e.g. blanket bog and marsh/marshy grassland, minor watercourses and flushes, mature broadleaved trees) would help to further reduce impacts on any species that these habitats support and hep to reduce changes to natural hydrological regime, which in the long term would mean reduced indirect loss / degradation of these habitats.	Low	Minor (Not Significant)	Long-term
	Breeding waders	Low (LH)	Negligible	Minor (Not Significant)	Long-term		Negligible	Minor (Not Significant)	Long-term
	Barn owl	Medium	Negligible	Minor (Not Significant)	Short-term		Negligible	Minor (Not Significant)	Short-term
	Forest owls	Low (LH)	Low	Minor (Not Significant)	Long-term		Low	Minor (Not Significant)	Long-term
	Nightjar	Medium-High	Negligible	Minor (Not Significant)	Long-term		Negligible	Minor (Not Significant)	Long-term
	Moorland / wetland passerines	Medium	Negligible	Minor (Not Significant)	Long-term		Negligible	Minor (Not Significant)	Long-term
	Woodland passerines	Medium	Low	Minor (Not Significant)	Long-term		Low	Minor (Not Significant)	Long-term
Operational Phase - Collision Risk for bird receptors, without mitigation	Whooper swan	High	Low +	Minor + (Not Significant)	Long-term	Mitigation, in the form of 'bird flight diverters' are proposed to reduce the potential collision risk primarily to target species, area identified as being high risk, but will also reduce the collision risk to other species that have a relatively high collision risk in the Study Area. The placement of bird flight diverters along various sections of the proposed OHL is proposed to reduce the risk of collision in areas of relatively high flight activity by target species and/or where flight activity might be anticipated following tree clearance. It is recommended that the bird flight diverters are spaced at intervals of no more than 5m apart on the earth wire and staggered between the three conductors, so that no diverter is greater than 5m apart from the inner or outer conductor. Therefore on an approach to the OHL, the markers appear to be 5m apart.	Low +	Minor + (Not Significant)	Long-term
	Pink-footed goose	Medium	Low	Minor (Not Significant)	Long-term		Low	Minor (Not Significant)	Long-term
	Greylag goose	Medium	Low +	Minor + (Not Significant)	Long-term		Low +	Minor +(Not Significant)	Long-term
	Red kite	Medium-High	Low	Minor (Not Significant)	Long-term		Low	Minor (Not Significant)	Long-term
	Hen harrier	Medium-High	Low	Minor (Not Significant)	Long-term		Low	Minor (Not Significant)	Long-term
	Goshawk	High	Low	Minor (Not Significant)	Long-term		Low	Minor (Not Significant)	Long-term
	Merlin	Medium	Low	Minor (Not Significant)	Long-term		Low	Minor (Not Significant)	Long-term
	Peregrine	Medium	Low-Medium	**Minor-Moderate (Significant)**	Long-term		Low	Minor (Not Significant)	Long-term
	Waders	Low (LH)	Low	Minor (Not Significant)	Long-term		Low	Minor (Not Significant)	Long-term
	Barn owl	Medium	Low	Minor (Not Significant)	Long-term		Low	Minor (Not Significant)	Long-term
Operational Phase - Electrocution risk for each bird receptor	Whooper swan	High	Negligible	Minor (Not Significant)	Long-term	No specific mitigation to address electrocution risk is deemed necessary. However, mitigation to decrease the collision risk to target bird species (e.g. placement of bird flight diverters along specific sections of the OHL) will also discourage all birds flying close to the conductors thereby also further reducing electrocution risk.	None	None	n/a
	Pink-footed goose	Medium	Negligible	Minor (Not Significant)	Long-term		None	None	n/a
	Greylag goose	Medium	Negligible	Minor (Not Significant)	Long-term		None	None	n/a
	Red kite	Medium-High	Negligible - Low	Minor (Not Significant)	Long-term		None	None	n/a
	Hen harrier	Medium-High	Negligible - Low	Minor (Not Significant)	Long-term		None	None	n/a
	Goshawk	High	Negligible - Low	Minor (Not Significant)	Long-term		None	None	n/a
	Merlin	Medium	Negligible - Low	Minor (Not Significant)	Long-term		None	None	n/a
	Peregrine	Medium	Negligible - Low	Minor (Not Significant)	Long-term		None	None	n/a
	Waders	Low (LH)	Negligible	Minor (Not Significant)	Long-term		None	None	n/a
	Barn owl	Medium	Negligible - Low	Minor (Not Significant)	Long-term		None	None	n/a
Operational Phase - Maintenance & Emergency Works	Whooper swan	High	Negligible - Low	Minor (Not Significant)	Short-term	Disturbance would be diminished by carrying out scheduled maintenance operations outside of the bird breeding season wherever possible. Where this is not possible, every effort would be made to undertake breeding bird surveys in advance of the works and to implement measures to prevent disturbance to any Schedule 1 / Annex 1 breeding birds in the vicinity of the works. See also mitigation for Construction Phase	Negligible - Low	Minor (Not Significant)	Short-term
	Pink-footed goose	Medium	Low	Minor (Not Significant)	Short-term		Low	Minor (Not Significant)	Short-term
	Greylag goose	Medium	Low	Minor (Not Significant)	Short-term		Low	Minor (Not Significant)	Short-term
	All other wildfowl	Low (LH)	Negligible - Low	Minor (Not Significant)	Short-term		Negligible - Low	Minor (Not Significant)	Short-term
	Red kite	Medium-High	Negligible - Low	Minor (Not Significant)	Short-term		Negligible - Low	Minor (Not Significant)	Short-term
	Hen harrier	Medium-High	Negligible - Low	Minor (Not Significant)	Short-term		Negligible - Low	Minor (Not Significant)	Short-term
	Goshawk	High	Low - Medium	**Moderate (Significant)**	Short-term		Low	Minor (Not Significant)	Short-term
	Peregrine falcon	Medium	Low	Minor (Not Significant)	Short-term		Negligible	Minor (Not Significant)	Short-term
	Merlin	Medium	Low	Minor (Not Significant)	Short-term		Low	Minor (Not Significant)	Short-term
	All other raptors	Low (LH)	Low	Minor (Not Significant)	Short-term		Low	Minor (Not Significant)	Short-term
	Black Grouse	Medium	Low - Medium	**Moderate (Significant)**	Short-term		Low	Minor (Not Significant)	Short-term
	Golden Plover	Medium	Negligible	Minor (Not Significant)	Short-term		Negligible	Minor (Not Significant)	Short-term
	All other waders	Low (LH)	Low	Minor (Not Significant)	Short-term		Low	Minor (Not Significant)	Short-term
	All other waterbirds (inc. Gulls)	Low (LH)	Low	Minor (Not Significant)	Short-term		Low	Minor (Not Significant)	Short-term
	Barn owl	Medium	Low	Minor (Not Significant)	Short-term		Low	Minor (Not Significant)	Short-term
	Short-eared owl	Medium	Low	Minor (Not Significant)	Short-term		Low	Minor (Not Significant)	Short-term
	Forest owls	Low (LH)	Low	Minor (Not Significant)	Short-term		Low	Minor (Not Significant)	Short-term
	Nightjar	Medium-High	Low-Medium	**Moderate (Significant)**	Short-term		Low	Minor (Not Significant)	Short-term
	Moorland / lowland passerines	Medium	Low	Minor (Not Significant)	Short-term		Low	Minor (Not Significant)	Short-term
	Woodland passerines	Medium	Low	Minor (Not Significant)	Short-term		Low	Minor (Not Significant)	Short-term



10

Archaeology & Cultural Heritage

Blackcraig and Margree Windfarms
Grid Connection
Environmental Statement

Table of Contents

10.1 Introduction ... 167
10.1.1 Scope ... 167
10.1.2 Objectives ... 167
10.1.3 Study Areas ... 167
10.1.4 Potential effects ... 177
10.1.5 Strategic Mitigation and Modifications to Scheme Design ... 177

10.2 Statutory and Planning Context ... 177
10.2.1 Statute and National Planning Policy ... 177
10.2.2 Regional and Local Planning Policy ... 178

10.3 Methods of Assessment ... 179
10.3.1 General ... 179
10.3.2 Consultation ... 179
10.3.2.1 Pre-Scoping & Scoping ... 179
10.3.2.2 Post-scoping ... 179
10.3.3 Desk-based Data Sources ... 179
10.3.4 Field survey within the Narrow Corridor Study Area ... 179
10.3.5 Identification of Receptors within ZTV Study Area and Characterisation of Setting ... 179
10.3.6 Significance Criteria ... 180
10.3.7 Criteria for Assessment of Physical Effects ... 180
10.3.8 Criteria for Assessment of Effects on Setting ... 181
10.3.8.1 Criteria for Assessing Sensitivity of Setting ... 181
10.3.8.2 Identification of How the Presence of the Proposed Development will Affect that Setting (Magnitude of Effect) ... 181
10.3.8.3 Assessment of Effects ... 181

10.4 Baseline Conditions ... 182
10.4.1 General ... 182
10.4.2 Cultural Heritage Assets within the Narrow Corridor ... 182
10.4.2.1 Assets with Statutory and Non-Statutory Designations ... 182
10.4.2.2 Gardens and Designed Landscapes ... 182
10.4.2.3 Archaeologically Sensitive Areas ... 182
10.4.2.4 Prehistoric Features ... 182
10.4.2.5 Medieval or Later Farming and Land Use ... 182
10.4.2.6 Roads and Bridges ... 187
10.4.2.7 Industrial and Extractive Features ... 187
10.4.2.8 Other Features ... 187
10.4.2.9 Natural Features ... 187
10.4.3 Cultural Heritage Features within the Broad Corridor ... 187
10.4.4 Potential for Undiscovered Archaeology within the Proposed Works Footprint ... 188
10.4.5 Cultural Heritage Features within the ZTV Study Area ... 188
10.4.5.1 Features from which the Proposed OHL would be Theoretically Perceptible ... 188
10.4.5.2 Features with Theoretical Visibility of the Existing N-Route OHL to be Removed, but from which the Proposed OHL would not be Theoretically Perceptible ... 188
10.4.6 Future Baseline Conditions without the Proposed Works ... 188

10.5 Effects and Mitigation ... 189
10.5.1 Felling and Construction Effects (Physical Effects) ... 189
10.5.1.1 Introduction ... 189
10.5.1.2 Likely Effects: Archaeologically Sensitive Areas ... 189
10.5.1.3 Likely Effects: Proposed OHL Route ... 189
10.5.1.4 Likely Effects: Dismantling of Existing N-Route OHL ... 191
10.5.1.5 No effect ... 193
10.5.1.6 Mitigation ... 193
10.5.1.7 Residual Effects ... 193
10.5.2 Operational Effects (Effects on Setting) ... 195
10.5.2.1 Likely Effects on Features with Theoretical Perceptibility of Proposed OHL ... 195
10.5.2.2 Likely Effects on Features with Theoretical Visibility of Existing N-Route OHL to be Removed but no Theoretical Perceptibility of Proposed OHL ... 196
10.5.2.3 Mitigation ... 196
10.5.2.4 Residual Effects ... 196
10.5.2.5 Summary ... 196
10.5.3 Secondary effects ... 196
10.5.4 Cumulative effects ... 196
10.5.4.1 Scope of Assessment ... 196
10.5.4.2 Likely Cumulative Operational Effects ... 196
10.5.5 Summary of Effects ... 197

10.6 Summary ... 197

10.7 Baseline Sources Consulted ... 198
10.7.1 Bibliographic ... 198
10.7.2 Cartographic ... 198
10.7.3 Aerial Photograph Sorties Examined (RCAHMS) ... 198
10.7.4 Web ... 198

Table of Figures

Figure 10.01.1 - Cultural heritage constraints 1 ... 168
Figure 10.01.2 - Cultural heritage constraints 2 ... 169
Figure 10.01.3 - Cultural heritage constraints 3 ... 170
Figure 10.01.4 - Cultural heritage constraints 4 ... 171
Figure 10.01.5 - Cultural heritage constraints 5 ... 172
Figure 10.01.6 - Cultural heritage constraints 6 ... 173
Figure 10.01.7 - Cultural heritage constraints 7 ... 174
Figure 10.01.8 - Cultural heritage constraints 8 ... 175
Figure 10.01.9 - Cultural heritage constraints 9 ... 176
Figure 10.02.1 - Cultural heritage constraints & perceptibility 1 ... 183
Figure 10.02.2 - Cultural heritage constraints & perceptibility 2 ... 184
Figure 10.02.3 - Cultural heritage constraints & perceptibility 3 ... 185
Figure 10.03 - Cultural heritage sites and N-Route visibility ... 186

List of Tables

Table 10.01 - Source of Impact and Possible Effects on Cultural Heritage ... 177
Table 10.02 - Regional and Local Planning Policies ... 178
Table 10.03 - Key consultee responses ... 179
Table 10.04 - Sensitivity of Cultural Heritage Assets ... 180
Table 10.05 - Magnitude of Physical Effects ... 180
Table 10.06 - Physical Effects ... 181
Table 10.07 - Contribution of Setting to the Understanding and Appreciation of a Cultural Heritage Receptor ... 181
Table 10.08 - Sensitivity of Setting of a Receptor ... 181
Table 10.09 - Magnitude of Effects on Setting ... 181
Table 10.10 - Effects on Setting ... 181
Table 10.11 - Summary of Likely Potential Felling and Construction (Physical) Effects ... 194
Table 10.12 - Assessment of Effect on Setting of Craigengillan GDL (GDL 110) ... 195
Table 10.13 - Assessment of Effect on Setting of Craigengillan Lodge (LB 1086) ... 196
Table 10.14 - Receptors Where Cumulative Operational Effects are Likely ... 197

10.0 Archaeology and Cultural Heritage

10.1 Introduction

10.1.1 Scope

1 This chapter considers the likely effects on cultural heritage assets of the proposed construction and operation of the Blackcraig and Margree overhead line (OHL), including the dismantling of the existing section of N-Route OHL. The S37 Applications for these OHLs includes the substations at Blackcraig and Margree (as ancillary development) and therefore these have been considered and are reported within the ES. A description of the proposed works is provided in Chapter 5.

2 Archaeology is the study of the past through the material remains of human activities left behind, be they visible monuments, buried sites or portable antiquities. Cultural heritage is a more encompassing concept embracing both archaeological remains and the built heritage, which combine to characterize the historic environment. Cultural heritage assets include features dating from the earliest Holocene human occupation, approximately 10,000 years ago, through to 20th century buildings and townscapes.

3 Cultural heritage assets include:

- assets with statutory designations:
  - > Scheduled Monuments (SMs);
  - > Listed Buildings (LBs);
  - > Conservation Areas (CAs);
  - > Designated Wreck Sites;
- assets with non-statutory designations;
  - > Gardens and Designed Landscapes (GDLs);
  - > World Heritage Sites;
  - > Battlefield Sites;
- other historic environment interests,
  - > Non-designated archaeological sites and monuments, historic buildings and areas of historical interest, including historic landscapes, gardens and designed landscapes, woodlands and routes such as drove roads.

4 Cultural heritage assets relevant to this assessment are Scheduled Monuments and other archaeological features and areas of archaeological interest (including Archaeologically Sensitive Areas (ASAs) defined by Dumfries and Galloway Council); Listed Buildings and other buildings of historic or architectural importance; Conservation Areas (CAs); Gardens and Designed Landscapes (GDLs) and other important historic landscapes (Non-Inventory Designed Landscapes (NIDLs) as defined by Dumfries and Galloway Council). There is no Designated Wreck Site or World Heritage Site within the area covered by this study. [1]

10.1.2 Objectives

1 The objectives of the cultural heritage study were to:

- identify the cultural heritage baseline;
- consider the proposed works locations in terms of their archaeological and historic environment potential, including their potential to contain undiscovered archaeological remains;
- assess the effects of, variously, the construction, operation and dismantling of elements of the proposed scheme upon archaeology and cultural heritage interests; and
- identify measures to mitigate any predicted adverse effects, where practical, assessing residual effects taking into account the mitigation proposed.

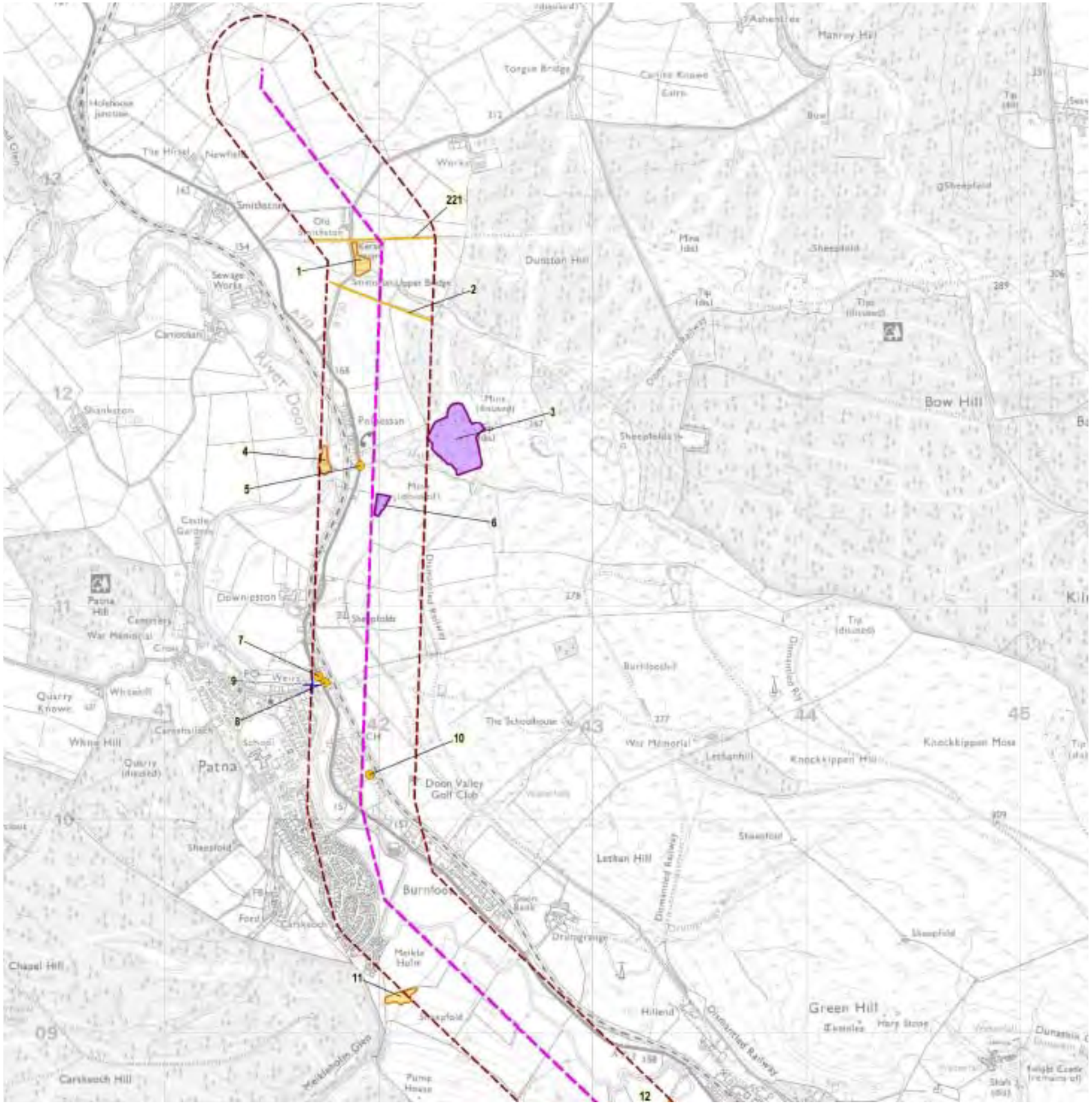
10.1.3 Study Areas

1 The study adopted a three-tier, nested approach to identifying the cultural heritage baseline necessary to inform the assessment of effects of the proposed works on cultural heritage assets.

- *Zone of Theoretical Visibility (ZTV) Study Area*. Baseline data was collected on cultural heritage sites and features with statutory, non-statutory and regional designations, and undesignated features considered in local authority Sites and Monuments Records / Historic Environment Records to be of national importance, present within the ZTV relating to the proposed OHL, and within the ZTV of the existing N-Route OHL proposed for dismantling, to permit an assessment of the effects of the proposals on the settings of these assets.
- *Broad corridor Study Area*. Desk-based assessment was conducted to identify cultural heritage features, designated or otherwise, within 'broad corridors' 1km wide centred along the proposed OHL and 500m wide centred upon the existing N-Route OHL, where this will be dismantled. Corridors 100m wide were studied on the proposed cable link to Blackcraig substation and along the route of proposed accesses (existing tracks) that extend beyond the limit of the main corridor. This study was carried out to identify cultural heritage features, designated or otherwise, along and in the vicinity of the proposed works routes, and to inform an assessment of the archaeological potential of the landscapes crossed by the proposed OHL.
- *Narrow corridor Study Area*. The narrow corridor Study Area focuses upon the proposed works locations as shown on Figure 10.01. It includes corridors of varying widths centred on proposed works locations within which non-invasive reconnaissance field survey took place.

2 Further information relating to the definition of the Study Areas is provided in Section 10.3.4-5.

1 - Effects on ancient woodland and veteran trees are considered in the Forestry and Ecology chapters.



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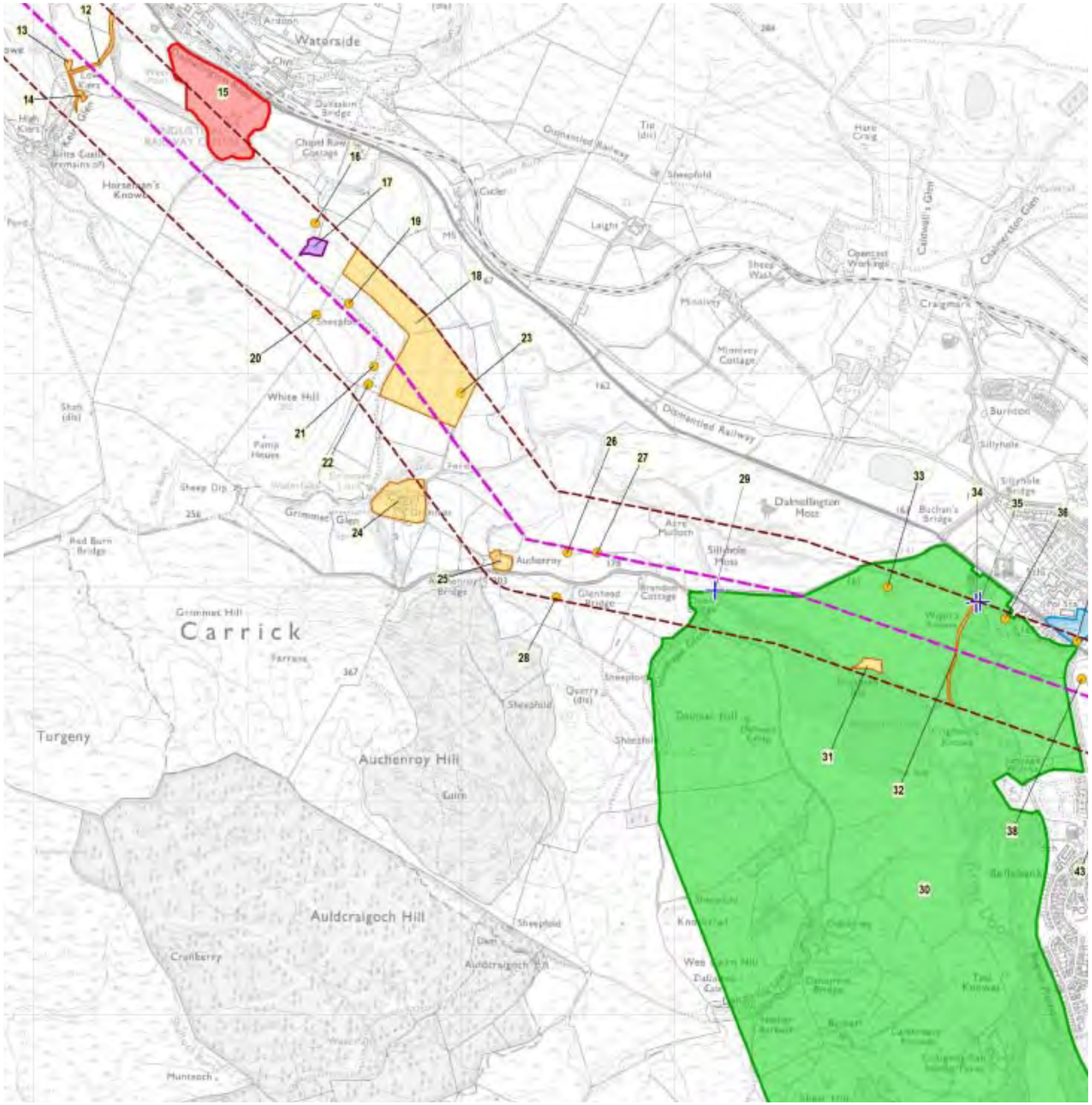
Legend

- Scheduled Monument
- B Listed Building
- C(S) Listed Building
- Nationally Important Archaeology Site
- Other Archaeological Sites
- Other Archaeological Site (Linear)
- Other Archaeological Site (Region)
- NIDL Area
- ASA Area
- Archaeological Interest Area
- Garden and Designed Landscape
- Conservation Area
- Broad Corridor Study Area
- Broad Corridor Study Area (N-Route Additional)
- Proposed Tower location
- Proposed Tower Line
- Proposed Access Tracks
- N-Route to be Removed
- N-Route to be Retained
- Proposed Access Tracks
- Pulling Location
- Substation and other infrastructure as noted
- Proposed felling - 80m corridor (160)
- Proposed felling - potential windthrow (108)
- Underground link

250m 750m
0m 500m 1km

Figure 10.01.1 - Cultural heritage constraints 1



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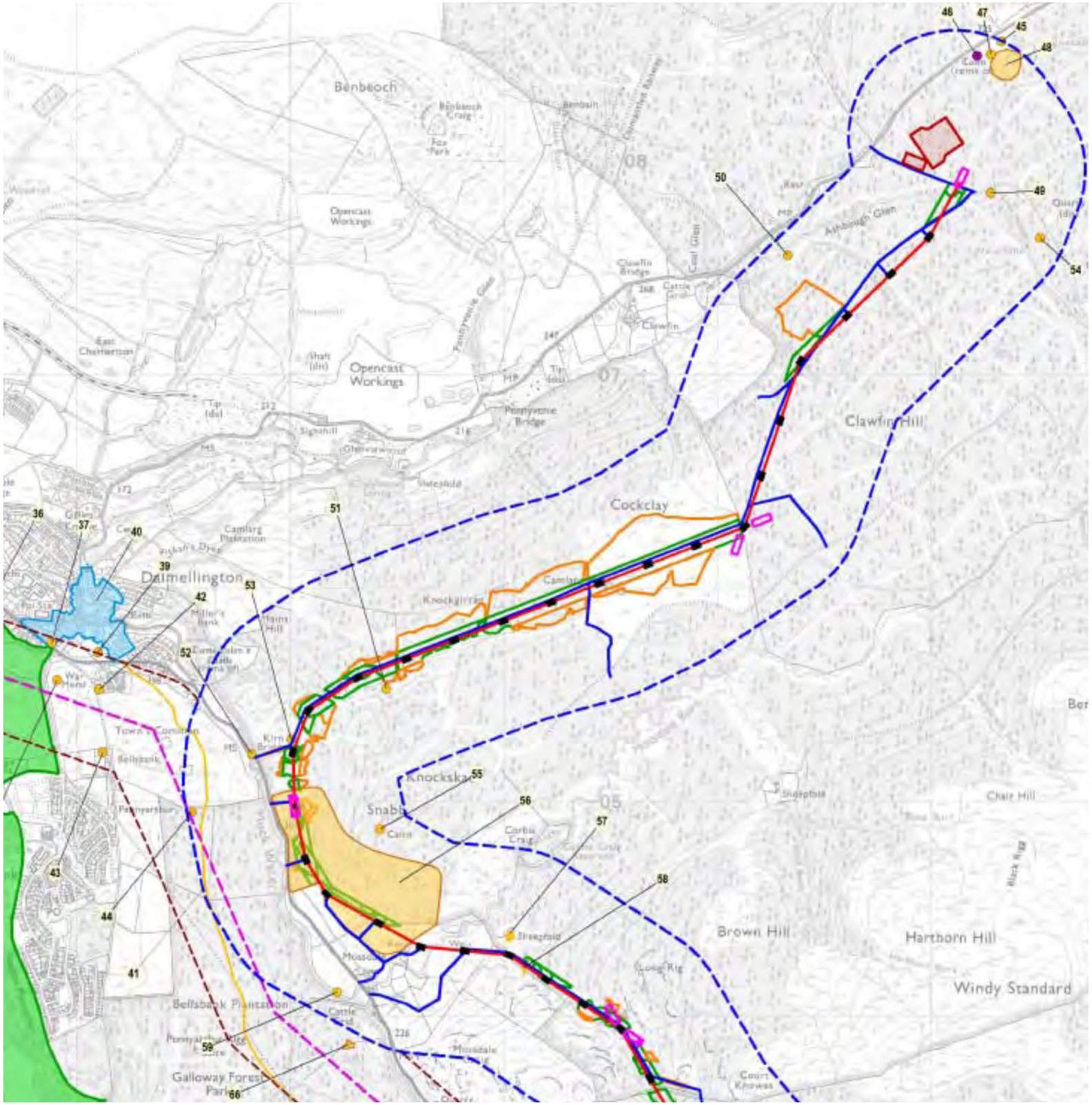
Legend

- Scheduled Monument
- B Listed Building
- C(S) Listed Building
- Nationally Important Archaeology Site
- Other Archaeological Sites
- Other Archaeological Site (Linear)
- Other Archaeological Site (Region)
- NIDL Area
- ASA Area
- Archaeological Interest Area
- Garden and Designed Landscape
- Conservation Area
- Broad Corridor Study Area
- Broad Corridor Study Area (N-Route Additional)
- Proposed Tower location
- Proposed Tower Line
- Proposed Access Tracks
- N-Route to be Removed
- N-Route to be Retained
- Proposed Access Tracks
- Pulling Location
- Substation and other infrastructure as noted
- Proposed felling - 80m corridor (160)
- Proposed felling - potential windthrow (108)
- Underground link

0m 250m 500m 750m 1km

Figure 10.01.2 - Cultural heritage constraints 2



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Legend

- Scheduled Monument
- B Listed Building
- C(S) Listed Building
- Nationally Important Archaeology Site
- Other Archaeological Sites
- Other Archaeological Site (Linear)
- Other Archaeological Site (Region)
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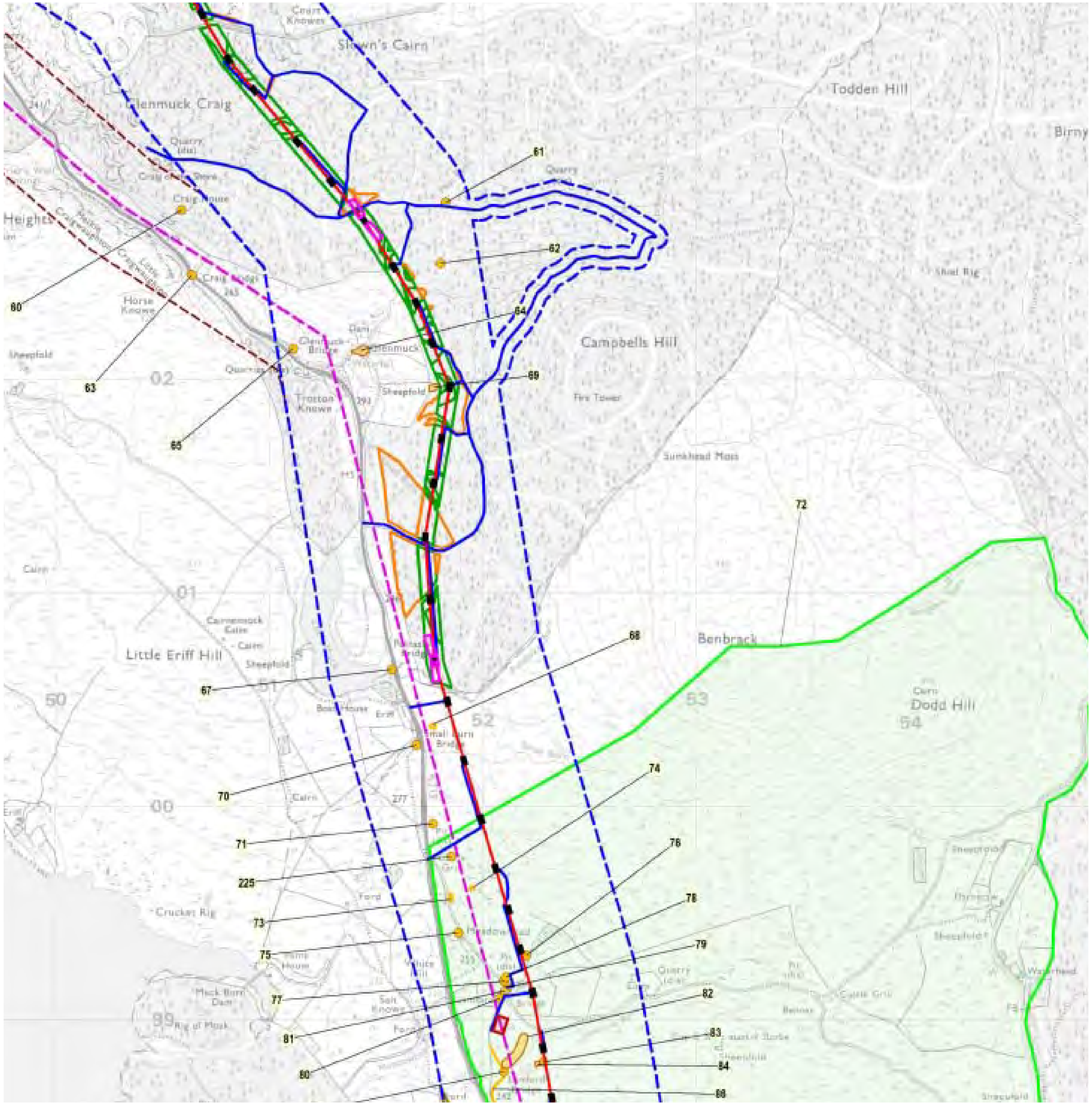
- Broad Corridor Study Area (N-Route Additional)
- Proposed Tower location
- Proposed Tower Line
- Proposed Access Tracks
- N-Route to be Removed
- N-Route to be Retained
- Proposed Access Tracks
- Pulling Location
- Substation and other infrastructure as noted
- Proposed felling - 80m corridor (160)
- Proposed felling - potential windthrow (108)
- Underground link

250m 750m
0m 500m 1km

Figure 10.01.3 - Cultural heritage constraints 3



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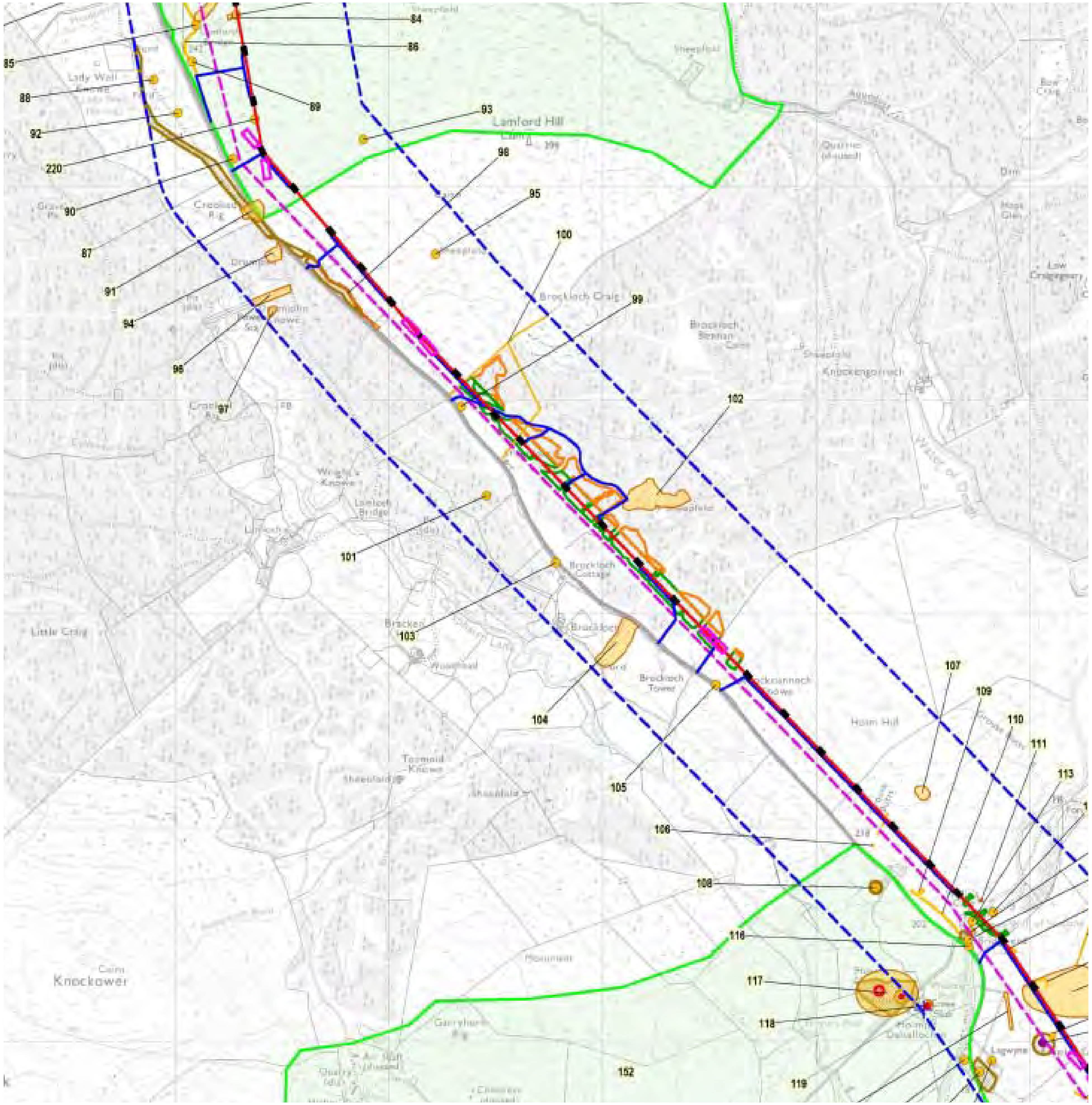
Legend

- Scheduled Monument
- B Listed Building
- C(S) Listed Building
- Nationally Important Archaeology Site
- Other Archaeological Sites
- Other Archaeological Site (Linear)
- Other Archaeological Site (Region)
- NIDL Area
- ASA Area
- Archaeological Interest Area
- Garden and Designed Landscape
- Conservation Area
- Broad Corridor Study Area
- Broad Corridor Study Area (N-Route Additional)
- Proposed Tower location
- Proposed Tower Line
- Proposed Access Tracks
- N-Route to be Removed
- N-Route to be Retained
- Proposed Access Tracks
- Pulling Location
- Substation and other infrastructure as noted
- Proposed felling - 80m corridor (160)
- Proposed felling - potential windthrow (108)
- Underground link

250m 750m
0m 500m 1km

N

Figure 10.01.4 - Cultural heritage constraints 4



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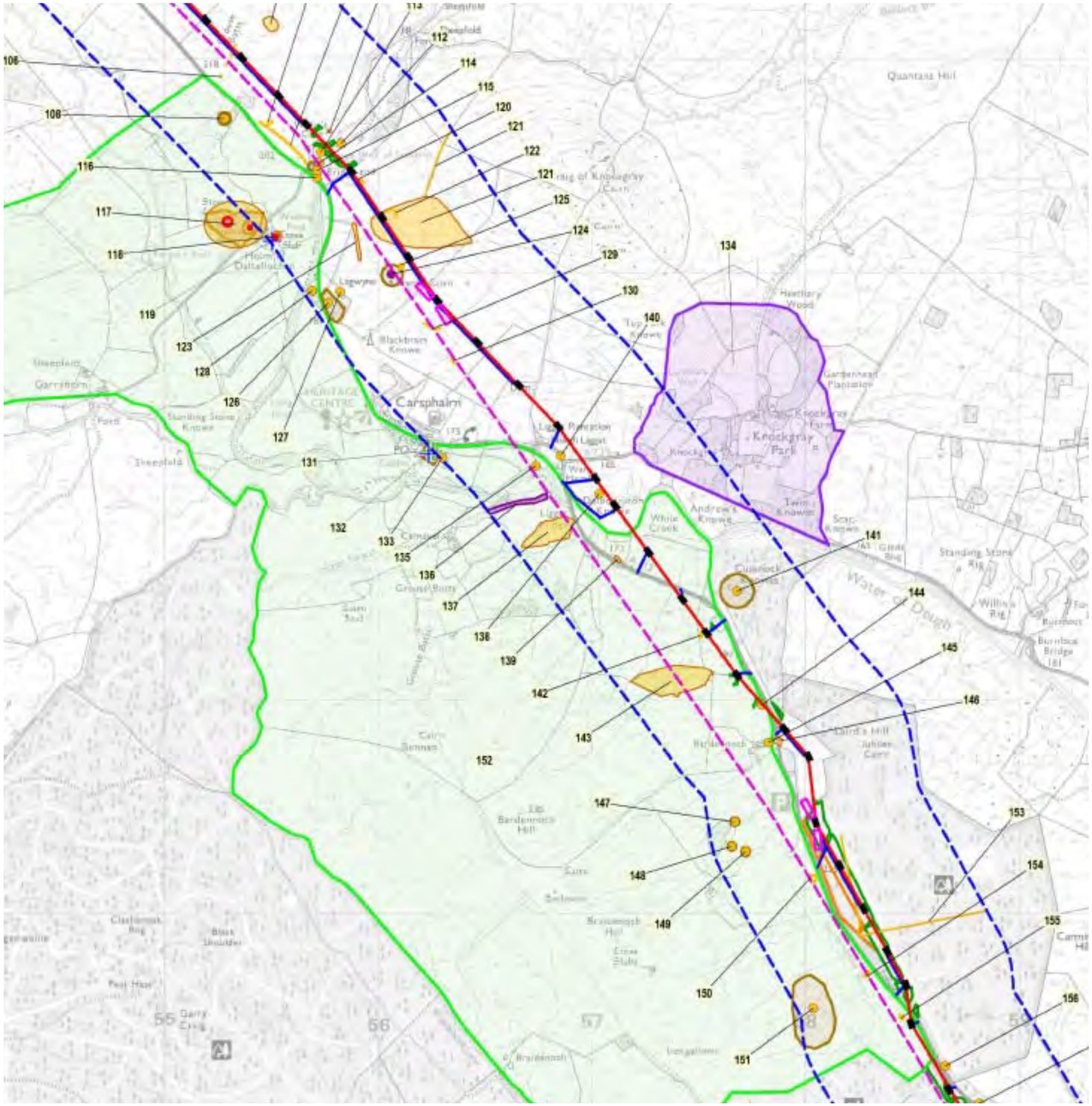
Legend

- Scheduled Monument
- B Listed Building
- C(S) Listed Building
- Nationally Important Archaeology Site
- Other Archaeological Sites
- Other Archaeological Site (Linear)
- Other Archaeological Site (Region)
- NIDL Area
- ASA Area
- Archaeological Interest Area
- Garden and Designed Landscape
- Conservation Area
- Broad Corridor Study Area
- Broad Corridor Study Area (N-Route Additional)
- Proposed Tower location
- Proposed Tower Line
- Proposed Access Tracks
- N-Route to be Removed
- N-Route to be Retained
- Proposed Access Tracks
- Pulling Location
- Substation and other infrastructure as noted
- Proposed felling - 80m corridor (160)
- Proposed felling - potential windthrow (108)
- Underground link

250m 750m
0m 500m 1km

N

Figure 10.01.5 - Cultural heritage constraints 5



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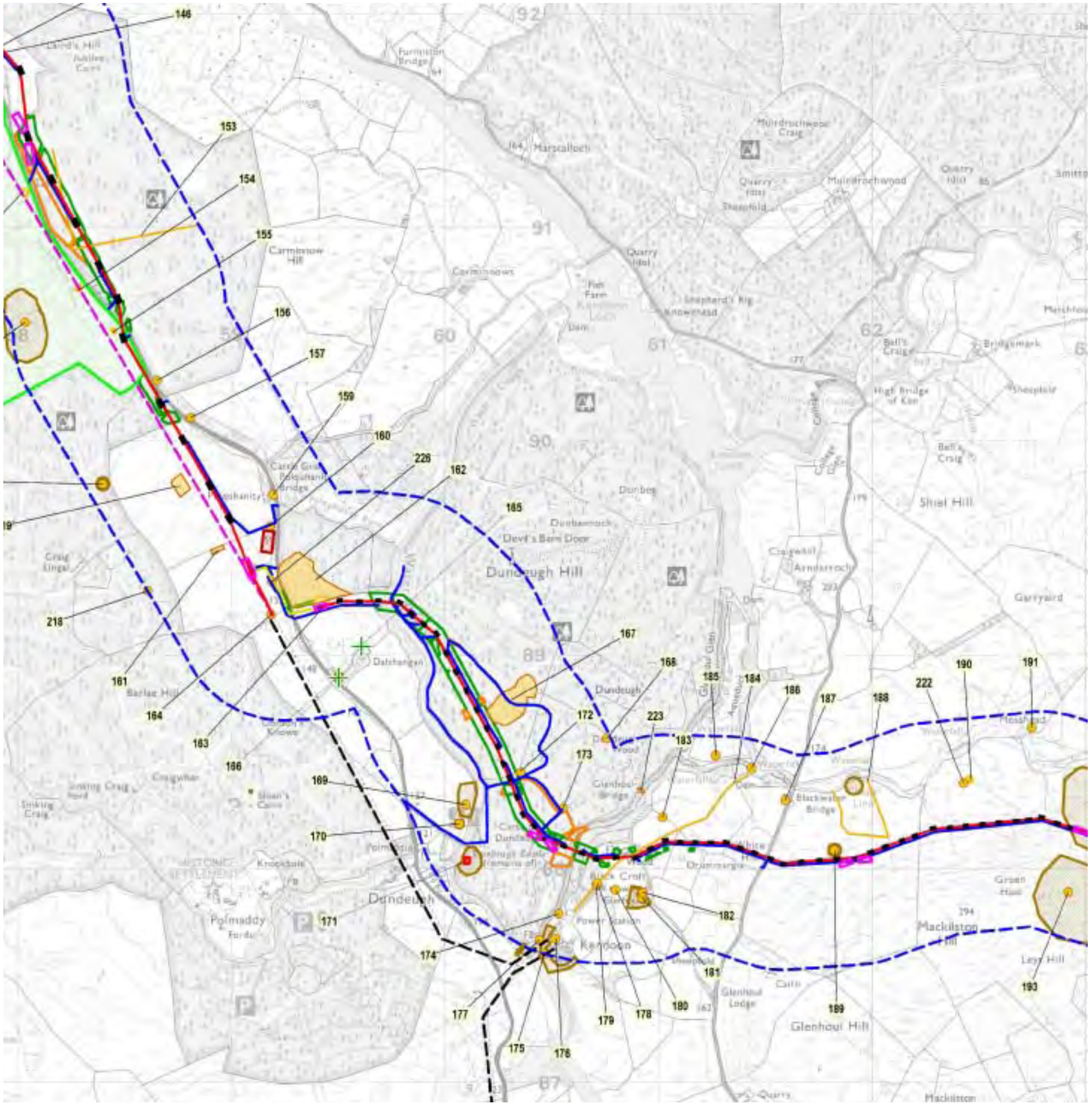
Legend

- Scheduled Monument
- B Listed Building
- C(S) Listed Building
- Nationally Important Archaeology Site
- Other Archaeological Sites
- Other Archaeological Site (Linear)
- Other Archaeological Site (Region)
- NIDL Area
- ASA Area
- Archaeological Interest Area
- Garden and Designed Landscape
- Conservation Area
- Broad Corridor Study Area
- Broad Corridor Study Area (N-Route Additional)
- Proposed Tower location
- Proposed Tower Line
- Proposed Access Tracks
- N-Route to be Removed
- N-Route to be Retained
- Proposed Access Tracks
- Pulling Location
- Substation and other infrastructure as noted
- Proposed felling - 80m corridor (160)
- Proposed felling - potential windthrow (108)
- Underground link

250m 750m
0m 500m 1km

Figure 10.01.6 - Cultural heritage constraints 6



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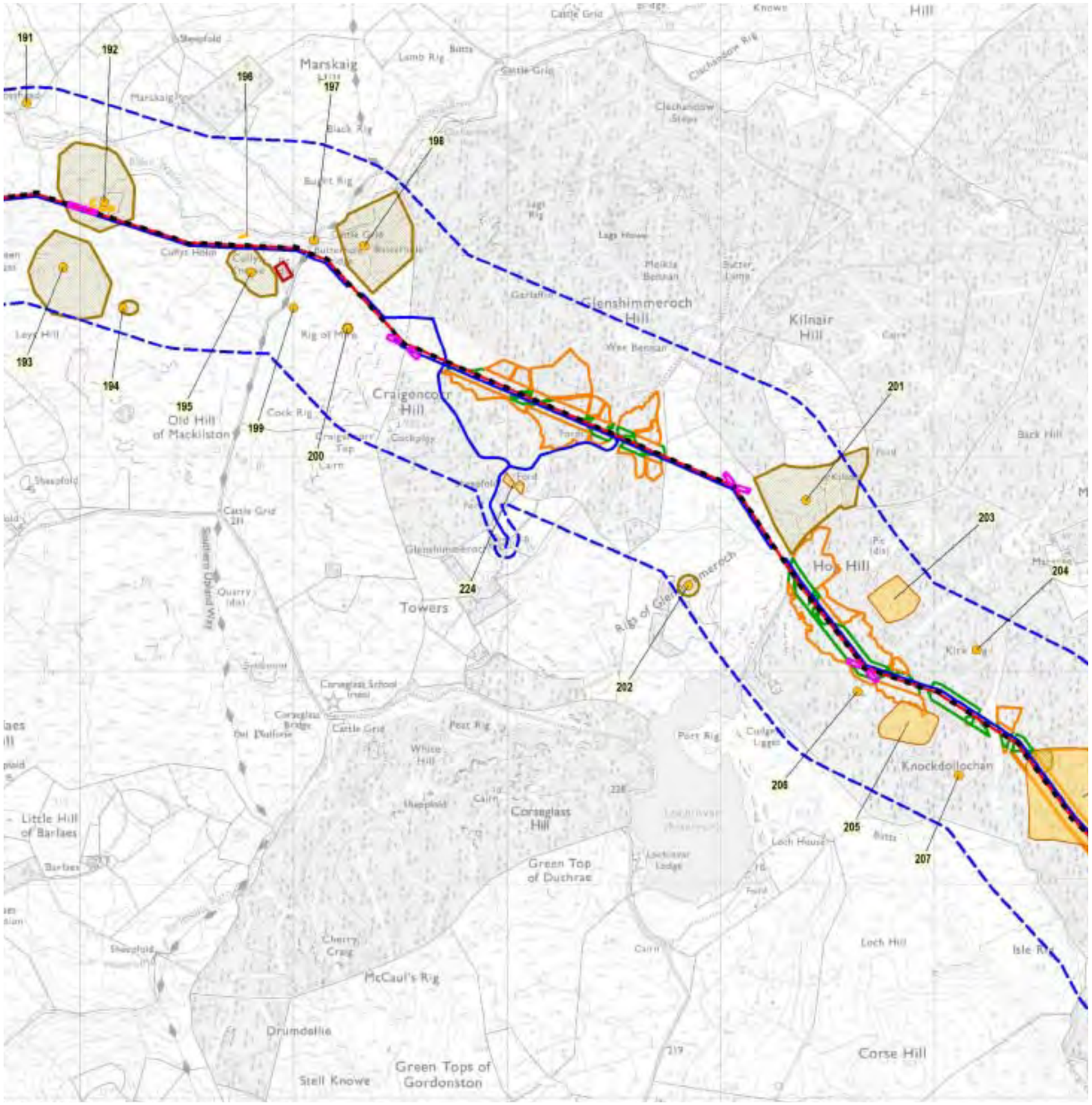
Legend

- Scheduled Monument
- B Listed Building
- C(S) Listed Building
- Nationally Important Archaeology Site
- Other Archaeological Sites
- Other Archaeological Site (Linear)
- Other Archaeological Site (Region)
- NIDL Area
- ASA Area
- Archaeological Interest Area
- Garden and Designed Landscape
- Conservation Area
- Broad Corridor Study Area
- Broad Corridor Study Area (N-Route Additional)
- Proposed Tower location
- Proposed Tower Line
- Proposed Access Tracks
- N-Route to be Removed
- N-Route to be Retained
- Proposed Access Tracks
- Pulling Location
- Substation and other infrastructure as noted
- Proposed felling - 80m corridor (160)
- Proposed felling - potential windthrow (108)
- Underground link
- Sealing End Platform adjacent to Tower 102R

0m 250m 500m 750m 1km

Figure 10.01.7 - Cultural heritage constraints 7



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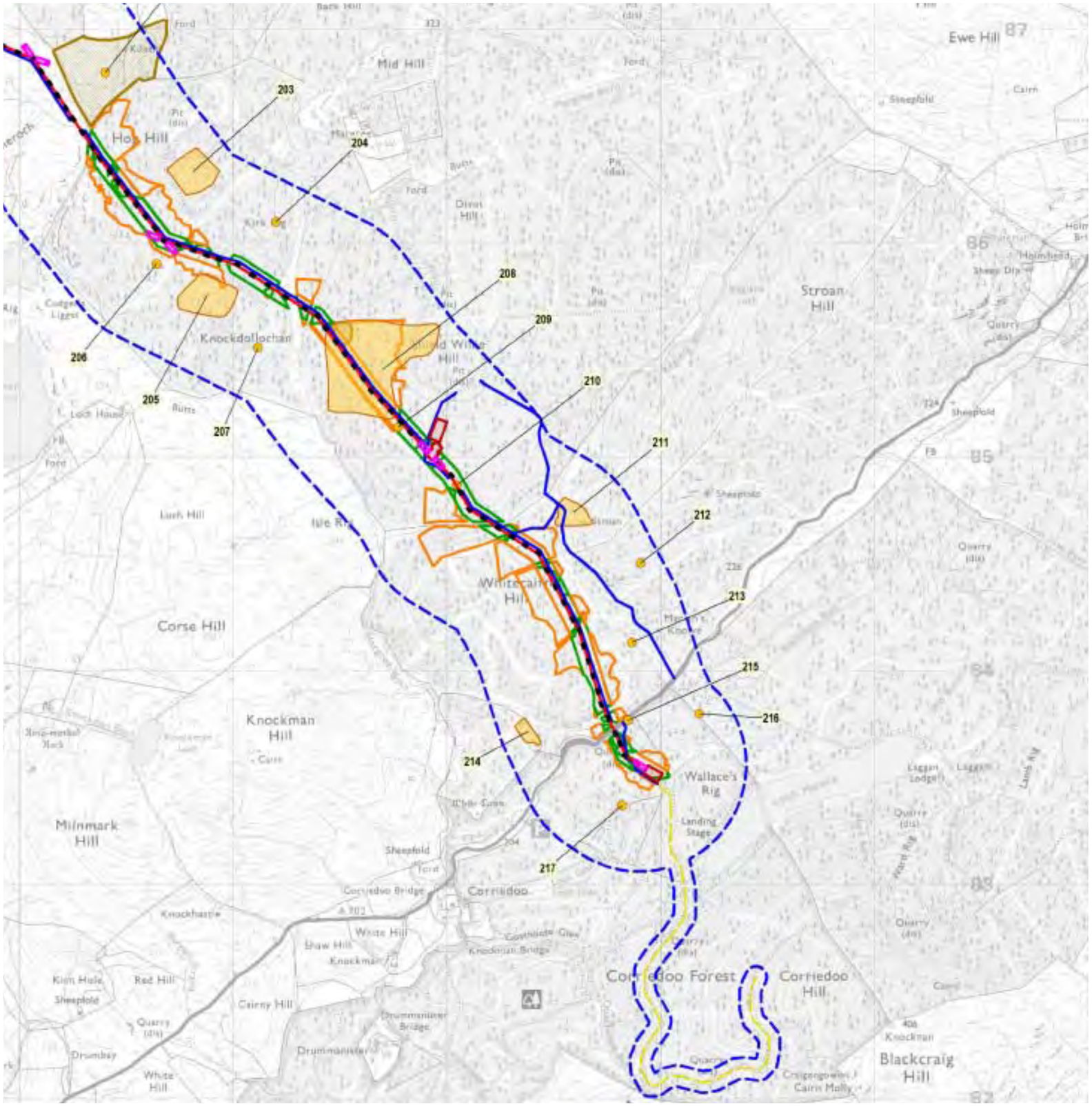
Legend

- Scheduled Monument
- B Listed Building
- C(S) Listed Building
- Nationally Important Archaeology Site
- Other Archaeological Sites
- Other Archaeological Site (Linear)
- Other Archaeological Site (Region)
- NIDL Area
- ASA Area
- Archaeological Interest Area
- Garden and Designed Landscape
- Conservation Area
- Broad Corridor Study Area
- Broad Corridor Study Area (N-Route Additional)
- Proposed Tower location
- Proposed Tower Line
- Proposed Access Tracks
- N-Route to be Removed
- N-Route to be Retained
- Proposed Access Tracks
- Pulling Location
- Substation and other infrastructure as noted
- Proposed felling - 80m corridor (160)
- Proposed felling - potential windthrow (108)
- Underground link

0m 250m 500m 750m 1km

Figure 10.01.8 - Cultural heritage constraints 8



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Legend

- Scheduled Monument
- B Listed Building
- C(S) Listed Building
- Nationally Important Archaeology Site
- Other Archaeological Sites
- Other Archaeological Site (Linear)
- Other Archaeological Site (Region)
- NIDL Area
- ASA Area
- Archaeological Interest Area
- Garden and Designed Landscape
- Conservation Area
- Broad Corridor Study Area
- Broad Corridor Study Area (N-Route Additional)
- Proposed Tower location
- Proposed Tower Line
- Proposed Access Tracks
- N-Route to be Removed
- N-Route to be Retained
- Proposed Access Tracks
- Pulling Location
- Substation and other infrastructure as noted
- Proposed felling - 80m corridor (160)
- Proposed felling - potential windthrow (108)
- Underground link

250m 750m
0m 500m 1km

Figure 10.01.9 - Cultural heritage constraints 9

10.1.4 Potential effects

1 Possible effects on cultural heritage resources may result from:

- (i) ground-disturbing activities, e.g. forestry felling, the erection and dismantling of towers/poles, construction of the substations, excavation of underground cable trenches, use of working areas and new temporary and upgraded accesses that may damage or possibly destroy, cultural heritage remains;
- (ii) above-ground disturbance, such as that caused by vehicle movement along temporary access tracks, that may produce irreversible effects upon archaeological remains;
- the presence of OHLs and substations, and the removal of towers, which may affect the settings of cultural heritage assets in their vicinity.

2 Effects of (i) and (ii) are most likely to occur during felling and construction although they could also result from ongoing access and maintenance. These effects on cultural heritage resources are normally adverse, permanent and irreversible in nature. Effects in the first two cases are predominantly to the settings of cultural heritage features and can occur during both the temporary construction phase and the permanent operational phase.

3 Table 10.01 below outlines the sources of possible impacts and their corresponding effects on cultural heritage (temporary effects are denoted in *italics*). Measures to reduce or mitigate likely effects are discussed later in this chapter.

Table 10.01 - Source of Impact and Possible Effects on Cultural Heritage

Source of Impact	Possible effect on Cultural Heritage
Felling and Construction	
Felling of trees for wayleave.	Direct ground disturbance and above ground disturbance (such as vehicle movements on temporary access tracks) which may damage or destroy cultural heritage features. Secondary disturbance as a consequence of windthrow which may also damage or destroy cultural heritage features.
Site clearance/preparation works and construction of access tracks, tower/pole working and pulling areas and substations.	Direct ground disturbance and above ground disturbance (such as vehicle movements on temporary access tracks) which may damage or destroy cultural heritage remains.
Introduction of lighting, erection of fencing, movement of HGVs, cranes, and personnel.	*Effects on the setting of cultural heritage features.*
Operation and Maintenance	
Introduction of substations, steel towers, underground cables and wood poles, plus associated fencing and signage.	Effects on the setting of cultural heritage features.
Substation/wayleave inspection and tree clearance including movement of vehicles, machinery and personnel.	Direct ground disturbance and above ground disturbance (such as vehicle movements on temporary access tracks) which may damage or destroy cultural heritage remains.

10.1.5 Strategic Mitigation and Modifications to Scheme Design

1 Prior to the commencement of the EIA, the strategic routeing studies, outlined in **Chapter 3**, sought to avoid or limit possible effects through the identification of key environmental constraints and avoidance of these (where possible) in identifying the preferred route and substation locations. In relation to cultural heritage, the strategic routeing studies identified areas designated at the national and regional level for their cultural heritage value (SMs, LBs, CAs, GDLs, ASAs, NIDLs). The scheme design has been further modified to avoid or reduce effects on cultural heritage. Modifications to the scheme design include relocation of towers / poles and access routes to minimise effects on the setting of Dalshangan stables and dovecot (**LB 3679, 3680**) and Dundeugh Castle (**SM 2476**).

10.2 Statutory and Planning Context

10.2.1 Statute and National Planning Policy

1 Scotland's historic environment contributes to The Scottish Government's strategic objectives and to the National Performance Framework. The *Scottish Historic Environment Policy* (SHEP) document[2] sets out Scottish Ministers' policies for the historic environment, and provides policy direction for Historic Scotland and a framework that informs the day-to-day work of a range of organisations that have a role and interest in managing the historic environment. Through the SHEP Scottish Ministers are determined to achieve three outcomes for Scotland's historic environment:

- That the historic environment is cared for, protected and enhanced for the benefit of our own and future generations;
- To secure greater economic benefits from the historic environment; and
- That the people of Scotland and visitors to our country value, understand and enjoy the historic environment.

2 *Scottish Planning Policy (February 2010)* (SPP) sets out the national planning policy for the historic environment and indicates how the planning system will contribute towards the delivery of The Scottish Government's policies as set out in SHEP. Historic environment assets are material considerations in the planning process and The Scottish Government expects planning authorities to safeguard historic assets through development plans and development management decisions. The SPP also requires prospective developers to take Government policy and guidance on the historic environment into account when forming development proposals.

3 Scheduled Monuments are protected under the *Ancient Monuments and Archaeological Areas Act 1979* (1979 Act). The statutory consent of the Scottish Ministers is required before any works are carried out which would affect the character or fabric of a Scheduled Monument. Impacts upon the setting of a Scheduled Monument form an important consideration in determining an application for planning consent. Further information on development control procedures relating to Scheduled Monuments is provided in SHEP, SPP and *Planning Advice Note 42, Archaeology* (PAN 42).

4 Listed Buildings are classified into Categories A, B and C(S) and are protected under the *Planning (Listed Buildings and Conservation Areas) (Scotland) Act 1997* (1997 Act). Under the 1997 Act the Scottish Ministers are required to compile a list of buildings of special architectural or historic interest. Planning authorities are required, when determining applications for planning permission or listed building consent, to have special regard for the desirability of preserving Listed Buildings and their settings and any features of special architectural or historic importance they possess. Scottish Government policy is also provided in SHEP and in SPP.

5 Conservation Areas are areas of special architectural or historic interest, the character or appearance of which is desirable to enhance or preserve. Designation as a Conservation Area provides the basis for positive management of the designated area, and SPP states that planning permission should normally be refused for proposed development within a Conservation Area that fails to preserve or enhance and character or appearance of the area.

6 The effect of a proposed development on a designated Garden or Designed Landscape listed in the *Inventory of Gardens and Designed Landscapes in Scotland* (Inventory) and other gardens and designed landscapes of regional and local importance, is a material consideration in the determination of a planning application, although the designation is non-statutory in effect. SPP states that planning authorities have a role in protecting, preserving and enhancing gardens and designed landscapes, and that relevant policies should be included in development plans.

7 There is a range of other non-designated archaeological sites and monuments and other historic assets and areas of historic interest, including battlefields, historic landscapes, other gardens and designed landscapes, woodlands and routes such as drove roads that do not have statutory protection. SPP requires that planning authorities take into account the presence and potential presence of these assets when allocating sites in development plans and when making decisions on planning applications. PAN 42 indicates that the principle that should underlie all planning decision-making is preservation of archaeological resources *in situ* where possible. PAN 42 recognizes that preservation may not always be possible and where damage is unavoidable various mitigation measures may be proposed. SPP states that planning authorities should use conditions or legal agreement to ensure appropriate excavation, recording, analysis, publication and archiving, before and/or during development, of assets where preservation *in situ* in not possible.

2 - Historic Scotland, *The Scottish Historic Environment Policy (SHEP) document* (July 2009)

10.2.2 Regional and Local Planning Policy

1 Table 10.02 identifies Structure and Local Plan policies that relate to cultural heritage within the Dumfries and Galloway and East Ayrshire planning areas.[3] Although the proposed works do not extend into South Ayrshire, one Scheduled Monument and part of one Garden and Designed Landscape assessed in this chapter are located in South Ayrshire, and the assessment of effect has taken account of *South Ayrshire Local Plan April 2007*, Policy BE6 relating to Scheduled Monuments and other archaeological sites and Policy ENV10 relating to Gardens and Designed Landscapes.

Table 10.02 - Regional and Local Planning Policies

Topic	Dumfries and Galloway Structure Plan 1999	Adopted Stewartry Local Plan July 2006	Ayrshire Joint Structure Plan November 2007 East Ayrshire Adopted Local Plan April 2003
General			Structure Plan Policy ENV 6 Protection of the Built Heritage – Development proposals considered to have an adverse effect on the following heritage resources shall not conform to the structure plan. A) listed buildings of architectural and historic interest; B) designated conservation areas; C) historic gardens and designed landscapes; and D) archaeological locations and landscapes. Local Plans shall prepare detailed policies to protect and enhance built heritage resources. Local Plan Policy ENV1 – The Council will seek to protect, preserve and enhance all heritage resources requiring conservation including Listed Buildings and Conservation Areas, together with their respective settings, Scheduled Ancient Monuments and Archaeological and Industrial Archaeological sites and landscapes.
Conservation Areas	Policy E8 Development in Conservation Areas – Development proposals and schemes should enhance the special character and appearance of Conservation Areas.	General Policy 50 – The Planning Authority will preserve or enhance the character and appearance of the Conservation Areas shown on the Inset Maps by ... [inter alia)] ensuring that new development preserves or enhances the character, appearance or setting of the Conservation Area through the appropriate design, use of materials, detailing and general massing and arrangement of any new proposal.	Local Plan Policy ENV4 – The Council will seek to ensure that all development within or affecting the setting of a Conservation Area or affecting the appearance or setting of a Listed Building, is sympathetic to the area or building concerned in terms of its layout, size, scale, design, siting, materials and colour of finish. Wherever possible, all proposals should seek to preserve, enhance or incorporate features, which contribute positively to the character or appearance of the area and have due regard to the architectural and historic qualities of the area or building concerned.
Listed Buildings	Policy E9 Listed Buildings includes – Development proposals which would destroy or adversely affect the character, appearance, or setting of a listed building will be resisted.	General Policy 51 – In considering proposals affecting listed buildings the Planning Authority will ensure that ... [inter alia] proposals for development will not be permitted if they would harm the setting of a listed building.	Local Plan Policy ENV4 (as above)
Gardens and Designed Landscapes	Policy E11 Historic Gardens and Designed Landscapes – Development in or affecting the setting of a site listed in the Inventory of Gardens and Designed Landscapes or mentioned in the list of Non-Inventory Sites will require an evaluation of the proposal's impact on the site and its setting. There will be a presumption against development which would adversely affect the landscape features, character and setting of these sites and the approaches and environs of Inventory Sites.	The explanatory text relating to General Policy 53a, concerning Gardens and Designed Landscapes, states that proposals in or that affect the setting of Non-Inventory Gardens and Landscapes will be subject to Dumfries and Galloway Structure Plan Policy E11.	Local Plan Policy ENV5 – The Council will seek to protect, preserve and enhance Historic Gardens and Designed Landscapes. In instances where a proposed development affects an Historic Garden or Designed Landscape which is included in the 'Inventory of Historic Gardens and Designed Landscapes in Scotland' a landscape management plan will require to be submitted as an integral part of any application submitted to the Council for consideration.
Scheduled Monuments and other archaeological features and areas	Policy E12 Development Affecting Archaeological Sites – There will be presumption against development which would destroy or adversely affect the appearance, fabric or setting of Scheduled Ancient Monuments, sites of national importance and other areas of significant archaeological interest. In exceptional circumstances, where it is not possible to secure the preservation of archaeological remains, the Council will require an appraisal of the impact of the development on the site. The developer will be responsible for securing an agreed programme of archaeological work to the satisfaction of the Council.	General Policy 54 – Within settlement boundaries known archaeological sites including Scheduled Ancient Monuments are defined on the Inset Maps. The Planning Authority will assess development proposals within or adjacent to the sites, in accordance with Structure Plan Policy E12. [The explanatory text states that the same Structure Plan policy will also apply to Scheduled Ancient Monuments and known archaeological sites that are not within the settlement boundaries.]	Local Plan Policy ENV3 – The Council will actively encourage the retention and preservation of archaeological and industrial archaeological resources and ensure that, in cases where the primary aim or preserving archaeological sites cannot be achieved, developers carry out appropriate archaeological investigations and recording of remains within a proposed development site, prior to the development being commenced.
Archaeologically Sensitive Areas (Dumfries and Galloway only)	Policy E13 Archaeologically Sensitive Areas – The Council will safeguard the character and archaeological interest of 'archaeologically sensitive areas', the boundaries of which will be defined in Local Plans. [The explanatory text states that the value of Sensitive Rural areas, extensive areas containing archaeological remains of various dates and types, could be damaged by inappropriate, large scale land use change.]	General Policy 55 – Archaeologically Sensitive Areas are defined on the Proposals Map and/ or Inset Maps. The Planning Authority will assess development proposals within these areas in accordance with Structure Plan Policy E13.	

3 - The East Ayrshire Adopted Local Plan is under review, and this assessment has taken account of the policies set out in the *Alteration to the East Ayrshire Local Plan: Finalised Draft With Modifications*, specifically Strategic Policy ENV1, Policy ENV4 (Listed Buildings), Policy ENV6 (Scheduled Monuments and other archaeological resources), Policy ENV7 (Conservation Areas) and Policy ENV8 (Gardens and Designed Landscapes).

10.3 Methods of Assessment

10.3.1 General

1 Baseline archaeology and cultural heritage conditions were established through archival and documentary research, consultation with interested parties, and non-invasive reconnaissance field survey. Baseline desk and field surveys were undertaken to comply with the Institute for Archaeologists' *Code of Conduct* (2009) and in accordance with its *Standard and Guidance for Archaeological Desk-Based Assessment* (2008).

2 The methodology proposed here for assessing effects on the setting of cultural heritage assets was developed by Land Use Consultants and CFA Archaeology in 2007 through consultation with Historic Scotland in relation to SPT's South West Scotland Project proposals, with which the current proposals will articulate at the proposed Meikle Hill substation.

10.3.2 Consultation

10.3.2.1 Pre-Scoping & Scoping

1 Historic Scotland, Dumfries and Galloway Council and East Ayrshire Council were consulted as regards cultural heritage interests as part of the development design process. Cultural heritage assets were one of the considerations taken into account in the routeing proposals set out in the Consultation Document and subsequent Scoping Request issued by SPT. Key Consultee comments were as follows and these were taken into account wherever possible within the technical requirements for the project.[4]

Table 10.03 - Key consultee responses

Consultee	Response
Historic Scotland	Historic Scotland set out relevant policy issues and provided guidance on information sources for baseline survey
Forestry Commission	FCS identified the importance of ancient woodlands and veteran trees (see Forestry and Ecology chapters), and the value of the historic environment in woodlands
D&G Council	Dumfries and Galloway Council's Archaeologist accepted the proposed approach to assessment, indicated that the new overhead line would likely have a greater impact on the Archaeologically Sensitive Areas crossed by the route than does the existing overhead line to be dismantled, and expressed concern that no consideration appeared to have been given to undergrounding the grid connection

10.3.2.2 Post-scoping

1 West of Scotland Archaeology Service and Dumfries and Galloway Council's Archaeologist were contacted by email in June 2009 to request baseline data, which was received shortly thereafter. They were further contacted on 5 November 2009 to request details of any local archaeological historical societies active in the vicinity of the proposed works that it would be appropriate to consult for information.

- Dumfries and Galloway Council responded on 6 November 2009, identifying the Carsphairn Heritage Group, and stating that the boundaries of the ASAs around Carsphairn are defined by land parcels that wrap around heritage walks that have been set up by the group. The Carsphairn Heritage Group was contacted by email on 27 November2009 for its views on the proposals and to seek information on unreported archaeological sites or finds and recent fieldwork. No response was received.

- West of Scotland Archaeology Service (WoSAS) responded on 9 November, suggesting the Ayrshire Archaeological and Natural History Society as a potential source of information on recent research in the area. The Ayrshire Archaeological and Natural History Society was contacted by email on 27 November 2009 for its views on the proposals and to seek information on unreported archaeological sites or finds and recent fieldwork. No response was received.

10.3.3 Desk-based Data Sources

1 The following data sources have been used in the desk-based compilation of the data used to inform this assessment:

i. Data-sets held by Historic Scotland, the Royal Commission on the Ancient and Historical Monuments (RCAHMS), WoSAS and Dumfries and Galloway Council, including the National Monuments Record of Scotland (NMRS), the Sites and Monuments Records (SMR) held by WoSAS and Dumfries and Galloway Council's Historic Environment Record (HER), and the relevant Structure and Local Plans;

ii. Environmental Statements relating to other recent local development proposals;

iii. Ordnance Survey 1st and 2nd Edition maps, and other historic maps held in the Map Library of the National Library of Scotland;

iv. Unpublished historic maps held in the National Archives of Scotland (although that source provided no relevant information);

v. Aerial photographic collections held by RCAHMS, and aerial photographs commissioned by SPT;

vi. Sites mentioned in published sources, including early descriptions of the area;

vii. The Scottish Palaeoenvironmental (SPA) Database (although that source provided no relevant information);

viii. The Historic Land-use Assessment data for Scotland (HLAMAP) (http://hla.rcahms.gov.uk/), presently available only from Polquhanity northwards; and

ix. The East Ayrshire Council Archives (although that source provided no relevant information).

2 These data were collected for the broad corridor Study Area, with the exception of iii-v, where the studies focused primarily upon the narrow corridor Study Area.

10.3.4 Field survey within the Narrow Corridor Study Area

1 A non-invasive reconnaissance field survey, comprising a non-intrusive walkover survey, was conducted within the narrow corridor Study Area for the proposed OHL. Field survey was undertaken within a 200m wide corridor along the route of the proposed OHL and directly along the routes of proposed new temporary accesses that extend beyond that corridor. Field survey was also conducted along a 100m wide corridor centred on the existing N-Route OHL to be dismantled, between Kendoon and Glenmuck (where the routes run close together). To the north of Glenmuck fieldwork was restricted to site visits to cultural heritage features identified from desk-based study wherever possible (as no land access permissions were in place). The survey work was undertaken principally in July, August and November 2009.

2 The aims of the field survey were to:

- Locate all cultural heritage sites, monuments and landscape features, both identified during the desk-based assessment and previously unrecognised, and record their character, extent and current condition;

- Identify areas with the potential to contain unrecorded, buried archaeological remains, taking into account factors such as topography, geomorphology and ground conditions; and

- Inform the assessment of the possible effects of the proposed works on those features, and their settings where appropriate.

3 Identified sites were recorded on pro-forma monument recording forms, including a sketch plan where applicable, and by digital photography, and were located using GPS readings. These archive materials will be offered to the relevant SMR/HER.

4 The process of field survey was hampered in certain areas owing to the presence of dense conifer plantations. Areas of dense commercial forests were not surveyed, and the baseline conditions of features identified within these areas during the desk-based studies were not fully established. Any uncertainty as a consequence of this has been acknowledged in the assessments. Post-felling archaeological field survey will be more effective post-consent in these areas.

10.3.5 Identification of Receptors within ZTV Study Area and Characterisation of Setting

1 Details were obtained for cultural heritage sites and features with statutory, non-statutory and regional designations, and undesignated features considered in local authority SMRs/HERS to be of national importance, present within the ZTV Study Area. ZTV mapping was used to identify those cultural heritage receptors from where there will be theoretical visibility of one or more component of one or more OHL. Perceptibility mapping carried out as part of the Landscape and Visual Amenity assessment was then be used to identify from which of those receptors one or more element of the proposed OHL will be theoretically perceptible. Further technical information on the principles and methods of generation of the ZTV and perceptibility maps are provided in **Chapter 7**.

4 - No scoping response had been received from East Ayrshire Council at the time of writing (April 2010).

2 Receptors identified by these procedures were taken forward for further assessment, i.e.

- Those with theoretical perceptibility of the proposed OHL;
- Those with no theoretical visibility of the proposed OHL but with theoretical visibility of the existing N-Route OHL proposed for dismantling. Assets in this case were limited to those present within 5km of the existing N-Route OHL proposed for dismantling, since in principle the removal of a length of existing OHL is most unlikely to lead to an adverse effect on the setting of cultural heritage features in the surrounding landscape, unless perhaps they happen to be modern features directly or functionally associated with the OHL. None of receptors identified within 5km of the existing N-Route OHL proposed for removal falls into that category.

3 Guidance issued by Historic Scotland[5] notes that the setting of a receptor could be affected by the introduction of new development into its surroundings, even if that new development will not be directly visible from the receptor. Such cases may arise, for example, when both development and receptor will be caught in important views, vistas or prospects from somewhere other than the receptor location. Therefore, where the ZTV predicts that the proposed OHL works locations will not be visible from a receptor, further appraisal was undertaken to establish if there are any other recognized viewpoints from which both development and receptor will be visible and perceptible. None was identified.

4 The baseline setting of each relevant receptor was characterised on a case-by-case basis. Characterisation of setting of a receptor was based upon its properties and location, and took into account the factors identified in the guidance issued by Historic Scotland. The baseline setting of each receptor was characterised principally in terms of the:

- Archaeological / historical context of the receptor;
- Current landscape and visual surroundings of the receptor;
- Aesthetic and experiential properties of the receptor within its surroundings; and
- Social value (actual or potential) of the receptor as a recreational / leisure or educational resource.

5 Targeted field visits were undertaken in October 2009 to assess the character and sensitivity of the settings of identified receptors with theoretical perceptibility of one or more component of the proposed OHL, and to assess the effects of the proposed works on those settings. It was not possible to visit all receptors, since many are located on private land at some distance from publicly accessible locations. In such cases publicly accessible locations as close as possible to the receptor were sought as a basis for assessment wherever possible. Wireframes were generated of views from receptors to aid assessment. As wireframes provide bare ground views, field observation was important in identifying any obstructions, screening etc that limit visibility of the proposed OHL in key views. Record forms were completed for each receptor visited or observed, identifying the nature of its setting, and digital images were taken of a range of receptors. These archive materials will be offered to relevant local authority archives.

6 The outcome of this work was an understanding, involving the application of professional judgement, of the key characteristics that define the setting of each receptor. As noted in Historic Scotland's published guidance[6], the setting of a cultural heritage asset may not include all land visible from that asset, since distant views alone are not necessarily sufficient to raise concerns about adverse effects on setting.

10.3.6 Significance Criteria

1 The effects of the proposed works on cultural heritage assets were assessed on the basis of their type (direct, secondary / indirect, cumulative), nature (beneficial, neutral or adverse), and longevity (reversible, short-term or long-term; irreversible, permanent). The assessment took into account the sensitivity of the receptor and the magnitude of effect.

- Direct effects arise as a straightforward consequence of the scheme. They include physical changes to the fabric of a cultural heritage feature, or effects on the setting of a cultural heritage feature;
- Secondary / indirect effects are effects that arise as a result of an initial effect of the scheme, for example changes to the setting affecting tourism as regards heritage sites. Potential damage to archaeological sites arising from disturbance caused by trees blown over in areas where this can be regarded as a consequence of forestry felling is a secondary / indirect effect;
- Beneficial effects are those that contribute to the value of a receptor through enhancement of desirable characteristics or the introduction of new, positive attributes, such as the opening up of views to, and from, a feature formerly enclosed by forest or the removal of intrusive features;
- Neutral effects occur where a development can be accommodated comfortably by the receiving environment whilst neither contributing to nor detracting from the value of a receptor[7];
- Adverse effects are those that detract from the value of a receptor through a reduction in, or disruption of, valuable characterising components or patterns, or the introduction of new inappropriate characteristics; and
- Short-term temporary effects are those that do not last longer than the construction period. Long-term effects are those that continue through the operation of the development but are ultimately reversible (for example where the setting of a cultural heritage feature is affected by the presence of a development).

2 The assessment of sensitivity of archaeological and heritage assets reflects the relative weight which statute and policy attach to them, principally as published in SPP and SHEP. Table 10.04 summarises the relative sensitivity of key cultural heritage resources.

Table 10.04 - Sensitivity of Cultural Heritage Assets

Sensitivity	Definition / criteria
High	Sites of national importance, including: Scheduled Monuments, and sites proposed for scheduling Undesignated archaeological sites and areas of national importance Category A Listed Buildings Gardens and Designed Landscapes Outstanding Conservation Areas
Medium	Sites of regional importance, including: Archaeological sites and areas of distinctive regional importance Archaeologically Sensitive Areas Category B Listed Buildings Conservation Areas Non-Inventory Designed Landscapes
Low	Sites of local Importance, including: Archaeological sites of local importance Category C(S) Listed Buildings Unlisted historic buildings and townscapes with local (vernacular) characteristics
Negligible	Sites of little or no importance, including: Sites of former archaeological features Unlisted buildings of minor historic or architectural interest; Poorly preserved examples of particular types of feature

10.3.7 Criteria for Assessment of Physical Effects

1 Criteria for assessing magnitude of physical effect, which measures the degree of change to the baseline condition of a feature that would result from the construction of one or more element of the proposed works, are classified in Table 10.05.

Table 10.05 - Magnitude of Physical Effects

Level of magnitude	Definition
High	A fundamental change to the baseline condition of the receptor, leading to total or major alteration of character.
Medium	A material, partial alteration of character.
Low	Minor alteration of the baseline condition of the receptor.
Imperceptible	A very slight and barely distinguishable change from baseline conditions.

2 Sensitivity of the receptor and magnitude of effect are then used to inform the professional judgement of the likely significance of the physical effect. Table 10.06 summarises the criteria for assigning significance of a physical effect. Effects are classified as major, moderate, minor or none, as defined in **Chapter 2**. Major and moderate effects are considered to be significant in terms of the EIA Regulations.

5 - http://www.historic-scotland.gov.uk/scoping_of_development_proposals_2009.pdf; last accessed 02/04/10

6 - See previous footnote

7 - SPP, Section115 on Conservation Areas, refers to a neutral effect as an effect which does no harm.

Table 10.06 - Physical Effects

Magnitude				
High	Minor	Moderate	Major	Major
Medium	Minor	Minor	Moderate	Major
Low	None	Minor	Minor	Moderate
Imperceptible	None	None	Minor	Minor
	Negligible	**Low**	**Medium**	**High**
	Sensitivity			

10.3.8 Criteria for Assessment of Effects on Setting

1 For each receptor identified as requiring consideration, the assessment of possible effects adopted a four-stage approach:

- Identification of the characteristics of the setting of the receptor (see above);
- Assessment of the sensitivity of that setting;
- Identification of how the presence of the proposed development will affect that setting (magnitude of effect); and
- Assessment of significance of effect.

10.3.8.1 Criteria for Assessing Sensitivity of Setting

1 Sensitivity of setting was assessed by considering two factors:

- the relative weight which statute and policy attach to the receptor and its setting; and
- the degree to which the baseline setting contributes to the understanding and/or appreciation, and hence value, of the receptor.

2 The relative weight that statute and policy attach to the receptor and its setting was determined using the sensitivity of archaeological and heritage resources set out in Table 10.04. Where individual designated receptors are present within larger designated areas (e.g. Listed Buildings within a Conservation Area), the sensitivity was stated as the higher of the two designations. No site assessed is of 'negligible sensitivity'.

3 The degree to which the baseline setting contributes to the understanding and/or appreciation of the receptor was assessed according to the criteria set out in Table 10.07.

Table 10.07 - Contribution of Setting to the Understanding and Appreciation of a Cultural Heritage Receptor

Contribution	Definition
High	A setting which makes a strong positive contribution to the understanding and/or appreciation of the siting and/or historical/ archaeological/architectural context of a receptor. E.g. a prominent topographic location; surroundings that include related monuments in close association; surroundings that are believed to be little changed from those when the receptor was created.
Moderate	A setting which makes some positive contribution to the understanding and/or appreciation of the siting and/or historical/archaeological/ architectural context of a receptor. E.g. surroundings that complement the siting and appearance of a receptor, such as the presence of a feature of the rural past within a more recent farming landscape containing little or no urban or industrial development.
Low	A setting which makes little positive contribution to the understanding and/or appreciation of the siting and/or historical/archaeological/ architectural context of a receptor. E.g. where surroundings only partially complement the siting and appearance of a receptor, such as the presence of a feature of the rural past within a partly urbanised or industrialised landscape.
Negligible	A setting which does not contribute positively to the understanding and/or appreciation of the siting and/or historical/archaeological/ architectural context of a receptor. E.g. immediate surroundings of a commercial coniferous single species woodland or industrial development that are not relevant to understanding the context of the receptor.

4 These two criteria were combined to assess the overall sensitivity of a setting, as set out in Table 10.08.

Table 10.08 - Sensitivity of Setting of a Receptor

Sensitivity of receptor	Contribution			
	High	*Moderate*	*Low*	*Negligible*
High	High	High	Medium	Low
Medium	High	Medium	Low	Low
Low	Medium	Low	Low	Low

5 Table 10.08 defines the overall contribution of setting. The characterisation of baseline setting for each receptor identifies any specific elements of that setting which individually provide a greater contribution to understanding and/or appreciation of a receptor than the overall contribution assessment might suggest.

10.3.8.2 Identification of How the Presence of the Proposed Development will Affect that Setting (Magnitude of Effect)

6 Magnitude of effect on setting is assessed according to the thresholds in Table 10.09:

Table 10.09 - Magnitude of Effects on Setting

Level of magnitude	Definition
High	Fundamental effects obviously changing the surroundings of a receptor, such that its baseline setting is substantially or totally altered.
Medium	Effects discernibly changing the surroundings of a receptor, such that its baseline setting is partly altered.
Low	Slight, but detectable effects that do not alter the baseline setting of the receptor materially.
Imperceptible	A very slight and barely distinguishable change from baseline conditions, including a "no change" situation.

10.3.8.3 Assessment of Effects

1 The effect depends on both the magnitude of effect and the sensitivity of the setting of the receptor. The following diagram represents the process by which the effects on the setting of cultural heritage receptors were determined and Table 10.10 presents the matrix that was used to inform the process.

Diagram: the Assessment Process

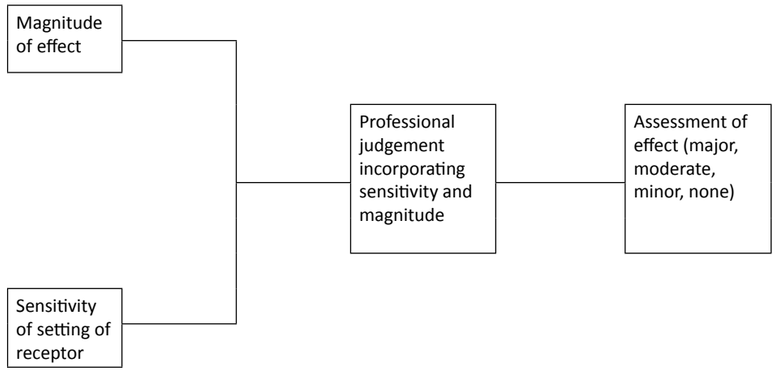


Table 10.10 - Effects on Setting

	Sensitivity		
Magnitude	*High*	*Medium*	*Low*
High	Major	Major	Minor
Medium	Major	Moderate	Minor
Low	Minor[8]	Minor	None
Imperceptible	None	None	None

2 Effects are classified as major, moderate, slight or none, as defined in **Chapter 2**. Major and moderate effects are considered to be significant in terms of the EIA Regulations.

8 - A non-material change to baseline conditions cannot by its nature lead to a significant effect. A significant effect arises from a material change to baseline conditions. This distinction explains why this particular significance assessment finding is not 'moderate'.

10.4 Baseline Conditions

10.4.1 General

1 A thematic summary of the character of the baseline is provided here. A detailed gazetteer of all features, sites and areas of interest identified within the Broad Corridor Study Area, and numbered consecutively, can be found in Appendix E.1. The gazetteer contains a column identifying the sensitivity of each identified feature, using the criteria set out in Table 10.04, in each case based upon available information regarding the character and condition of each monument, taking into account designations where appropriate, and an assessment of 'cultural significance'. Locations of features, sites and areas are depicted on Figure 10.01.

2 A gazetteer of features and areas with theoretical perceptibility of the proposed OHL, ordered by designation type, and identified by the unique identification number provided by each designating body where available, is provided as Appendix E.2. Feature and area locations are depicted on Figure 10.02.

3 A summary list of additional features and areas with no theoretical perceptibility of the proposed OHL but with theoretical visibility of the existing N-Route OHL proposed for dismantling, and present within 5km of it, is provided as Appendix E.4. Feature and area locations are depicted on Figure 10.03.

4 Feature, site and area numbers are in **bold** in the following text.

10.4.2 Cultural Heritage Assets within the Narrow Corridor

10.4.2.1 Assets with Statutory and Non-Statutory Designations

1 Features with statutory protection present within the narrow corridor consist of the scheduled Waterside Bing (**15**) and the Category B listed Doon Bridge on Straiton Road (**29**), both in East Ayrshire. Features with non-statutory or regional designations intersected by the narrow corridor are Craigengillan GDL (**30**) in East Ayrshire, and the ASAs in Dumfries and Galloway at Water of Deugh (**72**) and Bardennoch to Garryhorn (**152**). There are four unscheduled sites of national importance present within the narrow corridor – the remains of Delharco Mines at Polnessan (**6**) and the farmstead at Nether Grimmet (**17**) in East Ayrshire, and Lagwine Cairn (**124**) and part of the Barlae Hill to Stroengassel Hill old road (**136**) in Dumfries and Galloway.

10.4.2.2 Gardens and Designed Landscapes

1 The Inventory describes Craigengillan GDL (**30**) as a rare example of a complete and unfragmented estate landscape, with 16th century origins and held by the McAdam family for almost 400 years. Much of the designed landscape visible today dates from the latter half of the 18th century. The grounds and gardens provide the setting for the Category A listed Craigengillan House, and incorporate formal gardens, a range of gardens and garden buildings, extensive policy woodland, a rocky gorge and industrial archaeological remains. There are panoramic views of the surrounding hills from Craigengillan House and from different parts of the GDL. The Inventory assesses the GDL as having outstanding value in all assessment categories (work of art, historical, horticultural, architectural, scenic, nature conservation, archaeological).

10.4.2.3 Archaeologically Sensitive Areas

1 The Water of Deugh ASA (**72**) consists of an expanse of moorland stretching from the summit of Lamford Hill in the south to the summit of Benbrack in the north, and from the A713 in the west to the edge of extensive forest plantation in the east. The boundaries of the ASA were defined to wrap around a heritage walk promoted by the Carsphairn Heritage Group (consultation response from Dumfries and Galloway Council's Archaeologist). The ASA contains a considerable number of features of archaeological importance, principally of prehistoric and medieval or later date, and including the scheduled Lamford Burn cairn (SM **1034**, see Appendix E.2). Previously recorded features within the ASA that are within the narrow corridor include the house at Meadowhead (**75**), farmhouse and byre at Lamford (**80**) and natural mounds at Lamford (**77**, **84**). Other features of medieval or later date, including rig and furrow cultivation (**79**), an enclosure (**225**), sheepfolds (**76**, **82**, **83**), road bridges (**81**, **85**) and an old road (**86**), and several quarries and gravel pits (**73**, **74**, **78**, **82**, **89**, **90**, **91**) were recorded during the desk study and/or field survey within the ASA.

2 The Bardennoch to Garryhorn ASA (**152**) consists of an expanse of moorland and farmland stretching from Braidenoch Hill in the south to Holm of Daltallochan in the north and thence westwards to Woodhead, for the most defined by the A713 to the east. The boundaries of the ASA were defined to wrap around heritage walks promoted by the Carsphairn Heritage Group (consultation response from Dumfries and Galloway Council's Archaeologist, received 6 November 2009). The ASA contains a considerable number of features of archaeological significance, principally of prehistoric and medieval or later date. Statutorily protected features within the ASA (see Appendix E.2 for details) include the scheduled Cairn Avel cairn (**1006**), Braidenoch Hill cross slabs (**1105**), Holm of Daltallochan cross slab (**1106**) and stone circle and standing stone (**1029**), and Woodhead lead mines and smelter (**5184**); and the listed Carsphairn Parish Church and Churchyard (**3677**, **3678**) and Holm of Daltallochan (**3681**). Several unscheduled archaeological sites of national importance are also recorded within the ASA. Previously recorded features within the ASA that are within the narrow corridor include part of the Barlae Hill to Stroengassel Hill old road (**136**), a field system at Liggat Bridge (**137**), and a field system and sheepfold at Bardennoch (**143**). Other features of medieval or later date, including a hay ree (**142**) and several gravel pits (**135**, **139**, **144**, **145**, **150**, **154**, **155**) were recorded during the desk study and/or field survey within the ASA.

10.4.2.4 Prehistoric Features

1 There are few confirmed features of prehistoric origin present within the Narrow Corridor Study Area. The remains of a large burial cairn are located on a level shelf at the base of a SW-facing hillside at Lagwine (**124**); although poorly preserved and heavily robbed, its core appears undisturbed. A group of eleven clearance cairns previously recorded on the SW side of Cully's Knowe (**195**) could be evidence of later prehistoric land clearance and cultivation, but a more recent origin is also conceivable for these undated features. The Dumfries and Galloway Council HER polygon extends this site into the Narrow Corridor Study Area, but field survey detected no cairns within the narrow corridor.

10.4.2.5 Medieval or Later Farming and Land Use

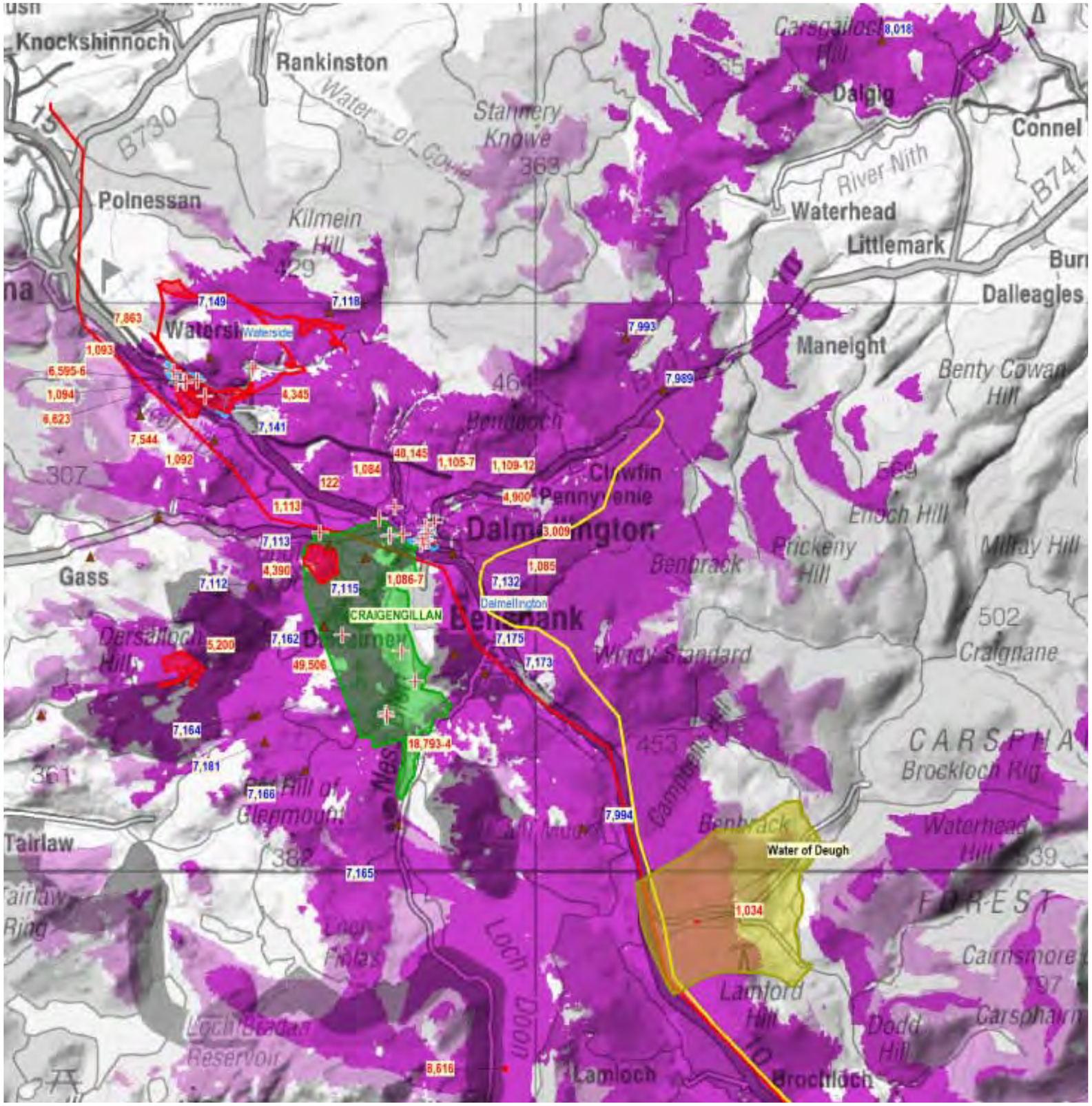
1 The remains of medieval or later rural settlement and land use form numerically the most common element of the cultural heritage assets identified within the Narrow Corridor Study Area. The identified sites included the remains of settlements – farmsteads and other buildings – as well as a wide range of land use features including field systems, enclosures, rig and furrow cultivation, clearance cairns, hay rees, sheepfolds and sheep rees, and peat cuttings. These collectively reflect the historic agricultural exploitation of the landscape crossed by the proposed and existing OHLs, and occur along the full length of the proposed scheme.

2 The sites of six deserted farmsteads have been identified. On White Hill are the remains of 'Nether Grimmet' farmstead (**17**), surviving in pasture as the foundations of buildings, enclosures and a kiln. On Green Haas is the site of 'Leys' farmstead (**192**), depicted on maps as consisting of buildings, a field and a head dyke. Field survey within the narrow corridor detected the well-preserved remains of a drystone enclosure. Further east is the recorded site of Kilnair farmstead (**201**); field survey identified the remains of two buildings, field walls and clearance cairns associated with the farm, but these lay outside the Narrow Corridor Study Area; no associated remains were identified within the narrow corridor. Historic maps record the former presence of a farmstead named Regland on Shield Willie Hill (**208**), consisting of buildings set around a courtyard, enclosures, fields and a head-dyke. This site now lies under forest plantation, and its present condition is not known. The site of 'Stroan' farmstead (**211**) nearby is also under forest and its present condition is not known; the first edition Ordnance Survey map of 1854 recorded two buildings, a sheep ree and a head-dyke. The site of 'Craig' farmstead (**53**) is known only from an 18th century map source, and its precise location and the present conditions of any surviving remains are not known.

3 The site of a group of shielings, temporary dwellings associated with upland pastoral farming during the summer months, have been recorded beside the Parrie Burn (**51**), but it is not known in what condition these features survive and their recorded location is presently within conifer plantation.

4 A range of other medieval or later buildings have been recorded from their presence on the first edition Ordnance Survey mapping of the mid 19th century. Those still standing include the farmstead at Smithston Upper Bridge (**1**), although the arrangement of buildings has been much modified; a large harled two-storey building at Gatefauldhead (**42**); a small two-storey house at Meadowhead (**75**); the harled two-storey farmhouse at Lamford (**80**); and a building at Bridge-end (**115**). Field survey detected no visible remains of Bank Mill and Midgie Ha at Bridge-end (**112**), or a building and enclosure formerly located on the east side of what is now the A713 at Bardennoch (**146**). The first edition Ordnance Survey map depicts an isolated building near Auchenroy (**26**). This building is not depicted on current Ordnance Survey maps, and there are no visible remains of the structure.

5 Several field systems have been identified by the study. The most substantial of these is at Mossdale (**56**), where a complex of turf and stone field banks extend around the SW slopes of Snabb, and forming at least five fields, as well as possible house platforms, field banks, a trackway, rig and furrow cultivation and a rectangular enclosure. At other locations the first edition Ordnance Survey map depicts fields



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Legend

- Scheduled Monument
- Listed Building
- Nationally Important Archaeological Site
- NIDL
- Conservation Area
- ASA Area
- Garden and Designed Landscape
- Existing N-Route to be dismantled
- Proposed OHL

Theoretical perceptibility

- L7 Tower line section **Perceptible**
- L7 Tower line section theoretically visible but **Not Perceptible**
- Wood Pole line section **Perceptible**
- Wood Pole line section theoretically visible but **Not Perceptible**
- L7 Tower & Wood Pole line section **Perceptible**
- L7 Tower & Wood Pole line section theoretically visible but **Not Perceptible**

Note: Visibility mapped at up to 10km for L7 Towers and up to 6km for Wood Poles.

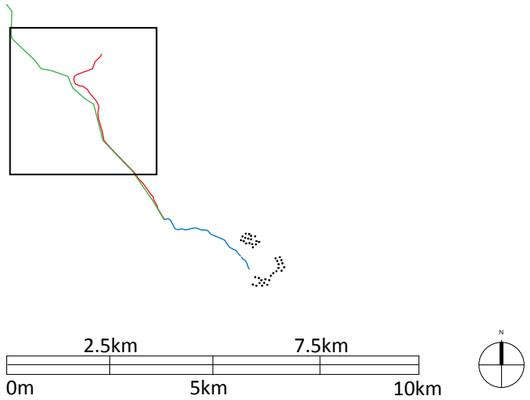
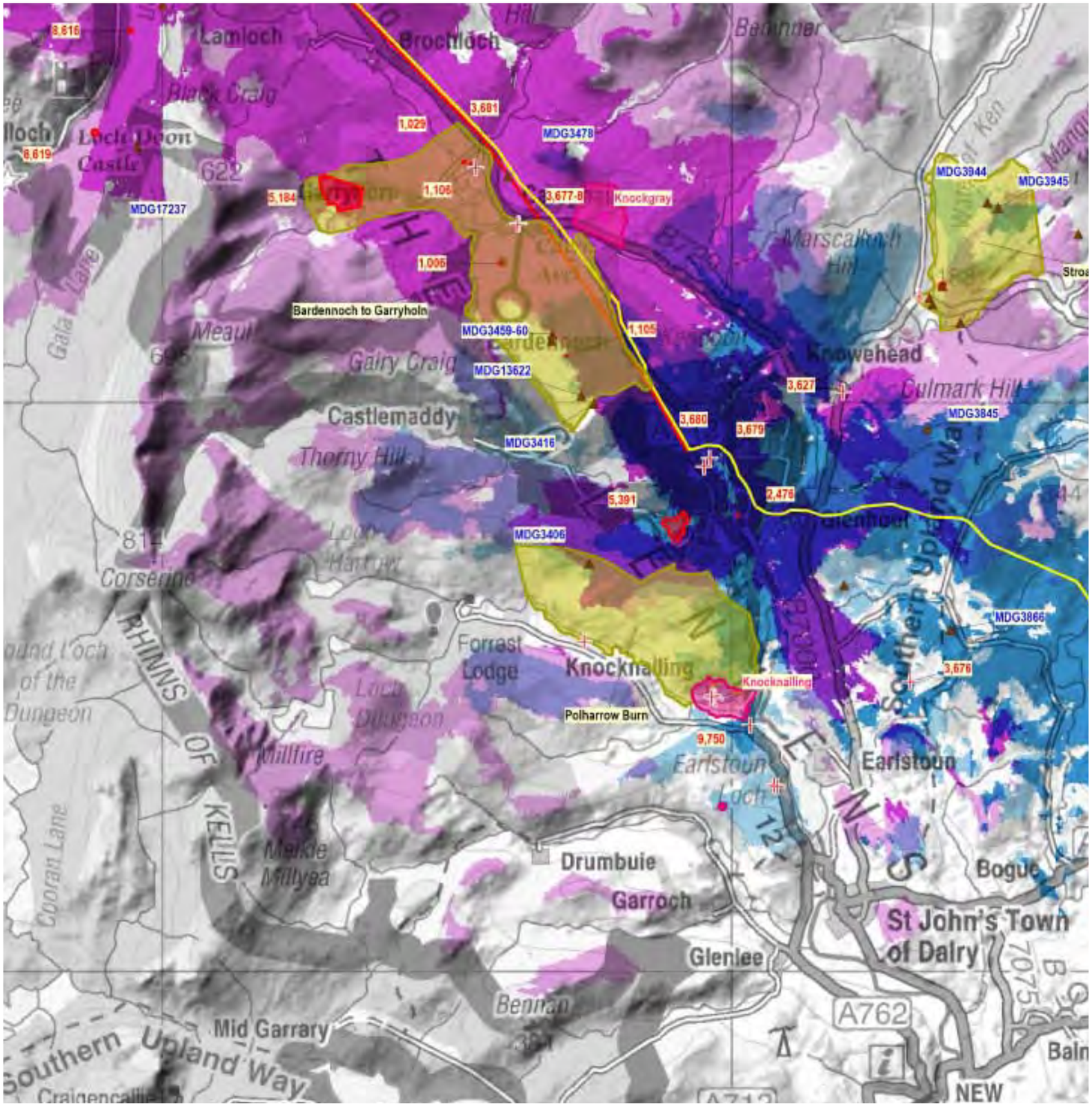


Figure 10.02.1 - Cultural heritage constraints & perceptibility 1



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Legend

- Scheduled Monument
- Listed Building
- Nationally Important Archaeological Site
- NIDL
- Conservation Area
- ASA Area
- Garden and Designed Landscape
- Existing N-Route to be dismantled
- Proposed OHL

Theoretical perceptibility

- L7 Tower line section **Perceptible**
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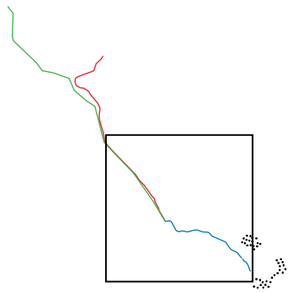
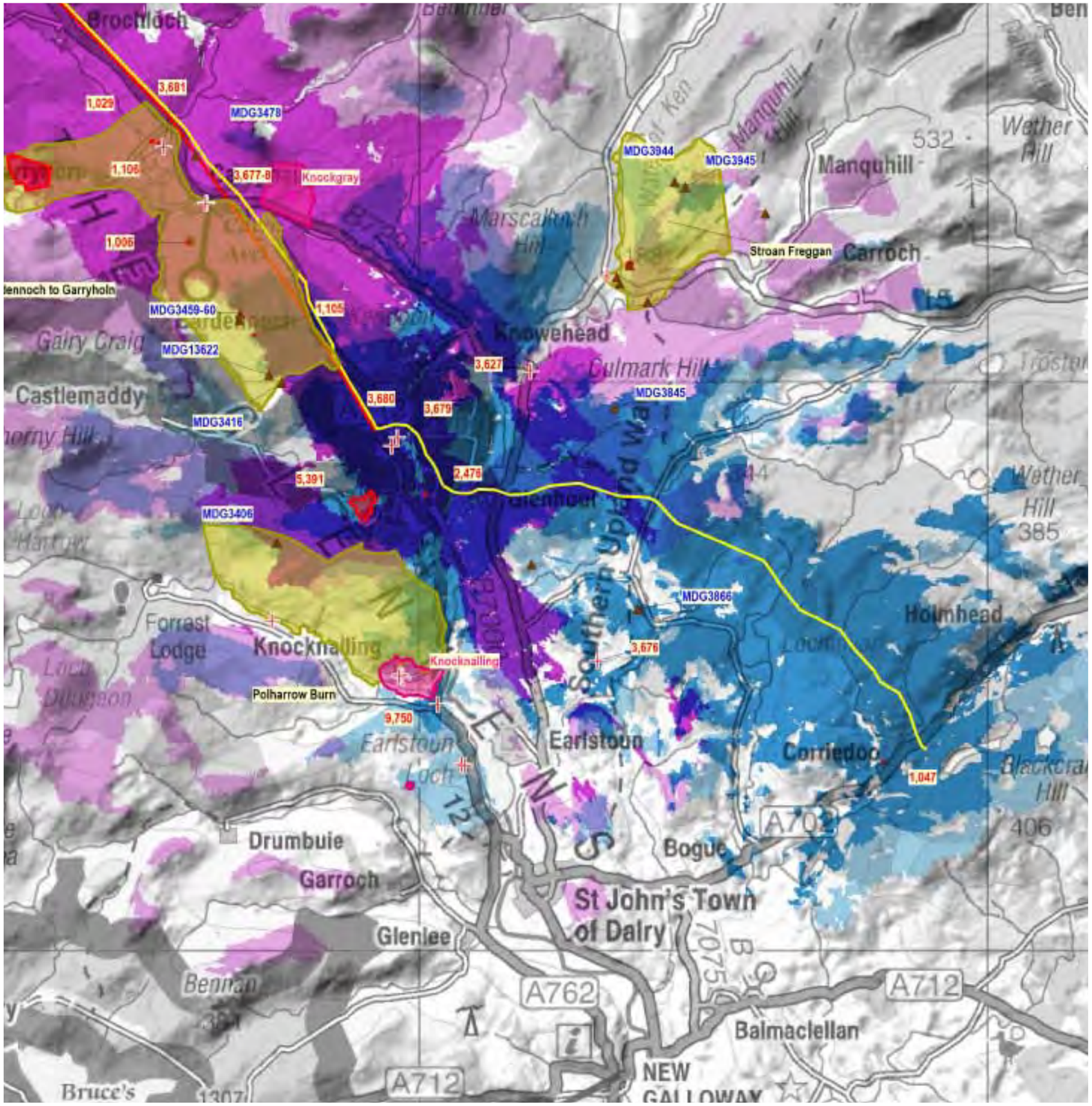
- Wood Pole line section theoretically visible but **Not Perceptible**
- L7 Tower & Wood Pole line section **Perceptible**
- L7 Tower & Wood Pole line section theoretically visible but **Not Perceptible**

Note: Visibility mapped at up to 10km for L7 Towers and up to 6km for Wood Poles.



2.5km 7.5km
0m 5km 10km

Figure 10.02.2 - Cultural heritage constraints & perceptibility 2



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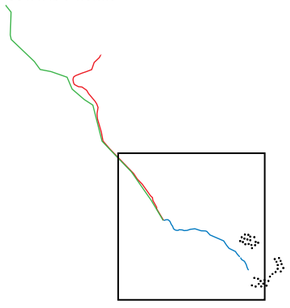
Legend

- Scheduled Monument
- Listed Building
- Nationally Important Archaeological Site
- NIDL
- Conservation Area
- ASA Area
- Garden and Designed Landscape
- Existing N-Route to be dismantled
- Proposed OHL

Theoretical perceptibility

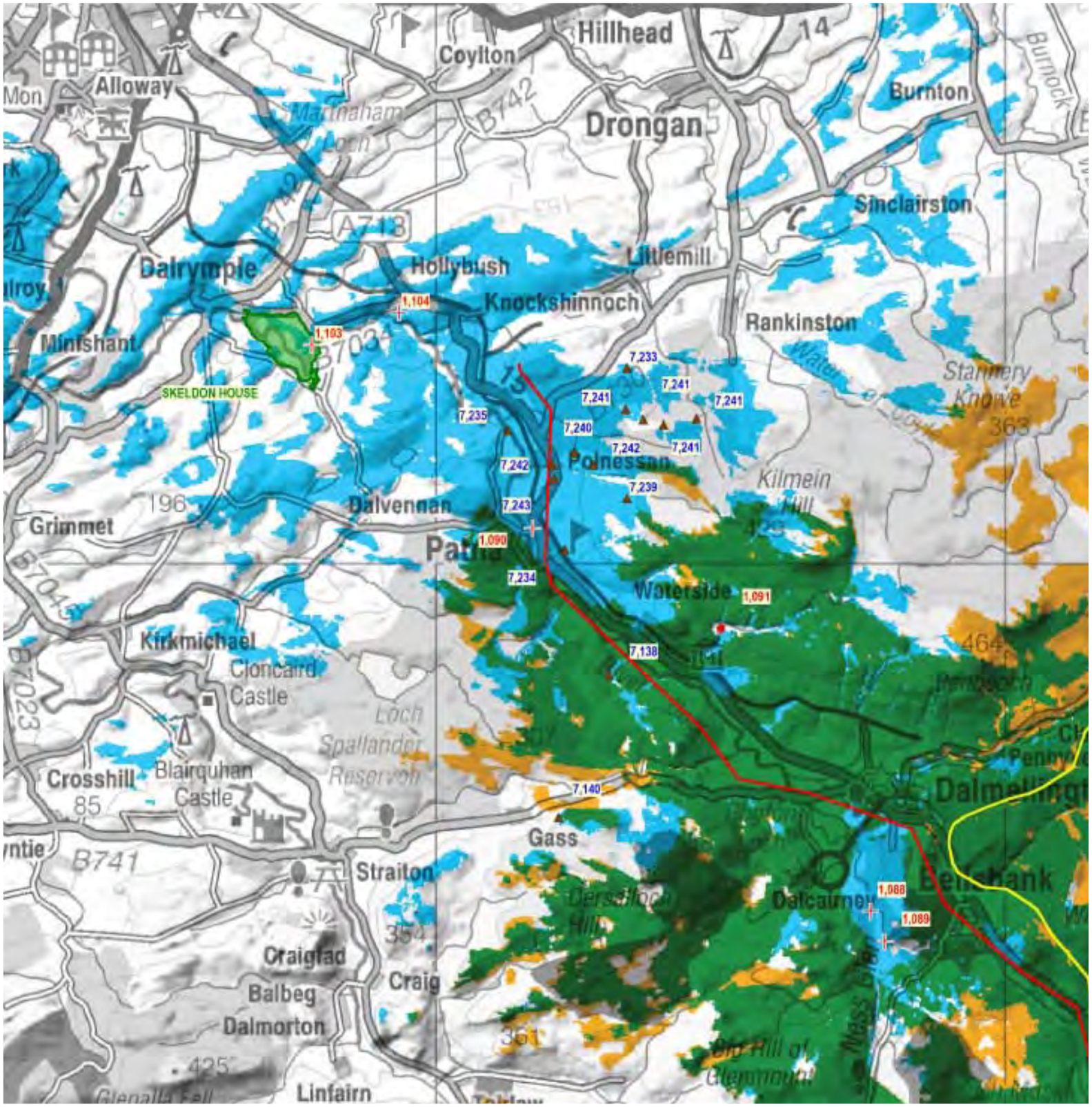
- L7 Tower line section **Perceptible**
- L7 Tower line section theoretically visible but **Not Perceptible**
- Wood Pole line section **Perceptible**
- Wood Pole line section theoretically visible but **Not Perceptible**
- L7 Tower & Wood Pole line section **Perceptible**
- L7 Tower & Wood Pole line section theoretically visible but **Not Perceptible**

Note: Visibility mapped at up to 10km for L7 Towers and up to 6km for Wood Poles.



2.5km 7.5km
0m 5km 10km

Figure 10.02.3 - Cultural heritage constraints & perceptibility 3



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Legend

- Scheduled Monument
- Listed Building
- Nationally Important Archaeological Site
- Garden and Designed Landscape
- Existing N-Route to be dismantled
- Proposed OHL

Theoretical visibility

- Areas where removed N-Route visibility replaced with proposed route visibility (Wood Poles or towers)
- New areas of visibility resulting from proposed route Wood Poles or towers
- Areas where previous N-Route visibility is not replaced by visibility of proposed route (Wood Poles or towers)

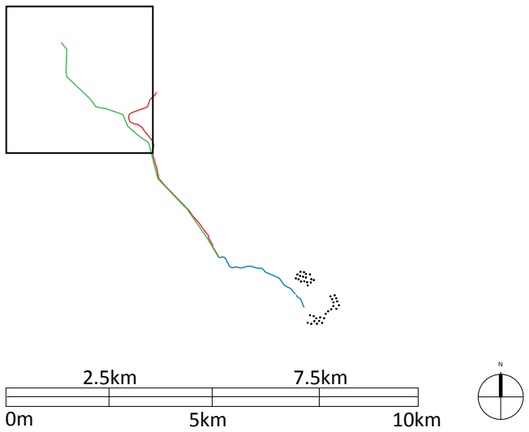

Figure 10.03 - Cultural heritage sites and N-Route visibility

defined by 'old fences', for the most part defining irregular enclosures in moorland, or hill-fields of a type that appear to have fallen out of use before the middle of the 19th century. At none of these sites has any physical remains been confirmed. At Lagwyne (**121**) a length of poorly preserved field bank (**122**) may be a related feature. At Bardennoch (**153**) and Dalshangan (**162**) walls now follow the fence-lines, in the latter case forming a plantation boundary. At other locations where field survey was possible – at Lagwyne (**123**), Liggat Bridge (**137**) and Bardennoch (**143**) no visible remains of old fences were identified. The remaining examples are located on land that is now forested – at Brockloch Craig (**100**, **102**), Dundeugh (**167**) and Knockdollochan (**205**). Isolated lengths of disused field bank were recorded during field survey at Bridge-end (**120**), Lagwyne (**122**) and near Carsphairn (**129**, **130**). A bank and adjacent ditch identified by field survey on Brown Hill (**58**) may be the remains of either a head-dyke or a hollow way.

6 Five other agricultural enclosures are located within the Narrow Corridor Study Area. A sub-divided enclosure of unequal compartments is depicted on the Ordnance Survey first edition map of 1859 beside the Peat Burn (**61**); this site lies within plantation and its present condition has not been established. A disturbed oval enclosure was identified during field survey to the north of Meadowhead (**225**). The foundations of a drystone enclosure or field boundary were identified during field survey at Chapel Linn on the south bank of the Black Water (**188**). A late 19th century rectangular walled enclosure, mapped first on the second edition Ordnance Survey map, survives in good condition near Polquhanity (**219**). The disturbed remains of a drystone enclosure depicted on the first edition Ordnance Survey map are present near Auchenroy (**27**).

7 Areas of rig and furrow cultivation remains, likely to have been last used in the 18th century (if not before), were detected in varying states of preservation during field survey for the South West Scotland Project on White Hill (**18**) and during field survey for this study at Mossdale (**56**), Meadowhead (**79**), Lagwyne (**122**) and North Liggat (**140**).

8 Although field clearance cairns in some cases are likely to be of prehistoric origins (see **195** above), in other cases they are evidently of more recent origin and are associated with post-medieval land improvements for agriculture. Examples identified within the narrow corridor survey area include a large spread of stones on White Hill (**19**) and beside the Black Water at Cully's Knowe (**196**). Clearance cairns identified previously at Butterhole (**198**) have been interpreted by others as relatively recent in origin; the present condition of these features is not known, as they are not present within the Narrow Corridor Study Area (although the Dumfries and Galloway Council HER polygon for this site does extend into the narrow corridor).

9 The Ordnance Survey first edition depicts four 'hay rees' within the narrow corridor Study Area. In two cases field survey revealed surviving remains – at Bardennoch (**142**) the poorly preserved foundations of a rectangular structure measuring 15m by 10m were recorded, whereas at Polquhanity (**161**) a well preserved rectangular enclosure measuring 100m by 50m was recorded. The locations of the other two examples – at Carse of Dundeugh (**173**) and Stroan (**210**) – presently lie within plantation, and their current conditions have not been established.

10 Sheepfolds, both disused and in use, are a common feature of the landscapes crossed by the proposed works, and numerous examples have been identified within the narrow corridor Study Area. They are described variously on Ordnance Survey first edition maps as 'sheepfolds' and 'sheep rees', and encompass a range of circular, sub-divided rectangular and complex forms. Surviving examples have been confirmed at Linn Water (**49**), Corbie Craig (**57**), Willie's Cave (**111**), Lagwyne (**125**), Bardennoch (**143**), Carse of Dundeugh (**172**), and Glenshimmeroch (**224**). Field survey detected no trace of other examples, at Meadowhead (**76**), Lamford (**82**, **83**), North Liggat (**138**), and Dalshangan (**164**). The current conditions of others were not established, either because they are located in what is now plantation – at Mossdale (**66**), Glenmuck (**69**), Shield Willie Hill (**209**) – or as at Nether Grimmet on White Hill (**20**) were not in an area subject to field survey. A tripartite (Y-shaped) drystone sheep shelter is located on the lower northern slopes of Mackilston Hill (**189**).

10.4.2.6 Roads and Bridges

1 The alignments of several old roads and tracks have been detected by the study. Two examples have been posited as Roman Road alignments. At Smithston (**2**) the first edition Ordnance Survey map of 1857 depicts a Roman road running east-west, but subsequent sources have preferred a line a little further north (itself disputed by other commentators). There is no good evidence for, or visible traces of, a Roman road at Smithston. Similarly, the first edition Ordnance Survey map of 1857 depicts the course of a Roman road running southwards from Dalmellington across Town Common and Pennyarthur Rigg, whereas the second edition map notes only 'track of old road' (**41**). The baseline conditions of this old transport route were not confirmed on the ground (and much of the route is now forested). This feature may be a continuation of the 17th / 18th century Old Galloway Road present further south around Crooked Rig (**87**). Further south the modern access track to Carnavel farm forms part of the alignment of an old road ascending Bardennoch Hill and heading southwards to Polmaddy (**136**), which reputedly was formerly an old pilgrimage route between Strathclyde and Whithorn (see Appendix E.2, **MDG3416**). It is possible that sites **41**, **87**, **136** all form sections of the same long distance transport route.

2 Elsewhere, roads which were in use in the middle of the 19th century, but were subsequently superseded by realignments that form the present A713, were detected at Lamford Bridge (**86**), now reduced to a minor farm road and track, and Bridge-end (**110**), which survives as a trackway.

3 The first edition Ordnance Survey map names a series of bridges that carry what is now the A713 over burns – at Polnessan (**5**), Kirn (**52**), Craig (**63**), Polnaskie (**67**), Small Burn (**70**), and Bridge-end (**116**). The Small Burn bridge has been replaced by a culvert. A sequence of three bridges is present at Bridge-end, of possibly sequentially 18th, 19th and 20th century origins. The hump-backed Doon Bridge (**29**) carrying the B741 Straiton road over the River Doon is Category B listed. Two masonry bridges are present on the minor old road alignment (**86**) at Lamford (**81**) and Lamford Bridge (**85**); the former is depicted on the Ordnance Survey first edition map as a toll bridge.

4 Glenhoul Bridge is substantial arched bridge that a track over the Water of Ken (**223**), which runs in a narrow wooded gorge at this point. The scale of this bridge is larger than that of the road bridges above, and it seems possible that this was an estate bridge, possibly associated with Glenhoul House (**181**).

10.4.2.7 Industrial and Extractive Features

1 A wide range of historic industrial features have been identified along the Doon Valley to the north of Dalmellington. By far the most substantial of these is the massive iron slag bing at Waterside (**15**), which is a Scheduled Monument. This bing forms a prominent landmark in the base of the Doon Valley adjacent to the former Dalmellington Ironworks, and was formed between c. 1850 and 1920. Further north are the remains of Delharco coal mines at Polnessan (**6**), which provided fuel for the ironworks, and the site of the Jellieston coal pit (**10**) at Patna, its site now occupied by housing. At Kiers is the site of a 19th century limestone quarry; the access to Low Kiers and High Kiers is depicted on the Ordnance Survey first edition map of 1857 as a tram road serving the quarry (**12**). The same map source depicts a limekiln adjacent to the tram road at Low Kiers (**13**); it present condition was not established. At Smithston Upper Bridge the study corridor is intersected by the route of a former tram road (**221**) that connected ironstone mines to the east with the Ayr and Dalmellington railway to the west, and which survives as a pronounced embankment.

2 On a more modest scale are numerous small stone quarries (**21**, **44**, **68**, **74**, **78**, **82**, **109**, **215**) and gravel extraction pits (**71**, **73**, **89**, **90**, **91**, **98**, **99**, **105**, **114**, **135**, **139**, **144**, **145**, **150**, **154**, **155**, **156**, **157**, **160**, **197**, **226**) depicted on first edition Ordnance Survey maps. Most of the latter are located adjacent to roads and tracks, and may be associated with their construction or maintenance. Field survey confirmed that a majority, but not all, of these features survive as visible hollows.

10.4.2.8 Other Features

1 Miscellaneous other features were recorded during the survey, including a line of 20th century grouse butts on moorland near Brockloch (**106**), the site of a First World War railway associated with the Loch Doon Gunnery School (**32**), a cropmark enclosure of unknown date and function at Gatefauldhead (**38**), a clump plantation boundary associated with a relict designed landscape at Dalshangan (**163**), and a buried pipeline supplying Carsfad Power Station, at Kendoon (**184**). An area of peat cutting (**220**) has been identified.

10.4.2.9 Natural Features

1 Two mounds formerly believed to be of archaeological origin near Lamford are now understood to be natural eskers (**77**, **84**). The Green Well of Scotland (**113**) appears to be a natural pool, although the feature has folkloric associations, including as the place where gold stolen from Lagwyne was deposited and never recovered (http://www.carsphairnheritage.co.uk).

10.4.3 Cultural Heritage Features within the Broad Corridor

1 The character of the cultural heritage resource within the broad corridor Study Area to a large degree reflects that identified within the narrow corridor. A great majority of the recorded sites additional to those in the narrow corridor relate to medieval or later agricultural and industrial exploitation of the landscape. However, a number of sites increase the range of features present, and provide evidence of greater time depth to the human presence in the landscape in this area.

- The discovery of Mesolithic and other prehistoric flint artefacts at Dundeugh (**169**) and Kendoon (**175**) identify the land around the confluence of the Water of Deugh and Water of Ken as a potentially important focus for early prehistoric settlement.
- The occurrence of Neolithic / Bronze Age monuments, such as the scheduled stone circle and standing stone at Holm of Daltallochan (**117**) and the cairns at Beoch (**46**), Lamford (**88**), and Polquhanity (**158**), provide evidence that the landscape crossed by the proposed grid connection and existing N-Route OHL has been exploited extensively since prehistoric times.
- A range of aristocratic and/or country house residences (and policies) are present in proximity to the proposed and existing overhead lines. They include the remains of the scheduled Dundeugh Castle (**171**); the C(S) listed stables block (**165**) and dovecot (**166**) at Dalshangan, which are elements of a relict designed landscape; and the NIDL associated with Knockgray (**134**).
- Cross slabs at Holm of Daltallochan (**118**), which is scheduled, and formerly standing at Cumnock Knowes (**141**) are associated with Early Medieval ecclesiastical activity.
- The Conservation Area at Dalmellington (**40**) defines a historic town centre that contains a range of 18th century and later residential, ecclesiastical and commercial buildings, several of which outside the Broad Corridor Study Area are Listed Buildings (see Appendix E.2). Carsphairn church, churchyard and manse (**131-133**) also have important historical associations with the village of Carsphairn, as well as with the Covenanting movement.
- Hydro-electric schemes at Drumjohn (**96**) and Kendoon Power Station (**174**, **176**, **178**, **179**) form elements of Stage II of the 1930s Galloway Hydro-Electric Scheme.

10.4.4 Potential for Undiscovered Archaeology within the Proposed Works Footprint[9]

1 In closely planted forestry areas, it is likely that any buried archaeological remains have been damaged to some extent by pre-afforestation ploughing, subsequent tree-root action and/or forestry operations.

2 Any areas of deep peat present at proposed works locations have the potential to act as a repository of palaeoenvironmental information and to contain or seal archaeological remains. In forested areas, ploughing, planting and drainage will have diminished the value of the peat as a palaeoenvironmental resource, whereas better quality sample locations may be present in undisturbed peat deposits outside the afforested areas.[10]

3 Taking account of the present land use at proposed works locations , the potential for the preservation of buried remains of archaeological interest is considered to be moderate through areas of farmland and moorland, and low through the forest areas. The probability of the proposed felling and construction works encountering buried sites or features of archaeological importance, given the limited and non-intensive ground disturbing nature of the proposed works, is considered to be low.

10.4.5 Cultural Heritage Features within the ZTV Study Area

10.4.5.1 Features from which the Proposed OHL would be Theoretically Perceptible

1 There are 84 cultural heritage receptors within the ZTV Study Area from which one or more element of the proposed OHL would theoretically be perceptible (Figure 10.02). A review of datasets revealed that there is no other receptor which is protected by a designation considered in this assessment, with no theoretical perceptibility of the proposed OHL, where any potential effect on its setting can still be anticipated.

2 The receptors include several designated areas - the Conservation Area at Dalmellington (**102**); the Outstanding Conservation Area at Waterside (**109**); the Garden and Designed Landscape at Craigengillan (**110**); the NIDLs at Knockgray and Knocknalling; and the ASAs at Water of Deugh, Bardennoch to Garryhorn, Polharrow Burn and Stroan Freggan.

3 Thirty-one Listed Buildings have been identified, of which two are Category A listed, 15 are Category B and 14 Category C(S). Ten of these are 18th century or later residential, ecclesiastical, commercial or civic buildings within Dalmellington Conservation Area (**1085**, **1105-7**, **1109**, **1111-13**, **4900**, **48145**), and five are within Waterside Outstanding Conservation Area (**1093-4**, **6595-6**, **6623**) and are associated with the village supporting the former Dalmellington Ironworks. Five buildings are associated with Craigengillan Estate and are within the GDL – Craigengillan House (**18793**) and adjacent stable block (**18794**), a lodge (**1086**) and two bridges (**1087**, **49506**). The remaining buildings include a church and churchyard at Carsphairn (**3677-8**), a stable block and dovecot at Dalshangan (**3679-80**), farmhouses at Barlaes (**3676**) and Holm of Daltailochan (**3681**), and five road bridges (**122**, **1084**, **1113**, **3627**, **9750**).

4 Seventeen Scheduled Monuments have been identified. Prehistoric features include burial cairns at Cairn Avel (**1006**), Lamford Burn (**1034**) and Corriedoo ('White Cairn'; **1047**), and a stone circle and standing stone at Holm of Daltallochan (**1029**). Early Medieval / Medieval features include cross slabs on Braidenoch Hill (**1105**) and at Holm of Daltallochan (**1106**), although in the latter case its present location does not appear to be where the stone was originally erected. Medieval or later aristocratic residences consist of Dalmellington motte (**3009**), Dundeugh Castle (**2476**) and the remains of Loch Doon Castle (**8619**). A medieval island settlement is present in Loch Doon (**8616**). Two medieval or later rural farmsteads and field systems, at Dalnean Hill (**4390**) and Munteoch (**5200**), are also scheduled, as is the deserted medieval and later village at Polmaddy (**5391**). Post-medieval industrial complexes at Dalmellington Ironworks (**4345**, **7544**, **7863**) and Woodhead (**5184**) are Scheduled Monuments.

5 Twenty-seven unscheduled sites considered in local authority SMRs / HERs considered by the local authorities to be of national importance have been identified. Thirteen of these are prehistoric cairns located in locally prominent topographic locations; most probably all were burial monuments (**7112**, **7149**, **7162**, **7173**, **7175**, **7989**, **7994**, **8018**, **MDG3406**, **MDG3460**, **MDG3478**, **MDG3845**, **MDG3944**). Other prehistoric monuments consist of an alleged prehistoric barrow (**7113**), an alleged crannog (**7115**), a settlement and field system (**MDG3866**) and a burnt mound (**MDG3945**). Six receptors are medieval or later farmsteads, some with associated field systems (**7118**, **7141**, **7164-6**, **7181**, **MDG13622**). An alleged tower house (**7132**) is of post-medieval date, and an old road (**MDG3416**) may have origins in the Early Medieval period. A firing range associated with the former Loch Doon Gunnery School dates from the First World War (**MDG17237**).

6 Fuller tabulated information detailing the character and setting of these receptors, and their sensitivities, can be found in Appendix E.2.

10.4.5.2 Features with Theoretical Visibility of the Existing N-Route OHL to be Removed, but from which the Proposed OHL would not be Theoretically Perceptible

1 Several additional cultural features have theoretical visibility only of the existing N-Route OHL proposed for dismantling. Those within 5km of the existing N-Route OHL proposed for dismantling include a Scheduled Monument (Laight Castle, **7690/1091**), three B or C(S) listed bridges at Craigengillan and Patna (**1088-90)**, a B listed country house at Hollybush (**1104**), and the Garden and Designed Landscape including the B listed castle (**1103**) at Skeldon Castle. Also theoretically visible within 5km are ten unscheduled sites considered by WoSAS to be very likely of national importance (NSR Code V) – these sites include a prehistoric burial cairn at Carline Knowe (**7233**), the remains of Kiers Castle (**7138**), a building and enclosure at Gass (**7140**), and several areas of coal mining remains around Patna and Polnessan (**7234-5**, **7239-43**). Further information on these 17 features is provided in Appendix E.4.

10.4.6 Future Baseline Conditions without the Proposed Works

1 The proposed Blackcraig and Margree wind farms requiring connection, and the steel tower elements of the proposed SWS Project (Parts A and B), are considered to be present as part of the baseline environment (as the present proposals are predicated on their pre-existence). Those developments will alter the existing character and/or settings of the cultural heritage baseline from those presently apparent. Other cumulative developments that may affect the settings of cultural heritage assets considered here are considered separately below (**Section 10.5.4**).

2 Excluding the above, apart from the proposals assessed here, no specific sources of future changes to the character of the cultural heritage baseline have been identified. However, the character of archaeological sites could be affected by future forestry felling unrelated to the project. Where no future land development or land use change takes place, baseline conditions of archaeological sites are likely to remain broadly unchanged in the short and medium term. The conditions of Listed Buildings, and other structures of architectural or historical interest, may change as a result of decay, alteration, extension or demolition. A range of activities could contribute to a change in character of Conservation Areas and Gardens and Designed

9 - This section focuses upon the proposed new grid connection, since ground-breaking works associated with the dismantling of the existing N-Route OHL are likely to be restricted to ground already disturbed when the N-Route was constructed.

10 - No peat depth data was available for analysis.

Landscapes. The settings of cultural heritage sites may change as a result of other future development in their vicinities, for example changes in forest planting / felling, opencast mining, and housing development.

10.5 Effects and Mitigation

10.5.1 Felling and Construction Effects (Physical Effects)

10.5.1.1 Introduction

1 This assessment based upon the Project Description set out in **Chapter 5**. Likely effects without mitigation are first assessed; mitigation is then proposed to variously avoid, reduce or offset identified likely effects; residual effects are then assessed taking into account the mitigation measures proposed. The assessments are made taking into account certain assumptions. Assumptions relating to the construction of the proposed OHL are:

- Along the line of the proposed new OHL route (i.e. excluding access routes), physical effects are anticipated to be likely to occur within 40m of the proposed OHL route, except where proposed works locations are specifically depicted on Figure 10.01 as extending a greater distance from the proposed OHL route. This distance has been determined by adding the maximum width of the Infrastucture Location Allowance (25m; see **Section 5.2.5.12**) to half the width of a typical construction area at each tower position (15m), which are assumed to be located lengthways online.
- Specific locations where existing access tracks are to be upgraded or widened are not known at this stage. No direct effect is predicted on a site or feature identified adjacent to a proposed access track, where it is an existing track or a proposed temporary track, except where that feature is intersected by the proposed track alignment. Measures will be proposed in the Environmental Management Plan to ensure that all features located adjacent to proposed access routes will be preserved *in situ*. It is embedded mitigation (see **Section 5.2.5.3**) that access track upgrades will be sited so as to avoid disturbing any adjacent features of archaeological interest, wherever possible.
- Construction compounds locations are not known and those depicted on Figure 10.01 are notional (cf **Section 5.2.5.5.1**), and therefore have not been assessed.
- Stone sources are assumed to be "off-site" and any effects are therefore excluded from this assessment.

2 In relation to the proposed dismantling of the existing N-Route OHL it is assumed that physical effects are anticipated to be likely to occur within 30m of the proposed OHL route, within which works may be located and towers may be felled. Effects are likely to arise from above-ground disturbance caused by felling towers on to cultural heritage features or by vehicle movements. The removal of tower foundations is most likely to be restricted to ground disturbed when the towers were erected.

3 Taking into account these assumptions, direct, physical construction and/or felling effects on 47 cultural heritage features or areas of interest are predicted, and are permanent and adverse unless otherwise stated. For each feature or area of interest, the assessment contains a summary statement of the 'cultural significance' of that feature or area of interest (following the guidance defined in Annex 1 of SHEP and the Burra Charter[11]), which contributes to an assessment of the sensitivity made for each receptor. The magnitude of change and likely effect are then assessed following the methodology set out in **Section 10.3.7**.

4 No effects are predicted on 38 sites present within areas of construction and dismantling activities, for a variety of reasons set out below.

10.5.1.2 Likely Effects: Archaeologically Sensitive Areas

1 Within the Water of Deugh ASA (**72**), it is proposed to construct ten new L7 towers and associated temporary access tracks, and to site two pulling stations within the ASA at a change in direction of the proposed OHL. It also proposed to dismantle nine existing N-Route towers within the ASA. The ASA consists of an expanse of moorland, its boundaries defined to wrap around a heritage walk promoted by the Carsphairn Heritage Group and containing a considerable number of features of archaeological importance, principally of prehistoric and medieval or later date. Previously recorded features within the ASA that are within the narrow corridor include the house at Meadowhead (**75**), farmhouse and byre at Lamford (**80**) and natural mounds at Lamford (**77**, **84**). Other features of medieval or later date, including rig and furrow cultivation (**79**), an enclosure (**225**), sheepfolds (**76**, **82**, **83**), road bridges (**81**, **85**) and an old road (**86**), peat cuttings (**220**), and several quarries and gravel pits (**73**, **74**, **78**, **82**, **89**, **90**, **91**) were recorded during the desk study and/or field survey within the ASA. The promoted heritage walk provides the ASA with high social value. The ASA and the monuments within it have good scientific research potential and varying aesthetic appeal. The ASA has been designated at regional level and is therefore assessed as being of medium sensitivity. The construction and dismantling works are predicted to have physical effects on only four features identified within the ASA (two quarries (**74**, **82**), an enclosure (**225**) and an area of peat cuttings (**220**), of negligible or low sensitivity), with effects assessed as none or minor (and not significant) in each case. On that basis the proposed works are anticipated to result in an imperceptible change to the character and archaeological interest of the ASA. The likely effect is therefore **minor** and is **not significant**.

2 Within the Bardennoch to Garryhorn ASA (**152**), it is proposed to construct five new L7 towers and associated temporary access tracks. It also proposed to dismantle thirteen existing N-Route towers from within the ASA. The ASA consists of an expanse of moorland and farmland, its boundaries defined to wrap around heritage walks promoted by the Carsphairn Heritage Group and containing a considerable number of features of archaeological importance, principally of prehistoric and medieval or later date. Statutorily protected features within the ASA (see Appendix E.2 for details) include the scheduled Cairn Avel cairn (**1006**), Braidenoch Hill cross slabs (**1105**), Holm of Daltallochan cross slabs (**1106**) and stone circle and standing stone (**1029**), and Woodhead lead mines and smelter (**5184**); and the listed Carsphairn Parish Church and Churchyard (**3677-8**) and Holm of Daltallochan (**3681**). Several unscheduled archaeological sites of national importance are also recorded within the ASA. Previously recorded features within the ASA that are within the narrow corridor include part of the Barlae Hill to Stroengassel Hill old road (**136**), a field system at Liggat Bridge (**137**), and a field system and sheepfold at Bardennoch (**143**). Other features of medieval or later date, including a hay ree (**142**) and several gravel pits (**135**, **139**, **144**, **145**, **150**, **154**, **155**) were recorded during the desk study and/or field survey within the ASA. Heritage walks promoted within the ASA provide it with high social value. The ASA and the monuments within it have good scientific research potential and in some cases high aesthetic appeal. The ASA has been designated at regional level and is therefore assessed as being of medium sensitivity. The construction and dismantling works are predicted to have physical effects on only eight features identified within the ASA, with effects assessed as none or minor (and not significant) in each case (**135**, **136**, **142**, **143**, **144**, **150**, **154**, **155**). On that basis the proposed works are anticipated result in at most a low magnitude change to the character and archaeological interest of the ASA. The likely effect is therefore **minor** and is **not significant**.

10.5.1.3 Likely Effects: Proposed OHL Route

1 The extensive earthwork remains of a field system, enclosure, rig and furrow cultivation, hollow way and putative building platforms at Mossdale (**56**) are located within an area where forestry felling, and the construction of four L7 towers and temporary access tracks are proposed. This site is a residue of local medieval or later rural settlement, but it has no known association with a specific historical event or figure. The remains of this site have some aesthetic appeal as a group of related features, although that appeal is reduced by the presence of trees which has masked the formerly more open aspect of the site, but no known social / spiritual value. However, through archaeological and documentary research, the site has the potential to reveal information about post-medieval rural society in south-west Scotland. For these reasons the site is considered to be of low sensitivity. Disturbance caused by felling and construction activities is predicted to lead to a medium magnitude change to the character and fabric of this site. On that basis the likely effect is assessed as being **minor** and **not significant**. However, the creation of a more open aspect by felling may have a beneficial effect on the ability of observers to understand and appreciate the remains. The confidence placed upon this assessment is reduced as the current condition of this site has not been established fully.

2 The earthwork of a length of what is part of either a hollow way or head dyke, and an adjacent small patch of rig and furrow cultivation, intersects the proposed OHL route on Browns Hill (**58**), between two tower positions. The features are intersected by a proposed temporary access track, and are at the edge of an area of proposed felling. The features form a fragment of a relict medieval or later landscape. Rig and furrow cultivation in particular is a residue of an unenclosed medieval or later farming landscape that was swept away as part of the widespread agricultural improvements of the 18th century onwards. These improvements locally led to the reorganisation of patterns of land use and farm locations. The Browns Hill features have little aesthetic appeal and no known social / spiritual value, but have some scientific research potential (to reveal information on past farming practices through archaeological survey and excavation). For this reason this site is considered to be of low sensitivity. Disturbance caused by felling and construction activities is predicted

11 - ICOMOS 1999 Burra Charter.

to lead to a medium magnitude change to the character and fabric of this site. On that basis the likely effect is assessed as being **minor** and **not significant**.

3 The alignment of the Old Galloway Road (**87**) will be crossed by a temporary access track at Drumjohn, although no visible traces of the old road are visible at that location. This feature can be understood as it being formerly the main north-south transport route between the Doon Valley and Stewartry, now superseded by the A713. This general corridor has probably been used for movement of people since prehistoric times; it appears to have been a recognised pilgrimage route by the medieval period (see **136; MDG3416**, Appendix E.2). The old road therefore has historical associations, and some social / spiritual value, and it has some scientific research potential (to reveal information on its character and date through archaeological survey and excavation). For these reasons the old road is considered to be medium sensitivity. The construction of an access track has the potential to lead to an imperceptible change to the character and fabric of this road. On that basis the likely effect is assessed as being **minor** and **not significant**.

4 Two grouse butts, forming part of a longer alignment, stand in proximity to the proposed OHL and online temporary access track near Brockloch (**106**). They are evidence of relatively recent, probably 20th century, recreational use of the moorland in this area for sporting pursuits. They have little aesthetic appeal or social / spiritual value, and very little scientific research potential. For these reasons the grouse butts are assessed as being of negligible sensitivity. Works associated with proposed construction of a nearby L7 tower have the potential to cause a high magnitude change to the condition of these features. On that basis the likely effect is assessed as being **minor** and **not significant**.

5 A length of disused field bank near Bridge-end (**120**) intersects the proposed OHL route adjacent to a proposed L7 tower position, and will also be intersected by a proposed online temporary access track. This feature is most probably an element of a relict farming landscape (albeit an apparently isolated feature), but this remains uncertain as there is no firm evidence for its date and function. The bank has no known specific historical association, some aesthetic appeal, but no known social / spiritual value, and only modest scientific research potential (to reveal information on its character and date through archaeological survey and excavation). For these reasons the bank is assessed as being of negligible sensitivity. Proposed construction works have the potential to cause a high magnitude change to the condition of this feature. On that basis the likely effect is assessed as being **minor** and **not significant**.

6 The proposed OHL route intersects a field boundary and an area of rig and furrow cultivation near Lagwyne (**122**); an L7 tower and a temporary access track would be constructed within the area of the site. The features form fragments of a relict medieval or later landscape (see above for further consideration of the 'cultural significance' of rig and furrow cultivation (**58**) and relict field banks (**120**)). They have very little aesthetic appeal, as they are poorly preserved, and no known social / spiritual value or historical association, and have only limited scientific research potential (to reveal information on past farming practices through archaeological survey and excavation). For these reasons, and particularly its poor condition, this site is assessed as being of negligible sensitivity. Proposed construction works have the potential to cause a high magnitude change to the condition of this site. On that basis the likely effect is assessed as being **minor** and **not significant**.

7 A circular sheepfold at Lagwyne (**125**) is located close to a proposed L7 tower position. Sheepfolds are commonly found elements of post-medieval upland rural landscapes. This sheepfold has no known association with a specific historic event or figure, although an association with the nearby prehistoric Lagwine cairn (**124**) can be reasonably surmised, since it is likely that the stone used to build the sheepfold was taken from the cairn. It has little scientific research value, some local aesthetic value, but no known social / spiritual value. For these reasons the site is considered to be of low sensitivity. Proposed construction works have the potential to cause a high magnitude change to the condition of this site. On that basis the likely effect is assessed as being **moderate** and **significant**.

8 The poorly preserved remains of a hay ree are located adjacent to a proposed L7 tower position north of Bardennoch (**142**). The feature is a fragment of a relict medieval or later landscape associated with the storage of hay to provide winter fodder. This hay ree has a historical association with the farmland within which it survives, but very little aesthetic appeal, as it is poorly preserved, and no known social / spiritual value. It has only limited scientific research potential (to reveal information on past farming practices through archaeological survey and excavation). For these reasons, and particularly its poor condition, this site is assessed as being of negligible sensitivity. Proposed construction works have the potential to cause a high magnitude change to the condition of this site. On that basis the likely effect is assessed as being **minor** and **not significant**.

9 Four old gravel pits near Bardennoch (**144**, **155**), and Polquhanity (**160, 226**) may be affected by construction works. One (**144**) lies online between two towers, although not in a section where a temporary online access track is proposed, and a second (**155**) lies c. 25m from a proposed L7 angle tower position. The third lies along the route of a proposed temporary access track (**160**), and the last (**226**) is intersected by the proposed underground cable connection (and associated access track) linking the L7 tower and wood pole elements of the proposed OHL. Old gravel pits have little cultural heritage importance beyond their local historic landscape context as commonly found elements of post-medieval farming landscapes, being most probably small-scale borrow pits for material extracted to build or maintain roads, or for agricultural purposes. These features have no known association with a specific historical event or figure, very little scientific research value, no known social / spiritual value and little aesthetic appeal. As such, they are assessed as being of negligible sensitivity. Disturbance caused by construction activities is predicted to lead to low magnitude changes to character in one case (**144**) medium magnitude changes in two (**155**, **160**), and a high magnitude change in one case (**226**). On that basis the likely effects are assessed as being **minor** and **not significant** in three cases (**155**, **160, 226**) and **none** and **not significant** in the other case (**144**).

10 At Bardennoch, the site of a building and enclosure (**146**) extends to less than 40m from a proposed tower position and lies adjacent to a proposed temporary access track. Field survey detected no surface trace of the building and enclosure, although it is possible that buried archaeological remains could survive. This site can be understood as an, at best, poorly preserved fragment of medieval or later settlement of a type that occurs commonly in the surrounding landscape. The site has no aesthetic value, no known spiritual / social value, and no known specific association with a historical event or figure, although it has some scientific research potential (to obtain information on the character and date of the buildings through the archaeological investigation of any surviving remains). For these reasons the site is assessed as being of low sensitivity. Disturbance caused by construction activities is predicted to lead to, at most, a low magnitude change to the character and fabric of this site (as much of the site is outside proposed working areas). On that basis the likely effect is assessed as being **minor** and **not significant**.

11 At Dalshangan, it is proposed to construct a pulling station and lay the proposed underground cable connection linking the L7 tower and wood pole elements of the proposed OHL within the remains of an elliptical walled enclosure that is believed to be the remains of a clump plantation boundary (**163**). If this interpretation is correct, the feature can be associated with the relict designed landscape associated with Dalshangan, other features of which include a disused carriage drive, a disused listed dovecot (**166**) and areas of former parkland surrounding the site of the house. The enclosure is now bounded to the north by mature plantation, which detracts from its aesthetic appeal. It has specific historical associations with the Dalshangan policies, but has no known social / spiritual value and very little scientific research potential. For these reasons, the enclosure is assessed as being of low sensitivity. Proposed construction works have the potential to cause a high magnitude change to the condition of this site. On that basis the likely effect is assessed as being **moderate** and **significant**.

12 A poorly preserved walled enclosure on the south side of the Black Water at Chapel Linn (**188**) extends to within c. 30m of the proposed OHL route. The enclosure is likely to be a former field of medieval or later date, with the absence of evidence for cleared stone suggesting that it was defined for pasture, although the place-name evidence could suggest an ecclesiastical connection to the site. The enclosure has little aesthetic appeal, as it is poorly preserved, and no known social / spiritual value or specific association with a historical event or figure, but has some scientific research potential. For these reasons, and particularly its poor condition, this site is assessed as being of low sensitivity. Proposed construction works have the potential to cause a low magnitude change to the condition of this site, since most of the enclosure is located beyond the area potentially to be affected by construction works. On that basis the likely effect is assessed as being **minor** and **not significant**.

13 A Y-shaped sheep shelter (**189**) is located c. 20m from the proposed OHL route on Mackilston Hill. The importance of this feature can be understood in much the same way as for sheepfolds (see **125** above). The sheep shelter is assessed as being of low sensitivity. Proposed construction works associated have the potential to cause a high magnitude change to the condition of this site. On that basis the likely effect is assessed as being **moderate** and **significant**.

14 The proposed OHL route intersects the remains of Leys farmstead on the slopes of Green Haas (**192**). Field survey identified the remains of a drystone enclosure; further associated remains may be located outside the survey corridor, including the remains of buildings and a limekiln as depicted on the first edition Ordnance Survey map. This site is a residue of local medieval or later rural settlement, but it has no

known association with a specific historical event or figure (although this perhaps could be established through documentary study). The remains of this site have some aesthetic appeal as a group of related features, but no known social / spiritual value. However, through archaeological and documentary research, the site has the potential to reveal information about post-medieval rural society in south-west Scotland. For these reasons the site is considered to be of low sensitivity. Disturbance caused by construction activities is predicted to lead to a high magnitude change to the character and fabric of this site. On that basis the likely effect is assessed as being **moderate** and **significant**.

15 The proposed OHL route runs within c. 30m of a spread of cleared stone at Cully's Knowe (**196**). This stone appears to have been removed from an adjacent area of cleared ground to the north, suggesting that together these are evidence of a small relict hill field. The feature has no known specific historical association, little aesthetic appeal, and no known social / spiritual value. It has only modest scientific research potential (to reveal information on its character and date through archaeological survey and excavation). For these reasons the feature is assessed as being of negligible sensitivity. Proposed construction works have the potential to cause a medium magnitude change to the condition of this feature. On that basis the likely effect is assessed as being **minor** and **not significant**.

16 Forestry felling and the construction of the OHL and temporary access tracks will be located within the area of a farmstead named Regland, associated with a hay ree and an area of old fences (**208**). The 'cultural significance' of deserted medieval or later farmsteads such can be understood in much the same way as for site (**192**). However, the current condition of this site is not known, as it is located in conifer plantation and was not subject to field survey. This setting most probably has the effect of removing any aesthetic appeal the site may otherwise possess, as the farmland surroundings of any surviving remains are no longer apparent. Based upon available information the site is considered to be of low sensitivity. Disturbance caused by felling and construction activities could lead to a medium magnitude change to the condition of this site. On that basis the likely effect is assessed as being **minor** adverse and **not significant**. However, the creation of a more open aspect by felling may have a beneficial effect on the ability of observers to understand and appreciate any visible remains. The confidence placed upon this assessment is reduced as the current condition of this site has not been established.

17 At Shield Willie Hill, the recorded site of a sheepfold (**209**) is in an area proposed for forestry felling and is close to the proposed OHL. The 'cultural significance' of this sheepfold can be understood in much the same way as for site (**125**). However, the current condition of this site is not known, as it is located in conifer plantation and was not subject to field survey. This setting has the effect of removing any aesthetic appeal the structure may otherwise possess, as the pastoral surroundings of any surviving remains are no longer apparent. Based upon available information the site is considered to be of low sensitivity. Disturbance caused by felling and construction activities could lead to a medium magnitude change to the condition of this site. On that basis the likely effect is assessed as being **minor** adverse and **not significant**. However, the creation of a more open aspect by felling may have a beneficial effect on the ability of observers to understand and appreciate any visible remains. The confidence placed upon this assessment is reduced as the current condition of this site has not been established.

18 At Shield Willie Hill, the recorded site of a hay ree (**210**) is in an area proposed for forestry felling and is close to the proposed OHL. The 'cultural significance' of this hay ree can be understood in much the same way as for site (**142**). However, the current condition of this site is not known, as it is located in conifer plantation and was not subject to field survey. This setting has the effect of removing any aesthetic appeal the structure may otherwise possess, as the farmland surroundings of any surviving remains are no longer apparent. Based upon available information the site is considered to be of low sensitivity. Disturbance caused by felling and construction activities could lead to a medium magnitude change the condition of this site. On that basis the likely effect is assessed as being **minor** adverse and **not significant**. However, the creation of a more open aspect by felling may have a beneficial effect on the ability of observers to understand and appreciate any visible remains. The confidence placed upon this assessment is reduced as the current condition of this site has not been established.

19 The proposed OHL intersects an area of peat cuttings south of Lamford Bridge (**220**), although at a location between two tower positions and where no temporary access track is proposed. These peat cuttings are probably the result of the extraction of peat used for heating purposes at some unknown date in the past. They have no known association with a specific event or figure, no aesthetic value, very little scientific research potential and no known social / spiritual value. For these reasons the peat cuttings are assessed as being of negligible sensitivity. Disturbance caused by construction activities is predicted to cause at most a low magnitude change to the condition of this site. On that basis the likely effect is assessed as being **none** and **not significant**.

20 In addition, felling operations and ground-breaking activities associated with the construction works have the potential to have an effect on any currently unidentified, buried archaeological remains and upstanding remains within unsurveyed areas, present at those locations. Based upon the baseline and the archaeological potential assessed above, a **minor** and **not significant** effect is considered most likely to result, although confidence in this prediction is limited by the lack of knowledge of what buried remains are present within the proposed working areas.

10.5.1.4 Likely Effects: Dismantling of Existing N-Route OHL

1 A spoil heap associated with the former Delharco mines (**6**) stands c. 20m from a tower proposed to be dismantled. This site has its origins as an element of an extensive coal mining industry that developed in the Dalmellington area in the 19th century, much of it providing fuel to power the Dalmellington Ironworks. Much of the associated coal mining infrastructure has since been removed, and a spoil heap forms the most visible remnant of this site. Coal extraction in the locality continues today through opencast methods. The site has limited aesthetic appeal and some social / spiritual value, but its principal value is gained by its historic industrial association with Dalmellington Ironworks. The site has been assessed in the WoSAS SMR as being very likely of national importance, and hence of high sensitivity. Proposed dismantling works, including the felling of an adjacent tower, have the potential to cause a low magnitude change to the condition of this feature. On that basis the likely effect is assessed as being **moderate** and **significant**.

2 At Low Kiers the existing N-Route wires pass over the line of a 19th century tram road (**12**), now used as an access road, although the road is not within 30m of a tower position. This feature has a historic association with the former limestone quarry at Kiers, which formed a minor element of an extensive suite of 19th and 20th century mining activities along the Doon Valley. The tram road has no known social / spiritual value, and very little scientific research potential or aesthetic appeal. For these reasons the tramway is considered to be low sensitivity. The dismantling works have the potential to cause a change of imperceptible magnitude to the character and fabric of this road, by causing surface disturbance to the feature. On that basis the likely effect is assessed as being **none** and **not significant**.

3 A tower proposed for dismantling is located within an area of rig and furrow cultivation on White Hill (**18**). The general 'cultural significance' of rig and furrow cultivation has been set out above (see **58** above).These remains have some aesthetic appeal, as they are relatively well preserved, some scientific research potential (to reveal information on past cultivation practices through archaeological survey and excavation), but no known social / spiritual value. For these reasons the rig and furrow cultivation is assessed as being of low sensitivity. The dismantling works, including the felling of a tower, have the potential to cause a medium magnitude change to the condition of this site, by causing surface disturbance to it. On that basis the likely effect is assessed as being **minor** and **not significant**.

4 A post-medieval spread of cleared stone is located at the edge of a pasture field on White Hill (**19**), within c. 20m of a tower proposed for dismantling. The general 'cultural significance' of features of this type has been set out above (see **196** above). The feature has no known specific historical association, no aesthetic appeal, no known social / spiritual significance, and very little scientific research potential. For these reasons the feature is assessed as being of negligible sensitivity. The dismantling works, including the felling of a tower, have the potential to cause a high magnitude change to the condition of this feature. On that basis the likely effect is assessed as being **minor** and **not significant**.

5 The site of a building recorded as unroofed in the middle of the 19th century is present near Auchenroy (**26**). The site is within 20m of the existing N-Route OHL, although c. 100m from the nearest tower. Buildings such as these are commonly depicted on early Ordnance Survey map coverage, and they represent a commonly found residue of the local medieval and later rural landscape, possibly with origins prior to the reorganisation of the rural landscape with the agricultural improvements of the 18th century onwards. As there are no visible surface remains of this building, it has no aesthetic appeal, although buried archaeological remains may survive and provide some scientific research potential. It has no known social / spiritual value or specific associations with historical events or figures. Taking into account this information, the feature is assessed as being of negligible sensitivity. The dismantling works have the potential to cause at most a low magnitude change to the condition of building **26**. On that basis the likely effect is assessed as being **none** and **not significant**.

6 The remains of an enclosure attached to a field wall, recorded on maps in the middle of the 19th century, are present near Auchenroy (**27**). The site is partly disturbed by an existing tower. Enclosures such as these are commonly depicted on early Ordnance Survey map coverage, and they represent a commonly found residue

of the local medieval and later rural landscape. The enclosure has some aesthetic appeal, and limited scientific research potential. It has no known social / spiritual value or specific associations with historical events or figures. Taking into account this information, the feature is assessed as being of low sensitivity. The dismantling works have the potential to cause a high magnitude change to the condition of the site. On that basis the likely effect is assessed as being **moderate** and **significant**.

7 Five towers within Craigengillan GDL (**30**) are proposed for dismantling. None of these is located close to a specific designed landscape feature identified by this study, although one is located close a boundary that may nevertheless form an important but minor component of the designed landscape. The Inventory assesses the GDL as having outstanding value in all assessment categories (work of art, historical, horticultural, architectural, scenic, nature conservation, archaeological), and hence the site is of considerable 'cultural significance' and high sensitivity. The dismantling works, including the felling of towers, have the potential to cause at most a low magnitude change to the condition of the GDL, by causing surface disturbance to historic boundaries. On that basis the likely effect is assessed as being **moderate** and **significant**.

8 Within Craigengillan GDL, the existing N-Route OHL passes over the former route of the Loch Doon Gunnery School railway (**32**), although at a location where there are no visible remains of a railway. This site has a specific historical and military association with the World War One, and potentially considerable social / spiritual value. As the feature does not survive where crossed by the existing N-Route OHL, its aesthetic appeal and hence scientific research potential are there negligible. This feature is assessed overall as being of medium sensitivity. The dismantling works, including the felling of a tower, have the potential to lead to only an imperceptible magnitude change to the character and fabric of this feature. On that basis the significance of effect is assessed as being **minor** and **not significant**.

9 The existing N-Route OHL passes over the route of an old road, formerly thought to be a Roman road, within a forest ride at Pennyarthur (**41**). The feature is more likely part of the Old Galloway Road (see site **87** above), and its historic context can perhaps be understood in the same way. For the same reasons the old road is considered to be of medium sensitivity. The dismantling works have the potential to cause only an imperceptible magnitude change to the character and fabric of this road, by causing surface disturbance to any surviving remains where they would be intersected by construction works. On that basis the likely effect is assessed as being **minor** and **not significant**.

10 Four stone quarries have been identified along the existing N-Route OHL, at Pennyarthur (**44**), Meadowhead (**68**, **74**) and Lamford (**82**). The quarry at Pennyarthur is beside the existing N-Route OHL, but over 20m from the nearest tower; those at Meadowhead are c. 20m from the existing N-Route OHL and over 50m from the nearest tower; and the quarry at Lamford is adjacent to the existing N-Route OHL but not close to a tower. Stone quarries of this type have little importance beyond their local historic landscape context as commonly found elements of a post-medieval upland pastoral landscape. The quarries are probably less than 300 years old, and were opened to extract stone, perhaps to erect nearby field walls or possibly farm buildings. They have no known association with a specific historical event or figure, very little scientific research value, no known social / spiritual value and little aesthetic appeal. For these reasons the quarries are assessed as being of negligible sensitivity. In each case the nature of the proposed dismantling works is such that no more than a low magnitude change to the condition of the quarries can be anticipated. On that basis the likely effect in each case is assessed as **none** and **not significant**.

11 A grouse butt, forming part of a longer alignment, stands close to an existing tower near Brockloch (**106**). The 'cultural significance' of this site has been assessed above. Dismantling works have the potential to cause a high magnitude change to the condition of this feature of negligible sensitivity. On that basis the likely effect is assessed as being **minor** and **not significant**.

12 The remains of Lagwine cairn (**124**) stand immediately adjacent to a tower proposed to be dismantled. The cairn is a prehistoric burial monument and, although robbed and poorly preserved, may well contain the remains of graves containing human remains (either inhumed or cremated) within stone-lined cists either within or beneath the cairn material. The cairn has considerable scientific research potential (e.g. to provide information on prehistoric burial practices through archaeological excavation) and, although mutilated by stone robbing, has some aesthetic appeal. Prehistoric burial monuments can attract considerable public interest, and therefore generally possess social / spiritual value. The cairn has no specific association with a historical event or figure. Dumfries and Galloway Council has assessed this cairn as being of national importance, and hence it is of high sensitivity. The dismantling works have the potential to cause a medium magnitude change to the character and fabric of this cairn, by causing physical disturbance to it, especially the less well preserved areas around its periphery. On that basis the likely effect is assessed as being **major** and **significant**.

13 A circular sheepfold at Lagwyne (**125**) is located within c. 30m of an existing tower. The 'cultural significance' of this site has been assessed above. Dismantling works have the potential to cause a medium magnitude change to the condition of this feature of low sensitivity. On that basis the likely effect is assessed as being **minor** and **not significant**.

14 The existing N-Route OHL passes over two lengths of disused field bank, to the north-east of Carsphairn (**129**, **130**); in both cases the banks extend to within c. 20m of a tower proposed to be dismantled. The 'cultural significance' of disused field banks has been considered above (**120**), and for those reasons these banks are assessed as being of negligible sensitivity. Proposed dismantling works have the potential to cause medium magnitude changes to the condition of these features. On that basis the likely effect is assessed in each case as being **minor** and **not significant**.

15 Four gravel pits, at North Liggat (**135**), Bardennoch (**150**, **154**) and Polquhanity (**155**), are located along or adjacent to the existing N-Route OHL, although between the locations of towers proposed for dismantling. The minimal 'cultural significance' of old gravel pits has been considered above (**144, 155**), and for those reasons these gravel pits are assessed as being of negligible sensitivity. Proposed construction works have the potential to cause low magnitude changes to the condition of these features through surface disturbance caused by vehicle movements (although natural hollows such as these in practice are likely to be avoided by vehicles). On that basis the likely effect in each case is assessed as being **none** and **not significant**.

16 The existing N-Route OHL passes over the route of an old trackway at Liggat Bridge (**136**), which is now a modern access to Carnavel. Dumfries and Galloway Council has assessed this trackway as being of national importance, and hence high sensitivity, on the basis that it forms part of an old road running between Barlae Hill and Stroengassel Hill, which may have a long history of use stretching back before the medieval period as a pilgrimage route between Strathclyde and Whithorn. The section intersected by the existing N-Route OHL, however, has been much modified, detracting from its aesthetic appeal as an old road. Proposed construction works have the potential to cause only an imperceptible magnitude change to the condition of this feature. On that basis the likely effect is assessed as being **minor** and **not significant**.

17 The existing N-Route OHL intersects the site of a sheep ree and three fields defined by old fences at Bardennoch (**143**), as depicted on the Ordnance Survey first edition map. Field survey detected no trace of the old fences, but did identify a length of disused field bank. The sheep ree survives, but is more than 30m from the existing N-Route OHL. These features are fragmentary remains of a medieval or later farming landscape. They have little aesthetic appeal or social / spiritual value, little scientific research potential, and no specific association with historical events or figures. Taking into account the good condition of the sheepfold, this site is assessed as being of low sensitivity. The dismantling works, including the felling of a tower, have the potential to have an effect of no more than low magnitude on the character and fabric of this site. On that basis the likely effect is assessed as being **minor** and **not significant**.

18 At Smithston Upper Bridge the existing N-Route OHL wires pass over the route of a 19th century industrial tramway (**221**); an angle tower is present immediately to the south. This feature forms a minor element of an extensive suite of 19th and 20th century mining remains present along the Doon Valley. This tramway served ironstone mines located to the east, and was used to connect the mines with the railway network. The tramway therefore has historical associations, and some social / spiritual value, some aesthetic appeal provided by the surviving embankment, but it has little scientific research potential. For these reasons the tramway is considered to be of low sensitivity. The dismantling works, including the felling of a tower, have the potential to cause a low magnitude change to the character and fabric of this road, by causing surface disturbance to the feature. On that basis the likely effect is assessed as being **minor** and **not significant**.

19 To the north of Meadowhead the existing N-Route OHL passes over the remains of an oval enclosure (**225**), which may have been partly disturbed with the construction of an existing tower. This enclosure is probably of post-medieval date, and a fragment of a farming landscape (although an earlier origin cannot be entirely ruled out). It is considered to be of low sensitivity. The dismantling works, including the felling of a nearby tower, have the potential to cause a medium magnitude change to the character and fabric of this enclosure. On that basis the likely effect is assessed as being **minor** and **not significant**.

20 The nature of the dismantling works is such that no effect is anticipated on currently undetected, buried archaeological remains. Ground-breaking works are anticipated to be restricted to the removal of tower foundations, in ground that is almost certain to have been disturbed when the towers were erected.

10.5.1.5 No effect

1 No effects are anticipated on 38 cultural heritage sites and features, which are recorded at proposed construction or dismantling works locations. The reasons for the assessment of no effect can be summarised as follows:

- The features are located adjacent to existing tracks proposed for use as temporary access tracks (**61**, **78**, **79**, **172**, **173**, **211**, **215**, **224**);
- Are standing buildings or structures (e.g. bridges) that will not be affected (**52**, **80**, **81**, **85**, **115**);
- The features appear no longer to survive (**10**, **76**, **83**, **90**, **99**, **114**, **121**, **123**, **137**, **138**, **153**, **156**, **162**, **164**). At Cully's Knowe (**195**) no cairns are present within the working areas associated with to the proposed OHL.
- At five locations old fences depicted on first edition Ordnance Survey maps at Brockloch Craig (**100, 102**), Dundeugh (**167**), Knockdollochan (**205**) are in locations now covered by plantation. Field survey evidence suggests that networks of fences no longer survive in areas not covered by forest, and therefore their survival in densely planted forest is not anticipated. On that basis no effects are anticipated on these sites.
- The recorded features are of natural origin and no certain archaeological significance (**77**, **84**, **113**);
- There is no reason to believe that an alleged site was ever present at its recorded location (**2**);
- The location of one site is not known with any accuracy (**53**); and
- The proposed works will be designed to have no effect on buried pipeline at Kendoon (**184**).

10.5.1.6 Mitigation

1 Mitigation measures will be implemented to avoid, reduce or offset the likely effects of the proposed felling, construction and dismantling works on cultural heritage features (except where otherwise stated). This is in line with the requirements of national, regional and local planning policies set out in **Section 10.2**. Suitable programmes of mitigation will be prepared and presented in Written Scheme of Investigations (WSI)[12] for the approval of East Ayrshire Council and Dumfries and Galloway Council prior to the commencement of any construction works. Provision will be made within the WSIs for an appropriate programme of investigation and recording of any archaeological remains identified as a result of any mitigation works undertaken in advance of, or during construction works, that cannot not be preserved *in situ*. The mitigation works will include the consequent production of written reports on the findings of the archaeological work conducted, with post-excavation analyses, publication and archiving of the results of the work where appropriate.

2 Guidelines on the protection of archaeological sites within forest areas are set out in the Forestry Commission's *Forests and Archaeology Guidelines* (1995). These guidelines include measures to protect archaeological sites and monuments during felling operations, which will be observed during the proposed felling works.

3 In addition to the strategic mitigation identified above, the following measures are proposed during the felling and construction phase:

- Construction and dismantling operations will seek to avoid known archaeological areas, which will not be used for storage of materials, timber stacking or parking vehicles or machinery. Procedures will incorporate the exclusion of cultural heritage features from working areas, and avoidance of features during upgrading of existing tracks to provide temporary access and construction of new tracks to provide temporary access. Cultural heritage features will be fenced off for the duration of construction works where appropriate (e.g. sites **6**, **19**, **27**, **41**, **56**, **106**, **120**, **122**, **124**, **125**, **129**, **130**, **142**, **143**, **146**, **188**, **189**, **192**, **196**, **208**, **209**, **210, 225**). Ground disturbance will be avoided to the routes of a former tramways (**12**, **221**), a former railway (**32**), an old road (**136**), and at the site of a former building (**26**);
- Towers to be dismantled will be felled away from archaeological features, to prevent damage occurring to them (**6**, **19**, **27**, **106**, **124**, **125**).
- At Lagwine cairn (**124**), careful consideration will be given to defining a tower dismantling procedure (cf **Section 5.2.5.7.2**) that presents least risk of disturbing the cairn and any adjacent buried archaeological remains. This tower next to the cairn should be dismantled under archaeological supervision.
- The underground cable route, access track and pulling station at Dalshangan clump plantation boundary (**163**) will be micro-sited to avoid or minimize any disturbance caused to this feature.
- If archaeological areas have to be crossed, for example, if trees on an archaeological feature are being felled (e.g. **208**), damage will be reduced by techniques such as brash matting and working in dry conditions. Stumps will be left in the ground to rot rather than causing further damage by uprooting them. Timber processing will not be carried out on archaeological sites;
- Post-felling archaeological survey will be carried out to identify and record any previously unknown features that survive in felled areas, and to identify and record known cultural heritage sites and features that were previously inaccessible due to the tree cover (e.g. **56**, **100**, **153**, **167**, **205**, **208**, **209**, **210**). Any identified features will be protected from further disturbance as necessary before subsequent construction works commence, e.g. by fencing off where they lie in proximity to proposed working areas, or will be recorded appropriately if disturbance cannot be avoided.
- Construction method statements will be prepared by the contractors (c.f. **Section 5.2.5.10**) that will ensure that construction and dismantling operations minimise any disturbance to cultural heritage features (upstanding or buried) in Craigengillan GDL (**30**) and the ASAs at Water of Deugh (**72**) and Bardennoch (**152**).
- An appropriate scheme of archaeological investigation of sites which will be unavoidably and directly affected by the proposed works (e.g. potentially **18**, **27**, **56**, **58**, **120**, **122**, **129**, **130**, **163**, **192**) will be included within the WSIs to be agreed with East Ayrshire Council and Dumfries and Galloway Council prior to construction works commencing;
- A watching brief will be conducted during ground breaking construction works, at archaeologically sensitive locations to be agreed with East Ayrshire Council and Dumfries and Galloway Council. The purpose of this work will be to allow for the identification and appropriate recording of currently unidentified and buried features of archaeological importance exposed by topsoil removal. Watching briefs will be conducted on any ground-breaking works in the vicinity of Auchenroy (**27**), Mossdale (**56**), the Old Galloway Road (**87**), Lagwine Cairn (**124**) and in the ASAs at Water of Deugh (**72**) and Bardennoch to Garryhorn (**152**). Provision will be made for the further investigation of any remains of archaeological importance discovered during an archaeological watching brief, and will comply with the requirements of the Institute of Field Archaeologists' *Standard and Guidance for an Archaeological Watching Brief* (2008);
- Formal arrangements will be put in place for any unforeseen archaeological discoveries made by the felling and/or construction contractor to be reported to a retained professional archaeological organisation. This will require any unexpected discoveries in areas not subject to archaeological monitoring (e.g. building remains, human remains, artefacts etc) to be assessed and dealt with appropriately, and will make clear the legal responsibilities placed upon those who make unexpected discoveries of archaeological significance. These arrangements will be included in SPT's Environmental Management Plan for the Project which will form a legally binding contract document and will be explained in toolbox talks presented by the retained archaeological organisation.

4 No mitigation is proposed in relation to a number of sites of minimal or no cultural heritage interest, including quarries (**44**, **74**, **82**), gravel pits (**68**, **135**, **144**, **150**, **154**, **155**, **160**, **226**) and an area of peat cuttings (**220**).

10.5.1.7 Residual Effects

1 One potential major (and significant) (**124**) and seven potential moderate (and significant) (**6**, **27**, **30**, **125**, **163**, **189**, **192**) site-specific effects were predicted before mitigation. Taking into account mitigation, the residual effects are reduced such that in all cases these are not significant.

2 Construction and felling operations may have minor adverse residual direct effects on 22 sites. In some cases mitigation measures have been proposed that will reduce the magnitude of change to baseline condition (**27**, **30**, **124**, **163**, **192**) whereas in others disturbance may not be avoidable and offset mitigation has been proposed that does not alter the assessed effect (**18**, **41**, **56**, **58**, **72**, **87**, **120**, **122**, **129**, **130**, **152**, **208**, **209**, **210**) or its significance.

12 - A Written Scheme of Investigation (WSI) is a written proposal that will be produced as necessary by SPT and submitted to a planning authority. It will set out a methodology and programme for delivering the cultural heritage mitigation measures required to allow the discharge of any cultural heritage condition determined by that planning authority, and will be developed from the mitigation measures set out here. The WSI will be submitted to the planning authority for approval in advance of construction works commencing. The need for this will also be identified within the Environmental Management Plan, as will all resultant mitigation proposals.

3 SPT commits to micro-siting works locations that will ensure the preservation *in situ* of eleven known sites of cultural heritage interest that are present in proximity to proposed works locations (**6**, **19**, **106**, **125**, **142**, **143**, **146**, **188**, **189**, **196**, **225**). Therefore there will be no direct, physical effects on those sites. The avoidance of ground-disturbing operations on five other sites will lead no effects occurring (**12**, **26**, **32**, **136**, **221**).

4 No mitigation has been proposed in relation to a number of quarries and gravel pits, and an area of peat cuttings, of minimal or no cultural heritage interest, and the effects remain as originally assessed – minor in three cases (**155**, **160, 226**) and none in the others (**44**, **68**, **74**, **82**, **135**, **144**, **150**, **154**, **220**).

5 Table 10.11 summarises each potential effect identified above; the mitigation measures proposed to avoid, reduce or offset those effects where appropriate; and the residual effect taking into account mitigation.

6 The residual effect on any previously undiscovered sites and features that may be discovered during post-felling survey or archaeological watching briefs at proposed works locations is most likely to be **minor** and **not significant**, based upon professional judgement, although confidence in this assessment is limited by a lack of knowledge as to what is present at proposed works locations. In line with the requirements of national, regional and local planning policies, any archaeological remains that are identified will be either preserved *in situ* or excavated and recorded to a standard agreed with East Ayrshire Council and Dumfries and Galloway Council, leading to the accrual of archaeological information.

Table 10.11 - Summary of Likely Potential Felling and Construction (Physical) Effects

Site No	Site Name	Potential Effect	Effect before Mitigation	Mitigation Proposal	Residual effect
6	Dalmellington Dalharco Mines	Potential disturbance from dismantling works	**Moderate**	Avoid feature / fence off if appropriate; fell tower away from site	None
12	Low Kiers, tram road	Potential disturbance from dismantling works	None	Avoid ground-disturbing operations	None
18	White Hill, rig and furrow	Potential disturbance from dismantling works	Minor	Field survey; minimise vehicular access and ground disturbance during dismantling works	Minor
19	White Hill, clearance spread	Potential disturbance from dismantling works	Minor	Avoid feature / fence off if appropriate; fell tower away from site	None
26	Auchenroy, building	Potential disturbance from dismantling works	None	Avoid ground disturbance at recorded site	None
27	Auchenroy, building	Potential disturbance from dismantling works	**Moderate**	Avoid feature / fence off where possible; watching brief / recording; fell tower away from site	Minor
30	Craigengillan, GDL	Potential disturbance from dismantling works	**Moderate**	Construction methods statement aimed at minimising disturbance to any features of designed landscape	Minor / None
32	Craigengillan, Loch Doon Gunnery School, railway	Potential disturbance from dismantling works	Minor	Avoid ground disturbance at recorded site	Minor
41	Dalmellington, Roman road (alleged)	Potential disturbance from dismantling works	Minor	Field survey to establish baseline condition; avoid / fence off if visible remains; watching brief on any ground-breaking works in vicinity of route	Minor / none
44	Pennyarthur, whinstone quarry	Potential disturbance from dismantling works	None	None	None
56	Mossdale, enclosure, field system, hollow-way	Potential construction / felling disturbance to features of this extensive site	Minor	Post-felling survey; mapping of remains; avoidance / fencing off of key features; recording / watching brief	Minor
58	Brown Hill, hollow way/ head dyke / rig and furrow	Potential disturbance from construction / felling operations	Minor	Protect where crossed by temporary access / record if protection not possible	Minor / none
68	Meadowhead, quarry pit	Potential disturbance from dismantling works	None	None	None
72	Water of Deugh ASA	Potential disturbance from construction and dismantling operations	Minor	Construction methods statement aimed at minimising disturbance to any features of ASA; watching brief	Minor
74	Meadowhead, quarry	Potential disturbance from dismantling works	None	None	None
82	Lamford, quarries and sheep ree	Potential disturbance to quarry from dismantling works	None	None	None
87	Salt Knowe, road	Potential disturbance from construction of temporary access track	Minor	Watching brief if ground breaking works where crossed by temporary access	Minor
106	Brockloch, grouse butts	Potential disturbance from construction and dismantling operations	Minor	Avoid / fence off if appropriate; fell tower away from site	None
120	Bridge-end, field bank	Potential disturbance from construction operations	Minor	Avoid / fence off if appropriate; record if not possible	Minor / none
122	Lagwyne, field boundary and rig and furrow	Potential disturbance from construction operations	Minor	Avoid / fence off if appropriate; record if not possible	Minor / none
124	Lagwyne, Lagwine cairn	Potential disturbance from dismantling works	**Major**	Avoid feature / fence off; fell tower away from cairn; archaeologist to monitor felling; watching brief on ground breaking works in vicinity	Minor
125	Lagwyne, sheepfold	Potential disturbance from construction and dismantling operations	**Moderate**	Avoid feature / fence off if appropriate; fell tower away from site	None
129	Carsphairn, field bank	Potential disturbance from dismantling works	Minor	Avoid / fence off if appropriate; record if not possible	Minor / none
130	Carsphairn, field bank	Potential disturbance from dismantling works	Minor	Avoid / fence off if appropriate; record if not possible	Minor / none
135	North Liggat, gravel pit	Potential disturbance from dismantling works	None	None	None
136	Liggat Bridge, track	Possible disturbance from dismantling of tower	Minor	Avoid ground-disturbing operations	None
142	Bardennoch, hay ree	Potential disturbance from construction operations	Minor	Avoid / fence off if appropriate	None
143	Bardennoch, field system, sheepfold	Potential disturbance from dismantling works	Minor	Avoid / fence off if appropriate	None
144	Bardennoch, gravel pit	Potential disturbance from construction operations	None	None	None
146	Bardennoch, building and enclosure	Potential disturbance from construction operations	Minor	Avoid / fence off if appropriate	None
150	Bardennoch, gravel pit	Potential disturbance from dismantling works	None	None	None
152	Bardennoch to Garryhorn ASA	Potential disturbance from construction and dismantling operations	Minor	Construction methods statement aimed at minimising disturbance to any features of ASA; watching brief	Minor

Site No	Site Name	Potential Effect	Effect before Mitigation	Mitigation Proposal	Residual effect
154	Bardennoch, gravel pit	Potential disturbance from dismantling works	None	None	None
155	Bardennoch, gravel pit	Potential disturbance from construction and dismantling operations	Minor	None	Minor
160	Polquhanity, gravel pit	Potential disturbance from construction operations	Minor	None	Minor
163	Dalshangan, clump plantation boundary	Potential disturbance from construction operations	**Moderate**	Micro-site underground cable route, access track and pulling station to avoid disturbance to feature; record if disturbance not possible	Minor
188	Chapel Linn, enclosure	Potential disturbance from construction operations	Minor	Avoid / fence off if appropriate	None
189	Mackilston Hill, sheep shelter	Potential disturbance from construction operations	**Moderate**	Avoid / fence off if appropriate	None
192	Green Haas, cultivation remains, enclosure, lime kiln	Potential disturbance from construction operations	**Moderate**	Mapping of remains; avoidance / fencing off of key features; record if not possible; watching brief	Minor
196	Cullys Knowe, clearance cairn	Potential disturbance from construction operations	Minor	Avoid / fence off if appropriate	None
208	Shield Willie Hill, farmstead, field system	Potential disturbance from felling and construction operations	Minor	Post-felling survey; mapping of remains; avoidance / fencing off of key features; recording / watching brief if necessary	Minor
209	Shield Willie Hill, sheepfold	Potential disturbance from felling and construction operations	Minor	Post-felling survey; avoidance / fencing off if appropriate; recording / watching brief if necessary	Minor
210	Stroan, hay ree	Potential disturbance from felling and construction operations	Minor	Post-felling survey; avoidance / fencing off if appropriate; recording / watching brief if necessary	Minor
220	Lamford Hill, peat cutting	Potential disturbance from construction operations	None	None	None
221	Smithston Upper Bridge, tramway	Possible disturbance from dismantling of tower	Minor	Avoid ground-disturbing operations	None
225	Meadowhead, enclosure	Possible disturbance from dismantling of tower	Minor	Avoid / fence off if appropriate	None
226	Polquhanity, gravel pit	Potential disturbance from construction operations	Minor	None	Minor
	Unrecorded buried archaeology	Possible disturbance from construction / felling / dismantling operations	Minor	Watching briefs at locations to be agreed with planning authorities. Discoveries at other locations will be dealt with through reporting procedures to be contained in the Environmental Management Plan.	Minor

10.5.2 Operational Effects (Effects on Setting)

10.5.2.1 Likely Effects on Features with Theoretical Perceptibility of Proposed OHL

1 Using the methodology described above, Appendix E.3 details the findings of the assessment of the operational effects of the proposed works upon the settings of the 84 receptors identified in Appendix E.2 and summarised above, from which one or more component of the proposed OHL is predicted to be theoretically perceptible.[13]

2 The assessment has identified two significant operational effects of the proposed works, both beneficial. Both effects will arise from the dismantling of the existing N-Route OHL where it crosses the northern end of Craigengillan GDL, and will affect the GDL (**110**; Table 10.12) and the B listed lodge at the entrance to Craigengillan (**1086**; Table 10.13).

3 Excluding Craigengillan GDL discussed in Table 10.12 minor effects that are not significant are predicted in relation to 47 receptors, resulting from the construction of the proposed OHL and/or the removal of the existing N-Route OHL. In eight cases those minor effects are predicted to be adverse in nature, resulting from the construction of the proposed OHL on the settings of Lamford Burn cairn (**1034**, scheduled), White Cairn (**1047**, scheduled), Braidenoch Hill cross slabs (**1105**), Dalshangan stables (**3679**, C(S) listed), Knockgray NIDL, Dame Helen's Castle (**7132**, NSR), Bardennoch Hill, cairn (**MDG3460**, NSR) and Water of Deugh ASA. In eight cases those minor effects are anticipated to be beneficial in nature, arising from the dismantling of the N-Route OHL on the settings of Dalnean Hill farmstead and field system (**4390**, scheduled), Craigengillan, bridge adjacent to lodge (**1087**, B listed), Doon Bridge on Straiton Road (**1113**, B listed), Craigengillan (**18793**, A-listed), Dalcairnie Bridge (**49506**, C(S) listed), Nether Grimmet farmstead (**7141**, NSR), Lagwine Cairn (**MDG3478**, NSR) and the Bardennoch to Garryhorn ASA. In all other cases minor effects are predicted to be neutral in nature. Further details of all assessments of minor effect are provided in Appendix E.3.

4 The settings of the majority of receptors were assessed either from site visits or from nearby vantage points from which those settings could be appreciated. A small number of receptors (SMs **1006**, **1105**, **5184**, **5200**; LBs **3676**, **49506**; NSRs **7118, 7164**, **7166**, **7181**, **MDG3406**, **MDG3460**, **MDG 3944**, **MDG3945**, **MDG13622**, **MDG17237**) were not visited and could not be seen from publicly accessible locations nearby. This restricted the degree to which their settings could be appreciated, in turn limiting the confidence that can be placed upon the assessments of effect made in Appendix E.3.

Table 10.12 - Assessment of Effect on Setting of Craigengillan GDL (GDL 110)

Setting (High Sensitivity) Craigengillan is a rare example of a complete and unfragmented estate landscape, with 16th century origins and held by the McAdam family for almost 400 years. Much of the designed landscape visible today dates from the latter half of the 18th century. The grounds and gardens provide the setting for the A listed Craigengillan House, and incorporate formal gardens, a range of gardens and garden buildings, extensive policy woodland, a rocky gorge and industrial archaeological remains. There are panoramic views of the surrounding hills from Craigengillan House and from different parts of the GDL. The Inventory assesses the GDL as having outstanding value in all assessment categories (work of art, historical, horticultural, architectural, scenic, nature conservation, archaeological). The key parts of the GDL in relation to the proposed works are the northern and western parts. This contains the open ground of the marshy valley bottom through which the River Doon flows, the slopes to the west, and Crighton's Knowe to the east. From these areas there are generally extensive and open views of the range of hills to the north, the Doon Valley, and across Dalmellington / Bellsbank and the largely forested hills beyond to the east. The existing N-Route OHL intersects the northern part of the GDL on a north-west to south-east alignment, and provides a substantial modern industrial intrusion into the GDL. The GDL has good recreational value, containing various walks that are open to the public, and signboards provide interpretative / educational information.
Changes Five towers will be removed from within the open, low-lying part of the GDL. Other towers visible from within, and in views looking towards, the GDL will also removed on the higher ground around Town Common to the east and White Hill to the north. Magnitude of effect – medium. New towers will be visible in the hills to the east, partly screened by forests within which they will stand. Magnitude of effect – low.
Effect on Setting The dismantling of the existing N-Route OHL is predicted to have a **major**, **beneficial** effect on the setting of the GDL, since the most visible modern intrusion present within the essentially rural character of the northern part of the GDL will have been removed. This likely effect is **significant**. The construction of the proposed new OHL is predicted to have a **minor**, **adverse** effect on the setting of the GDL. The towers will be detectable from certain parts of the designed landscape, but will form a minor addition to the landscape surrounding the GDL. They will not materially detract from the present landscape, visual and recreational aspects of the setting of the GDL. This likely effect is **not significant**.

13 - The proposed wind farm substations are included within this assessment of effects on setting, although both are up to 8.5m high and will be located within areas of conifer plantation that will limit views to and from them.

Table 10.13 - Assessment of Effect on Setting of Craigengillan Lodge (LB 1086)

Setting (High Sensitivity) This unobtrusive 1-storey lodge is located on the south side of the main approach to Craigengillan House, within Craigengillan GDL, and was built in the late 18th or early 19th century. Trees screen views of the building on all sides except for the north-west facing frontage, from where views are focussed along the valley of the River Doon and across the hills to either side. The hillsides visible to the north of Dalmellington contain a range of existing industrial features, houses and overhead power lines. The existing N-Route towers proposed for removal cross the GDL c. 250m south of the lodge, and a tower is in direct view beside the lodge when looking along the Craigengillan road from the A713 to the north-east. The key aspects of the setting of the lodge are its intimate visual links with the adjacent listed bridge (**1087**) and road leading to Craigengillan House, and the historic and landscape links with Craigengillan Estate. The lodge building has some recreational value, in that the adjacent road now provides public access into Craigengillan Estate.
Changes Towers will be removed from within Craigengillan GDL (**110**), including the tower prominently in view when viewing the lodge along the avenue from the north-east. Magnitude of effect – medium. The proposed new tower line will be very largely screened from view by trees, and does not form part of the setting of this building. Magnitude of effect – imperceptible.
Effect on Setting The dismantling of the existing N-Route OHL is predicted to have a **major, beneficial** effect on the setting of the lodge, since the most visible modern intrusion into the essentially rural character of the GDL visible from the lodge will have been removed. This likely effect is **significant**. The construction of the proposed new OHL is predicted to have no effect on the setting of the lodge, since the proposed OHL will be barely, if at all, perceptible from the lodge. This likely effect is **not significant**.

10.5.2.2 Likely Effects on Features with Theoretical Visibility of Existing N-Route OHL to be Removed but no Theoretical Perceptibility of Proposed OHL

1 In principle the removal of a length of existing OHL is most unlikely to lead to an adverse effect on the setting of cultural heritage features in the surrounding landscape, unless perhaps they happen to be modern features directly or functionally associated with the OHL. None of receptors identified within 5km of the existing N-Route OHL proposed for removal (Appendix E.4) falls into that category. Most are of a character (e.g. coal mining remains) or at a sufficient distance from the existing N-Route OHL that appreciable beneficial effects on setting cannot be anticipated from the proposed removal of the existing N-Route OHL. All likely changes are therefore anticipated to be neutral in effect, and hence not to cause material changes to the settings of the receptors. Based upon the foregoing, the likely effects of the removal of the existing N-Route OHL on the settings of the receptors listed in Appendix E.4 are assessed as being **none or minor**, **neutral**, and **not significant**.

10.5.2.3 Mitigation

1 No mitigation measures are proposed in relation to the likely operational effects.

10.5.2.4 Residual Effects

1 No mitigation has been proposed, and therefore effects remain as predicted above. Of the 84 receptors assessed with theoretically perceptibility of the proposed OHL, two significant residual beneficial effects have been predicted in relation to the settings of Craigengillan GDL (**110**) and Craigengillan Lodge (**1086**). Minor (not significant) operational effects have been predicted in relation to 47 receptors, of which effects are anticipated to be adverse in eight cases and beneficial in eight.

2 The proposed removal of a length of the existing N-Route OHL will have no significant effect on receptors with theoretical visibility of the existing N-Route OHL but no theoretical perceptibility of the proposed OHL.

10.5.2.5 Summary

1 The proposed works will lead to two significant beneficial effects occurring, in relation to the settings of Craigengillan GDL (**110**) and Craigengillan Lodge (**1086**), and no significant adverse effect on any identified cultural heritage asset.

10.5.3 Secondary effects

1 Potential secondary effects on cultural heritage interests have been identified as effects on tourism as regards cultural heritage and damage caused to archaeological remains by windthrown trees blown over a result of their increased exposure to wind as a direct consequence of felling for the proposed works.

2 There is potential for the proposed changes to have effects on tourism in relation to the heritage walks promoted through the Carsphairn Heritage Centre. As these walks are located primarily within ASAs, the secondary effects are indistinguishable from the effects on the character and setting of the ASAs. On that basis is predicted that there will be a **minor** and **not significant** secondary effect on the heritage walks from the proposed works.

3 Four cultural heritage sites are located in areas where potential windthrow has been predicted as a result of forestry felling associated with the construction of the proposed OHL (**100**, **153**, **205**, **208**). In three cases (**100**, **153**, **205**) no effect is predicted for the reasons provided above in relation to likely physical effects, since it is considered that no traces of these sites are likely to survive in presently forested land. In the fourth case (**208**) it is hard to predict any likely effect of windthrow, as the present condition of the site is not known. If the site survives in a coherent condition, then it possible that windthrow could cause a medium magnitude change to the condition of this site of low sensitivity, leading to likely effect that is **minor**, **adverse** and **not significant**.

10.5.4 Cumulative effects

10.5.4.1 Scope of Assessment

1 The identification of likely cumulative effects focuses here upon the residual operational effects of the proposed OHL works on the setting of cultural heritage assets in combination with the likely operational effects of other proposed energy developments present within 10km of the proposed works on the setting of cultural heritage assets[14]. No cumulative construction and felling effects are predicted, as the various cumulative developments occupy different parts of the landscape.

2 Identified cumulative developments are the consented windfarms at Windy Standard Extension and Torrs Hill, and the proposed Afton and Dersalloch windfarms (Figure 7.07), and the proposed Dersalloch-Meikle Hill OHL component of the proposed SWS Project. The assessment is necessarily based upon the present OHL proposals and other projects for which information on assessment of effects on cultural heritage assets was available[15].

3 It is necessary to note that the available assessments were conducted by different organizations, using different methods, and assessing operational effects on different categories of cultural heritage asset over varying distances from the proposed development sites. The individual assessments are therefore inherently inconsistent in their approach, and this inevitably limits the confidence that can be placed upon the findings of this assessment of cumulative operational effects. This assessment is based upon professional judgment and informed by the findings of other assessments (i.e. no attempt has been made to validate the assessment findings made by others).

4 The assessment of likely operational cumulative effects has taken into account only those receptors considered in Section 10.5.2 and Appendix E.3 where either significant residual effects on setting or minor adverse or beneficial residual effects on setting have been identified. Where the operational effect of the present OHL proposals has been assessed as either 'none' or 'minor neutral', it is considered that the theoretical additional effect resulting from the presence of the proposed OHL works would not change the effect on the setting of a receptor theoretically caused by the presence of other cumulative development/s.

10.5.4.2 Likely Cumulative Operational Effects

1 The Environmental Statement relating to Afton wind farm did not identify any adverse effect on the setting of cultural heritage assets present in the landscape surrounding

14 - The operational Hare Hill, Wether Hill and Windy Standard wind farms are part of the baseline environment and are not assessed. The proposed Blackcraig and Margree wind farms requiring connection, and the steel tower elements of the proposed SWS Project (Parts A and B), are considered to be present as part of the baseline environment (as the present proposals are predicated on their pre-existence). The 10km limit follows that undertaken in the cumulative effects assessment in the cultural heritage chapter of the SWS Project Environmental Statement.

15 - Information was taken from Environmental Statements (including Addenda) and Supplementary Environmental Information for the wind farms at Afton, Brockloch Rig, Dersalloch, and the proposed SWS Project Part D2. Torrs Hill and Pencloe wind farms are not assessed here, as no information was available for assessment. It is anticipated that the operational effect of Pencloe wind farm is likely to be broadly comparable with that of Afton wind farm.

the proposed wind farm site; all effects were assessed as neutral. Therefore no cumulative effects are likely to arise from the presence of Afton wind farm and the present OHL proposals. The Brockloch Rig Environmental Statement does not assess the effects of the proposed wind farm on the setting of cultural heritage assets beyond the planning application boundary, and therefore it is not possible to identify cumulative effects between that wind farm and the present proposals.

2 On this basis, cumulative operational effects on the setting of cultural heritage assets has been assessed in detail against the SWS Project Part D2 (Dersalloch Link), and the proposed Dersalloch wind farm. Seven receptors have been identified where cumulative operational effects are likely (Table 10.14).

Table 10.14 - Receptors Where Cumulative Operational Effects are Likely

Receptor	Operational effect (this project)	Operational effect (SWS Project Dersalloch Link)	Operational effect (Dersalloch wind farm)
Dalnean Hill, farmstead and field system (4390, scheduled)	Minor, beneficial; not significant	Minor, adverse; not significant	-
Craigengillan, lodge (1086, B listed)	Major, beneficial; significant	Minor, adverse; not significant	-
Craigengillan, bridge (1087, B listed)	Minor, beneficial; not significant	Minor, neutral; not significant	-
Doon Bridge on Straiton Road (1113, B listed)	Minor, beneficial; not significant	Minor, neutral; not significant	-
Dalcairnie Bridge, Craigengillan (49506, C(S) listed)	Minor, beneficial; not significant	None; not significant	-
Craigengillan GDL (110)	Major, beneficial: significant	Minor, adverse; not significant	Adverse: significant
Nether Grimmet, farmstead (7141, NSR Code V)	Minor, beneficial; not significant	Minor, adverse; not significant	-

3 For all identified receptors the likely operational effect of this project has been assessed as beneficial, through the removal of the existing N-Route OHL.

4 For six receptors the cumulative operational effect will arise from a combination of the removal of the existing N-Route OHL and the construction on a different alignment across the landscape of a new OHL running between the proposed Dersalloch wind farm and the proposed Meikle Hill substation. In those cases where the existing N-Route OHL to be removed is considerably closer to the receptor than that to be constructed as part of the South West Scotland Project, the minor neutral or adverse effect of the proposed construction is assessed as not reducing the beneficial effect of the existing N-Route OHL removal; i.e. the removal of the existing N-Route OHL would contribute more to the cumulative effect than the proposed new OHL construction. Therefore the cumulative operational effect on Craigengillan lodge (**1086**) is assessed as **major, beneficial** and **significant**, and on Dalnean Hill farmstead (**4390**), Craigengillan Bridge (**1087**), Doon Bridge (**1113**) and Dalcairnie Bridge (**49506**) as **minor**, **beneficial** and **not significant**. The proximity of both existing N-Route OHL to be removed and proposed SWS Project Dersalloch Link OHL to Nether Grimmet farmstead (**7141**) suggest a cumulative effect that is little changed from the baseline condition, and the cumulative operational effect is likely to be **none** and **not significant**.

5 Assessment of the cumulative operational effect on Craigengillan GDL (**110**) is more complex. Whilst the proposed Dersalloch wind farm has been assessed as having an adverse and significant effect on the setting of the GDL, the major beneficial effect of the proposed removal of the existing N-Route OHL from within the northern part of the GDL cannot be regarding as either reducing or compensating for the presence of the proposed wind farm, since the two proposals affect different aspects of the setting of the GDL and are not complementary. For these reasons the cumulative effect is judged to be **significant**, but with beneficial and adverse aspects contributed by the present OHL proposals and the proposed Dersalloch wind farm respectively.

6 Conversely, the construction of the SWS Project Dersalloch Link OHL and the removal of the existing N-Route OHL would both affect views into and out of the northern end of the GDL. Together it is considered that the removal of the existing N-Route OHL from within the OHL would outweigh the construction of the new OHL c. 1km to the north of the GDL. On that basis the cumulative operational of these two proposals is assessed as being **moderate, beneficial** and **significant**.

10.5.5 Summary of Effects

1 Likely felling and construction effects were identified in relation to 47 cultural heritage features. Of these, one potential major (and significant) and seven potential moderate (and significant) effects were predicted before mitigation. Taking into account mitigation, the residual effects are reduced such that in all cases these are not significant. Construction and felling operations may have minor adverse residual direct effects on 23 sites and upon unrecorded buried archaeology.

2 The proposed works will lead to two significant beneficial operational effects on the setting of cultural heritage assets occurring, in relation to the settings of Craigengillan GDL (**110**) and Craigengillan Lodge (**1086**), and no significant adverse effect on the setting of any identified cultural heritage asset. Minor (not significant) operational effects have been predicted in relation to 47 receptors, of which effects are anticipated to be adverse in eight cases and beneficial in eight. No mitigation has been proposed.

3 Likely secondary effects have been identified in relation to potential tree windthrow effects on one site and upon heritage walks within ASAs at Water of Deugh and Bardennoch to Garryhorn. The effects are assessed as being **minor, adverse** and **not significant**.

4 Cumulative operational effects on the settings of seven cultural heritage assets have been identified. In one case the cumulative effect is assessed as being major, beneficial and significant (**1086**), in four cases a minor, beneficial and not significant effect is identified, and in one case the effect is identified as none and not significant. The assessment of cumulative effect on Craigengillan GDL (**110**) is complex, but the cumulative effect with the proposed Dersalloch wind farm is considered to be significant, incorporating non-complementary adverse and beneficial aspects, with the beneficial aspect contributed by the proposal to remove the existing N-Route OHL from within the GDL.

10.6 Summary

1 This chapter has considered the likely effects on cultural heritage assets of the proposed construction and operation of the Blackcraig and Margree overhead lines and substations at the two wind farms, including the dismantling of a length of the existing N-Route OHL. Desk-based assessment and reconnaissance field survey were carried out to identify the cultural heritage baseline within and in the landscape surrounding the proposed works locations. The baseline survey identified over 300 relevant cultural heritage sites, monuments, features and areas of interest, ranging in date from early prehistoric findspots to the remains of 20th century military installations and industrial monuments. These cultural heritage assets are testament to the long and continuous history of occupation and exploitation of the landscape crossed by the proposed and existing overhead lines since early prehistoric times.

2 Likely felling and construction effects (i.e. physical effects on cultural heritage assets) have been identified in relation to 47 cultural heritage features. Taking into account the range of mitigation measures identified that will variously prevent, reduce or offset these likely effects, this study has not identified any residual construction and felling effect that is considered to represent a significant environmental effect. The effect on presently unrecognized archaeological remains is likely to be adverse but not significant, although such predictions inevitably are inherently uncertain. Two assets are likely to experience beneficial operational effects on their settings as a result of the implementation of the proposals – the designed landscape at Craigengillan and a listed lodge within the designed landscape will benefit from the proposed removal of the existing N-Route OHL that presently crosses the northern part of the designed landscape. No adverse operational effect has been identified that is considered to represent a significant environmental effect. A small number of secondary effects on cultural heritage assets has been identified, on heritage walks and as a result of potential disturbance caused by windthrown trees consequent upon forestry felling, but those likely effects have been assessed as not significant. Cumulative operational effects have been identified in relation to seven specific cultural heritage receptors; in all cases the Blackcraig and Margree proposals provide a beneficial contribution to the identified cumulative operational effect, through the removal of a length of the existing N-Route OHL.

3 Overall, it is assess that the proposed works will have a **minor**, **adverse** and **not significant** effect on cultural heritage assets and the historic environment, principally as a result of the likely physical effects of construction and felling operations upon archaeological remains. However, there are positive environmental outcomes of the proposed works, specifically resulting from the removal of a length of the existing N-Route OHL, which will be **beneficial** and **significant**.

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2 540/RAF/954, 28.11.52, 1:9996

3 541/A/394, 19.05.48, 1:10,000

4 541/A/529, 1:10,000

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10.7.4 Web

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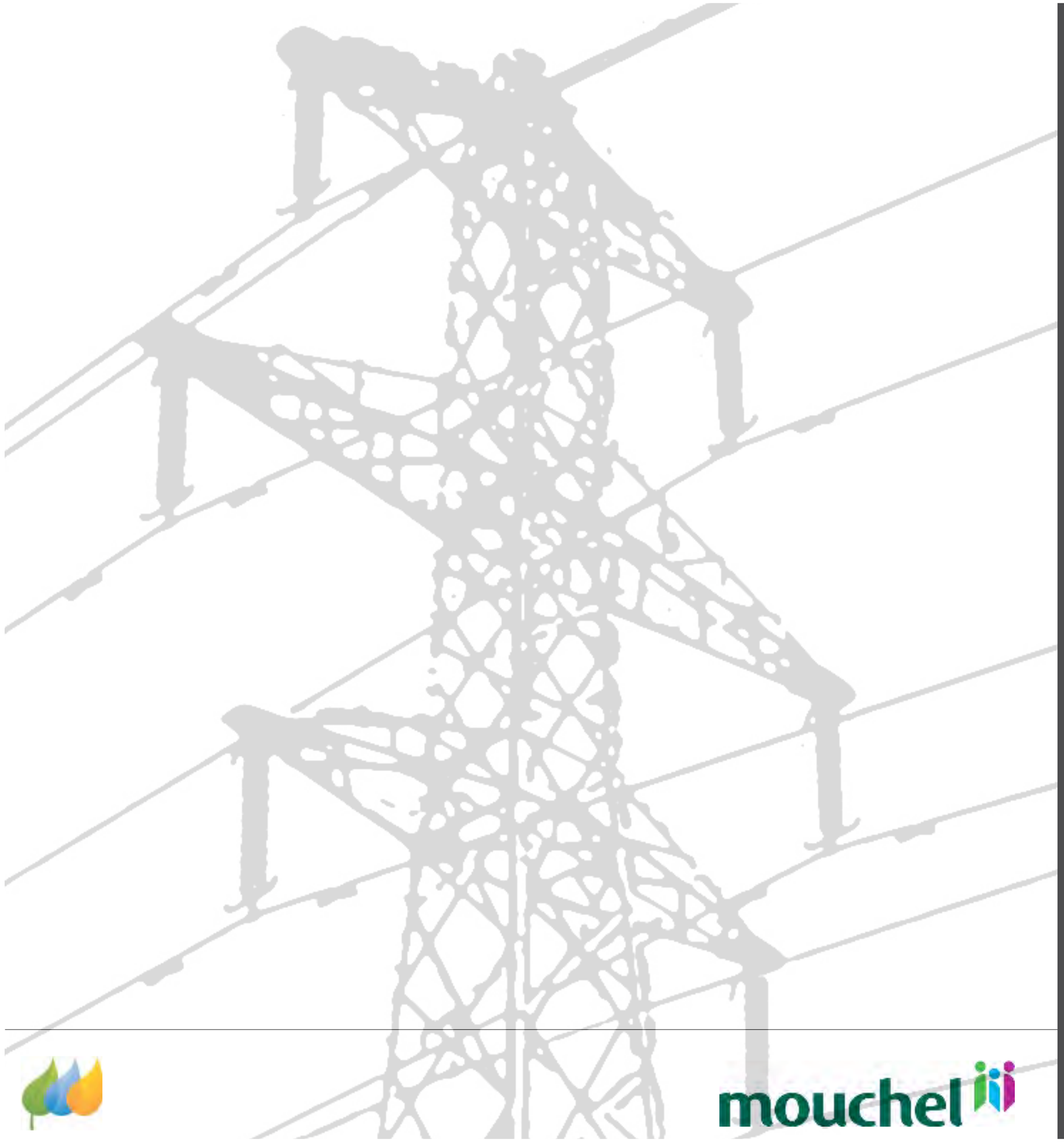


11

Hydrology & Hydrogeology

Blackcraig and Margree Windfarms
Grid Connection
Environmental Statement

Table of Contents

11.1 Chapter Summary 202

11.2 Introduction 202

11.3 Scope of Assessment 202

11.4 Scoping and Consultation Responses 202

11.5 Guidance and Policy Context 202

11.5.1 Baseline Assessment 202

11.5.2 Significance Criteria 203

11.6 Baseline Conditions 203

11.6.1 Context 203

11.6.2 Designated and Protected Areas 203

11.6.3 Climate 204

11.6.4 Geology 204

11.6.5 Hydrogeology 204

11.6.6 Geomorphology 204

11.6.7 Soils 204

11.6.8 Hydrology 205

11.6.8.1 Catchment description 205

11.6.8.2 Water resources 206

11.6.9 Modifying Influences 221

11.6.10 Information Gaps 221

11.7 Predicted Effects and Mitigation Measures 221

11.7.1 Development Characteristics 221

11.7.1.3 Developments Considered Within Baseline 221

11.7.1.4 Generic Mitigation Measures 221

11.8 Effects on Surface Water 230

11.8.1 Receptor sensitivity 230

11.8.2 Construction effects 230

11.8.2.1 Pollution: 230

11.8.2.2 Erosion and sedimentation: 230

11.8.2.3 Impediments to flows: 230

11.8.2.4 Modifications to surface runoff: 230

11.8.3 Predicted ongoing and operational effects 230

11.8.3.5 Pollution: 230

11.8.3.6 Erosion and sedimentation: 231

11.8.3.7 Impediments to flows: 231

11.8.3.8 Modifications to surface runoff: 231

11.8.4 Predicted decommissioning effects 231

11.8.4.1 Pollution: 231

11.8.4.2 Erosion and sedimentation: 231

11.8.4.3 Impediments to flows: 231

11.8.4.4 Modifications to surface runoff: 231

11.8.5 Summary of effects on surface water 231

11.9 Effects on Groundwater 231

11.9.1 Receptor sensitivity 231

11.9.2 Construction effects 231

11.9.2.1 Pollution: 231

11.9.2.2 Modification of groundwater flows: 232

11.9.3 Predicted ongoing and operational effects 232

11.9.3.1 Pollution: 232

11.9.3.2 Modification to groundwater flows: 232

11.9.4 Predicted decommissioning effects 232

11.9.4.1 Pollution: 232

11.9.4.2 Modification to groundwater flows: 232

11.9.5 Summary of effects on groundwater 232

11.10 Effects on Peat and Soils 232

11.10.1 Receptor sensitivity 232

11.10.2 Construction effects 232

11.10.2.1 Pollution: 232

11.10.2.2 Compaction and erosion: 232

11.10.3 Predicted ongoing and operational effects 233

11.10.3.1 Pollution: 233

11.10.3.2 Compaction and erosion: 233

11.10.4 Decommissioning effects 233

11.10.4.1 Pollution: 233

11.10.4.2 Compaction and erosion: 233

11.10.5 Summary of effects on peat and soils 233

11.11 Effects on Water Supplies 233

11.11.1 Receptor sensitivity 233

11.11.2 Construction effects 233

11.11.2.3 Pollution: 233

11.11.2.4 Modification of groundwater flows: 236

11.11.2.5 Modifications to surface runoff: 236

11.11.3 Predicted ongoing and operational effects 236

11.11.3.1 Pollution: 236

11.11.3.2 Modification of groundwater flows: 236

11.11.3.3 Modifications to surface runoff: 236

11.11.4 Decommissioning effects 236

11.11.4.1 Pollution: 236

11.11.4.2 Modification to groundwater flows: 236

11.11.4.3 Modifications to surface runoff: 236

11.11.5 Summary of effects on water supplies 237

11.12 Cumulative Effects 237

11.13 Summary of Assessment 237

Table of Figures

Photograph 11.1a 205

Photograph 11.1b 205

Figure 11.01a - Hydrological features 1 of 8 207

Figure 11.01b - Hydrological features 2 of 8 208

Figure 11.01c - Hydrological features 3 of 8 209

Figure 11.01d - Hydrological features 4 of 8 210

Figure 11.01e - Hydrological features 5 of 8 211

Figure 11.01f - Hydrological features 6 of 8 212

Figure 11.01g - Hydrological features 7 of 8 213

Figure 11.01h - Hydrological features 8 of 8 214

Figure 11.02a - Catchments 1 of 3 215

Figure 11.02b - Catchments 2 of 3 216

Figure 11.02c - Catchments 3 of 3 217

Figure 11.03a - Water Framework Directive Waterbody classification 1 of 3 218

Figure 11.03b - Water Framework Directive Waterbody classification 2 of 3 219

Figure 11.03c - Water Framework Directive Waterbody classification 3 of 3 220

Figure 11.04a - Flood risk areas 1 of 8 222

Figure 11.04b - Flood risk areas 2 of 8 223

Figure 11.04c - Flood risk areas 3 of 8 224

Figure 11.04d - Flood risk areas 4 of 8 225

Figure 11.04e - Flood risk areas 5 of 8 226

Figure 11.04f - Flood risk areas 6 of 8 227

Figure 11.04g - Flood risk areas 7 of 8 228

Figure 11.04h - Flood risk areas 8 of 8 229

List of Tables

Table 11.01 - Summary of scoping and consultation responses relating to soil and water 202

Table 11.02 - Definitions of sensitivity 203

Table 11.03 - Definitions of magnitude 203

Table 11.04 - Effects matrix 203

Table 11.05 - Soils information 205

Table 11.06 - Catchment area information 205

Table 11.07 - Private water supply locations 206

Table 11.08 - Summary of waterbody classification 206

Table 11.09 - Effects on public water supplies 233

Table 11.10 - Effects on private water supplies 233

Table 11.11 - Summary of predicted construction effects 237

Table 11.12 - Summary of predicted ongoing & operational effects 237

Table 11.13 - Summary of predicted decommissioning effects 238

11.0 Hydrology & Hydrogeology

11.1 Chapter Summary

1 This chapter considers the existing hydrological and hydrogeological conditions present in the area and assesses the potential effects of the proposed overhead line (OHL) to connect the Blackcraig & Margree windfarms. Attention has been focused on the proposed OHL route but also takes into consideration areas adjacent to and downstream from the site that may be influenced by the proposed development.

11.2 Introduction

1 This chapter assesses the potential effects of the proposed Blackcraig & Margree OHL on hydrology and hydrogeology. The assessment has been carried out by Mouchel Ltd, water and environmental consultants.

2 Hydrology and hydrogeology are closely linked resources, with the possibility of common effects. For the purposes of this assessment, 'hydrology' is considered to include surface water and 'hydrogeology' is considered to cover groundwater, including water present in peat, soils, mineral soils and drift deposits.

3 The Hydrology and Hydrogeology Assessment is closely linked to the Ecology Assessment, detailed in Chapter 8 (Terrestrial Ecology). Effects on hydrology and hydrogeology may result in secondary ecological effects on habitats and/or species. Any such effects are detailed in Chapter 8 (Terrestrial Ecology).

11.3 Scope of Assessment

1 The Study Area for the hydrology and hydrogeology assessment is based around the OHL proposals as described in Chapter 5, and includes areas adjacent to and downstream from the site that may potentially be affected.

2 The assessment considers site preparation, construction and operation, and decommissioning of the OHL. During construction there will be limited physical disturbance and removal of soil by mobile plant. The steel L7 Towers, wood poles and related infrastructure, including temporary storage compounds, will introduce physical changes which may in turn alter the hydrological characteristics of the site. During construction, and to a lesser extent during operation and decommissioning, the OHL will introduce potential sources of pollution to the site.

3 The potential effects to be considered are:

- Pollution incident;
- Erosion and sedimentation;
- Changes to water resources, including water quality and water supplies;
- Modification of surface and groundwater flows;
- Modification of natural drainage patterns;
- Impediments to flows and flood risk; and
- Compaction of soils.

11.4 Scoping and Consultation Responses

1 The scoping and consultation responses relating to hydrology and hydrogeology are summarised in Table 11.01 below and have been taken account of within the preparation of the ES..

Table 11.01 - Summary of scoping and consultation responses relating to soil and water

Consultee	Summary of Response
Scottish Environment Protection Agency (SEPA)	The ES should provide details of any potential pollution issues and suitable mitigation measures, with specific reference to surface waters. Site construction and development must be carried out with regard to SEPA's guidance on avoidance of pollution, including reference to the relevant PPG (Pollution Prevention Guidance). Waste materials must be stored, used and disposed of according to appropriate regulations. The ES should give full details of stream crossing points and type of crossing proposed. Stream crossings may require authorisation.
Scottish Natural Heritage (SNH)	Expect the ES to consider underlying geology, soils, standing water and hydrology, river systems including flora and fauna. This should include consideration of European Protected Species, such as otter and bats, and protected areas, such as SSSIs, within the Study Area.
Forestry Commission Scotland	An assessment of the implications of the overhead power line proposals on water, soil and air resources is recommended. Reference is made to the FC Forest and Water Guidelines, now in its fourth edition.
Marine Scotland	The ES should address fish issues, in addition to appropriate mitigation measures, including potential impacts on important salmonid spawning rivers and Loch Doon. Consideration should be given to changes in hydrology, turbidity and sediment load from excavation and construction work. Nutrient release, increased acidification risk, altered water levels and sediment increase from forestry operations should be included.
Scottish Water	No response received to date
Dumfries & Galloway Council	Information supplied regarding properties on private water supply
East Ayrshire Council	Information supplied regarding properties on private water supply
Galloway Fisheries Trust (GFT)	GFT hold some data regarding fish species, populations and associated habitats for the Study Area. GFT can offer a range of services relating to fisheries study if required.
Ayrshire Rivers Trust (ART)	The River Doon is a productive salmon fishery and supports a threatened population of freshwater pearl mussels; Loch Doon is a SSSI for Arctic charr. ART holds data on fish populations across the Doon catchment. ART would like to be kept informed of any developments with this proposal and will be able to comment further once potential routes have been identified.
Association of Salmon Fishery Boards (ASFB)	Local fishery management organisations should be involved by the developers in assessing potential impacts. Particularly mentioned are the Ayrshire Rivers Trust and Galloway Fisheries Trust.
Scottish Wildlife Trust (SWT)	Any impact on blanket bog should be avoided or, where this is not possible, compensated for in the Habitat Management Plan. Areas of deep peat should be avoided.
Craigdarroch Fishing Club (CFC)	Lease, look after and stock Loch Howie and Loch Skae near Corriedoo. CFC express concern that this development will have significant effects on the environment in this area.
Local Landowners & Residents	Attention drawn to the "Rhododendron Pool" on the Water of Deugh, used for fishing and swimming. Also wildlife in this area, including Kingfishers. Various responses relating to significant impacts on the environment, including wildlife. Several species of conservation interest will be affected by the development. Various responses relating to private water supplies, concerning location and type of source.

11.5 Guidance and Policy Context

1 The assessment of the effects and development of mitigation have been undertaken in accordance with appropriate guidance and policy. The relevant documentation is included within Technical Appendix F.

2 The hydrology and hydrogeology assessment has involved consultations, detailed desk studies and field surveys to ascertain the current baseline conditions on site and to identify potential effects. Measures have been identified to avoid, minimise or mitigate any significant adverse effects identified. Finally, the significance of the residual effects has been assessed. The determination of the baseline conditions and the significance criteria used are discussed further below.

11.5.1 Baseline Assessment

1 The baseline desk study involved:

- Collation of geological and hydrogeological information;
- Identification of all catchments, watercourses, springs and boreholes;
- Estimation of peak flows;
- Collation of hydrological information for the immediate area and the main downstream watercourses;
- Identification of local flood risk locations;
- Collation of rainfall data from local stations; and
- Collation of data on public and private abstractions.

2 Data were collated from the following sources:

- Ordnance Survey 1:25,000 digital raster mapping;
- British Geological Survey 1:50,000 geological mapping, bedrock and superficial, sheets 8E (Loch Doon), 9W (New Galloway), 14E (Cumnock) and 15W (New Cumnock);
- British Geological Survey Hydrogeological Map of Scotland;
- Map of Vulnerability of Groundwater in the Uppermost Aquifer, Scotland;
- Maps of Superficial and Bedrock Aquifers, Scotland;
- Soil Survey of Scotland 1:250,000 Sheet 6, Macaulay Institute for Soil Research;
- Centre for Ecology and Hydrology, Flood Estimation Handbook CD-ROM v2;

- ISIS hydrological software;
- Wallingford HydroSolutions LowFLows 2000 software.

3 The fieldwork involved site visits undertaken during July and October 2009. The site visits concentrated on establishing baseline conditions in the local area including the site, to gain a good overall understanding of the hydrological regime of the area, and undertaking a visual inspection of the main surface waters.

11.5.2 Significance Criteria

1 The significance of potential events has been categorised taking into account three key factors: the **sensitivity** of the receiving environment; the potential **magnitude** of the event; and the **likelihood** of that event occurring. This approach is based on guidance contained within the Scottish Natural Heritage publication, 'A Handbook on Environmental Impact Assessment.'

2 The sensitivity of a receptor represents its ability to absorb the anticipated event without any resultant perceptible change. Three levels of sensitivity have been adopted (Table 11.02).

Table 11.02 - Definitions of sensitivity

Sensitivity	Definition
High	The receptor/resource has little ability to absorb change without fundamentally altering its present character, is of high environmental value, or of international or national importance.
Moderate	The receptor/resource has moderate capacity to absorb change without significantly altering its present character, has some environmental value, or of national importance.
Low	The receptor/resource is tolerant of change without detriment to its character, is of low environmental value, or of local importance.

3 Evaluation of the sensitivity of hydrology and hydrogeology can be difficult to quantify. A substantial degree of judgement, based on defined characteristics and values and calling on professional experience, is accordingly applied during evaluation.

4 The magnitude of a potential event includes its geographical extent as well as its duration. Four levels of magnitude have been adopted in this assessment (Table 11.03).

Table 11.03 - Definitions of magnitude

Magnitude	Definition
Major	Total loss or major/substantial alteration to key elements/features of the baseline conditions such that post-development character/composition/ attributes of the baseline condition will be fundamentally changed.
Moderate	Loss or alteration to one or more of key elements/features of the baseline conditions such that post development character/ composition/ attributes of the baseline condition will be materially changed.
Minor	Minor shift away from baseline conditions. Change arising from the loss/alteration will be discernable/detectable but not material. The underlying character/composition/attributes of the baseline condition will be similar to the pre-development circumstances/situation.
None	Very little change from baseline conditions. Change is barely detectable, approximating to a 'no change' situation.

5 The likelihood of an event occurring is defined as being one of **unlikely, possible** or **likely**.

6 The criteria considered during the effects evaluation have been brought together to arrive at an assessment of each effect (Table 11.04). Potential effects are concluded to be **major**, **moderate**, **minor** or **none**, taking into account proposed mitigation measures. The assessment concludes with a review to determine if the anticipated effects will be significant in terms of the Environmental Impact Assessment regulations. Those defined as major or moderate are deemed to be **significant**, whilst those which are minor or none are deemed **not significant**.

Table 11.04 - Effects matrix

Sensitivity	Magnitude	Likelihood	Effect	Significance
High	Major	Likely	Major	Significant
		Possible	Major	Significant
		Unlikely	Moderate	Significant
	Moderate	Likely	Moderate	Significant
		Possible	Moderate	Significant
		Unlikely	Minor	Not significant
	Minor	Likely	Minor	Not significant
		Possible	Minor	Not significant
		Unlikely	Minor	Not significant
	None	Likely	Minor	Not significant
		Possible	None	Not significant
		Unlikely	None	Not significant
Moderate	Major	Likely	Major	Significant
		Possible	Moderate	Significant
		Unlikely	Minor	Not significant
	Moderate	Likely	Moderate	Significant
		Possible	Minor	Not significant
		Unlikely	Minor	Not significant
	Minor	Likely	Minor	Not significant
		Possible	Minor	Not significant
		Unlikely	None	Not significant
	None	Likely	None	Not significant
		Possible	None	Not significant
		Unlikely	None	Not significant
Low	Major	Likely	Moderate	Significant
		Possible	Minor	Not significant
		Unlikely	None	Not significant
	Moderate	Likely	Minor	Not significant
		Possible	Minor	Not significant
		Unlikely	Minor	Not significant
	Minor	Likely	Minor	Not significant
		Possible	None	Not significant
		Unlikely	None	Not significant
	None	Likely	None	Not significant
		Possible	None	Not significant
		Unlikely	None	Not significant

11.6 Baseline Conditions

11.6.1 Context

1 The proposed OHL runs from the proposed Blackcraig and Margree Windfarms in the south to the Meikle Hill Substation just north-east of Dalmellington. The OHL will link the substation at Blackcraig to the Margree substation and, via Kendoon, to the collector substation at Meikle Hill.

2 The first section from Blackcraig, past Margree and round to the north of Lochinvar, is mostly through commercial forestry plantation. Some of this has been clear-felled. The route then runs west beside the Black Water, through open moorland, to cross the Water of Ken just upstream of Kendoon. It crosses the Carse of Dundeugh, through mixed woodland, before crossing the Water of Deugh where the route turns north-west to follow the main A713 as it runs along the Water of Deugh valley. In places the OHL route passes through conifer plantations. Two further crossings of the Water of Deugh are proposed, to either side of Carsphairn, where the route diverges to follow the Carsphairn Lane, still running parallel to the A713.

3 At Glenmuck, the OHL route swings north from the road, again passing through commercial forests, crossing the Mossdale Burn just upstream of Mossdale. Shortly before Dalmellington the route bears east along the Parrie Burn, through mixed forest and open ground, to reach the Meikle Hill substation.

4 Most of the OHL will be overhead, with the majority on L7 towers. The section of the line connecting Blackcraig and Margree Windfarms to Kendoon will use the smaller wood poles. A short section of underground cable will be required to make the connection between the wood pole and L7 sections, at Dalshangan.

11.6.2 Designated and Protected Areas

1 Scottish Natural Heritage identifies a number of protected areas in the region. Nearby sites and sites downstream of the route are listed below, with information on the sites, their proximity to the route and the basis for their designations provided in Technical Appendix F.

- Benbeoch SSSI;
- Dalmellington Moss SSSI;
- Bogton Loch SSSI;
- Ness Glen SSSI;
- Loch Doon SSSI;
- Cleugh SSSI;
- Water of Ken Woods SSSI;
- Kenmure Holms SSSI;
- Airds of Kells Wood SSSI;
- River Dee (Parton to Crossmichael) SSSI;
- Threave & Carlingwark Loch SSSI;
- Loch Ken & River Dee Marshes SPA.

2 In addition, both the River Doon and the River Dee catchments have been designated as protected areas under the Freshwater for Fish Directive. The surface water catchment areas for the Benloch Burn and for Lochinvar are Drinking Water Protected Areas, and the whole alignment is within Drinking Water Protected Areas for groundwater bodies.

11.6.3 Climate

1 The standard annual average rainfall (SAAR) for the Study Area, calculated from the Flood Estimation Handbook (FEH), ranges from 1464mm to 1822mm. In context, annual rainfall in Scotland varies from over 3000mm in the Western Highlands to less than 800mm in areas near the east coast.

2 Average monthly rainfall data are available from the SEPA rain gauges at Drumjohn (NX 524 975), on the proposed OHL route and approximately 9.5km south-east of Dalmellington, and Penwhapple Reservoir near Girvan (NX 254 969), 27km west of the route. These data are compared with long term average monthly data from Eskdalemuir monitoring station (NS 256 977), 65km east of the site. The data are displayed graphically in Technical Appendix F, along with additional background information.

3 The general trends for the average monthly rainfall are similar for all three stations and provide a broad indication of the rainfall patterns likely in the area of the OHL.

11.6.4 Geology

1 The OHL route is underlain by a sequence of mixed greywacke sandstones with subsidiary siltstones, conglomerates and mudstones, variably of Ordovician and Silurian age. The youngest strata of this group are in the area around Blackcraig substation, becoming progressively older in a north-westerly direction. The greywackes have undergone considerable folding and dip angles are often steep or near-vertical.

2 The area has undergone extensive faulting and the OHL route crosses several major faultlines, including the Southern Uplands Fault just south of Dalmellington. Most of the faultlines are oriented north-east–south-west, although a later fault runs parallel to the main Water of Deugh–Water of Ken valley on a north-west–south-east axis.

3 North of the Southern Uplands Fault is a sequence of Devonian to Carboniferous strata. The Devonian rocks are sandstones and conglomerates with basaltic andesite lavas; occasional felsite intrusions are present in some areas. These strata all belong to the Lower Old Red Sandstone system.

4 The area north and west from Dalmellington, including the very northern end of the OHL, is underlain by Carboniferous Coal Measures sandstones and mudstones with coal seams, limestone bands and intrusive doleritic sills. This area has both active and disused coal mines.

5 The bedrock along the proposed OHL route is extensively overlain by superficial deposits, which are dominated by peat and boulder clay.

6 Superficial geology is dominated by deposits of boulder clay, moraine and peat accumulations. Moraine deposits are concentrated in the area south of Loch Doon, blanketing the main valley floors and lower slopes. Above the moraine and along smaller valleys the boulder clay deposits become important. Peat accumulations are fairly discontinuous and typically occur on higher ground, although the Carsphairn Lane has peat development alongside the watercourse for most of its length. A similar development of peat is present in the area north of Bogton Loch, just to the west of Dalmellington.

7 Most of the river valleys have deposits of alluvium; these are often discontinuous in the upper reaches but have wider coverage in areas with well-developed flood plains, such as around Carsphairn (NX 562 932) and along the River Doon downstream from Dalmellington.

11.6.5 Hydrogeology

1 The Ordovician and Silurian bedrock that underlies the majority of the Study Area has a very low permeability and consequently a low capacity for storing and transporting groundwater. Despite mostly consisting of sandstones, the greywackes that dominate the succession have a wide range of grain sizes and include a significant mud component, which substantially reduces water storage potential. The greywacke sandstones demonstrate low productivity and the limited storage and flow capacity achieved is restricted to shallow fractures, bedding planes and permeable fault lines.

2 North of the Southern Uplands Fault the bedrock has a higher permeability, especially within the sandstone units of the Old Red Sandstone and Coal Measures strata. These sandstones have moderate productivity through both intergranular and fracture flow and both are considered to form locally important aquifers within the Study Area. Further downstream along the River Doon, the Old Red Sandstone and Coal Measures strata are classed as highly productive aquifers of limited extent.

3 The overlying peat, boulder clay and moraine deposits have very limited permeability, although sandy or gravelly lenses within the boulder clay or moraine deposits could have a local storage capacity and productivity. The alluvial deposits within the river valleys form concealed aquifers of limited or local potential, particularly in the area around Dalmellington; however, this aquifer is likely to be slow to recharge owing to its limited surface expression and restricted size.

4 Given the generally low permeability, the water table is likely to reflect the surface topography. Groundwater within peat is likely to be perched on less permeable underlying till deposits. In areas where peat deposits are thick, such as upland areas of low slope, groundwater from peat provides some baseflow to the local streams and rivers. Groundwater infiltration in the Study Area, based on geology, topography and baseflow data, is estimated to be less than 100mm per year for most of the site and 100-300mm for the northernmost end of the area. The geological formations do not widely contain groundwater in exploitable quantities although several private water supplies in the area are reliant on springs, wells and boreholes which exploit groundwater on a local scale.

5 The Groundwater Vulnerability Map of Scotland classes the grid connection route as 'Most vulnerable' (5) to 'Slightly vulnerable' (2). The most vulnerable sections lie towards the southern end of the route and correlate with the areas which have limited superficial cover. This reflects the proximity of the bedrock to the ground surface, indicating that potential contaminants could easily infiltrate into the groundwater but would be slow to dilute and disperse owing to the low groundwater storage and flow capacity of the bedrock. Areas with mapped peat, boulder clay or moraine cover have a lower vulnerability, reflecting the protection afforded by the low permeability superficial deposits.

11.6.6 Geomorphology

1 The landscape in this western region of the Southern Upland Hills has undergone historical glaciation and subsequent fluvial erosion. The landform features in the local area reflect these processes and consist of low rounded hills and gently sloping valleys. The River Doon, Water of Deugh and Water of Ken and their principal tributaries are prominent features of the area. The flood plains associated with these rivers are crossed in several places by both the existing and proposed route alignments.

11.6.7 Soils

1 The distribution of soils within the Study Area is dependent on the local geology, topography and drainage regime. Information on the soils found on and adjacent to the site comes from the Soil Survey of Scotland map, Sheet 6, South-West Scotland, 1:250,000 and the main units are summarised in Table 11.05.

2 The soils in Table 11.05 are listed in order of dominance in relation to the proposed development. In the northern part of the Study Area blanket peat is abundant on the higher ground around the alignment. Further south, this gives way to more mixed peaty soils including peaty podzols and peaty gleys. Brown forest soils form a small component of several soil units across the site, with minor noncalcareous gleys. Alluvial soils are present along the main river valleys.

Table 11.05 - Soils information

Soil Unit	Soil Association	Component Soils	Parent Material	Associated Vegetation	Associated Landform	% of Route Length
230	Ettrick	Peaty podzols, peaty gleys; some peat and rankers	Lower Palaeozoic greywackes with shales	Moist Atlantic heather moor. Heath rush-fescue grassland. Blanket and flying bent bog	Hills with complex strong and steep slopes; non-rocky	19.6%
214	Ettrick	Peaty podzols, brown forest soils, peat, peaty gleys	Lower Palaeozoic greywackes with shales	Moist Atlantic heather moor. Blanket and flying bent bog. Flying bent grassland	Hummocky moraine	15.8%
4	ORGANIC SOILS	Blanket peats	Organic Deposits	Blanket and flying bent bog. Upland and mountain blanket bog	Uplands and northern lowlands with gentle and strong slopes	13.7%
213	ETTRICK	Peaty podzols, peaty gleys, peat	Lower Palaeozoic greywackes with shales	Moist Atlantic heather moor. Heath rush-fescue grassland. Blanket and flying bent bog	Drumlins with intervening simple and complex gentle slopes	12.7%
216	Ettrick	Peaty podzols, peaty gleys, peat; some brown forest soils and rankers	Lower Palaeozoic greywackes with shales	Moist Atlantic heather moor. Heath rush-fescue grassland. Blanket bog	Undulating uplands with complex and short gentle and strong slopes	8.4%
210	Ettrick		Lower Palaeozoic greywackes with shales	Sharp-flowered rush pasture. Tussock grass pasture. Arable and permanent pastures	Foothills and depressions with gentle slopes	5.2%

3 Although peat forms a component of many of the soils present along the route alignment, the detailed desk study and subsequent site walkovers indicate that there will be very little construction in areas of peatland. For this reason it was considered inappropriate to undertake a detailed peat assessment for the route. Any pockets of peat encountered during construction will be avoided by micrositing as far as possible, thereby minimising any risk to peatland hydrology and stability.

11.6.8 Hydrology

1 Site hydrology is dominated by the Water of Deugh/Water of Ken and, in the nothern section, the River Doon and their various tributaries.

2 The Water of Deugh/Water of Ken catchment has its main outflow to the south, flowing into the River Dee and ultimately into the Solway Firth at Kirkcudbright. The River Doon flows roughly north-west to meet the Ayrshire coast just south of Ayr. For the purposes of this study, these two main catchments have been considered in detail, with consideration also given to relevant sub-catchments where these are easily definable.

11.6.8.1 Catchment description

1 Local hydrological features and catchment extents are shown in Figure 11.01a-h and Figure 11.02a-c. Catchment area information is derived from Flood Estimation Handbook data and professional judgement.

2 The OHL route crosses through the areas drained by the River Doon, the Water of Deugh and the Water of Ken and a number of their respective tributaries. The smaller streams display similar characteristics and morphology in the local area, with many running through upland conifer plantations with flows supplemented by artificial forest and agricultural drains. The larger rivers, principally the River Doon, the Water of Deugh and the Water of Ken, pass through varied landuses from upland moorland and forestry plantations to farmland, wetlands and built-up areas. Catchment data is provided in Table 11.06, including the total length of route within each catchment.

Table 11.06 - Catchment area information

Catchment	Total catchment area (km^2)	Length of proposed route within catchment (km)	Percentage of proposed route within catchment	Length of decomm-issioned N-route within catchment (km)	Percentage of decomm-issioned N-route within catchment
River Doon	233	11.2	31%	18.9	58%
Water of Deugh / Water of Ken	443	25.4	69%	13.7	42%
TOTAL		36.6	100%	32.6	100%

Photograph 11.1a

11.6.8.1.1 River Doon

1 The River Doon has a catchment area of approximately 233km^2 within the Study Area and principally drains commercial forests, grazing land and upland rough moorland. The river flows in a north-westerly direction and eventually flows into Firth of Clyde at the Foot of Doon, south of Ayr. There are several settlements situated beside the River Doon, of which for this study the most important are Patna, Waterside and Dalmellington.

2 There are two main tributaries to the River Doon that are important within the Study Area. These are the Cummock Burn and the Muck Water, both of which join the River Doon just west of Dalmellington. The Cummock Burn runs parallel to the B471 and drains the northernmost section of the proposed grid line route. Some of its tributaries run from the opencast mine workings south of Benbeoch but most flow through open grazing land and forestry. One of the smaller tributaries, the Linn Water, is shown in Photograph 11.1 (a).

3 The Muck Water runs for the most part beside the A713 to Dalmellington. It has two main tributaries, the Parrie Burn which joins the Muck Water just north of Kirn Bridge (NS 486 054) and the Mossdale Burn which joins the Muck Water at Mossdale (NS 492 040). The Muck Water and its tributaries flow for the most part through conifer forests, with minor areas of open land.

11.6.8.1.2 Water of Ken

1 The Water of Ken catchment covers an area of approximately 443km^2 within the Study Area and includes the majority of the proposed grid connection. Most of the land is under conifer forestry plantations with some open agricultural and rough moorland. There are several settlements within the catchment, of which the most important for this study are St John's Town of Dalry, New Galloway and Carsphairn.

Photograph 11.1b

2 The Water of Ken itself is a major river, flowing south to Kendoon Loch where it is joined by the Water of Deugh and flows in a more south-easterly direction. It is a principal tributary to the River Dee, which it joins at Loch Ken, and reaches the Solway Firth at Kirkcudbright. A number of smaller watercourses join the Water of Ken, including the Black Water just downstream of Kendoon Loch and the Garple Burn/Margree Burn system between St John's Town of Dalry and New Galloway.

3 The Water of Deugh is a major tributary of the Water of Ken, which it joins at Kendoon Loch. It runs south through Carsphairn Forest, a substantial conifer plantation lying north of the proposed grid line, before joining the main valley at Carsphairn. From here, the Water of Deugh turns more to the south-east, through agricultural land, down to its confluence with the Water of Ken. The Water of Deugh is shown in Photograph 11.1(b) by the Green Well of Scotland, just north of Carsphairn (NX 557 945). A number of smaller watercourses join the Water of Deugh, including the Benloch Burn to the north of Carsphairn.

4 The Carsphairn Lane joins the Water of Deugh at Carsphairn and drains the section of the route between Carsphairn and the catchment watershed west of Lamford (NX 521 991). The upper part of this area is conifer forestry plantation, with the lower section forming agricultural land.

5 Additional catchment data are given in Technical Appendix F.

11.6.8.1.3 Flooding

1 SEPA has developed a Flood Risk Map showing 1:200 year probability events for river flooding; the local data are shown in Figure 11.04a-h. The River Doon, Water of Deugh and Water of Ken plus a number of their tributaries have sections that are prone to flooding. The grid connection crosses the Water of Deugh and its floodplain, plus the Black Water, a tributary to the Water of Ken, and its floodplain.

2 In addition, the existing N-route between Kendoon and Polnessan crosses the Water of Deugh floodplain and the River Doon floodplain.

3 Flood risk and the implications are discussed in the section on Predicted Effects and Mitigation Measures below.

11.6.8.2 Water resources

11.6.8.2.1 Public water supplies

1 The catchment areas for Lochinvar and Benloch Burn are both Drinking Water Protected Areas Benloch Burn catchment lies entirely upstream of the proposed OHL and will therefore be unaffected by the development. The proposed alignment does, however, pass through the Lochinvar catchment. Approximately 1.5km of the route is within the protected area and three stream crossings will be required.

2 An additional public supply was identified during the site visit in October 2009, with a small treatment plant adjacent to Kendoon Youth Hostel (NX 615 883). It is not known at present where this supply sources its water as no obvious intake was visible on the Black Water, which is the nearest surface waterbody to the plant.

3 The entire grid connection, for both existing infrastructure to be decommissioned and proposed new line, lies within Drinking Water Protected Areas for groundwater bodies.

11.6.8.2.2 Private water supplies

1 Private water supply information has been provided by East Ayrshire and Dumfries & Galloway Councils. Sources located within 2km of the proposed route are listed in Table 11.07 and their locations shown in Figure 11.01a-h.

Table 11.07 - Private water supply locations

PWS Property	Grid Reference	Type of Supply	No. Properties Supplied	Distance From Line (approx)
Shankston Farm	NS 406 118	unknown		1,360m
Carclout Farm	NS 400 099	unknown		1,840m
The Schoolhouse	NS 428 104	unknown		950m
Auldcraigoch	NS 453 042	unknown		1,930m
Clawfin Farm	NS 505 072	mains		n/a
Glenmuck Farm	NS 514 021	stream	1	325m
Meadowhead	NX 518 994	spring	1	250m
Lamford	NX 520 991	spring	1	150m
Drumjohn	NX 524 976	unknown		270m
Knockengorroch	NX 555 970	spring		1,540m
Deugh Studio, Knockengorroch	NX 555 971	unknown		1,590m
Lamloch	NX 525 963	unknown		1,120m
Woodhead	NX 531 958	spring	1	1,030m
Brockloch Farm & Cottage & Fourwinds	NX 537 959	collector well	3	300-480m
Holm of Daltallochan & Bridge-end	NX 554 941, NX 557 944	spring	2	100-520m
Lagwyne	NX 558 939	well/spring	1	355m
Garryhorn	NX 547 934	spring	1	1,540m
Carnavel	NX 563 927	unknown		715m
Burnfoot	NX 590 923	borehole	2	1,260m
Bardennoch & West Bardennoch	NX 577 917	spring	2	105-190m
Nether Loskie	NX 600 917	well	1	1,860m
Braidenoch	NX 566 903	unknown		1,750m
Carminnows & Cottage	NX 600 907	borehole	2	1,510-1,470m
Knowehead	NX 609 906	unknown		1,830m
Polquhanity	NX 591 897	unknown		195m
Dalshangan, Lodge & Cottage	NX 596 889	borehole	3	215-365m
Polmaddie Farm	NX 599 880	borehole	1	490m
Deughside	NX 597 880	unknown		640m
1-14 Dundeugh	NX 599 879	stream	14	500m
Kendoon Power Station	NX 605 877	mains	16	n/a
Kendoon Hall	NX 605 877	mains	16	n/a
Kendoon properties	NX 604 876	mains	16	n/a
Stroangassel	NX 604 867	unknown		
Glenhoul & Lodge	NX 609 878	spring	2	215-720m
Arndarroch Cottage	NX 616 892	well/ borehole	1	1,230m
Arndarroch	NX 616 893	well	1	1,270m
Kendoon Youth Hostel	NX 615 883	unknown		280m
Blackwater Cottage	NX 616 883	spring	1	280m
Nether Cleugh & Cottage	NX 613 862	unknown		1,770m
Mackilston	NX 624 868	unknown		1,310m
Marskaig	NX 634 886	well	1	630m
1&2 Glenshimmeroch	NX 649 866	unknown		660-670m
Corriedoo	NX 680 829	unknown		1,010m
Knockman	NX 677 826	spring	1	1,410m

11.6.8.2.3 Water quality

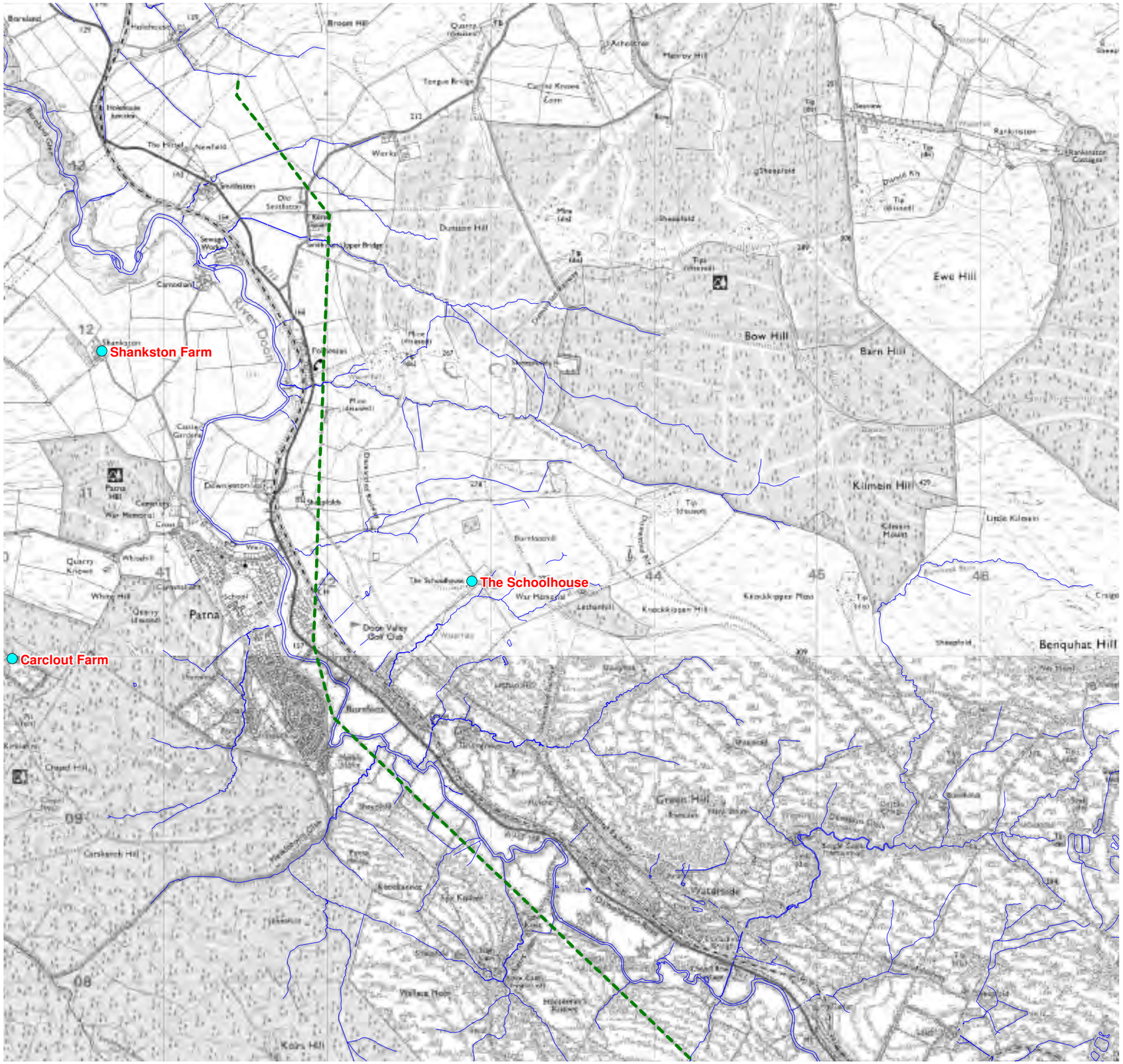
1 The Water Framework Directive came into force in December 2003 and is implemented in Scotland through the Water Environment and Water Services (Scotland) Act 2003. A key objective of this Directive is the achievement of 'good ecological status' (as a minimum) of all natural waterbodies by 2015. This involves a move towards a risk-based classification system (SEPA, 2009[1]). This risk-based system highlights issues such as stream morphology and existing artificial structures in addition to chemical water quality. Heavily modified waterbodies, which can no longer be considered to be natural, are classified on the basis of 'ecological potential'.

2 A number of local watercourses and waterbodies have been classified under the new system; the results are presented in Table 11.08 and shown in Figure 11.03a-c.

Table 11.08 - Summary of waterbody classification

Waterbody	Risk Class	Overall Classification	Summary of Pressures
River Doon	1a	Bad ecological potential	Diffuse source pollution; morphological alterations; flow regulation; abstraction
Loch Doon	1a	Poor ecological potential	Abstraction; diffuse source pollution; morphological alterations
Cummock Burn	1b	Good	Morphological alterations
Muck Water	1b	Poor	Diffuse source pollution; morphological alterations
Water of Deugh (upstream of Carsphairn Lane)	1a	Bad ecological potential	Diffuse source pollution; flow regulation; morphological alterations; abstraction
Water of Deugh (Carsphairn Lane to Water of Ken)	1a	Poor ecological potential	Morphological alterations; flow regulation
Water of Ken (upstream of High Bridge of Ken)	2b	Poor	Morphological alterations

1 - SEPA, 2009. River Basin Management Planning, Interactive Map - http://gis.sepa.org.uk/rbmp/ (accessed October 2009).



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Legend

- Proposed OHL route
- Proposed OHL infrastructure
- Pulling compounds
- Substations, construction compounds
- Proposed access tracks
- N-Route
- N-Route to be decommissioned
- Watercourses

Watercourse crossings

- New crossings
- Existing crossings

Public water supply sources

- River
- Loch

Private water supply sources

- Property
- Header tank/source location
- Group of properties

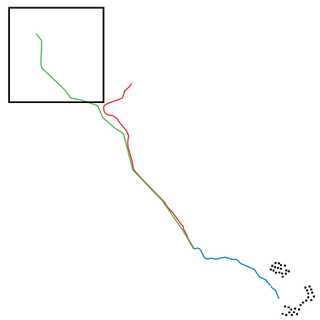

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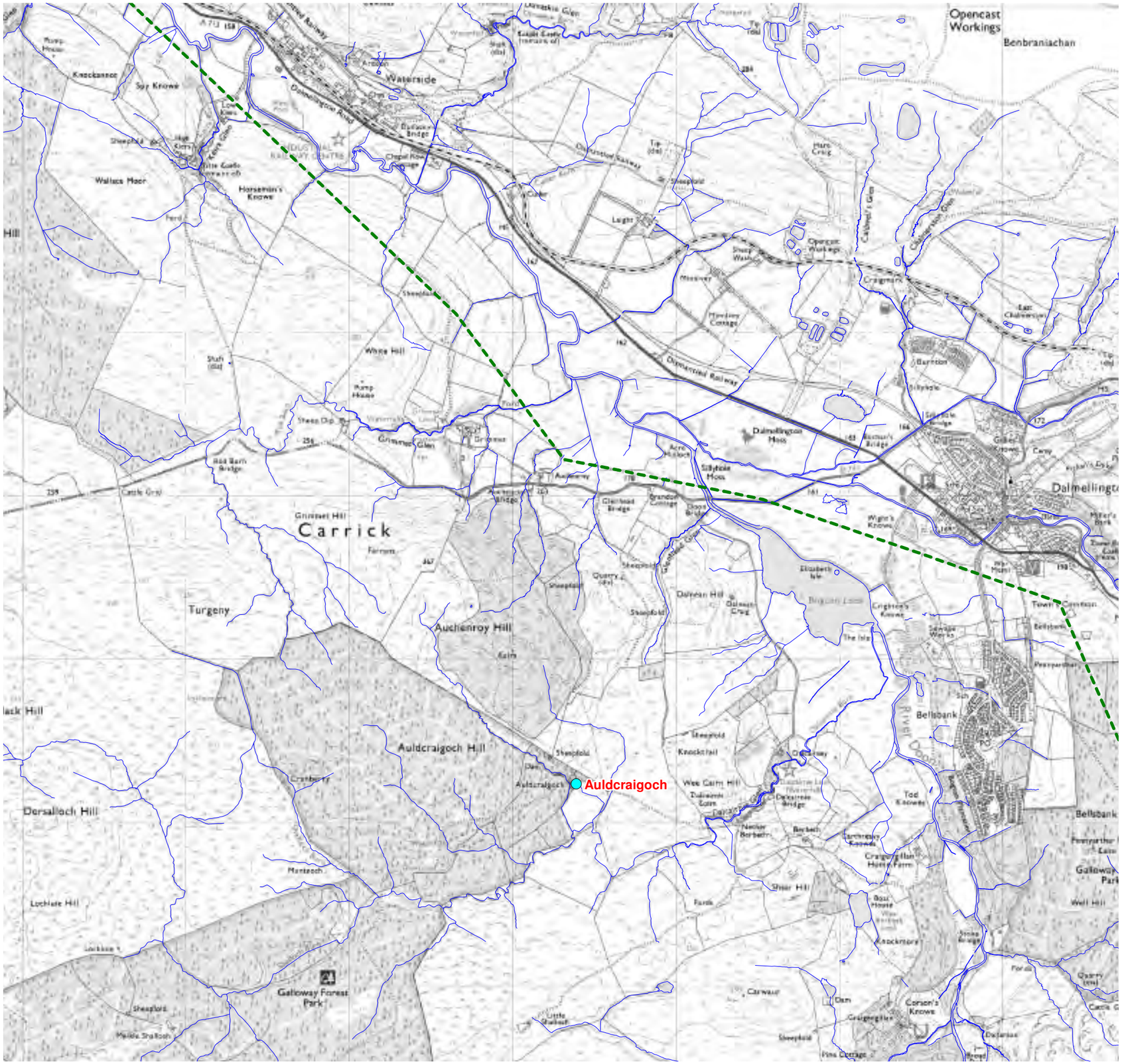
Figure 11.01a - Hydrological features 1 of 8



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Legend

- Proposed OHL route
- Proposed OHL infrastructure
- Pulling compounds
- Substations, construction compounds
- Proposed access tracks
- N-Route
- N-Route to be decommissioned
- Watercourses

Watercourse crossings

- New crossings
- Existing crossings

Public water supply sources

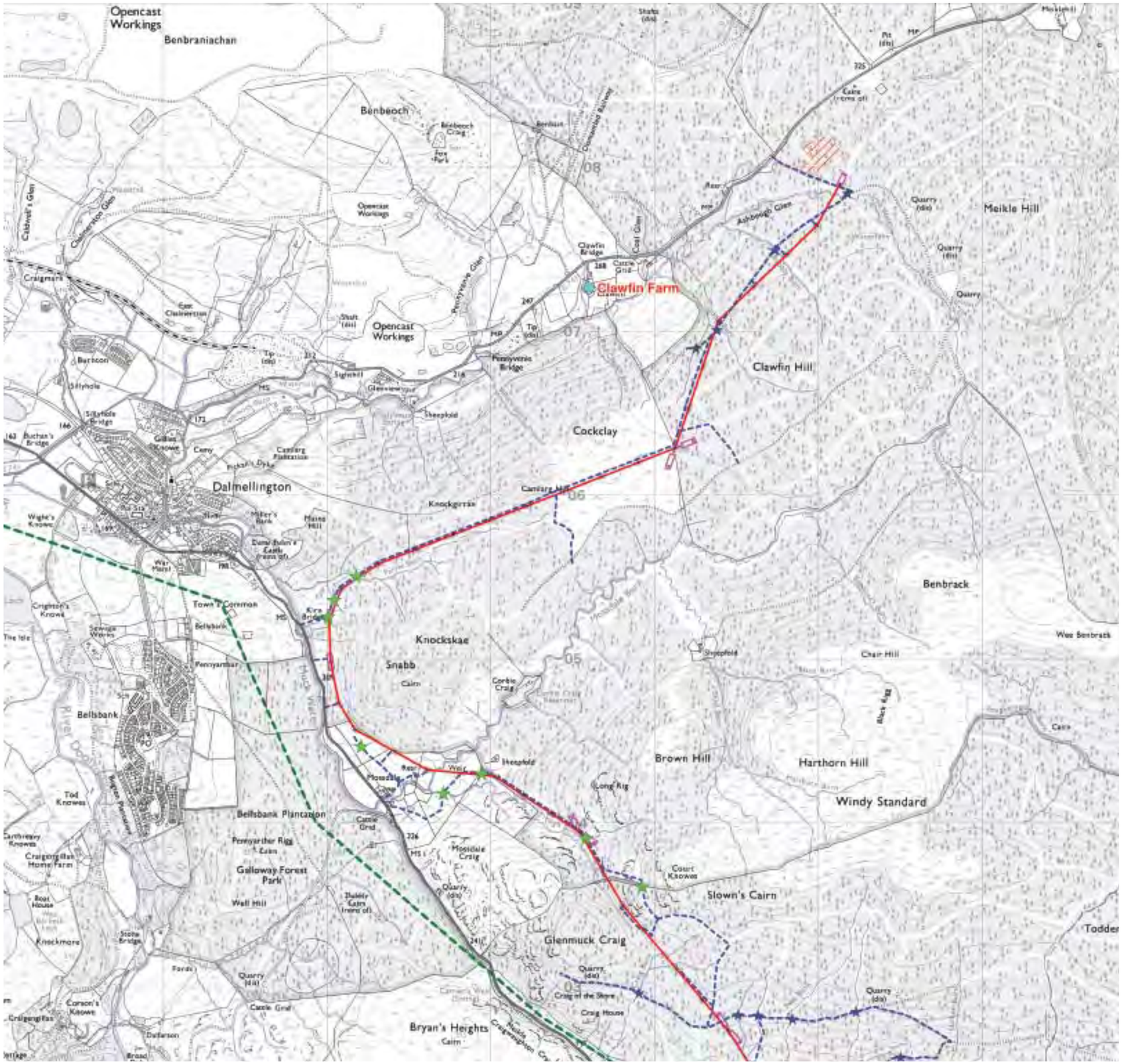
- River
- Loch

Private water supply sources

- Property
- Header tank/source location
- Group of properties

0m 0.5km 1km

Figure 11.01b - Hydrological features 2 of 8



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Legend

- Proposed OHL route
- Proposed OHL infrastructure
- Pulling compounds
- Substations, construction compounds
- Proposed access tracks
- N-Route
- N-Route to be decommissioned
- Watercourses

Watercourse crossings

- New crossings
- Existing crossings

Public water supply sources

- River
- Loch

Private water supply sources

- Property
- Header tank/source location
- Group of properties

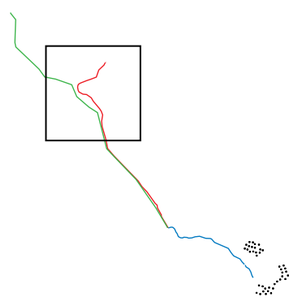

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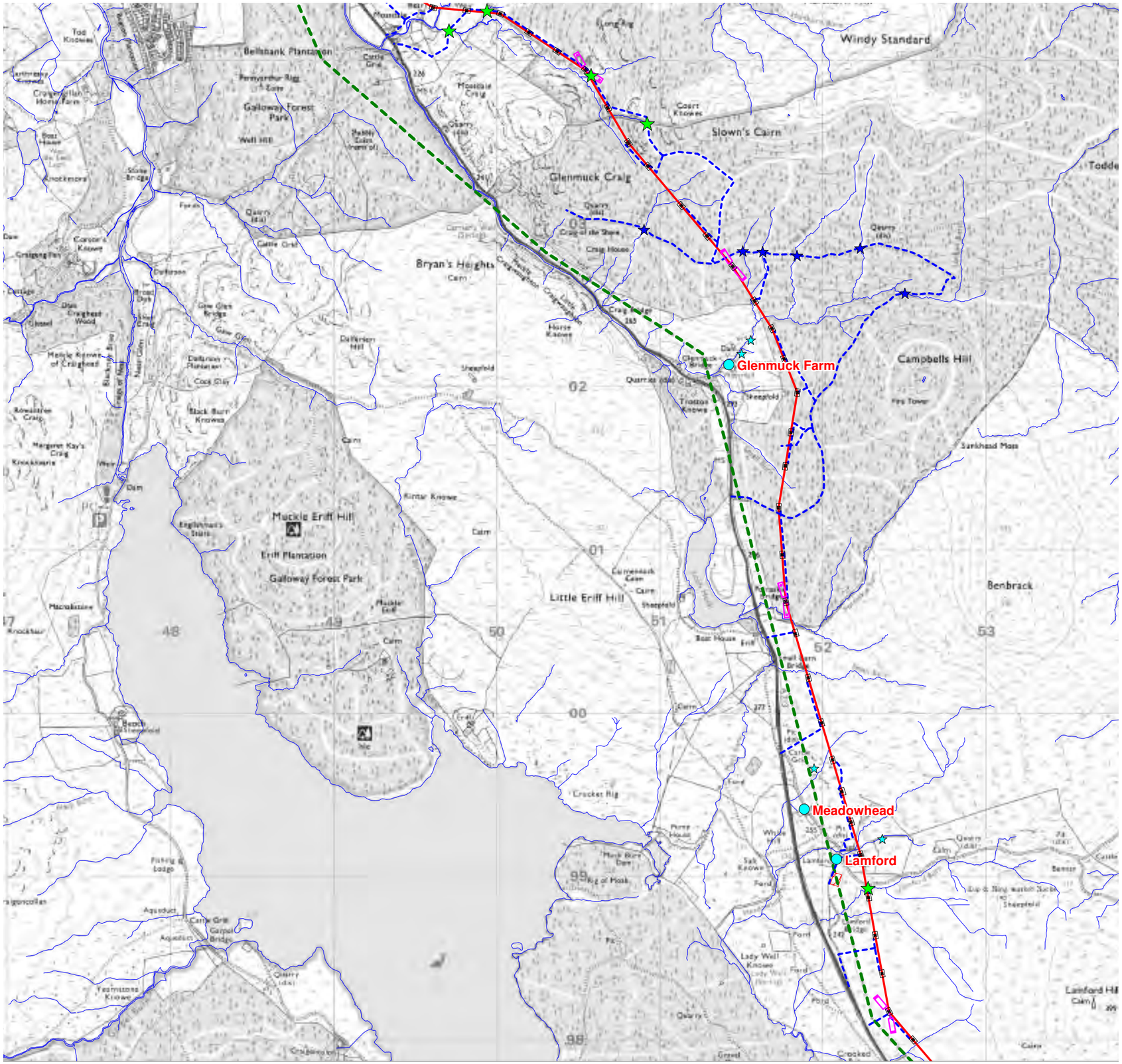
Figure 11.01c - Hydrological features 3 of 8



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Legend

- Proposed OHL route
- Proposed OHL infrastructure
- Pulling compounds
- Substations, construction compounds
- Proposed access tracks
- N-Route
- N-Route to be decommissioned
- Watercourses

Watercourse crossings

- New crossings
- Existing crossings

Public water supply sources

- River
- Loch

Private water supply sources

- Property
- Header tank/source location
- Group of properties

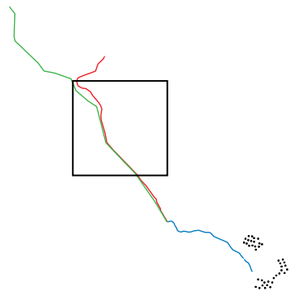

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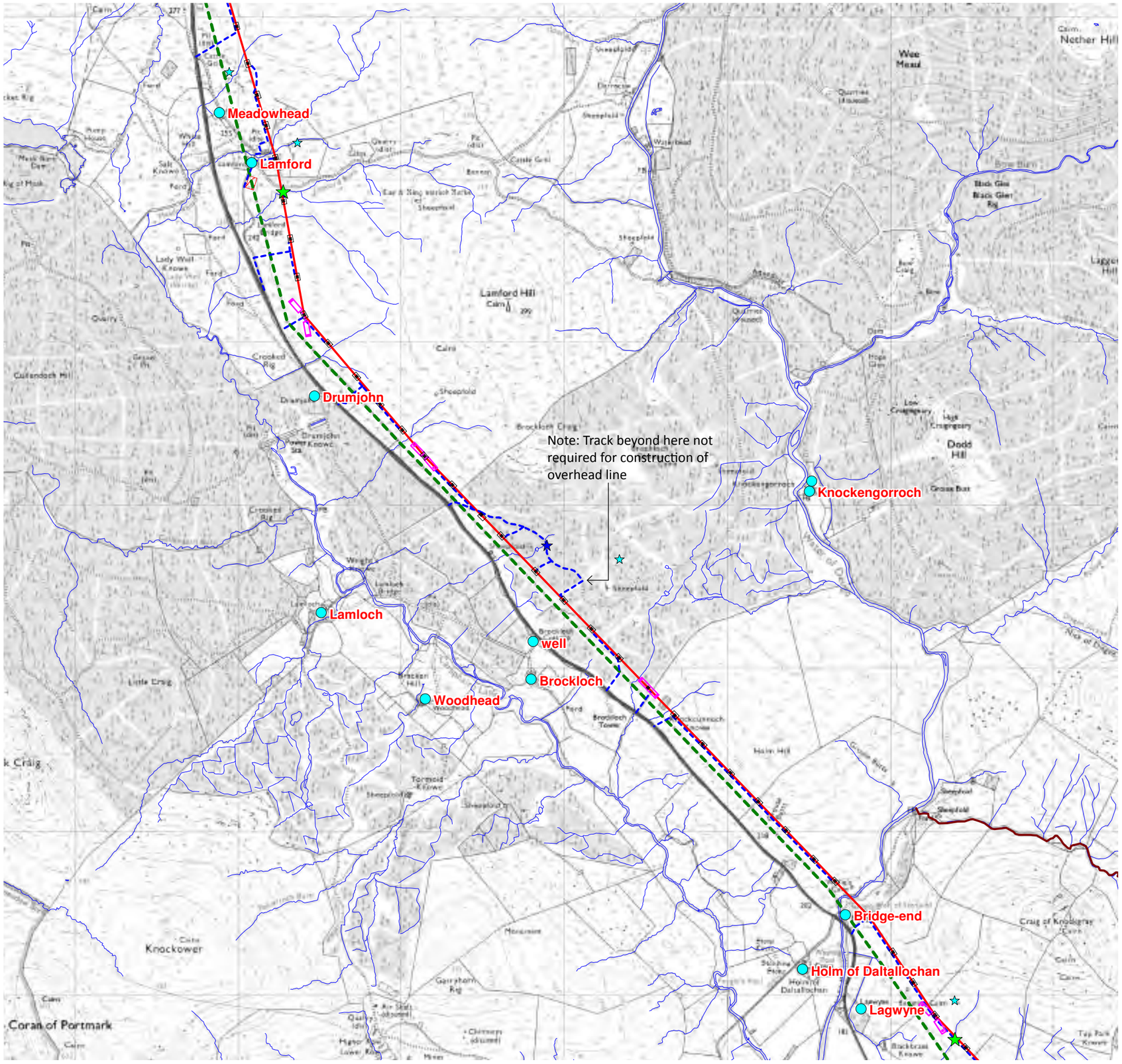
Figure 11.01d - Hydrological features 4 of 8



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Legend

- Proposed OHL route
- Proposed OHL infrastructure
- Pulling compounds
- Substations, construction compounds
- Proposed access tracks
- N-Route
- N-Route to be decommissioned
- Watercourses

Watercourse crossings

- New crossings
- Existing crossings

Public water supply sources

- River
- Loch

Private water supply sources

- Property
- Header tank/source location
- Group of properties

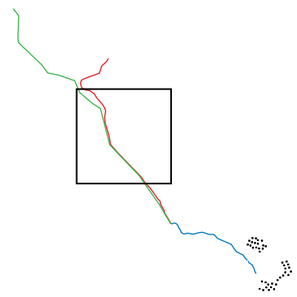

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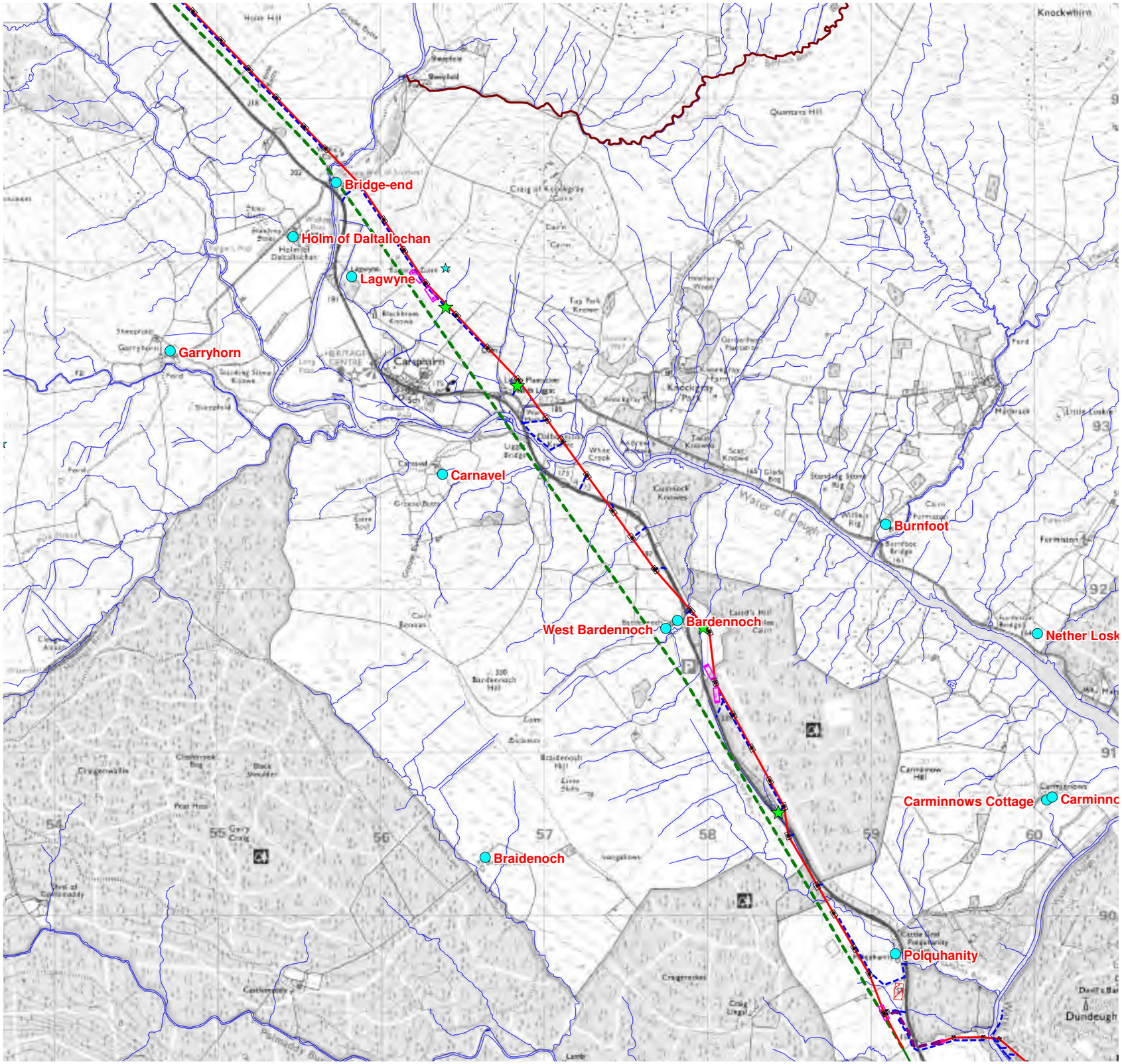
Figure 11.01e - Hydrological features 5 of 8



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Legend

- Proposed OHL route
- Proposed OHL infrastructure
- Underground cable
- Pulling compounds
- Substations, construction compounds
- Proposed access tracks
- N-Route
- N-Route to be decommissioned
- Watercourses

Watercourse crossings

- New crossings
- Existing crossings

Public water supply sources

- River
- Loch

Private water supply sources

- Property
- Header tank/source location
- Group of properties

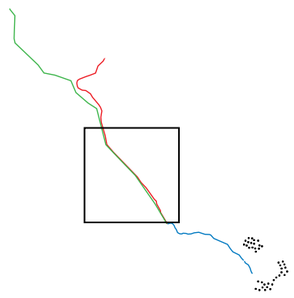

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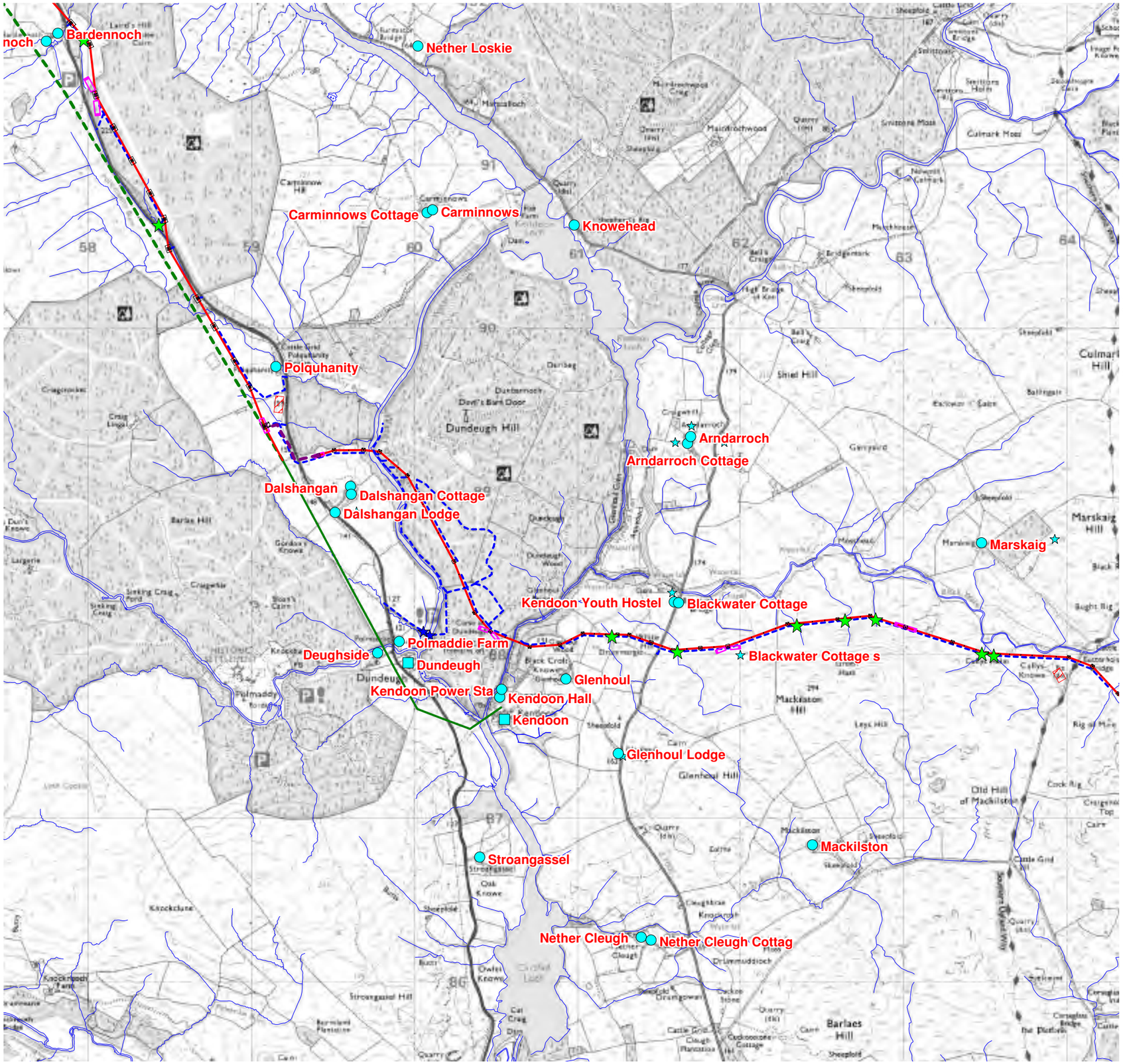
Figure 11.01f - Hydrological features 6 of 8



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Legend

- Proposed OHL route
- Proposed OHL infrastructure
- Underground cable
- Pulling compounds
- Substations, construction compounds
- Proposed access tracks
- N-Route
- N-Route to be decommissioned
- Watercourses

Watercourse crossings

- New crossings
- Existing crossings

Public water supply sources

- River
- Loch

Private water supply sources

- Property
- Header tank/source location
- Group of properties

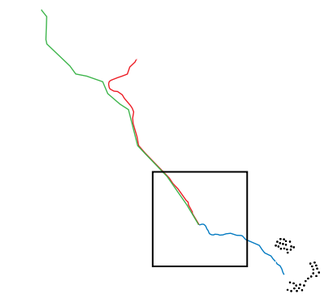

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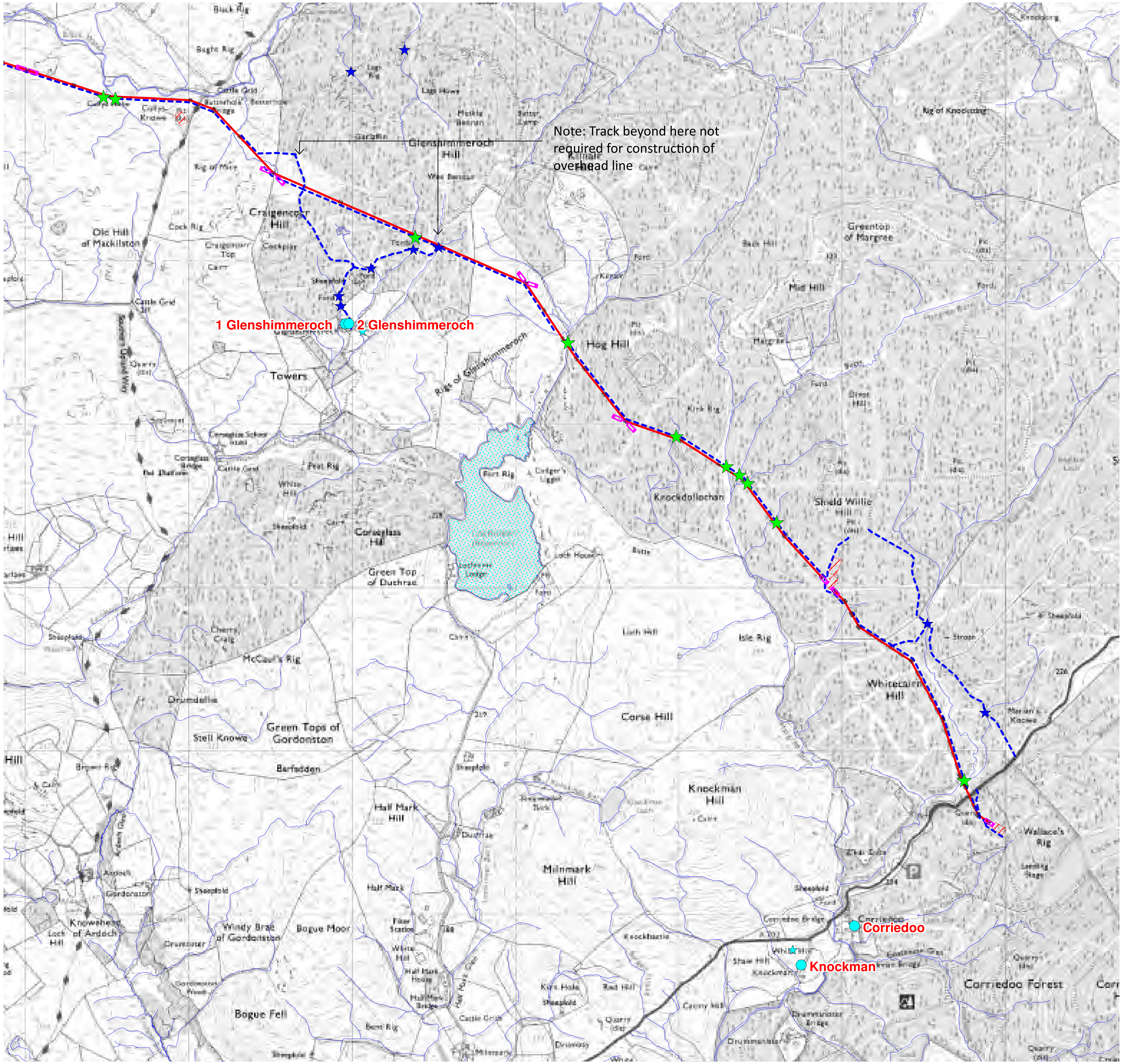
Figure 11.01g - Hydrological features 7 of 8



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Legend

- Proposed OHL route
- Proposed OHL infrastructure
- Pulling compounds
- Substations, construction compounds
- Proposed access tracks
- N-Route
- N-Route to be decommissioned
- Watercourses

Watercourse crossings

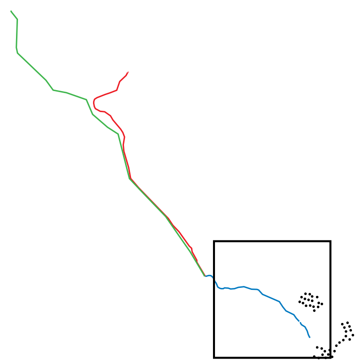
- New crossings
- Existing crossings

Public water supply sources

- River
- Loch

Private water supply sources

- Property
- Header tank/source location
- Group of properties



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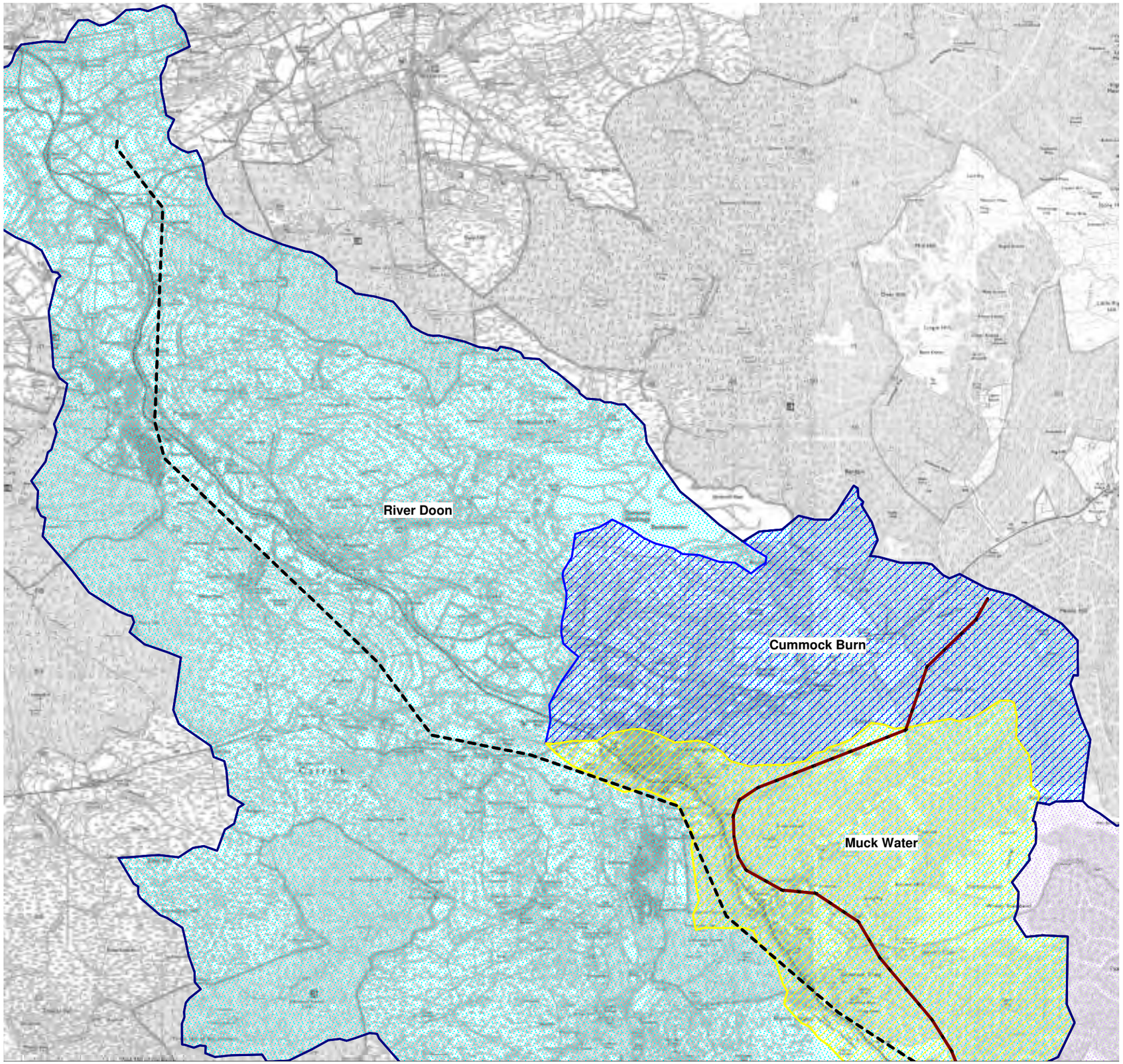
0m 1km

Figure 11.01h - Hydrological features 8 of 8



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Legend

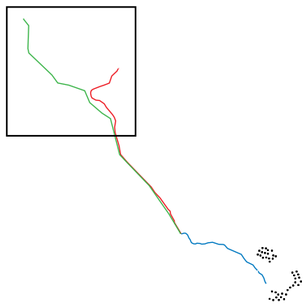
- Proposed OHL route
- N-Route to be decommissioned
- N-Route

Watercourse catchments

- River Doon
- Water of Deugh/ Water of Ken

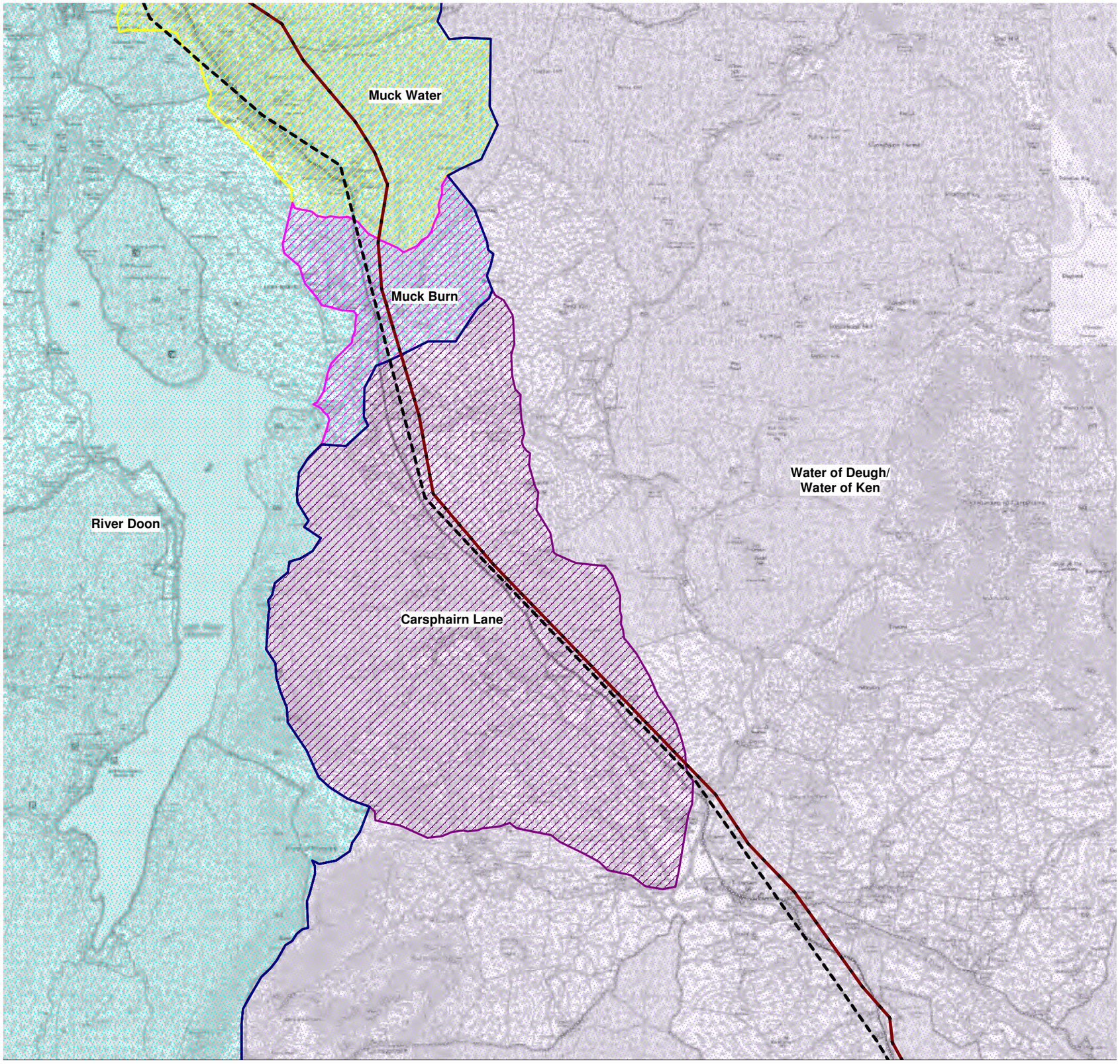
Sub-catchments

- Black Water
- Garple/ Margree Burn
- Lochinvar Burn
- Earlstoun Burn
- Carsphairn Lane
- Cummock Burn
- Muck Water
- Muck Burn



0m 1km 2km

Figure 11.02a - Catchments 1 of 3



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Legend

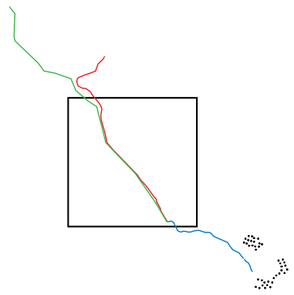
- Proposed OHL route
- N-Route to be decommissioned
- N-Route

Watercourse catchments

- River Doon
- Water of Deugh/ Water of Ken

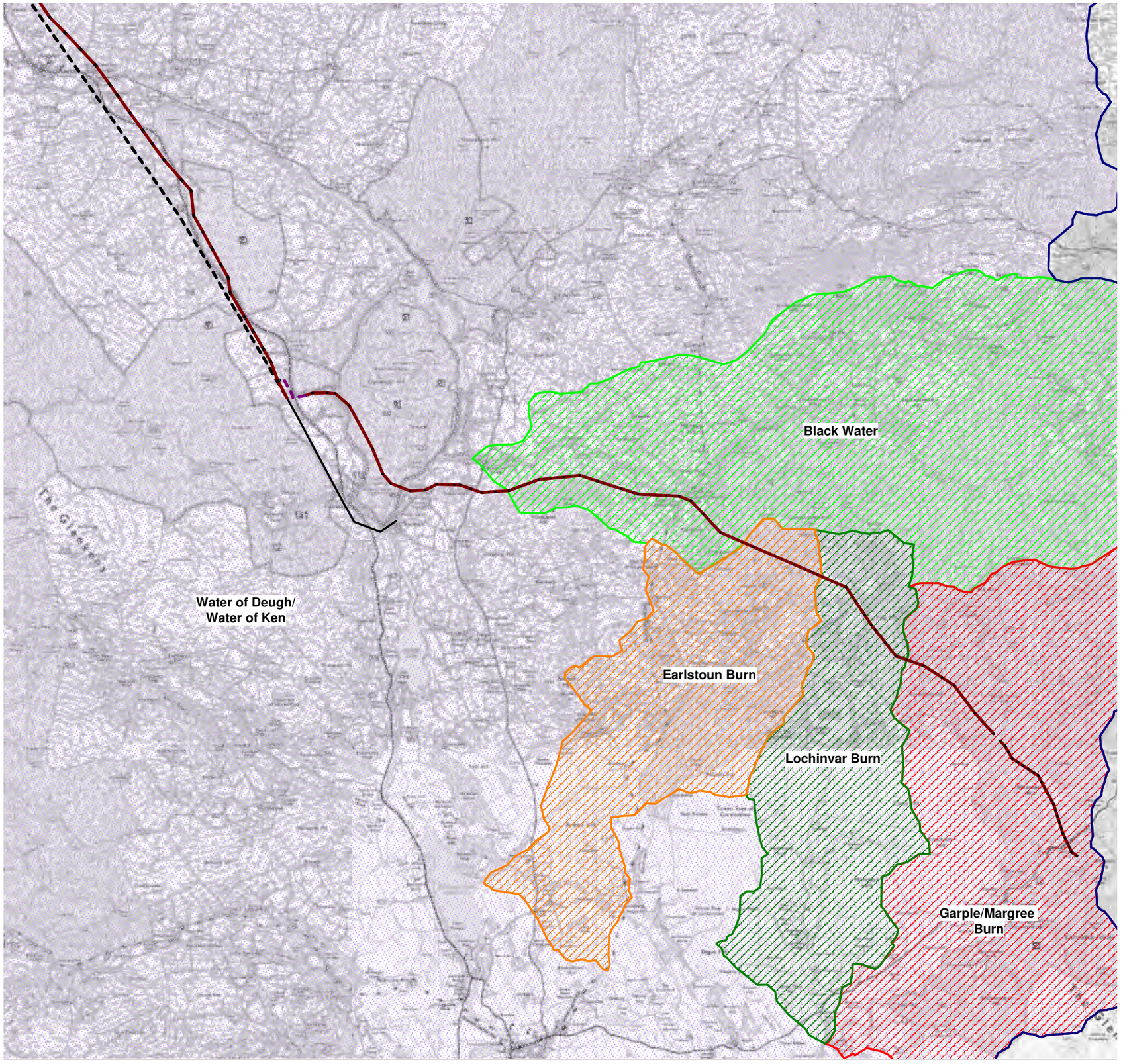
Sub-catchments

- Black Water
- Garple/ Margree Burn
- Lochinvar Burn
- Earlstoun Burn
- Carsphairn Lane
- Cummock Burn
- Muck Water
- Muck Burn



0m 1km 2km

Figure 11.02b - Catchments 2 of 3



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Legend

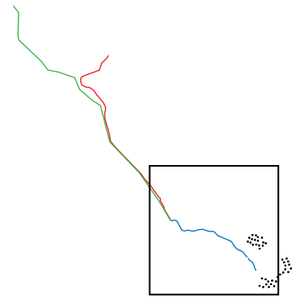
- Proposed OHL route
- N-Route to be decommissioned
- N-Route
- Underground cable

Watercourse catchments

- River Doon
- Water of Deugh/ Water of Ken

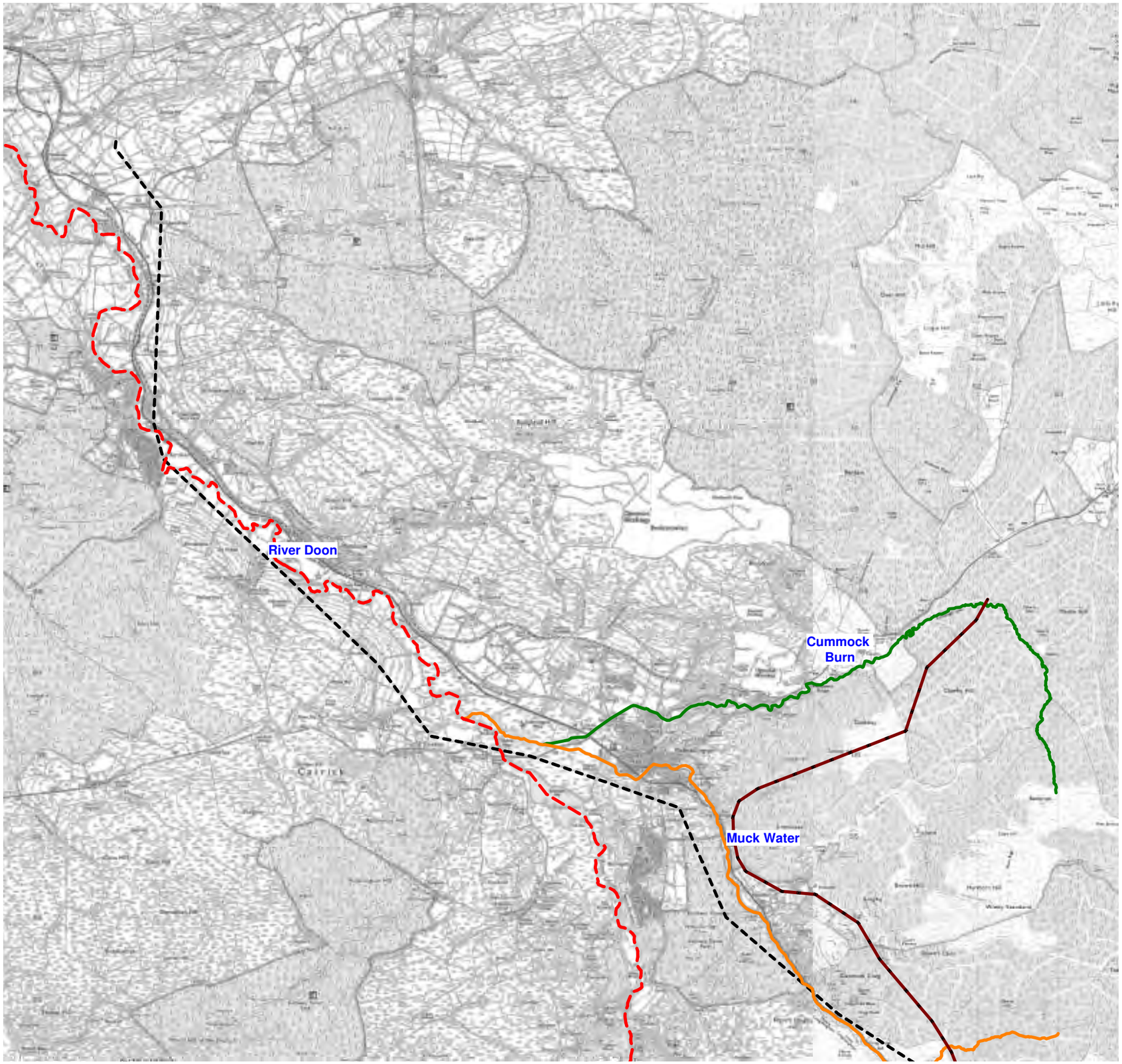
Sub-catchments

- Black Water
- Garple/ Margree Burn
- Lochinvar Burn
- Earlstoun Burn
- Carsphairn Lane
- Cummock Burn
- Muck Water
- Muck Burn



0m 1km 2km

Figure 11.02c - Catchments 3 of 3



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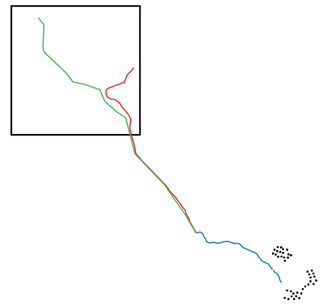
Legend

- Proposed OHL route
- N-Route to be decommissioned
- N-Route

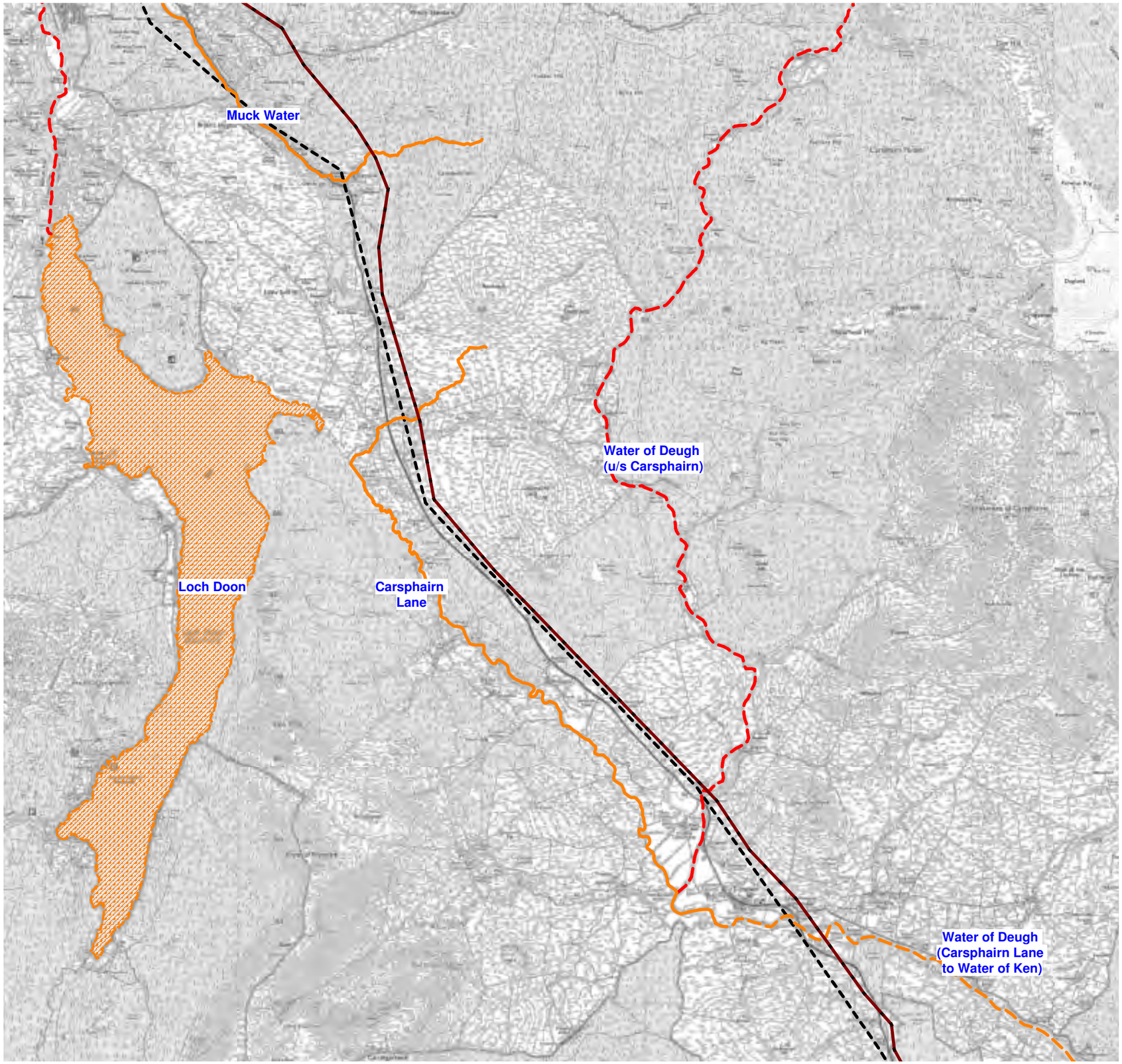
Waterbody classification

- Good ecological status
- Moderate ecological status
- Poor ecological status
- Bad ecological status
- Poor ecological potential
- Bad ecological potential
- Poor ecological potential



0m 1km 2km

Figure 11.03a - Water Framework Directive Waterbody classification 1 of 3



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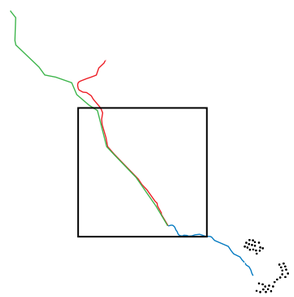
Legend

- Proposed OHL route
- N-Route to be decommissioned
- N-Route

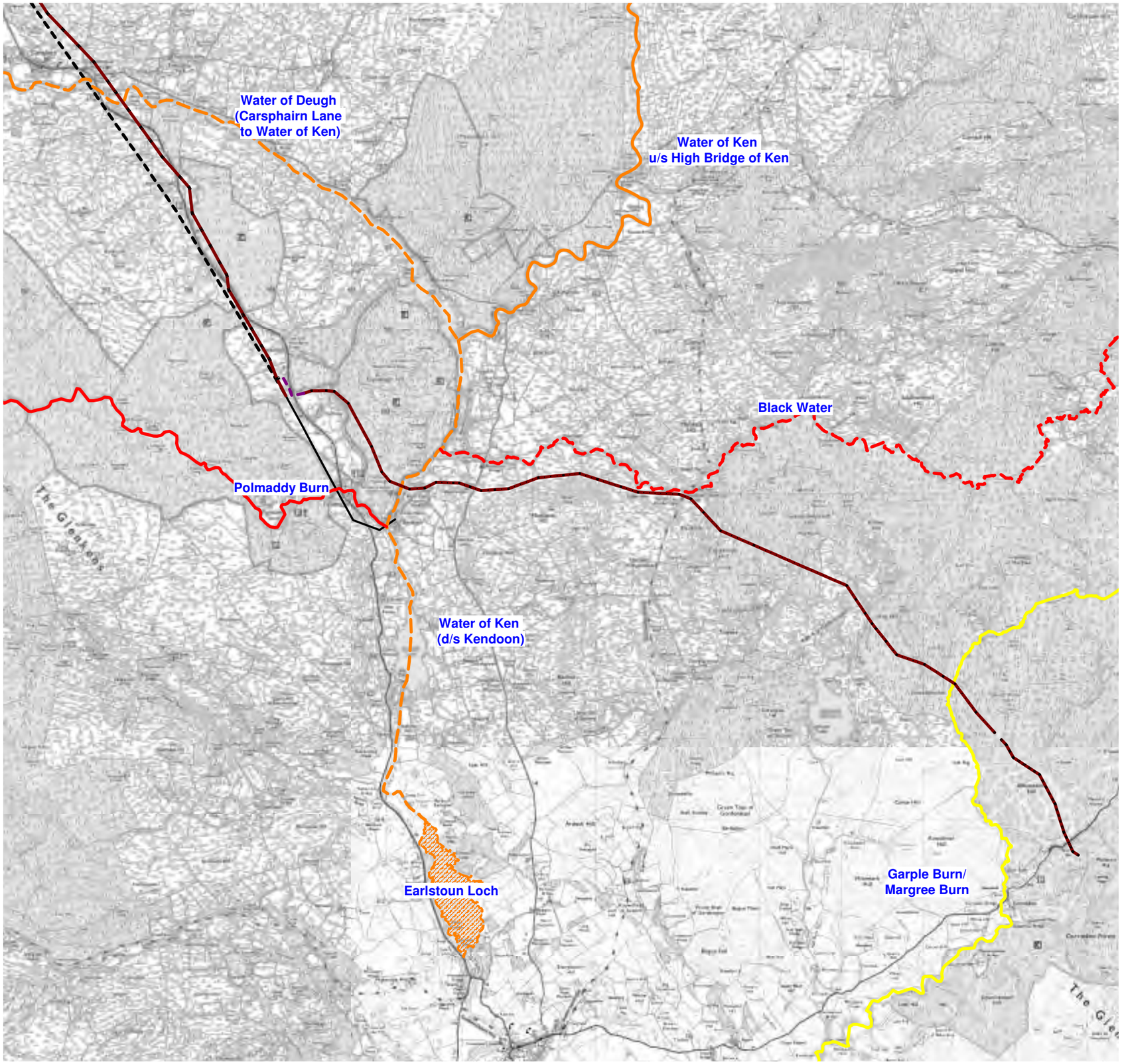
Waterbody classification

- Good ecological status
- Moderate ecological status
- Poor ecological status
- Bad ecological status
- Poor ecological potential
- Bad ecological potential
- Poor ecological potential



0m 1km 2km

Figure 11.03b - Water Framework Directive Waterbody classification 2 of 3



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Legend

- Proposed OHL route
- N-Route to be decommissioned
- N-Route
- Underground cable

Waterbody classification

- Good ecological status
- Moderate ecological status
- Poor ecological status
- Bad ecological status
- Poor ecological potential
- Bad ecological potential
- Poor ecological potential

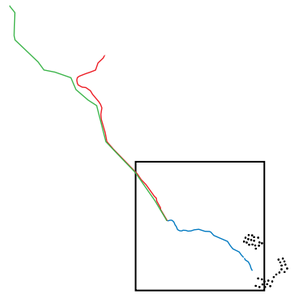

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Figure 11.03c - Water Framework Directive Waterbody classification 3 of 3

Waterbody	Risk Class	Overall Classification	Summary of Pressures
Water of Ken (downstream from Kendoon)	1a	Poor ecological potential	Flow regulations; morphological alterations; abstraction
Carsphairn Lane	2b	Poor	Morphological alterations
Black Water	1a	Bad ecological potential	Abstraction; flow regulation; morphological alterations
Polmaddy Burn	1a	Bad	Morphological alterations; diffuse source pollution
Earlstoun Loch	1a	Poor ecological potential	Flow regulations; abstraction; morphological alterations
Garple Burn/Margree Burn	1b	Moderate	Point source pollution; alien species; morphological alterations

3 Many of the watercourses in this area are classed as heavily modified, through the installation of hydro-electric dams. This, in turn, has implications for the ecology as dams can pose an impediment to fish passage unless fish passes are installed.

4 Chemical water quality data have not yet been determined under the new classification but are assumed to be of at least 'Good' status in line with WFD requirements.

11.6.8.2.4 Freshwater fisheries

1 There are various fishing interests present within watercourses along the route. Both the River Dee (including the Water of Ken and the Water of Deugh) and the River Doon catchments have been designated under the Freshwater for Fish Directive as important for salmonids. In addition to the main rivers, the principal tributaries are also noted as important for salmonids. These include the Cummock Burn and Muck Water in the River Doon catchment, and the Carsphairn Lane, Black Water, Polmaddy Burn and Garple Burn/Margree Burn in the River Dee catchment.

2 In addition to being an important salmon fishery, the River Doon supports a threatened population of freshwater pearl mussels. Part of Loch Doon's citation as a SSSI includes its genetically distinct population of Arctic charr.

3 Fish farming takes place in parts of the Water of Ken/Water of Deugh catchment, notably on Kendoon Loch (NX 606 907) and on the Black Water (NX 689 890). There is also a trout farm at the head of Loch Ken (NX 635 760), which lies more than 9km downstream of the proposed route.

4 Loch Howie and Loch Skae, near the proposed Blackcraig substation, are stocked for fishing by Craigdarroch Fishing Club. In addition, Loch Muck (NS 513 008) is maintained as a private fishing loch. See Chapter 12 (Tourism & Recreation) for more details.

11.6.9 Modifying Influences

1 Possible influences of climate change on the existing baseline conditions are discussed in Technical Appendix F.

11.6.10 Information Gaps

1 As part of the baseline assessment, comprehensive desk and field-based studies of the geology, hydrogeology, hydrology and soils on and around the site have been undertaken. Public and private water supplies in and around the site have been identified through contact with Scottish Water and the local authorities. However, it is possible that the information provided by the local authorities/occupiers may not be comprehensive in relation to properties on private supplies and it has not proved possible to obtain definitive information regarding source locations and source types for all identified properties on a private supply.

11.7 Predicted Effects and Mitigation Measures

11.7.1 Development Characteristics

1 The proposed Blackcraig & Margree OHL will consist of approximately 36.5km of 132kV OHLs, of which 12.2km will be on Wood Poles and 24.3km will be on L7 Towers. In addition, there will be permanent electricity substations at Blackcraig and Margree Windfarms and approximately 6 temporary construction compounds situated along the route. The 33kV cable connection from Blackcraig Windfarm to the substation will be underground along the existing forest track and the connection between the Wood Pole and L7 Tower sections will also be underground.

2 Effects on the hydrology and hydrogeology will predominantly be construction effects and the longer-term effects around the foundations of the steel towers and wood poles. Decommissioning of the N-route will involve more limited effects, and additional minor effects will result from ongoing maintenance activities during the lifetime of the OHL. Watercourse crossings will be designed such that they fall between poles or towers.

3 There are a number of potential effects on the hydrological environment in the vicinity of the proposed OHL route. Consequently, a range of mitigation measures is proposed in order to ensure that any such effects are kept to a minimum.

11.7.1.3 Developments Considered Within Baseline

1 A number of developments are planned, consented, under construction or already constructed within the catchments affected by the proposed Blackcraig & Margree OHL. These include Blackcraig, Margree, Torrs Hill, Windy Standard and Windy Standard Extension, Afton, Pencloe and Dersalloch Windfarms and the South West Scotland Renewables Grid Connection (SWS Project). It is assumed that construction and operation of all these developments will adhere to current industry best practice standards, such as the Forest & Water Guidelines.

11.7.1.4 Generic Mitigation Measures

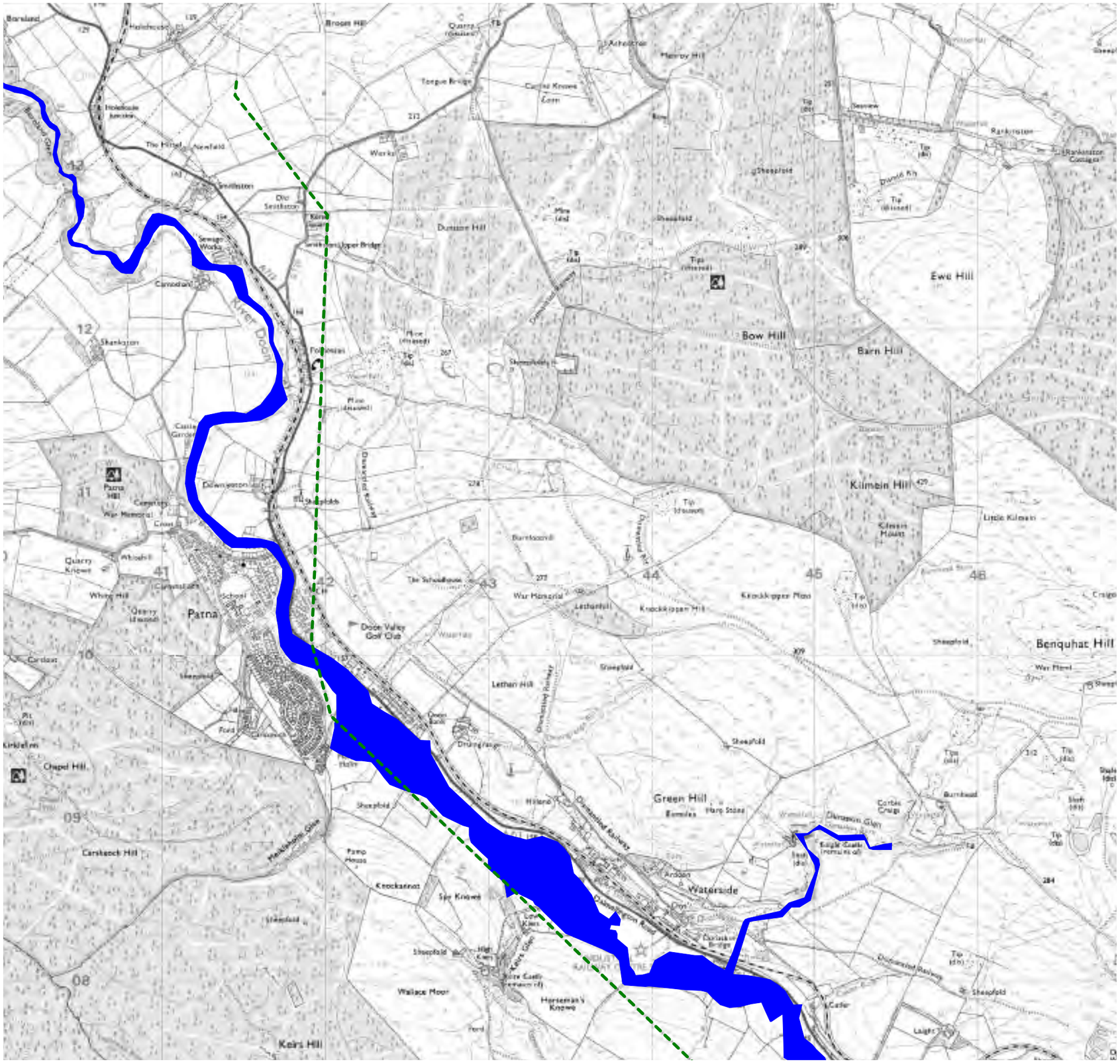
1 A Pollution Prevention Plan and Environmental Management Plan will ensure that mitigation measures are put in place and activities carried out in such a manner as to minimise or prevent effects on the surface and groundwaters.

2 Generic mitigation measures that will be employed to prevent effects on the hydrology and hydrogeology are listed below:

- Installation of pre-construction land drainage, where appropriate, to minimise capture of water by wood pole and steel lattice tower foundation excavations;
- Use of sediment control measures such as straw bales and/or silt fences to control silt content of run-off;
- Adopting stringent precautions if pumping-out of water is required;
- Plant and vehicles will not require to cross watercourses;
- Prevention of concrete entering watercourses by careful siting of steel tower locations and use of appropriate shuttering;
- Compliance with best practice guidelines for fuel storage and refuelling;
- Providing adequate facilities for the collection, treatment and disposal of sewage and waste.

3 These and other mitigation measures as required will be incorporated into the detailed method statements that will be produced for all construction activities. The key issues that will be addressed by mitigation proposals are set out below, with further details of these provided in Technical Appendix F and the Schedule of Mitigation Technical Appendix A:

- Route design;
- Site preparation;
- Felling;
- Excavation of cable trench;
- Water ingress into wood pole and tower foundations and cable trench;
- Suspended solids & sediment control;
- Watercourse crossings;
- Flood risk;
- Pollution control –
  - > Storage;
  - > Vehicles and refuelling;
  - > Maintenance;
  - > Welfare facilities;
  - > Concrete transport and pouring;
  - > Washout areas;
  - > Copper earthing rods;
  - > Contingency plans;
  - > Operating and emergency procedures;



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Legend

- Proposed OHL route
- Proposed OHL infrastructure
- Pulling compounds
- Substations, construction compounds
- Proposed access tracks
- N-Route
- N-Route to be decommissioned
- Area at risk in a 1:200 year flood

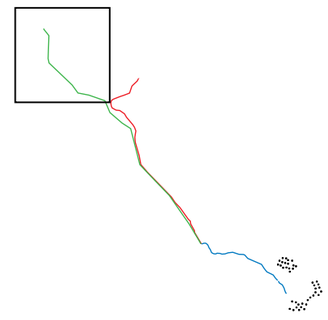

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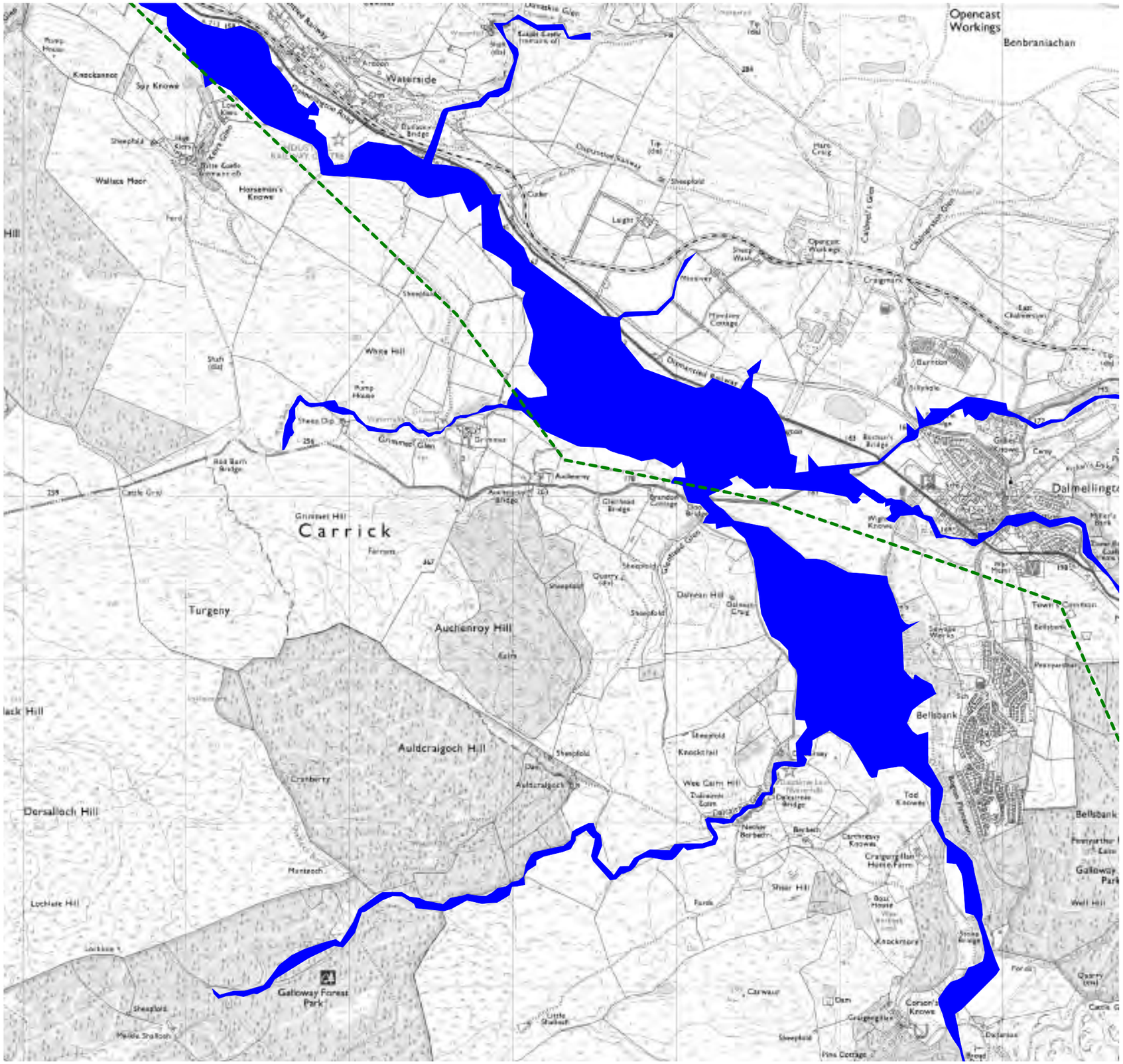
Figure 11.04a - Flood risk areas 1 of 8



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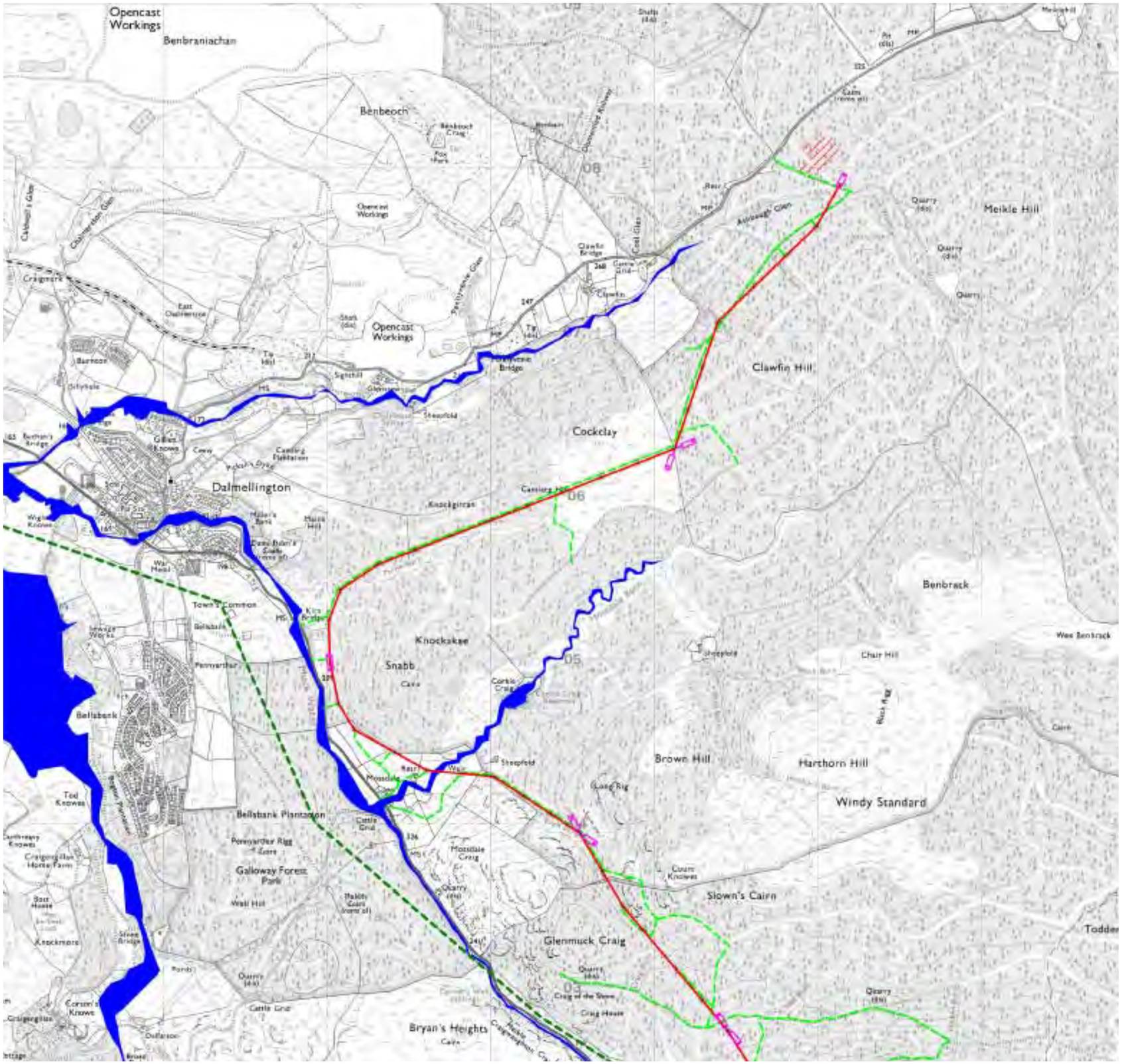
Legend

- Proposed OHL route
- Proposed OHL infrastructure
- Pulling compounds
- Substations, construction compounds
- Proposed access tracks
- N-Route
- N-Route to be decommissioned
- Area at risk in a 1:200 year flood

0m 0.5km 1km

Figure 11.04b - Flood risk areas 2 of 8



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Legend

- Proposed OHL route
- Proposed OHL infrastructure
- Pulling compounds
- Substations, construction compounds
- Proposed access tracks
- N-Route
- N-Route to be decommissioned
- Area at risk in a 1:200 year flood

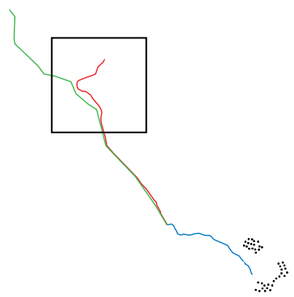

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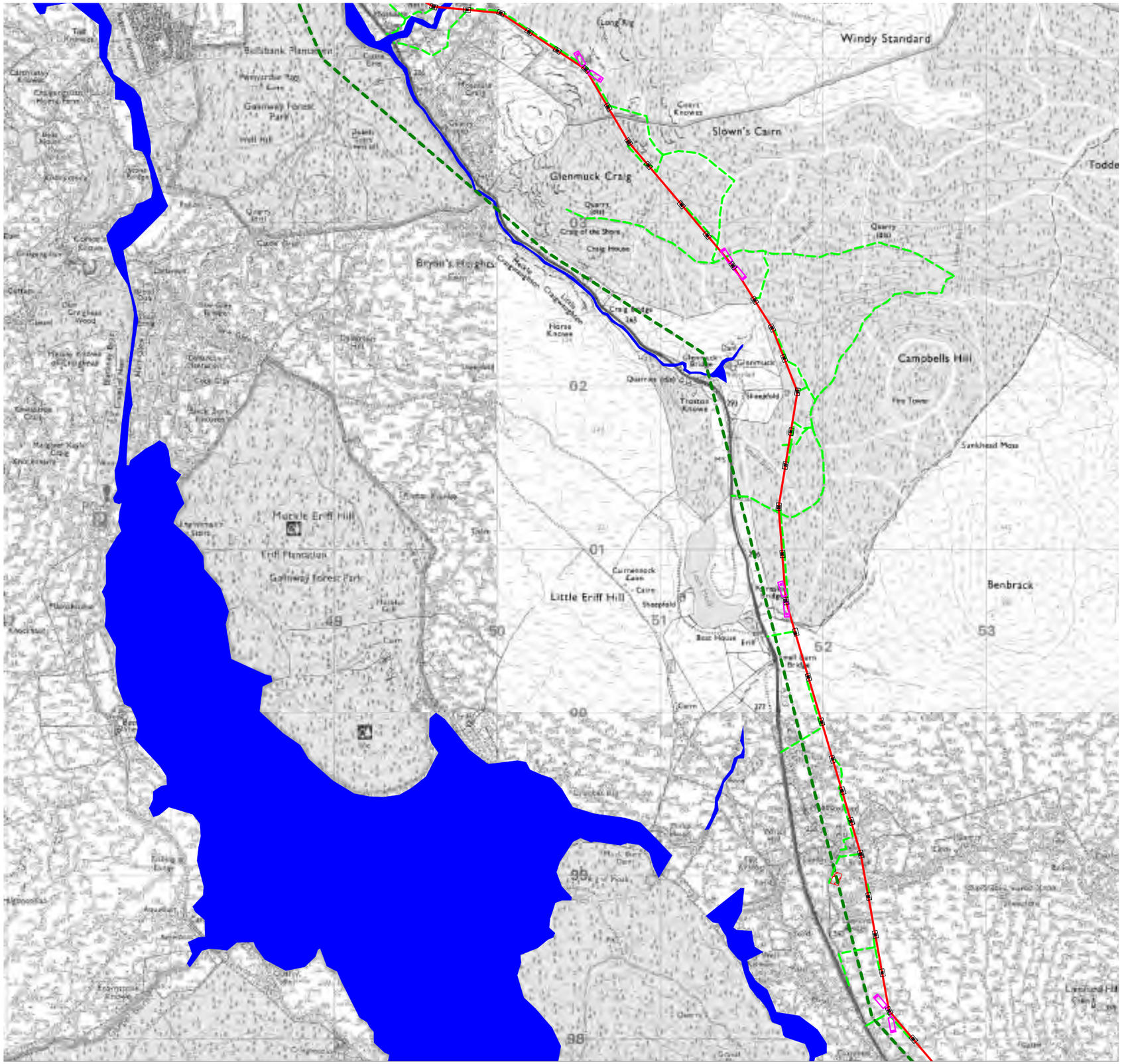
Figure 11.04c - Flood risk areas 3 of 8



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Legend

- Proposed OHL route
- Proposed OHL infrastructure
- Pulling compounds
- Substations, construction compounds
- Proposed access tracks
- N-Route
- N-Route to be decommissioned
- Area at risk in a 1:200 year flood

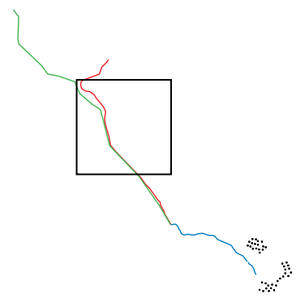

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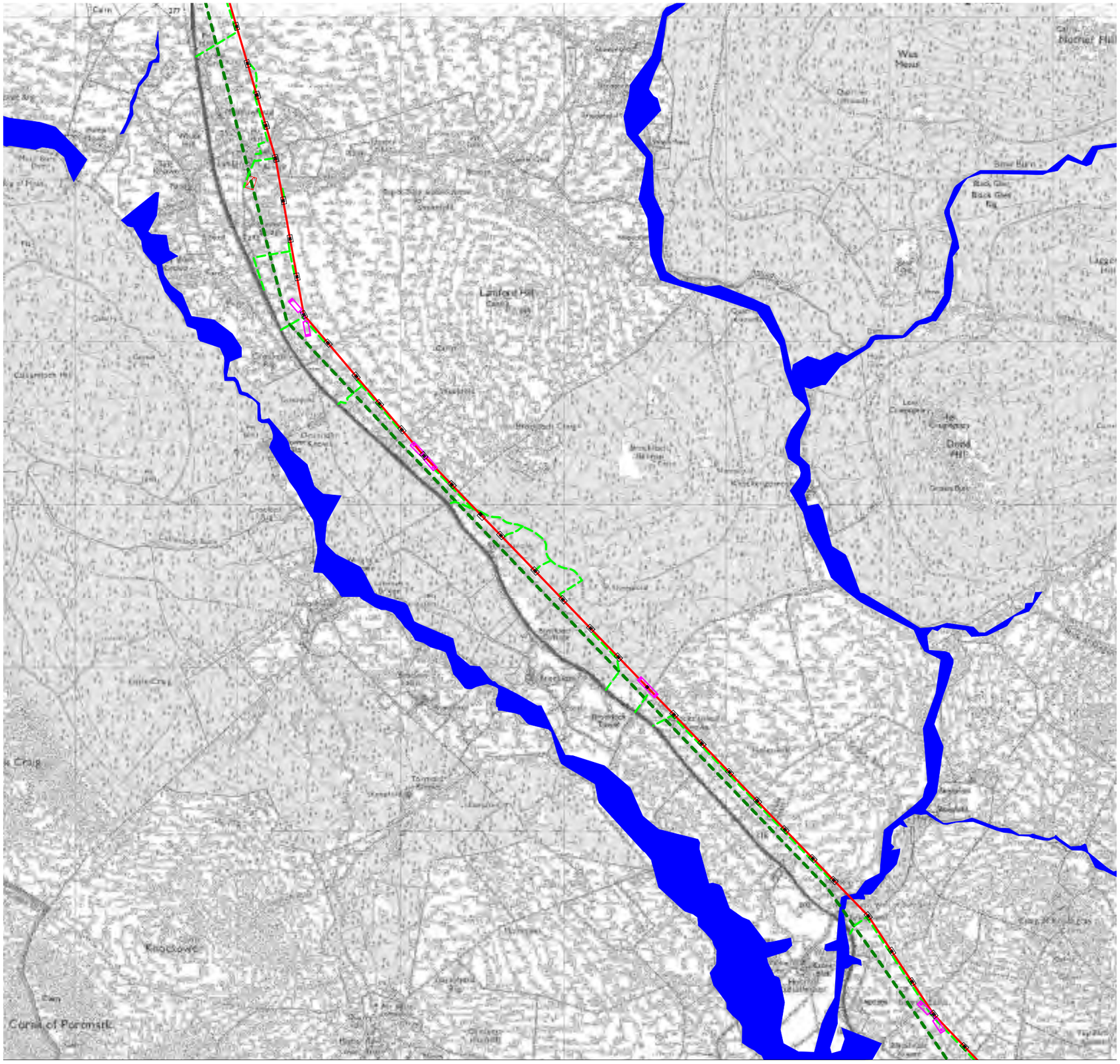
Figure 11.04d - Flood risk areas 4 of 8



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Legend

- Proposed OHL route
- Proposed OHL infrastructure
- Pulling compounds
- Substations, construction compounds
- Proposed access tracks
- N-Route
- N-Route to be decommissioned
- Area at risk in a 1:200 year flood

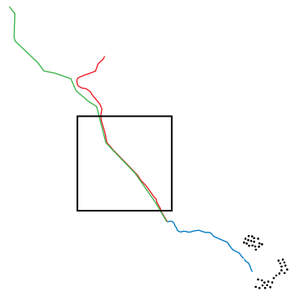

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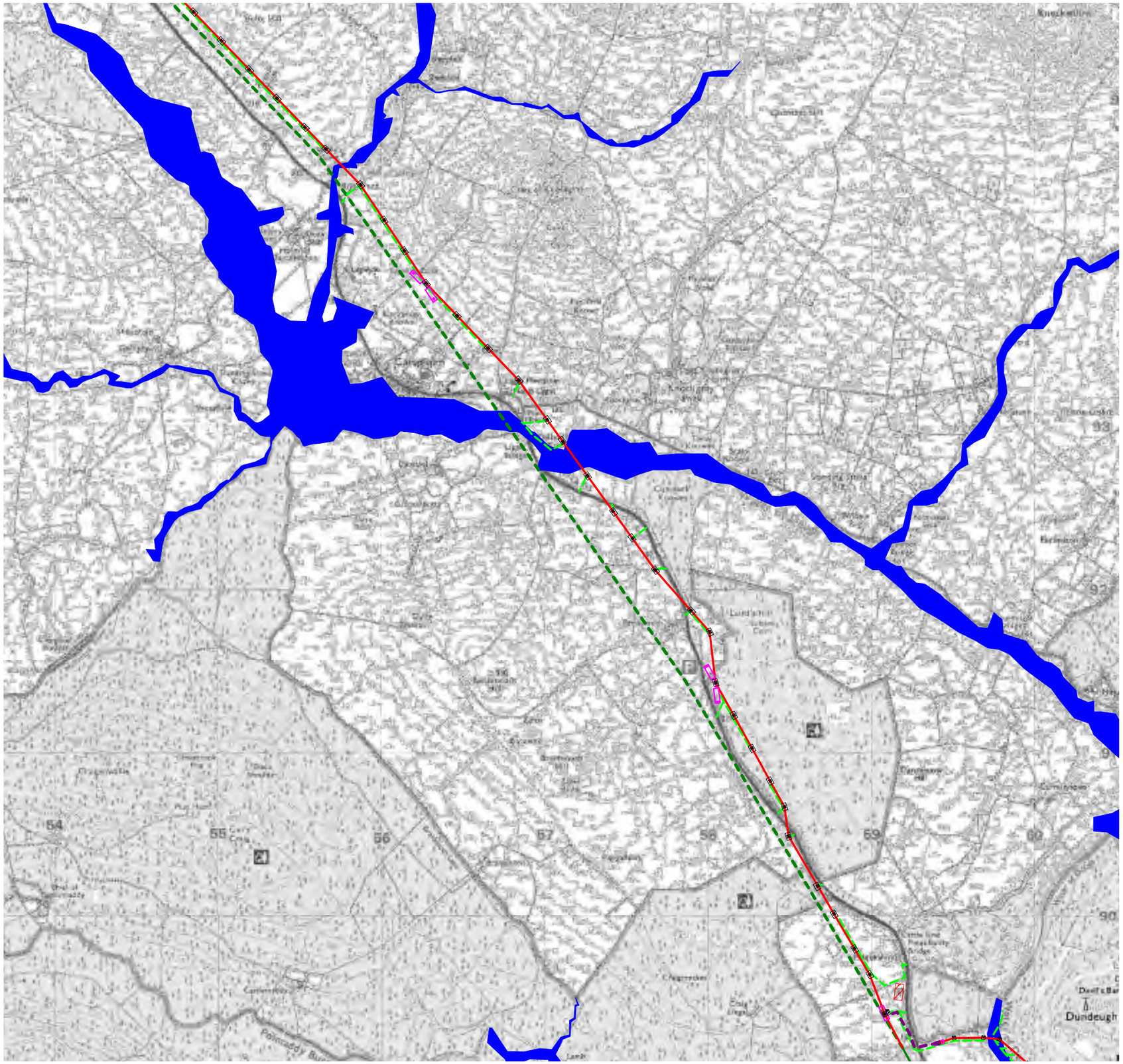
Figure 11.04e - Flood risk areas 5 of 8



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Legend

- Proposed OHL route
- Proposed OHL infrastructure
- Pulling compounds
- Substations, construction compounds
- Proposed access tracks
- N-Route
- N-Route to be decommissioned
- Area at risk in a 1:200 year flood
- Underground cable

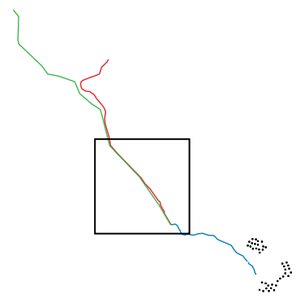

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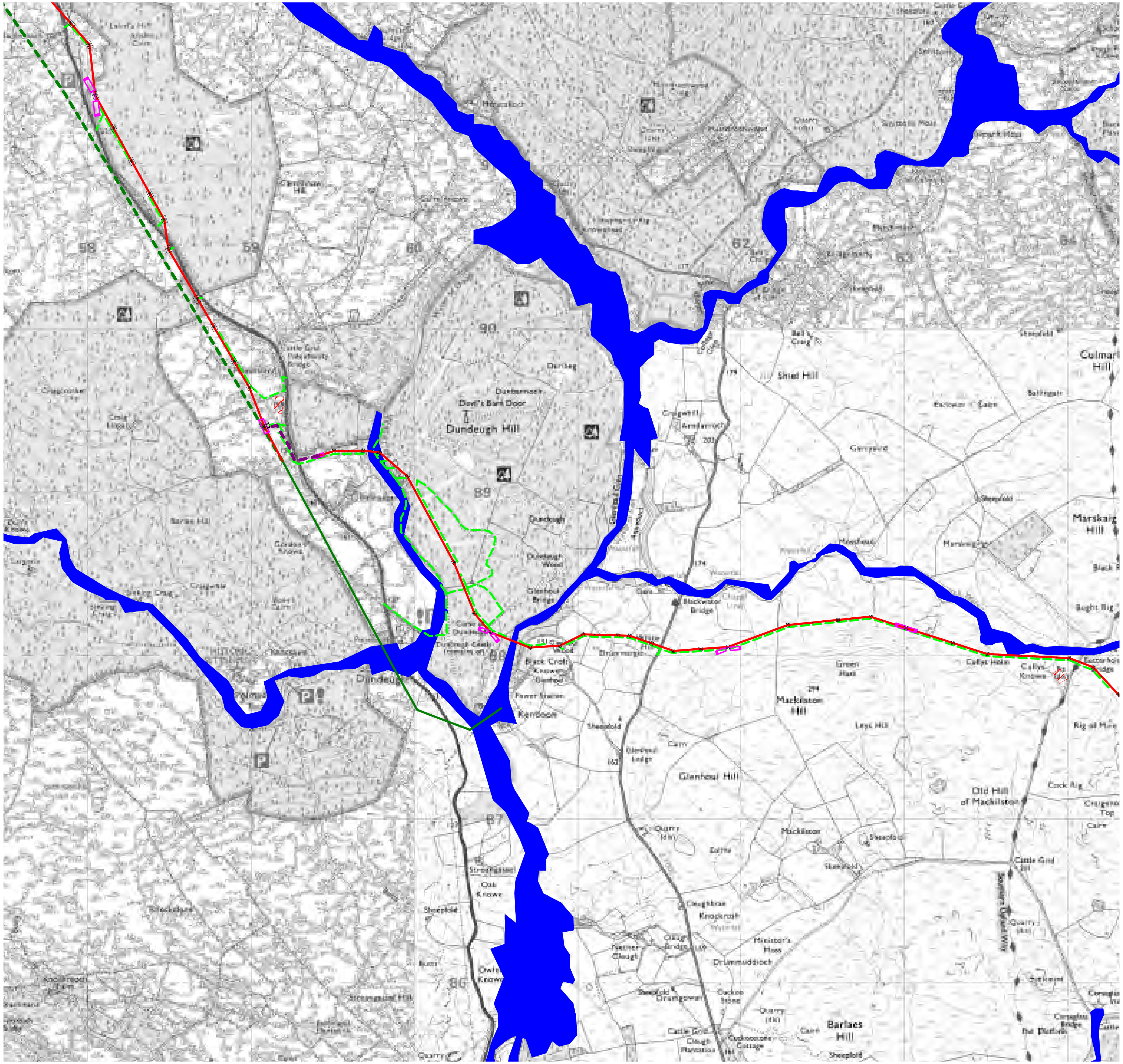
Figure 11.04f - Flood risk areas 6 of 8



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Legend

- Proposed OHL route
- Proposed OHL infrastructure
- Pulling compounds
- Substations, construction compounds
- Proposed access tracks
- N-Route
- N-Route to be decommissioned
- Area at risk in a 1:200 year flood
- Underground cable

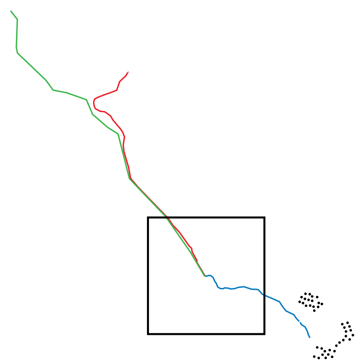

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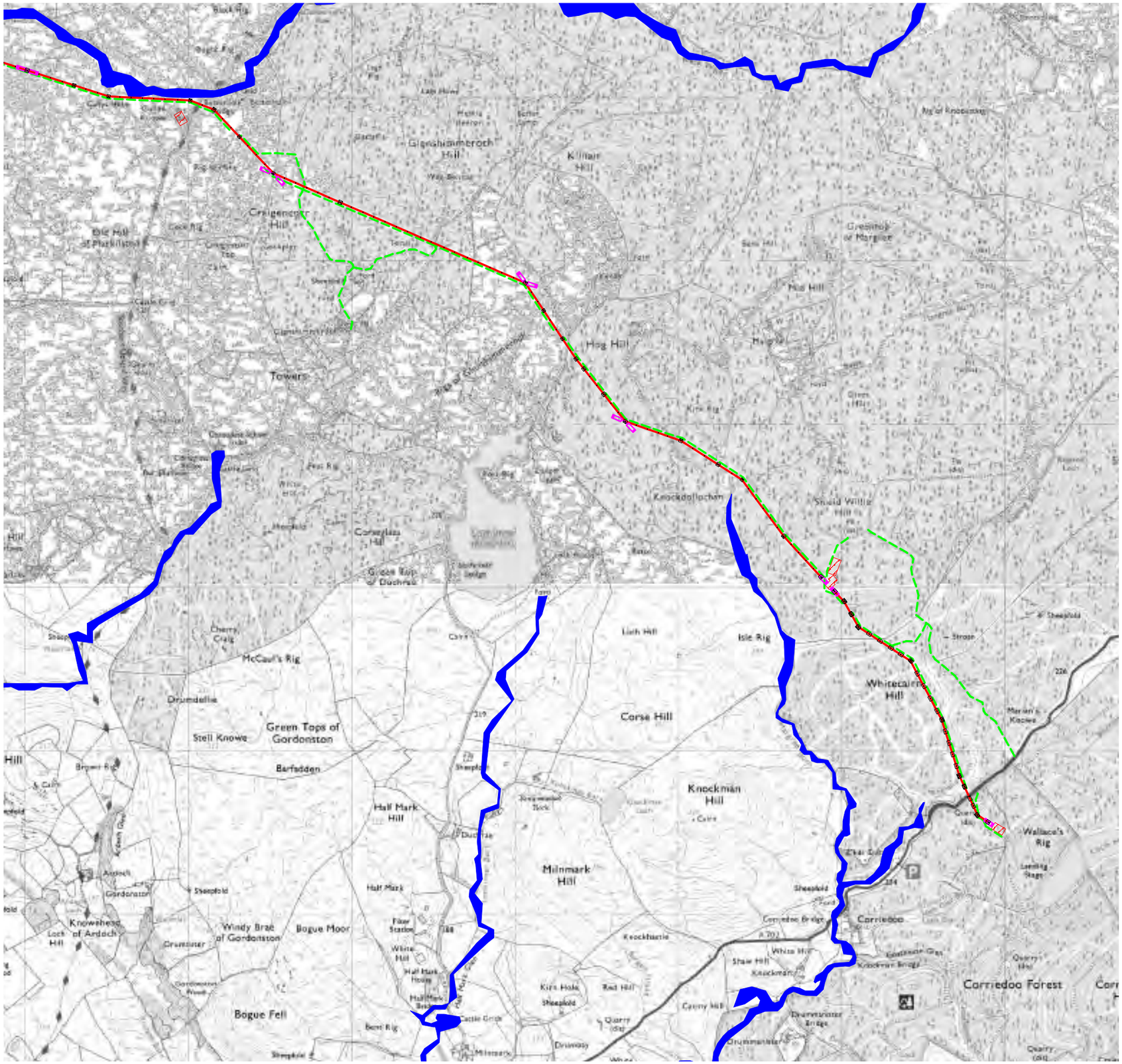
Figure 11.04g - Flood risk areas 7 of 8



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Legend

- Proposed OHL route
- Proposed OHL infrastructure
- Pulling compounds
- Substations, construction compounds
- Proposed access tracks
- N-Route
- N-Route to be decommissioned
- Area at risk in a 1:200 year flood

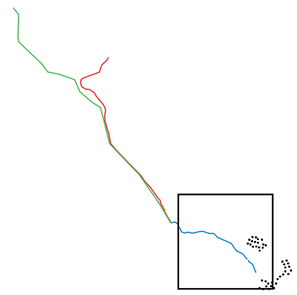

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Figure 11.04h - Flood risk areas 8 of 8

- Backfill and restoration;
- Contaminated land;
- Construction management.

4 In addition to the generic mitigation set out above, specific measures will be employed to mitigate potential effects on public and private water supplies. Prior to commencing works on site, the contractor will undertake an Environmental Risk Assessment (ERA) on the quantity and quality of water supplies for all properties reliant on private water supplies within 1km of the proposed grid connection and that might be affected by it. This ERA will include mitigation measures for the protection of supplies where a risk is identified. These measures will include a contingency plan to provide an alternative supply of drinking water within 24 hours in the event of any effect which renders the existing source unusable as a result of the development of the grid connection. Where a risk is identified, and there are no existing data on tap water quality, the contractor will undertake at his own expense water testing to establish baseline analyses.

11.8 Effects on Surface Water

11.8.1 Receptor sensitivity

1 Owing to the important fish populations supported by watercourses within the Study Area, their high water quality status and risk classification, the surface water sensitivity is classified as high. Further information concerning the fish populations is included in Chapter 8 - Ecology.

11.8.2 Construction effects

11.8.2.1 Pollution:

1 During the grid connection construction, there will be a number of activities taking place that could affect surface waters. These include plant and machinery movement, excavations for wood pole and steel lattice tower foundations and cable trenching, and pouring of concrete for tower and substation foundations. A number of potential pollutants will be present on site, including oil, fuels, chemicals and concrete as well as waste and waste water from staff facilities. Any pollution incident occurring as a result of these works may adversely affect the quality of nearby surface waters.

2 A small number of proposed towers are situated between 20 and 35m from watercourses (most are located 50m or more from watercourses to avoid potential effects); particular care and additional precautions will be required during their construction to minimise potential access of pollutants into these watercourses. Of particular concern is the tower at NS 515 025, upstream of Glenmuck Farm, which is approximately 20m from a watercourse.

3 Without mitigation measures the potential magnitude of a pollution incident could be major, with the likelihood of occurrence being likely. This would result in a major effect.

4 Mitigation measures are set out above. With these mitigation measures in place the potential magnitude will be reduced to moderate and the likelihood to unlikely. This gives a residual effect of minor and not significant.

11.8.2.2 Erosion and sedimentation:

1 Increased levels of sediment will be generated during the excavation of wood pole and tower foundations and the cable trenches, preparation of the working area including tree felling works, from erosion of stock-piled or excavated soils, during the construction of temporary watercourse crossings where necessary and from plant and machinery movement. If this sediment reached the natural watercourses in the area it could cause high turbidity levels, thereby reducing light and oxygen levels, with a consequent effect upon the water quality and ecology of the streams and upon existing fish populations. The deposition of sediment could also blanket fish spawning grounds and reduce the flood storage capacity of the stream channel, increasing flood risk. Increased sediment load from conifer plantation, generated by felling activity, could cause an increase in acidification of watercourses.

2 As discussed above, extra precautions will be required when constructing towers within 35m of watercourses to minimise potential sediment release into the watercourses. Particular care will be required in areas identified as being sensitive.

3 Without mitigation measures the potential magnitude of erosion and sedimentation could be **major** with the likelihood of occurrence being **likely**. This would result in a **major** effect.

4 Mitigation measures are set out above. With these mitigation measures in place the potential magnitude will be reduced to **minor** and the likelihood to **possible**. This gives a residual effect of **minor and not significant**.

11.8.2.3 Impediments to flows:

1 Temporary watercourse crossings for construction plant will need to be installed for use during construction works. The use of inadequately designed or constructed watercourse crossings on site could restrict the flow in the stream channels, thereby reducing hydraulic capacity. The results of this could be increased flood risk upstream, promotion of erosion and sedimentation and the obstruction of fish migration. Design checks and liaison with statutory agencies will ensure that such structures are adequately designed and constructed. Once no longer necessary, temporary crossings will be removed and their sites fully reinstated.

2 Without mitigation measures the potential magnitude of such impediments could be **moderate** with the likelihood of occurrence being **possible**. This would result in a **moderate** effect.

3 Mitigation measures are set out above. With these mitigation measures in place the potential magnitude will be reduced to **minor** and the likelihood to **unlikely**. This gives a residual effect of **minor and not significant**.

11.8.2.4 Modifications to surface runoff:

1 Permanent drainage will be required in the areas around the substations at Blackcraig and Margree Windfarms. In addition, the construction of hard ground surfaces, either concrete for foundations or compacted aggregate hardstanding, will increase runoff volumes from affected areas.

2 Temporary cut-off drains will be constructed uphill of and beside wood pole and tower foundation excavations to divert surface runoff around the excavation area. Water from these drains will be discharged to ground downhill of the excavation, using suitable dispersal and erosion protection measures as discussed above. Temporary drainage will be kept operational for a short period after reinstatement to prevent erosion of newly spread topsoil. Once vegetation is re-established, temporary drainage will be reinstated.

3 Temporary cut-off drains will also be constructed uphill from and parallel to the working width along the undergrounded sections, to minimise direct access of surface runoff to stripped and excavated areas. Discharge will be diverted around the open trench and discharged to ground with suitable dispersal and erosion protection measures, as discussed above. Temporary drainage will be kept operational for a short period after reinstatement, with frequent cross-drains to prevent erosion of newly spread topsoil and to minimise the concentration of flows. Once vegetation is re-established on the working width, temporary drainage will be reinstated.

4 Permanent and temporary drainage will intercept diffuse overland flow, interrupting the natural drainage regime by concentrating flows and potentially increasing runoff rates, peak flows and response times during storm events. This is particularly the case for the underground cable trench sections, where temporary drainage will be laterally more continuous so will affect a greater area. Permanent and temporary site drainage, if inadequately designed, could also promote erosion and sedimentation.

5 Without mitigation measures the potential magnitude of such modifications could be **moderate** with the likelihood of occurrence being **possible**. This would result in a **moderate** effect.

6 Mitigation measures are set out above. With these mitigation measures in place the potential magnitude will be reduced to **minor** and the likelihood to **unlikely**. This gives a residual effect of **minor and not significant**.

11.8.3 Predicted ongoing and operational effects

11.8.3.5 Pollution:

1 During the operational phase of the grid connection there will be considerably less activity than during construction. Vehicles may be required near the wood poles and towers to carry out routine maintenance activities and machinery will be required if the line needs restringing. In both situations potential pollutants such as oil and fuels will be present on site in small quantities.

2 Without mitigation measures the potential magnitude of a pollution incident could be **minor** with the likelihood of occurrence being **possible**. This would result in a **minor** effect.

3 Mitigation measures are set out above. With these mitigation measures in place the potential magnitude will remain **minor** and the likelihood will be reduced to **unlikely**. This gives a residual effect of **minor and not significant**.

11.8.3.6 Erosion and sedimentation:

1 Levels of erosion and sedimentation will be very much lower than during construction as there will be no excavations or exposed ground. Some erosion and mobilisation of sediment could result from vehicle and machinery movements on the site during routine or emergency maintenance, especially if undertaken during very wet conditions. As specialist low ground pressure machinery will be used for all maintenance activity the potential effect of erosion and sedimentation will be minimised.

2 Without mitigation measures the potential magnitude of erosion and sedimentation could be minor with the likelihood of occurrence being **possible**. This would result in a **minor** effect.

3 Mitigation measures are set out above. With these mitigation measures in place the potential magnitude will be reduced to **none** and the likelihood to **unlikely**. This gives a residual effect of **none and not significant**.

11.8.3.7 Impediments to flows:

1 As no permanent stream crossings will be constructed to give vehicular access to wood poles or L7 Towers there is the possibility that vehicles will need to cross watercourses during routine or emergency maintenance operations. This could cause damage to the watercourse bed and banks and could cause an impediment to flow. The need for such crossings can be removed by using alternative access wherever possible and, if a watercourse crossing is unavoidable, by installing a temporary bridge for the duration of the maintenance activitiy.

2 Without mitigation measures the potential magnitude of such impediments could be **minor** with the likelihood of occurrence being **possible**. This would result in a **minor** effect.

3 Mitigation measures are set out above. With these mitigation measures in place the potential magnitude will remain **minor** and the likelihood be reduced to **unlikely**. This gives a residual effect of **minor and not significant**.

11.8.3.8 Modifications to surface runoff:

1 There are no anticipated operational effects on surface water arising from modifications to surface runoff.

11.8.4 Predicted decommissioning effects

11.8.4.1 Pollution:

1 During the decommissioning of the N-route section there will be a number of activities taking place that could affect surface waters. These include plant and machinery movement to facilitate tower removal and the breaking-out of tower foundations to below ground level. A number of potential pollutants will be present on site, including oil, fuels, waste and waste water from staff facilities. Breaking-out of foundations could generate concrete dust, which may enter surface waterbodies.

2 A small number of existing towers are situated within 35m of watercourses; particular care and additional precautions will be required during their removal to minimise potential access of pollutants into these watercourses. Of particular concern is the tower at NS 516 006, opposite Loch Muck, which is approximately 16m from a watercourse. This stream feeds directly into Loch Muck which is used as a fishing loch and is therefore highly sensitive to pollution.

3 Without mitigation measures the potential magnitude of a pollution incident could be **moderate** with the likelihood of occurrence being **possible**. This would result in a **moderate** effect.

4 Mitigation measures are set out above. With these mitigation measures in place the potential magnitude will be reduced to **minor** and the likelihood to **unlikely**. This gives a residual effect of **minor and not significant**.

11.8.4.2 Erosion and sedimentation:

1 Increased levels of sediment will be generated during the breaking-out of tower foundations to below ground level and their subsequent reinstatement with topsoil. If this sediment reached the natural watercourses in the area it could cause high turbidity levels, thereby reducing light and oxygen levels, with a consequent effect upon the water quality and ecology of the streams and upon existing fish populations. The deposition of sediment could also blanket fish spawning grounds and reduce the flood storage capacity of the stream channel, increasing flood risk.

2 As discussed above, extra precautions will be required during the removal of towers situated within 35m of watercourses to minimise potential sediment release into the watercourses. Particular care will be required in areas identified as being sensitive.

3 Without mitigation measures the potential magnitude of erosion and sedimentation could be **moderate** with the likelihood of occurrence being **possible**. This would result in a **moderate** effect.

4 Mitigation measures are set out above. With these mitigation measures in place the potential magnitude will be reduced to **minor** and the likelihood to **unlikely**. This gives a residual effect of **minor and not significant**.

11.8.4.3 Impediments to flows:

1 Temporary watercourse crossings for construction plant may need to be installed for use during decommissioning works. The use of inadequately designed or constructed watercourse crossings on site could restrict the flow in the stream channels, thereby reducing hydraulic capacity. The results of this could be increased flood risk upstream, promotion of erosion and sedimentation and the obstruction of fish migration. Where crossings are required, design checks and liaison with statutory agencies will ensure that such structures are adequately designed and constructed. Once no longer necessary, temporary crossings will be removed and their sites fully reinstated.

2 Without mitigation measures the potential magnitude of such impediments could be **moderate** with the likelihood of occurrence being **possible**. This would result in a **moderate** effect.

3 Mitigation measures are set out above. With these mitigation measures in place the potential magnitude will be reduced to **minor** and the likelihood to **unlikely**. This gives a residual effect of **minor and not significant**.

11.8.4.4 Modifications to surface runoff:

1 Temporary cut-off drains may be required uphill of and beside tower foundation excavations during breaking-out work, to divert surface runoff around the excavation area. Water from these drains will be discharged to ground downhill of the excavation, using suitable dispersal and erosion protection measures as discussed above. Temporary drainage will be kept operational for a short period after reinstatement to prevent erosion of newly spread topsoil. Once vegetation is re-established, temporary drainage will be reinstated. Temporary drainage will intercept diffuse overland flow, interrupting the natural drainage regime by concentrating flows and potentially increasing runoff rates, peak flows and response times during storm events. Temporary site drainage, if inadequately designed, could also promote erosion and sedimentation.

2 Without mitigation measures the potential magnitude of such modifications could be **minor** with the likelihood of occurrence being **possible**. This would result in a **minor** effect.

3 Mitigation measures are set out above. With these mitigation measures in place the potential magnitude will remain **minor** and the likelihood will be reduced to **unlikely**. This gives a residual effect of **minor and not significant**.

11.8.5 Summary of effects on surface water

1 The assessment of potential effects on surface water during construction and operation of the proposed grid connection and decommissioning of part of the N-route has indicated that there will be no effects of an order greater than **minor** and not significant. As such, the anticipated effects on surface water will not be significant.

11.9 Effects on Groundwater

11.9.1 Receptor sensitivity

1 Groundwater in fractured, low-porosity bedrock is highly sensitive to contamination owing to the low water volume and low flow rates which reduce the potential for recovery. The groundwater also has a high vulnerability rating for much of the Study Area. The receptor sensitivity is therefore **high.**

11.9.2 Construction effects

11.9.2.1 Pollution:

1 As with surface water, there will be a number of activities undertaken during construction that could influence groundwater. The presence of potential pollutants on site, including oil, fuel and concrete, combined with work near or below the

water table provide the necessary links in the chain source-pathway-receptor. The requirement for concrete foundations for the L7 Towers and substations will introduce concrete into direct contact with bedrock and superficial deposits and the work may occur at or below the water table in some areas. In addition, the installation of copper earthing rods beneath each wood pole introduces a pollutant directly into the groundwater regime.

2 As volumes of groundwater present in both the bedrock and superficial deposits are low, with slow flow rates, there is little chance for dilution of contaminants and attenuation will be slow. This will, however, restrict the transportation of contaminants such as copper within the groundwater regime and consequently will limit the affected area.

3 Without mitigation measures the potential magnitude of a pollution incident could be **major**, with the likelihood of occurrence being **likely.** This would result in a **major** effect.

4 Mitigation measures are set out above. With these mitigation measures in place the potential magnitude will be reduced to **moderate** and the likelihood to **unlikely**. This gives a residual effect of **minor and not significant**.

11.9.2.2 Modification of groundwater flows:

1 The excavations required for wood pole, lattice tower and substation foundations and the cable trench are likely to disrupt any shallow groundwater systems within the drift and shallow bedrock. Temporary groundwater controls such as dewatering or physical cut-offs may be required to prevent the foundations filling with water, which would be likely to result in the lowering of groundwater levels in the immediate vicinity of the excavation. The cable trench is likely to provide a preferential pathway for groundwater, particularly where it is cut to the soil/drift–bedrock interface.

2 The effects from dewatering of foundations are, however, likely to be localised and short-term and full recovery would be anticipated once dewatering was stopped or removal of cut-offs was completed. Without mitigation measures the potential magnitude of groundwater flow modification from foundation dewatering could be minor, with the likelihood of occurrence being likely. This would result in a minor effect.

3 Dewatering of the cable trench sections is likely to affect a wider area owing to the length of the trenching, and their potential to act as a preferential flow pathways could also have a wider effect on local groundwater flow. Without mitigation measures the potential magnitude of groundwater flow modification from cable trenching could be moderate, with the likelihood of occurrence being likely. This would result in a moderate effect.

4 Mitigation measures are set out above. With these mitigation measures in place the potential magnitude will remain or be reduced to minor with the likelihood reduced to possible. This gives a residual effect of minor and not significant.

11.9.3 Predicted ongoing and operational effects

11.9.3.1 Pollution:

1 During the operational phase of the grid connection there will be considerably less on-site activity than during construction. Vehicles may be required near the wood poles and L7 Towers to carry out routine maintenance activities and machinery will be required if the line needs restringing. In both situations potential pollutants such as oil and fuels will be present on site in small quantities. However, the absence of work at or below the water table will help to restrict entry of these pollutants into the groundwater system.

2 Without mitigation measures the potential magnitude of a pollution incident could be **minor**, with the likelihood of occurrence being **possible**. This would result in a **minor** effect.

3 Mitigation measures are set out above. With these mitigation measures in place the potential magnitude will remain **minor** with the likelihood reduced to **unlikely**. This gives a residual effect of **minor and not significant**.

11.9.3.2 Modification to groundwater flows:

1 There are no anticipated operational effects on groundwater arising from modifications to groundwater flow.

11.9.4 Predicted decommissioning effects

11.9.4.1 Pollution:

1 During the decommissioning of the N-route section there will be a number of activities taking place that could affect groundwater. These include plant and machinery movement to facilitate tower removal and the breaking-out of tower foundations to below ground level. A number of potential pollutants will be present on site, including oil and fuels. Whilst it is unlikely that tower foundations will be broken-out to water table level, work below ground increases the possibility of pollutant entry into the groundwater.

2 Without mitigation measures the potential magnitude of a pollution incident could be **moderate** with the likelihood of occurrence being **possible**. This would result in a **moderate** effect.

3 Mitigation measures are set out above. With these mitigation measures in place the potential magnitude will be reduced to **minor** and the likelihood to **unlikely**. This gives a residual effect of **minor and not significant**.

11.9.4.2 Modification to groundwater flows:

1 There are no anticipated decommissioning effects on groundwater arising from modifications to groundwater flow.

11.9.5 Summary of effects on groundwater

1 The assessment of potential effects on groundwater during construction and operation of the proposed grid connection and decommissioning of part of the N-route has indicated that there will be no effects of an order greater than minor. As such, the anticipated effects on surface water will not be significant.

11.10 Effects on Peat and Soils

11.10.1 Receptor sensitivity

1 Owing to the current pastoral and forestry land uses on the site, which have given rise to modification of the soil regime, soils are considered to have a **moderate** sensitivity.

11.10.2 Construction effects

11.10.2.1 Pollution:

1 A pollution incident could affect the peat in the vicinity of the incident. Owing to the low infiltration potential of the peat, contaminants are unlikely to penetrate into the deeper peat. However, high surface runoff coefficients mean a large area of the surface of the peat could be affected. Contaminants will be likely to cause irremediable damage to the water quality and ecology of the peat and reduce its ecological status. Direct entry of contaminants into the soils will be facilitated by excavations for wood pole, lattice tower and substation foundations and for cable trenching. The use of copper earthing rods at the wood pole bases will introduce a pollutant directly into the soil system.

2 Without mitigation measures the potential magnitude of a pollution incident could be **moderate** with the likelihood of occurrence being **possible**. This would result in a **minor** effect.

3 Mitigation measures are set out above. With these mitigation measures in place the potential magnitude will be reduced to **minor** and the likelihood to **unlikely**. This gives a residual effect of **none and not significant**.

11.10.2.2 Compaction and erosion:

1 The movement of construction plant through the site and the process of reinstatement of the wood pole and tower foundations and the cable trenches could cause compaction in the soils, affecting both the hydrology and the hydrogeology. The effects of compaction are likely to be highly localised and should be restricted to the running tracks and areas around foundation excavations, but could have a damaging effect on the timescales for vegetation regrowth, heightening the likelihood of erosion. Topsoil stripping during preparation of the working width and the stockpiled material from this and the excavations could be at risk of desiccation and erosion. The requirement for felling along the route where it crosses forestry areas will provide an increased likelihood of soil erosion owing to increased ground disturbance and reduced rainfall attenuation potential.

2 Without mitigation measures the potential magnitude of compaction and erosion could be **minor** with the likelihood of occurrence being **likely**. This would result in a **minor** effect.

3 Mitigation measures are set out above. With these mitigation measures in place the potential magnitude will remain **minor** with the likelihood reduced to **unlikely**. This gives a residual effect of **none and not significant**.

11.10.3 Predicted ongoing and operational effects

11.10.3.1 Pollution:

1 As with surface and groundwater, there will be considerably less activity on site during the operation phase. Routine maintenance may require vehicles to be near the wood poles and L7 Towers and other machinery will be required if the line needs restringing. Both situations will necessitate the presence of potential pollutants such as oil and fuels on site.

2 Without mitigation measures the potential magnitude of a pollution incident could be **minor** with the likelihood of occurrence being **possible**. This would result in a **minor** effect.

3 Mitigation measures are set out above. With these mitigation measures in place the potential magnitude will be reduced to **minor** and the likelihood to **unlikely**. This gives a residual effect of **none and not significant**.

11.10.3.2 Compaction and erosion:

1 Vehicle access for routine maintenance activities or line restringing, if required, could result in compaction of soils along access routes. These effects are likely to be highly localised and restricted to the running track. Soil erosion could result from vehicle access under wet ground conditions, where vegetation damage is more likely to result from the access. These effects will also be highly localised and restricted to the running track. Specialist low ground pressure machinery will be used for all maintenance activities.

2 Without mitigation measures the potential magnitude of compaction and erosion could be **minor** with the likelihood of occurrence being **possible**. This would result in a **minor** effect.

3 Mitigation measures are set out above. With these mitigation measures in place the potential magnitude will be reduced to **none** and the likelihood to **unlikely**. This gives a residual effect of **none and not significant**.

11.10.4 Decommissioning effects

11.10.4.1 Pollution:

1 During the decommissioning of the N-route section there will be a number of activities taking place that could affect peat and soils. These include plant and machinery movement to facilitate tower removal and the breaking-out of tower foundations to below ground level. A number of potential pollutants will be present on site, including oil and fuels. As for construction, a pollution incident could affect the peat and soils in the vicinity of the incident. Breaking-out of tower foundations will also provide a direct pathway into the soils for potential contaminants.

2 Without mitigation measures the potential magnitude of a pollution incident could be **moderate** with the likelihood of occurrence being **possible**. This would result in a **minor** effect.

3 Mitigation measures are set out above. With these mitigation measures in place the potential magnitude will be reduced to **minor** and the likelihood to **unlikely**. This gives a residual effect of **none and not significant**.

11.10.4.2 Compaction and erosion:

1 As during construction, the movements of construction plant through the site to gain access to the towers could cause compaction in the soils. These effects are likely to be highly localised and restricted to the running tracks and areas immediately around tower foundations, but could have a damaging effect on the timescales for vegetation regrowth, heightening the likelihood of erosion. Tower foundations will be reinstated to ground level but will remain susceptible to erosion until vegetation growth has been re-established.

2 Without mitigation measures the potential magnitude of compaction and erosion could be **minor** with the likelihood of occurrence being **likely**. This would result in a **minor** effect.

3 Mitigation measures are set out above. With these mitigation measures in place the potential magnitude will remain **minor** with the likelihood reduced to **unlikely**. This gives a residual effect of **none and not significant**.

11.10.5 Summary of effects on peat and soils

1 The assessment of potential effects on peat and soils during construction and operation of the proposed grid connection and decommissioning of part of the N-route has indicated that there will be no effects of an order greater than **none**. As such, the anticipated effects on peat and soils will not be significant.

11.11 Effects on Water Supplies

11.11.1 Receptor sensitivity

2 Three public and 40 private water supplies were identified in the area near the proposed grid connection. Water supplies are particularly at risk from faecal or chemical contamination. The receptor sensitivity is therefore considered to be **high**.

11.11.2 Construction effects

11.11.2.3 Pollution:

1 Local public and private water supplies, within 2km of the route, were investigated to ascertain those which may be affected by this development. The locations of the public and private water supplies are given in Figure 11.01a-h. A source-pathway-receptor methodology was employed, where site construction practices and infrastructure were considered as potential pollution sources, overland flow or flow via watercourses or groundwater as the likely pathways and the receptors as the public and private water supply source locations. The results are given in Table 11.09 and Table 11.10.

Table 11.09 - Effects on public water supplies

Public Supply	Distance From Line (approx)	Comments	Further Assessment
Benloch Burn	650-1,480m	Supply catchment and intake situated upstream of proposed route and N-route so will not be affected by site activity.	No
Black Water	330m	Treatment plant located adjacent to Black Water but intake type and location uncertain.	Yes
Lochinvar Reservoir	530-1,040m	Proposed wood pole route crosses supply catchment. Two stream crossings on temporary access tracks cross watercourses upstream of reservoir.	Yes

Table 11.10 - Effects on private water supplies

PWS Property	Grid Reference	Type of Supply	Distance From Line (approx)	Comments	Further Assessment
Shankston Farm	NS 406 118	unknown	1,360m	Situated across River Doon from N-route so is protected from contamination by this watercourse and will not be affected by site activity	No
Carclout Farm	NS 400 099	unknown	1,840m	Situated across River Doon from N-route so is protected from contamination by this watercourse and will not be affected by site activity	No
The Schoolhouse	NS 428 104	unknown	950m	Situated well uphill from N-route so will not be affected by site activity	No
Auldcraigoch	NS 453 042	unknown	1,930m	Situated across River Doon from N-route so is protected from contamination by this watercourse and will not be affected by site activity	No

PWS Property	Grid Reference	Type of Supply	Distance From Line (approx)	Comments	Further Assessment
Glenmuck Farm	NS 514 021	stream	325m	Source situated c. 145m downstream of proposed route. Two towers close upstream, at 147 and 247m distance. Tower at 247m is 20m from a watercourse feeding the PWS. The temporary access route to this tower also passes within 20m of the watercourse for 200m upstream of the tower.	Yes
Meadowhead	NX 518 994	spring	250m	Header tank for this supply situated 123m downhill of proposed route; source location uncertain but is uphill from tank.	Yes
Lamford	NX 520 991	spring	150m	Header tank for this supply situated 150m uphill of proposed route; source location is uncertain but is further uphill from tank. Source should therefore be unaffected by site activity but care needed to avoid damage to supply pipe.	Yes
Drumjohn	NX 524 976	unknown	270m	Source location unknown; likely to be on Lamford Hill, may be close to proposed route or existing N-route.	Yes
Knockengorroch	NX 555 970	spring	1,540m	Situated across Water of Deugh from proposed route so is protected from contamination by this watercourse and will not be affected by site activity.	No
Deugh Studio, Knockengorroch	NX 555 971	unknown	1,590m	Situated across Water of Deugh from proposed route so is protected from contamination by this watercourse and will not be affected by site activity.	No

PWS Property	Grid Reference	Type of Supply	Distance From Line (approx)	Comments	Further Assessment
Lamloch	NX 525 963	unknown	1,120m	Situated across Carsphairn Lane from proposed route so is protected from contamination by this watercourse and will not be affected by site activity.	No
Woodhead	NX 531 958	spring	1,030m	Situated across Carsphairn Lane from proposed route so is protected from contamination by this watercourse and will not be affected by site activity.	No
Brockloch Farm & Cottage & Fourwinds	NX 537 959	collector well	300-480m	Collector well for this supply situated adjacent to Brockloch Cottage; source intake in forestry areas across A713 and uphill of proposed route. Care needed to avoid damage to supply pipe.	Yes
Holm of Daltallochan & Bridge-end	NX 554 941, NX 557 944	spring	100-520m	Header tank for this supply situated adjacent to Water of Deugh, near Bridge-end; source location on Holm Hill, uphill of proposed route. Source should therefore be unaffected by site activity but care needed to avoid damage to supply pipe.	Yes
Lagwyne	NX 558 939	well/ spring	355m	Source for this supply uncertain but believed to be uphill of proposed route. Source should therefore be unaffected by site activity but care needed to avoid damage to supply pipe.	Yes
Garryhorn	NX 547 934	spring	1,540m	Situated across Water of Deugh and Carsphairn Lane from proposed route so is protected from contamination by this watercourse and will not be affected by site activity.	No

PWS Property	Grid Reference	Type of Supply	Distance From Line (approx)	Comments	Further Assessment
Carnavel	NX 563 927	unknown	715m	Situated across Water of Deugh and/or well upstream from proposed route so is protected from contamination by this watercourse and will not be affected by site activity.	No
Burnfoot	NX 590 923	borehole	1,260m	Situated across Water of Deugh from proposed route so is protected from contamination by this watercourse and will not be affected by site activity.	No
Bardennoch & West Bardennoch	NX 577 917	spring	105-190m	Source for this supply is situated well uphill from proposed route and N-route so will not be affected by site activity. Care needed to avoid damage to supply pipe.	Yes
Nether Loskie	NX 600 917	well	1,860m	Situated across Water of Deugh from proposed route so is protected from contamination by this watercourse and will not be affected by site activity.	No
Braidenoch	NX 566 903	unknown	1,750m	Situated in a sub-catchment unaffected by the development and consequently hydraulically separated from site activity.	No
Carminnows & Cottage	NX 600 907	borehole	1,510-1,470m	Property owner declined to provide details of source location. Property is located across a watershed from proposed route so is unlikely to be affected by site activity. Groundwater contamination unlikely due to influence of local topography.	No
Knowehead	NX 609 906	unknown	1,830m	Situated across Water of Deugh from proposed route so is protected from contamination by this watercourse and will not be affected by site activity.	No

PWS Property	Grid Reference	Type of Supply	Distance From Line (approx)	Comments	Further Assessment
Polquhanity	NX 591 897	unknown	195m	Details of source location unavailable. Property is located close to and downstream from proposed route and N-route.	Yes
Dalshangan, Lodge & Cottage	NX 596 889	borehole	215-365m	Source located near watershed with no direct connection to proposed route. Groundwater contamination unlikely due to influence of local topography.	No
Polmaddie Farm	NX 599 880	borehole	490m	Situated across Water of Deugh from proposed route so is protected from contamination by this watercourse and will not be affected by site activity.	No
1-14 Dundeugh	NX 599 879	stream	500m	Situated across Water of Deugh from proposed route so is protected from contamination by this watercourse and will not be affected by site activity.	No
Deughside	NX 597 880	unknown	640m	Details of source location unavailable but likely to be same as for Dundeugh.	Yes
Stroangassel	NX 604 867	unknown	1,330m	Situated across Water of Deugh/ Water of Ken from proposed route so is protected from contamination by these watercourses and will not be affected by site activity.	No
Glenhoul & Lodge	NX 609 878	spring	215-720m	Source location for this supply protected from contamination by several small watercourses flowing between the water supply and the proposed route. Groundwater contamination unlikely due to the influence of local topography.	No

PWS Property	Grid Reference	Type of Supply	Distance From Line (approx)	Comments	Further Assessment
Arndarroch Cottage	NX 616 892	well/ borehole	1,230m	Situated across Black Water from proposed route so is protected from contamination by these watercourses and will not be affected by site activity.	No
Arndarroch	NX 616 893	well	1,270m	Situated across Black Water from proposed route so is protected from contamination by these watercourses and will not be affected by site activity.	No
Kendoon Youth Hostel	NX 615 883	unknown	280m	Details of source location unavailable but likely to be on mains supply from Black Water.	Yes
Blackwater Cottage	NX 616 883	spring	280m	Source located on slopes of Macilston Hill, potentially very close to proposed route. Exact source location is unknown but may be downhill of proposed route. Care may be needed to avoid supply pipe.	Yes
Nether Cleugh & Cottage	NX 613 862	unknown	1,770m	Situated in a sub-catchment unaffected by the development and consequently hydraulically separated from site activity.	No
Mackilston	NX 624 868	unknown	1,310m	Situated in a sub-catchment unaffected by the development and consequently hydraulically separated from site activity.	No
Marskaig	NX 634 886	well	630m	Situated across Black Water from proposed route so is protected from contamination by these watercourses and will not be affected by site activity.	No
1&2 Glenshi-mmeroch	NX 649 866	unknown	660-670m	Header tank for this supply situated 660m downhill of proposed route; source location uncertain. Burn adjacent to property is crossed by proposed route 675m upstream from property.	Yes

PWS Property	Grid Reference	Type of Supply	Distance From Line (approx)	Comments	Further Assessment
Corriedoo	NX 680 829	unknown	1,010m	Header tank for this supply situated 1,010m downhill of proposed route; source location uncertain. Tributaries to burn adjacent to property are crossed by proposed route	Yes
Knockman	NX 677 826	spring	1,410m	Source location for this supply protected from contamination by several small watercourses flowing between the water supply and the proposed route. Groundwater contamination unlikely due to the influence of local topography.	No

2 Based on topographical data, hydrological information, the positions of intervening watercourses, distances of separation and a degree of professional judgement, most of the private water supplies and the public supply sourced from Benloch Burn are considered unlikely to be adversely influenced by the grid connection.

3 There remains, however, a small number of supplies which could be adversely affected or about which we currently have insufficient information to undertake an assessment.

4 A number of properties are known to have a source uphill from the proposed route or N-route but where the supply pipe will cross the area affected by construction. These properties are as follows:

- Brockloch Farm,
- Holm of Daltallochan & Bridge-end;
- Brockloch Cottage & Fourwinds; and
- Bardennoch & West Bardennoch.

5 For these supplies, the location and route of the supply pipe will need confirming prior to any construction activity and appropriate protection installed where necessary to safeguard the pipe.

6 For a number of properties close to the proposed route it was not possible to obtain definitive information about the source location. Although a door-to-door survey was conducted, not all residents were available at the time and have generally not responded to letters requesting information. One property owner declined to provide information about their supply. The relevant properties are as follows:

- Meadowhead,
- Drumjohn;
- Polquhanity
- Kendoon Youth Hostel;
- Corriedoo.
- Lamford;
- Lagwyne
- Deughside;
- 1&2 Glenshimmeroch; and

7 It is likely that for most of these properties the source location will not be affected by the proposed development. There remains sufficient uncertainty at this stage, however, that further investigation will be required to identify the source location

and to allow a full assessment to be completed. Some of these properties may also have a supply pipe that crosses the construction area, as discussed above. It is likely that Kendoon Youth Hostel is on the Kendoon mains supply, although this has not been confirmed at present.

8 Blackwater Cottage is known to be supplied by a spring on Mackilston Hill. Although the exact location of the intake is unknown, the approximate position provided by the property owner is close to the proposed wood pole line in this area. Further investigation will be required to identify the exact source location and location of the supply pipe, and to allow a full assessment to be completed.

9 A small water treatment works exists next to Kendoon Youth Hostel, which provides water for properties in the Kendoon area. Although this is a public supply, it is not known at present where the source is for this supply. The likely options include an intake off the Black Water, a borehole or spring. Confirmation of the source location would be needed to allow a full assessment to be completed for this supply.

10 The proposed wood pole route crosses the catchment for the public water supply at Lochinvar and two temporary stream crossings on proposed access tracks are located upstream of the reservoir. Except for the area immediately around these two crossings, the route and access tracks have been located at least 20m from watercourses. The presence of construction activity within close proximity of this source indicates that it is at risk from a pollution incident, through spillage of oil or fuel and mobilisation of sediment from excavations, stockpiled soils and vehicle and plant movement. Specific mitigation measures for this supply are discussed further in Technical Appendix F.

11 Without mitigation measures the potential magnitude of a pollution incident on the Lochinvar supply could be **moderate** with the likelihood of occurrence being **possible**. This would result in a **moderate** effect.

12 Mitigation measures are set out above. With these mitigation measures in place the potential magnitude will be reduced to **minor** with the likelihood remaining **possible**. This gives a residual effect of **minor and not significant**.

13 The property at Glenmuck Farm is known to have a stream intake downstream of the proposed route. Two towers are proposed upstream of this source, one of which is located 20m from a watercourse that feeds directly into the supply. The temporary access route for this tower passes within 20m of the same watercourse for a distance of 200m between the existing forestry track and the tower location. The presence of construction activity within close proximity of this source indicates that it is at risk from a pollution incident, through spillage of oil or fuel, or concrete during pouring of tower foundations and mobilisation of sediment from excavations, stockpiled soils and vehicle and plant movement. Specific mitigation measures for this supply are discussed further in Technical Appendix F.

14 Without mitigation measures the potential magnitude of a pollution incident on the Glenmuck Farm supply could be major with the likelihood of occurrence being possible. This would result in a major effect.

15 Mitigation measures are set out above. With these mitigation measures in place the potential magnitude will be reduced to **moderate** with the likelihood remaining **unlikely**. This gives a residual effect of **minor and not significant**.

11.11.2.4 Modification of groundwater flows:

1 There are a number of private water supplies that abstract from spring sources, wells or boreholes (Table 11.10), all of which are reliant on groundwater. Lowering of groundwater levels from temporary groundwater controls could affect these supplies, although effects are likely to be localised and short-term.

2 Without mitigation measures the potential magnitude of modification of groundwater flows could be minor with the likelihood of occurrence being unlikely. This would result in a minor effect.

3 Mitigation measures are set out above. With these mitigation measures in place the potential magnitude will be reduced to **none** with the likelihood remaining **unlikely**. This gives a residual effect of **none** and therefore **not significant**.

11.11.2.5 Modifications to surface runoff:

1 A number of public and private water supplies rely on surface water. Installation of temporary drains associated with wood pole and tower foundations, cable trench excavation and construction activity will intercept diffuse overland flow. This will interrupt the natural drainage regime by concentrating flows and potentially increasing runoff rates, peak flows and response times during storm events.

2 Without mitigation measures the potential magnitude of modifications to surface runoff could be minor with the likelihood of occurrence being **possible**. This would result in a **minor** effect.

3 Mitigation measures are set out above. With these mitigation measures in place the potential magnitude will remain **minor** with the likelihood reduced to **unlikely**. This gives a residual effect of **minor and not significant**.

11.11.3 Predicted ongoing and operational effects

11.11.3.1 Pollution:

1 Owing to the reduced activity on site during the operational period the risk of a pollution incident is much less than during construction. However, the need for routine and emergency maintenance will necessitate having vehicles and specialist machinery on site, which will introduce potential pollutants into the area.

2 The relative positions of the water supplies and the on site activities indicates that the majority will be unaffected by any operational work. Supplies discussed above for which there is currently insufficient information will need to be assessed fully once additional information has been acquired. The public supply at Lochinvar and private supply at Glenmuck Farm remain potentially at risk from a pollution incident.

3 Without mitigation measures the potential magnitude of a pollution incident at Lochinvar and Glenmuck Farm could be **moderate** with the likelihood of occurrence being **unlikely**. This would result in a **minor** effect.

4 Mitigation measures are set out above. With these mitigation measures in place the potential magnitude will be reduced to **minor** with the likelihood remaining **unlikely**. This gives a residual effect of **minor and not significant**.

11.11.3.2 Modification of groundwater flows:

1 There are no anticipated operational effects on public or private water supplies arising from modifications to groundwater flows.

11.11.3.3 Modifications to surface runoff:

1 There are no anticipated operational effects on public or private water supplies arising from modifications to surface runoff.

11.11.4 Decommissioning effects

11.11.4.1 Pollution:

1 During the decommissioning of the N-route section there will be a number of activities taking place that could affect public and private water supplies. These include plant and machinery movement to facilitate tower removal and the breaking-out of tower foundations to below ground level. A number of potential pollutants will be present on site, including oil, fuels, waste and waste water from staff facilities. Breaking-out of foundations could generate concrete dust, which may enter water supplies.

2 The relative positions of the water supplies and the on site activities indicates that the vast majority will be unaffected by any operational work. Supplies discussed above for which there is currently insufficient information will need to be assessed fully once additional information has been acquired.

3 Without mitigation measures the potential magnitude of a pollution incident could be **moderate** with the likelihood of occurrence being **unlikely**. This would result in a **minor** effect.

4 Mitigation measures are set out above. With these mitigation measures in place the potential magnitude will be reduced to **minor** with the likelihood remaining **unlikely**. This gives a residual effect of **minor and not significant**.

11.11.4.2 Modification to groundwater flows:

1 There are no anticipated decommissioning effects on water supplies arising from modifications to groundwater flow.

11.11.4.3 Modifications to surface runoff:

1 Temporary cut-off drains may be required uphill of and beside tower foundation excavations during breaking-out work, to divert surface runoff around the excavation area. Water from these drains will be discharged to ground downhill of the excavation, using suitable dispersal and erosion protection measures as discussed above. Temporary drainage will be kept operational for a short period after reinstatement to prevent erosion of newly spread topsoil. Once vegetation is re-established, temporary drainage will be reinstated. Temporary drainage will intercept diffuse overland flow, interrupting the natural drainage regime by

concentrating flows and potentially increasing runoff rates, peak flows and response times during storm events. Temporary site drainage, if inadequately designed, could also promote erosion and sedimentation.

2 Without mitigation measures the potential magnitude of such modifications could be **minor** with the likelihood of occurrence being **possible**. This would result in a **minor** effect.

3 Mitigation measures are set out above. With these mitigation measures in place the potential magnitude will be reduced to **none** and the likelihood to **unlikely**. This gives a residual effect of n**one and not significant**.

11.11.5 Summary of effects on water supplies

1 The assessment of potential effects on public and private water supplies during construction and operation of the proposed grid connection and decommissioning of part of the N-route has indicated that there will be no effects of an order greater than **minor**.

11.12 Cumulative Effects

1 A number of developments known to be located within the affected catchment areas have been considered within the baseline assessment. There are no additional developments known to be proposed within the Study Area at present. There are therefore no anticipated cumulative effects resulting from development of the grid connection.

11.13 Summary of Assessment

1 An assessment has been carried out of the likely effects of the proposed Blackcraig and Margree windfarms Grid Connection on the hydrological and hydrogeological environments. The assessment has considered site preparation, construction and operation of the grid connection, together with removal and decommissioning of part of the existing N-route. The predicted effects are summarised in Table 11.11 to Table 11.13.

2 The potential effects on the surface waters, groundwaters, peat and soils, and public and private water supplies that have been considered are:

- Pollution incident;
- Erosion and sedimentation;
- Changes to water resources, i.e. public and private water supplies;
- Modification to surface water and groundwater flows;
- Modification of natural drainage patterns;
- Impediments to flows and flood risk; and
- Compaction of soils.

3 A number of layout, design and construction proposals have been identified that will minimise, mitigate or offset these effects.

4 It is concluded that, with the proposed mitigation in place, the majority of effects on the hydrological and hydrogeological environments will not be significant.

Table 11.11 - Summary of predicted construction effects

Potential Event	Identified Receptor	Receptor Sensitivity	WITHOUT MITIGATION IN PLACE			WITH MITIGATION IN PLACE			Significance
			Magnitude	Likelihood	Effect	Magnitude	Likelihood	Residual Effect	
Pollution Incident	Surface Water	High	Major	Likely	Major	Moderate	Unlikely	Minor	Not Significant
	Groundwater	High	Major	Likely	Major	Moderate	Unlikely	Minor	Not Significant
	Peat & Soils	Moderate	Moderate	Possible	Minor	Minor	Unlikely	None	Not Significant
	Water Supplies	High	Major	Possible	Major	Moderate	Unlikely	Minor	Not Significant
Erosion & sedimentation	Surface Water	High	Major	Likely	Major	Minor	Possible	Minor	Not Significant
Modification of Surface Runoff	Surface Water	High	Moderate	Possible	Moderate	Minor	Unlikely	Minor	Not Significant
	Water Supplies	High	Minor	Possible	Minor	Minor	Unlikely	Minor	Not Significant
Impediments to Flows	Surface Water	High	Moderate	Possible	Moderate	Minor	Unlikely	Minor	Not Significant
Modification of Groundwater Flows	Groundwater	High	Moderate	Likely	Moderate	Minor	Possible	Minor	Not Significant
	Water Supplies	High	Minor	Unlikely	Minor	None	Unlikely	None	Not Significant
Compaction & Erosion	Peat & Soils	Moderate	Minor	Likely	Minor	Minor	Unlikely	None	Not significant

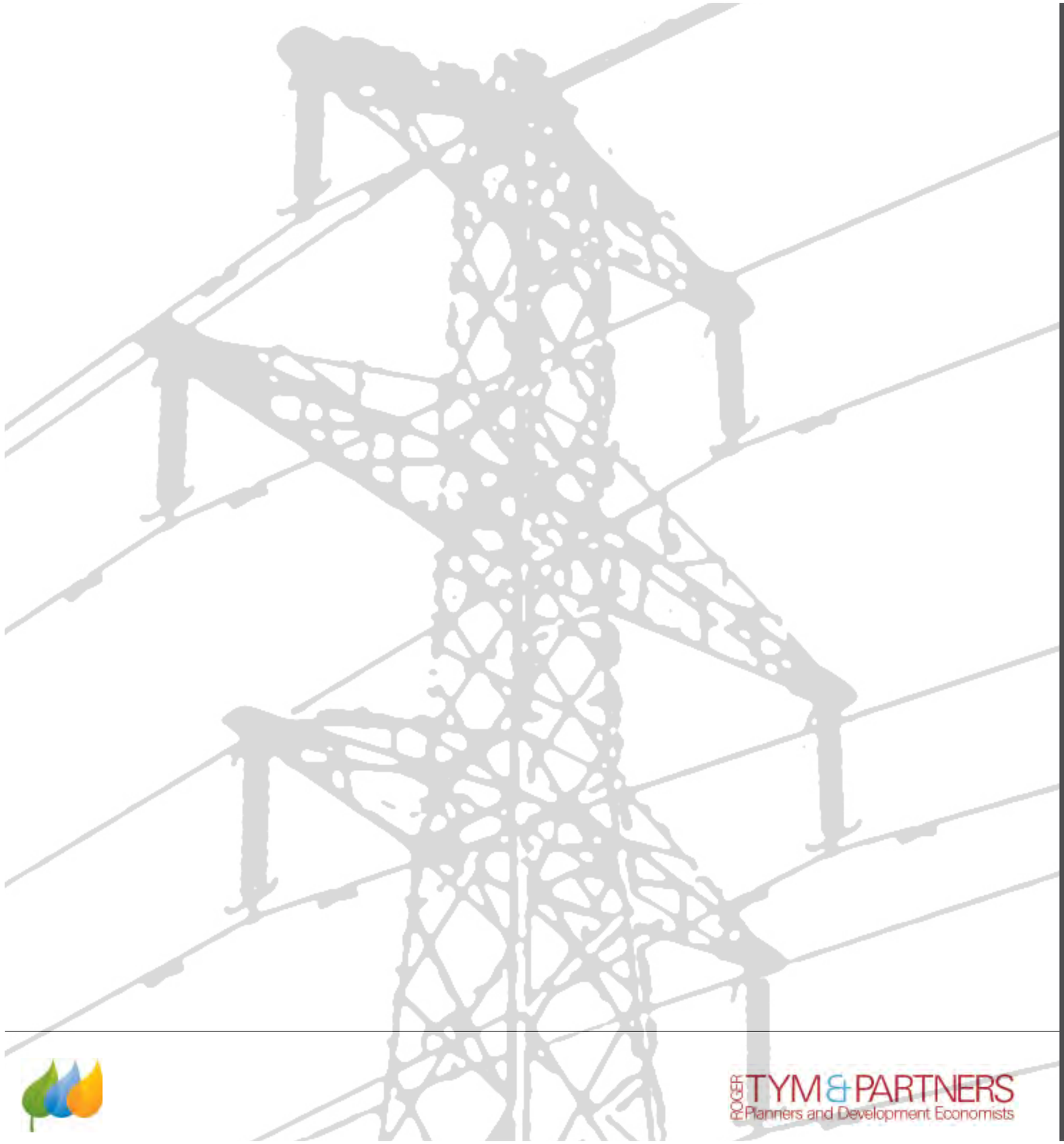
Table 11.12 - Summary of predicted ongoing & operational effects

Potential Event	Identified Receptor	Receptor Sensitivity	WITHOUT MITIGATION IN PLACE			WITH MITIGATION IN PLACE			Significance
			Magnitude	Likelihood	Effect	Magnitude	Likelihood	Residual Effect	
Pollution Incident	Surface Water	High	Minor	Possible	Minor	Minor	Unlikely	Minor	Not Significant
	Groundwater	High	Minor	Possible	Minor	Minor	Unlikely	Minor	Not Significant
	Peat & Soils	Moderate	Minor	Possible	Minor	Minor	Unlikely	None	Not Significant
	Water Supplies	High	Moderate	Unlikely	Minor	Minor	Unlikely	Minor	Not Significant
Erosion & sedimentation	Surface Water	High	Minor	Possible	Minor	None	Unlikely	None	Not Significant

Modification of Surface Runoff	Surface Water	High	No anticipated effects						
	Water Supplies	High	No anticipated effects						
Impediments to Flows	Surface Water	High	Minor	Possible	Minor	Minor	Unlikely	Minor	Not Significant
Modification of Groundwater Flows	Groundwater	High	No anticipated effects						
	Water Supplies	High	No anticipated effects						
Compaction & Erosion	Peat & Soils	Moderate	Minor	Possible	Minor	Minor	Unlikely	None	Not significant

Table 11.13 - Summary of predicted decommissioning effects

Potential Event	Identified Receptor	Receptor Sensitivity	WITHOUT MITIGATION IN PLACE			WITH MITIGATION IN PLACE			Significance
			Magnitude	Likelihood	Effect	Magnitude	Likelihood	Residual Effect	
Pollution Incident	Surface Water	High	Moderate	Possible	Moderate	Minor	Unlikely	Minor	Not Significant
	Groundwater	High	Moderate	Possible	Moderate	Minor	Unlikely	Minor	Not Significant
	Peat & Soils	Moderate	Moderate	Possible	Minor	Minor	Unlikely	None	Not Significant
	Water Supplies	High	Moderate	Unlikely	Minor	Minor	Unlikely	Minor	Not Significant
Erosion & sedimentation	Surface Water	High	Moderate	Possible	Moderate	Minor	Unlikely	Minor	Not Significant
Modification of Surface Runoff	Surface Water	High	Minor	Possible	Minor	Minor	Unlikely	Minor	Not Significant
	Water Supplies	High	Minor	Possible	Minor	None	Unlikely	None	Not Significant
Impediments to Flows	Surface Water	High	Moderate	Possible	Moderate	Minor	Unlikely	Minor	Not Significant
Modification of Groundwater Flows	Groundwater	High	No anticipated effects						
	Water Supplies	High	No anticipated effects						
Compaction & Erosion	Peat & Soils	Moderate	Minor	Likely	Minor	Minor	Unlikely	None	Not Significant



12

Tourism & Recreation

Blackcraig and Margree Windfarms
Grid Connection
Environmental Statement

ROGER TYM & PARTNERS
Planners and Development Economists

Table of Contents

12.1 Introduction ... 241
12.1.1 Sources of Information ... 241
12.1.2 Methodology ... 241
12.1.3 Conclusions ... 241

12.2 Baseline Conditions ... 242
12.2.1 Socio-Economic Baseline Conditions ... 242
12.2.1.1 Assessment ... 242
12.2.2 Tourism and Recreation Baseline Conditions ... 242
12.2.2.1 Assessment ... 242
12.2.3 Tourism and Recreation Audit ... 242
12.2.3.1 Identification of Principal Activities and Facilities ... 242
12.2.3.2 Definition of Study Area ... 242
12.2.3.3 Audit ... 242
12.2.3.4 Principal Settlements ... 243
12.2.3.5 Principal Tourist Routes ... 243
12.2.3.6 Principal Walking Routes ... 243
12.2.3.7 Rights of Way ... 243
12.2.3.8 Horse-riding ... 244
12.2.3.9 Climbing Routes ... 244
12.2.3.10 Principal Cycle Routes ... 244
12.2.3.11 Golf ... 244
12.2.3.12 Fishing ... 244
12.2.3.13 Forest Parks ... 244
12.2.3.14 Estates ... 244
12.2.3.15 Events ... 245
12.2.3.16 Visitor Attractions ... 245
12.2.3.17 Activity Centres ... 245
12.2.3.18 Accommodation ... 245

12.3 Potential Effects ... 245
12.3.1 Comparative Research on Potential Effects ... 245

12.4 Assessment of Effects ... 246
12.4.1 Evaluation Criteria ... 246
12.4.1.1 Adverse Effects ... 246
12.4.1.2 Beneficial Effects ... 247
12.4.1.3 Overall Effects ... 247
12.4.2 Tourism and Recreation Impact Assessment ... 247
12.4.2.1 Adverse Effects from the Construction of the Proposed Overhead Line ... 247
12.4.2.2 Principal Settlements ... 247
12.4.2.3 Principal Tourist Routes ... 247
12.4.2.4 Principal Walking Routes ... 247
12.4.2.5 Rights of Way ... 247
12.4.2.6 Core Paths ... 247
12.4.2.7 Climbing Routes ... 247
12.4.2.8 Principal Cycle Routes ... 247
12.4.2.9 Golf ... 247
12.4.2.10 Fishing ... 247
12.4.2.11 Forest Parks ... 247
12.4.2.12 Estates ... 247
12.4.2.13 Events ... 248
12.4.2.14 Visitor Attractions ... 248
12.4.2.15 Activity Centres ... 248
12.4.2.16 Accommodation Providers ... 248
12.4.3 Summary of Effects ... 248
12.4.3.1 Beneficial Effects from Removal of the N-Route ... 248
12.4.4 Summary of Beneficial Effects ... 249
12.4.5 Construction and Other Effects ... 250

12.5 Mitigation ... 250
12.5.1 Proposed Mitigation Measures ... 250
12.5.2 Construction Mitigation ... 250
12.5.3 Operational Mitigation ... 250

12.6 Residual Effects ... 250

12.7 Conclusion ... 250
12.7.1 Adverse Effects ... 250
12.7.2 Beneficial Effects ... 250

Table of Figures

Figure 12.01 - Study Area ... 242

Figure 12.02 - ZTV and 10km Study Area Comparison Map ... 242

Figure 12.03 - Distribution of Adverse Effects of Proposed grid connection on Tourism and Recreation receptors ... 250

Figure 12.04 - Distribution of Beneficial Effects of Proposed Removal of the N-Route on Tourism and Recreation receptors ... 250

List of Tables

Table 12.01 - Evaluation of Effects Criteria ... 246

Table 12.02 - Summary of Adverse Effect of Proposed OHL on Tourism and Recreation ... 248

Table 12.03 - Summary of Beneficial Effect of Proposed OGC on Tourism and Recreation ... 249

12.0 Tourism & Recreation

12.1 Introduction

1 Roger Tym and Partners were commissioned in October 2007, by Capita Lovejoy, to undertake a Socio-Economic, Recreation and Tourism Impact Assessment in support of the proposal for the development of the Blackcraig & Margree overhead line (OHL).

2 This chapter provides an assessment of the potential Tourism and Recreation effects that could occur as a result of the development of the proposed OHL. The approach to this assessment has been developed in accordance with the agreed methodology for the overall proposed project. The approach adopted in the preparation of this assessment includes a discussion of the existing baseline conditions in the survey area and the surrounding area[1], which follows the proposed route, in terms of tourism and recreation resources; historic and current tourism market conditions, trends and features; factors influencing these conditions; and any direct and indirect effects of the proposed OHL. It also considers the potential effect of the proposed project upon the tourism and recreation resources within the overall survey area. The key objectives of the assessment are:

- To determine the nature of the tourism and visitor resources, and the associated tourism issues, taking account of the regional, Scottish, and wider context;
- To identify the principal tourism and recreation effects (both beneficial and adverse) that may result from the proposed project and assess the importance of these effects;
- To recommend measures for preventing, reducing and offsetting any identified considerable adverse effects, and/or enhancing any beneficial effects; and
- To identify any residual adverse effects.

12.1.1 Sources of Information

1 The assessment included an extensive review of information sources to establish existing conditions and to identify current tourism and recreational activities within the survey area. The datasets used in this document are those standard sources of tourist and visitor data as found on VisitScotland's website on www.scotexchange.net, and other individual research, reports, and surveys referenced throughout the chapter. A full list of these is provided in Technical Appendix G.

12.1.2 Methodology

1 This assessment was carried out to establish the nature and conditions of the tourism and recreational resources in the defined area. In this the assessment is based upon a robust and well tested methodology employing a combination of web-based, desk-based, and visual survey, and information assessment and analysis. This approach has been tried and tested in a number of similar projects throughout Scotland where the effects of infrastructural development upon local economies generally and specifically the tourism and recreation industry have been assessed. This approach has been robustly tested and accepted as valid through various stages of the development process and at public inquiry.

2 A socio-economic profile of the Study Area has been provided, including key issues, trends and the performance of the East Ayrshire, South Ayrshire and Dumfries and Galloway economies relative to Scotland. This is then followed by a baseline assessment of tourism in terms of:

- Tourism volume and value;
- Nature of visits;
- Visitor accommodation used and occupancy rates;
- Visitor attractions;
- Tourism related employment; and
- The drivers currently affecting the industry both nationally and more locally.

3 This sets a context for the remainder of the assessment, and against which any effect are be set. The baseline review draws upon standard available VisitScotland and other tourism related and economic statistic datasets.

4 Tourism and recreation resources were defined as including the following:

- Key tourist, visitor and recreation focal points, events, or destinations including visitor centres, monuments, etc;
- Key tourist and visitor routes, etc;
- Key walking and cycling routes and bridleways, including Core Paths, Rights of Way, and 'Promoted Paths';
- Key viewpoints including notable tourist/visitor viewpoints;
- Principal fishing rivers, lochs, and fisheries;
- Tourist accommodation including B&Bs and guest houses, caravan and camping sites, and hotels; and
- Other principal tourist, visitor, and recreational facilities.

5 Generally the approach to the survey area of assessment within the vicinity of the proposed route would be taken to be up to and including those areas within a 10km distance on each side of the OHL, which is shown in Figure 12.01, which was the area used for the initial audit of facilities and activities. This assessment area was defined on the basis that experience has shown that the visual importance of development within a landscape can be directly related to its proximity or distance from a given viewpoint, and that its visual importance decreases appreciably at the threshold points of 5km and 10km from the development. However the preliminary ZTV subsequently identified the visibility of the proposed OHL, where on average the majority of visual effects on activities and facilities are limited to 5km or less from the proposed OHL. Therefore the tourism and recreation area of interest for assessment has been subsequently reduced to reflect this. The ZTV is shown in Figure 12.02.

6 This area includes the settlements of:

- St John's Town of Dalry (c 5km);
- Kendoon (c 0.1km);
- Carsphairn (c 0.25km);
- Bellsbank (c 0.5km);
- Dalmellington (c 0km);
- Waterside (c 5.5km); and
- Patna (c 8km);

7 The assessment was undertaken using desk-based and web-based information sources. This was supplemented by site visits to validate the desk and web based information sources, particularly those most accessible to tourists / visitors.

8 In terms of tourism and recreation issues there is no specific methodology developed or recommended for the assessment of cumulative impacts. These particular issues are addressed and dealt with through the Landscape and Visual Impact Assessment for the project, which is accepted as valid for the purposes of tourism and recreation impact assessment.

12.1.3 Conclusions

1 We have drawn together the results of the assessment in the form of summary conclusions on quantitative and qualitative effects. Supporting detailed information and data have been included as Appendices to substantiate the assessment provided.

1 - The survey area for assessment within the vicinity of the proposed OHL route was taken to be up to and including those areas within a 10km distance on each side of the OHL.

Figure 12.01 - Study Area

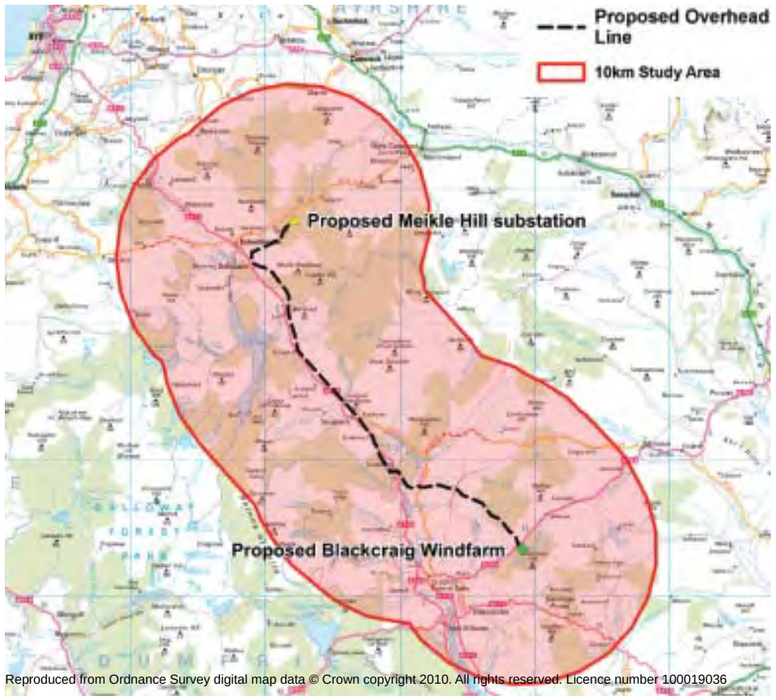


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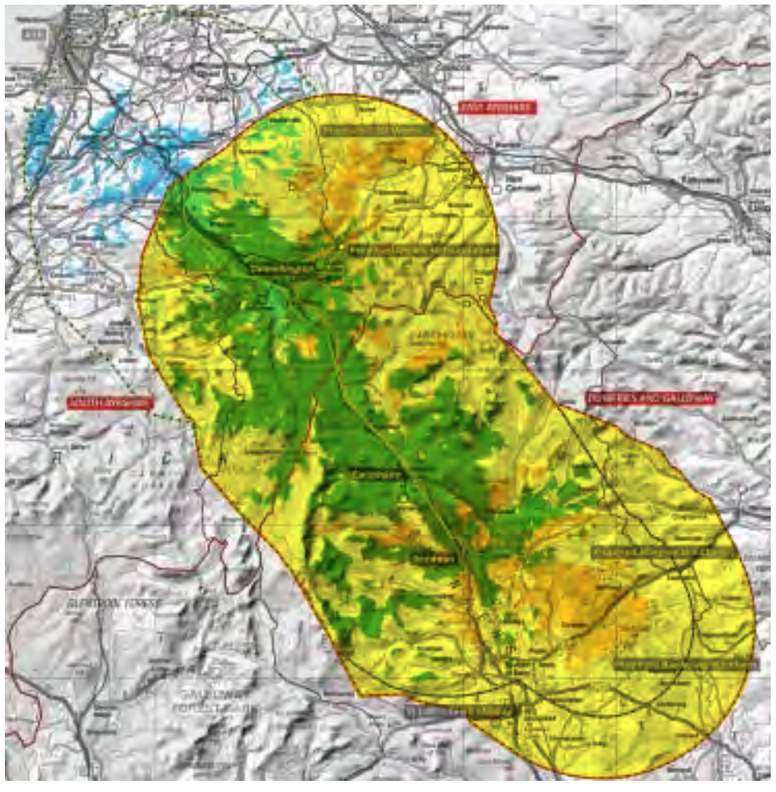
Figure 12.02 - ZTV and 10km Study Area Comparison Map



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12.2 Baseline Conditions

1 In rural areas including Ayrshire and Dumfries and Galloway tourism and tourism employment is a major part of the overall economy, particularly in the context of the decline in traditional employment in agriculture and forestry. Thus to maintain tourism is of importance in retaining an economically active population in the countryside and to prevent de-population.

12.2.1 Socio-Economic Baseline Conditions

1 The proposed OHL will be situated within both the Dumfries and Galloway (D&G), East Ayrshire (EA) Council areas. The Study Area however also extends to include the South Ayrshire (SA) Council area.

2 The following analysis outlines the social and economic characteristics of the locality and wider region in which the proposed OHL and associated infrastructure will be situated. A table of socio-economic data is provided to support the assessment in Technical Appendix G. The subsequent section provides a profile of the tourist region's product.

12.2.1.1 Assessment

1 Compared to an increase in Scotland's population of 1% from 2000 to 2006, Dumfries and Galloway increased by 0.3%. However East and South Ayrshire decreased by 0.6% and 0.5% respectively.

2 The three local authority areas considered within this study have a lower than average working age population, average economic activity and inactivity, lower qualification and skills levels, higher than average weekly earnings and higher numbers of unemployment benefit claimants.

3 Overall East Ayrshire has a lower than average economic level, while South Ayrshire and Dumfries and Galloway have average economic levels.

12.2.2 Tourism and Recreation Baseline Conditions

1 The proposed OHL will be situated within both the Ayrshire and Arran and Dumfries and Galloway (D&G) tourist regions.

2 The following analysis outlines the tourism and recreation characteristics of the locality and wider region in which the Blackcraig and Margree grid connection and associated infrastructure will be situated. Detailed tourism and recreation information is provided in Technical Appendix G.

12.2.2.1 Assessment

1 The wider UK and Scottish tourism and recreation market is affected by a number of 'macro-economic' drivers and factors including weather patterns, levels of real disposable income, factors such as concerns over terrorism reducing travel, as well as changes in exchange rates. These macro-factors are considered to be as influential in affecting tourism patterns as local environmental circumstances such as those under consideration in this assessment. These factors are no less important at a Scottish and sub-Scottish regional market level.

2 Ayrshire and Arran and Dumfries and Galloway have a higher than average proportion of tourism related jobs, however this fluctuates over time.

3 Ayrshire and Arran attract many more overseas visitors that spend more per trip, than Dumfries and Galloway. However the two areas have roughly the same proportion of domestic tourists. Most tourists in the two areas come for a holiday or to visit friends and relatives, with higher than average levels while there are lower than average levels of business trips. Most visitors to the two areas stay with friends/ relatives or in guest hotel/guesthouses and self-catering accommodation. In terms of accommodation there is a higher than average usage of camping and self –catering accommodation and a lower than average B&B and hotel and guest house usage.

4 All of the top ten tourist attractions in Ayrshire and Arran and Dumfries and Galloway are located outwith the Study Area.

12.2.3 Tourism and Recreation Audit

12.2.3.1 Identification of Principal Activities and Facilities

1 In assessing the tourist, visitor and recreational facilities within the Study Area, it is those which register most frequently or readily within tourist or visitor websites, brochures, guidebooks, and other media that are taken here to represent the principal tourism resources in the area. This is a standard approach taken as a proxy for tourists or other visitors assessing the potential attraction of an area. Therefore we have set out below the principal attractions, festivals and events, walking and cycling routes, and other facilities.

12.2.3.2 Definition of Study Area

1 The proposed OHL starts c.5km north east of St. John's Town of Dalry, running from the centre of Corriedoo Forest north west through woodland to the north of Mackilston Hill. It then passes west to Kendoon and shadows the A713, past Carsphairn, to Dalmellington. The OHL then heads north-east to Meikle Hill.

2 The area is attractive with open countryside, rolling hills, and the Galloway Forest Park, with excellent walking, cycling and fishing, and extensive bird watching and wildlife. Among the activities promoted within the area are walking, fishing, cycling and bird watching.

12.2.3.3 Audit

1 This section identifies the various forms of tourism and recreation activities or facilities within the Study Area. This includes settlements, tourist routes, walking routes, rights of way, core paths, bridleways, climbing routes, cycle routes, golf and fishing (i.e. lochs and rivers), forest parks/nature reserves, estates, events, visitor attractions, activity centres and accommodation providers present within a corridor 20km wide with the OHL at its centre.

2 A full audit list for the Study Area is provided in Technical Appendix G. Maps detailing the tourist and recreation activities and facilities are provided here also.

12.2.3.4 Principal Settlements

1 There are eight principal settlements in the study, with those most likely to be affected by the proposed grid connection being Carsphairn, Dalmellington and Kendoon.

12.2.3.5 Principal Tourist Routes

1 There are five principal tourist routes in the Study Area, with the most likely to be affected including:

- A713 – leading from Castle Douglas, passed Dalmellington, to Ayr; and
- B7000 – a minor road leading from St. John's Town of Dalry to High Bridge of Ken and the B729.

12.2.3.6 Principal Walking Routes

12.2.3.6.1 Long Distance Routes

1 The Southern Upland Way is 340km long (the longest long distance path in Scotland) and is one of four official long distance routes. It runs from Portpatrick in the West to Cockburnspath in the East, via Bargrennan and Moffat (among others). This route is not included in this part of the analysis but in the audit of Rights of Way analysis as it is designated as a national Right of Way by ScotWays. This route is included in this audit under Dumfries and Galloway Core Path 6000.

12.2.3.6.2 Carsphairn Settlement Walks

- Cairnsmore of Carsphairn – starts at Green Well of Scotland and leads to Cairnsmore of Carsphairn;
- Carsphairn Trail – is a short linear walk through the village looking at its history from the south to the north of the village, then to the Green Well of Scotland and back;
- Dodd and Moorbrock Hills – is along a minor Road following Water of Ken to the Dodd and Moorbrock Hills;
- Stroanpatrick Trail – is a route along the way marked trail for the hill fort and the viewpoint;
- Windy Standard and Blue Peter Memorial – is a route starting at Craigengillan that leads to Windy Standard via Dugland and the Trostan Hills; and
- Windy Standard and Lorg – leaves from Craigengillan and goes up to Windy Standard via Dugland and the Trostan Hills coming back via Lorg.

12.2.3.6.3 Dalmellington Settlement Walks

- Dalmellington Town Trail - Round the centre of Dalmellington, past the football ground and main street.

12.2.3.6.4 Patna Settlement Walks

- Patna Walk – a short walk round the centre of Patna.

12.2.3.6.5 St. John's Town of Dalry Settlement Walks

- Corriedoo and Goathouse Glen – is an easy short circular walk in the Corriedoo Forest along forest tracks and country roads. The walk passes close to the proposed site of the Blackcraig substation;
- Halfmark to Blackcraig Hill - is a short hill-walk, rated as moderately difficult, and offering views over Glenkens. The walk starts south of Halfmark and leads up to Blackcraig Hill and the proposed windfarm;
- Meikle Millyea from the Clenries – is a route that starts at Garroch Glen car park going to Rig of Clenrie then Meikle Millyea and back;
- Milldown via Hawse Burn – is a route from Forest Lodge car park south west to Milldown through woodland; and
- Troquhain Hills - is a strenuous walk on forest tracks and heather clad open hillside. Starts c1km north east of Corriedoo and passes over Troquhain Hill.

12.2.3.6.6 Straiton Settlement Walks

- Lady Hunter Blair's Walk;
- Straiton Village Ramble;
- The Curch Walk;
- The Hill Wood; and
- The Monument and Bennan Circuit.

12.2.3.6.7 Hill Tracks[2]

1 There are seven Hill Tracks (which are not counted as RofW) that are located within the Study Area. The Tracks that are likely to be most affected are:

- 80 - Bargrennan to Carsphairn or Dalmellington; and
- 83 - Barr to Carsphairn.

12.2.3.6.8 Other Walks

1 There are also a wide range of more local walks, path and Rights of Way, which criss-cross the Study Area. These include a diverse range of short to medium length village and rural walks, beside rivers and through woodland, and most of these walks are used sporadically by local residents and visitors alike, but any data upon their level of usage are unavailable.

2 Some of these routes may follow the Rights of Way in the area (described in the next section) but have all been referred to here separately as they may have extra 'legs' or variations from the original Rights of Way.

2 - Hill Tracks taken from the 'Scottish Hill Tracks' book by ScotWays.

12.2.3.7 Rights of Way

12.2.3.7.1 Definition of Rights of Way

1 A Right of Way (RofW) is defined as a path which links two public places (including roads), over land which is owned by another party and which has been used by the general public for at least 20 years. The council which has jurisdiction in the area has a duty to keep these routes open and free from obstructions.

2 These routes can be anything from local footpaths used for dog walking to bridleways, roads and long distance hill paths. A variety of users can also be found on the RofW including walkers, cyclists and horse riders. Many RofWs are also able to be accessed by disabled people.

3 The main authority on RofWs in Scotland is ScotWays. ScotWays has been working to look after Rights of Way for 160 years. They created and now maintain the National Catalogue of Rights of Way, together with Scottish Natural Heritage, which lists all the known Rights of Way in Scotland. It also deals with enquiries on problems related to the RofWs and provides legal advice on RofW law. This catalogue is the basis for the following analysis.

4 The RofWs dealt with in this section come from maps made available by ScotWays. Maps with the routes of each RofW are provided in the Technical Appendix G. There are 67 Rights of Way contained within the Study Area. The Rights of Way that are most likely to be affected include:

- DS3 - Drumjohn to Meadowhead;
- DS5 - Green Well of Scotland to Knockengorroch then west to A713;
- DS6 - Knockengorroch to Sluice in woodland;
- DS8 – Green Well of Scotland to Cairnsmore of Carsphairn;
- DS9 - Lamloch to Corserine southwards;
- DS11 - Garryhorn to Carsphairn;
- DS15 - Knockgray north east to Moorbrock;
- DS23 - Garryhorn to Green Well of Scotland;
- DS28 – Dundeugh Hill Wood - south eastern side;
- DS54 - A702 north west of Stroan Hill to Divot Hill path;
- DS222 - Butterhole Bridge to Stroanpatrick; and
- SCD108 - Eriff to Craigengillan then to Dalmellington by Bellsbank.

12.2.3.7.2 Core Paths

1 One of the duties of the different councils in Scotland under the Land Reform (Scotland) Act 2003 was to prepare a draft core path plan by February 2008. This will consist of a system of paths sufficient to give the public reasonable access in their local area, generally around settlements and including well known rights of way or well used paths.

2 In February 2008 East Ayrshire and South Ayrshire Councils provided to the public several interim draft core path plans for all areas within their Council area boundaries[3]. These were subject to comment and may be altered in the future, meaning that the draft core paths included in this document may or may not be included in the final plans for both councils.

12.2.3.7.3 East Ayrshire Council Draft Core Path Plan

1 The draft maps provided for the Dalmellington area are provided in Technical Appendix G.

2 There are 11 East Ayrshire core paths that fall within the Study Area. Those which are most likely to be affected include:

- D12 – Dalmellington to Bellsbank Plantation (south);
- D13 – Dalmellington to Auldcraigoch Hill Woodland Loop;
- D15 – Dalmellington to Bellsbank via Loch Doon;
- D16 - Bellsbank to Auldcraigoch Hill Wood;
- D17 – Loch Doon; and
- D18 – Loop east of Dalmellington.

12.2.3.7.4 South Ayrshire Council Draft Core Path Plan

1 There is a core path plan for South Ayrshire, however none of the core paths fall within the Study Area.

12.2.3.7.5 Dumfries and Galloway Council Draft Core Path Plan

1 There are 90 Dumfries and Galloway core paths that fall within the Study Area. The core paths that are likely to be most affected include:

- 451 - Dundeugh to Bardennoch Hill;
- 466 – Garryhorn Rig;
- 467 – Carsphairn Craig of Knockgrey;
- 468 – Green Well of Scotland;
- 470 - Dundeugh Hill
- 479 - Dundeugh Hill;
- 499 – Dundeugh Hill;
- 506 –Dundeugh Hill;
- 507 - Dundeugh Hill;
- 524 – Garryhorn Rig;
- 534 – Dundeugh Hill;
- 560 – Dundeugh Hill;
- 979 – Dundeugh Hill;
- 987 - Margree
- 990 – Kendoon Youth Hostel;
- 991 –Margree;
- 6000 – Southern Upland Way

12.2.3.8 Horse-riding

1 Craigengillan Estate and Glenlee Estate (included in Estates) provide horse riding facilities. Furthermore, there is the opportunity for equestrian users to ride within Forestry Commission owned woods in the Study Area, on designated bridleways, riding trails or forest roads. Of particular note are the horse-riding facilities/routes available in the Galloway Forest Park (included in forest parks).

12.2.3.9 Climbing Routes

2 There are three climbing areas, with 10 crags in the Study Area, which include:

- Rhinns of Kells;
- Craig Michael; and
- Cairnsmore of Carsphairn.

12.2.3.10 Principal Cycle Routes

1 There are many cycle routes within the Study Area, on main or minor roads, tracks or off-road, and across-country. All types of cyclists come to the area including road, mountain bike and race cyclists.

2 Some of these routes may follow the Rights of Way in the area but have all been referred to here separately as they may have extra 'legs' or variations from the original Rights of Way.

3 There are six principal cycle routes located within the Study Area. The routes most likely to be affected include:

- Carsphairn Loop to Moniaive and Dalry;
- St John's Town of Dalry to Drumlanrig Castle; and
- The National Byway.

12.2.3.11 Golf

1 The south of Scotland is well known for its golf courses with only one located within the Study Area. That is Doon Valley Golf Course, outside Patna, a 9-hole course with countryside views.

12.2.3.12 Fishing

1 Fishing is readily available in the Study Area and there are a variety of fishing clubs, with the main ones being:

- Castle Douglas Angling Association;
- Dalry Angling Association;
- Glencairn Angling Club;
- Mid Nithsdale Angling Club;
- New Cumnock Angling Association; and
- New Galloway Angling Association.

2 These clubs deal with the principal rivers, lochs and fisheries within the area.

3 There is plenty of fishing available in the various estates in the area, which are detailed later in this section, and there are many lochs and rivers across the Study Area where it is possible to fish for salmon, trout and coarse fish.

4 There are 14 lochs and rivers in the Study Area that provide fishing, with those most likely to be affected including:

- Water of Deugh (trout fishing); and
- Water of Ken (brown trout and perch).

5 There is a proposal and newly secured funding to build a shelter with toilets at Loch Howie to encourage the use of the loch. This is to be built over three years.

12.2.3.13 Forest Parks

1 There are eight forest parks in the Study Area. A forest park is a area of woodland owned by the Forestry Commission or a private organisation, which provides recreation activities, events and is promoted. Those which are most likely to be affected include:

- Bellsbank Plantation – is a Forestry Commission plantation near Dalmellington. A path has been established round the shallow pond and a basic network of paths and visitor facilities are planned. It is part of the Bellsbank Community Project;
- Benbeoch/Pennyvenie Glen – is a SSSI and provisional wildlife site; and
- Dundeugh Hill Woodland and Dundeugh Castle Remains – is woodland containing the remains of Castle Dundeugh and walks around the woodland and Dundeugh Hill.

12.2.3.14 Estates

1 There are two principal estates in the area:

- Craigengillan Estate, near Dalmellington; and
- Forrest Estate (Fred Olsen Sporting Estates), south of Kendoon.

3 - The plans can be found at http://www.east-ayrshire.gov.uk/comser/paths/corepathplan/candidatepaths.asp and http://south-ayrshire.gov.uk/outdooraccess/corePathsMaps.htm

2 These estates provide a range of fishing (mainly salmon and trout), shooting (including pheasant, partridge, clay pigeon and grouse) and stalking (red and roe deer) as well as horse riding and guided tours. They also provide on-estate accommodation and can provide other activities or passes for other activities on their estate or in near-by settlements.

12.2.3.15 Events

1 There are five principal events that take place in the area. Those which are most likely to be affected include:

- Dumfries and Galloway Wildlife Festival, annually in March-April;
- Newton Stewart Walking Festival; and
- The Hairth Music Festival and World Ceilidh, annually in May and September consecutively.

12.2.3.16 Visitor Attractions

1 There are seven principal visitor attractions located within the Study Area. Those which are most likely to be affected include:

- Arndarroch Gardens, Kendoon;
- Carricks of Carsphairn, Carsphairn; and
- Carsphairn Heritage Centre, Carsphairn.

12.2.3.17 Activity Centres

1 There are numerous outdoor pursuits that can be undertaken individually or by groups within the Study Area, with Craigmalloch Outdoor Centre located within the Study Area.

12.2.3.18 Accommodation

1 As the Study Area is predominantly rural, there are few accommodation providers, which most locating near or in major settlements. The following providers are readily identifiable and/or promoted.

12.2.3.18.1 Hotels and B&Bs

1 The Study Area is home to five hotels of varying standards and varying locations, including:

- Bellsbank Country House Hotel, Dalmellington;
- Clachan Inn, St John's Town of Dalry;
- Eglinton Hotel, Dalmellington;
- Lochinvar Hotel, St John's Town of Dalry; and
- Riverdoon Hotel and Lancers Restaurant.

2 The Study Area is also home to three B&Bs and guest houses, of varying standards in the intermediate rural area and surrounding settlements, including:

- Muirdrochwood;
- The Lodgings; and
- The Porridge House.

12.2.3.18.2 Caravan Parks

1 There is one caravan and camping facility within the Study Area, which is Carskeoch Caravan Park, Patna.

12.2.3.18.3 Self-Catering Accommodation

1 There are seven self-catering accommodation providers within the Study Area, ranging from country cottages to farm apartments, out in the country or located in the centre of the many small towns in the area.

12.2.3.18.4 Youth Hostels

1 The Kendoon Youth Hostel is located within the Study Area.

12.3 Potential Effects

12.3.1 Comparative Research on Potential Effects

1 In assessing the potential effects of the proposed OHL, reference has been made to a number of sources of information, including:

- Other comparative research on tourist and visitor views on the effects of overhead transmission OHLs; and
- Commentary on the likely scale of visitors and recreational users of the facilities and / or routes.

2 The results of these assessments provide a 'finer-grained' understanding of the nature and distribution of potential effects, their pattern of concentration if relevant and distribution, on the basis of sub-areas as per the baseline analysis.

3 Relevant comparative research on other forms of infrastructural development is relatively extensive. However that specifically related to the effect of OHLs on the tourist and recreation economy is rather more limited.

4 The most widely referred to research[4] which makes reference to OHLs, is entitled: "Investigation into the Potential Impact of Windfarms on Tourism in Scotland" - Final Report for VisitScotland in 2002. This research focused upon the perceived effect of windfarms but importantly also used OHLs as a comparative visual element in the countryside in ascertaining visitors' views and the visual effect upon their visitor experience.

5 Although relating specifically to the effects of windfarms rather than OHLs on taking further holidays in the Scottish countryside, the research sheds some light on visitor attitudes towards such development, and therefore helps to inform the contextual picture. Thus as regards OHLs and towers, the research specifically states that:

"Although pylons were more numerous throughout the country with similar visual impacts to windfarms, the general feeling was that there was less controversy attached to them as people seemed to accept them as necessary for everyday life. According to one respondent: 'people just get used to them'."

6 Essentially therefore, the effect of OHLs on tourism and recreation would be important if it were such as to reduce the numbers of visitors or users of the facilities and services within the area of influence and indeed their expenditure within the local economy. Assuming that the effect on tourism of windfarm development would be broadly similar to that of the development of OHL, the VisitScotland research appears to conclude that respondents view the potential effect as generally important.

7 However, when assessing the research methodology for sample selection in this VisitScotland research it has become evident that this was skewed, in that it was more likely to result in a group of respondents which emphasised that windfarms and OHLs were either unpopular or visually intrusive, and that when unprompted questions were asked of respondents only 1% mentioned windfarms, and none OHLs, in contrast with 12% refuse/rubbish; 4% driving/roads; and 3% equally cutting down of trees and housing estates. It was only when prompted that OHLs were mentioned by 51%, and windfarms and turbines by 29% as being visually intrusive or potentially likely to affect visitor or tourist behaviour.

8 It is evident therefore that the value of this research in total is now clearly in question in terms of over-emphasising the level of any visitor or tourist effect from OHLs, windfarms or turbines on tourists, a point of criticism, which has been raised in recent public inquiries in Scotland.

9 Other comparative research specifically relevant to the Blackcraig & Margree proposals, and based in Ayrshire, includes the 'ex ante' (before the event) research[5] into the 'Impact of the Scotland – Northern Ireland Electricity Interconnector on the Ayrshire Tourism Economy' in 1994. This concluded that the business effect, focused upon the effects of OHLs upon business turnover, would be unlikely to be greater than 10% at most.

10 Indeed this quantum of estimated effect was accepted by the Reporter in his Report of the Scotland – Northern Ireland Electricity Interconnector Public Inquiry in his Findings of Fact and Related Conclusions.

The Reporter also found that "the performance of the (tourism) industry is as strongly influenced by macro-economic factors as local circumstances. If built the project would be one such local circumstance." In addition the Reporter also found "that there would be a negative impact on tourism and recreation within the immediate corridor of the overhead transmission line. Since the effect would be the consequences of the visual impact of the project, I find that it would extend as far as the limit of perceptibility….It would therefore be

4 - "Investigation into the Potential Impact of Wind Farms on Tourism in Scotland" – NFO System Three for VisitScotland (2002)

5 - Assessment of the impact of the Scotland – Northern Ireland Electricity Inter-connector on the Ayrshire Tourism Economy: Roger Tym & Partners for Scottish Power (1995)

of local significance. Although the effect could initially be material, I find that within 1-2 years it would be likely to be overtaken by year on year growth in tourist activity and spending. In overall terms, the effect is therefore likely to be limited."

11 However more recent research into the 'after the event' tourism and visitor effect of the same Interconnector in Ayrshire[6] in 2006, has demonstrated that the actual effect resulting from the construction of that OHL was negligible, amounting to <2% of businesses expressing concern as to the resulting adverse effect on tourism and visitor business during the planning, construction, and post-construction of that OHL. This very much does substantiate the view that the 1994 'before the event' appraisal was correct in as much as any adverse effect as a result of the Interconnector would be of minor scale, and that the Reporter's Findings of Fact were equally valid, even if the scale of effect was exaggerated.

12 It is reasonable to assume from this research that applying these findings to this OHL would indicate that there are good grounds for believing that the effects, should this tend to be over-estimated before the event, over time are likely to be notably less than might be predicted.

13 In addition, in terms of coverage, each of the four most popular paid tourist and all of the five most popular unpaid tourist attractions that took part in the Interconnector research's business survey stated that the OHL towers had no adverse effect on visitors over each of the three appraisal periods (1995-99, 2000-03, and 2004-06). It is also worth noting that these tourist attractions are scattered across wider Ayrshire, not just within the 20km wide survey corridor centred on the OHL route. The principal reasons given for this lack of effect were the distant location of the attractions in relation to the OHL, and the lack of any adverse visitor feedback or information received by the attractions about them from visitors. The research further deduced that there had been a minimal effect upon tourism businesses close to the OHL, or indeed upon the reputation as a whole, of Ayrshire as a tourist and visitor destination.

14 This is not to suggest that OHLs do not elicit adverse views in some quarters. However, as the Interconnector research illustrates, this does not mean such views appreciably affect tourism or recreation. For, while a number of respondents to the survey did feel that the OHL spoiled part of the landscape, they also felt that there was more support and understanding for them in comparison with windfarms. People understood that they had to have OHLs for electricity supply purposes.

15 This can be illustrated by statements from respondents to the business survey in that research, thus:

- *"The pylons are an eyesore and we fought against them at the proposal stage but since they are up, they don't affect us and people have got used to their presence" (from a holiday/touring park);*
- *"The lines are never mentioned by visitors, so they are out of sight and out of mind literally. Consumption of energy is going up and up nowadays and we need to continually have more and more energy. Pylons and windfarms provide us with the energy that we need" (from a hotel); and*
- *"There has been no noticeable effect on business from the power line. It already exists and makes no difference. It is an eyesore but people tend to get used to it and visitors don't notice" (from a food and drink establishment).*

16 Therefore in summary there is no research evidence to substantiate a view that recreational visitors would be discouraged from visiting or using the range of recreational or visitor facilities within the Study Area, be displaced elsewhere to other locations, or indeed be discouraged from visiting similar facilities elsewhere in Scotland overall.

17 In addition, few of the wider tourism and recreation activities and resources generate revenue or expenditure per se, but rather such expenditure is largely made through provision of facilities and services provided by businesses in the survey area. An assessment has been made of the potential effects upon the users of the activities and resources derived from the magnitude of landscape and visual change, and commentary provided as to the likely scale of effect on these activities and resources categorised by their status in terms of national, regional, and local importance.

12.4 Assessment of Effects

12.4.1 Evaluation Criteria

1 The potential adverse effects of the proposed OHL and the potential beneficial effects of the removal of the N-Route north of Dalmellington and the replacement of the N-Route by a L7 Tower OHL from Meikle Hill to Polquhanity, on tourism and recreation activities and facilities will be assessed using the following evaluation criteria for the level of importance in terms of effect on the tourism and visitor economy within the survey area, including activities, resources, businesses, and the local population.

Table 12.01 - Evaluation of Effects Criteria

Effect	Definition
Major Adverse	Where the extent of effects on activities, resources, or the local population is large in scale or magnitude, and a large number of people or activities will be affected; or where there is an obvious view of the grid connection with potential to cause appreciable change. These effects are considered to be significant.
Moderate Adverse	Where the extent of effects on activities, resources, or the local population is small in scale or magnitude, but a large number of people or activities will be affected; or where the grid connection would be visible from parts of a path or the views towards it would be limited, which could have a possible detrimental effect on users, subject to individual user's preferences. Or alternatively Where the extent of effects on activities, resources, or the local population is large in scale or magnitude but only a small number of people or activities will be affected. These effects are considered to be significant.
Minor Adverse	Where the extent of effects on activities, resources, or the local population is small in scale or magnitude, and will only affect a small number of people or activities; or where the grid connection would be unlikely to be visible (as it would be obscured by hills or woodland, etc) or would be at a distance, therefore if there was any effect it would be minor or negligible. These effects are not considered to be significant.
No Adverse	No effects are predicted; or the grid connection would not be visible.
Beneficial	Similar categories of effect as negative above but for positive reasons and outcomes

2 Note: Activities and resources are set out in detail in Technical Appendix G.

3 Effects assessed as Major or Moderate and considered significant in terms of the EIA Regulations, whilst those others are considered not significant.

12.4.1.1 Adverse Effects

1 Potential adverse Tourism Effect is judged to arise, in the absence of mitigation, where there is a substantial visual effect experienced by the visitor to or user of the resource. This might represent the tourist visiting a specific attraction or location, or indeed those visitors travelling to, through, or out of the local area, and which are exposed to views of the OHL, and which might result in a adverse effect upon their enjoyment of their visit or trip. Alternatively the adverse effect might result in the visitors not returning to the area in the future.

2 The assessment of tourism effects does not operate on the same basis as the visual effect methodology in terms of sensitivity of receptors but rather takes a view that the 'worst case' is what the visual effect is rated as. Thereafter this is placed in context with the results of the comparative research on the likelihood of tourists returning / not returning. This latter research does not show that there is a direct causal relationship between an adverse effect and the same % of visitors not returning, but rather there is little if any research to demonstrate that visitors would not return to an area, as a result of such effects.

3 In terms of Recreational Impact, guidance[7] is provided by SNH, within which examples of 'potential outdoor access effects' are set out as including:

- Loss / closure / extinguishment;
- Diversion;
- Reduction in amenity;
- Enhancement in amenity;
- Intrusion;
- Obstructing access routes;
- Enhancing access; and
- Changes to setting and context.

6 - The Scotland–Northern Ireland Interconnector Ex Post Tourism Impact Assessment: Roger Tym & Partners for SSE (2006)

7 - 'Outdoor Access Impact Assessment,' in 'A Handbook on Environmental Impact Assessment:' SNH (February 2006) Appendix 5, Table 4

12.4.1.2 Beneficial Effects

1 It is assumed here that the removal of an OHL will only benefit the local area as it will improve the perception of the landscape and setting.

2 This beneficial assessment includes some tourism and recreation activities and facilities not included in the adverse effects assessment as the removal of the N-Route runs north of Dalmellington, unlike the proposed OHL, which terminates east of Dalmellington, thus having a reduced Study Area.

12.4.1.3 Overall Effects

1 This Recreational Impact Assessment assesses the potential effect of the proposed grid connection on those aspects related to the recreational resources as set out in the audit above. Where such effects are judged to be experienced by users of the facilities (as set out in Table 12.01) these are assessed as resulting in the appropriate effect.

12.4.2 Tourism and Recreation Impact Assessment

12.4.2.1 Adverse Effects from the Construction of the Proposed Overhead Line

1 This section deals with the adverse effect which the proposed OHL would have on tourism and recreation within the Study Area. This includes settlements, tourist routes, walking routes, rights of way, core paths, bridleways, climbing routes, cycle routes, golf and fishing, forest parks, estates, events, visitor attractions, activity centres and accommodation providers present within the reduced Study Area covered by the ZTV and perceptibility study.

2 Full details of the effect assessment findings for the Study Area are provided in Technical Appendix G.

12.4.2.2 Principal Settlements

1 There are nine principal settlements contained within the Study Area, which are dealt with here:

- Three of these principal settlements would experience a **minor** adverse effect (**Not Significant**) from the proposed OHL (Carsphairn/Dalmellington/Kendoon); and
- All of the remaining (six) principal settlements would experience **no** adverse effect (**Not Significant**) from the proposed OHL.

12.4.2.3 Principal Tourist Routes

1 There are five tourist routes contained within the Study Area, which are dealt with here.

- Two of these routes would experience a **moderate** adverse effect (**Significant**) from the proposed OHL (A713/B7000); and
- Three of these routes would experience a **minor** adverse effect (**Not Significant**) from the proposed OHL (A702/B729/B741).

12.4.2.4 Principal Walking Routes

1 There are 25 principal walking routes contained within the Study Area, which are dealt with here.

- One of these routes would experience a **moderate** adverse effect (**Significant**) from the proposed OHL (Carsphairn Trail);
- Four of these routes would experience a **minor** adverse effect (**Not Significant**) from the proposed OHL (Corriedoo and Goathouse Glen/Troquhain Hills/HT80/ HT83); and
- All of the remaining (20) routes would experience **no** adverse effect (**Not Significant**) from the proposed OHL.

12.4.2.5 Rights of Way

1 There are 67 Rights of Way (RoW) contained within the Study Area that are dealt with here:

- 12 of these RoW would experience a **moderate** adverse effect (**Significant**) from the proposed OHL (DS3/DS5/DS6/ DS8/ DS9/ DS11/ DS15/ DS23/ DS28/DS54/ DS222/SCD108);
- 16 of these RoW would experience a **minor** adverse effect (Not **Significant**) from the proposed OHL (DS4/ DS7/ DS10/ DS27/DS33/ DS34/ DS35/ DS36/DS56/ DS58/ DS59/DS60/DS221/ DS247/SCD16/SCD109); and
- All of the remaining (39) RoW would experience **no** adverse effect (**Not Significant**) from the proposed OHL.

12.4.2.6 Core Paths

1 There are 101 draft core paths that lie within the Study Area, which are dealt with here:

- 19 of these core paths would experience a **moderate** adverse effect (**Significant**) from the proposed OHL (D17/451/462/466/467/468/470/479/499/506/507/524/534/560/979/987/990/991/6000);
- 19 of these core paths would experience a **minor** adverse effect (**Not Significant**) from the proposed OHL (D12/D13/D15/D16/D18/60/61/103/105/446/487/490/496/521/1000/1001/3286/3289/3310); and
- All of the remaining (63) core paths would experience **no** adverse effect (**Not Significant**) from the proposed OHL.

12.4.2.7 Climbing Routes

1 There are 10 recognised climbing routes within the Study Area however none of the routes would be adversely affected by the OHL.

12.4.2.8 Principal Cycle Routes

1 There are six cycle routes within the Study Area, which are dealt with here.

- Three of these cycle routes would experience a **moderate** adverse effect (**Significant**) from the proposed OHL (Carsphairn Loop to Moniaive and Dalry/ St John's Town of Dalry to Drumlanrig Castle/ The National Byway; and
- Two of these cycle routes would experience a **minor** adverse effect (**Not Significant**) from the proposed OHL (Lochinvar Circular Route/The Scottish Coal Cycle Route).
- One of these cycle routes would experience no negative effect from the proposed line (B7045).

12.4.2.9 Golf

1 There is one golf course contained within the Study Area, which would experience no effects arising from the proposed OHL.

12.4.2.10 Fishing

1 There are 20 principal fishing sites contained within the Study Area that are dealt with here.

- Two of these principal fishing sites would experience a **moderate** adverse effect (**Significant**) from the proposed OHL (Water of Deugh/Water of Ken);
- Ten of these principal fishing sites would experience a **minor** adverse effect (**Not Significant**) from the proposed OHL (Glencairn Angling Club/New Cumnock Angling Association/Carsfad Loch/Carsphairn Lane/Loch Doon/Loch Howie/Loch Skae/Lochinvar Reservoir/Polmaddy Burn/River Doon); and
- All of the remaining (Eight) principal fishing sites would experience **no** adverse effect (**Not Significant**) from the proposed OHL.

12.4.2.11 Forest Parks

1 There are eight forest parks contained within the Study Area that are dealt with here:

- One of these forest parks would experience a **moderate** adverse effect (**Significant**) from the proposed OHL (Dundeugh Hill Woodland and Dundeugh Castle Remains);
- Two of these forest parks would experience a **minor** adverse effect (**Not Significant**) from the proposed OHL (Bellsbank Plantation/Benbeoch/Pennyvenie Glen); and
- All of the remaining (Five) forest parks would experience **no** adverse effect (**Not Significant**) from the proposed OHL.

12.4.2.12 Estates

1 There are two estates identified that are contained within the Study Area, which are dealt with here:

- One of these estates would experience a **minor** adverse effect **(Not Significant)** from the proposed OHL (Craigengillan Estate); and
- One of these estates would experience **no** adverse effect (**Not Significant**) from the proposed OHL (Forrest Estate – Fred Olsen).

12.4.2.13 Events

1 There are five events identified that are contained within the Study Area, which are dealt with here:

- Three of these events would experience a **minor** adverse effect (**Not Significant**) from the proposed OHL (Dumfries and Galloway Wildlife Festival/Newton Stewart Walking Festival/The Hairth Music Festival and World Ceilidh); and
- All of the remaining (Two) events would not experience an adverse effect (**Not Significant**) from the proposed OHL.

12.4.2.14 Visitor Attractions

1 There are seven visitor attractions identified that are contained within the Study Area, which are dealt with here.

- Two of these visitor attractions would experience a **moderate** adverse effect (**Significant**) from the proposed OHL (Carricks of Carsphairn/Carsphairn Heritage Centre);
- One of these visitor attractions would experience a **minor** adverse effect (**Not Significant**) from the proposed OHL (Arndarroch Gardens); and
- All of the remaining (four) visitor attractions would experience **no** adverse effect (**Not Significant**) from the proposed OHL.

12.4.2.15 Activity Centres

1 The one outdoor centre within the Study Area would not be affected by the proposed OHL.

12.4.2.16 Accommodation Providers

1 There are 17 accommodation providers (including hotels, B&Bs, guest houses, caravan and camping parks and youth hostel) identified that are contained within the Study Area, which are dealt with here.

- One of these accommodation providers would experience a **moderate** adverse effect (**Significant**) from the proposed OHL (Kendoon Youth Hostel);
- Five of these accommodation providers would experience a **minor** adverse effect (**Not Significant**) from the proposed OHL (Bellsbank Country House Hotel/ Eglinton Hotel/Muirdrochwood/ Auchencheyne Guest House/Lavender Holiday Cottages); and
- All of the remaining (12) would experience **no** adverse effect (**Not Significant**) from the proposed OHL.

12.4.3 Summary of Effects

Table 12.02 - Summary of Adverse Effect of Proposed OHL on Tourism and Recreation

	Number of Each Activity / Facility	Possible Major Adverse Effect	Possible Moderate Adverse Effect	Possible Minor Adverse Effect	No Adverse Effect
Settlements	8	0	0	3	6
Tourist Routes	5	0	2	3	0
Walking Routes	25	0	1	4	20
Rights of Way	67	0	12	16	39
Core Paths	101	0	19	19	63
Climbing Routes	10	0	0	0	10
Cycling Routes	6	0	3	2	1
Golf	1	0	0	0	1
Fishing	20	0	2	10	8
Forest Parks	8	0	1	2	5
Estates	2	0	0	1	1
Events	5	0	0	3	2
Visitor Attractions	7	0	2	1	4
Activity Centres	1	0	0	0	1
Accommodation	17	0	1	5	11
Total	284	0	43	69	172
% of Total	100%	0	15	24	59

1 In conclusion it is clear that there is a large variety of different activities that tourists can undertake within the Study Area. However, of the few facilities and/or activities located within close proximity of the proposed OHL, 15% are likely to be subject to a **moderate** adverse effect (**Significant**) while 85% are likely to be subject to a **minor** or **no** effect (**Not Significant**).

12.4.3.1 Beneficial Effects from Removal of the N-Route

1 This section deals with the beneficial effect which the removal of the N-Route north of Dalmellington and the replacement of the N-Route with the proposed L7 Tower OHL from Meikle Hill to Polquhanity, north of Kendoon would have on tourism and recreation within the Study Area. This includes settlements, tourist routes, walking routes, rights of way, core paths, bridleways, climbing routes, cycle routes, golf and fishing, forest parks, estates, events, visitor attractions, activity centres and accommodation providers present within the reduced Study Area covered by the ZTV and perceptibility study.

2 Full details of the effect assessment findings for the Study Area are provided in Technical Appendix G.

12.4.3.1.1 Principal Settlements

1 There are nine principal settlements contained within the Study Area, which are dealt with here:

- Four of these principal settlements would experience a **moderate** beneficial effect (**Significant**) from the proposed OHL changes (Bellsbank/Burnfoot/Patna/ Straiton);
- One of these principal settlements would experience a **minor** beneficial effect (**Not Significant**) from the proposed OHL changes (Dalmellington); and
- All of the remaining (four) principal settlements would experience **no** beneficial effect (**Not Significant**) from the proposed OHL changes.

12.4.3.1.2 Principal Tourist Routes

1 There are five tourist routes contained within the Study Area, which are dealt with here.

- One of these principal tourist routes would experience a **moderate** beneficial effect (**Significant**) from the proposed OHL changes (A713);
- One of these principal tourist routes would experience a **minor** beneficial effect (**Not Significant**) from the proposed OHL changes (B741); and
- All of the remaining (three) principal tourist routes would experience **no** beneficial effect (**Not Significant**) from the proposed OHL changes.

12.4.3.1.3 Principal Walking Routes

1 There are 25 principal walking routes contained within the Study Area, which are dealt with here.

- Two of these principal walking routes would experience a **moderate** beneficial effect (**Significant**) from the proposed OHL changes (Dalmellington Town Trail/ Patna Walk);
- Two of these principal walking routes would experience a **minor** beneficial effect (**Not Significant**) from the proposed OHL changes (HT80/HT84); and
- All of the remaining (21) walking routes routes would experience **no** beneficial effect (**Not Significant**) from the proposed OHL changes.

12.4.3.1.4 Rights of Way

1 There are 67 Rights of Way (RoW) contained within the Study Area that are dealt with here:

- 12 of these RoW would experience a **moderate** beneficial effect (**Significant**) from the proposed OHL changes (SCD1/SCD2/SCD3/SCD6/SCD7/SCD8/SCD9/ SCD10/SCD14/ SCD15/SCD16/SCD109);
- Six of these RoW would experience a **minor** beneficial effect (**Not Significant**) from the proposed OHL changes (SCD4/SCD5/SCD11/13/SCD108/SCD110); and
- All of the remaining (49) RoW would experience **no** beneficial effect (**Not Significant**) from the proposed OHL changes.

12.4.3.1.5 Core Paths

1 There are 101 draft core paths that lie within the Study Area, which are dealt with here:

- Four of these core paths would experience a **moderate** beneficial effect (**Significant**) from the proposed OHL changes (D5/D10/D12/D15);
- Five of these core paths would experience a **minor** beneficial effect (**Not Significant**) from the proposed OHL changes (D4/D6/D13/D16/D18); and
- All of the remaining (92) core paths would experience **no** adverse effect (**Not Significant**) from the proposed OHL changes.

12.4.3.1.6 Climbing Routes

1 There are 10 recognised climbing routes within the Study Area however none of the routes would be beneficially affected by the proposed OHL changes.

12.4.3.1.7 Principal Cycle Routes

1 There are six cycle routes within the Study Area, which are dealt with here.

- One of these cycle routes would experience a **minor** beneficial effect (**Not Significant**) from the proposed OHL changes (The Scottish Coal Cycle Route); and
- All of the remaining (Five) cycle routes would experience **no** beneficial effect (**Not Significant**) from the proposed OHL changes.

12.4.3.1.8 Golf

1 There is one golf course, the Doon Valley Golf Course, contained within the Study Area, which would experience a **moderate** beneficial effect (**Significant**) from the proposed OHL changes.

12.4.3.1.9 Fishing

1 There are 20 principal fishing sites contained within the Study Area that are dealt with here.

- One of these principal fishing sites would experience a **moderate** beneficial effect (**Significant**) from the proposed OHL changes(River Doon);
- All of the remaining (19) principal fishing sites would experience **no** beneficial effect (**Not Significant**) from the proposed OHL changes.

12.4.3.1.10 Forest Parks

1 There are eight forest parks contained within the Study Area that are dealt with here:

- One of these forest parks would experience a **moderate** beneficial effect (**Significant**) from the proposed OHL (Bellsbank Plantation);
- Four of these forest parks would experience a **minor** beneficial effect (**Not Significant**) from the proposed OHL (Benbeoch/Pennyvenie Glen/Bogton Loch SSSI/Dalmellington Moss/Dunaskin Glen SSSI); and
- All of the remaining (Three) forest parks would experience **no** beneficial effect (**Not Significant**) from the proposed OHL changes.

12.4.3.1.11 Estates

1 There are two estates identified that are contained within the Study Area, which are dealt with here:

- One of these estates would experience a **moderate** beneficial effect (**Significant**) from the proposed OHL changes (Craigengillan Estate); and
- One of these estates would experience a **minor** beneficial effect (**Not Significant**) from the proposed OHL changes (Forest Estate – Fred Olsen).

12.4.3.1.12 Events

1 There are five events identified that are contained within the Study Area, which are dealt with here:

- Two of these events would experience a **minor** beneficial effect (**Not Significant**) from the proposed OHL changes (Dumfries and Galloway Wildlife Festival/ Newton Stewart Walking Festival); and
- All of the remaining (Three) events would not experience a beneficial effect (**Not Significant**) from the proposed OHL changes.

12.4.3.1.13 Visitor Attractions

1 There are seven visitor attractions identified that are contained within the Study Area, which are dealt with here.

- One of these visitor attractions would experience a **moderate** beneficial effect (**Significant**) from the proposed OHL changes (Cathcartson Visitor Centre/Doon valley Museum);
- All of the remaining (six) visitor attractions would experience **no** beneficial effect (**Not Significant**) from the proposed OHL changes.

12.4.3.1.14 Activity Centres

1 The one outdoor centre within the Study Area would experience **no** beneficial effect (**Not Significant**) from the proposed OHL changes.

12.4.3.1.15 Accommodation Providers

1 There are 17 accommodation providers (including hotels, B&Bs, guesthouses, caravan and camping parks and youth hostel) identified that are contained within the Study Area, which are dealt with here.

- One of these accommodation providers would experience a **moderate** beneficial effect (**Significant**) from the proposed OHL changes (Carskeoch Caravan Park);
- Three of these accommodation providers would experience a **minor** beneficial effect (**Not Significant**) from the proposed OHL changes (Eglinton Hotel/Bellsbank Country House Hotel/Riverdoon Hotel and Lancers Restaurant); and
- All of the remaining (13) accommodation providers would experience **no** beneficial effect (**Not Significant**) from the proposed OHL changes.

12.4.4 Summary of Beneficial Effects

Table 12.03 - Summary of Beneficial Effect of Proposed OGC on Tourism and Recreation

	Number of Each Activity / Facility	Possible Major Beneficial Effect	Possible Moderate Beneficial Effect	Possible Minor Beneficial Effect	No Beneficial Effect
Settlements	9	0	4	1	4
Tourist Routes	5	0	1	1	3
Walking Routes	25	0	2	2	21
Rights of Way	67	0	12	6	49
Core Paths	101	0	4	5	92
Climbing Routes	10	0	0	0	10
Cycling Routes	6	0	0	1	5
Golf	1	0	1	0	0
Fishing	20	0	1	0	19
Forest Parks	8	0	1	4	3
Estates	2	0	1	1	0
Events	5	0	0	2	3
Visitor Attractions	7	0	1	0	6
Activity Centres	1	0	0	0	1
Accommodation	17	0	1	3	13
Total	284	0	29	26	229
% of Total	100	0	10	9	81

1 In conclusion it is clear that there is a large variety of different activities that tourists can undertake within the Study Area. However, of the few facilities and/or activities located within close proximity of the proposed removal of the N-Route north of Dalmellington or the replacement of the N-Route with a L7 Tower OHL, 10% are likely to be subject to a **moderate** beneficial effect (**Significant**) while 90% are likely to be subject to a **minor** or **no** effect (**Not Significant**), and. Therefore there is likely to be a limited beneficial effect on tourism and recreation activities and facilities within the Study Area.

12.4.5 Construction and Other Effects

1 There would be temporary adverse effects derived from the construction of the proposed OHL, particularly for those tourism and recreation activities and facilities situated nearest the proposed OHL and also along the main roads, which would carry most traffic associated with the construction.

2 Those effects assessed as being **significant** - **major** or **moderate** – on the facilities and activities on a permanent basis would similarly be assessed as appreciable during the temporary construction programme.

12.5 Mitigation

12.5.1 Proposed Mitigation Measures

1 The following draft mitigation measures are proposed for the OHL.

12.5.2 Construction Mitigation

1 Construction of the OHL would be programmed wherever practicable to avoid sensitive locations, tourist / visitor viewpoints, and the A713 from New Galloway to Patna corridor at peak visitor or tourist periods, although this is likely only to be possible to a limited degree. Where possible, construction would be programmed to avoid appreciable construction traffic on this key route, and within proximity of notable local festivals or events. This is taken into account in the Traffic Assessment.

2 In addition, should access to construction areas be required from the A713, or from lay-bys for 'lay down' areas, every effort would be made to programme these to avoid the peak tourist or visitor periods of June to August, particularly where the OHL would run parallel to the route.

3 The contractors would be required to ensure ongoing safe access to all key walking and cycling routes, etc, and provide an alternative if any route was closed temporarily due to construction activities. These routes are set out in detail within this chapter.

12.5.3 Operational Mitigation

1 Routeing of the OHL has sought, where possible, to reduce the effect on tourism and recreation resources. Poles would be micro-sited to minimise tourism or recreation effects in sensitive areas or on sensitive views, by making use of the natural features in the landscape to minimise any effects upon tourists or visitors.

2 During the course of operation where maintenance is required, maintenance staff and vehicles would use only designated operational / maintenance routes and tracks to gain access to the OHL to minimise disturbance to users of recreational resources within the area. Access for operational and maintenance purposes is dependent on landowner access along the length of the proiposed OHL.

12.6 Residual Effects

1 Appreciable direct and/or indirect adverse effects are assessed upon the tourism and recreation resources and activities within the Study Area, as a result of the proposed grid connection.

2 Temporary adverse effects derived from construction works would be mitigated by those proposed mitigation measures as set out in section 5. Hence the conclusion of this effect assessment is that limited adverse residual effects upon the tourism and recreational resources in the Study Area would occur as a result of the construction, and operation of the proposed OHL.

3 A limited number of direct and/or indirect beneficial effects are also assessed upon the tourism and recreation resources and activities within the Study Area, as a result of the proposed OHL changes.

12.7 Conclusion

12.7.1 Adverse Effects

1 The conclusion of this assessment is that there are limited adverse / adverse residual effects derived from the proposed route of the OHL. The distribution of effects experienced by tourism and recreational resource are as shown in Figure 12.03.

12.7.2 Beneficial Effects

1 The conclusion of this assessment is that there would be beneficial effects derived from the removal of the current N Route north of Dalmellington and the replacement of the existing N-Route with the proposed L7 Tower OHL. The effects experienced by tourism and recreational resource would be as shown in Figure 12.04.

Figure 12.03 - Distribution of Adverse Effects of Proposed grid connection on Tourism and Recreation receptors

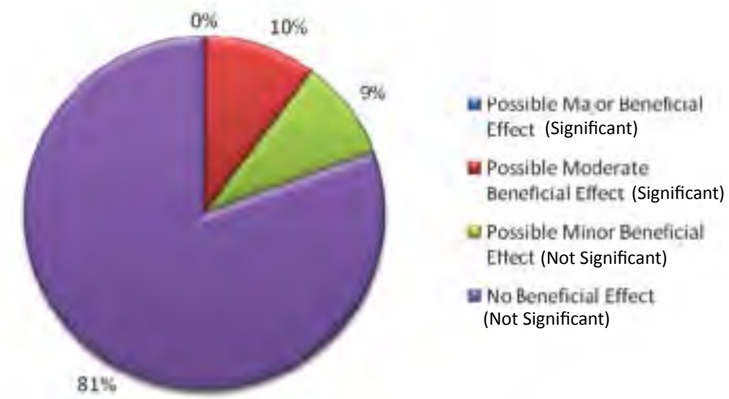
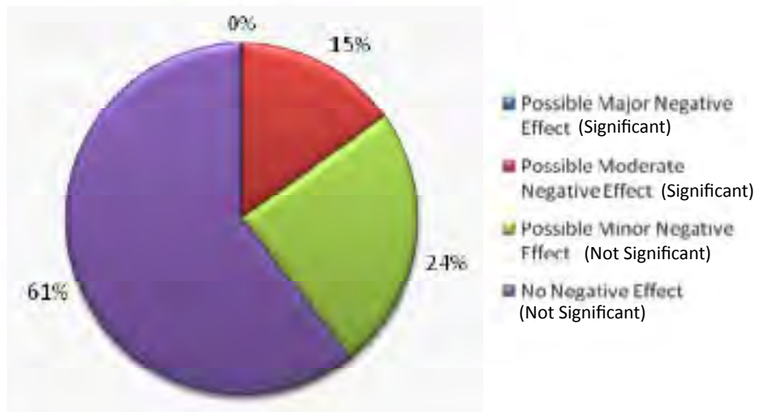


Figure 12.04 - Distribution of Beneficial Effects of Proposed Removal of the N-Route on Tourism and Recreation receptors



13

Traffic & Transport

Blackcraig and Margree Windfarms
Grid Connection
Environmental Statement

CAPITA SYMONDS

Table of Contents

13.1 Introduction 253
13.1.1 Overview 253
13.1.2 Study Area description 253
13.2 Assessment Methodology 254
13.2.1 Overview 254
13.2.2 Data Sources And Guidance 254
13.2.3 Consultation 254
13.2.4 Consideration Of Sensitive Receptors 254
13.2.5 Significance Criteria 254
13.2.6 Assessment Assumptions 254
13.3 Baseline Conditions 255
13.3.1 Overview 255
13.3.2 Traffic Flows 255
13.3.3 Road Traffic Accidents 256
13.4 Traffic Generation And Assignment 256
13.4.1 Types Of Vehicle 256
13.4.2 Trip Generation 256
13.4.2.1 Construction Activities 257
13.4.2.2 Blackcraig Substation 258
13.4.2.3 Margree Substation 258
13.4.2.4 Wood Pole Overhead Line 259
13.4.2.5 Steel Lattice Overhead Line 259
13.4.3 Trip Distribution 261
13.5 Assessment 261
13.5.1 Overview 261
13.5.2 Assessment Of Potential Effects 261
13.5.2.1 Collision Data 261
13.5.2.2 Assessment of Routes 261
13.5.2.3 Assessment of Access Points 262
13.5.2.4 Impact of Development Traffic (IEMA Guidelines) 262
13.5.2.5 Impact of Development Traffic (Capacity) 262
13.5.3 Summary Of Effects 262
13.5.4 Mitigation 263
13.5.4.1 Construction Phase 263
13.5.5 Residual Effects 263
13.5.5.1 Construction Phase 263
13.6 Cumulative Effect Of Windfarm Construction 264
13.6.1 Overview 264
13.6.2 Assessment Of Potential Effects 264
13.6.2.1 Impact of Development Traffic (Capacity) 264
13.6.3 Summary Of Effects 265
13.6.4 Residual Effects 265
13.7 Cumulative Effect Of Windfarm & SWS Project Construction 266
13.7.1 Overview 266
13.7.2 Assessment Of Potential Effects 266
13.7.2.1 Impact of Development Traffic (Capacity) 266
13.7.3 Summary Of Effects 266
13.7.4 Residual Effects 266
13.8 Summary 267

Table of Figures

Figure 13.01 - Road network considered as part of this assessment 253

List of Tables

Table 13.01 - Significance 254
Table 13.02 - Baseline Traffic Flow Data & Capacity on Relevant Routes 255
Table 13.03 - Personal injury accidents on road network in the past three years 256
Table 13.04 - Total trips by forest access point (felling operations) 257
Table 13.05 - Total and average trips by road (felling operations) 257
Table 13.06 - Road Network connecting to Access Points 257
Table 13.07 - Total and Average Trips for Stone Loads (access tracks) 257
Table 13.08 - Total number of trips required for construction of substation 258
Table 13.09 - Average trips per day on roads in the network 258
Table 13.10 - Total number of trips required for construction of substation 258
Table 13.11 - Average trips per day on roads in the network 258
Table 13.12 - Stone Quantity/Trips for wood pole Construction 259
Table 13.13 - Trips Generated by wood pole Construction 259
Table 13.14 - Total and average number of trips for wood pole construction distributed on the road network 259
Table 13.15 - Total number of trips required for stone loads to construct compounds 259
Table 13.16 - Average number of trips for construction compounds distributed on the road network 259
Table 13.17 - Concrete & Aggregate Quantities/Trips for L7 Tower Erection 260
Table 13.18 - Total and average number of Concrete & Aggregate Trips for L7 Tower erection distributed on the road network 260
Table 13.19 - Total and average number of Concrete & Aggregate Trips for L7 Tower erection distributed on the road network 260
Table 13.20 - Total and average number of Steel Tower construction 260
Table 13.21 - Total number of stone load trips for construction of compounds 261
Table 13.22 - Average number of trips per day for construction of compounds 261
Table 13.23 - Estimated construction traffic distribution on network 261
Table 13.24 - Percentage change over baseline traffic flow for construction period 262
Table 13.25 - Development Traffic Impact on Capacity 262
Table 13.26 - Mitigation and Residual Effect on Road Network 264
Table 13.27 - Percentage change over baseline traffic flow for construction period (including windfarm traffic) 264
Table 13.28 - Development Traffic Impact on Capacity (including Windfarm Traffic) 265
Table 13.29 - Mitigation and Remedial Effect on Road Network (including windfarm traffic) 265
Table 13.30 - Percentage change over baseline traffic flow for construction period (including windfarm traffic & SWS Project traffic) 266
Table 13.31 - Development Traffic Impact on Capacity (including windfarm traffic & SWS Project traffic) 266
Table 13.32 - Mitigation and Remedial Effect on Road Network (including windfarm traffic & SWS Project traffic) 266

13.0 Traffic & Transport

13.1 Introduction

13.1.1 Overview

1 This assessment has been undertaken to assess the traffic and transport effects on the surrounding road network for the construction and operational phases of new overhead lines (OHLs) linking these substations with Meikle Hill Substation to the north. The S37 Applications for these OHLs includes the substations at Blackcraig and Margree (as ancillary development) and therefore these have been considered and are reported within the ES. Further detail can be found within Chapter 5.

2 The main effect expected from the construction phase of this proposal is that there will be an increase in the number of HGVs using the local road network. These HGVs will be essential for the activities of timber felling and the delivery of construction materials, including stone, concrete and plant vehicles. The presence of these large vehicles needs to be assessed to ensure that existing roads will be able to cope with the additional loads.

3 This assessment examines each element of the construction period, looking at timber felling, temporary access track creation and the construction requirements for the two substations as well as the overhead lines (OHLs).

4 Traffic generated by the associated windfarms leading to the need for the overhead line has also been considered. In addition to this, the construction traffic required by the SWS Project is also considered where the same roads are used.

5 The removal of the existing N-Route OHL has not been assessed as part of this study as a result of the limited vehicle movements.

13.1.2 Study Area description

1 The area under consideration for this study consists of the public road network that has the greatest potential of being used by construction traffic during the implementation phase of the developments.

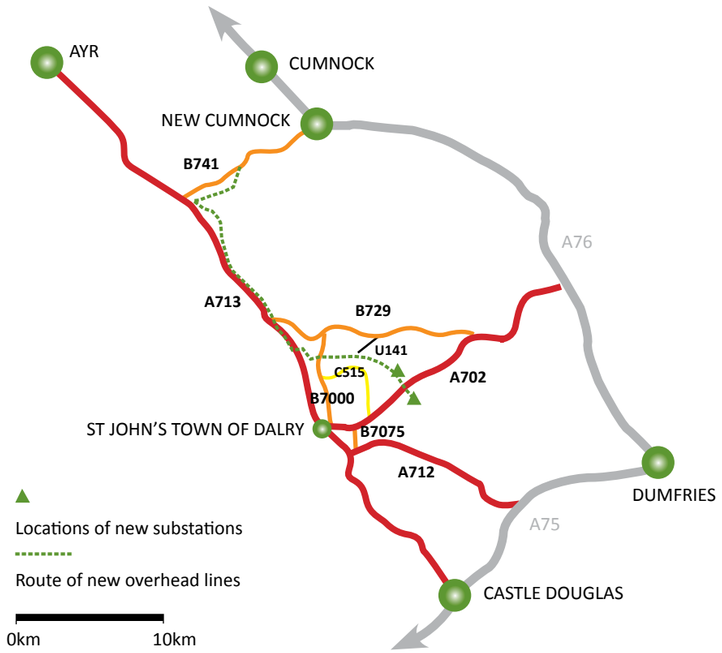
2 The road network considered as part of the assessment is illustrated in Figure 13.01.

3 The roads which are considered most likely to be used by construction traffic are the A76, A713, A712, A702, B729, B741, B7000, B7075, C51S and the U141.

4 The A76 is a trunk road connecting East Ayrshire in the north with Dumfries to the south and a number of communities in-between. It is considered that due to this road's categorisation as trunk the additional traffic expected by the construction phase of the developments will not appreciably affect flows. This road is therefore not assessed as part of this report.

5 The A713 provides a link between the A75, north of Castle Douglas and the A77 near the coastal town of Ayr. From the south, the A713 runs in a general northwesterly direction to its termination at the A77 and along its route it passes through or close to the communities of Crossmichael, St Johns Town of Dalry, Carsphairn, Dalmellington and Patna.

Figure 13.01 - Road network considered as part of this assessment



6 The section of A712 considered provides a connection between the A713, south of St Johns Town of Dalry and the A75 at Crocketford. The A712 does not directly serve any accesses to the development sites but is recognised as a likely route for traffic coming from the A75 at Crocketford.

7 The A702 is the highest category of road passing close by to the substation construction sites and is therefore essential in the chain of traffic coming to and from the sites. The Margree site is located to the north of the road, whereas the Blackcraig site is to the south of the road. This section of the A702 links St Johns Town of Dalry at its junction with the A713 with the A76 at Thornhill. The road runs generally from southwest to northeast with St Johns Town of Dalry at the most southwesterly point. The A702 continues in a northeasterly direction away from the A76 at Carronbridge which is located north of Thornhill and continues until it reaches the A74(M) at junction 14 to the north of Elvanfoot. There are small communities to be found along this section of the A702, one of which is Moniaive. This village sits almost halfway along the length between St Johns Town of Dalry and Thornhill and is a termination point for the B729 which stretches out westwards to the A713 near Carsphairn. Penpont is also a small village on the A702 just to the west of Thornhill

8 The B729 connects to the A713 at Carsphairn and spans eastward to its connection with the A702 at Moniaive. The road is a two lane carriageway between the A713 and the junction with the B7000. After this junction the B729 becomes a single lane carriageway although passing places are present.

9 The B741 connects the communities of Dalmellington in the west at the A713 junction with New Cumnock on the A76 to the east. The carriageway is a single carriageway allowing for two-way traffic flow at 60mph. The width of the road is generally in excess of 6m.

10 The northern section of the B7000 is identified as being 'excluded' by the Forestry Commission's Agreed Timber Transport Routes Map. The section of B7000, which is excluded, stretches between the junction with the B529 to the north and the C51 junction. This exclusion is most likely attributable to a weight restriction on a small bridge

11 The B7075 has been identified as a possible route choice in the Margree ES as it provides an option for bypassing the small town of St Johns Town of Dalry for traffic travelling north on the A713. Rather than entering the town and turning right onto the A702, the B7075 can be used as a link by using a short stretch of the A712 east of the A713, to gain access to the B7075 and then travel north on it until the A702 is reached

12 The C51S, C class road forms a connection between the B7000 to the west and the A702 at its southern point. The road appears to have a primary role of providing access to Lochinvar reservoir and areas of forests.

13 The U141, unclassified road links with the B729 and is the sole link to one of the access points needed in the construction of the wood pole OHL. This road has also been identified as a link to the wind turbine access road. The road is extremely lightly trafficked at present.

14 It is reported that the final decision on which routes to use for accessing the construction will need to be undertaken prior to the commencement of felling and construction. The detailed route description will be provided by the chosen contractor.

13.2 Assessment Methodology

13.2.1 Overview

1 This section considers the approach to the assessment including Data Sources and Guidance, Consultation, Consideration of Sensitive Receptors, Significance Criteria and Assessment Assumptions.

13.2.2 Data Sources And Guidance

1 The following data sources were used:-

- The Design Manual for Roads and Bridges, Volume 5, 2008 (Highways Agency/ Scottish Government)
- The Design Manual for Roads and Bridges, Volume 11, Environmental Assessment, 2008 (Highways Agency/Scottish Government)
- Guidelines for the Environmental Assessment of Road Traffic (IEMA), 1993
- Personal Injury Accidents, Dumfries & Galloway Constabulary, 2009
- SWS Project: Environmental Statement, Technical Annex 15, 2008
- Blackcraig Hill Windfarm Environmental Statement
- Margree Windfarm Environmental Statement
- Agreed Route Maps, Forestry Commission website, Scotland, accessed Oct 2009

13.2.3 Consultation

1 Consultation was conducted with Dumfries and Galloway Council, Dumfries and Galloway Constabulary, East Ayrshire Council and Strathclyde Constabulary. The purpose of this consultation was mainly to ascertain the personal injury accidents numbers for the previous three years on the local road network and also to arrange for traffic counts to be undertaken due to the lack of current data. Comments made through consultation and recorded in other relevant studies have also been sourced and considered as part of this assessment.

13.2.4 Consideration Of Sensitive Receptors

1 The term, 'sensitive receptor' constitutes anything that could be considered to be at risk of being adversely affected by the presence of additional traffic or certain types of traffic. There have been very few sensitive locations identified through previous studies and environmental statements that apply to the roads which are being considered in this study.

2 The Margree Windfarm ES identified a number of sensitive receptors that can be found on the network intended for construction and staff use by this study. These receptors are all located adjacent to the A713 and are Queen Margaret Academy (Ayr), Dalmellington High School (Dalmellington) and Carsphairn Primary School (Carsphairn). These sensitive receptors are therefore all confined to the A713 and are all north of the B729 junction. The Margree Windfarm ES does not indicate any additional sensitive receptors on the remainder of the roads which it surveyed. The routes that are of particular consequence to this assessment were the A712, A702, B729 and B7075.

3 Blackcraig Hill Windfarm ES did not indicate any sensitive receptors in its assessment of the Windfarm traffic flow in the construction phase of the development.

4 For the purpose of this assessment a desk based survey was undertaken to identify any additional sensitive receptors that were either not identified by previous studies or were present on roads that had not been surveyed by previous studies. The result of this new identification exercise yielded no new additional information for the roads being assessed in this study. Attention was also paid to the lower category roads of the C51S and the U141 but there is not considered to be any particular sensitivities on these sections either.

13.2.5 Significance Criteria

1 This assessment is not a formal Transport Assessment (TA) as these are not required for the purposes of temporary construction works. When the substations and OHLs become operational the vehicle flows generated by the infrastructure will not prove sufficient to warrant a formal TA either.

2 In order to provide an assessment of the effects that will be experienced by the local road network due to the construction phase, the Guidelines for the Environmental Assessment of Road Traffic (IEMA Guidelines 1993) have been adopted. The IEMA guidelines are deemed suitable as they are intended to assess effects from major new developments and are used consistently in windfarm and associated infrastructure development assessments.

3 There are two rules identified through the IEMA Guidelines which seek to demonstrate how significant traffic effects are on existing traffic flow levels and the road network.

- Rule 1: Include highway links where traffic flows would increase by more than 30% (or the number of HGVs would increase by more than 30%)
- Rule 2: Include any other specifically sensitive routes where traffic flows would increase by 10% or more.

4 The term 'sensitive routes' is a subjective term and opinion may vary on what constitutes such a route. Sensitive receptors located adjacent to a road would tend to identify that road as sensitive also and will be subject to Rule 2.

Table 13.01 - Significance

Effect	Increase in traffic flows
Major	Greater than or equal to 60%
Moderate	Greater than or equal to 30% and less than 60%
Minor	Greater than or equal to 10% and less than 30%
None	Less than 10%

5 Table 13.01 sets out the significance criteria and scoring to be used for this assessment. The table shows that for the purposes of this assessment, any identified effect caused by the development which is categorised as either **major** or **moderate** will be considered to be **significant**.

6 Alongside the IEMA guidelines for assessing significance of effects, the capacity of each road will also be considered. This is because, although the IEMA guidelines are useful for determining the significance level for each road, where the road under consideration is one of low flow, the IEMA criteria will often result in additional movements resulting in a **major** effect. In many cases however, the additional traffic can be readily accommodated within the capacity of the existing road and therefore in reality is not considered to have an appreciable effect on the road's operation.

13.2.6 Assessment Assumptions

1 The A76 is a trunk road and is therefore assumed to be capable of the increase in traffic associated with the developments. If this assumption is correct then any additional traffic on the A76 will not have any significant effect on the flow and, as a result, can be eliminated from further investigation in this study. This is determined on the basis that the increase in traffic will be less than 30%.

2 At this stage there has been no identification of the precise source locations for construction materials. This precludes any accurate assessment of the exact percentage of construction traffic being generated from the region.

3 This assessment assumes that improvements will be implemented on the B7075 as assumed in the SWS Project, Environmental Statement. This ensures the route can be used as a bypass for traffic from the south, helping them avoid St Johns Town of Dalry. The road will not be required to carry any abnormal loads during the construction phase but will be utilised by HGVs.

4 Staff required for the construction of substations has been estimated to meet the following criteria:-

- The workforce required at each substation during construction has been indicated to consist of 14 staff;
- 4 week working month (48 week working year);
- 5 day working week; and
- Working hours range between 07:00 until 19:00 (April to September) and 07:30 to 17:00 (October to March).

5 Staff required for the construction of the wood pole OHL has been estimated to meet the following criteria:-

- The workforce required at each wood pole during construction has been indicated to consist of 12 staff. They will be required at each pole location for 3 days (spread over a period of time);
- 4 week working month (48 week working year);

- 5 day working week; and
- Working hours range between 07:00 until 19:00 (April to September) and 07:30 to 17:00 (October to March).

6 Staff required for the construction of steel lattice towers has been estimated to meet the following criteria:-

- The workforce required at each steel tower during construction has been indicated to consist of 14 staff. They will be required at each tower location for 10 days;
- 4 week working month (48 week working year);
- 5 day working week; and
- Working hours range between 07:00 until 19:00 (April to September) and 07:30 to 17:00 (October to March).

7 The effect on the existing network by maintenance vehicles travelling to the substations when they are operational is not considered to be significant over and above existing traffic volumes. This assumption is based on the understanding that such vehicle movements will be infrequent and low in number. Any further analysis of these vehicle movements as part of this assessment is not considered to be of relevance.

13.3 Baseline Conditions

13.3.1 Overview

1 This section considers the baseline conditions for roads which are likely to provide access to the development. Information has been sourced on traffic flows and accident records covering the most recent three year period.

13.3.2 Traffic Flows

1 Existing traffic data from 2007 was available for the A713 and B741 from the SWS Project ES prepared by Mott McDonald. These counts are considered to be still relevant for this assessment. Other existing count data used as part of the SWS Project Environmental Statement was discounted due to its age.

2 Blackcraig Hill and Margree Environmental Statements were examined in order to acquire any available traffic flow data for roads that were identified as possible constructioN-Routes. Margree ES was the only one of the two documents that gave any figures for traffic flows with the data based on counts carried out in 1997 and 2001. It has been deemed that by using this same dated information and simply applying a growth factor to it, the results could not be relied upon to produce a robust result for this assessment.

3 There have been no traffic counts carried out on the roads being considered in this assessment in recent history which could be used to provide baseline data.

4 Traffic counts were therefore undertaken on the roads likely to be affected by the introduction of construction traffic serving the substations and OHL construction areas. These are the A712, A702, B7000 and the B7075. These counts took place inclusive of and between the dates of 10 November 2009 and 18 November 2009.

5 The B729 was not the subject of a new count but the consideration is that this would not have any effect on the results of the impact assessment. The assumption is that the B729 would have a similar baseline traffic flow to that of the A702 which despite being a higher category shares many of the same characteristics as the B729.

6 Flows for traffic on the C51S and the U141 are anticipated to be so low at present that a physical count would have reflected this, rendering the count as unnecessary. For the purposes of this assessment a nominal baseline flow has been attributed to these lower category roads. It has been assumed that a reasonable Annual Average Daily Traffic (AADT) figure for the C51S is 25% of the average AADT shared by the A702 and The B7000 which the C51S links to. Similarly, this assumption is applied to the U141, but this time the percentage is reduced to only 15% of the feeder road which takes into account the lower classification of the U141 and that it is a dead end.

7 The construction phase for the substations and OHLs is envisaged to commence from March 2011. TEMPRO software was used to apply growth factors to the newly acquired count data and those figures provided in the Mott MacDonald Report to determine projected flows for the roads at the point of construction commencing.

8 The capacity (vehicles per hour per lane) of each of the roads under consideration has been calculated using formula provided in the Design Manual for Road and Bridges (DMRB) and is shown below:

Capacity = A – (B x Pk%H)

Where: A and B are lane capacity factors and Pk%H is percentage of HGVs]

9 This capacity was then used to generate the Congestion Reference Flows (CRF) for the roads. These CRFs are estimated AADT flows taken when the carriageway is likely to be congested in an average day. This CRF is the measure by which the roads will be compared to in order to see whether the CRF is exceeded by the baseline and construction AADT when in combination.

The CRF is calculated by the following equation:

CRF = Capacity x NL x Wf x 100/PkF x 100/PkD x AADT/AAWT

10 Where:

- NL is number of lanes per direction
- Wf is width factor
- PkF is percentage of total 2 way daily traffic occurring in the peak hour
- PkD is the percentage of directional split in the peak hour
- AADT is Annual Average Daily Traffic
- AAWT is Annual Average Weekly Traffic

11 Baseline traffic flow data and CRF are shown in Table 13.02.

12 The 2009 baseline traffic flows for weekdays can be viewed in Figure H.01 in Technical Appendix H.

Table 13.02 - Baseline Traffic Flow Data & Capacity on Relevant Routes

Road	Location description (2 way flow)	Baseline AADT	% HGV AADT	CRF
A713	Patna to Dalmellington	6,475*	11%	17,060
	South of B741 junction	6,180*	12%	16,850
A712	East of B7075 junction	652**	5.9%	21,215
A702	East of B7075 junction	194**	4.9%	16,498
B729	from A713 junction to A702 at Moniaive (Estimated baseline figure)	194***	4.9%	9,484
B741	Dalmellington to New Cumnock	3,118*	11%	11,819
B7000	North of St Johns Town of Dalry	218**	3.5%	13,426
B7075	Between A702 and A712 junctions	175**	7.9%	11,698
C51S	Entire length (Estimated baseline figure)	52***	2%	12,575
U141	Entire length (Estimated baseline figure)	29***	2%	7,033

* Mott MacDonald Survey 2007

**Newly commissioned surveys, Capita Symonds, 2009

***Estimated baseline AADTs derived as percentages of feeder roads

13.3.3 Road Traffic Accidents

1 There was no existing collision data recorded in either the Blackcraig Hill or Margree Windfarm Environmental Statements.

2 Dumfries and Galloway Council and East Ayrshire Council were contacted in relation to the supply of personal injury collision records occurring on the identified roads within the past three years. Roads which are situated in East Ayrshire include the A713 between its commencement at the A77 near to Ayr and where it meets the boundary with Dumfries and Galloway. The only other road which lies in East Ayrshire is the B741.

3 Data obtained from Dumfries and Galloway came directly from the Constabulary for that area and accounted for a three year period between 1 October 2006 and 30 September 2009.

4 Data obtained for East Ayrshire came from East Ayrshire Council and accounted for a three year period between 1 September 2006 and 30 August 2009.

5 The records were investigated to discover any indication of HGV involvement in collisions and to highlight any other apparent trends which may influence route choice and suitability for construction traffic. Table 13.03 shows the results of the collision investigation.

6 HGVs were involved in 5 injury collisions during the three year study period. This accounts for a 5% share of the total number of injury collisions.

7 There were eight injury collisions recorded for the A702 in the previous three years. All of these collisions occurred to the east of the access points that have been identified for the substations. The only collision which involved a HGV was the nearest of all the collisions to the proposed access points and the severity was slight. The remaining collisions were all on the section of A702 between Moniaive and the A76.

8 On the northern section of the A713, between its junction with the A70 near Ayr to the boundary between East Ayrshire and Dumfries and Galloway, there were a total of 43 PIAs in the three year study period.

9 On the A713 (Dumfries & Galloway) there was a collision between a motorcycle and a HGV which resulted in the motorcycle driver being fatally injured. The location of the collision was recorded as being 300m south of Stroangassel Another collision on the A713 involving a HGV was a single vehicle accident leaving the driver with slight injuries. This collision occurred at a junction with an unclassified road (U140), a junction where two other collisions were recorded, both of them involving motorcycles and both were single vehicle accidents.

10 There were a total of nine PIAs on the A712, of which four included a motorcycle. Two of these were single vehicle accidents whilst the other two consisted of one collision between two motorcycles and the final accident between a motorcycle and car.

11 Personal Injury Accidents on the B729 in the past three years were all confined to the section of the road connecting the A76 and the A702. The entire stretch of the western section between the A702 and the A713 witnessed no PIAs in the same three year period.

12 As has been previously stated in this study, the C51S and the U141 were not investigated for their accident record as the traffic flows are presumed to be very low and of this flow, HGVs are not expected to constitute an appreciable share. The junctions where these lower classification roads connect with the A702, B7000 and B729 have been covered in the data however and it was found that there were no collisions at those locations.

13 There were four personal injury collisions on the B741, with one of these resulting in a fatality. HGVs were involved in one of the collisions which was a two vehicle accident and the severity was serious.

14 The B7075 was entirely free of PIAs for the three year study period.

15 A particular trend that has emerged from this accident investigation is the involvement of motorcyclists in collisions. 24% of PIAs which happened on the A713 involved a motorcycle and on the A712, 44% involved a motorcycle. These figures tend to suggest that the routes are a popular choice with motorcyclists and the period of year in which all these were recorded (April to September) supports a theory that they may be leisure riders.

Table 13.03 - Personal injury accidents on road network in the past three years

Road	Number of PIAs	Severity			HGV involvement (%)
		Fatal	Serious	Slight	
A713 – from junction with A77 at Ayr to the D&G boundary	43	0	9	34	2%
A713 – Boundary with Strathclyde to A712 junction	24	1	6	17	8%
A713 - from junction with A712 to the A75	5	0	2	3	0%
A712 - from junction with A713 to the A75	9	-	3	6	0%
A702 – from A713 junction to A76 at Thornhill	8	-	3	5	13%
B729 - from A713 junction to A702 at Moniaive	16	-	3	13	0%
B741 - from A713 junction to A76 at New Cumnock	4	1	1	2	25%
B7000 – from B729 junction to A702 junction	1	-	-	1	0%
B7075	0	-	-	-	0%
C51 – Entire length					
U141 – Entire length					
TOTAL	110	2	27	81	5%

13.4 Traffic Generation And Assignment

13.4.1 Types Of Vehicle

1 The types of vehicle that will be used during the construction period are identified below along with a brief description of their purpose and capabilities.

Abnormal Loads	
	There are a total of two abnormal loads required as part of this construction phase. These loads will be in the form of the transformers required at the substations.

HGV Loads	
	The haulage of extracted timber from the sites will be conducted by HGVs capable of carrying 30m^3 of product.
	Stone deliveries are needed for access track upgrades, the construction of new tracks, construction compounds and substation areas. HGVs with load capacities of 20m^3 have been identified for this task.
	Concrete will be delivered to the substations and steel tower sites ready mixed. The concrete for the substations will be transported in 6m^3 capacity vehicles and the remaining concrete deliveries will be made in 4m^3 capacity vehicles.
	The delivery of generic construction materials, including steel and mesh for base construction will be provided by flatbed HGVs.
	Construction Plant will be transported to the developments via HGV low-loaders where the plant will be dropped off and then recovered when the plant has accomplished all of its tasks.
	The erection of the wood poles, steel lattice towers and the placement of infrastructure within the substation compounds will require the use of crane equipment. A mobile crane is the most suitable option for this purpose as it can move between construction areas without the need for dismantling and reconstruction each time.
	There will be a need for fuel to be brought to the various locations to replenish plant vehicles on site.

LGV & Other	
	Vehicles for the transportation of construction personnel to and from the development areas. These are anticipated to be mainly LGVs which covers cars, vans and mini-buses.

13.4.2 Trip Generation

1 This section looks at the individual core activities to be undertaken in the construction of the substations and OHLs. These core activities are felling, creation or improvement of access tracks, substation construction, wood pole erection and L7 Tower erection.

2 The number of trips generated have been left in their decimal state within each of the following core activities. These decimals have been rounded to create actual whole trips within Technical Appendix H.02 where total trips are shown against their relevant activity.

3 The numbers and types of vehicles and traffic generation have been based on SPT's extensive experience of undertaking works of this type. These estimates have been used to inform the development of Technical Appendix H.02.

13.4.2.1 Construction Activities

13.4.2.1.1 Felling

1 Felling will take place in the first six months of the construction phase and will require traffic movements to and from 13 individual forests in the area. The access points that have been identified for timber felling operations share many of their access points with those identified for the substation construction and OHL erection. The only two exceptions to this are for Forest Access Points 4 and 6 that have their own accesses from the A713.

2 The vehicle movements required for the felling stage have been identified to separately from the other traffic needed for the construction activities. Although accesses are identified, there may be a degree of crossover between what felling is being done for the construction of the substations and that needed for wood pole erection. By treating the felling as a separate exercise there is not considered to be any loss of overall accuracy for total construction vehicle movements on the network.

3 The following trip data is based on the maximum number of trips anticipated, which will give a worst case scenario result. These anticipated trips are based on one trip counted as empty in and full out and the trips are calculated on an assumption of a volume of 30m^3 per vehicle.

Table 13.04 - Total trips by forest access point (felling operations)

Forest Access Point	Forest	Trips	Plant movements= Trips +10%	Construction Access Point	Road used
FA1	Blackcraig	11	12	AP39	A702
FA2	Margree	570	627	AP38	A702
FA3	Glenshimmerock	112	124	AP37	C51S
FA4	FC Kendoon	47	52	AP33	A713
FA5	FC Barlae Hill	13	14	AP30	A713
FA6	Bardennoch	71	78	-	A713
FA7	Brochloch	67	74	AP15	A713
FA8	Brownhills	218	240	AP8	A713
FA9	FC above Brownhills	4	4	AP7	A713
FA10	FC above Brownhills	2	2	AP6	A713
FA11	FC to Parrie burn	1	1	AP5	A713
FA12	FC to Mossdale burn	11	12	AP2	A713
FA13	FC to Meikle Hill	193	212	AP1	B741
TOTAL		1,321	1,453		

4 The worst case scenario for felling trips is 1453 and these movements will take place in the first six months of construction. The majority of felling traffic will access the forest areas from the A713.

Table 13.05 - Total and average trips by road (felling operations)

Road Number	Trips Generated	Trips Generated +10%	Average Trips Generated per day (all vehicles)	Average Trips Generated per day (HGVs)
A702	581	639	5.32	5.32
C51S	112	124	1.03	1.03
A713	434	477	3.98	3.98
B741	193	212	1.77	1.77

5 Six months of felling time is equivalent to 24 weeks, which itself is the equivalent of 120 work days. This is based on the assumptions made previously in this report.

6 Using the trip figure which has the 10% contingency for plant delivery applied to it, the average number of daily trips generated by felling is therefore 12.1. If this average is distributed to the road network according to percentage share, then the following results are demonstrated for the average daily trips per road.

- A702: 5.3 trips per work day
- A713: 4 trips per day
- B741: 1.9 trips per day
- C51S: 1.1 trips per day

7 All of these trips are anticipated to be made by HGVs. Figure H.03 in Technical Appendix H shows the predicted distribution of these trips on the road network.

13.4.2.1.2 Access Tracks

1 There are a total of 41 accesses planned for the two substations and the new wood pole and steel tower OHLs. These accesses are varied in terms of their proximity to the existing road network. Some accesses link directly with the existing road network with little need for additional works to facilitate access to the tower and pole sites. There are however, other accesses which will pose a more complicated task as there will be a need for the creation temporary access tracks to be laid. These are required to enable links to be maintained between the road network and the associated infrastructure.

2 Table 13.06 shows the access points that have been identified along with the road that the access links to.

Table 13.06 - Road Network connecting to Access Points

Access Point	Access via…	Links to…
1	B741	A713 (west), A76 (east)
2 to 19	A713	A75 (south), A77 (north)
20	B729	A713 (west), A702 (south), A76 (east)
21 to 34	A713	A75 (south), A77 (north)
35	B7000	B729 (north), A702 (south)
36	B7000	B729 (north), A702 (south)
37	U141	B729 (north)
38	C51S	A702 (south), B7000 (west)
39	A702	A713 (west), A76 (east)
40	A702	A713 (west), A76 (east)
Road Network Utilised	A713, A702, B7000, B741, B729, C51S, U141	

3 Chapter 5 identifies that there is a need for 36,100m^3 of stone to either upgrade existing tracks or create new ones. The construction period allotted to access tracks is a total of 11 months although this has been split into two separate periods. The initial phase will commence in the second month of construction and run to and include the seventh month. The second phase of access track work will commence in the seventeenth month of construction and last until the end of the entire construction period in month 21 (excluding the removal of the N-Route programme period).

4 By using 20m^3 capacity trucks to deliver the stone, 1805 trips will be required in total, spread throughout the 11 months in order to deliver the stone. These trips can be broken down to;

- 164 trips per month or
- 41 trips per week or
- 8.2 trips per day

5 Table 13.07 shows how these trips with the purpose of delivering stone for access tracks are assumed to be distributed throughout the road network. The average number of trips each day refers to the 11 month construction period in which access tracks are being improved or created.

Table 13.07 - Total and Average Trips for Stone Loads (access tracks)

Road Number	Access Points	Trips Generated	Average Trips Generated per day
A713	2 to 34	1,104	5.0
A702	39 to 40	237	1.08
B741	1	95.55	0.43
B7000	35 to 36	152	1.01
C51S	38	146	0.7
U141	37	70.15	0.32

6 Figure H.04 in Technical Appendix H shows the predicted distribution of these average trips per day on the road network.

13.4.2.2 Blackcraig Substation

13.4.2.2.1 Access Arrangements

1 The site is accessed by a section of track linking the substation to the A702. The access point is referenced as AP40 and is the only access required in the construction and operational maintenance of the substation.

2 The transformer for the Blackcraig substation is assumed to be transported to the site from the port of Ayr. The route for this abnormal load is anticipated to be via the A77, south along the A713 and then onto the A702 eastward towards the site access. Transporting the abnormal load on this final section along the A702 from the west will be dependent on the final length and width of the abnormal load. The Blackcraig ES does indicate that such a route is possible however, but may require additional escort vehicle provision to ensure safety due to the road width available on the A702 section.

13.4.2.2.2 Construction

1 The period of construction for this substation has been programmed to last for 18 months. This will commence in the third month of the construction programme and end in month 20.

Table 13.08 - Total number of trips required for construction of substation

Type of Vehicle	Purpose of Vehicle	Number of Trips*	Description
	Hardcore deliveries	**187**	Trips based on volume of stone required for substation platform (3730m^3) and the volume of stone that can be transported by the tipper truck (20m^3)
	Ready mixed concrete deliveries	**26**	Trips based on volume of concrete required for substation compound components (152.3m^3) and the volume of concrete that can be transported by the concrete truck (6m^3)
	Transformer delivery	**1**	1 transformer required for Blackcraig site
	General construction material deliveries	**60**	Deliveries to include reinforcement bars for foundations and other components connected with substation
	Delivery of construction plant	**30**	
	Fuel for plant vehicles	**36**	Based on assumption of 2 fuel deliveries per month
	Transportation of workforce	**5040**	Assumption of 14 staff on a daily basis, 280 trips per month, 18 months
Total number of trips		**5380**	

*1 Trip = 2 vehicle movements (inbound and outbound)

2 The average daily number of trips anticipated for the construction of Blackcraig Substation is 15. If staff movements made in LGVs and cars is extracted from this overall average, then the remaining HGV traffic will account for 340 trips out of the original 5380. These HGV only trips can be equated to;

- 18.89 trips per month or
- 4.72 trips per week or
- 0.94 trips per day

3 The transport of the abnormal load will inevitably lead to some level of delay for traffic on the A713 and to a lesser degree on the A702. This trip will only be required once however and can therefore be assumed to have a significance of **minor** (temporary).

Table 13.09 - Average trips per day on roads in the network

Road Number	Access Points	Average Trips Generated per day (all vehicles)	Average Trips Generated per day (HGVs)
A702	40	14.9	0.94

4 Figure H.05 in Technical Appendix H shows the predicted distribution of these average trips per day on the road network.

13.4.2.3 Margree Substation

13.4.2.3.1 Access Arrangements

1 The site is accessed by a section of track linking the substation to the A702. The access point is referenced as AP39 and is the only access required in the construction and maintenance of the substation.

2 The transformer for the Margree substation is assumed to be transported to the site from the port at Ayr. The route for this abnormal load is anticipated to be via the A77, south along the A713 and then the A702 east towards the site access.

13.4.2.3.2 Construction

1 The period of construction for this substation has been programmed to last for 18 months

Table 13.10 - Total number of trips required for construction of substation

Type of Vehicle	Purpose of Vehicle	Number of Trips*	Description
	Hardcore deliveries	**256**	Trips based on volume of stone required for substation platform (5113m^3) and the volume of stone that can be transported by the tipper truck (20m^3)
	Ready mixed concrete deliveries	**36**	Trips based on volume of concrete required for substation compound components (214.33m^3) and the volume of concrete that can be transported by the cement truck (6m^3)
	Transformer delivery	**1**	1 transformer required for Margree site
	General construction material deliveries	**60**	Deliveries to include reinforcement bars for foundations and other components connected with substation
	Delivery of construction plant	**30**	
	Fuel for plant vehicles	**36**	Based on assumption of 2 fuel deliveries per month
	Transportation of workforce	**5040**	Assumption of 14 staff on a daily basis, 280 trips per month, 18 months
Total number of trips		**5459**	

*1 Trip = 2 vehicle movements (inbound and outbound)

2 The average daily number of trips anticipated for the construction of Margree Substation is 15. If staff movements made in LGVs and cars is extracted from this overall average, then the remaining HGV traffic will account for 419 trips out of the original 5459. These HGV only trips can be equated to;

- 23.28 trips per month or
- 5.82 trips per week or
- 1.16 trips per day

3 The transport of the abnormal load will inevitably lead to some level of delay for traffic on the A713 and to a lesser degree on the A702. This trip will only be required once however and can therefore be assumed to have a **minor** effect (temporary).

Table 13.11 - Average trips per day on roads in the network

Road Number	Access Points	Average Trips Generated per day (all vehicles)	Average Trips Generated per day (HGVs)
A702	39	15.16	1.16

4 Figure H.06 in Technical Appendix H shows the predicted distribution of these average trips per day on the road network.

13.4.2.4 Wood Pole Overhead Line

13.4.2.4.1 Access Arrangements

1 Access Points 33 to 40 inclusive provide the access for construction vehicles to the wood pole locations.

13.4.2.4.2 Construction

1 The period of construction of this line has been programmed to last for 12 months.

2 Table 13.12 shows the predicted volumes of stone required and as a result, the number of trips needed to build the temporary access tracks and construction compounds.

Table 13.12 - Stone Quantity/Trips for wood pole Construction

Access Point	Wood Pole Numbers	Stone required (m^3)	Stone Truck Trips (no)
Kendoon to Margree (K-M)			
33	2 to 5	390	19.5
34	6 to 22	1,961	98
35	23 to 34	1,312	65.65
36	35 to 51	1,183	59.15
37	52 to 73	1,403	70.15
38	74 to 105	2,920	146
Kendoon to Margree & Margree to Blackcraig combined			
39	106 to 136 (K-M) & 1 to 20 (M-B)	4,431	221.55
Margree to Blackcraig (M-B)			
40	21 to 24	309	15.45
TOTALS		13,909	695.45

3 The number of trips required for each construction are:

- 1,600 construction movements (based on 10 visits per pole)
- 4,800 stringing operation visits (based on 30 visits per pole)
- 16,800 construction personnel visits (based on 105 visits per pole)

4 These figures are distributed according to how many wood poles require erecting and from what access point these poles are reached. The result of this allocation of trips is shown in Table 13.13 which gives a breakdown of the trips for each activity and where access is required.

Table 13.13 - Trips Generated by wood pole Construction

Access Point	Wood Poles	Trips			Total Trips
		Construction personnel	Construction movements	Stringing operations	
AP33	2-5	525	50	150	725
AP34	6-22	1,785	170	510	2,413
AP35	23-34	1,260	120	360	1,357
AP36	35-51	1,785	170	510	2,900
AP37	52-73	2,310	220	660	3,190
AP38	74-105	3,360	320	960	4,640
AP39	106-136 and B&M 1-20	3,255+2,100 =5,355	310+200= 510	930+600= 1,530	7,415
AP40	B&M 21-24	420	40	120	580
TOTALS		16,800	1,600	4,800	23,200

5 The average daily number of trips anticipated for the construction of the wood pole OHL is 96.75. If staff movements made in LGVs is extracted from this overall average, then the remaining HGV traffic will account for 6,420 trips out of the original 23,200. These 'HGV only' trips can be equated to an average of 26.75 trips per day.

6 The roads that will accommodate these vehicle movements are shown in Table 13.14

Table 13.14 - Total and average number of trips for wood pole construction distributed on the road network

Road Number	Wood Poles	Trips Generated	Average Trips Generated per day (all vehicles)	Average Trips Generated per day (HGVs)
A713	2 to 22	3,138	13.07	3.59
A702	106 to 136 & 1 to 24 (Margree to Blackcraig)	7,995	33.31	9.17
B7000	23 to 51	1,357	5.65	1.55
C51S	74 to 105	4,640	19.33	5.33
U141	52 to 73	3,190	13.29	3.67

13.4.2.4.3 Construction Compounds

1 In addition to the stone deliveries required to create access tracks and the erection for the wood poles, construction compounds require their own deliveries to form their working areas. The volume of stone for each compound is identified in Chapter 5.

2 Principal Construction Compound

Stone required: 1,500m^3 = 75 trips (based on 20m^3 tipper trucks)

3 Secondary Construction Compound (1 required)

Stone required: 1,125m^3 = 56 trips (based on 20m^3 tipper trucks)

4 Pulling Compound (16 required)

Stone required: 2,880m^3 = 144 trips (based on 20m^3 tipper trucks)

= 9 trips per compound

5 The number of trips required by stone trucks (with a capacity of 20m^3) to accomplish this task are shown in Table 13.15 along with the access points used.

Table 13.15 - Total number of trips required for stone loads to construct compounds

Access Point	Principal Construction Compound	Stone Load Trips	Secondary Construction Compound	Stone Load Trips	Pulling Compound	Stone Load Trips
40					38	9
39	5,000m^2	75			34 to 37	36
38					30 to 33	36
37			3,750m^2	56	28 to 29	18
36					26 to 27	18
35					0	0
33					23	9
34					24 to 25	18

6 Table 13.16 shows how these trips are distributed on the road network via the access points.

Table 13.16 - Average number of trips for construction compounds distributed on the road network

Road Number	Average number of trips per day for Construction Compounds			Total average trips per day for construction compounds
	Principal	Secondary	Stringing	
A702	0.31		0.2	0.51
C51		0.23	0.15	0.38
U141			0.08	0.08
B7000			0	0
A713			0.15	0.15

7 There is an average of 1.12 trips required each working day to access Construction Compounds in the 12 month period that the wood pole line is being constructed.

8 Figure H.07 in Technical Appendix H shows the predicted distribution of these average trips per day on the road network.

13.4.2.5 Steel Lattice Overhead Line

13.4.2.5.1 Access Arrangements

1 Access Points 1 to 33 (inclusive) provide the accesses for construction vehicles to the L7 Tower locations.

13.4.2.5.2 Construction

1 The period of construction for this line has been programmed to last for 17 months.

2 Table 13.17 shows the predicted volumes of stone and concrete required at the tower sites in order to facilitate their erection. The resulting number of trips needed are also indicated in Table 13.17 and are based on vehicle capacities of 20m^3 for stone deliveries and 4m^3 for concrete.

Table 13.17 - Concrete & Aggregate Quantities/Trips for L7 Tower Erection

Access Point	Steel Lattice Tower	Stone required for construction area (m³)	Stone Load Trips (no)	Concrete Volume (m³)	Concrete Load Trips (no)
Meikle Hill to Dalmellington (MHD)					
1	1 to 8	1620	81	83.6	20.9
2	9 to 18	2025	101.25	72.35	18.09
Dalmellington to Kendoon					
3	19	202.5	10.13	11.6	2.9
4	21	202.5	10.13	11.6	2.9
5	22 to 24	607.5	30.38	26.95	6.74
6	25 to 34	2025	101.25	61.05	15.26
7	35 to 44	2025	101.25	88.05	22.01
8	45	202.5	10.13	3.75	0.94
9	46 to 48	405	20.25	7.5	1.88
10	49 to 51	607.5	30.38	11.25	2.81
11 & 12	52 to 55	810	40.5	22.85	5.71
13	56 to 57	405	20.25	26.65	6.66
14	58 to 60	607.5	30.38	11.25	2.81
15	61 to 66	1215	60.75	22.5	5.63
16	67 to 68	405	20.25	7.5	1.25
17	69	202.5	10.13	11.6	2.9
18	70 to 76	1417.5	70.88	26.25	6.56
19	77 to 82	1215	60.75	30.35	7.59
20	83	202.5	10.13	11.6	2.9
21	84 to 85	405	20.25	7.5	1.88
22	86	202.5	10.13	3.75	0.94
23	87	202.5	10.13	3.75	0.94
24	88	202.5	10.13	3.75	0.94
25	89	202.5	10.13	11.6	2.9
26	90 to 91	405	20.25	26.65	6.66
27	92 to 94	607.5	30.38	19.1	4.78
28	95 to 96	405	20.25	15.35	3.84
29	97	202.5	10.13	11.6	2.9
30	98	202.5	10.13	3.75	0.94
31	99 to 101	607.5	30.38	11.25	2.81
32	102	202.5	10.13	3.75	0.94
TOTALS		20,249.5	1,012.62	630.75	157.66

3 Table 13.18 shows how the resulting trips from stone and concrete deliveries are distributed on the network.

Table 13.18 - Total and average number of Concrete & Aggregate Trips for L7 Tower erection distributed on the road network

Road Number	Access Points	Trips Generated		Average Trips Generated per day (HGVs)
		Stone	Concrete	
A713	2 to 32	941.75	137.7	3.17
B741	1	81	20.9	0.3

4 The construction spreadsheet which approximates the number of trips required for each construction activity gives an indication of:

- Construction movements based on 59 visits per tower
- Steelwork deliveries based on 57 visits per tower
- Stringing operation visits based on 73 visits per tower
- Construction personnel visits based on 141 visits per tower

5 Steel bars for reinforcing the tower bases are assumed to constitute a single delivery load each. This will support a worst case scenario assessment with each tower location receiving an individual HGV visit each to deliver the reinforcement materials. In reality there is the possibility that reinforcement bars could be stockpiled on site somewhere before being distributed on the internal tracks to the tower locations. This method of distribution would most likely require fewer delivery vehicles to accomplish.

Table 13.19 - Total and average number of Concrete & Aggregate Trips for L7 Tower erection distributed on the road network

Access Point	Towers	Trips				Total Trips
		Construction personnel	Construction movements	Steelwork delivery & assembly	Stringing operations	
AP1	1-8	1,128	472	456	584	2,640
AP2	9-18	1,410	590	570	730	3,300
AP3	19	141	59	57	73	330
AP4	21	141	59	57	73	330
AP5	22-24	423	177	171	219	990
AP6	25-34	1,410	590	570	730	3,300
AP7	35-44	1,410	590	570	730	3,300
AP8	45	141	59	57	73	330
AP9	46 & 48	282	118	114	146	660
AP10	49-51	423	177	171	219	990
AP11 & 12	52-55	564	236	228	292	1,320
AP13	56-57	282	118	114	146	660
AP14	58-60	423	177	171	219	990
AP15	61-66	846	354	513	657	2,370
AP16	67-68	282	118	114	146	660
AP17	69	141	59	57	73	330
AP18	70-76	987	413	399	511	2,310
AP19	77-82	846	354	513	657	2,370
AP20	83	141	59	57	73	330
AP21	84-85	282	118	114	146	660
AP22	86	141	59	57	73	330
AP23	87	141	59	57	73	330
AP24	88	141	59	57	73	330
AP25	89	141	59	57	73	330
AP26	90-91	282	118	114	146	660
AP27	92-94	423	177	171	219	990
AP28	95-96	282	118	114	146	660
AP29	97	141	59	57	73	330
AP30	98	141	59	57	73	330
AP31	99-101	423	177	171	219	990
AP32	102	141	59	57	73	330
TOTALS		14,100	5,900	6,042	7,738	33,780

6 The roads that will accommodate these vehicle movements are shown in Table 13.20.

Table 13.20 - Total and average number of Steel Tower construction

Road Number	Access Points	Trips Generated	Average Trips Generated per day (all vehicles)	Average Trips Generated per day (HGVs)
A713	2 to 32	31,470	92.6	54
B741	1	2,640	7.76	4.45

13.4.2.5.3 Construction Compounds

1 In addition to the stone required to create access tracks and the erection for the steel towers, construction compounds require their own deliveries to form their working areas. The volume of stone for each compound has been identified in Chapter 5.

2 Principal Construction Compound

Stone required: 3,000m^3 = 150 trips (based on 20m^3 tipper trucks)

3 Secondary Construction Compound (1 required)

Stone required: 1,125m^3 = 56 trips (based on 20m^3 tipper trucks)

4 Stringing Compound (22 required)

Stone required: 8,910m^3 = 445.5 trips (based on 20m^3 tipper trucks)

= 20.25 trips per compound

5 The number of trips required by stone truck (with a capacity of 20m^3) to accomplish this task are shown in Table 13.21 along with the access points used.

Table 13.21 - Total number of stone load trips for construction of compounds

Access Point	Principal Construction Compound	Stone Load Trips	Secondary Construction Compound	Stone Load Trips	Pulling Compounds	Stone Load Trips	Total Trips
1	10,000m^2	500	5,000m^2	150	1 to 3	60.75	710.75
3					4 to 5	40.5	40.5
6					6 to 7	40.5	40.5
7					8 to 11	81	81
11			3,750m^2	56			56
13					12 to 13	40.5	40.5
15					14 to 15	40.5	40.5
17					16 to 17	40.5	40.5
19					18 to 19	40.5	40.5
27					20 to 21	40.5	40.5
31			5,000m^2	150			150
33					22	20.25	20.25
TOTALS		500		356		446	1,302

6 The 1,302 trips needed for the construction of the compounds is loaded onto the network in Table 13.22

Table 13.22 - Average number of trips per day for construction of compounds

Road Number	Average number of trips per day for Construction Compounds			Total average trips per day for construction compounds
	Principal	Secondary	Stringing	
A713		0.61	1.13	1.74
B741	1.47	0.44	0.18	2.09

7 Figure H.08 in Technical Appendix H shows the predicted distribution of these average trips per day on the road network.

13.4.3 Trip Distribution

1 The most likely origins for trips connecting to the development sites have been determined to be from towns in the vicinity. These origins are Ayr, Cumnock and New Cumnock, to the north and Dumfries and Castle Douglas from the south.

2 It is recognised that some deliveries or certain materials may be required from further afield and may require vehicle movements from Glasgow or Carlisle. The specific origins of all construction materials cannot be known at this stage but this is not thought to be too much of an influence oN-Routes to be used. Glasgow generated traffic is most likely to approach the development sites via the A713 and traffic from Carlisle would use the A713 or A712 after departing the A75, west of Dumfries.

3 The general assumption for trip distribution in this scenario is that the substations will be used as the marker for estimating where traffic is coming from. Individual access points along the A713 or other roads will not be attended to on an individual basis as that level of detail is considered unnecessary when specific origins are not known. An additional factor that has been adopted for the purposes of this assessment is that the distance measured will be between each individual origin and a point on the A702, halfway between the accesses to Blackcraig Substation and the Margree Substation. This has been chosen as it is assumed that the crews who will construct the substation compounds will be from the same general locations as crew members tasked with erecting the wood poles and the L7 Towers.

4 A basic gravity model has been applied to these selected origins to determine the percentage of total construction traffic that each would produce. The equation used by this study to generate the percentage share is as follows:-

$$\frac{1}{\text{Distance to substation from origin}} \times \text{Population of origin}$$

5 The population data has been obtained from the National Statistics 2001 census as this is the most recent source available.

Table 13.23 - Estimated construction traffic distribution on network

Origin	Distance between origin & substation (miles)	Population of Locality (2001 census)	Route used on approach to destination	Result of gravity model calculation	Percentage of construction traffic using road
From North					
Ayr	34	46,431	A713	1,366	43%
Cumnock	35.5	9,358	A713	264	8%
New Cumnock	30	3,165	A713	106	3%
From South					
Dumfries	26	31,146	A712	1,198	38%
Castle Douglas	15	3,671	A713	245	8%
TOTALS				3,179	100%

13.5 Assessment

13.5.1 Overview

1 This section assesses the likely effects on the local road network of the construction traffic movements.

13.5.2 Assessment Of Potential Effects

13.5.2.1 Collision Data

1 It is considered that from an analysis of the collision data for the routes and junctions in this assessment there is not expected to be any additional impact on existing collision locations. There are no cluster sites, where at least five collisions have taken place in the past three years, neither are any junctions of particular concern in terms of recorded collisions. The HGV involvement in collisions is low despite the only fatal collision involving a HGV.

13.5.2.2 Assessment of Routes

1 The Forestry Commission's Agreed Timber Transport Routes Map is an online resource available for public information that identifies routes suitable for the haulage of timber as well as those routes which are unsuited to the task. The selected roads have all been compared with this Agreed Route Map to highlight any instances where large vehicle movements are not recommended or in some instances, precluded.

2 The Forestry Commission's Agreed Timber Transport Routes Map shows the entire length of the B7075 as an excluded route. Improvements have been identified as part of the SWS Project ES to allow this road to be used as a bypass for St Johns Town of Dalry and for this reason the exclusion has been noted but the B7075 deemed an acceptable route.

3 The Forestry Commission's Agreed Timber Transport Routes Map shows the entire length of the C51S as a severely restricted route. This road is however critical for accessing wood pole construction locations and must be attended to through mitigating measures to ensure its use. The creation of a one-way system utilising the C51S and the B7000 may go some way to remedying any effect and would benefit both roads as a result in terms of the reduction in large vehicle conflicts.

4 The B7000 between its junction with the C51S and the B729 is marked as an excluded route for the transport of timber. It has been recognised in this assessment that this northern section the B7000 can be avoided during the construction period and as such, this exclusion can be retained for this project and its assessment.

5 All the other roads identified as most likely to be used by construction traffic are identified as being suitable routes for the haulage of timber.

13.5.2.3 Assessment of Access Points

1 There were no physical site visits made to the development areas for the purposes of this assessment. Aerial photography provided to the assessment team was deemed sufficient for consideration of accesses and the existing road network. Previous related studies, including the environmental statements for Blackcraig and Margree Windfarms as well as the SWS Project ES, gave a great deal of detail concerning the road network and descriptions of the local area.

2 Although access points have been identified through the development process it is not yet possible to assess these accesses in terms of their compliance with highway design standards. For example, visibility spays for the access points entering the road network cannot as yet be adequately investigated on site as precise junction designs have not been produced. This assessment requires that the access points will need this compliance if they are to operate as intended.

13.5.2.4 Impact of Development Traffic (IEMA Guidelines)

1 All of the roads assessed as part of this study are currently operating within capacity. The addition of construction and operational traffic associated with the substations and OHL will not exceed capacity on any of the roads.

2 Technical Appendix H contains Figures which show the flows expected and how these vehicles will be distributed on the road network. There are individual figures for each activity of the construction phase, as determined by this assessment, showing individual trips for Felling, Temporary Access Tracks, Substations, wood pole, and Steel Lattice Tower construction and stringing. The construction traffic numbers for these activities is shown as a total in Figure H.09. Figure H.10 shows the percentage increase over baseline traffic when construction traffic is added to the network. Table 13.24 below summarises these changes in traffic flows and identifies the effects and their significance. The baseline AADT flows are the baseline flows expected in the year of construction commencing in 2011.

3 The change in AADT shown in Table 13.24 is based on the worst case scenario and uses the trip numbers from the month in the construction period when traffic flows are at their highest. There are a total of three months which share this high figure and occur in the 4th, 5th and 6th months of construction. Technical Appendix H.02 shows these flows for each month and each development activity.

Table 13.24 - Percentage change over baseline traffic flow for construction period

Road	Section Description	Baseline AADT (2011)	Baseline HGV AADT (2011)	Construc-ction Traffic (AADT)	HGV construc-tion traffic only	Change over baseline (%)	Effect (all traffic)
A713	Patna to Dalmell-ington	6,860	734	223	103	+3	None
A713	South of B741 junction	6,547	809	144	66	+2	None
A712	East of B7075 junction	672	40	225	104	+33	Moderate
A702	East of B7075 junction	200	10	213	98	+107	Major
B729	from A713 junction to A702 at Moniaive*	200	10	31	14	+15	Minor
B741	Dalmell-ington to New Cumnock	3,303	353	79	36	+2	None
B7000	North of St Johns Town of Dalry	224	8	60	28	+27	Minor
B7075	Between A702 and A712 junctions	181	14	100	46	+55	Moderate
C51	Entire length*	54	1	44	20	+81	Major
U141	Entire length*	30	1	28	13	+95	Major

*Estimated baseline figure

13.5.2.5 Impact of Development Traffic (Capacity)

1 As stated earlier, it is considered important to consider the capacity of each road alongside the IEMA guidelines assessment. This is because when considering roads with a low traffic flow the IEMA criteria often results in the identification of a **major** effect which is **significant**. However, the additional traffic can be readily accommodated within the capacity of the existing road and therefore in reality will not have an appreciable effect on the road's operation.

2 The construction traffic was added to the baseline traffic and compared to the capacity of each road. The significance of the development traffic impact on capacity is deemed to be 'None' if the road operates within capacity with the combination of baseline and construction traffic. Table 13.25 details the development traffic impact on capacity for each of the roads under consideration.

Table 13.25 - Development Traffic Impact on Capacity

Road	Section Description	Baseline AADT (2011)	Construction Traffic (AADT)	Baseline + Construction Traffic (AADT)	CRF (AADT)	Effect in context of Capacity
A713	Patna to Dalmellington	6,860	223	7,083	17,060	None
A713	South of B741 junction	6,547	144	6,691	16,850	None
A712	East of B7075 junction	672	225	897	21,215	None
A702	East of B7075 junction	200	213	413	16,498	None
B729	from A713 junction to A702 at Moniaive*	200	31	231	9,484	None
B741	Dalmellington to New Cumnock	3303	79	3,382	11,819	None
B7000	North of St Johns Town of Dalry	224	60	284	13,426	None
B7075	Between A702 and A712 junctions	181	100	281	11,698	None
C51	Entire length*	54	44	98	9,804	None
U141	Entire length*	30	28	58	7,033	None

*Estimated baseline figure

3 The significance in Table 13.25 based on capacity highlights that although the effect in terms of IEMA guidelines was often of **major** or **moderate**, the increase in traffic volume as a result of the development traffic was well within capacity of the existing roads and therefore the IEMA generated results needs to be considered in this context.

13.5.3 Summary Of Effects

1 The data for the A713 shows that average increase in daily traffic flow of 3% and 2% will be generated by the developments. These changes result in an effect that is considered to be **none**. The significance of construction traffic flows on the B741 are also assumed to be **none**. There is a predicted 14% increase in HGV traffic flows on the northern section of the A713 and an 8% increase for the southern part. These increases in HGV flows are **not significant** on the A713 either as the HGV effects would be considered **minor** and **none** respectively.

2 The A712 is demonstrated to have a **moderate** effect when construction traffic is applied to the road. There is a 260% increase in HGV traffic from the baseline year meaning the HGV impact is **major**. Both of these effects are **significant**.

3 The A702 is categorised with an effect of **major**. This is an expected outcome as the A702 will have to carry traffic wishing to enter the substation construction sites, forest accesses and other accesses. All of these activities constitute an appreciable share of the overall construction traffic and have meant a peak AADT increase in flow of 107% for weekday traffic on the A702. The HGV increase is 980% above the 2011 baseline and demonstrates a **major** effect on this type of vehicle for the road. These effects are **significant**.

4 The baseline AADT flow for the B729 has been estimated and has been based on flows for the A702 due to both roads connecting in the community of Moniaive in the east and both connecting to the A713 in the west. It is assumed that this baseline is robust enough for assessment and by doing so the effect that construction traffic will have on the B729 is found to be **minor** and **not significant**. This estimation applies to the HGV assessment also, which, assumes a 140% increase over the estimated baseline. The HGV effect is therefore **major** and **significant**.

5 The B741 shows a 2% increase in traffic flows the effect of which is **none** and **not significant**. HGV traffic flows accounted for a 10% increase which is categorised as a **minor** effect which is **not significant**.

6 Construction traffic on the B7000 is shown to have a **minor** and **not significant** effect compared to the 2011 baseline and can be assumed to not warrant any mitigation. The HGV traffic flow does however suffer a **major** effect with a 350% increase over the baseline. This effect is **significant**.

7 The B7075 is predicted to have a **moderate** effect in terms of the additional traffic flow on the road which is **significant**. Appropriate mitigation is required to minimise the effect that the construction traffic will have on the road. The effect of the increase in HGV movements is **major** (**significant**) with an increase of 329% over the baseline.

8 **Major** effects (**significant**) are expected on the C51S and U141 roads. Their lower category would suggest that this was going to be the most likely result. The lack of physical count data on the C51S and U141 is not expected to have any appreciable effect on this **major** effect and therefore mitigation is required to effectively manage the increase in traffic. HGVs on these routes reflects the overall traffic flow results with a 2000% increase on the C51S and a 1300% increase on the U141.

9 According to the IEMA guidelines, mitigation will be required for the A702, B7075, C51S and U141 as they all have a effects which are **moderate** or **major** and therefore **significant**.

10 The results of the CRF comparison demonstrate that the roads within this assessment are capable of accommodating the additional traffic without exceeding their capacities. This puts the results from the IEMA guidelines for roads with existing low traffic flows into context for this assessment. The existing low flows on those roads has lead to them receiving elevated effects based on the IEMA assessment criteria. The CRF balances the effects of the IEMA results by showing that in reality the effects will be not be as appreciable as the IEMA assessment has suggested.

13.5.4 Mitigation

13.5.4.1 Construction Phase

1 The following mitigation measures have been identified for the construction phase and are referenced by number although the number is not a signifier of any measure being more or less important than any another. These measures, if rigorously applied and in the correct combination to the relevant roads should measurably reduce any environmental impacts felt through the traffic flow increases.

M1

2 The provision of stone and concrete for the various elements of the developments has been assumed to be entirely sourced from off-site. Where it is practical, stone should be sourced locally to reduce the distance covered on the road network by the 20m^3 capacity trucks. Concrete batching within the confines of the development should be investigated to determine how practically this could be achieved and by doing so would reduce the trips required on the local road network. This would however require the necessary environmental precautions to be put in place to ensure that this did not result in any additional effects on other receptors.

M2

3 The delivery of the two abnormal loads, for the purpose of delivering the transformers to the substation sites will need to be aided by the local police authority. This is to prevent vehicle conflicts occurring at junctions such as where the A713 meets the A702 at St Johns Town of Dalry. The route will be the same for both loads as their access points from the network occur in close proximity to one another on the A702. Delivery of these loads will take place outside of core hours when the roads are at their quietest.

M3

4 Felling of timber has been programmed and a check needs to be made to ensure that best practice is adhered to when the timber is extracted from the forest and enters the road network. The most suitable roads for these timber vehicles are highlighted by the 'Agreed Routes Map' on the Forestry Commission's website. The road network should be agreed with operators prior to felling commencing.

M4

5 A worst case scenario has been planned for with this assessment for staff movements to and from the development sites. This assumes that each individual uses their own transport to make the journey. In reality, vehicle sharing should be encouraged, perhaps through the use of mini-buses to reduce vehicle movements. This could potentially have a measurable positive change as staff movements account for 54% of total vehicle movements for the construction of the substations and OHLs.

M5

6 The opportunity to avoid conflict between vehicles exists for construction traffic using the B7000 and C51S as in combination, these roads create a loop. This loop could be used as a one-way system which would appreciably reduce the instances when large vehicles would meet each other on these narrow carriageways.

M6

7 Access roads which are to be created and that link directly to the network will need to be designed to take account of the visibility requirements for vehicles accessing roads with 60mph national speed limits on them. Appropriate warning signs will be required to indicate to both construction traffic and the general public the presence of these newly created access points.

M7

8 A Traffic Management Plan (TMP) should be implemented prior to construction activities commencing. Within this plan should be agreed routes for traffic approaching the development from the north, south, east or west. If vehicles can be managed through this predetermined route plan, then problems such as the use of roads with physical restrictions on them can be avoided or at least minimised. The road accident records would go some way to supporting this plan also as the records demonstrate that some stretches of the assessed roads are more at risk than other parts of the same road.

9 The Blackcraig ES proposes the adoption of a Traffic Management Plan and sets out a number of criteria which could be addressed. This TMP should be consulted prior to the development of any additional plan so that continuity can be maintained between the developments.

M8

10 From the collisions records for the assessed roads, it appears that motorcycles may be at risk on some of the routes. The A713 and A712 in particular demonstrated an appreciable proportion of accidents involved powered two wheelers. It may be necessary to cater for this risk by specifically signing these routes with warnings that address this road user group.

11 A combination of these mitigation measures would have a beneficial effect on a variety of routes investigated by this assessment. The effects of these measures on the effects are considered in Table 13.25. Within that table, where no mitigation measure has been applied to a road due to it having an effect of **none** or **minor**, it should be assumed that these roads will still be considered for the measures to ensure efficiency. This comprehensive approach will yield the best potential results in terms of route compliance, delivery schedules and staff movements, which all have a measurable effect on the AADT peaks.

13.5.5 Residual Effects

13.5.5.1 Construction Phase

1 All of the traffic flows assessed in this study are temporary and for the purpose of construction only.

2 There are appreciable increases envisaged for traffic on many of the roads which have been assessed with changes of 107% and 95% over baseline flows for the A702 and U141 respectively. These increases are mainly due to the existing low levels of traffic flow on those roads. The main road on the network being assessed is the A713 and the effect is assessed to be **none** which demonstrates that it can quite comfortably accept the increase in flow without exceeding capacity.

3 There will be a need for operational vehicles to access the development sites on occasion and also for the purpose of maintenance. It assumed that these trips will be so infrequent and low in quantity as to have no effect of any significance.

Table 13.26 - Mitigation and Residual Effect on Road Network

Road	Effect		Mitigation Measures	Residual Effect
A713[1]	All Traffic	None	M3, M6, M7, M8	None
	HGV only	Minor	M3, M6, M7, M8	Minor
A713[2]	All Traffic	None	M3, M6, M7, M8	None
	HGV only	None	M3, M6, M7, M8	None
A712	All Traffic	Moderate	M1, M4, M6, M7, M8	Minor
	HGV only	Major	M1, M4, M6, M7, M8	Major
A702	All Traffic	Major	M1, M3, M4, M2, M7	Major
	HGV only	Major	M1, M3, M4, M2, M7	Major
B729	All Traffic	Minor	M6, M7	Minor
	HGV only	Major	M1, M4,M7	Major
B741	All Traffic	None	M3, M6, M7	None
	HGV only	Major	M1, M3, M4, M6, M7	Major
B7000	All Traffic	Minor	M6, M7	Minor
	HGV only	Major	M1, M4, M5, M6, M7	Major
B7075	All Traffic	Moderate	M1, M4, M6, M7	Moderate
	HGV only	Major	M1, M4, M6, M7	Major
C51S	All Traffic	Major	M1, M3, M4, M5, M6, M7	Major
	HGV only	Major	M1, M3, M4, M5, M6, M7	Major
U141	All Traffic	Major	M1, M4, M6, M7	Major
	HGV only	Major	M1, M4, M6, M7	Major

13.6 Cumulative Effect Of Windfarm Construction

13.6.1 Overview

1 This section considers how the construction period for the substations and OHL will affect the network when considered in combination with the windfarms planned for Blackcraig and Margree. These windfarms are at application stage and detail regarding traffic volumes for their construction has been gathered from their environmental statements.

2 Technical Appendix H.02 shows the AADT for each of the windfarms during the construction phase. It has been assumed that construction of the windfarms will commence at the same time as the substations and OHLs. From Appendix H.02, it can be seen that the month with the highest anticipated flows for all construction traffic is either the 4th, 5th or 6th month as each has the same total. These are the same months that were found to have the highest AADT for the substations and OHL construction.

13.6.2 Assessment Of Potential Effects

1 The effects of the construction period for Blackcraig and Margree Windfarms are considered in their respective environmental statements. The mitigation measures from these environmental statements have been considered as part of this study in order of ascertaining where problems may arise on the road network. The resulting conclusion of this assessment is that **none** of the mitigation measures developed for this substations traffic assessment contradicts or compromises those measures set out in the windfarm environmental statements.

2 Table 13.26 summarises the new total AADT in a worst case scenario for all construction traffic.

Table 13.27 - Percentage change over baseline traffic flow for construction period (including windfarm traffic)

Road	Section Description	Baseline AADT (2011)	Baseline HGV AADT (2011)	Construction Traffic (AADT)	HGV construction traffic only	Change over baseline (%)	Effect
A713	Patna to Dalmellington	6,860	734	1,182(223)	688 (103)	+17 (+3)	Minor
A713	South of B741 junction	6,547	809	667 (144)	303 (66)	+10 (+2)	Minor
A712	East of B7075 junction	672	396	1,082(225)	23 (104)	+161 (+33)	Major
A702	East of B7075 junction	200	40	1,060(213)	340 (98)	+530 (+107)	Major
B729	from A713 junction to A702 at Moniaive*	200	10	1,108(31)	671 (14)	+555 (+15)	Major
B741	Dalmellington to New Cumnock	3,303	353	306(79)	36 (36)	+9 (+2)	None
B7000	North of St Johns Town of Dalry	224	8	60(60)	38 (28)	+27 (+27)	Moderate
B7075	Between A702 and A712 junctions	181	14	294(100)	110 (46)	+163 (+55)	Major
C51	Entire length*	54	1	44(44)	20 (20)	+81 (+81)	Major
U141	Entire length*	30	1	1,106 (28)	671 (13)	+3687 (+95)	Major

(The contribution from the Blackcraig and Margree substations and overhead line is shown in brackets)

*Estimated baseline figure

13.6.2.1 Impact of Development Traffic (Capacity)

1 As stated earlier, it is considered important to consider the capacity of each road alongside the IEMA guidelines assessment. This is because when considering roads with a low traffic flow the IEMA criteria often results in the identification of a **major** effect which is **significant**. However, the additional traffic can be readily accommodated within the capacity of the existing road and therefore in reality will not to have an appreciable effect on the road's operation.

2 The construction traffic was added to the baseline traffic and compared to the capacity of each road. The significance of the development traffic impact on capacity is deemed to be 'None' if the road operates within capacity with the combination of baseline and construction traffic. Table 13.25 details the development traffic impact on capacity for each of the roads under consideration.

3 In the case of all roads considered except the B7000 and C51 the contribution to the overall effects attributable to the Blackcraig and Margree substations and overhead line can be seen to be very limited in comparison with the wider effects of the windfarm construction.

Table 13.28 - Development Traffic Impact on Capacity (including Windfarm Traffic)

Road	Section Description	Baseline AADT (2011)	Construction Traffic (AADT)	Baseline + Construction Traffic (AADT)	CRF (AADT)	Effect in context of Capacity
A713	Patna to Dalmellington	6,860	1,182	8,042	17,060	None
A713	South of B741 junction	6,547	667	7,214	16,850	None
A712	East of B7075 junction	672	1,082	1,754	21,215	None
A702	East of B7075 junction	200	1,060	1,260	16,498	None
B729	from A713 junction to A702 at Moniaive*	200	1,108	1,308	9,484	None
B741	Dalmellington to New Cumnock	3303	306	3609	11,819	None
B7000	North of St Johns Town of Dalry	224	60	284	13,426	None
B7075	Between A702 and A712 junctions	181	294	475	11,698	None
C51	Entire length*	54	44	98	9,804	None
U141	Entire length*	30	1,106	1,136	7,033	None

*Estimated baseline figure

13.6.3 Summary Of Effects

1 The effect has increased for the A713 from **none** to **minor**. This demonstrates that despite the increase there is no need to develop any specific mitigation for this particular road. Existing flows on the A713 mean that it can cope with increases for the construction traffic for the windfarms and substations as well as OHLs without any specific mitigation. There is a 94% increase in HGV flow when the windfarm traffic is included in the construction period. This HGV increase is **major** and **significant** for the northern part of the A713. A 38% in HGV traffic flow occurs on the southern section of the A713 which is categorised as **moderate** and **significant**.

2 The A712 effect has increased from **moderate** to **major** when construction traffic is applied to the road. The increase is 161% over the adjusted 2011 baseline figure with the construction traffic split; 64% LGVs and 36% HGVs. The HGVs on the road are 60% above the baseline flow figure for 2011, which means the effect is **major** and **significant**.

3 The A702 is categorised as a **major** effect. This is to be expected as the A702 will have to carry traffic wishing to enter the substation construction sites, forest accesses and other accesses. The HGV flow on the A702 is 850% above the baseline so must be seen as a **major** effect which is **significant**.

4 The increase over the baseline for traffic on the B729 represents a 555% increase when the AADT peaks and is considered to be **major**. The HGV flow assessment gives an increase over the estimated baseline of 671%. The HGV effect is therefore **major** and **significant**.

5 The B741 is categorised as having an effect of **none** which has remained unchanged from the initial assessment where only the substations and overhead lines construction were considered. The percentage increase over the baseline increases from 2% to 9% but still remains below the 10% threshold. The HGV increase is 10% and is considered to have a **minor** effect.

6 The B7000 is the only assessed road with an effect of **moderate** and the cumulative traffic levels have not affected the traffic flow. This is due to the fact that no construction traffic for the windfarm construction phase is predicted to use that road. There is a 475% increase in HGV flow above the baseline meaning a **major** effect which is **significant**.

7 The B7075 experiences an increase in overall traffic of 163% making the effect **major**. The HGV flow required on this B road is 786% greater than the baseline flow of HGVs and must also be categorised as **major** and **significant**.

8 The C51S is affected through all traffic using the road as the flow increases by 81% over the baseline, which makes it a **major** effect. The HGVs account for a 2000% increase over the expected existing totals for HGVs and must also be considered a **major** effect which is **significant**.

9 The U141 has been subject to a 3703% increase over the baseline (demonstrating just how low existing traffic flows are). HGV trips are assumed to be 6710% greater than the original baseline figure. The majority of this traffic will be for the purposes of windfarm access

10 The results of the CRF comparison demonstrates once again that all of the roads within this assessment are capable of accommodating the additional traffic without exceeding their capacities. Even in light of these large increases in traffic flows explained previously, the congestion point for the road is not even close to being met, and this can be seen in Table 13.28.

13.6.4 Residual Effects

1 On every local road, barring the A713 which has appreciably higher baseline flows than the others, the increase in HGVs is found to have a **major** and **significant** effect.

2 All construction traffic flows are temporary and although there may be short term delays caused by the presence of HGVs for certain periods, the effect will not be sustained.

3 When combined with the substation and OHL construction activities, the windfarm construction movements increases the number of roads that are categorised as **moderate** or **major** from 50% to 70%. These percentages take into account all construction traffic. The split when only HGVs are assessed is 70% without windfarm HGVs, and 90% with windfarm HGVs.

4 Roads such as the U141 and C51S are not expected to carry HGVs in their everyday operation as there are no destinations or origins that require HGV usage. The very large increases in flow such as 6710% on the U141 can be explained due to this fact as many movements will be required on this **minor** road to access the Margree Windfarm.

Table 13.29 - Mitigation and Remedial Effect on Road Network (including windfarm traffic)

Road	Effect		Mitigation
A713[1]	All Traffic	Minor	It should be assumed that the mitigation measures from Table 13.26 will still apply to all the roads in this table. Where the significance has been made worse through the addition of windfarm construction traffic, the measures from Table 13.26 will be applied in conjunction with mitigation measures already identified for the separate windfarms in their respective environmental statements.
	HGV only	Major	
A713[2]	All Traffic	Major	
	HGV only	Moderate	
A712	All Traffic	Major	
	HGV only	Major	
A702	All Traffic	Major	
	HGV only	Major	
B729	All Traffic	Major	
	HGV only	Major	
B741	All Traffic	None	
	HGV only	Minor	
B7000	All Traffic	Moderate	
	HGV only	Major	
B7075	All Traffic	Major	
	HGV only	Major	
C51	All Traffic	Major	
	HGV only	Major	
U141	All Traffic	Major	
	HGV only	Major	

5 The effects of the traffic from the construction of the windfarms considerably exceeds that for the overhead line and substations for all routes except the B7000 and C51.

13.7 Cumulative Effect Of Windfarm & SWS Project Construction

13.7.1 Overview

1 This section investigates how the construction period for the substations and OHL will impact on the network when considered in combination with the windfarms planned for Blackcraig and Margree and the SWS Project. The traffic flow data for the SWS Project has been taken from Technical Annex 15: Traffic and Transport, from the SWS Project Environmental Statement.

2 In order that a worst case scenario can be investigated for this project, the highest anticipated AADT for the SWS Project has been used in combination with the highest AADT recorded for the Margree and Blackcraig OHLs and substations and the windfarms.

13.7.2 Assessment Of Potential Effects

1 The effects of the construction period for the SWS Project are investigated in its environmental statement and have not been added to in this assessment. The mitigation measures from the SWS environmental statement have been assessed as part of this study in order to ascertain where problems may arise on the road network. The resulting conclusion of the assessment is that none of the mitigation measures developed for this traffic assessment contradicts or compromises those measures set out in the SWS Project environmental statement.

2 The roads that will be affected by the SWS Project construction and that have also been identified for the Blackcraig and Margree grid connection are the A713, both north and south of Dalmellington and the B741 between Dalmellington and New Cumnock. These roads have therefore been adjusted in terms of AADT flows during the construction period to ascertain what the effects will be with all of the cumulative construction traffic on the roads at the same time.

3 The baseline AADT for the roads has been assumed to be that which has been used throughout this traffic assessment for the substation and OHLs, and although it is recognised that the SWS Project used slightly different baseline AADTs, for the purposes of this assessment the difference between them is determined to be of little importance and can be ignored.

4 Table 13.30 summarises the new total AADT in a worst case scenario for all construction traffic.

Table 13.30 - Percentage change over baseline traffic flow for construction period (including windfarm traffic & SWS Project traffic)

Road	Section Descri-ption	Baseline AADT (2011)	Baseline HGV AADT (2011)	Constr-uction Traffic (AADT)	HGV constru-ction traffic only	Change over baseline (%)	Effect
A713	Patna to Dalmell-ington	6,860	734	1,514 (223)	897 (103)	+22(+3)	Moderate
A713	South of B741 junction	6,547	809	865 (144)	406 (66)	+13(+2)	Minor
B741	Dalmel-lington to New Cumnock	3,303	353	490 (79)	150 (36)	+15(+2)	Minor

(The contribution from the Blackcraig and Margree substations and overhead line is shown in brackets)

13.7.2.1 Impact of Development Traffic (Capacity)

1 As stated earlier, it is considered important to consider the capacity of each road alongside the IEMA guidelines assessment. This is because when considering roads with a low traffic flow, the IEMA criteria often identifies a **major** effect. However, the additional traffic can be accommodated within the capacity of the existing road and therefore in reality is deemed not to have a **major** effect on the road's operation.

2 The construction traffic was added to the baseline traffic and compared to the capacity of each road. The significance of the development traffic impact on capacity is deemed to be 'None' if the road operates within capacity with the combination of baseline and construction traffic. Table 13.31 details the development traffic impact on capacity for each of the roads under consideration.

Table 13.31 - Development Traffic Impact on Capacity (including windfarm traffic & SWS Project traffic)

Road	Section Description	Baseline AADT (2011)	Construction Traffic (AADT)	Baseline + Construction Traffic (AADT)	CRF (AADT)	Significance (all traffic)
A713	Patna to Dalmellington	6,860	1,515	8,375	17,060	None
A713	South of B741 junction	6,547	867	7,414	16,850	None
B741	Dalmellington to New Cumnock	3,303	490	3,793	11,819	None

13.7.3 Summary Of Effects

1 The effect has increased for the A713, north of Dalmellington from **minor** to **moderate**. This increase does not require the implementation of any new or additional mitigation measures for this particular road. The HGV flow increases by 122% over the baseline and is rated as **major**.

2 The effect on A713, south of Dalmellington continues to rate as **minor**. There is an increase in HGV flow by 50% over the baseline but this does not affect its significance but the effect remains **moderate**.

3 The additional flow on the B741 does increase the effect from **none** to **minor**, although this will still not require any specific mitigation. HGV effect increases to **moderate** due to the flow increasing by 42% on this road.

4 The results of the CRF comparison demonstrate that even when all of the construction traffic required for the substations, OHLs, windfarms and SWS developments is using the network, the A713 and the B741 are still capable of accommodating it all. The congestion point for each of these roads is not even close to being met, and this can be seen in Table 13.31.

13.7.4 Residual Effects

1 The combination of all construction traffic from each of the developments leads to increases in AADT for the A713 and B741. The effect that this cumulative traffic has on the roads means that the A713 would require mitigation measures for the northern section above Dalmellington when assessed by the IEMA guidelines.

2 All construction traffic flows are temporary and although there may be short term delays caused by the presence of HGVs for certain periods, the effect will not be sustained.

Table 13.32 - Mitigation and Remedial Effect on Road Network (including windfarm traffic & SWS Project traffic)

Road	Effect		Mitigation
A713[1]	All Traffic	Moderate	It should be assumed that the mitigation measures from Table 13.26 will still apply to all the roads in this table.
	HGV only	Major	
A713[2]	All Traffic	Minor	
	HGV only	Moderate	
B741	All Traffic	Minor	
	HGV only	Moderate	

3 Where the significance has been made worse through the addition of SWS Project traffic, the measures from Table 13.26 will be applied in conjunction with mitigation measures already identified for the SWS project in its environmental statement.

13.8 Summary

1 The period which will be subject to the highest traffic flows will be the 4th, 5th and 6th months for both the substations and OHL construction period and when in combination with the windfarm construction period.

2 For the majority of the road network HGV construction traffic will have a **major** effect at peak periods, appreciably exceeding the existing average daily flows for vehicles of that type on those roads. The construction phases for the Substations, the windfarms and the SWS Project will be temporary despite the construction period length of 21 months.

3 The IEMA guidelines categorise the most affected roads as being short term adverse. This is due to the temporary nature of the construction period. The key contributory factor towards this effect is the low level of AADT on these roads at present and at the projected baseline for 2011. According to IEMA scoring for the road network, the A713, south of Dalmellington, is the only road that has the flow level which will allow construction traffic to be accommodated without any effects requiring mitigation.

4 The Congestion Reference Flows which have been calculated for each road demonstrate that there should be no issue with congestion as all increases in traffic can be accommodated by the roads at present. The construction traffic in combination with the projected baseline flow will not come close to the CRF figure for any of the roads and the effect has been judged to be '**None**'.

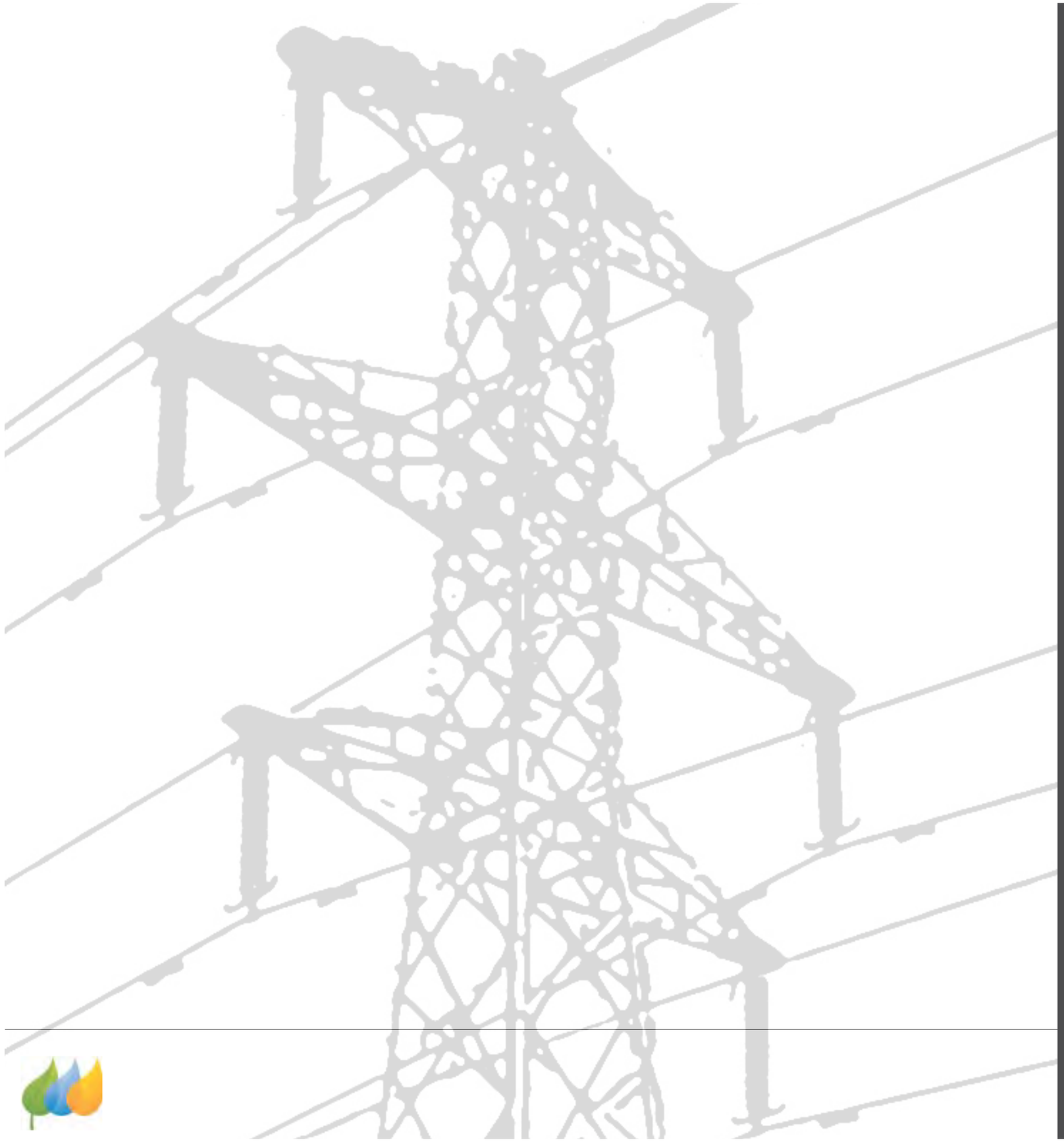
5 The cumulative AADT brought about through the consideration of the Blackcraig and Margree substations, OHL and windfarms, as well as additional construction traffic from the SWS Project, has demonstrated that the A713 and B741 will be able to accommodate all traffic without significant effect on capacity. The IEMA guideline assessment does however indicate that there will be a **moderate** effect on the A713, north of Dalmellington. As this section of the A713 is a **major** road, mitigation will likely be needed to ensure the effect is kept to a minimum.

6 Approximately 54% of trips connected with the construction period are attributed to staff and personnel. The reduction in the number of these trips could potentially have an appreciable beneficial effect on the flows especially at peak times in the morning and evening. Mini-buses for staff travel are identified as a possible solution and should be given consideration prior to construction activities commencing.

7 Mitigation will be useful in permitting the construction activities as a whole to be undertaken in accordance with the programmed period. One of these remedial measures and perhaps the one which offers the most consistent benefit to all the roads is the development of a comprehensive traffic management plan. This plan will consider the substations, OHLs and windfarms.

8 The operational phase of the substations and the windfarms in combination will not have a significant effect on the local road network. The numbers of vehicles serving the various infrastructure will be low both in terms of the numbers required and the size of vehicle requiring access.

9 The significance of effects felt on much of the local road network has to be seen in context and the indications are that the majority of these roads are rural in nature with few sensitive locations identified and a minimal number of property frontages. These characteristics need to be considered in conjunction with the temporary nature of the construction period, the mitigation measures, the capacity of the roads and the limited effects of the overhead line and substation construction especially when compared to the windfarm construction activity.



14

Other Issues

Blackcraig and Margree Windfarms
Grid Connection
Environmental Statement

Table of Contents

14.1 Noise & EMF 271

14.1.1 Construction Noise 271

14.1.1.1 Mitigation 271

14.1.2 Operational Noise 271

14.1.3 Electric and Magnetic Fields 272

14.2 Waste Management 272

14.3 Land use 273

14.0 Other Issues

14.1 Noise & EMF

1 This section was prepared by scientists and engineers at Exponent, a scientific research and engineering firm, to summarise and evaluate the possible effects of the 132-kV overhead line (OHL) grid connections proposed as part of Section 37 applications under the Electricity Act of 1989 on: 1) audible noise that may be noticeable, principally during foul weather; and 2) levels of electric and magnetic fields (EMF). The modelled levels of transmission line operational noise and fields were compared to relevant guidelines at distances near to the lines and at more distant dwellings to assess potential effects. No likely significant effects were predicted, which confirms the Project Scoping Opinion (SPT 2009).

14.1.1 Construction Noise

1 As with all construction operations, the construction of the substations and overhead lines (OHLs) is likely to give rise to additional noise compared to the existing baseline at these locations and along the route of the OHL.

2 This noise will arise from the construction operations including vehicle movements, forestry felling, civil engineering operations to prepare accesses and bases for substations, L7 Towers and wood poles and stringing operations.

3 The decommissioning and removal of the redundant sections of the N-Route will also give rise to additional noise.

4 As a result of the way in which these proposals will be procured it is not possible to identify the exact locations and sequencing of operations which will give rise to construction noise and as result of this it has not been possible to undertake a detailed assessment of the noise attributable to these operations.

5 The potential for construction noise to constitute a significant environmental effect is however recognised and a suite of measures are proposed to ensure that the effects of this are maintained below accepted thresholds.

6 The locations of the substations and OHLs are in general in relatively remote areas of limited sensitive noise receptors and thus the sensitivity of much of the route to increases in noise is limited. There are however a limited number of properties which are within relatively close proximity to the line and these will be afforded particular consideration as detailed below. Similarly much of the route of the OHL is in close proximity to the A713 and this provides both a receptor and an existing source of background noise. There are other existing natural noise sources within the environment such as inclement weather, wildlife and watercourses.

7 It should be remembered that much of the area is already subject to occasional noise increase as a result of the existing and ongoing forestry operations.

8 The potential effects on the flora and fauna to construction noise is considered within the ecology and ornithology chapters under the issue of disturbance and displacement.

14.1.1.1 Mitigation

1 In the absence of a detailed assessment of the likely noise resulting from the development the following measures have been adopted to ensure that noise sensitive receptors will not experience noise levels resulting from the construction process that exceed normal accepted thresholds.

2 The mitigation measures to limit the effects of additional noise include both avoidance and reduction mitigation.

3 The most effective mitigation is avoidance and the development of the proposed route has been undertaken to provide the maximum achievable separation between residential properties and the OHL and substations. There are only very limited locations where the line is within 200m of a residential property and limited locations where it is within 500m.

4 Notwithstanding the generally considerable separation between noise sensitive receptors and the proposed substations and OHLs, all activities which give rise to appreciable noise will be subject to the requirements of best practice in terms of both Health and Safety Requirements and Environmental Health Requirements. The EMP developed to control the effects of the development will detail the approaches the contractor will adopt to ensure that construction noise will remain within acceptable levels.

5 In essence the EMP will require that during construction all contractors would be required to maintain low noise levels in the vicinity of dwellings or other noise sensitive receptors by employing sufficiently silenced machinery and by distancing, or where practicable, screening noisy activities or items of plant, as outlined in BS5228-1 and 2 : 2009.

6 This will be achieved through the following approaches to limiting noise:

- Locating infrastructure (including temporary construction compounds) as far as practically possible from residential properties and any other noise sensitive receptors;
- Programming the construction processes to reduce the time period for which noise sensitive receptors will experience construction noise;
- Utilise a number of accesses to avoid concentration of vehicle movements in limited locations;
- Adoption of good practice methodologies to reduce felling and construction noise;
- A 48 week working year and construction over a five day working week has been assumed. Construction activities will be undertaken during daytime periods only, between approximately 07:00 to 19:00 during the summer months and 07:30 to 17:00 during the winter (or as daylight allows). Where there are no human or environmental sensitivities working outwith these times may be locally possible to optimise operational opportunities subject to agreement with the Local Authority Environmental Health Department;
- All construction activities will be undertaken in accordance with good practice as set out in BS5228-1 and 2 : 2009;
- All equipment will be maintained in good working order and will be fitted with appropriate noise control at all times (for example, silencers, mufflers and acoustic hoods);
- All site employees will be advised of the noise sensitive nature of the receptors (human and others) and be informed of any requirements for quiet working practices where required;
- Site terrain, material stockpiles and suitable work locations will be used to screen work locations and increase the separation between noise sensitive receptors and sources of construction noise; and
- A site contact number will be provided for local residents to allow them to access further information or notify the contractor and/or EHO of any issues related to this.

7 Through this suite of measures the effects of construction noise on any noise sensitive receptors will be limited to within accepted thresholds.

14.1.2 Operational Noise

1 The partial electrical breakdown of the air around the conductors of an overhead transmission line may be perceived as audible noise (AN). This AN can be characterised as a hissing, crackling sound that may be accompanied by a 100-Hz hum at higher rain rates. The conductors of transmission lines are designed to be free of AN during fair weather but wetting of the conductors during periods of foul weather, including rain, fog, snow, or ice, increase AN. Debris on the conductors also can increase AN.

2 The AN performance of the two sections of OHL was evaluated where the line is supported on wood poles, and where the line is supported on L7H towers (along with the existing N-Route line) as described in Technical Appendix i.1. The median (L_{50}) AN level produced in foul and fair weather by each overhead line at the nearest dwelling was calculated in A-weighted decibel (dBA) values, which approximates the response of the human ear to various frequency components of noise. The capability of a person to detect AN was judged by comparisons of the calculated values to AN values of 30-35 dBA, which were taken to be representative of a quiet rural area, similar to that of a quiet library.

3 The proposed choice of conductors and distance of the line from residential dwellings and other buildings will not produce additional detectible AN at these locations. There are only a small number of dwellings within 500 metres (m). The highest AN level at a dwelling along the wood pole line section is estimated to occur during foul weather at 170 m (15.0 dBA) and would be below assumed rural background levels. Along the L7H tower line the highest AN level at a dwelling would be 1.3 dBA at 98 m. These AN levels from the line would be even lower at other more distant residences and typically masked by the noise of rain and wind in foul weather. In fair weather, no elevation of AN is expected. Even without considering the masking effect of AN generated by foul weather conditions, the AN level would not lead to

noise complaints as judged by compliance with BS 4142: 1997 and would be far below the limit recommended by the WHO of 50-55 dBA for outdoor living spaces.

4 Based on this screening level analysis, the AN generated by the proposed overhead transmission line during foul weather (rain, etc.) would not be detected outside residential dwellings and would be further masked by the noise of foul weather.

14.1.3 Electric and Magnetic Fields

1 Extremely low frequency (ELF) EMF are found virtually everywhere in our environment where electricity is used or transported. Common sources include distribution and transmission lines, appliances, and wiring to and in buildings. The background levels of electric fields and magnetic fields in residences are between 1-20 volts per metre (V/m) and 0.01-0.2 microtesla (µT), respectively

2 The proposed overhead lines in the Project are sources of both electric and magnetic fields. The possible effects attributable to the electric field of this line include the radio interference and AN. Possible effects of magnetic fields considered were the induction of voltages on fence wires, pipelines, or other conductive objects that closely parallel the lines for considerable distances, and a statistical association with childhood leukaemia for long-term average exposures above 0.4 µT reported in research studies. These possible effects were evaluated in Technical Appendix I.2 and a brief summary of the issues and results are summarized below.

3 The levels of EMF associated with the typical operation of the proposed lines were modelled using conservative assumptions, including minimum statutory conductor clearances, which resulted in higher predicted EMF levels. The highest magnetic field level under normal operating conditions would occur under the section of the line supported on L7 tower structures and would be less than 22 µT. Similarly, the highest electric field under typical operating conditions would occur under this section of line and would be less than 3 kV/m . The levels of electric and magnetic fields associated with these line configurations comply with UK Government guidelines.

4 The maximum estimated levels of electric and magnetic fields will have diminished at the nearest dwelling 170 m from the wood pole line section to 0.001 kV/m and 0.02 µT, respectively. The estimated electric and magnetic field levels at the dwelling closest to the L7H section of line will be 0.004 kV/m and 0.04 µT, respectively . These values are all within the range of levels measured in typical UK residences.

5 The Project reflects good practice and precautionary measures. The Project lines are not routed close to dwellings and other sensitive land uses. Where the new line is supported on double-circuit towers the line will also be 'reverse-phased' to minimise magnetic fields as a precautionary response consistent with the recommendations of the Health Protection Agency (HPA), a non-governmental advisory group called the Stakeholder Advisory Group on ELF EMF (SAGE), and the World Health Organisation (WHO).

6 A consideration of the reviews by the WHO and other health agencies of human epidemiology and other research support the assessment provided by the HPA and its advisors that the evidence for an association of magnetic fields with leukaemia is inconclusive and that,

… the epidemiological association may be due to chance, confounding factors or some unrecognized artefact related to the way the data have been collected. The review of the experimental studies gives no clear support for a causal relationship between ELF EMF and cancer (HPA, 2008b).

7 The good practices proposed by SPT are appropriate and consistent with the recommendations of the HPA and other health agencies.

8 The distances to nearby dwellings and to other infrastructure as well as the experience and standard practices of SPT in addressing radio interference and magnetic induction justify the classification of these effects as of very limited significance.

14.2 Waste Management

1 Wastes will be generated, and will require management, at a number of construction stages.

2 Prior to commencing construction operations the contractor will be required to provide a Waste Management Plan to detail the requirements for managing any waste to accord with accepted good practice and to ensure that wherever possible materials are reused or recycled in preference to disposal.

3 Waste material will arise from the following activities:

- tree felling and clearance of vegetation across the area proposed for construction of the OHLs, cabled connections and substations;
- stripping of topsoil and overburden at substation sites and storage for reuse;
- excavation of materials for construction of tower/pole and substation foundations;
- construction of ancillary works, including access tracks and temporary lay down areas;
- occupation of temporary construction premises;
- proposed landscape works around the substations; and
- the dismantling and removal of the redundant sections of the N-Route.

4 Measures to reduce potential environmental effects associated with the storage and transportation of wastes will include:

- the careful location of stockpiles and other storage areas;
- the use of good practice in the design of waste storage areas and the use of suitable waste containers;
- the use of sheeting, screening, and damping where appropriate and practicable;
- the control and treatment of runoff from soil and waste soil stockpiles;
- minimising storage periods;
- minimising haulage distances; and
- the sheeting of vehicles.

5 All wastes will be identified, classified, quantified and, where practicable, appropriately segregated. Any materials that cannot be reused will be disposed of according to relevant waste management legislation which will serve to address a number of possible environmental effects. This includes:

- the Duty of Care imposed by Section 34 of the Environmental Protection Act 1990; and
- the Waste Management Licensing Regulations 1994 (as amended), particularly provisions relating to registered exemptions from waste management licensing.

6 All waste materials removed from site will be handled in accordance with relevant waste and environmental regulations. Waste will be transferred using a registered waste carrier to a licensed waste disposal site or recycling centre.

14.3 Land use

1 The OHL connecting the substations at Blackcraig and Margree Windfarms with the substation at Meikle Hill passes through a number of areas of different land use, predominantly commercial coniferous forests and upland rough grazing, although there are limited areas of broad-leaved woodland and areas of improved grazing, including one which is used for hay production.

2 The construction of the substations will result in the area of their footprints being lost to their previous use. In the case of both the Blackcraig and Margree Windfarm substations the existing use is forestry, although the area of the Margree substation and surroundings has recently been felled. The two substations will result in the permanent loss of approximately ¾ ha of commercial forest. The effect of this is assessed within Chapter 6 considering the wider effects on forestry activity.

3 Within the areas of forest the proposed OHL will occupy a wayleave corridor that is typically a minimum of 80m wide. This corridor will require felling (111 ha) where there is a standing timber crop and will need to be maintained open for the life of the OHL. This will preclude the use of this area for commercial forestry activity for the lifetime of the OHL, although some low growing scrub may be allowed to develop providing ecological opportunities. In addition there will be some areas of additional tree loss predicted as a result of likely windthrow outwith this corridor (106 ha). This area will initially be lost to forest when the wayleave is cleared, although future development of the forest design plans will allow these areas to be at least partially reintegrated into the forest (subject to the application of forest design principles). This reintegration of the areas outwith the wayleave corridor could facilitate improvements to the local forest design and provide beneficial diversity of the forest edges. The effects of this change to the forest estate are considered in detail in Chapter 6.

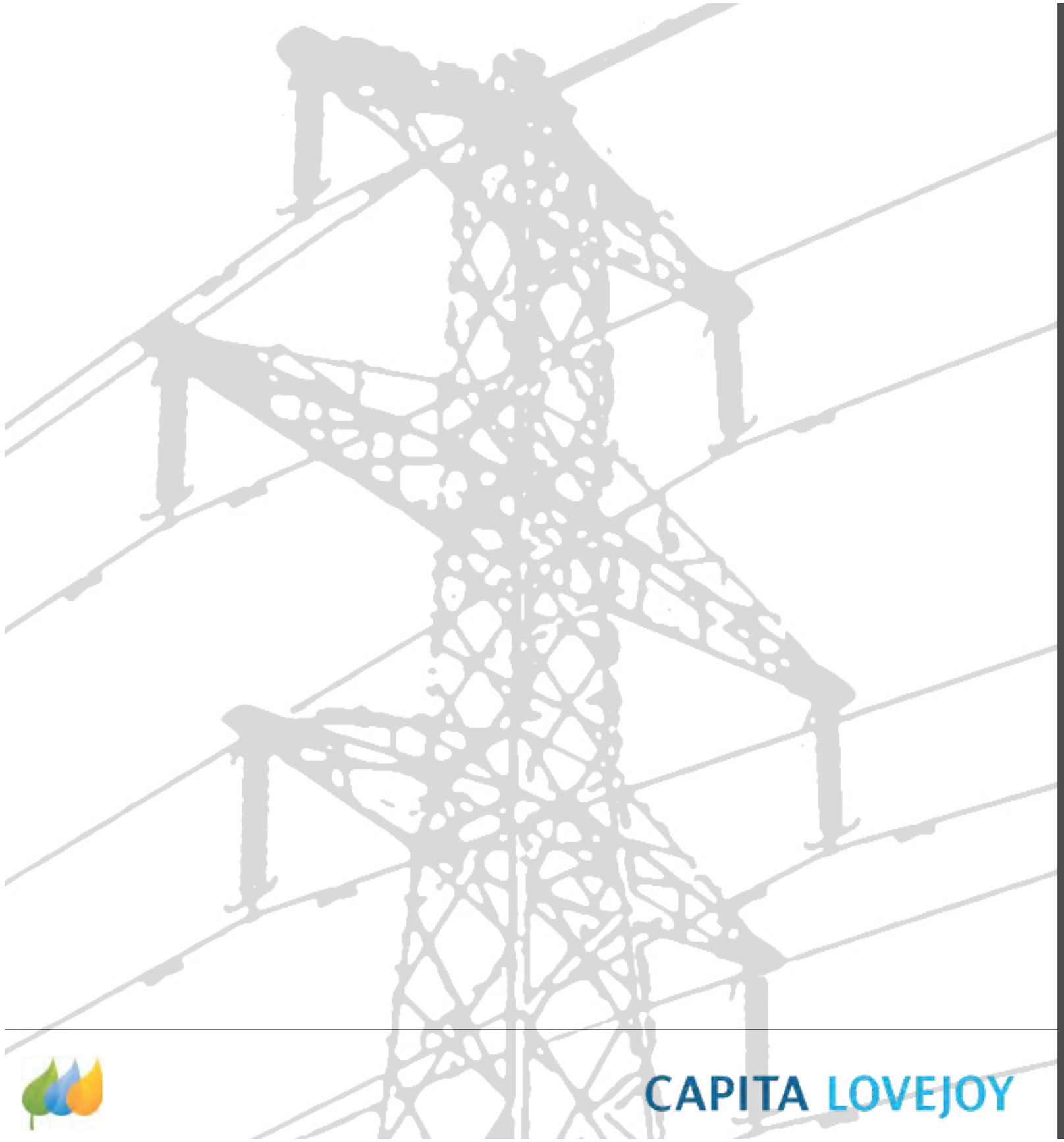
4 The removal of the redundant sections of the N-Route where this passes through areas of forest will result in the removal of the need to maintain a clear wayleave corridor and will potentially allow the reintegration of these areas within the wider forest estate, with similar opportunities to those described above.

5 In most cases where the OHLs run within areas of upland grazing the current land use will remain unchanged following the construction of the L7 Towers and wood poles. There is no requirement to restrict access to the foot of these structures and apart from their very limited immediate footprint their will be no change to the land use following construction. Any access roads and compounds required during construction will be removed following the completion of the works and the ground reinstated to its previous condition and use.

6 In the areas where the redundant N-Route is to be removed, the limited existing intrusion of the footprints of each L7 Tower will be fully removed, with all elements removed to below ground level.

7 In the light of the accepted sensitivity and importance of areas of broadleaved woodland, the proposed OHL has been subject to appreciable design effort in order to avoid any changes to land use within these area and this is detailed in Chapter 6.

8 There is a small area of improved pasture at Dalbonniton Knowe which provides one of the few areas locally capable of use to grow a hay crop. In order to avoid the potentially restrictive effects that a L7 Tower would have had in this limited local resource, the OHL has been designed to avoid the need for such a tower within this field.



15

Summary of Effects

Blackcraig and Margree Windfarms
Grid Connection
Environmental Statement

CAPITA LOVEJOY

Table of Contents

15.1 Introduction 276

List of Tables

Table 15.01 - Summary of Significant Effects table 277

15.0 Summary of effects

15.1 Introduction

1 Through the preceding chapters the effects of the proposed OHL have been identified for each topic area. These effects have been the subject of appreciable mitigation at all levels including avoidance, reduction and offset.

2 The principal mitigation for the potential effects of this OHL has been achieved through the following means:

- identification of an appropriate strategy to provide the connections to these windfarms in the light of the existing, proposed and envisaged transmission network infrastructure in this part of south-west Scotland;
- routeing the OHL in response to the constraints identified;
- the selection of elements of the required infrastructure in response to the landscape and other considerations to limit potential effects;
- developing an OHL which allows removal of elements of the existing ageing transmission network; and
- developing an approach to the construction, maintenance, operation and dismantling (of those elements to be removed) which reduces or avoids potential effects.

3 This approach to the development of this OHL has allowed the following subject areas to remain free of any significant adverse effects:

- Forestry;
- Terrestrial and Aquatic Ecology;
- Ornithology;
- Archaeology;
- Hydrology;
- Noise; and
- EMF.

4 Notwithstanding the considerable effort undertaken in the light of the identified constraints and comments received to avoid, reduce or offset any effects there are a number of aspects of the environment that will be subject to significant effects. These include:

- Landscape resource;
- Perception of the landscape resource;
- Visual amenity;
- Traffic and Transport; and
- Tourism and Recreation.

5 In many cases these effects are adverse and result from the addition of the OHL and substations into the local landscape. These effects are typically located in close proximity (circa 1km) to the proposed OHL between Meikle Hill and the Blackcraig Windfarm.

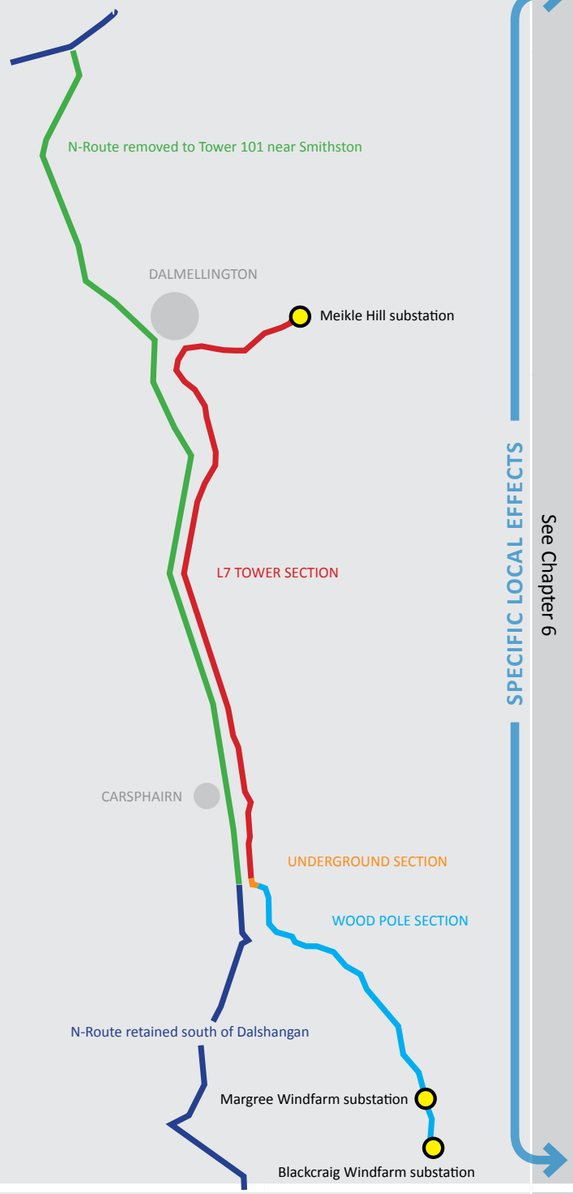
6 There are a number of cases where the removal of the existing ageing elements of the transmission network as part of this proposal will result in significant beneficial effects. These are identified for:

- Landscape resource;
- Perception of the landscape resource;
- Visual amenity;
- Archaeology; and
- Tourism and Recreation

7 These effects are similarly typically located in close proximity (circa 1km) to the section of the N-Route to be removed between Dalmellington and Smithston.

8 In order to provide an over view of the significant effects (or absence of these) and their indicative locations, they are set out diagrammatically on Table 15.01 opposite.

Schematic Route plan



Significant Effects

	Forestry	Landscape Resource	Perception of landscape resource	Visual Amenity	Ecology	Ornithology	Archaeology	Hydrology	Traffic & Transport	Tourism & recreation
SPECIFIC LOCAL EFFECTS	No Significant Effects See Chapter 6	Upland River Valley LCA 17a Southern Upland with Forest LCA 8a Upland River Valley LCA 17a Upper Dale LCA 10a Foothills with Forest LCA 12a	A713 A713 B7000 B729 Southern Upland Way	VP33 Dalmellington VP24 Mossdale VP23 Court Knowes VP22 Glenmuck VP16 North Liggat VP13 Linnfraig VP29 Dundeugh Hill VP07 Blackwater Valley VP05 Hog Hill VP36 Knockman Hill VP02 A702	No Significant Effects See Chapter 8	No Significant Effects See Chapter 9	Setting of Craigengillan GDL Setting of Craigengillan Lodge	No Significant Effects See Chapter 11	A713 B7000 U141 B729 C51 A702 B7075 A712	Straiton Doon Valley Golf Course Patna Patna Walk Burnfoot Bellsbank A713 A713 A713 Tourist Route Carricks of Carsphairn Carsphairn Heritage Centre Carsphairn Trail Fishing on Water of Deugh and Water of Ken B7000 Tourist Route Forest Park at Dundeugh Hill Kendoon Youth Hostel
EXTENDED EFFECTS				Potential for significant beneficial effects from viewpoints within circa 1km of N-Route removed north of Dalmellington Potential for significant adverse effects from viewpoints within circa 1km of the proposed OHL						12 Rights of Way and 4 Core Paths would be subject to significant beneficial effects 12 Rights of Way and 19 Core Paths would be subject to significant adverse effects

Legend
- Significant Adverse Effects
- Significant Beneficial Effects

Table 15.01 - Summary of Significant Effects table

ScottishPower EnergyNetworks
New Alderstone House
Dove Wynd
Strathclyde Business Park
Bellshill
ML4 3FF

SP TRANSMISSION