New Forest Dartford warbler 2014 Survey Report

Higher Level Stewardship Agreement

The Verderers of the New Forest

AG00300016

December 2014

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NEW FOREST NATIONAL PARK
SURVEY OF DARTFORD WARBLER
2014

December 2014

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EXECUTIVE SUMMARY

- RPS was commissioned by the New Forest National Park Authority on behalf of its partners within the New Forest Higher Level Stewardship (HLS) Scheme to undertake a survey of breeding Dartford Warbler on land covered by the New Forest HLS Scheme and New Forest Crown Lands outside the scheme managed by the Forestry Commission.
- Areas within the defined survey area containing habitat with the potential to support Dartford Warbler were identified using GIS data layers of vegetation classification from various sources. Once these areas had been identified, a fieldwork programme was designed, following the criteria and methods set in out in previous national surveys.
- Once the programme of fieldwork had been completed, data were analysed to determine the number of individual territories present.
- The analysis produced a breeding population estimate of 268 Dartford Warbler territories within the area surveyed in the New Forest in 2014.
- Comparisons with previous surveys would indicate a significant decrease in the breeding population of Dartford Warbler within the New Forest since the previous survey in 2006.
- The dataset compiled provides:
    - a robust baseline of the current breeding population of Dartford Warbler in the New Forest;
    - the appropriate detail to inform future surveys of Dartford Warbler within the New Forest; and
    - a basis upon which to further assess factors influencing the breeding population and distribution of Dartford Warbler within the New Forest.

1 INTRODUCTION

Background to the study and the HLS

1.1 The Higher Level Stewardship Scheme (HLS) awarded to the New Forest in February 2010 is unique. Normally this scheme is granted by the Department for Environment, Food and Rural Affairs (Defra) through Natural England to a single landowner. In the case of the New Forest, whilst the Crown Lands are managed by the Forestry Commission (FC), the Verderers have statutory rights conferred under the New Forest Acts to administer the commoning rights. The scheme entitled the New Forest HLS was awarded in 10 February 2010 by Natural England to a single signatory, The Verderers of the New Forest.

1.2 The Verderers are legally and financially accountable for the delivery of the scheme, but on the proviso that a formal Partnership was established with the Forestry Commission and National Park Authority to deliver the scheme. This was set up through a Memorandum of Agreement (MoA) signed on the 22nd February 2010.

1.3 The delivery of the agreement is overseen by a Board drawn from the chief executives of the Partners as well as representatives from key stakeholders.

1.4 As part of the HLS agreement there is a requirement to undertake surveys for bird species for which the New Forest SPA is designated. The HLS Board identified the requirement for delivery of a comprehensive survey of Dartford Warbler *Sylvia undata* in 2014 in accordance with the methodology used in the national surveys of this species.

1.5 RPS was commissioned by the New Forest National Park Authority (NFNPA) on behalf of its partners within the New Forest HLS scheme to undertake a survey of breeding Dartford Warbler on land covered by the HLS scheme. In addition survey was also required to cover suitable habitat outside the HLS area but forming part of the Crown Lands managed by the Forestry Commission. Costs of work associated with these areas were paid for by the Forestry Commission. Where additional habitat was surveyed this was achieved without additional cost to the HLS scheme.

1.6 Natural England assisted the delivery of this contract by making available previous survey data for Dartford Warbler which were obtained during national census work carried out by Natural England's predecessor body in partnership with the British Trust for Ornithology.

Approach to the contract

1.7 This document provides a detailed account of the methods used to determine the extent of habitat considered suitable for supporting breeding Dartford Warbler within the New Forest and reports on and evaluates the findings of the surveys. Accordingly, this document provides the following:

- a detailed account of the methods employed to determine the areas which are suitable to support breeding Dartford Warbler;
- the survey method used based on the national survey methodology;

- an estimate of the breeding population of Dartford Warbler within the target area;
- an analysis of the survey information including the status of the population compared to previous local and national studies; and
- a preliminary analysis of the potential factors which may be affecting the distribution of Dartford Warbler within the study area.

Designations and Conservation Importance of the New Forest

1.8 The New Forest is one of the largest tracts of semi-natural vegetation in the country and consequently holds three international wildlife site designations.

1.9 The New Forest is recognised as an internationally important site for its breeding and over wintering bird species and is classified as a Special Protection Area (SPA) in accordance with the European Birds Directive (Directive 2009/147/EC on the conservation of wild birds [codified version]). The New Forest qualifies and has been classified as an SPA under Article 4.1 of the Birds Directive by supporting internationally important populations of the following species during the breeding season:

- Dartford Warbler *Sylvia undata*
- Nightjar *Caprimulgus europaeus*
- Woodlark *Lullula arborea*
- Honey Buzzard *Pernis apivorus*

1.10 The site also qualifies and is classified under Article 4.1 by supporting over wintering populations of Hen Harrier *Circus cyaneus*; and is classified under Article 4.2 for supporting significant breeding populations of both Hobby *Falco subbuteo* and Wood Warbler *Phylloscopus sibilatrix*.

1.11 The New Forest is also designated as Special Area of Conservation (SAC) for its habitats and non-avian species of European importance, in accordance with the European Habitats Directive (Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora).

1.12 The requirements of both European directives, ensuring the protecting of European wildlife sites, are transposed into UK law by the Conservation of Habitats and Species Regulations 2010. The New Forest Site of Special Scientific Interest (SSSI) is the national wildlife designation underpinning the European site designations and recognises the wider national scientific and biodiversity value of the New Forest.

1.13 The New Forest is also listed as a Ramsar site, under the Ramsar Convention. This recognises the importance of the site as a wetland, supporting wetland flora and fauna of international importance.

Dartford Warbler populations nationally and in the New Forest

1.14 National surveys of the UK breeding population of Dartford Warbler were undertaken in 1974, 1984, 1994 and 2006. The sampling methodology and data recording has varied slightly between years. Fearnley *et al.* (2012) provide a summary of New Forest populations in the context of national populations recorded during national surveys.

1.15 Following a dramatic decline in breeding numbers and contraction of range nationally during the mid 20th century, following a succession of severe winters, numbers fluctuated until a dramatic population increase was recorded during the 1994 national survey. The numbers of breeding Dartford Warbler have continued to increase and the most recent national survey, undertaken in 2006, recorded a total population estimate of 3,142 territories.

1.16 The New Forest was surveyed as part of the national survey in 2006 and recorded 453 territories (420 when corrected for accuracy and within the SPA) (Fearnley *et al., 2*012). The overall trend in the numbers of territories recorded annually in the New Forest roughly follows that observed in the national population (Fearnley *et al., 2*012).

Dartford Warbler ecology

1.17 In Britain Dartford Warbler principally breed on mature lowland heathland, generally with abundant stands of mature gorse *Ulex*. Gorse provides a rich source of invertebrate prey, protection from predators and shelter in poor weather (Murison *et al., 2*007). Dartford Warbler are susceptible to prolonged periods of cold winter weather which can result in high mortality and range contraction (Bibby, 1978; Bradbury *et al., 2*011).

1.18 The main threats to the species are considered to be:

- a reduction and lack of management to areas of lowland heathland;
- severe and prolonged winter weather; and
- recreational disturbance (Murison *et al., 2*007; Wotton *et al., 2*009).

The New Forest National Park boundaries

1.19 Figure 1.1 shows the New Forest HLS Scheme and Crown Lands Study Area.

2 METHODS

Identification of the area to be surveyed and design of the survey programme

2.1 This section of the report provides a detailed account of the process which was undertaken to establish the extent of the habitats to be surveyed as part of the contract.

2.2 The areas of the National Park containing habitat with the potential to support Dartford Warbler were identified using GIS data layers obtained from the New Forest National Park Authority, Forestry Commission and Natural England. This included the following sources:

- map layers supplied by the HLS partners showing the boundaries of the HLS and Crown Land areas; and
- map layers from the Lowland Heathland Inventory showing lowland heathland habitat (and other habitats) within the National Park (obtained from Natural England).

2.3 The habitats/land use types identified in the map layers listed above and considered suitable for Dartford Warbler followed those identified in previous national surveys for the species (Wotton *et al., 2*009, Gibbons & Wotton, 1996) and were broadly classified as lowland heathland.

2.4 The design of the fieldwork programme was based on the criteria and methods set out in the national survey (Wotton *et al., 2*009). The following criteria were followed when designing the survey programme:

- a minimum of two visits, one within each of the periods 1st April – 15th May and 16th May – 30th June, ideally with a minimum of ten days between visits;
- visits should be undertaken between dawn and mid-morning on mild, dry days with little wind; and
- all suitable habitat should be covered to maximise detection of territorial individuals.

2.5 Once the extent of the area to be surveyed had been identified from the available GIS data and the above methodological criteria had been considered, a process of identifying survey units centred upon a suitable route was undertaken. This involved defining approximately 150 ha survey units within the identified suitable habitat ensuring as near to complete coverage as possible. Based on previous work within the New Forest 150 ha was considered an appropriate size to survey within the standard methodology's parameters, i.e. 3-4 hours. Through each survey unit a route was determined which, where feasible, allowed all suitable habitat to be approached within approximately 50-100m. Where possible, survey units were determined to allow observers to follow a route which could be walked in conjunction with another observer covering an adjacent survey unit. This was important as it enabled observers to maintain contact and ensure that birds were not double counted. The routes were established using aerial photographs, ordnance survey maps and ground truthing.

2.6 Once the survey units and routes had been finalised they were recorded in GIS format. This then enabled a survey programme to be drawn up to ensure that the surveyor resource was

allocated in the most efficient manner and to ensure full coverage of the identified survey units in the allotted time frames.

2.7 The extent of the area identified as being potentially suitable to support breeding Dartford Warbler and surveyed during 2014 is shown in Figure 2.1.

Delivery of the survey programme

2.8 The survey for Dartford Warbler was carried out in accordance with the national survey methodology (Wotton *et al., 2*009).

2.9 An initial visit to each survey unit was carried out to assess the survey route and identify any on-site issues. This ensured that issues regarding the survey route or access to the route were determined before the survey commenced. Any adjustments to survey routes were mapped to ensure that the route could be following on the subsequent visit.

2.10 Two visits to each of the survey units were undertaken; commencing at dawn and finishing around mid-morning.

2.11 The visits were undertaken between the 1st April and the 30th June, with at least ten days between visits to a survey unit. The visits were carried out between the following dates:

- visit one; 1st April 2014 – 15th May 2014
- visit two; 16th May 2014 – 30th June 2014

2.12 Surveys were only carried out on mild, dry days with little wind. Surveys were not undertaken in cold, wet or windy conditions.

2.13 The locations of all Dartford Warbler were recorded, with special attention given to those showing territorial behaviour such as singing or alarm calling and in particular simultaneously singing males. All other observations of calling birds (both males and females) or birds seen flying were also recorded.

2.14 All data were recorded in the field directly onto an ArcGIS base map using ESRI software on hand-held PDA devices. Data were then transferred to a central database and all data went through an internal verification process.

Data analysis

Definition of a territory

2.15 The definition of a territory followed that used in the national survey (Wotton *et al., 2*009) and general guidance for Dartford Warbler surveying techniques (Gilbert *et al.* 1998). A territory was defined as such if it contained the following:

- a singing male;
- a pair exhibiting breeding activity (nest, mating, displaying, etc.);
- individuals present on more than one occasion; and / or

- two individuals present.

Determination of territories

2.16 On completion of the surveys individual territories were determined by replicating the analysis used in Wotton *et al.* (2009) and use of generic territory mapping techniques given in Bibby *et al.* (2000). This involved analysing the data recorded from the two survey visits and applying the following process to bird registrations to determine the individual number of territories.

- Data were firstly filtered by visit number (1 or 2) and then, where observers were able to identify different individuals such as those recorded as simultaneously singing males, these were marked as such. Registrations of singing males which were not specifically recorded as representing different individuals in the field where considered to be such if the registrations were over 200m apart or separated by known topographical or structural features (barriers such as a hill ridge or forest block).

- The consolidated maps for both visits were then combined and clusters of registrations (i.e. two singing males from the sequential visits) indicating the presence of distinct groupings of registrations were identified as being indicative of discrete territories.

- A territory centre point was then allocated to each of these discrete territories based on the distribution of the registrations considered to represent this territory.

Limitations

2.17 Whilst it is acknowledged that the methods described above do not strictly conform with the 1km square sampling approach used in the previous national survey in 2006, the area covered by the survey in 2014 is the same. The method used and described in this document ensured complete coverage of all suitable habitat occurring within the national park.

2.18 The survey described above followed the guidelines set out in the national survey methodology and ensured all suitable habitat was surveyed. It is acknowledged that due to the nature of the species preferred habitat (large stands of dense mature gorse) that it may not have been possible to record all birds actually present. However, methods used and described above allow comparison to previous survey results and provide a baseline protocol against which comparable surveys can be undertaken in the future. Given, the extent of the area to be covered and the time restrictions imposed through the survey windows, other methods of surveys would be very difficult to control for bias and ensure even and repeatable survey coverage.

3 RESULTS

Survey coverage and delivery

3.1 Observers managed to survey the entirety of the suitable habitat, as identified in paragraphs 2.1-2.3 and shown in Figure 2.1. This included a small number of additional heathland areas outside of the agreed HLS and Crown Land boundaries, which were included as they formed continuous tracts of heathland with areas included in the survey and were incorporated for completeness. This did not affect the survey programme. Surveys were undertaken twice within the required timeframes and in appropriate weather conditions ensuring confidence in the completeness and accuracy of the results presented here.

Breeding population in 2014

3.2 The breeding population of Dartford Warbler recorded from the entire New Forest area surveyed in 2014 was 268.

3.3 The survey recorded 251 territories on land within the HLS Scheme area and 1 territory within the forestry inclosures which lie outside the HLS Scheme area. Nearly all the Scheme area lies within the Crown Lands which are under the management of the FC. Some of the inclosures (forestry plantations) are excluded from the HLS Scheme because they are not open to grazing. A further 16 territories were recorded on land outside of these boundaries but within the New Forest National Park.

3.4 The location of all territories recorded during the survey of breeding Dartford Warbler in 2014 is provided in Figure 3.1. The location details for each territory are provided in Appendix A.

4 EVALUATION AND DISCUSSION

Trends in the breeding population

4.1 For the purpose of this evaluation the breeding population includes all the territories derived from the 2014 survey, irrespective of land landownership/management boundaries, as this is considered to most accurately reflect the extent of the area covered in previous surveys.

4.2 Fearnley *et al.* (2012) considered the breeding population within the current survey area at the time of the last national survey in 2006 to be 420 (corrected figure).

4.3 It is considered that the breeding population of 268 territories recorded in 2014 indicates a decrease of 36% in the breeding Dartford Warbler population since the previous survey in 2006. This represents an annual decrease of 4.9% during that period. When compared with the change observed in the New Forest population between the previous national surveys (1984, 1994 and 2006) the annual population change varies markedly. Between 1984 and 1994 the population rose annually by 14.1%, whereas between 1994 and 2006 the population decreased annually by 1.8%. The current population level observed in 2014 remains well above that recorded during the first national survey in 1984.

4.4 The UK breeding population of Dartford Warbler based on the last national survey for the species in 2006 is considered to consist of 3,142 territories. The breeding population recorded in the New Forest National Park in 2014, therefore, represents 9% of the UK breeding population.

4.5 It should be noted that the species has been affected by a series of cold winters since 2008, with prolonged cold spells and heavy snowfall in its core range. This has reduced the population, especially in southern England. Recent national population increases may indicate that the species is starting to recover from the effects of these cold winters (Wotton *et al., 2*009; Holling *et al., 2*013; Holling *et al., 2*014).

Densities of territorial Dartford Warbler within the New Forest

4.6 Fearnley *et al.* (2012) considered the density of breeding Dartford Warbler occurring within the New Forest SPA to be relatively low when compared with other heathland SPAs in southern England. Based on the 2014 survey data the density of breeding Dartford Warbler per hectare for the whole of the New Forest area covered within the survey boundary (irrespective of habitat suitability) is 0.01 (based on a survey area of 25,345 ha). When compared with densities based on the 2006 national survey from the Dorset Heaths SPA (0.09) and the Thames Basin Heaths SPA (0.05) the density occurring in the New Forest remains relatively low. It should be noted that this calculation is based on total SPA area and that large tracts of habitat within the New Forest SPA (as well as the Dorset Heaths and Thames Basin Heaths SPAs) are not suitable for breeding Dartford Warbler.

4.7 This apparent lower density of Dartford Warbler has previously been highlighted (Sharp *et al., 2*008), although it remains unclear as to the mechanisms causing this. The New Forest National Park is subject to various pressures and it is likely that a combination of these is responsible for

these low densities, when compared with other southern heathlands. The New Forest is unique in terms of its size and the extent of management practices which occur; the Forest also has a continuous history of grazing, which has greatly influenced the structure and distribution of certain habitats.

Territory distribution and habitat relationship

4.8 Dartford Warbler territories within the New Forest National Park are aggregated around the main areas of heathland, predominantly in the western half of the Forest. Their distribution correlates well with that of areas of dry heathland (see Table 4.1). Other habitats are less often used, with other heathland and grassland mosaic types the next most important habitats utilised within the New Forest. Table 4.1 shows the number of territories recorded per habitat type and the density of territories occurring within these habitats.

Table 4.1. The number and density of Dartford Warbler per habitat type in the New Forest in 2014, compared with the previous survey (2006) and those on the Dorset Heaths and Thames Basin Heaths (Sharp *et al., 2*008)

Habitat	Number of Dartford Warbler territories				Dartford Warbler density (per ha)			
	New Forest 2014[1]	New Forest 2006	Dorset Heaths	Thames Basin Heaths	New Forest 2014[2]	New Forest 2006	Dorset Heaths	Thames Basin Heaths
Dry Heathland	194	213	266	223	0.028	0.030	0.110	0.102
Conifer Plantation/clearfell	0	11	92	55	0	0.002	0.023	0.012
Wet Heath	38	57	160	28	0.010	0.016	0.100	0.164
Deciduous woodland/scrub	0	34	14	0	0	0.002	0.031	0
Grassland	20	72	7	0	0.006	0.005	0.015	<0.001
Other	0	5	8	5	0	<0.001	0.048	0.033
Total	252	392	547	311				

Notes on Table 4.1:

1. The 2014 territories presented are only those recorded from within the HLS/Crown Lands survey area and do not include the additional 16 recorded outside this area, for which the detailed habitat data were not available.

2. The habitat area used to calculate density for the 2014 data is based on the habitat present within the survey area; this does not necessarily represent the equivalent area of habitat identified in 2006 – this has been based on the entirety of National Park boundary.

4.9 The Dartford Warbler density per hectare is compared to that occurring on both the Dorset Heaths and Thames Basin Heaths (Table 4.1). For all habitat types the density recorded in the New Forest is lower than that of the respective habitat within the other two southern lowland heathlands. The density per habitat type recorded in the New Forest in the 2014 survey is comparable with that reported based on the 2006 national survey data, with slight changes in densities in the dominant habitats reflecting the reduced breeding population recorded in 2014. It should be noted that the density occurring in the 'grassland' habitat category is a reflection of the smaller area of this habitat included within the survey area in 2014, than that included within the 2006 survey when the entirety of the National Park boundary (i.e. areas out with the HLS

boundary and including large tracts of farmland and other grassland habitats) was covered and included in the analysis.

4.10 Each territory centre was buffered by 50 m, in line with other studies (Clarke, Sharp and Liley, 2010), to account for the fact that whilst the territory centre may fall outside of the dry heath, that habitat may still form an important component of the territory area. Table 4.2 shows the number of territory centres occurring within 50 m of dry heathland both within the 2014 survey and previous national surveys. The majority of Dartford Warbler records (91%) were located on, or within 50m of, dry heath. This is a higher figure to that recorded during the 1984, 1994 and 2006 surveys of the New Forest (79%, 82% and 80%, respectively); however, this may reflect differences in habitat data rather than actual increase in the use of dry heath. Notwithstanding this, it is clear that dry heath accounts for the largest proportion of Dartford Warbler territories within the New Forest.

Table 4.2. The number of Dartford Warbler territory centres from the 2014 survey on, or within 50m of, dry heathland in the New Forest compared with those from previous surveys (Fearnley *et al., 2*012)

Year	Total records	Number of territory centres on dry heath	Territory centres on and within 50m of dry heath
1984	125	60	99
1994	535	260	439
2006	420	213	337
2014	252	193	229

Management of New Forest National Park

4.11 The nature of the New Forest is unique and subsequently so are the management processes. The heathland habitat is managed by the Forestry Commission through burning, cutting, mowing, bale and flail. The area of heathland managed annually across the New Forest is not consistent, with Fearnley *et al.* (2012) giving a median figure of 123.9 ha per year (data from 1991-2006). Burning is the dominant management technique with more than seven times as much heath burned than cut in the review period (Fearnley *et al., 2*012).

4.12 Since 2004 the Forestry Commission continue to create areas of open habitat through its Forest Design Plans which has led to a greater increase in areas of woodland edge habitat and open habitat itself.

4.13 In investigating whether the management of dry heathland could have an impact on the distribution and density of Dartford Warbler territories, Fearnley *et al.* (2012) concluded that, in keeping with other studies which show a preference for areas of mature heath (e.g. Bibby & Tubbs, 1975), Dartford Warbler in the New Forest show significant differences in densities on areas of heathland managed over eight years previously, compared to those managed within the last eight years.

4.14 Further work is suggested using both the 2006 and 2014 datasets to investigate the impacts of management techniques at a finer scale and especially the resultant mosaics of habitat that arise.

5 CONCLUSIONS

5.1 A full survey of breeding Dartford Warbler was successfully undertaken in 2014 on land within the New Forest HLS Scheme and Crown Lands. All habitat potentially suitable for breeding Dartford Warbler was identified and visited twice during the periods defined in the national survey methods (Wotton *et al., 2*009).

5.2 The analysis of the survey data identified a total of 268 Dartford Warbler territories within the area surveyed.

5.3 Comparisons with previous surveys would indicate a decrease in the breeding population of Dartford Warbler within the New Forest since the previous survey in 2006.

5.4 The dataset compiled provides:

- a robust baseline of the current breeding population of Dartford Warbler in the New Forest;
- the appropriate detail to inform future surveys of Dartford Warbler within the New Forest; and
- a basis upon which to further assess factors influencing the breeding population and distribution of Dartford Warbler within the New Forest.

5.5 The survey of breeding Dartford Warbler in 2014 fulfils the commitment of the HLS Board, under the agreement for the HLS scheme, for providing accurate and current population information on Dartford Warbler; one of the species for which the New Forest SPA is designated.

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FIGURES

Figure 1.1. The New Forest HLS Scheme and Crown Land Study Area.

Figure 2.1. The extent of the area identified as being potentially suitable to support breeding Dartford Warbler and surveyed in 2014.

Figure 3.1. The location of all Dartford Warbler territories recorded in 2014.

APPENDICES

Appendix A. Location data for all Dartford Warbler territories recorded in 2014.

Territories within the HLS survey area

Ordnance Survey Easting (m)	Ordnance Survey Northing (m)
417886	113577
418030	108881
418038	113583
418066	108382
418211	108699
418522	104192
418540	111366
418603	114838
418611	115227
418638	113518
418653	106475
418688	106655
418760	103195
418845	112402
418897	103203
418907	101304
418909	103334
418923	101549
418932	104519
418945	103501
418958	103729
418962	102363
419051	105072
419102	101604
419189	104306
419234	115012
419248	112977
419253	105251
419261	113507
419304	101619
419321	102217
419338	116168
419360	107051
419382	104478
419383	106760
419419	103946
419428	115215
419475	116047
419482	100722
419515	113769
419551	111675

Ordnance Survey Easting (m)	Ordnance Survey Northing (m)
419554	113626
419566	102230
419612	103511
419703	115237
419758	111818
419779	102462
419832	106102
419873	116011
419879	115146
419886	102488
419926	112021
419964	113856
420021	101665
420039	110388
420067	107183
420183	114085
420196	107576
420219	115622
420226	112119
420232	116658
420236	100559
420299	112043
420364	117578
420403	101606
420449	112505
420451	111936
420463	116087
420500	112274
420511	114241
420518	114332
420531	107640
420563	107920
420585	100892
420643	115845
420681	114759
420709	117571
420741	110647
420762	110561
420765	117615
420775	108258
420798	114181
420856	100629
420859	116094
420859	105023
420952	110958
421110	106937
421119	102150
421165	106499

Ordnance Survey Easting (m)	Ordnance Survey Northing (m)
421322	106957
421342	101039
421421	101207
421449	116129
421514	108628
421551	109017
421563	117348
421590	106294
421644	106680
421651	107836
421659	110448
421679	117229
421731	116370
421752	106756
421753	102040
421761	107365
421775	106818
421789	107944
421857	101166
421871	106990
421938	107322
421992	101076
422045	101204
422111	107806
422284	107907
422288	107725
422353	110700
422444	113810
422484	101606
422534	101838
422612	101755
422857	107861
422872	116548
422994	101915
423052	101994
423055	101868
423104	101702
423299	103454
423394	101474
423492	111067
423497	101295
423500	108941
423619	102831
423667	101545
423680	102199
423681	101953
423714	110962
423757	101834

Ordnance Survey Easting (m)	Ordnance Survey Northing (m)
423773	101973
423794	109350
423799	110740
423843	102957
423942	102907
423969	103018
424009	109704
424041	102888
424128	103233
424265	103068
424444	103398
424920	110765
425053	102405
425077	101899
425167	101694
425233	103010
425343	101638
425354	102728
425828	101613
425846	103112
426065	102577
427152	101730
427592	99977
427947	99831
428923	99537
431926	107632
432272	107580
432784	107848
433845	99424
433961	100342
433972	107208
433978	99716
434004	100496
434219	99820
434271	100999
434317	99300
434418	107048
434513	100797
434537	99947
434592	100078
434618	99373
434776	99127
434876	108128
434969	105393
435247	106064
435275	105809
435497	101069
435575	105199

Ordnance Survey Easting (m)	Ordnance Survey Northing (m)
435618	104264
435652	100492
435665	100008
435687	105631
435827	100209
435856	105846
435893	100842
435902	106944
436041	106705
436108	105800
436168	102233
436222	105651
436300	106266
436311	106736
436329	106580
436338	99017
436385	106858
436389	105264
436400	105863
436428	105252
436450	106819
436463	106932
436498	106517
436521	106066
436531	106250
436544	101163
436657	106834
436742	106293
436857	106603
436918	106747
437429	106092
437530	105897
437589	105991
437729	105773
437791	105287
437797	105670
438207	106050
438422	106044
438479	105856
438985	106206
439090	106316
439307	106335
439667	105501
439680	106344
439693	105226
439695	106453
439726	105985
440257	104654

Ordnance Survey Easting (m)	Ordnance Survey Northing (m)
440293	103612
440367	104324
440389	104176
440455	103683
440593	104191
440714	104546
440853	103567
440932	104892
441379	104465
441391	103235
441461	102947
441474	104681
441516	103217
441586	104746
441622	104687
442046	102974
443489	101672
443536	101709

Territories within the Forestry Commission Crown Lands

Ordnance Survey Easting (m)	Ordnance Survey Northing (m)
418921	101702

Territories outside of the HLS/FC Crown Land survey boundary

Ordnance Survey Easting (m)	Ordnance Survey Northing (m)
416964	109346
416970	109441
417291	110596
417436	109556
417482	108724
417588	109770
417625	110534
417692	111228
417701	108481
417890	111030
417891	108443
417990	110296
418027	110636
418399	101430
418519	101336
418713	101535