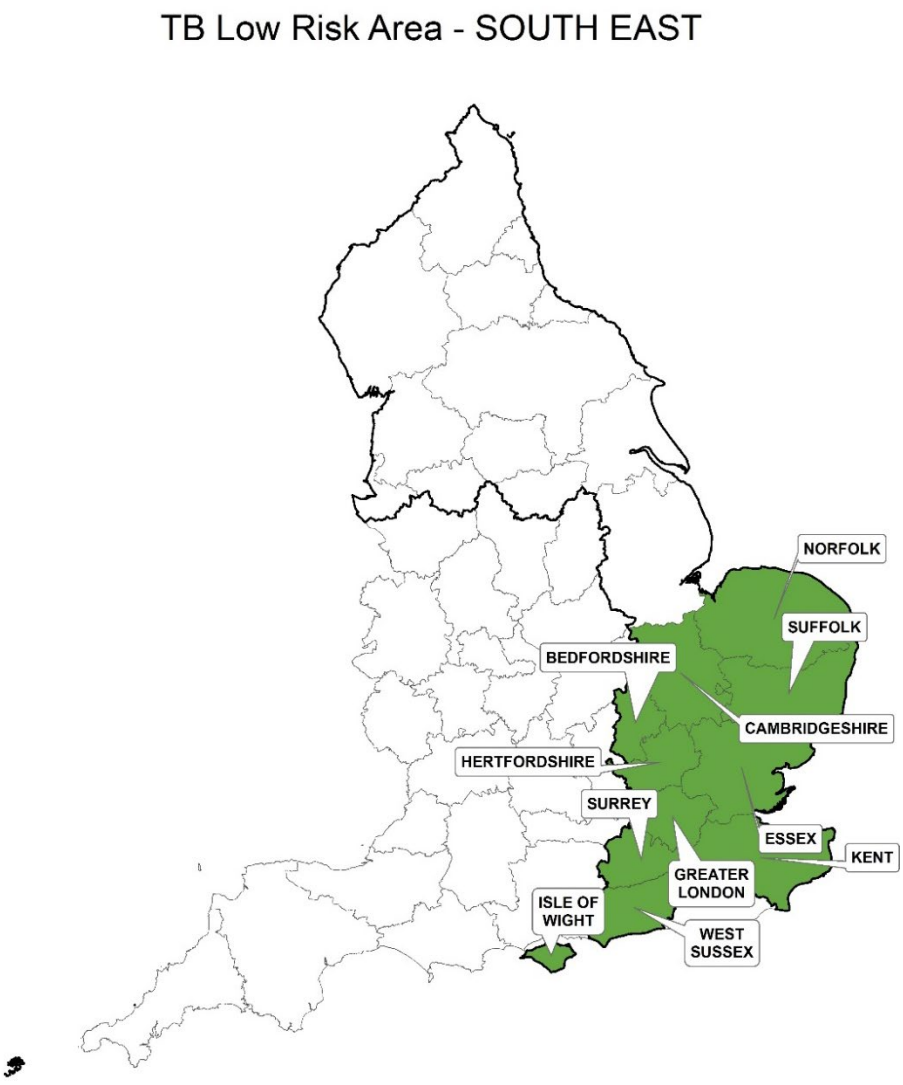
Animal & Plant Health Agency

Year-end descriptive epidemiology report: Bovine TB in the Low Risk Area of England

County coverage: South East of England (including Bedfordshire, Cambridgeshire, Essex, Isle of Wight, Hertfordshire, Kent, Greater London, Norfolk, Suffolk, Surrey, and West Sussex)

Year-end report for: 2020



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Executive summary

Reporting area

The South East of England (including the counties of Bedfordshire, Cambridgeshire, Essex, Isle of Wight, Hertfordshire, Kent, Greater London, Norfolk, Suffolk, Surrey, and West Sussex, but excluding East Sussex) is part of the Low Risk Area (LRA) that was established in 2013. This area was later incorporated into the Government's strategy to achieve Officially Tuberculosis Free (OTF) status for England by 2038. Overall, the LRA has a very low and stable incidence of infected herds. This end of year report describes bovine TB (bTB) in the specified reporting area only.

Local cattle industry

The herd types are predominantly beef fattening, with a moderate number of beef suckler herds, and a few dairy herds. Cattle for finishing, or stores, are traditionally bought in from other areas of the country for finishing on areas of grazing that are unsuitable for arable production, and/or fed on grain/by-products from arable production.

New incidents of TB

There were four new TB incidents with OTF status withdrawn (OTF-W) of the Southern region of the LRA in 2020 (eight less than the number of OTF-W incidents disclosed in 2019) plus another 27 incidents with OTF status suspended (OTF-S, 38 TB incidents in 2019). These four OTF-W incidents were disclosed in Bedfordshire, Essex, Suffolk, and Hertfordshire. From the 27 OTF-S incidents there were eight disclosed in Kent, five in West Sussex, four in Norfolk, and three in both Suffolk and Hertfordshire. Only one OTF-S was disclosed per county in Cambridgeshire, Bedfordshire, Greater London, and the Isle of Wight.

The decrease in the number of animals tested in the majority of counties reported on is likely to be mostly associated with the reduction in number of new TB incidents rather than effects of the ongoing COVID-19 pandemic and the lockdown measures, which delayed the completion of some TB surveillance and incident tests.

Potential or confirmed TB hotspot areas

There are two active potential TB hotspot areas in the Southern region: one in Norfolk (HS25) and one in West Sussex (HS24). Enhanced wildlife surveillance in these two areas has not revealed evidence of *Mycobacterium bovis* (*M. bovis*) infection in badgers or wild deer.

Unusual TB incidents

In 2020 there were two laboratory-confirmed incidents of *M. bovis* infection in non-bovine species. One was in a pig in Norfolk which had epidemiological links to farms in the south-west of England. The second was in an alpaca in Surrey.

Suspected sources and risk pathways for TB infection

According to the incident investigations conducted by APHA case veterinarians, the most common risk transmission pathway recorded for new TB incidents, as in previous years, was the purchase of cattle with undisclosed infection. Infected animals originated mainly from the High Risk Area of England (HRA), but also, with lower frequency, from the Edge area and high TB area of Wales. Less often, the most likely source of infection were animals moved from other LRA farms which had themselves sourced cattle from farms in the HRA.

Details of the methodology used to calculate the weighted contribution of the different suspected sources of *M. bovis* infection for all new incidents can be found in the main body of the report and in the Explanatory Supplement.

Disclosing tests

The main surveillance methods disclosing new TB incidents in 2020 were, in decreasing order of frequency: routine herd testing (22.5%), radial testing (19.4%), post-movement testing (16.1%), and 12-month testing following the conclusion of a previous TB incident (12.9%). There were two bacteriologically confirmed TB slaughterhouse cases in 2020, one less than in 2019.

Reactor numbers

There was a substantial decrease in the number of skin test reactors (42) and IFN-γ test positive animals (26) detected in 2020 compared to 2019 (109 and 92, respectively). This is probably due to the decrease in OTF-W incidents from 12 in 2019 to four in 2020.

Risks to the reporting area

There was no evidence from cattle incidents occurring in 2020 in the counties covered in this report to suggest the presence of endemic infection, including the areas adjacent to Edge Area counties. However, the cattle trading practices of some farms, as evidenced by the commonest risk pathways of infection, pose a risk of introduction of infection from endemic areas by cattle movements. There is no evidence of risk to Cambridgeshire from HS23 (south-west Lincolnshire).

Risks posed by the reporting area

The counties in the LRA of the South East of England do not pose a significant risk of spreading TB to other contiguous areas at present because of their very low and sporadic TB incidence and apparent absence of endemic infection. Evidence for the latter was provided by the fact that all the OTF-W TB incidents were associated with introductions of TB-infected cattle, and no clear secondary infection disclosed by enhanced surveillance (radial testing) around the affected holdings. The majority of OTF-S incidents in the region were also associated with a cattle movement source, but this is caveated by increased uncertainty in the absence of any *M. bovis* genotyping information from such herds.

Forward look

Based on the current trends the counties in this region are likely to maintain their target of <0.1% of OTF-W incidence by 2025.

Introduction

This report describes the level of bovine tuberculosis in cattle herds in the South East of England (including the counties of Bedfordshire, Cambridgeshire, Essex, Isle of Wight, Hertfordshire, Kent, Greater London, Norfolk, Suffolk, Surrey, and West Sussex) in 2020. Bovine tuberculosis is caused by the bacterium *Mycobacterium bovis* (*M. bovis*) and will subsequently be referred to as TB. This report explores the spatial and temporal distribution of TB in cattle herds. It examines what is likely to be driving TB in this area, and the risks the disease in this area may pose to neighbouring cattle. Although other sources may refer to TB 'breakdown(s)', this report will use the term 'incident(s)' throughout. This report is intended for individuals involved in the control of TB, both in the local area and nationally. This includes, but is not limited to farmers, veterinarians, policy makers and the scientific community.

In 2014 the Government published its Strategy to achieve Officially Bovine Tuberculosis Free (OTF) status for England by 2038. A key action was to recognise the different levels of TB in different parts of the country and to vary the approach to control accordingly. To this end three management areas were established (see Appendix 1). Most of the South East of England forms part of the Low Risk Area (LRA). Overall, the LRA has a very low and stable incidence of infected herds. The current strategy seeks to rapidly control infection when it arises through high sensitivity testing of affected herds and temporarily enhanced local surveillance (radial and hotspot testing). Mandatory pre- and post-movement testing of cattle entering the LRA from higher risk areas of the UK is also performed to reduce the risk of TB introduction. The aim is to preserve the favourable disease status of this area so that its counties can be declared OTF as soon as possible.

Changes due to COVID-19

During 2020, public health measures adopted by the government to contain the COVID-19 outbreak impacted the ability to carry out some TB testing due to social distancing and self-isolation guidelines, affecting both veterinarians and farmers. In particular, from 23 March 2020, routine or targeted TB skin tests were not mandatory for cattle under 180 days old where, in the official veterinarian's judgement, the young stock could not be tested safely in line with social distancing guidelines. The temporary amendment allowing calves under 180 days old to be excluded from TB testing did not apply to short interval tests in TB incident herds (required to restore a herds OTF status) or pre- and post-movement testing.

Routine TB skin tests are required within a pre-defined window of time to maintain a herds OTF status. From 23 March 2020, for tests that were allocated until 30 June 2020, the Animal and Plant Health Agency (APHA) permitted an extension to the TB skin testing windows on a case-by-case basis, where testing had not been completed due to valid reasons associated with COVID-19. The testing window for short interval tests was also extended by up to 30 days, where tests were unable to be completed due to COVID-19.

Furthermore, on-farm epidemiological assessments carried out to establish the route of infection for a TB incident herd were carried out remotely, by telephone, for the majority of 2020. Putting this in the context of the eleven counties in this report, 22 tests that were due in 2020 were completed in 2021. However, only three cited COVID-19 reasons for the late test.

Cattle industry

Herd types

In general terms, there is a large proportion of small cattle herds (up to 50 animals/herd) in all the counties of the south-eastern region of the LRA (Figure 1). Most cattle herds in the region are concentrated in Norfolk, Kent, Suffolk, and West Sussex in comparison to the other counties included in this report. Norfolk, Kent, West Sussex, and Surrey have the largest proportion of large cattle herds (+501 animals/herd), and the greatest proportion of dairy herds in relation to the total number of cattle per county (see Appendix 2). The greatest number of beef cattle herds are located in Norfolk, Kent, Suffolk, and West Sussex.

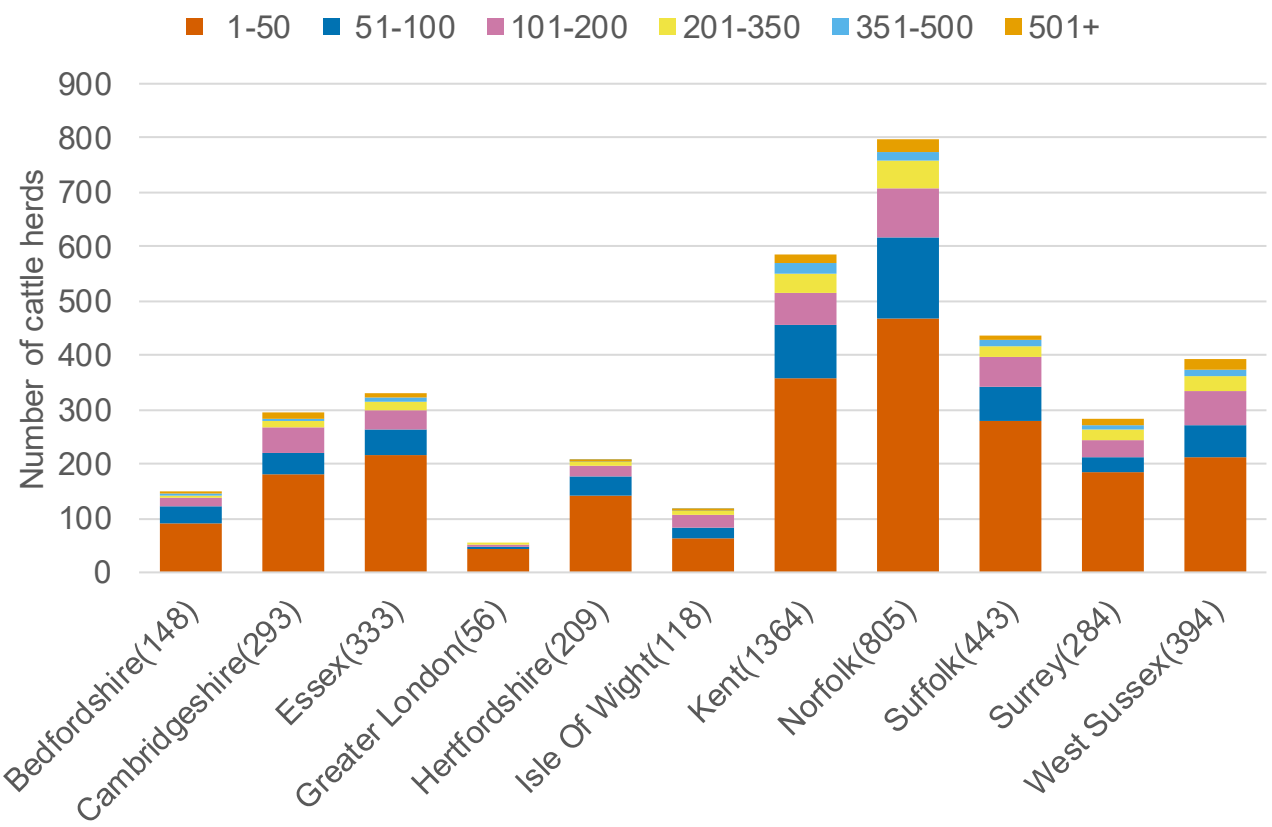

Figure 1: Proportion of cattle holdings in the LRA counties of the South East of England, by herd size and county in 2020. Note herds with an undetermined size are not shown.

Markets and abattoirs

There are three livestock markets regularly operating in the region, one in each of the counties of Norfolk, Essex and Kent. A Collection Centre operates in Suffolk. There are no dedicated sales/collections approved by APHA for onward consignment of TB-restricted cattle direct to a slaughterhouse.

Orange markets for the sale of clear tested cattle from TB-restricted herds are not permitted in the LRA.

Licensed Finishing Units

There are five active licensed finishing units (LFU) in the south-eastern region of the LRA, all of which are subjected to annual re-approval visits by APHA: one in Norfolk, one in Suffolk, two in Cambridgeshire and one in Essex. The latest LFU application was approved in December 2020.

Common land

There was common land grazed by cattle in West Sussex and Surrey LRA counties of the South East of England in 2020.

Descriptive epidemiology of TB

Temporal TB trends

Unless otherwise specified, this report includes all new TB incidents detected during the reporting period. This includes 'officially tuberculosis free status withdrawn' (OTF-W) incidents and 'officially tuberculosis free status suspended' (OTF-S) incidents. OTF-W incidents are confirmed by lesions identified at post-mortem, or *M. bovis* cultured from tissue samples. OTF-S incidents are those involving one or more test reactors with typical lesions of TB identified at post-mortem, and/or one or more animals with *M. bovis*-positive culture results from tissue samples. OTF-S incidents are triggered by reactors to the Single Intradermal Comparative Cervical Tuberculin (SICCT) skin test, but without subsequent detection of lesions or positive culture results in any of those animals.

The annual numbers of new OTF-W and OTF-S incidents identified in each county between 2015 and 2020 are presented in Figures 2a to 2d. Most of the 2020 incidents were disclosed in January (nine incidents), July and September (three incidents each), with one to two incidents per month for all others.

The trend in the last five years has been stable in most counties, with a small decline in the number of incidents (OTF-S and OTF-W combined) in some counties. However, there has been an upward trend in the number of incidents in Kent and Suffolk with a three-fold increase in numbers in Kent from 2019 to 2020, based on very small numbers.

During 2020, the total number of new TB incidents (OTF-W plus OTF-S incidents) in this region of the LRA was 31, which represents a decrease of 38% in the total number of incidents (19 less incidents) if compared to the 50 incidents detected in 2019. Although cattle TB testing in 2020 was affected by COVID-19, the overall effect of this on disclosure of new incidents was probably marginal. It seems more likely that the drop in the number of new incidents was associated with a reduced TB incidence in some HRA counties (resulting in less cattle with undisclosed infection being purchased into the LRA), and possible changes in cattle buying behaviours, particularly during the earlier period of the COVID-19 pandemic when the lockdown affected routine sales of cattle.

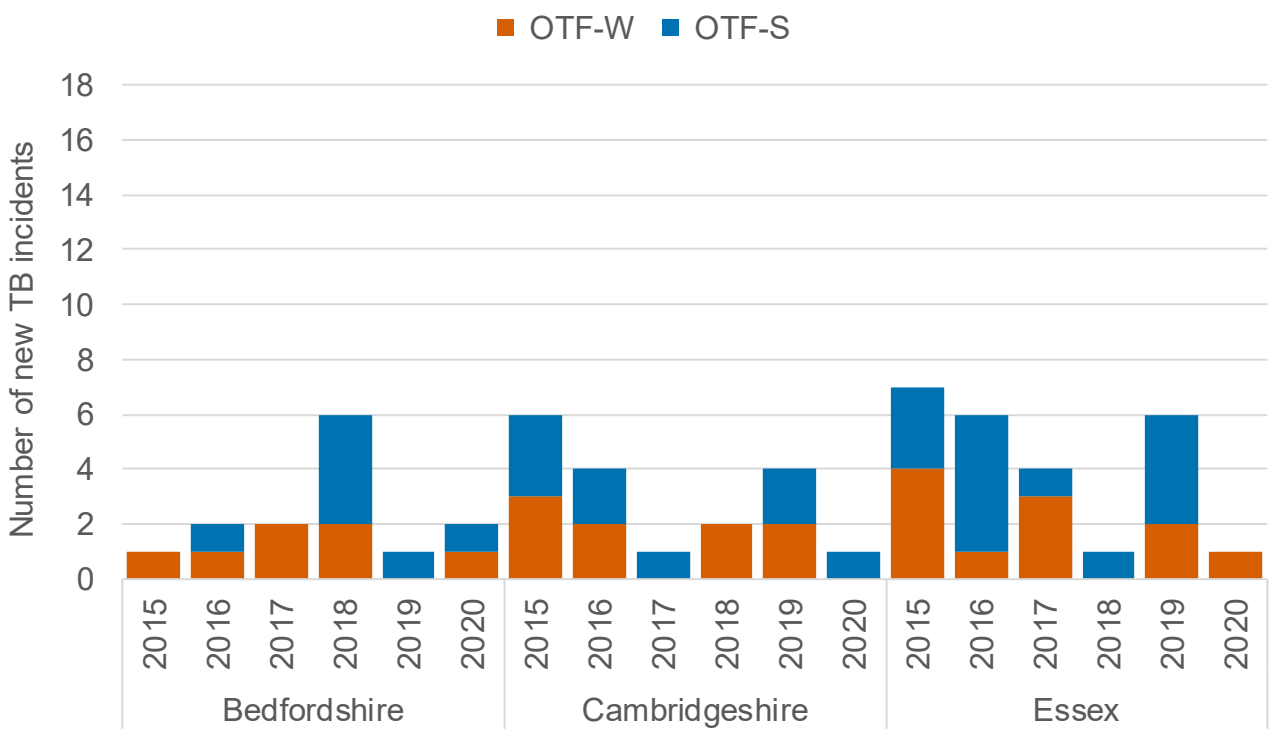

Figure 2a: Annual number of new TB incidents in Bedfordshire, Cambridgeshire, and Essex, from 2015 to 2020.

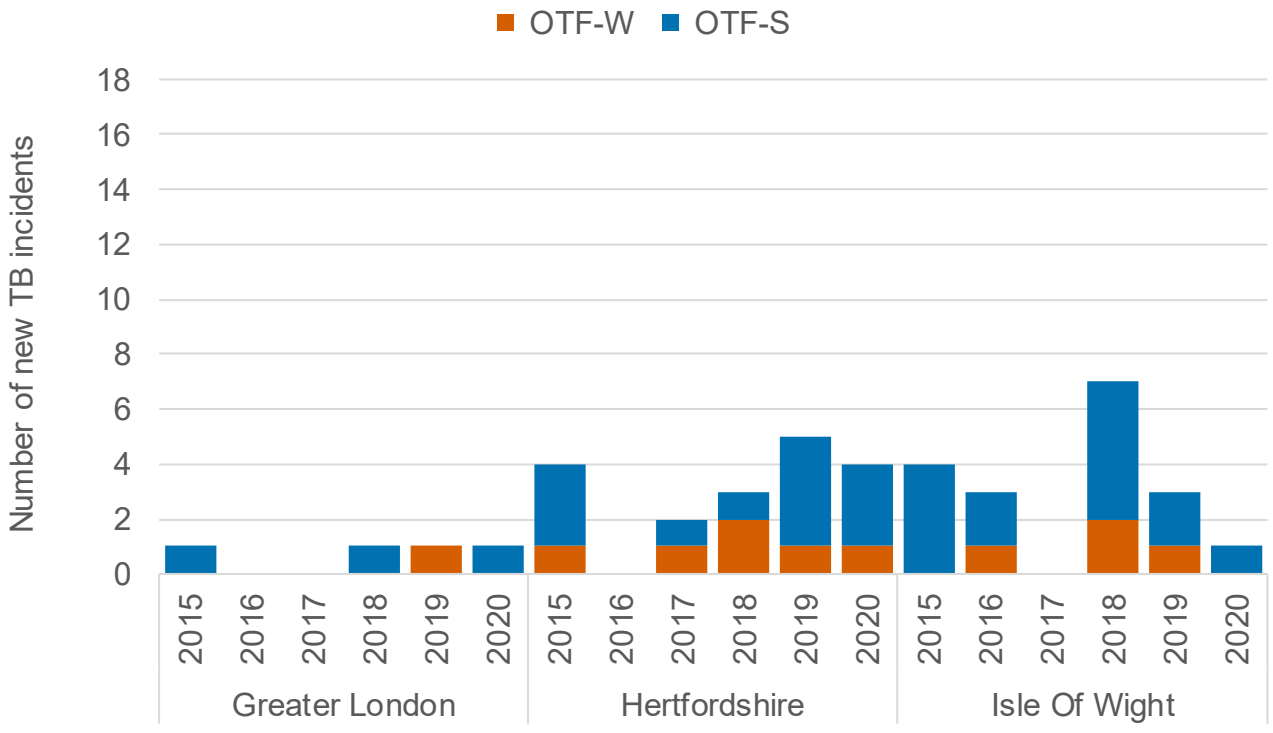

Figure 2b: Annual number of new TB incidents in Greater London, Hertfordshire, and the Isle of Wight, from 2015 to 2020.

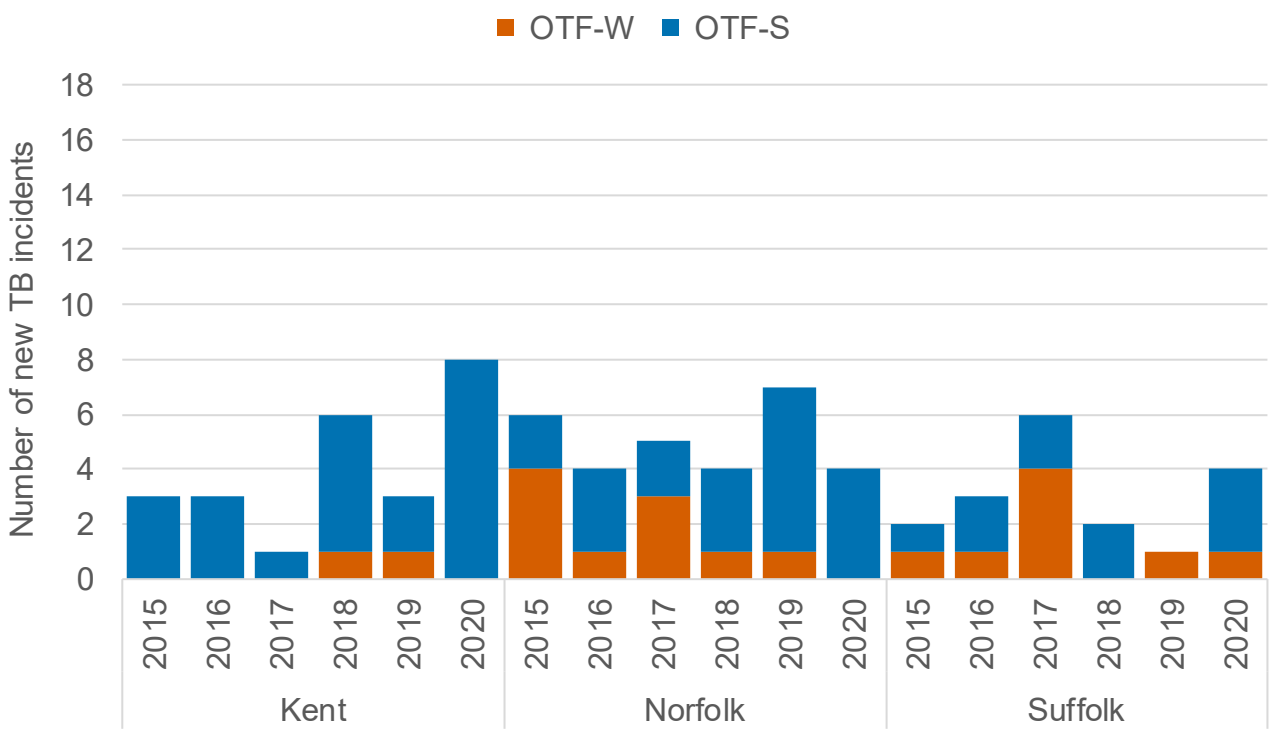

Figure 2c: Annual number of new TB incidents in Kent, Norfolk, and Suffolk, from 2015 to 2020.

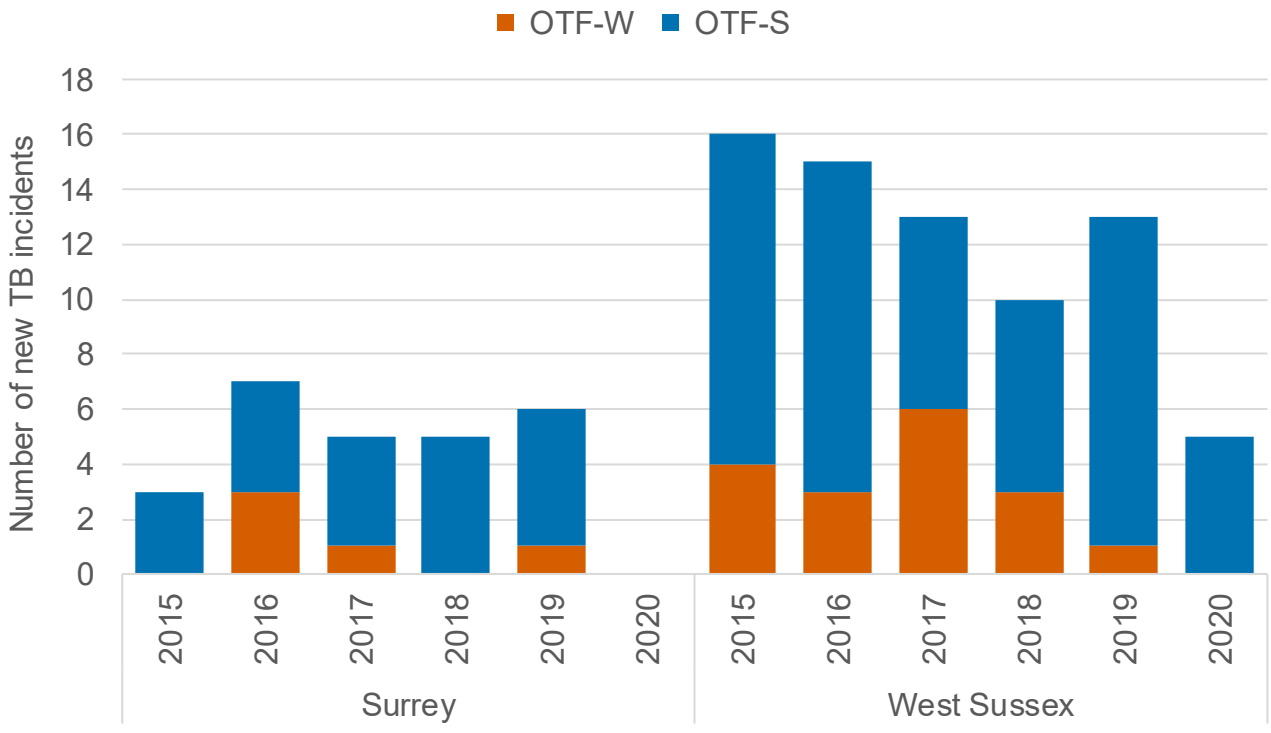

Figure 2d: Annual number of new TB incidents in Surrey, and West Sussex, from 2015 to 2020.

Geographical distribution of TB incidents

As shown in Figure 3, new TB incidents in 2020 were concentrated in the areas of highest cattle density in Kent (eight incidents), West Sussex (five incidents), and Norfolk, Suffolk, and Hertfordshire (four incidents each). Bedfordshire had two incidents and Cambridgeshire, Greater London, Isle of Wight, and Essex had one incident each. Surrey had no bovine incidents in 2020.

There were two confirmed TB incidents in non-bovine domestic animals: one in a commercial pig herd in Norfolk and the other involving an alpaca in a holding in Surrey (see TB in Other Species).

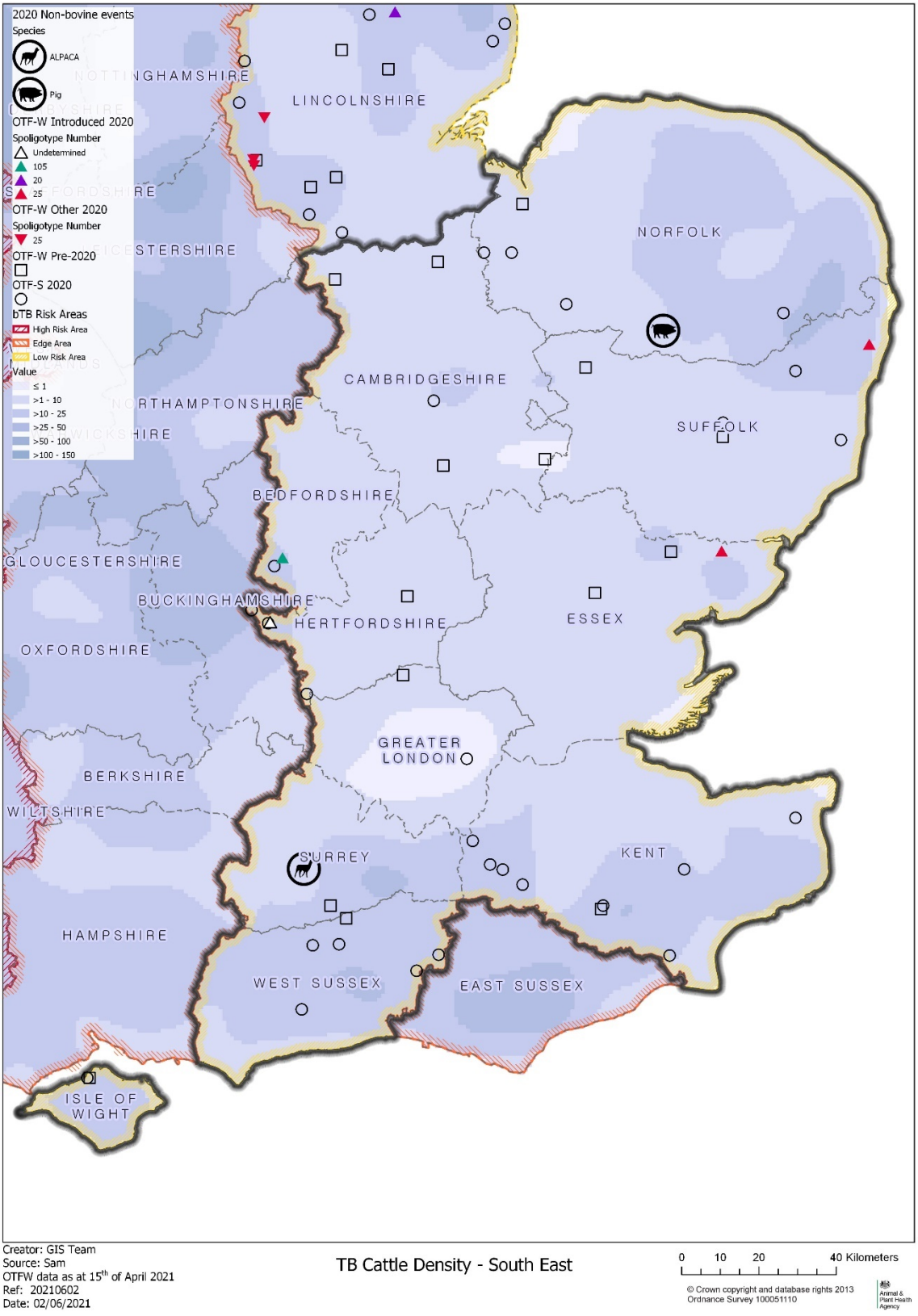

Figure 3: Location of cattle holdings in the LRA counties of the South East of England with new TB incidents (OTF-W and OTF-S) in 2020, and cattle holdings with pre-2020 OTF-W incidents still ongoing at the beginning of 2020, overlaid on a cattle density map. Note: 'OTF-W Introduced 2020' refers to OTF-W incidents in which introduction of infection through cattle movements was the most likely source identified.

Potential or confirmed TB hotspot areas

As shown in Figure 4, there were two active potential TB hotspot areas in the Southern region during 2020: one in Norfolk (HS25) and one in West Sussex (HS24). Enhanced wildlife surveillance in these two areas has not revealed evidence of *Mycobacterium bovis* infection in badgers or wild deer .

Potential hotspot area – Norfolk (HS25)

Initiated in March 2019, this potential hotspot was triggered by an OTF-W incident where TB lesions were detected at slaughter in a homebred animal in March 2018. This was the first OTF-W incident recorded in the parish of Needham. It could not be attributed to infected cattle movements because only two animals had been purchased onto the holding during the previous ten years from two farms in the LRA, both of which had clear TB histories. The genotype 25:a isolated in this parish in Norfolk was at least two whole counties away from its homerange in Staffordshire, Derbyshire, Cheshire, and north-east Shropshire, and could not be linked to cattle movements or by other transmission pathways to this area of the country.

A radial testing zone straddling Norfolk and Suffolk was established around the index farm for HS25 that included 28 holdings. This enhanced TB surveillance regime disclosed two OTF-S incidents (one skin reactor per holding) plus a total of 12 resolved IRs on five other cattle holdings within the radial zone. Between March 2019 and the end of December 2020, only one badger carcase had been collected (NVL and a negative culture result) in this potential hotspot area. However, investigations did not support local spread from the index case. The radial testing programme in the designated zone has been completed.

Potential hotspot area – West Sussex (HS24)

This potential hotspot was initiated in March 2019 and was triggered by a bacteriologically confirmed slaughterhouse case in April 2017. The source of TB was obscure, with no cattle movements recorded from the HRA or from premises which had had a TB incident. A few movements were reported onto this holding in the previous five years from other herds in the LRA and there were no contiguous cattle herds. The genotype 11:a isolated, was far from (>250km) its homerange area, located mostly within Devon and Somerset. TB surveillance of badgers and wild deer found dead in this hotspot has not yet yielded any information on wildlife infection in the area.

A radial testing zone was established around the index farm that included 21 cattle holdings. At the time of writing this report, radial testing had disclosed three additional incidents (one OTF-W and two OTF-S) and fifteen resolved IRs on five different holdings. Conclusions from incident investigations suggested that they were not caused by local spread from the index case. The radial testing programme in HS24 is now completed.

There were no new areas of concern or potential hotspot applications under consideration during this reporting period.

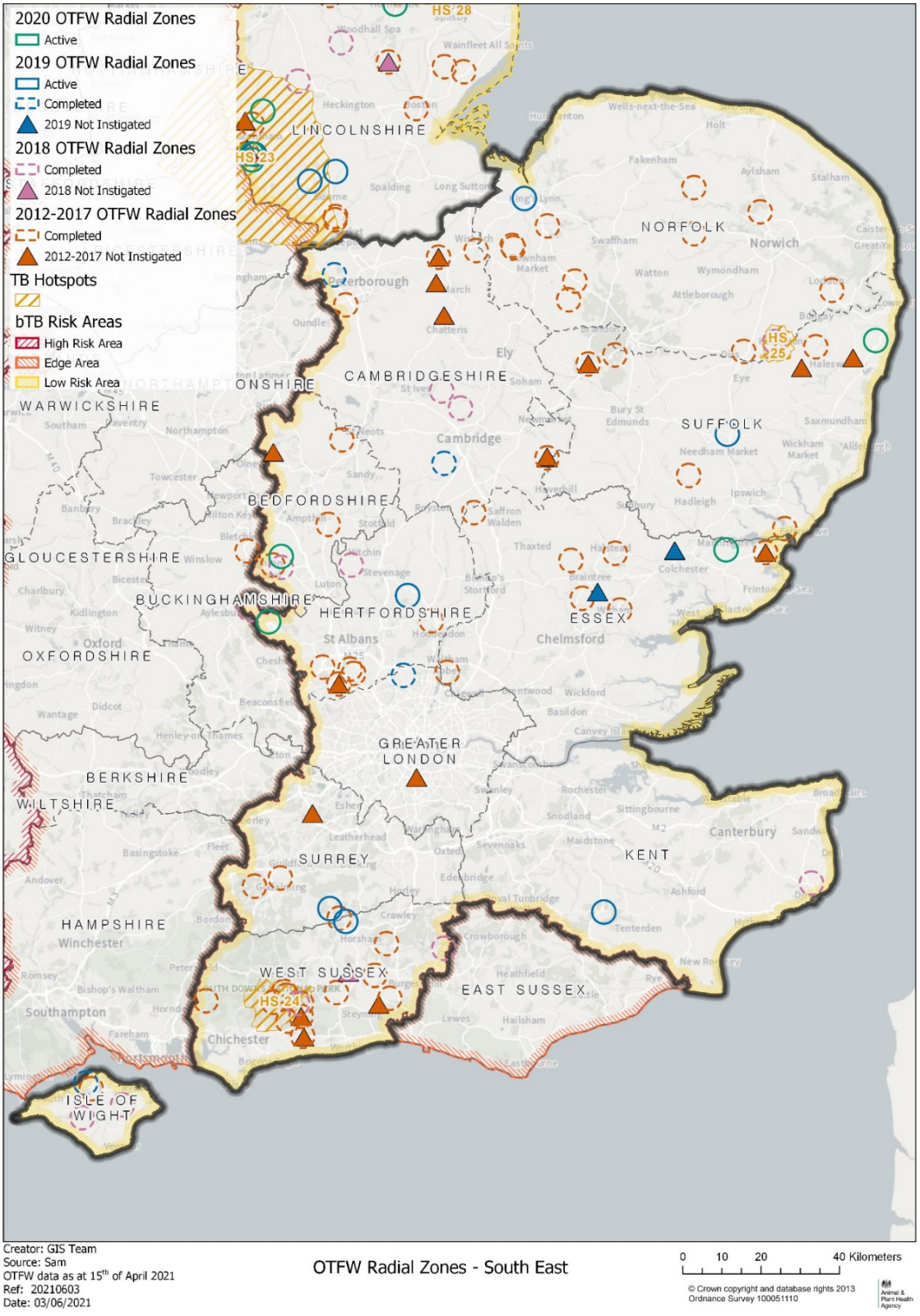

Figure 4: Potential hotspot areas and OTF-W radial surveillance zones that were active, completed or not instigated in the South East of England during 2020, by year of initiation.

Other characteristics of TB incidents

Unusual TB incidents

One OTF-S incident occurred on a dairy farm in Kent which produces raw milk for human consumption, including a small local delivery round selling raw milk. Consequently, the cattle herd on this holding was being tested annually for TB. Sales of raw drinking milk ceased following the detection of skin test reactors and the service of movement restrictions (suspension of OTF herd status). This was the farm's first TB incident and it appeared to be associated with the purchase of large number of cows from a herd in the High TB Area of South West Wales back in 2019.

Duration of TB restrictions

The duration of restrictions varied between counties (Figures 5a to 5d). Of all the TB incidents that started in 2020, the majority resolved within 60-240 days (two to eight months). There were three incidents still open at the end of the reporting year. However, these incidents started in the last quarter of the year. Those in the time interval of 151-240 days were likely to have passed either two (the minimum), or three tests before restrictions were lifted. Suffolk recorded the shortest TB incidents (90-150 days), followed by Norfolk (60-180 days), Kent (120-210 days) and West Sussex (90-240 days). There were no incidents lasting over 551 days (persistent incidents).

Longer durations were recorded for some incidents that started in 2019 (OTF-S and OTF-W) and were closed before the end of 2020. These incidents were in Norfolk OTF-W 510 days; Kent OTF-W and Essex OTF-S 360 days; Suffolk OTF-W and West Sussex OTF-S 330 days; Surrey OTF-W and Cambridgeshire OTF-W 300 days and Isle of Wight OTF-S 390 days.

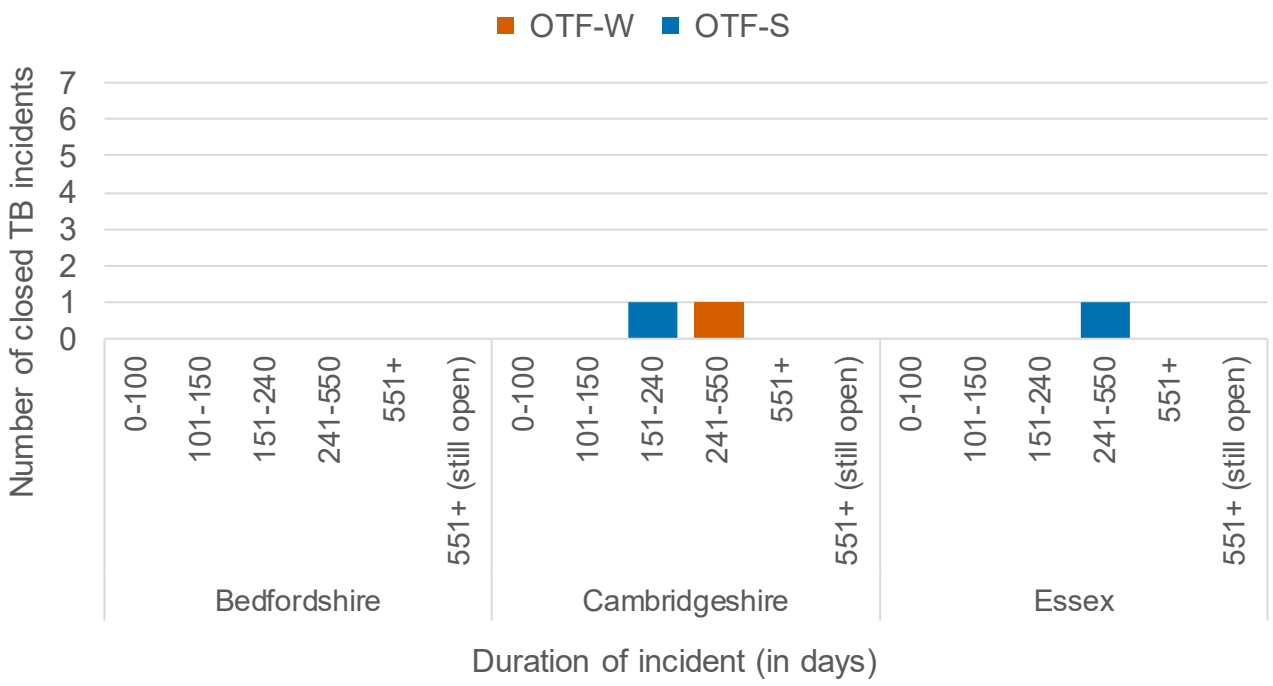

Figure 5a: Duration of all TB incidents (OTF-W and OTF-S) that ended in 2020, and the number of persistent TB incidents (551+ days) that were unresolved at the end of 2020 in Bedfordshire, Cambridgeshire, and Essex. Note that Licensed Finishing Units (LFUs) have been excluded.

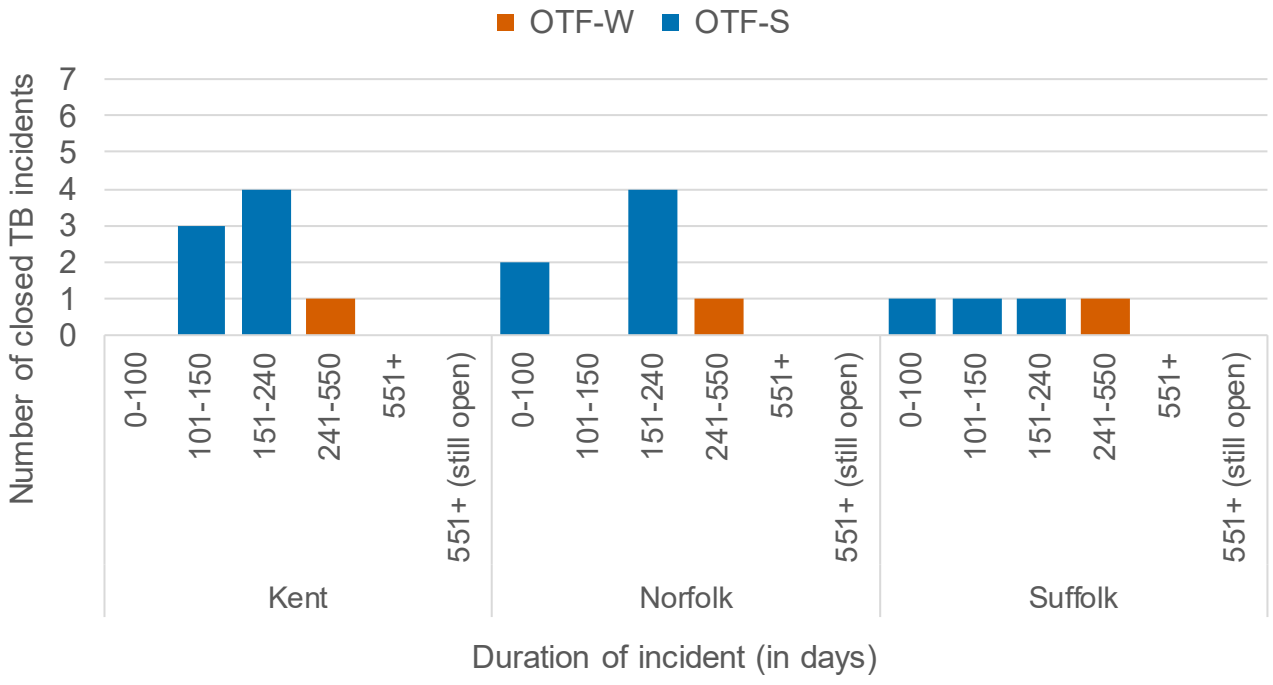

Figure 5b: Duration of all TB incidents (OTF-W and OTF-S) that ended in 2020, and the number of persistent TB incidents (551+ days) that were unresolved at the end of 2020 in Kent, Norfolk, and Suffolk. Note that Licensed Finishing Units (LFUs) have been excluded.

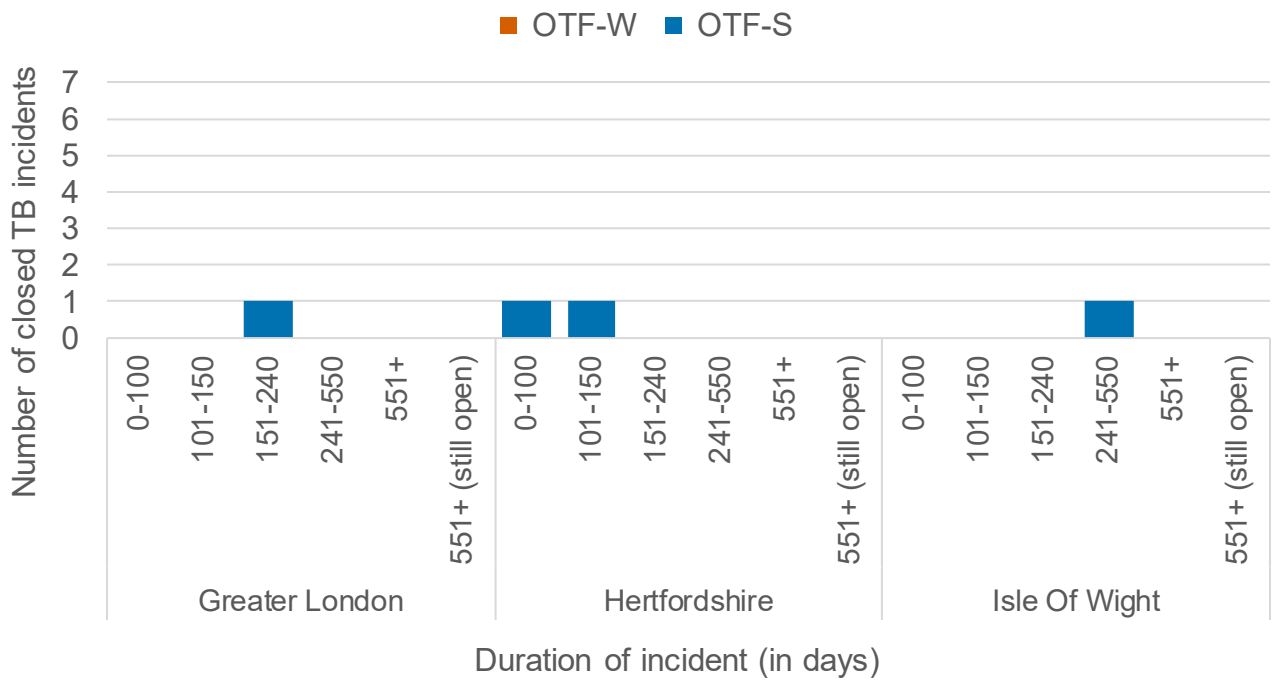

Figure 5c: Duration of all TB incidents (OTF-W and OTF-S) that ended in 2020, and the number of persistent TB incidents (551+ days) that were unresolved at the end of 2020 in Greater London, Hertfordshire, and the Isle of Wight. Note that Licensed Finishing Units (LFUs) have been excluded.

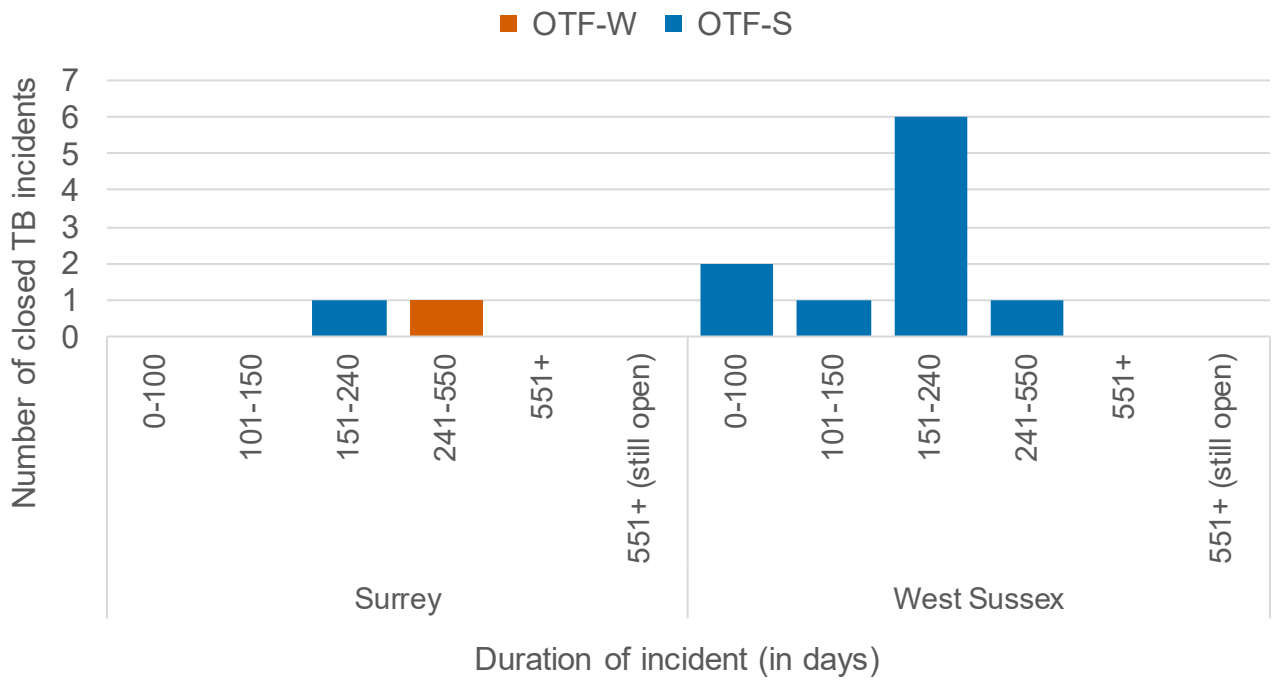

Figure 5d: Duration of all TB incidents (OTF-W and OTF-S) that ended in 2020, and the number of persistent TB incidents (551+ days) that were unresolved at the end of 2020 in Surrey, and West Sussex. Note that Licensed Finishing Units (LFUs) have been excluded.

Genotypes associated with TB incidents

Genotyping of *M. bovis* isolates is used to trace the origin of TB infection. It is particularly useful in identifying where spread has occurred through cattle movements. Stable genotype clusters tend to be found in areas where there is a persistent local reservoir of infection. APHA implemented whole genome sequencing (WGS) in place of genotyping from April 2021. During 2020 however, genotyping was still attempted for all OTF-W herds in the LRA.

Genotypes were identified in the four OTF-W incidents detected in 2020: 105:7-5-5-5*-3-3 in Bedfordshire; 25:a in Essex and Suffolk and nt:7-5-5-4*-3-3.1 in Hertfordshire (Figure 6). These were all attributable to the introduction of cattle with undisclosed infection from the HRA and Edge Area (see location of OTF-W incidents, Figure 3).

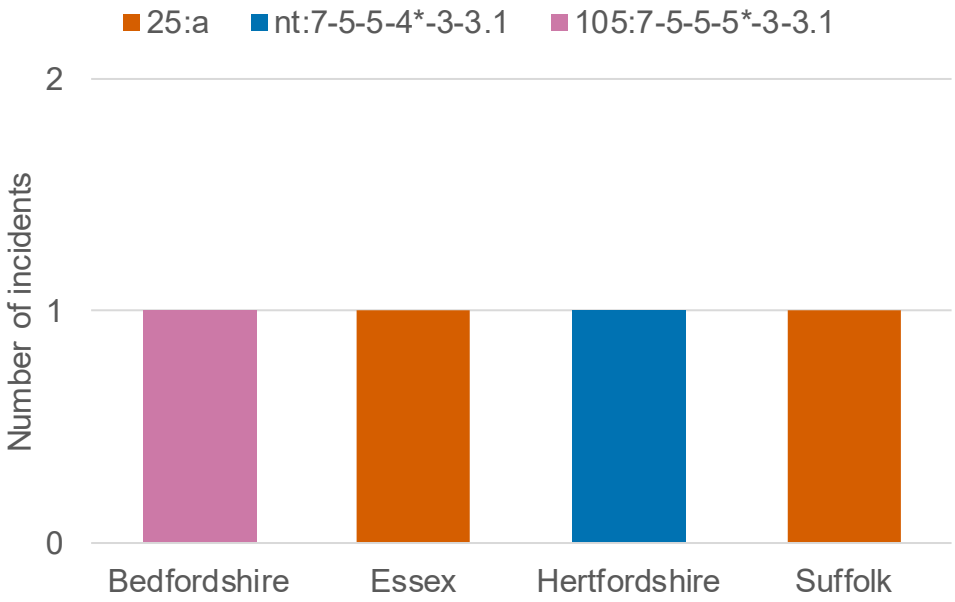

Figure 6: Genotypes of *M. bovis* identified in herds with OTF-W incidents in the South East of England that began in 2020, by county.

Suspected sources, risk pathways and key drivers for TB infection

The key drivers of the TB epidemic within the reporting area were as follows:

- Cattle movements from the HRA of England and Edge.
- Undetermined sources.
- Residual infection.

It can be challenging to retrospectively establish the route of infection for a TB incident herd. APHA aims to complete an epidemiological assessment for all TB incidents in the LRA (both

OTF-W and OTF-S). This includes a thorough on-farm investigation and scrutiny of routinely collected data; such as cattle movement records, and the results of molecular analyses where available (OTF-W incidents only).

During the APHA veterinary assessment, up to three risk pathways of infection are selected for each herd. Figure 7 shows the risk pathways identified with the highest level of certainty for OTF-W incidents only. Further details of all the risk pathways identified in both OTF-W and OTF-S incidents can be found in Appendix 4.

As shown in Figure 7, the main risk pathways of the four OTF-W TB incidents were movements of cattle with undisclosed infection (three from the Edge Area and one from the HRA). Risk pathways for OTF-S incidents are more difficult to attribute without genotype information and especially where there is no clear link to the purchase of infected cattle, which adds higher uncertainty to conclusions. Of the total number of OTF-S incidents, based on the risk pathway assessment most were linked to movements of cattle (62%), followed by via fomites or undetermined sources (11 %); and residual infection (7.4%). There was a small percentage of OTF-S incidents that were linked to non-specific skin test reactions, anomalous results, and badgers (3.7% for each).

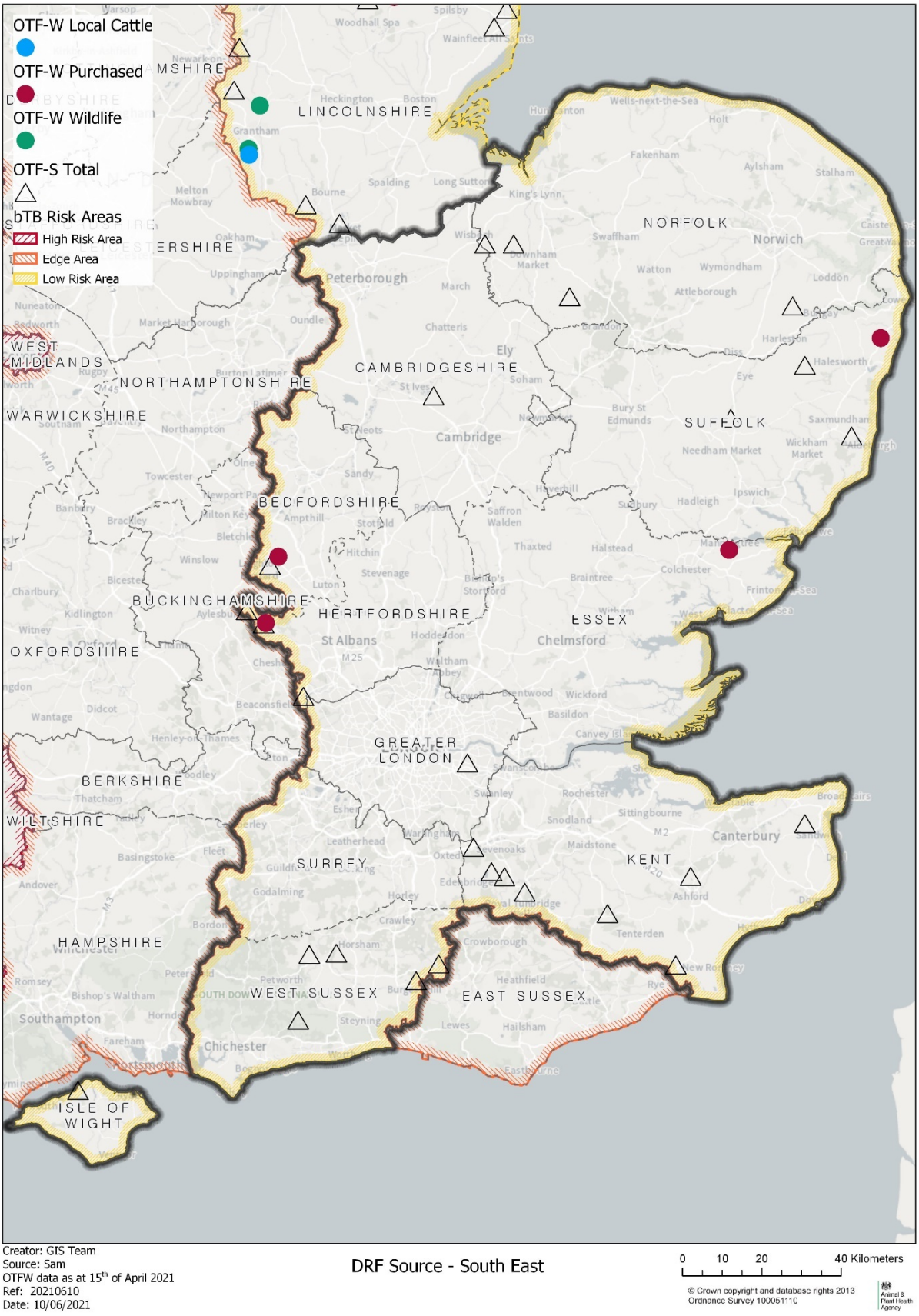

Figure 7: Map of the source of infection pathway recorded with the highest level of certainty, for OTF-W TB incidents, and the location of OTF-S incidents in the LRA counties of the South East of England which started in 2020.

TB in other species

There were no *M. bovis* infections detected in other animal species, except pigs and alpacas.

Pigs

There was one culture-confirmed incident of *M. bovis* infection (genotype 9:f) involving a homebred pig which was slaughtered in December 2019 from a farm in the south of Norfolk (Figure 3). The site was voluntarily depopulated by the keeper. The field was left empty for 60 days and then ploughed. TB movement restrictions were lifted in September 2020 . The herd was part of an integrated pig finisher group operating in the LRA.

There were two cattle farms located within a ~3km radius of the infected pig unit in Norfolk that were not considered to be a source of infection for the pigs. Neither of these two cattle herds had a history of TB incidents nor had they brought any replacement cattle from HRA of England and Wales in the last five years.

The origin of this incident was likely to be associated with pig movements or possibly via fomites such as contaminated transport vehicles, neither of which have been identified.

Alpacas

There was one culture-confirmed incident of *M. bovis* infection involving an alpaca on a small farm in Surrey. In 2020, the owner decided to test the whole herd (17 animals on the holding). The first short interval test was completed in March 2020 with negative results followed by serial blood test that disclosed one culture-positive animal (*M. bovis* genotype 10:a). Due to unforeseen circumstances the second short interval test was delayed and arranged to be completed in May-June 2021. Two skin test reactors were previously detected on the holding in 2012; neither were confirmed by either post-mortem or laboratory culture. The origin of disease is still under investigation.

Detection of incidents

As shown in Figure 8, the majority of new OTF-W and OTF-S incidents were detected by routine herd tests (seven incidents), radial tests (six incidents), post-movement test (four incidents), and post-incident 12 month testing (four incidents).

The surveillance methods which disclosed the four OTF-W incidents occurring in 2020, were: slaughterhouse post-mortem meat inspection, trace testing, post movement testing and check testing. Three of the four affected herds had not experienced a TB incident within the previous three years. The fourth incident, which had another OTF-W TB incident in the previous three years, was in Bedfordshire. However, movement of cattle with undisclosed infection was the most likely cause of this new incident, rather than residual herd infection from the previous one.

From the total 31 incidents (OTF-W and OTF-S) only four incidents were disclosed at a 12-month (post-incident) check test. This suggests that TB infection was cleared effectively from

most herds by statutory short interval skin testing and (in OTF-W herds) the supplementary IFN-γ blood test.

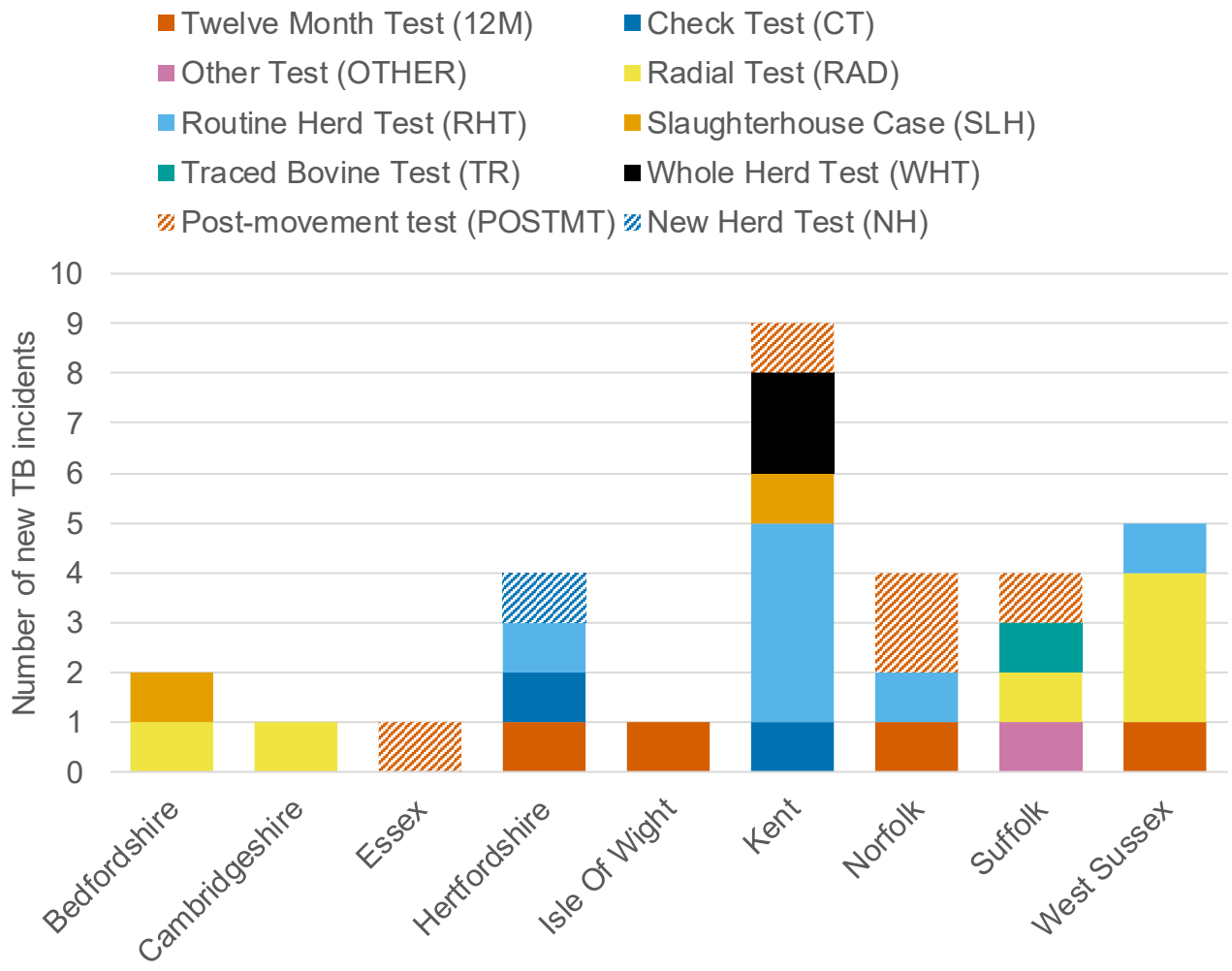

Figure 8: Number of TB incidents (OTF-W and OTF-S) in the LRA counties of the South East of England in 2020, disclosed by different surveillance methods in each county.

Skin test reactors and interferon gamma test positive animals removed

The total number of reactors detected in the South East LRA counties during 2020 was 68, of which 42 were detected by the skin test and 26 by IFN-γ (Figures 9a to 9d). This is a decrease of 132 (66%) reactor cattle from 2019 (200 reactor cattle), which is likely to have been mostly associated with the 38% decrease in the total number of TB incidents disclosed (from 50 in 2019 to 31 in 2020). However, reduced testing (particularly of IFN-γ) due to COVID-19 restrictions could have contributed to this. The highest number of reactor cattle per county in 2020 was recorded for Surrey (18), followed by Kent (13), Norfolk (9) and West

Sussex (7). The Surrey reactors were all from one incident that started in 2019 and resolved in the second half of 2020.

There was a reduction of between 8 and 44% in total number of cattle tested (animal tests) in all the counties covered in this report compared to 2019 except for Norfolk and Bedfordshire, where the number of cattle tested increased: 826 (4%) more tests in Norfolk and 1,656 (21%) more tests in Bedfordshire in 2020 (see Appendix 3 Table A3.2). This is probably more related to the overall reduction in the number of new OTF-W incidents in 2020 compared to 2019, and consequent fewer radial tests, than the impact of COVID-19 on testing.

The current TB control policy requires the imposition of cattle movement restrictions on the affected farm until all the animals have passed the required number of short-interval skin tests supplemented, where required, by the IFN-γ blood test. TB control measures can be a significant burden for farmers, particularly those whose business model relies on the movement of cattle between farms or purchased cattle.

TB surveillance testing can be logistically challenging for farmers. This is particularly true in large herds of beef cattle where animals are often not accustomed to being handled and which, particularly during the summer months, may be located on parcels of land away from the home farm. To add to this were the current social distancing measures due to the COVID-19 pandemic that made the logistics of cattle TB testing even more challenging.

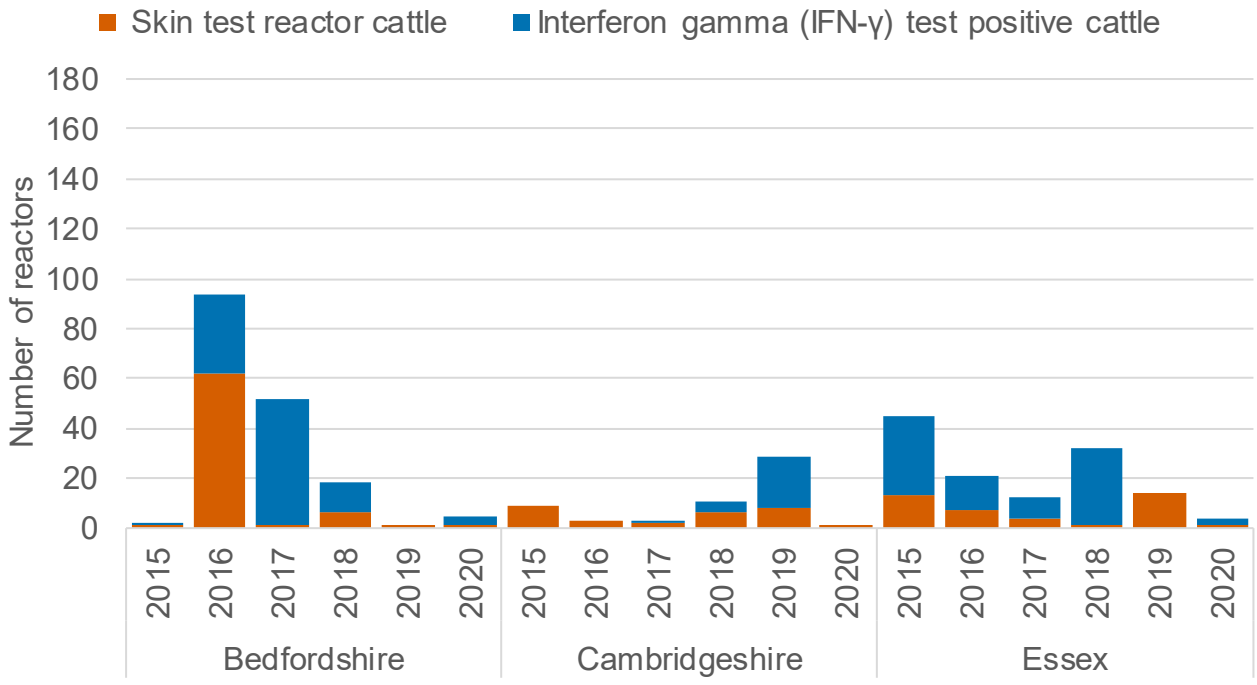

Figure 9a: Number of skin test reactors and interferon gamma (IFN-γ) test positive cattle removed by APHA for TB control reasons in Bedfordshire, Cambridgeshire, and Essex, 2015 to 2020, by county.

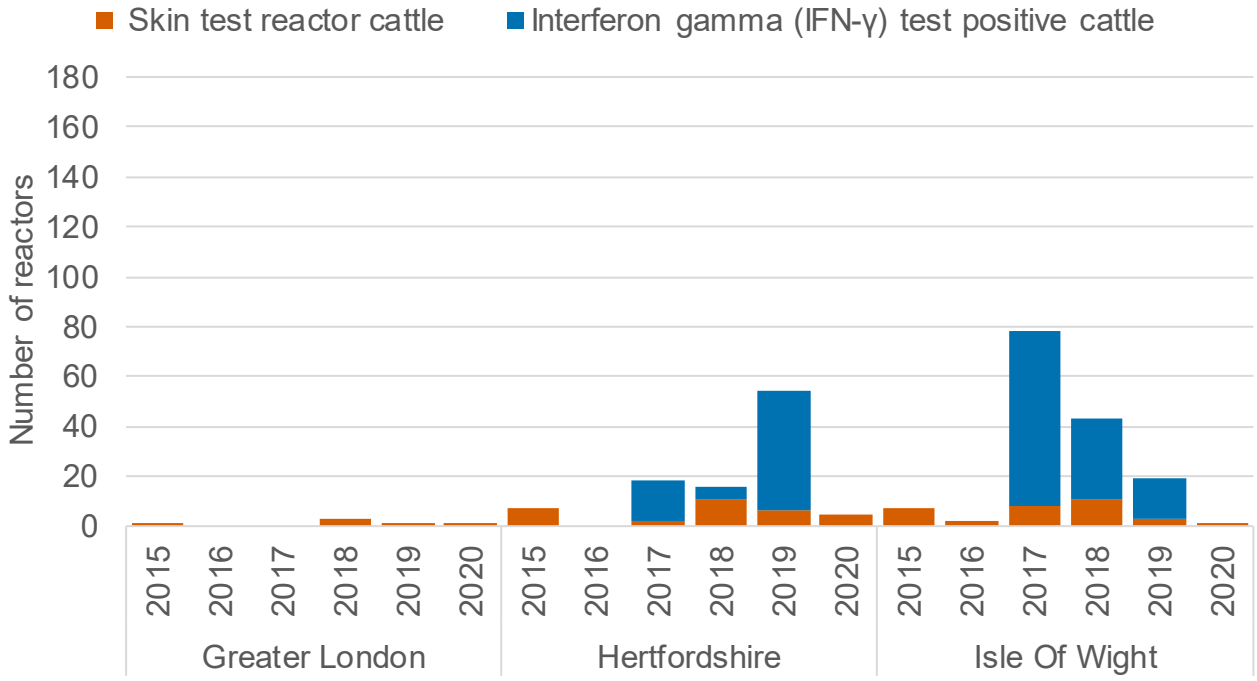

Figure 9b: Number of skin test reactors and interferon gamma (IFN-γ) test positive cattle removed by APHA for TB control reasons in Greater London, Hertfordshire, and the Isle of Wight, 2015 to 2020, by county.

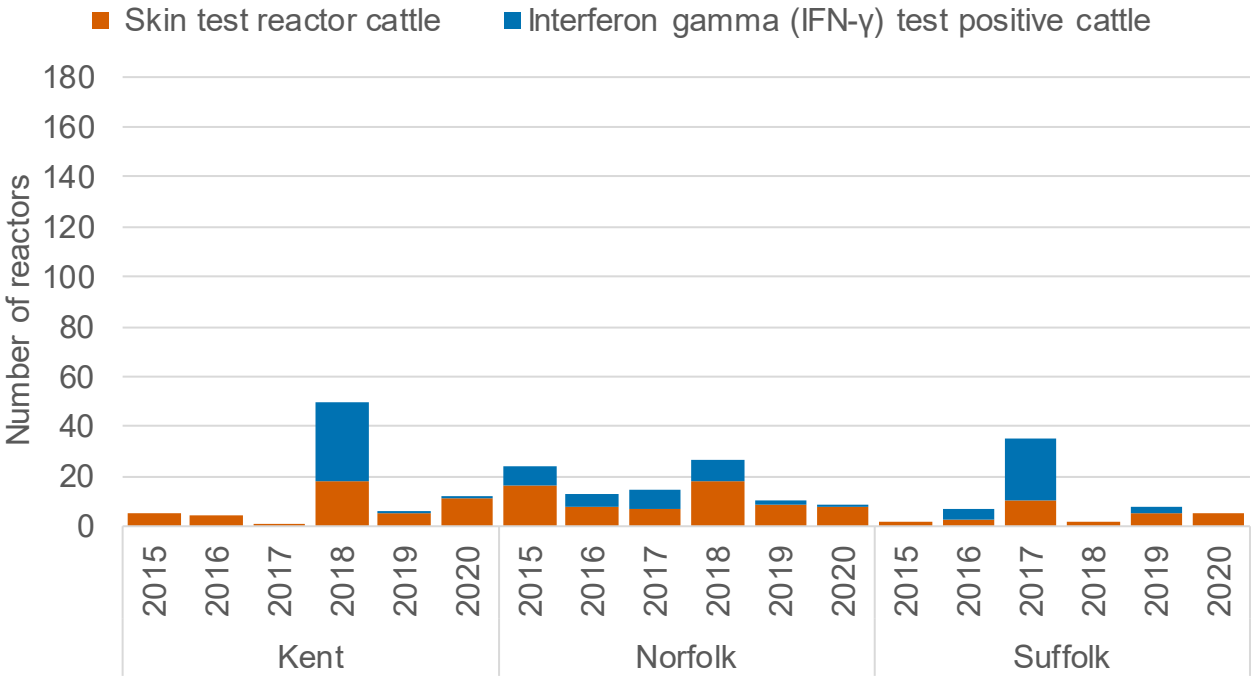

Figure 9c: Number of skin test reactors and interferon gamma (IFN-γ) test positive cattle removed by APHA for TB control reasons in Kent, Norfolk, and Suffolk, 2015 to 2020, by county.

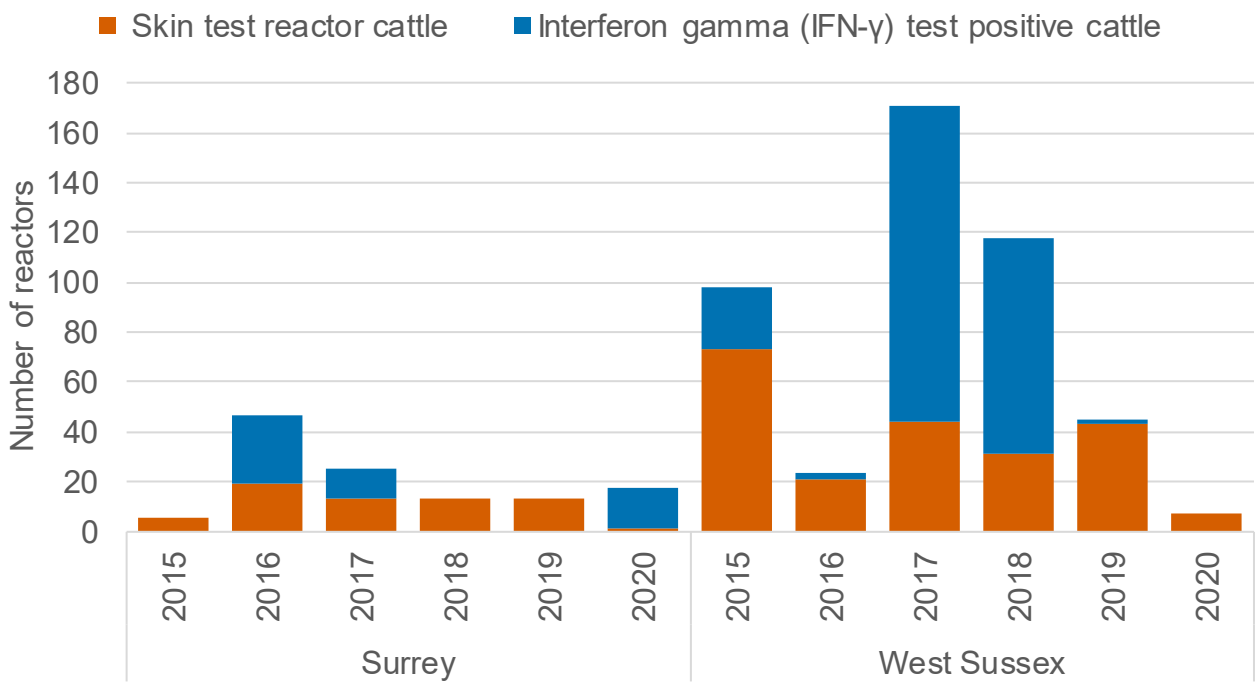

Figure 9d: Number of skin test reactors and interferon gamma (IFN-γ) test positive cattle removed by APHA for TB control reasons in Surrey, and West Sussex, 2015 to 2020, by county.

Summary of risks to the South East of England

The South East LRA counties are bordered by five adjacent counties in the Edge TB Area: Northamptonshire, Buckinghamshire, Berkshire, Hampshire, and East Sussex.

The risk of bovine TB spreading from Northamptonshire to the adjacent LRA counties of Cambridgeshire and Bedfordshire is currently low. Both of these counties have low cattle density and border the parts of Northamptonshire where cattle density is the lowest.

There is high cattle herd density in the western portions of Bedfordshire and Hertfordshire which border the Edge Area county of Buckinghamshire. Buckinghamshire could potentially pose a risk to the LRA counties exacerbated by the convoluted border shared with Hertfordshire to the East, which is partly embedded into the Edge Area. The four incidents in Hertfordshire (one OTF-W and three OTF-S) and Bedfordshire (one OTF-S and OTF-W) in 2020 were in the western part of these two counties, very close to the border with Buckinghamshire. These incidents have been attributed to movements of cattle with undisclosed infection.

West Sussex (five OTF-S) and Surrey (without bovine incidents in 2020) have higher cattle herd densities concentrated in their central and eastern sections, away from their county borders with the Edge Area counties of Berkshire and Hampshire. On the eastern and south-eastern boundaries of Berkshire, the M3 and M25 motorways may act as a physical barrier to the spread of infection through wildlife movements to the LRA.

Kent is contiguous to East Sussex (Edge Area), but there is no evidence to suggest the presence of a wildlife reservoir of infection in Kent. The few TB incidents detected each year in this county remain sporadic and mostly clearly attributed to purchased cattle. The majority of the incidents in East Sussex are concentrated in the southern part of the county (endemic TB area, formerly part of the HRA), away from the border with Kent and West Sussex. The endemic area of East Sussex remains relatively stable and there is little evidence to suggest that this area has expanded.

The infection front in west Berkshire has not advanced much in the last year and is still some 35km from the boundary with Surrey. Its advance to the east may be slowed by the presence of large conurbations such as Reading, Wokingham and Bracknell, where there are low cattle and wildlife densities.

The closest distance to Surrey from the endemic area for genotypes 10:a and 10:u in the north-west of Hampshire, is about 20km along the northern boundary of Hampshire. However, in the path of this infection front, if it continues to spread, is the large conurbation running south to north comprising Farnham, Aldershot, Farnborough, and Camberley. This may present a geographical barrier to wildlife spread and also has low cattle density.

There are no known endemic TB areas near the southern LRA counties apart from the East Sussex former HRA (now Edge Area), which is adjacent to West Sussex. The endemic area in the south of East Sussex remains stable and is further discussed in the East Sussex (Edge Area) county report. This generalisation is caveated by the very restricted wildlife surveillance limited to areas of enhanced surveillance (hotspot areas).

Purchase of cattle from markets and farms in the HRA and Edge Area for rearing and finishing in the southern counties poses the threat of introducing genotypes linked to endemic areas in England and Wales.

Summary of risks from the South East of England to surrounding areas

The southern LRA counties represent a low risk of TB to the surrounding areas. The counties with greater cattle herd densities (Norfolk, West Sussex, and Kent) are more likely to increase the potential risk to other surrounding counties in comparison to other counties with lower cattle densities.

Assessment of effectiveness of controls and forward look

Effectiveness of controls

Despite the current controls, there is sporadic introduction of TB into the region through the purchase of cattle with undisclosed TB infection. There is no evidence in 2020 to suggest

there is a wildlife reservoir of infection in the southern LRA counties. However, targeted active surveillance for TB infection in wildlife could be valuable in the areas of the southern LRA which border the Edge Area, especially if endemic infection has been reported in close proximity. The area most at risk is the border of West Sussex with the former HRA of East Sussex, although the likely endemic area is still some distance away.

The radial testing policy is helping to reduce the risk of lateral spread of TB and increases the likelihood of early detection of areas of endemic infection should they emerge. The radial test is a valuable surveillance test, considering that routine herd testing in the LRA is carried out every four years in most cases, with the potential to allow infection to spread within the herd and beyond during the period between tests.

The mandatory post-movement testing policy introduced in April 2016 for cattle entering farms in the LRA (to live) from the annual or six-monthly surveillance areas of England and Wales is now well embedded in the southern LRA region.

There are no known business or land (temporary land association) links which could facilitate the spread to the LRA.

Forward look

The recommendation would be to continue to utilise all control measures and to encourage biosecurity awareness through communications with the farmers' own veterinary providers and farming associations. More careful purchase of cattle is encouraged via the use of online interactive mapping tool set up to help cattle farmers and their vets understand the level of bovine TB in their area (ibTB mapping www.ibtb.co.uk).

Based on the current trends the southern LRA counties are likely to maintain their target of <0.1% of OTF-W incidence by 2025.

Appendices

Appendix 1: Overview of risk and surveillance areas of England and Low Risk Area objectives and controls

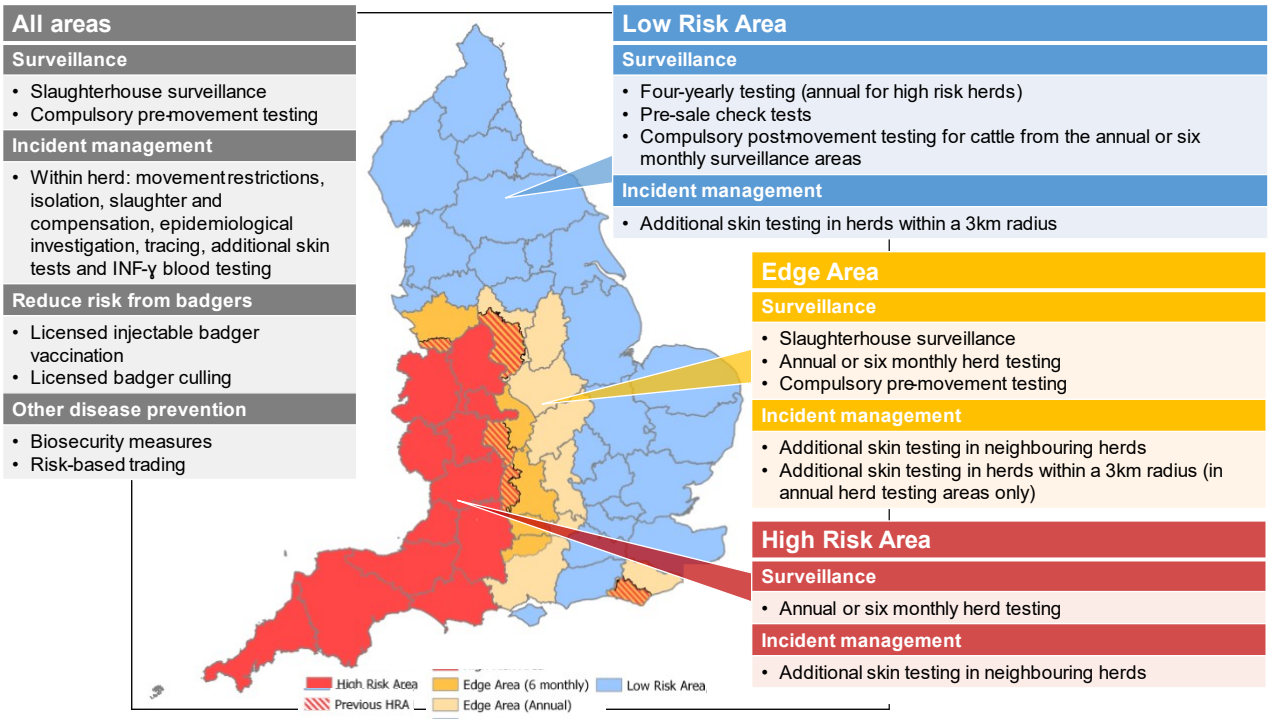

Figure A1: TB risk and surveillance areas of England effective since January 2018, as set out in the Government's Strategy for Achieving Officially Tuberculosis-Free Status for England. The map is described in more detail in the Explanatory Supplement for England 2020 (https://www.gov.uk/government/publications/bovine-tb-epidemiology-and-surveillance-in-great-britain-2020).

Policy objectives for the LRA

Progressive attainment of OTF status for individual counties (or groups of counties) within the current LRA, with the declaration of OTF status for all LRA counties by 2025. For more information about the government's strategy for achieving Officially Bovine Tuberculosis Free status for England, published in 2014 and independently reviewed in 2018, see:

https://www.gov.uk/government/publications/a-strategy-for-achieving-officially-bovine-tuberculosis-free-status-for-england

https://www.gov.uk/government/news/government-sets-out-next-phase-of-strategy-to-combat-bovine-tuberculosis

Key Control Measures in the Low Risk Area

Surveillance:

- default four-yearly routine surveillance (skin) testing of cattle herds, with annual testing for a small proportion of high risk herds
- voluntary pre-sale skin check tests
- compulsory pre- and post-movement testing for cattle entering farms in the LRA (to live) from the annual or six monthly surveillance areas of England and Wales
- additional targeted surveillance (radial testing) of cattle herds located within a 3km radius of new incident herds with OTF status withdrawn (OTF-W) following the detection of lesion-positive test reactors and/or culture-positive animals
- slaughterhouse (SLH) surveillance (through PM meat inspection) of all cattle slaughtered for human consumption

Management of incidents:

- herd movement restrictions, isolation and rapid slaughter of TB test reactors and any direct contacts with statutory compensation payments to farmers, epidemiological investigation, tracing tests (at severe interpretation), and short interval skin testing supplemented in all herds affected by OTF-W incidents with mandatory interferon gamma (IFN-γ) blood testing

TB controls in the wildlife reservoir (badgers):

- licensed injectable badger vaccination
- licensed badger culling in exceptional circumstances, where *M. bovis* infection has been confirmed in badgers and it has a clear epidemiologically link with a local cluster of TB in cattle (e.g., East Cumbria TB hotspot)

Other measures:

- biosecurity measures
- promotion of responsible sourcing of cattle (e.g., through the use of the ibTB online (www.ibtb.co.uk) mapping application)

Summary of enhanced TB control measures in this reporting area

There were no changes in routine skin herd testing surveillance policy in 2020.

Radial testing zones were triggered around 3 km of OTF-W incidents. This enhanced, targeted surveillance around OTF-W cattle herds has not disclosed further incidents to date, contrasting with 14 new incidents disclosed in 2019 (13 OTF-S and 1 OTF-W).

No exemptions were applied to the deployment of the IFN-γ blood test in eligible TB incident herds.

There were no known cases of human *M. bovis* infection in the region attributable to recent contact with infected animals.

There were no known non-specific or suspected fraudulent skin test reactors.

APHA held two stakeholder engagement meetings in January 2020 to discuss TB matters. The first one with Veterinary Practices and Farmers and secondly, with Local Authority, Trading Standards and Food Standard Agency.

Appendix 2: Cattle industry in the reporting area

Table A2.1 Number of cattle premises by size band in each county at 1 January 2020. (RADAR data)

Size of herds	Un*	1-50	51-100	101-200	201-350	351-500	501 +	Total number of herds	Mean herd size	Median herd size
Number of herds in Bedfordshire	0	90	32	15	6	2	3	148	69	36
Number of herds in Cambridgeshire	0	179	40	50	11	4	9	293	90	30
Number of herds in Essex	2	217	45	36	17	8	8	333	83	22
Number of herds in Greater London	3	45	2	4	2	0	0	56	31	8
Number of herds in Hertfordshire	3	143	32	20	8	2	1	209	51	22
Number of herds in the Isle of Wight	1	63	20	23	6	3	2	118	84	45
Number of herds in Kent	7	359	95	61	34	21	17	594	87	27
Number of herds in Norfolk	7	467	149	90	52	15	25	805	90	33
Number of herds in Suffolk	6	277	63	58	19	13	7	443	73	24
Number of herds in Surrey	1	186	26	31	22	8	10	284	95	22
Number of herds in West Sussex	3	211	60	64	27	13	16	394	103	38

*The number of herds with an undetermined size.

Table A2.2 Number of animals by breed purpose in each county at 1 January 2020.

Breed purpose	Beef	Dairy	Dual purpose	Unknown	Total
Number of cattle in Bedfordshire	7,663 (74%)	2,264 (22%)	303 (2%)	0	10,230
Number of cattle in Cambridgeshire	19,975 (75%)	5,519 (20%)	886 (3%)	0	26,380
Number of cattle in Essex	22,214 (79%)	4,445 (15%)	1,138 (4%)	3 (<0.1%)	27,800
Number of cattle in Greater London	1,259 (72%)	327 (18%)	141 (8%)	0	1,727
Number of cattle in Hertfordshire	8,250 (77%)	1,977 (18%)	456 (4%)	2 (<0.1%)	10,685
Number of cattle in the Isle of Wight	7,622 (76%)	2,214 (22%)	131 (1%)	1 (<0.1%)	9,968
Number of cattle in Kent	33,347 (64%)	17,675 (34%)	913 (1%)	1 (<0.01%)	51,936
Number of cattle in Norfolk	57,369 (78%)	12269 (16%)	3,014 (4%)	5 (<0.01%)	72,657
Number of cattle in Suffolk	22,858 (70%)	6,099 (18%)	3,275 (10%)	4 (<0.1%)	32,236
Number of cattle in Surrey	17,549 (65%)	7,938 (29%)	1,485 (5%)	0	26,972
Number of cattle in West Sussex	22,578 (55%)	16607 (40%)	1,547 (3%)	9 (<0.1%)	40,741

Appendix 3: Summary of headline cattle TB statistics

Table A3.1a Herd-level summary statistics for TB in cattle in 2020 in Bedfordshire, Cambridgeshire, Essex, and Greater London.

Herd-level statistics	Bedfordshire	Cambridgeshire	Essex	Greater London
(a) Total number of cattle herds live on Sam at the end of the reporting period	190	402	442	79
(b) Total number of cattle herds subject to annual TB testing (or more frequent) at the end of the reporting period (any reason)	27	23	14	14
(c) Total number of whole herd skin tests carried out at any time in the period	58	89	76	21
(d) Total number of OTF cattle herds having TB whole herd tests during the period for any reason	47	88	73	20
(e) Total number of OTF cattle herds at the end of the report period (i.e., herds not under any type of TB2 restrictions)	184	391	434	77
(f) Total number of cattle herds that were not under restrictions due to an ongoing TB incident at the end of the report period.	188	400	441	79
(g) Total number of new TB incidents detected in cattle herds during the report period	2	1	1	0
• OTF status suspended (OTF-S)	1	1	0	0
• OTF status withdrawn (OTF-W)	1	0	1	0
(h) Of the new OTF-W herd incidents, how many:				
• occurred in a holding affected by another OTF-W incident in the previous three years?	1	0	0	0
• could be considered secondary to a primary	0	0	0	0

Herd-level statistics	Bedfordshire	Cambridgeshire	Essex	Greater London
incident based on current evidence?				
• were triggered by skin test reactors or 2xIRs at routine herd tests?	0	0	0	0
• were triggered by skin test reactors or 2xIRs at other TB test types (forward and back-tracings, contiguous, check tests, post-movement, etc.)?	0	0	0	0
• were first detected through routine slaughterhouse TB surveillance?	1	0	0	0
(i) Number of new incidents revealed by enhanced TB surveillance (radial testing) conducted around those OTF-W herds				
• OTF-S	1	1	0	0
• OTF-W	0	0	0	0
(j) Number of OTF-W herds still open at the end of the period (including any ongoing OTF-W incidents that began in a previous reporting period)	1	2	1	0
(k) Number of OTF-W herds still open at the end of the period that are within a finishing unit	0	2	0	0
(l) New confirmed (positive *M. bovis* culture) incidents in non-bovine species detected during the report period (indicate host species involved)	0	0	0	0

Table A3.1b Herd-level summary statistics for TB in cattle in 2020 in Hertfordshire, Isle of Wight, Kent, and Norfolk.

Herd-level statistics	Hertfordshire	Isle of Wight	Kent	Norfolk
(a) Total number of cattle herds live on Sam at the end of the reporting period	262	142	721	1024
(b) Total number of cattle herds subject to annual TB testing (or more frequent) at the end of the reporting period (any reason)	31	18	71	28
(c) Total number of whole herd skin tests carried out at any time in the period	68	66	208	198
(d) Total number of OTF cattle herds having TB whole herd tests during the period for any reason	64	64	190	188
(e) Total number of OTF cattle herds at the end of the report period (i.e., herds not under any type of TB2 restrictions)	258	139	701	1,008
(f) Total number of cattle herds that were not under restrictions due to an ongoing TB incident at the end of the report period.	259	141	719	1,024
(g) Total number of new TB incidents detected in cattle herds during the report period	4	1	9	4
• OTF status suspended (OTF-S)	3	1	9	4
• OTF status withdrawn (OTF-W)	1	0	0	0
(h) Of the new OTF-W herd incidents, how many:				
• occurred in a holding affected by another OTF-W incident in the previous three years?	0	0	0	0
• could be considered secondary to a primary incident based on current evidence?	0	0	0	0

Herd-level statistics	Hertfordshire	Isle of Wight	Kent	Norfolk
• were triggered by skin test reactors or 2xIRs at routine herd tests?	0	0	0	0
• were triggered by skin test reactors or 2xIRs at other TB test types (forward and back-tracings, contiguous, check tests, post-movement, etc.)?	0	0	0	0
• were first detected through routine slaughterhouse TB surveillance?	0	0	0	0
(i) Number of new incidents revealed by enhanced TB surveillance (radial testing) conducted around those OTF-W herds				
• OTF-S	0	0	0	0
• OTF-W	0	0	0	0
(j) Number of OTF-W herds still open at the end of the period (including any ongoing OTF-W incidents that began in a previous reporting period)	1	0	0	0
(k) Number of OTF-W herds still open at the end of the period that are within a finishing unit	0	0	0	0
(l) New confirmed (positive *M. bovis* culture) incidents in non-bovine species detected during the report period (indicate host species involved)	0	0	0	1 (pig)

Table A3.1c Herd-level summary statistics for TB in cattle in 2020 in Suffolk, Surrey, and West Sussex.

Herd-level statistics	Suffolk	Surrey	West Sussex
(a) Total number of cattle herds live on Sam at the end of the reporting period	580	373	481
(b) Total number of cattle herds subject to annual TB testing (or more frequent) at the end of the reporting period (any reason)	24	37	57
(c) Total number of whole herd skin tests carried out at any time in the period	119	101	130
(d) Total number of OTF cattle herds having TB whole herd tests during the period for any reason	111	90	115
(e) Total number of OTF cattle herds at the end of the report period (i.e., herds not under any type of TB2 restrictions)	569	361	473
(f) Total number of cattle herds that were not under restrictions due to an ongoing TB incident at the end of the report period.	578	373	481
(g) Total number of new TB incidents detected in cattle herds during the report period	4	0	5
• OTF status suspended (OTF-S)	3	0	5
• OTF status withdrawn (OTF-W)	1	0	0
(h) Of the new OTF-W herd incidents, how many:			
• occurred in a holding affected by another OTF-W incident in the previous three years?	0	0	0
• could be considered secondary to a primary incident based on current evidence?	1	0	0

Herd-level statistics	Suffolk	Surrey	West Sussex
• were triggered by skin test reactors or 2xIRs at routine herd tests?	0	0	0
• were triggered by skin test reactors or 2xIRs at other TB test types (forward and back-tracings, contiguous, check tests, post-movement, etc.)?	0	0	0
• were first detected through routine slaughterhouse TB surveillance?	0	0	0
(i) Number of new incidents revealed by enhanced TB surveillance (radial testing) conducted around those OTF-W herds			
• OTF-S	1	0	3
• OTF-W	0	0	0
(j) Number of OTF-W herds still open at the end of the period (including any ongoing OTF-W incidents that began in a previous reporting period)	2	0	0
(k) Number of OTF-W herds still open at the end of the period that are within a finishing unit	1	0	0
(l) New confirmed (positive *M. bovis* culture) incidents in non-bovine species detected during the report period (indicate host species involved)	0	1 (alpaca)	0

Table A3.2a Animal-level summary statistics for TB in cattle in 2020 in Bedfordshire, Cambridgeshire, Essex, and Greater London.

Animal-level statistics (cattle)	Bedfordshire	Cambridgeshire	Essex	Greater London
(a) Total number of cattle tested in the period (animal tests, blood, and skin)	9513	10380	7221	811
(b) Reactors detected in tests during the year:				
• tuberculin skin test	1	1	1	0
• additional IFN-γ blood test reactors (skin-test negative or IR animals)	4	0	3	0
(c) Reactors detected during year per incidents disclosed during year	2.50	1.00	4.00	0.00
(d) Reactors per 1000 animal tests	0.53	0.10	0.55	0.00
(e) Additional animals identified for slaughter for TB control reasons (DCs, including any first-time IRs)				
• DCs, including any first-time IRs	0	0	0	0
• Private slaughters	0	0	0	0
(f) SLH cases (tuberculous carcases) reported by the Food Standards Agency (FSA) during routine meat inspection.	1	4	1	0
(g) SLH cases confirmed by culture of *M. bovis*	1	1	0	0

Note: (c) Reactors detected during year per incidents disclosed during year, reactors may be from incidents disclosed in earlier years, as any found through testing during the report year count here.
Note: (g) SLH cases confirmed by culture of *M. bovis*, not all cases reported are submitted for culture analysis. All cases reported are from any period prior to or during restrictions.

Table A3.2b Animal-level summary statistics for TB in cattle in 2020 in Hertfordshire, Isle of Wight, Kent, and Norfolk.

Animal-level statistics (cattle)	Hertfordshire	Isle of Wight	Kent	Norfolk
(a) Total number of cattle tested in the period (animal tests, blood, and skin)	6154	7807	20474	19577
(b) Reactors detected in tests during the year:				
• tuberculin skin test	5	1	12	8
• additional IFN-γ blood test reactors (skin-test negative or IR animals)	0	0	1	1
(c) Reactors detected during year per incidents disclosed during year	1.25	1.00	1.44	2.25
(d) Reactors per 1000 animal tests	0.81	0.13	0.63	0.46
(e) Additional animals identified for slaughter for TB control reasons (DCs, including any first-time IRs)				
• DCs, including any first-time IRs	0	0	1	0
• Private slaughters	0	0	3	0
(f) SLH cases (tuberculous carcases) reported by the Food Standards Agency (FSA) during routine meat inspection.	0	0	3	1
(g) SLH cases confirmed by culture of *M. bovis*	0	0	0	0

Note: (c) Reactors detected during year per incidents disclosed during year, reactors may be from incidents disclosed in earlier years, as any found through testing during the report year count here.
Note: (g) SLH cases confirmed by culture of *M. bovis*, not all cases reported are submitted for culture analysis. All cases reported are from any period prior to or during restrictions.

Table A3.2c Animal-level summary statistics for TB in cattle in 2020 in Suffolk, Surrey, and West Sussex.

Animal-level statistics (cattle)	Suffolk	Surrey	West Sussex
(a) Total number of cattle tested in the period (animal tests, blood, and skin)	11630	11046	23552
(b) Reactors detected in tests during the year:			
• tuberculin skin test	5	1	7
• additional IFN-γ blood test reactors (skin-test negative or IR animals)	0	17	0
(c) Reactors detected during year per incidents disclosed during year	1.25	0.00	1.40
(d) Reactors per 1000 animal tests	0.43	1.63	0.30
(e) Additional animals identified for slaughter for TB control reasons (DCs, including any first-time IRs)			
• DCs, including any first-time IRs	0	0	0
• Private slaughters	0	0	0
(f) SLH cases (tuberculous carcases) reported by the Food Standards Agency (FSA) during routine meat inspection.	1	0	1
(g) SLH cases confirmed by culture of *M. bovis*	0	0	0

Note: (c) Reactors detected during year per incidents disclosed during year, reactors may be from incidents disclosed in earlier years, as any found through testing during the report year count here.
Note: (g) SLH cases confirmed by culture of *M. bovis*, not all cases reported are submitted for culture analysis. All cases reported are from any period prior to or during restrictions.

Appendix 4: Suspected sources of *M. bovis* infection for all of the new OTF-W and OTF-S incidents identified in the report period

Each TB incident could have up to three potential risk pathways identified. Each risk pathway is given a score that reflects the likelihood of that pathway bringing TB into the herd. The score is recorded as either definite (score 8), most likely (score 6), likely (score 4) or possible (score 1). The source(s) for each incident are weighted by the certainty ascribed. Any combination of definite, most likely, likely, or possible can contribute towards the overall picture for possible routes of introduction into a herd. If the overall score for a herd is less than six, then the score is made up to six using the 'Other/Unknown Source' option. Buffering up to six in this way helps to reflect the uncertainty in assessments where only 'likely' or 'possible' sources are identified.

Table A4.1 combines the data from multiple herds and provides the proportion of pathways in which each source was identified, weighted by the certainty that each source caused the introduction of TB. The output does not show the proportion of herds where each pathway was identified (this is skewed by the certainty calculation). Genotyping of *M. bovis* isolates can be a powerful tool in identifying a likely source of infection, however genotypes are not determined for OTF-S herds. As a result of varying levels of uncertainty, only broad generalisations should be made from these data. A more detailed description of this methodology is provided in the Explanatory Supplement to the 2020 bovine TB epidemiology report for England (https://www.gov.uk/government/publications/bovine-tb-epidemiology-and-surveillance-in-great-britain-2020).

Table A4.1 Suspected sources of *M. bovis* infection for all the new OTF-W and OTF-S incidents identified in 2020.

Source of infection	Possible (1)	Likely (4)	Most likely (6)	Definite (8)	Weighted contribution
Badgers	6	1	0	0	5.5%
Cattle Movements	15	6	9	2	55.8%
Contiguous	4	0	0	0	2.2%
Residual Infection	1	1	0	0	2.8%
Domestic Animals	0	0	0	0	0.0%
Non-specific Reactor	4	0	1	0	5.5%
Fomites	6	0	0	0	3.2%
Other Wildlife	0	0	0	0	0.0%
Other or Unknown Source	2	0	1	0	25.1%

Please note that each TB incident could have up to three potential pathways so totals may not equate to the number of actual incidents that have occurred. Details of the methodology used to calculate the weighted contribution of the different suspected sources of *M. bovis* infection for all new incidents can be found in the main body of the report and in the Explanatory Supplement for England 2020 (https://www.gov.uk/government/publications/bovine-tb-epidemiology-and-surveillance-in-great-britain-2020).

Appendix 5: Assessment of the origin of (and potential for spread of infection from) all the new OTF-W incidents identified in the report period

A risk matrix was used to identify isolated incidents that were likely to have been introduced to the LRA by cattle movements, while not causing any onward local spread. The following two questions were considered for each incident, and a score attributed. TB incidents with a score of 1A, 1B or 2A may be removed from the county TB incidence calculations during an application for OTF status (but remain in the incidence calculations in this report).

What is the probability of *M. bovis* infection being introduced to the LRA via infected cattle movements?

1. Definite - for example, traced reactors found in the LRA OTF-W incident herd in question as a result of spread tracings from another TB incident herd, genotype/WGS linked.

2. Likely - for example, a Reactor or IR originated from a previous incident herd (and the genotype does not suggest otherwise), other cattle were moved into the herd from previous incident herd (but were subsequently slaughtered without testing), or the trading practice of herd provides likely evidence (purchasing large numbers of cattle from High Risk Area (HRA), or Edge Area, High and Intermediate TB areas of Wales, or from the island of Ireland).

3. Possible - not a closed herd, but cattle are purchased from the LRA, Scotland and/or EU Member States.

4. Not likely - indigenous infection is known in the locality, closed herd, genotype/WGS has been identified in local wildlife.

What is the probability of this being an isolated, sporadic ('one-off') incident, without secondary local spread from the index case?

A. Likely - no secondary incidents have been detected. There are **no** further incidents as a result of spread tracings anywhere and **no** genotype/WGS linked OTF-W incidents within 3km radial zone around the LRA OTF-W incident herd in question (or the 3km radial surveillance zone was not triggered).

B. Possible - no secondary incidents have been detected, but the dataset is incomplete. For example, incidents have occurred in the 3km radial zone, but only OTF-S ones, or, if OTF-W, they were of an unknown/different genotype.

C. Not likely - secondary spread from the index case, or exposure to a common wildlife source has occurred. For example, OTF-W incidents have occurred in the 3km zone linked by genotype or WGS, or there is known wildlife infection in the area with this genotype/close WGS.

Table A5.1 Risk matrix of the veterinary assessment of the origin of, and potential for spread of infection from, all the new OTF-W incidents identified in 2020.

	Probability of isolated, sporadic ('one-off') incident, without secondary local spread from the index case (A, B, C)		
Probability of *M. bovis* infection introduced through cattle movements (1, 2, 3, 4)	A. Likely	B. Possible	C. Not likely
1. Definite	1		
2. Likely	3		
3. Possible			
4. Not likely			

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