

**Bovine TB**

# **Badger control value for money analysis 2017**

**September 2017**

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# Summary

## Background

The 2011 Impact Assessment<sup>1</sup> on licensed badger control to address tuberculosis (TB) in cattle found that the costs were likely to marginally outweigh the financial benefits but with considerable uncertainty. This was particularly the case with policing costs where the weight given to such considerations was a matter of judgement for Ministers.

At the time no alternative option offered better value for money in the short to medium term, against a situation where the incidence of TB in cattle continued to rise, along with the costs to both government and farmers of dealing with it.

Piloting industry-led controlled shooting of badgers in Gloucestershire and Somerset in 2013 as a method of controlling TB in cattle was considered worthwhile to test assumptions around effectiveness, humaneness and safety and to improve our understanding of the potential long term cost-effectiveness of the approach. These pilots confirmed the assumptions and since 2013 licensed badger control has continued in Gloucestershire and Somerset, and was extended to Dorset in 2015. In 2016 seven additional areas were introduced, increasing momentum on the wider implementation of the policy.

Badger Control will be extended to eleven additional areas in the form of intensive culling. In addition, Gloucestershire and Somerset have now completed their four years of intensive culling and will be the first areas to start supplementary culling.

## Supplementary culling summary

Licensed Supplementary culling would take place in an area after successful completion of an intensive cull and is intended to maintain the predicted disease control benefits for a longer period of time. Supplementary culling should maintain the badger population at that achieved during the intensive cull, and therefore also keep the disease risk from wildlife in the area at a low level.

Supplementary culling is beginning in West Somerset and West Gloucestershire in 2017 and is expected to follow intensive culling in all other areas where an effective cull has been completed.

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<sup>1</sup> [Measures to address bovine tuberculosis in badgers: impact assessment](#). November 2011

## Costs and benefits of extending the current approach to a further eleven Intensive Culling areas and two Supplementary Culling areas

- Each new cull area is expected to deliver net benefits of **£1.09m** per area. This includes costs accrued over four years of culling and benefits accrued over eleven years in line with results from the Randomised Badger Control Trial.
- The future costs to government have been estimated at **£0.49m** per area over four years.
- Industry costs have been estimated at **£0.34m** per area over four years.
- The total quantified benefits are estimated at **£1.89m** per area over eleven years, based on the central results of the Randomised Badger Control Trial.

## Uncertainties

- The need for policing has been a feature of the policy to date due to the need to maintain public safety. It is likely that extending to eleven new areas will require a similar level of policing, at least in their initial year. However, police forces have consolidated their command and control structure for operations this year to reduce costs. It is a shared goal of Defra and the Home Office that policing should become business as usual for local police forces and attract no additional costs. Over time, following further successful badger control operations without security incident, we expect policing costs to disappear.
- The costs per area to government and industry presented here are lower than those observed in the ten badger control areas to date. Costs to government have fallen due to more cost-effective monitoring and policing. Costs to industry are expected to fall as lessons learnt over the last four years lead to efficiencies and improvements in operational delivery.
- The benefits per area presented here are lower than those presented in the 2016 VfM analysis. Defra now has more detailed data on the number of breakdowns in the new prospective cull areas (i.e. those that will start culling this year) and can apply this to inform the *breakdowns per KM<sup>2</sup> per year* value. This is a more accurate technique, presenting benefit values with higher confidence.
- The range in the quantified benefits takes account of scientific uncertainty around the impact of an effective cull in line with the Randomised Badger Culling Trial (RBCT). Any changes to the way badger control is delivered, the size of the control area, density of cattle or the baseline levels of TB will add further uncertainty which could mean greater or lower quantified benefits than those estimated here.

# Analysis of the costs and benefits of extending badger control in 2017

Defra's 2011 Impact Assessment set out the expected costs and benefits of licensed badger control to reduce TB in cattle. In 2013, licensed badger control was introduced in areas of Gloucestershire and Somerset, extended to Dorset in 2015 and then extended to seven additional areas in 2016. Based on this experience, this annex sets out an assessment of the costs and benefits of extending intensive culling to **eleven** additional areas and introducing supplementary culling in Somerset and Gloucestershire in 2017. Except where stated, all quantified costs and benefits per control area are presented in "present value" terms, which is calculated using a discount rate of 3.5% in line with HM Treasury Green Book guidance. **Table 1** illustrates the roll out over time.

**Table 1:** Roll out of badger control areas over time.

Year	Number of areas badger control introduced
2013	2
2014	0
2015	1
2016	7
2017	11

## The benefits of badger control

The benefits of badger control are the net reduction in the level of TB in cattle herds within and around control areas. They are estimated based on the impact of intensive culling observed in the RBCT over 11 years from the start of badger control<sup>2</sup>. These benefits are valued by the savings in disease control costs to farmers and Defra (i.e. taxpayers) through avoided cases of TB in cattle (breakdowns<sup>3</sup>).

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<sup>2</sup> Evidence on the effect of removing badgers on the incidence of TB in cattle from the three licensed areas is not yet available to inform this assessment.

<sup>3</sup> This assessment considers only confirmed cases of TB and excludes unconfirmed incidents because analysis of data from the RBCT did not identify any significant effect of badger culling on unconfirmed incidents.

**Table 2:** Estimated impact of badger control on the number of confirmed new TB incidents (compared to the baseline)

	<b>Pessimistic</b>	<b>Central</b>	<b>Optimistic</b>
<b>Within badger control areas</b>			
- during cull (years 1-4)	-12.4%	<b>-23.2%</b>	-32.7%
- post cull (years 5-11)	-10.9%	<b>-25.9%</b>	-38.4%
<b>Outside badger control areas (up to 2km from the boundary)</b>			
- during cull (years 1-4)	+56.0%	<b>+24.5%</b>	-0.6%
- post cull (years 5-11)	+26.4%	<b>-6.8%</b>	-31.2%

## The benefits of Supplementary Culling

The RBCT study quantified the benefits of Intensive Culling over an eleven year period (four years during the cull and a further seven years after the cull). The role of supplementary culling will be to preserve the benefits of intensive culling by maintaining the badger population at a similar or lower level than that achieved at the end of an effective intensive cull.

## Quantifying the average cost of a breakdown

A TB breakdown results in significant cost for both government and farmers as a result of disease control actions. The main control actions involve restricting movements of cattle from the herd, whole herd testing of cattle, slaughter of any cattle that react to the test and repeated testing and slaughter until the herd is cleared. The estimated average cost of a breakdown used in this assessment is **£18,745** split roughly equally between farmers and government. In practice there is a wide range in the scale, duration and cost of breakdowns. Many are minor but a small proportion are major, costly to farmers and government, and extremely disruptive to farm businesses. This assessment uses the average cost of a breakdown, but recognises the range that exists.

**Table 3:** Estimated average cost of a confirmed new TB breakdown in the High Risk Area of England (£, 2017 prices)

	<b>Government</b>	<b>Farmers</b>	<b>Total</b>
Testing	2,095	2,572	4,667
Slaughter Costs	6,419	6,893	13,312
Restrictions and Isolation	0	486	486
Administration	281	0	281
<b>TOTAL</b>	<b>8,795</b>	<b>9,950</b>	<b>18,745</b>

If the benefits of badger control in a new area are in line with the reduction in the level of TB observed over 11 years in the RBCT, they would be between **£0.39m** and **£3.06m** split between farmers and government. The central estimate is **£1.89m**.

These estimates are based on badger control taking place over an area of 489km<sup>2</sup> (the average size of the new areas in 2017) in the high risk area (HRA) of England with a rising baseline of new TB incidents of 0.55% per year. Each incident prevented due to badger control is valued according to the average cost of a breakdown in the HRA. Physical values on the duration and size of breakdowns are taken from the Animal and Plants Health Agency's (APHA) annual surveillance report. Costs to Defra are taken from appropriate financial sources in APHA whilst costs to farmers are estimated using a methodology established by Reading University<sup>4</sup>, inflated using appropriate price indices. All values are expressed in 2016 prices. See **Table 8** for a list of the main assumptions and sources used.

The quantified benefits presented here are lower per area than those estimated in the 2016 Value for Money analysis. This is the result of a number of changes to the underlying assumptions, but mainly due to being able to base the breakdown per Km<sup>2</sup> on the average in the cull areas in the past three years, rather than using the values from the 2011 impact assessment. This has given a much more accurate depiction of the current levels of TB in the cull areas and so the quantified benefits will be more accurate to these areas.

Qualitative evidence suggests that bovine TB can cause significant stress and ill health among the farming population. However, the impact of such stress is difficult to quantify or value. Studies looking at the social impacts of bovine TB have found self-reported stress among farmers. For example<sup>5</sup>, from a sample of 50 farmers interviewed in the South-West, 30 said their farm's TB breakdown had affected their own daily life, 20 that of their family or household, 10 their employees. Evidence suggests that a long period of time under movement restrictions is a significant contributor to stress across all farming groups. A standard questionnaire designed to identify psychiatric ill health found that farmers that have been under TB movement restrictions for a long period of time showed significantly higher levels of stress than farmers who had not experienced a TB herd breakdown.

## The costs of badger control

### To Industry

The main costs of badger control to farmer-led companies are surveying, preparation and coordination which includes communication, planning, support, management and

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<sup>4</sup> [Assessment of the economic impacts of TB and alternative control policies](#) - SE3112

<sup>5</sup> [Measures to address bovine tuberculosis in badgers: impact assessment](#). November 2011 (see paragraph 6.47)

administration; and delivery of badger control through a combination of controlled shooting and cage trapping and shooting which includes equipment and manpower.

Based on experience over three years and from discussions with farmers over the expected costs to new areas, the total cost to farmers of badger control over four years is estimated at **£340 thousand** per area in the central case.

**Table 4:** Estimated cost to farmers per licensed area (*£thousands*)

	Year 1	Year 2	Year 3	Year 4	Present Value
Cost per area	85	85	85	85	320

## To government

The main costs of badger control to Natural England are for processing licence applications and monitoring of compliance; the main costs to APHA relate to training and mentoring and advice; and local police forces incur costs in relation to maintaining public order and safety. All of these costs are met by taxpayers.

Costs to Natural England are based on the total cost of their licensing team, divided by the expected number of licensed areas per year. Costs are estimated at **£155 thousand** per area over four years in the central case.

Costs to APHA are based on actual costs in 2016. The expectation is that total costs will increase proportionately to the number of areas. Therefore, the cost per area will remain constant as new areas are added. The total costs to APHA are estimated at **£70 thousand** per area over four years in the central case.

Finally, Defra incurs additional costs related to equipment such as communications and positioning equipment. This is expected to cost **£10 thousand** per area over four years in the central case (costs are only incurred in year one when the equipment is purchased).

**Table 5:** Estimated cost to government per licensed area (*£thousands*)

	Year 1	Year 2	Year 3	Year 4	Present Value
APHA	17	17	17	17	65
Natural England	60	41	31	25	150
Defra (equipment)	10	0	0	0	8
<b>TOTAL</b>	<b>85</b>	<b>58</b>	<b>48</b>	<b>42</b>	<b>223</b>

The need for policing has been a feature of the policy to date due to the need to maintain public safety. It is likely that extending to eleven new areas will require a similar level of policing at least in their initial year. For the central case, we estimate that policing will cost **£255 thousand** per area over four years. These costs are based on actual and expected costs of policing in 2015 and 2016 respectively, and also assume that the Home Office

and Defra achieve the shared goal of business as usual policing by 2020 (i.e. no additional resource is provided by the police to support the culls).

**Table 6:** Estimated cost to government per licensed area (*£thousands*)

	Year 1	Year 2	Year 3	Year 4	Present Value
Policing Costs	190	65	0	0	255

Overall, we estimate that the total cost to government and farmers per area is **£0.8m** over 4 years in the central case.

## Total costs and benefits

The total costs are estimated at **£0.8m** per area in the central case. This compares to a total quantified estimated benefit of **£1.89m** per area in the central case (range between **£0.39m** and **£3.06m**).

The Net Present Value of Badger Control over an eleven year appraisal period is therefore estimated at **£1.09m** per area in the central case.

## Sensitivity Analysis

### Policing

The need for policing has been a feature of the policy to date due to the need to maintain public safety. It is likely that extending to eleven new areas will require a similar level of policing, at least in their initial year. However, police forces have consolidated their command and control structure for operations this year to reduce costs. It is a shared goal of Defra and the Home Office that policing should become business as usual for local police forces and attract no additional costs. Over time, following further successful operations without security incident, we expect policing costs to disappear. This ambition is factored into our central scenario.

However, in the scenario that we continue to incur policing costs over the next four years and potential efficiency gains are realised (we continue to incur costs at 2017 estimated level, a worst case scenario), we estimate that this would reduce the net benefit per licensed area to **£0.87m** in the central case.

### Roll out to additional areas over the 4 year period

A key contributing factor to the cost per area of badger control is the total number of areas being culled simultaneously. This is because most of the costs benefit from economies of scale; for activities such as licensing the costs per area are lower the greater the number of areas licensed. Defra has assumed in the central case that we will continue to roll out



intensive and supplementary culling to new areas over the four year period in which culling costs for the eleven areas starting in 2017 are accumulated.

## Cost of a breakdown

The estimated cost of a breakdown in the High Risk Area is central to quantifying the benefits of badger control. Defra continues to update our estimate based on the latest published data on breakdowns in the HRA. This includes inputs such as average length of movement restrictions, average number of reactors, average number of contiguous and trace tests triggered, administrative costs per breakdown to government and more. For this reason the average cost of a breakdown in 2017 differs slightly to that presented in the 2016 analysis.

## Baseline Incidence of TB

Future levels of TB prevalence in the absence of any Badger Control are uncertain. We have based our assumed level of TB prevalence growth on the most recent prevalence data, which has shown a levelling off of the disease in recent years. For this reason the assumed growth in the TB baseline is lower in this analysis than in the previous years (where it was assumed prevalence would increase by 1.35%). This analysis has assumed a baseline increase in TB cases in the counterfactual of 0.55% based on the average change in prevalence between 2011 and 2016.

Table 7: OTF-W Incidents in England<sup>6</sup>

Year	OTF-W Incidents	% Change
2010	2483	
2011	2628	5.84%
2012	2867	9.09%
2013	2806	-2.13%
2014	2789	-0.61%
2015	2896	3.84%
2016	2528	-12.71%
Mean		0.55%

<sup>6</sup> <https://www.gov.uk/government/statistics/incidence-of-tuberculosis-tb-in-cattle-in-great-britain>

## Perturbation

The RBCT suggested that badger control could lead to a relative increase in TB incidence (OTFW<sup>7</sup>) in cattle herds in the areas outside the licensed area due to the disruption of badger social groups – the so-called ‘perturbation effect’. The impact of perturbation is uncertain, with the central case using evidence of its effect from the RBCT. However, having hard boundaries to control areas, low cattle herd densities and biosecurity measures on farms around the licensed area could mitigate any negative effect.

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<sup>7</sup> This stands for “Officially TB Free Status Withdrawn”, which occurs the presence of TB in a herd is confirmed by APHA. [More information.](#)

## Assumptions and data sources

**Table 8:** Key assumptions and sources

Variable	Value	Source
<b>Costs</b>		
Training and mentoring costs to APHA per area	n/a	APHA advice based on experience to date, and the costs of activities in 2015 and 2016.
Natural England licensing and monitoring costs per area	n/a	Natural England accounts, divided by number of areas licensed in a given year
Equipment (e.g. GPS trackers)	n/a	Based on volumes and unit costs observed in licensed areas to date.
Policing	n/a	Based on the average cost of policing per area in 2015 and 2016
NFU costs	n/a	Based on total allocated funding for 2016/17 divided by total number of areas.
<b>Benefits</b>		
Area size	489km <sup>2</sup>	Based on the average size of the new badger control areas
Per annum change in TB breakdowns (baseline)	0.55%	Average annualised change in breakdowns base 2011-2016, from the National Statistics.
Breakdowns per km <sup>2</sup> in cull areas	0.084	Based on the average number of OTF-W incidents in the proposed new cull areas for the three years prior to culling starting.
Average cattle slaughter per breakdown	8.14	Bovine TB surveillance in Great Britain, 2016. (Based on HRA data).
Average days under restriction per breakdown	185	

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**Table 8:** Key assumptions and sources

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<b>Variable</b>	<b>Value</b>	<b>Source</b>
Cost of breakdown to government	£8,795	Expressed in 2016 prices. Cost to government based on characteristics of an average breakdown in the HRA and the cost of testing/admin concerned. Cost to farmers based on the Defra study " <a href="#">Assessment of the economic impacts of TB and alternative control policies - SE3112</a> "
Cost of a breakdown to farmers	£9,950	
<b>Miscellaneous</b>		
Discount rate for present values	3.5%	The <a href="#">Green Book: appraisal and evaluation in central government</a> . Last updated October 2015

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