Title: Removal of the pre-movement testing exemption for movements to and from common land **IA No:** 1526 **Lead department or agency:** Defra **Other departments or agencies:**	**Impact Assessment (IA)** **Date:** 23/10/2013 **Stage:** Consultation **Source of intervention:** Domestic **Type of measure:** Secondary legislation **Contact for enquiries:** TB Programme

Summary: Intervention and Options

RPC Opinion: N/A

Cost of Preferred (or more likely) Option				
Total Net Present Value	**Business Net Present Value**	**Net cost to business per year** (EANCB on 2009 prices)	**In scope of One-In, Two-Out?**	**Measure qualifies as**
£2.29	£0.69m	-£0.68m	Yes	In

What is the problem under consideration? Why is government intervention necessary?

Under Defra's TB pre-movement testing (PrMT) policy cattle moved from higher TB risk herds must be tested TB free before being moved. There are a small number of exempted movements one of which – movements to and from common land - represents a disease risk as potentially infected animals mix with non-infected ones. The spread of disease between farms is akin to an externality where the actions of a farmer with disease can lead to negative spillovers and costs to other farmers and Government.

What are the policy objectives and the intended effects?

Defra has committed to introduce measures - including enhanced pre-movement testing rules - to tackle TB in cattle. This includes removing pre-movement exemptions for cattle movements to and from common land which on the basis of veterinary advice increase disease risks.
Intended effects are: (i) reduce the risk of bovine TB spreading among cattle from higher TB risk herds (i.e. under annual routine testing) grazing on common land (ii) decrease the risk of disease spread within herds after they return to their original holding. Overall, the use of pre-movement testing should reduce the number and size (and so cost) of TB breakdowns within herds that use common land for grazing.

What policy options have been considered, including any alternatives to regulation? Please justify preferred option (further details in Evidence Base)

Option 0 – not removing any current pre-movement testing (PrMT) exemptions on common land in annually tested areas which is our business as usual (BAU) scenario.
Option 1 – Remove pre-movement exemptions for movements to and from common land.
Option 2 – Remove pre-movement exemption for movements to common land.
Option 3 – Remove pre-movement testing exemption for movements from common land.
The preferred option is Option 2: it allows cattle keepers to reduce costs of pre-movement testing to zero from year 1 (as opposed to Option 1) and also prevents additional breakdowns due to disease spread on common land (unlike Option 3).
Previous experience with a non-mandatory approach to pre-movement testing suggests that farmers are unlikely to do so voluntarily

Will the policy be reviewed? It will/will not be reviewed. **If applicable, set review date:** Month/Year

Does implementation go beyond minimum EU requirements?			Yes / No / N/A		
Are any of these organisations in scope? If Micros not exempted set out reason in Evidence Base.	**Micro** Yes/No	**< 20** Yes/No	**Small** Yes/No	**Medium** Yes/No	**Large** Yes/No
What is the CO_2 equivalent change in greenhouse gas emissions? (Million tonnes CO_2 equivalent)			**Traded:**	**Non-traded:**	

I have read the Impact Assessment and I am satisfied that, given the available evidence, it represents a reasonable view of the likely costs, benefits and impact of the leading options.

Signed by the responsible SELECT SIGNATORY: _____ Date: _____

Summary: Analysis & Evidence

Policy Option 1

Description: Remove pre-movement testing exemption for movements to and from common land.

FULL ECONOMIC ASSESSMENT

Price Base Year 2013	PV Base Year 2013	Time Period Years 10	Net Benefit (Present Value (PV)) (£m)		
			Low: -£1.30m	High: £3.36m	Best Estimate: £1.28m

COSTS (£m)	Total Transition (Constant Price)	Years	Average Annual (excl. Transition) (Constant Price)	Total Cost (Present Value)
Low	£78k	Year 0	£75k	**£0.65m**
High	£378k		£247k	**£2.26m**
Best Estimate	£158k		£123k	**£1.09m**

Description and scale of key monetised costs by 'main affected groups'

Cattle owners using common land in annually tested areas: In year 0, costs of PrMTs (vet fee, testing costs) and costs of administrative changes **£136k**, costs of PrMTs **£107k** in years 1-9.
Government: payment for tuberculin and cost of administrative changes **£22k** in year 0, payment for tuberculin £**16k** in years 1-9.
Over the appraisal's time period, discounted costs to cattle owners **£0.95m** and to government **£0.14m**

Other key non-monetised costs by 'main affected groups'

Cattle owners: potential source of stress to cattle.

Government: possible administration and enforcement costs as moves to and from common land are currently not recorded.

BENEFITS (£m)	Total Transition (Constant Price)	Years	Average Annual (excl. Transition) (Constant Price)	Total Benefit (Present Value)
Low	£70k	Year 0	£117k	**£0.96m**
High	£424k		£471k	**£4.01m**
Best Estimate	£213k		£284k	**£2.37m**

Description and scale of key monetised benefits by 'main affected groups'

Cattle owners using common land in annually tested areas: reduced TB breakdowns leading to avoided economic losses of infected animals, testing, isolation and movement restriction costs **£66k** in year 0, **£88k** in years 1-9.
Government: avoided compensation payments **£83k** in year 0, **£110k** in years 1-9; testing, slaughter, disposal and tracing costs **£64k** in year 0, **£86k** in years 1-9.
Over the period, **£1.63m** of discounted benefits would fall to Government and **£0.74m** to cattle owners.

Other key non-monetised benefits by 'main affected groups'

Cattle owners: reducing the level of disease in cattle has the potential to reduce spill-over into neighbouring farms and wildlife. Reduced health risks to cattle owners as bovine TB is a zoonotic disease. Increased information about disease status of animals on common land. Reduced stress to farmers, families and local communities as a result of fewer TB breakdowns.

Key assumptions/sensitivities/risks **Discount rate (%)** 3.5

25% of cattle keepers would not be able to substitute their PrMT for their annual routine test in year 0, and therefore pay for 2 additional tests. From year 1 onward all farmers would be able to substitute their routine test for one of PrMTs, incurring additional costs of 1 test only.
Each animal moves on and off common land once a year. Herds move roughly at the same time yearly.
Sensitivities: see section 9 for risks and assumptions.

BUSINESS ASSESSMENT (Option 1)

Direct impact on business (Equivalent Annual) £m:			In scope of OITO?	Measure qualifies as
Costs: £0.093m	Benefits: £0.072m	Net: - £0.021m	Yes	IN

Summary: Analysis & Evidence

Policy Option 2

Description: Remove pre-movement testing exemption for movements to common land.

FULL ECONOMIC ASSESSMENT

Price Base Year 2013	PV Base Year 2013	Time Period Years 10	Net Benefit (Present Value (PV)) (£m)		
			Low: £0.80m	High: £3.94m	Best Estimate: £2.29m

COSTS (£m)	Total Transition (Constant Price)	Years	Average Annual (excl. Transition) (Constant Price)	Total Cost (Present Value)
Low	£3k	Year 0	£0	**£3k**
High	£130k		£0	**£130k**
Best Estimate	£35k		£0	**£35k**

Description and scale of key monetised costs by 'main affected groups'

Cattle owners using common land in annually tested areas: In year 0, costs of PrMTs (vet fee, testing costs) and costs of administrative changes **£28k**, no costs of PrMTs in years 1-9.
Government: payment for tuberculin and cost of administrative changes **£7k** in year 0, no costs in years 1-9.

Over the appraisal's time period, discounted costs to cattle owners **£28k** and to government **£7k**.

Other key non-monetised costs by 'main affected groups'

Cattle owners: potential source of stress to cattle.

Government: possible administration and enforcement costs as moves to and from common land are currently not recorded.

BENEFITS (£m)	Total Transition (Constant Price)	Years	Average Annual (excl. Transition) (Constant Price)	Total Benefit (Present Value)
Low	£68k	Year 0	£114k	**£0.93m**
High	£417k		£464k	**£3.94m**
Best Estimate	£209k		£278k	**£2.33m**

Description and scale of key monetised benefits by 'main affected groups'

Cattle owners using common land in annually tested areas: reduced TB breakdowns leading to avoided economic losses of infected animals, testing, isolation and movement costs **£65k** in year 0, **£86k** in years 1-9.
Government: avoided compensation payments **£80k** in year 0, **£107k** in years 1-9; testing, slaughter, disposal and tracing costs **£64k** in year 0, **£85k** in years 1-9.
Over the period, **£1.61m** of discounted benefits would fall to Government and **£0.72m** to cattle owners.

Other key non-monetised benefits by 'main affected groups'

Cattle owners: reducing the level of disease in cattle has the potential to reduce spill-over into neighbouring farms and wildlife. Reduced health risks to cattle owners as bovine TB is a zoonotic disease. Increased information about disease status of animals on common land. Reduced stress to farmers, families and local communities as a result of fewer TB breakdowns.

Key assumptions/sensitivities/risks **Discount rate (%)** 3.5%

25% of cattle keepers would not be able to substitute their PrMT for their annual routine test in year 0, paying for additional test. From year 1 onward all farmers would be able to substitute their routine test for the PrMT, incurring no additional costs.
Each animal moves on and off common land once a year. Herds move roughly at the same time yearly.
Sensitivities: see section 9 for risks and assumptions

BUSINESS ASSESSMENT (Option 2)

Direct impact on business (Equivalent Annual) £m:			In scope of OIOO?	Measure qualifies as
Costs: £0.003m	**Benefits: £0.071m**	**Net: -£0.068m**	Yes	IN

Summary: Analysis & Evidence

Policy Option 3

Description: Remove pre-movement testing exemption for movements from common land.

FULL ECONOMIC ASSESSMENT

Price Base Year 2013	PV Base Year 2013	Time Period Years 10	Net Benefit (Present Value (PV)) (£m)		
			Low: -£0.06m	High: £0.13m	Best Estimate: £0.07m

COSTS (£m)	Total Transition (Constant Price)	Years	Average Annual (excl. Transition) (Constant Price)	Total Cost (Present Value)
Low	£3k	Year 0	£0	**£3k**
High	£130k		£0	**£130k**
Best Estimate	£35k		£0	**£35k**

Description and scale of key monetised costs by 'main affected groups'

Cattle owners using common land in annually tested areas: In year 0, costs of PrMTs (vet fee, testing costs) and costs of administrative changes **£28k**, no costs of PrMTs in years 1-9.
Government: payment for tuberculin and cost of administrative changes **£7k** in year 0, no costs in years 1-9.

Over the appraisal's time period, discounted costs to cattle owners **£28k** and to government **£7k**.

Other key non-monetised costs by 'main affected groups'

Cattle owners: potential source of stress to cattle.

Government: possible administration and enforcement costs as moves to and from common land are currently not recorded.

BENEFITS (£m)	Total Transition (Constant Price)	Years	Average Annual (excl. Transition) (Constant Price)	Total Benefit (Present Value)
Low	£5k		£8k	**£0.07m**
High	£13k		£15k	**£0.13m**
Best Estimate	£9k		£12k	**£0.10m**

Description and scale of key monetised benefits by 'main affected groups'

Cattle owners using common land in annually tested areas: avoided economic losses of infected animals **£3k** in year 0, **£4k** in years 1-9.
Government: avoided compensation payments **£6k** in year 0, **£8k** in years 1-9.

Over the period, **£34k** of discounted benefits would fall to Government and **£66k** to cattle owners.

Other key non-monetised benefits by 'main affected groups'

Cattle owners: reducing the level of disease in cattle has the potential to reduce spill-over into neighbouring farms and wildlife. Reduced health risks to cattle owners as bovine TB is a zoonotic disease.

Key assumptions/sensitivities/risks **Discount rate (%)** 3.5%

25 % of cattle keepers would not be able to substitute their PrMT for their annual routine test in year 0, paying for additional test. From year 1 onward all farmers would be able to substitute their routine test for the PrMT, incurring no additional costs.
Each animal moves on and off common land once a year. Herds move roughly at the same time yearly.
Sensitivities: see section 9 for risks and assumptions

BUSINESS ASSESSMENT (Option 3)

Direct impact on business (Equivalent Annual) £m:			In scope of OIOO?	Measure qualifies as
Costs: **£0.003m**	Benefits: **£0.003**	Net: **£0.0005m**	Yes	IN

1. Introduction

Bovine Tuberculosis (TB) is a serious infectious and zoonotic (transmissable to humans) disease of cattle. TB related controls cost government in the region of £100 million a year and are increasing. TB costs to farmers in England are estimated to be in the region of £75 million a year. In 2012 almost 5.9 million cattle were tested resulting in 3,900 new herd TB incidents, 6,950 herds under restriction and the slaughter of 28,000 animals[1].

Under Defra's pre-movement testing (PrMT) policy, cattle moved from higher TB risk herds (i.e. farmers within the annual testing counties of Berkshire, Buckinghamshire, Cheshire, Cornwall, Derbyshire, Devon, Dorset. Gloucestershire, Hampshire, Herefordshire, Worcestershire, Leicestershire, Northamptonshire, Oxfordshire, Avon, Shropshire, Somerset, Staffordshire, East Sussex, Warwickshire, Wiltshire and the West Midlands) must have had a clear TB test within the 60 days preceding the movement. Certain cattle movements are exempted from this rule in the TB Order. There are a small number of high risk herds (e.g. that have risky trading patterns) in the low risk areas that are placed on annual routine testing, these will also be subject to PrMT.

Expert veterinary advice is that one particular exemption – movements to/from common land – is unsafe, as it increases the risk of TB spread i.e. untested cattle within the annual testing area move to summer grazing on common land and potentially mix with other higher risk cattle before being moved back to the farm. The European Commission – who co-finance our TB eradication plan – have also expressed concerns about the 'common land exemption'.

2. Rationale for Government intervention

The spread of disease between herds and into wildlife is akin to an externality where the actions of one farmer with disease can lead to negative spillovers and costs to other farmers as well as to the tax payer. Requiring cattle keepers to test their animals prior to moves, and preventing those moves where disease is found, reduces this externality.

Additionally, alongside maintaining vigilance over risks to public health, the rationale for Government intervention is to mitigate the economic impact of the disease on the cattle farming industry, given the damage that can be done to farm businesses and farmers' livelihoods by TB breakdowns in their herds.

3. Policy objective and intended effect

Intended effects are: (i) reduce the risk of bovine TB spreading within and between higher TB risk cattle herds grazing and to wildlife on common land (ii) decrease the risk of disease spread within herds after they return to their original holding. Overall, the use of PrMT should reduce the number and size (and so cost) of TB breakdowns within herds that use common land for grazing.

4. Application and scope

The proposed changes will apply to cattle owners grazing animals on common land in annually tested areas in England only.

5. Considered options

Option 0 – not removing any current pre-movement testing exemptions on common land in annually tested areas which is our business as usual (BAU) scenario.

Option 1: Remove pre-movement testing exemption for movements to and from common land. This option will require cattle owners in annually tested areas to test their animals before they are moved to common land for grazing and after they return to the home farm.

[1] https://www.gov.uk/government/publications/incidence-of-tuberculosis-tb-in-cattle-in-great-britain

Option 2: Remove pre-movement testing exemption for movements to common land. This option will require cattle owners in annually tested areas to test their animals only before any move to common land. This is the preferred option.

Option 3: Remove pre-movement testing exemption for movements from common land. This option will require cattle owners in annually tested areas to test their animals when moved from common land back to the home farm.

6. Costs

The main impact of Options 1-3 on cattle keepers is that, as long as their herd is subject to annual TB surveillance testing and they use common land, they would have to arrange for PrMT. Where this would lead to additional testing, this would be largely funded by farmers.

The analysis below explains the calculation of cost in detail. Table 1 summarises the best estimates of the total costs of Options 1-3, separating costs to government and business.

Table 1 Summary of costs – best estimates

	Transitional costs (year 0)	Average annual costs (years 1-9)	Total costs (net present value)
Option 1	£158,000 (£136k business, £22k gov.)	£123,000 (£107K business, £16k gov.)	£1,094,000 (£953k business, £141k gov.)
Option 2	£35,000 (£28k business, £7k gov.)	£0	£35,000 (£28k business, £7k gov.)
Option 3	£35,000 (£28k business, £7k gov.)	£0	£35,000 (£28k business, £7k gov.)

Under existing arrangements the majority of the costs of PrMT are paid for by farmers. Our 'best' estimates show that cattle owners would pay around £4 per animal for vet fees along with costs of gathering, handling and any reduction in output of around £2.39 per animal.[2] Government pays roughly £1 per animal for tuberculin.[3] Table 2 sets out unit costs.

Table 2 Costs of pre-movement testing per animal

	Low estimates	Best estimates	High estimates
Business			
Vet fee	£ 3.0	£ 4.0	£ 8.0
Handling and gathering	£2.23	£2.39	£2.61
Government	£0.93	£0.93	£0.93

Using Farm Practice Survey (2010) data, we estimate around 16,800 cattle from annually tested areas (i.e. higher TB risk areas) graze on common land. Based on cattle census data, the average herd size in annually tested areas in England is around 150, which implies that around 110 agricultural holdings (businesses) would be affected. We expect these to be most likely beef farmers able to make use of summer grazing. These estimates are subject to significant uncertainty (reflected in the low and high scenarios) because cattle movements to and from common land are not currently recorded on the Cattle Tracing System. Table 3 shows the estimated number of cattle grazing on common land in annually tested areas across scenarios and the resulting number of agricultural holdings affected by this proposal.

Table 3 Cattle grazing on common land and agricultural holdings

	Low estimates	Best estimates	High estimates
Number of cattle	12,200	16,800	21,400

[2] For vet fees, we used PrMT review report, Phase 1 – Table 14 (2010) as the source. Regarding cots of gathering, handling and any reduction in outoput, we inflated farmers' costs of testing beef and dairy to 2013 prices using GDP deflator and Reading study (2004).

[3] See PrMT review report, Phase 1 – Table 14 (2010). This value was then inflated to 2013 prices using GDP inflator.

Agricultural holdings/businesses	**80**	**110**	**140**

Assuming each herd moves once on and once off common land (which is used for summer grazing) Option 1 could imply that each cattle owner would be required to pay for two additional PrMTs. However, farmers will be able to substitute their annual government-funded TB surveillance test for one of these additional tests. This in practice means that there would only be one extra test per year and this would be paid for by cattle keepers. To account for a transition period, the 'best estimate' below assumes that 25% of cattle keepers would not be able to switch their annual routine test for one of the PrMTs in year 0, therefore paying for two additional tests. From year 1 onward our 'best estimate' assumes that all farmers would be able to substitute their routine testing for a PrMT either to or from common land as testing dates are automatically allocated via AHVLA's 'Sam System'.

For Options 2 and 3 farmers would be subject to one PrMT only (either before the move to [Option 2] or from [Option 3] common land). Farmers would have to pay for one test less compared to Option 1. We assume that 25% of cattle keepers would not be able to substitute their PrMT for their annual routine test in year 0, therefore paying for one additional test. From year 1 onward our 'best estimate' assumes that all farmers would be able to substitute their routine test for the one PrMT, incurring no additional costs. We summarise estimates of additional PrMT in Table 4.

Table 4 Assumed number of additional tests per business

Option 1	Low estimates	Best estimates	High estimates
Year 0	1	1.25	1.5
Years 1-9	1	1	1
Option 2/3	Low estimates	Best estimates	High estimates
Year 0	0	0.25	0.5
Years 1-9	0	0	0

We expect that both farmers and AHVLA would bear costs for arranging PrMT (either re-arranging TB surveillance tests or additional PrMT) in year 0. For illustrative purposes we estimate this would take around one hour, including contacting AHVLA and any paperwork. Multiplying industry's labour wage costs[4] and AHVLA salary rates[5] with the number of agricultural holdings (Table 3) we estimate costs of arranging TB surveillance tests in year 0. These costs, which would be the same across different Options, are summarised in Table 5.

Table 5 Total costs of arranging TB surveillance test in year 0

Options 1-3	Low estimates	Best estimates	High estimates
Business	**£900** (£11.3 per hour)	**£1,300** (£12.2 per hour)	**£2,600** (£18.3 per hour)
Government	£1,600 (£20 per hour)	£2,500 (£23 per hour)	£3,800 (£27 per hour)
Total	£2,500	£3,800	£6,400

The removal of PrMT exemptions may decrease the number of cattle grazing on common land due to the costs of testing or increase the number since those farmers not currently using their grazing rights may be encouraged by the greater disease freedom security that PrMT offers. As the effect is not known the number of cattle grazing on common land in years 1-9 is unchanged.

Table 6 shows current estimates of the overall cost of Options 1-3 in the first year, both for businesses and government. Since these costs are for the transition period we expect costs in future years to be lower. We show Options 2 and 3 together because they both imply the same number of additional PrMT, differing only in the time of testing.

[4] John Nix Farm Management Pocketbook 2013, inflated by 30% to include non-wage costs etc.

[5] EO grade, inflated by 30% to include non-wage costs etc.

Table 6 Total costs of Options 1-3 in year 0

Option 1	Low estimates	Best estimates	High estimates
Business	**£64,500**	**£135,600**	**£343,800**
Government	£13,000	£22,100	£33,800
Total	£77,500	£157,700	£377,600
Option 2/3	Low estimates	Best estimates	High estimates
Business	**£ 900**	**£28,200**	**£116,300**
Government	£ 1,600	£6,400	£13,800
Total	£ 2,500	£34,600	£130,100

Table 7 shows annual costs in years 1 to 9 under Options 1-3.

Table 7 Total costs of Options 1-3 in years 1-9

Option 1	Low estimates	Best estimates	High estimates
Business	**£63,600**	**£107,400**	**£227,500**
Government	£11,300	£15,700	£20,000
Total	£74,900	£123,100	£247,500
Option 2/3	Low estimates	Best estimates	High estimates
Business	**£ -**	**£ -**	**£ -**
Government	£ -	£ -	£ -
Total	£ -	£ -	£ -

Unquantified costs

There may be administration and enforcement costs to Government as moves to and from common land are currently not recorded. Further, additional testing may cause stress to cattle.

7. Benefits

The benefits of removing PrMT exemptions are the savings in costs both to Government and cattle owners of bovine TB control measures through the reduction in size and frequency of TB breakdowns. For Government these are avoided compensation, testing, tracing, slaughter and haulage costs. For cattle keepers, there are avoided isolation and economic losses of infected animals, movement restrictions and testing costs.

The 'best' benefits of Options 1-3 are summarised in Table 9.

Table 9 Summary of benefits – best estimates

	Transitional benefits (year 0)	Average annual benefits (years 1-9)	Total benefits (net present value)
Option 1	£172,000 (£54k business, £118k gov.)	£229,000 (£71k business, £158k gov.)	£1,914,000 (£596k business, £1,318k gov.)
Option 2	£163,000 (£51k business, £112k gov.)	£217,000 (£67k business, £150k gov.)	£1,814,000 (£563k business, £1,251k gov.)
Option 3	£9,000 (£3k business, £6k gov.)	£12,000 (£4k business, £8k gov.)	£100,000 (£33k business, £67k gov.)

PrMT delivers 2 main quantified benefits.

(i) Testing animals prior to any move to common land will reduce the risk of infected animals mixing with uninfected herds and causing new TB breakdowns (Option 1 and 2).

(ii) Testing animals returning from common land will reduce the risk of infected animals spreading disease within their own herd which leads to a greater number of infected animals when disease is found (Option 1 and 3).

Ad (i): Avoiding new bTB breakdowns

When estimating (i), we compare the business as usual (BAU) scenario with the case of PrMT before moving to common land. We apply results of the veterinary risk assessment on PrMT to estimate that within 16,806 cattle grazing on common land each year there could be 22 reactors and converted inconclusive reactors (IRs) that could have been found if PrMT had been used.[6] Assuming that PrMT's sensitivity is 75%[7] this implies that there could be roughly 29 infected animals going to common land under BAU. These animals would be grazing on common land with TB free herds and we expect that this will lead to new bovine TB breakdowns as infection spreads to uninfected herds. We used the transmission rate from the Conlan et al. SOR model to estimate that each of the 29 infected animals would pass disease to an average of 0.97 animals in a six month period, resulting in 29 newly infected animals.[8] Assuming the number of new infections per infected animal follows the Poisson distribution and assuming that on average four herds are freely mixing on common land, these 29 new infected animals will be distributed among roughly 19 new herds as each originally infected animal will infect 0.65 new herds at common pasture. We conclude that there are 19 new breakdowns under BAU each year.

By using PrMT before moving animals to common land, 22 infected animals could be found but around 7 infected animals would still move onto common land. These 7 animals would spread disease as previously described, resulting in 4.8 new breakdowns in previously TB free herds. This suggests that using PrMT before moving to common land minimises disease spread on common land and helps to avoid 14.2 (19 – 4.8) new breakdowns in TB free herds. Since PrMT is not perfect at finding disease we assume that 75% of avoided breakdowns would be found in the first year (10.7) and the remainder (3.6) in the year after.

Since our knowledge of other aspects influencing disease spread, such as disease status of wildlife or trade patterns, on farms is limited we follow the same approach in each of the ten years.

These are the benefits associated with Option 1 and 2 as both include PrMT before moving to common land.

Ad (ii): reduced size of bTB breakdowns

For (ii) the main benefit of PrMT is the reduction in the size of breakdowns in already infected herds. For herds moving from common land, any infected animals could pass infection to other animals within the herd and increase the size of a TB breakdown when it is found, potentially at the next test. PrMT before moving back to common land therefore reduces the potential for disease to spread and so the size of breakdowns.

Under BAU around 36 (29 original and 7 new infections) infected animals go back to farms from where the disease was originally taken to common land.[9] There is uncertainty over when these animals would be next tested, but given the majority of routine TB testing is done in the winter we can expect that these animals have on average three months before a routine test. Based on the SOR model this could result in a further 7 animals being infected. In total, 44 animals might be infected and routine testing may find around 33 infected animals.

When estimating the benefits of Option 1 we look at the difference between the number of reactors at originally infected farms under BAU and under PrMT before and after the move to common land. This is because benefits experienced by originally TB free farms are already counted for by section (i). This means that while 33 reactors are found under BAU, the use of two PrMTs could remove 29 reactors from

[6] The VRA reports that between 1st September 2005 and 30th March 2011, there were 1,729,444 PrMTs in England, finding 1,781 reactors and 2,448 IRs. Further, PrMT review Phase 1 (2010, p.51) argues that 20% of IRs were slaughtered as reactors. Thus, total number of infected animals is estimated as: 16,806 x (1,781/1,729,444 + 0.2 x (2,448/1,729,444)) = 22.1.

[7] Karolemeas K, de la Rua-Domenech R, Cooper R, Goodchild AV, Clifton-Hadley RS, et al. (2012) Estimation of the Relative Sensitivity of the Comparative Tuberculin Skin Test in Tuberculous Cattle Herds Subjected to Depopulation.

[8] Conlan AJK, McKinley TJ, Karolemeas K, Pollock EB, Goodchild AV, et al. (2012) Estimating the Hidden Burden of Bovine Tuberculosis in Great Britain. Our estimation assumes that cattle spend on average 6 months on common land and that 330 animals are grazing on common land.

[9] As in (i), 29 initially infected animals spread disease to other 29 animals, where now 7 of those animals are within their herds on common land. In total, 36 infected animals return to already infected farms.

originally infected herds.[10] Therefore option 1 could avoid 4 (33 - 29) reactors in total. As previously, we assume that 75% of these reactors could be found in the first year (3) with the remainder in the second year (1).

For Option 3, we look at the number of reactors found through routine testing at both originally infected and uninfected farms under BAU. This is compared this to the number found under the use of PrMT after the move to common land. The scenarios are identical until the point of applying PrMT before moving animals back to farms. While 52 reactors could be found under BAU, only 44 reactors might occur under Option 3.[11] This means that Option 3 could help to avoid 8 (52 - 44) reactors. Again, 75% of these reactors could be found in the first year (6) and the remainder in the next year (2).

The benefits of each option vary depending upon the combination of testing options used. Table 10 describes monetised benefits of Options 1-3.

Table 10 Monetised benefits

	Benefits	**Business**	**Government**
Option 1	Avoided breakdowns in herds TB free before move to common land & reduced size of breakdowns in infected herds	Breakdown costs: testing; isolation of infected animals; costs of restricted movements; economic loss Reduced size of breakdowns: less infected animals resulting in lower economic losses	Breakdown costs: TB test costs; haulage, slaughter and disposal of infected animals, cost of tracing etc. Reduced size of breakdowns: less infected animals resulting in lower compensation costs
Option 2	Avoided breakdowns in herds TB free before move to common land	Breakdown costs: testing; isolation of infected animals; costs of restricted movements; economic loss	Breakdown costs: TB test costs; haulage, slaughter and disposal of infected animals, cost of tracing etc.
Option 3	Reduced size of breakdowns in all infected herds	Reduced size of breakdowns: less infected animals resulting in lower economic losses	Reduced size of breakdowns: less infected animals resulting in lower compensation costs

Monetised benefits are driven by the following factors: number of cattle, months spent grazing on common land, sensitivity of PrMT (likelihood of recognising TB infection), rate of disease spread between animals, likelihood of disease spread to uninfected herds on common land and average costs of a TB breakdown and infected reactors. Table 11 shows these values for the 'best scenario' along with high and low estimates. .

Table 11 Assumptions used in estimating the benefits of PrMT on common land

Variable	**'Best' value (low-high)**	**Source**
Number of cattle grazing on common land	16,806 (12,170-21,442)	Farm practice survey (2010)
Average number of months spent on common land	6 (5-7)	Expert advice
Sensitivity of PrMT	75% (60-90%)	*Estimation of the Relative Sensitivity of the Comparative Tuberculin Skin Test in Tuberculosis Cattle Herds Subjected to Depopulation*
Share of beef and dairy cattle	80%/20% (90%/10%-70%/30%)	Expert advice
Number of infected animals on common land by an infected animal	0.97 (0.81-1.14)	SOR model
Number of infected animals at	0.20	SOR model

[10] 22 found by PrMT before move to and 7 by PrMT after move from common land.

[11] Under BAU/Option 3, 33/28 reactors would be found on original farms and 19/16 on previously TB free farms.

a home farm by an infected animal	(0.24-0.17)	
Probability of disease spread to uninfected herds on common land	64.7% (38.5%-80%)	Derived using results from the SOR model.
Average number of herds mixing on common land	4 (2-10)	Assumption

Table 12 itemises the costs of a TB breakdown, both to cattle keepers and government, which was used in the 'best' scenario. It estimates the average cost of a TB breakdown to be around £19,500 for cattle grazing on common land. The benefits of a reduced size of a TB breakdown are around £1,400 per reactor.[12]

Table 12 'Best' estimate of costs of a TB breakdown (low-high)

	Business	**Government**	**Total**
Infected animals	£3,800 (economic loss) (£3,500-£4,000)	£7,500 (compensation net of salvage) (£6,700-£8,300)	**£11,300** (£10k-£12k)
Movement restriction	£470 (£530-£420)	N/A	**£470** (£530-£420)
Isolation	£200 (£207-£199)	N/A	**£200** (£207-£199)
Testing	£1,600 (gathering and handling) (£1,500-£1,700)	£3,500 (TB tests) and £440 (Tuberculin tests) (no range)	**£5,540** (£5.4k-£5.6k)
Tracing	N/A	£1,100 (tests) and £130 (animals) (no range)	**£1,230** (no range)
Other (haulage, slaughter, disposal, disease report form, advice guidance)	N/A	£270, £340, £50, £13, £200 (no range)	**£873** (no range)
Total	**£6,070** (£5.7k-6.3k)	**£13,543** (£12.7k-£14.3k)	**£19,613** (£18.5k-£20.7k)

Table 9 above shows the total estimated benefits by option.

Unquantified benefits

Reducing the level of disease in cattle has the potential to reduce spill-over into neighbouring farms and wildlife. It may also reduce health risks to cattle keepers as bovine TB is a zoonotic disease. This will also help to reduce stress to farmers, their families and local communities as a result of fewer TB breakdowns.

Options 1 and 2 could also increase information about the disease status of animals on common land.

8. Cost-benefit analysis

Applying the 'best' estimates of costs and benefits from previous sections Table 13 shows total net benefits (present value) over a 10-year appraisal period under each option both to businesses and government along with 'Equivalent Annual Costs to Business' (2009 prices, 2010 present value base year).

Table 13 'Best' estimates of net present benefits and equivalent annual costs to businesses (low/high)

	Net present benefits	Business	Government	EANCB

[12] We estimate that cattle owners lose roughly £457 and government pays around £907 in compensation (net of salvage) per reactor.

Option 1	£1,277,000 (-£1.3m – £3.4m)	-£216,000 (-£1.8m – £0.7m)	£1,493,000 (£0.5m – £2.7m)	£21,200 (£173k – -£67k)
Option 2	£2,291,000 (£0.8m – £3.9m)	£693,000 (£0.2m – £1.2m)	£1,598,000 (£0.6m – £2.7m)	-£67,900 (net benefit) (-£17k – -£119k)
Option 3	£65,000 (-£61k – £125k)	£5,000 (-£92k – £40k)	£60,000 (£31k – £85k)	-£500 (net benefit) (£9k – -£4k)

9. Risks and assumptions

Risks

In the case of not removing PrMT exemption in higher TB risk areas (i.e. annually tested), the BAU scenario may result in an increasing number of TB breakdowns and a larger size of TB breakdowns. This translates to increased compensation and testing costs for Government and negative economic impacts, such as trading restriction, for cattle owners.

Assumptions

On the costs side, the main assumption is related to the number of additional tests in Years 0 and 1-9. For more details see Table 4.

For benefits, we summarised the main driving assumptions in Table 11.

10. Wider impacts

Economic impacts

Competition assessment

Although cattle owners in annually tested areas would face initial costs of PrMT in year 0 we expect that the benefits of disease free common land would outweigh any potentially negative impacts on their competitiveness in following years.

Small Firms

The proposed measures do not discriminate between large and small businesses but focus on those whose business is most affected by bovine TB issue.

Environmental impacts

Greenhouse gases

Since we do not expect cattle owners to change the number of animals owned there is likely to be no impact on greenhouse gas emissions (i.e. methane emisssions).

Social impacts

Options 1 and 2 could reduce stress to farmers, families and local communities as a result of fewer TB breakdowns. bTB and its control has a significant impact on the health and wellbeing of farmers, their families and farming communities. The Farm Crisis Network found that bTB can cause stress within farming families.[13]

[13] Farm Crisis Network (2009). Stress and Loss: a report on the impact of bovine TB on farming families. Available at: http://www.tbfreeengland.co.uk/assets/4200

11. Summary and preferred option

Option 2 - removing PrMT for movements to common land – is our preferred option. While it allows cattle keepers to reduce costs of PrMT to zero from year 1 (as opposed to Option 1) it also prevents additional breakdowns due to disease spread on the common land (unlike Option 3) which is the main source of monetised benefits. As a result, this option delivers the highest overall net present benefits (£2.3m) and net annual benefits to businesses (£68,000 per annum).