



## **The potential for spills and leaks of hydraulic fracturing related fluids on well sites and from road incidents.**

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The potential growth of shale gas developments within Europe has raised concerns of the possibility of spills and leaks from shale gas sites and from liquid transportation via roads and pipelines. Data from a range of sources has been examined to estimate the likelihood of an incident. From the US, the Texas Railroad Commission and the Colorado Oil and Gas Commission have maintained records of the quantity; reasons for the spill; and reported impacts. For the UK, the Environment Agency pollution incident database and transport statistics from the UK's Department for Transport have also been analysed and used as an analogy to determine the likelihood of an incident or spill on the road. Data were used as an analogue to predict the potential number of spills and leaks that might occur at a well site, or in transport operation, under different shale gas development scenarios if fracking was to go forward in the UK.

Since 2014 the Colorado Oil and Gas Commission has recorded 3874 spills in the State of Colorado, the majority of these (1941) consisted of produced water, whereas 835 recorded oil spills. Of all the spills recorded 1809 spilt more than 0.79 m<sup>3</sup>, with 1356 of these leaking outside the berm of the well site, and three sites requiring construction of an emergency pits to contain the spillage. During 2015, there were 53054 active wells; the percentage of produced oil spilt was 0.001%, whilst the percentage of produced water spilt was 0.009%. Data from the Texas Railroad Commission shows the number of reported spills over 0.16 m<sup>3</sup> in Texas since 2009 has increased year on year, with 675 reported in 2009 and 1485 in 2015. The greatest loss each year was of crude oil, with 14176 m<sup>3</sup> being spilt in 2015, which is equivalent to 0.0089% of the oil produced. Clean-up operations recover some of the lost fluid; however, much is left unrecovered, annually 60% of the crude oil spilt is recovered, 65% of production fluid is recovered, whereas just 30% of liquid gas is recovered. The most common cause of leakage each year is equipment failure; these results highlight the need for good regulation and maintenance onsite.

The UK's Institute of Directors suggests several shale gas production scenarios for the UK and how this would influence truck movement. One of their scenarios suggests the development of well pads with 10-wells and 40 laterals (one well pad with 10 well each with 4 laterals). This type of well pad would be projected to use 544,000 m<sup>3</sup> of water, which would generate between 11155-31288 truck movements over 20 years, or 6.1-17.1 per day if averaged over 5 years. Dairy farmers in the UK produce 11 million m<sup>3</sup> of milk a year, which if the tanker has a capacity of 30 m<sup>3</sup>, equates to approximately 366667 milk tanker journeys a year. This study assesses the number of road incidents and milk tanker spills and predicts the likelihood of such events for fluids involved in hydraulic fracturing.