



## #4 - Gas Leak at North Sea Elgin Platform

Posted by [JoulesBurn](#) on December 30, 2012 - 3:40pm

*The Oil Drum staff wishes Happy Holidays to all in our readership community. We are on a brief hiatus during this period, and will be back with our regular publications early in the new year. In the meantime, we present the top ten of best read Oil Drum posts in 2012. The seventh in this series is a post by JoulesBurn on [the North Sea Elgin gas leak](#) which took the news headlines in March 2012. [The leak was successfully plugged May 15, 2012, and a permanent plug was put in place in September.](#)*

A crisis situation has developed at a gas and condensate production platform in the Elgin field in the North Sea. [Gas is leaking](#) out of a well near a offshore platform at a rate of approximately 2 kilograms per second (12 MMCF/day if gas), and a large sheen (assumed to be condensate) has been observed on the water. All workers on Total's Elgin PUQ (production-utilities-quarters) Platform plus those on the Rowan Viking drilling rig, which had been working next to it, have been [evacuated](#). On Monday, workers on a platform and drilling rig at the Shell-operated Shearwater field (4 miles / 6.4 km away) were also evacuated. There is currently a two-mile vessel exclusion zone around the site and a no-fly zone. As current winds are light, the most immediate concern is the potential for explosion both at the PUQ and elsewhere. While it is possible that the leak rate will lessen over time, the Rowan Gorilla V jack-up drilling rig is being provisioned by Total for a [possible relief well](#) that could take [months](#) to drill.

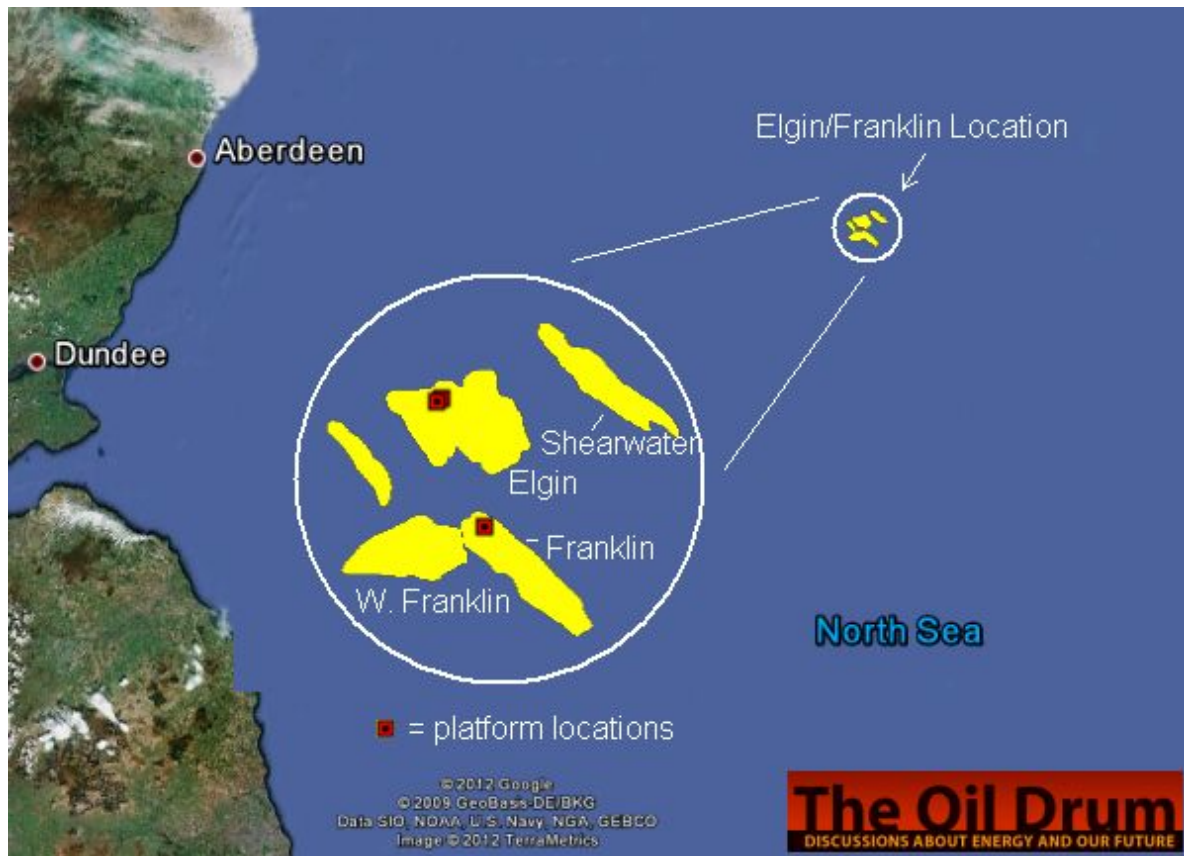


### The Where

Elgin is a high temperature/high pressure (HT/HP) gas field in the middle of the North Sea between Scotland and Norway at an ocean depth of about 90 meters. The reservoir is about 5500 meters deep with temperatures near 190°C and 1100 bar pressure. It was discovered in 1991 by Elf Exploration UK Ltd. It is being produced along with the nearby Franklin field using one unmanned wellhead platform in each field. The PUQ platform, connected to the Elgin wellhead platform by a 90m bridge, processes the sour gas and condensate for pipeline transit to shore. Production from the combined fields currently averages 140,000 boe/d (though a report on Rigzone said 230,000 boe/d), and [accounts for 10%](#) of UK gas production. Total recently upped its stake to 46.2% in the project, where the focus is [shifting to new prospects](#) in the West Franklin field. From [SubseaIQ](#):

This phase of development is aimed at producing estimated reserves of 85 million barrels of oil equivalent, and will consist of drilling three wells and installing a new platform tied-back to the Elgin/Franklin facilities.

The map below shows the location of the fields and the platforms within.



The picture below is probably representative of the location of the [Rowan Viking](#) relative to the Elgin PUQ platform.



*Rowan Viking rig next to Elgin PUQ platform*

The Upstreamonline report provided the following on the sequence of events:

Hainsworth said the problems had occurred during operations to plug and abandon the field's G4 well.

"On Sunday there was quite a sudden rise in pressure and they were finding it difficult to bleed off this rise in pressure," he said.

"That initiated what followed. Witnesses who were working on the well saw a release of what we expect is mud from just below the wellhead at the top of the casing followed by gas."

Hainsworth said that gas is being released on the Elgin wellhead platform at low pressure – about five bar - and that it is coming from a non-producing reservoir above the Elgin formation.

The Telegraph has [something similar](#):

The exact cause of the leak has still to be confirmed but Mr Hainsworth said workers at Elgin on Sunday had reported "a spray of liquid followed by a gas release" from a well casing.

The well had ceased production a year ago when it was plugged at its reservoir source, 6km below ground. Workers spotted changes to the pressure in its outer casing weeks ago and had been in the process of pumping in heavy mud to "kill" the casing on Sunday.

Gas is thought to be entering the casing from another, non-producing reservoir 4km underground, Mr Hainsworth said. Total did not yet know the capacity of this reservoir but in a "dream" scenario it could simply "run itself out".

From [HazardEx](#) comes this third-hand report:

"Engineers have told me that it is almost certain that gas is leaking directly from the reservoir through the pipe casing."

## The Well

The Elgin 22/30c-G4 well was the first development well drilled there. A paper in SPE Drilling and Completion, [Field Hydraulic Tests Improve HPHT Drilling Safety and Performance](#) discusses the drilling of this well, specifically on some testing that was conducted above the HT/HP regime (but at greater depths than suggested by Mr. Hainsworth's assessment above of where the gas is coming from).

One problematic zone (the Kimmeridge clays) is situated at a vertical depth between 5130 and 5370 m. The problem of the Kimmeridge clays is the uncertainty on the native pore pressure gradient (between 2150 and 2200 kg/m<sup>3</sup>), and the possibility of a

ballooning effect.

According to [this source](#), the well was producing 20,000 barrels of oil equivalent per day and gas at a rate of 2.6 million standard cubic meters per day in 2008.

## The Why

The well was in the process of being shut. But why? The [HazardEx](#) link provides another quote:

"The well in question had caused Total some problems for some considerable time ... a decision was taken weeks ago to try to kill the well, but then an incident began to develop over the weekend," he said.

[This source](#) says it has been shut off for a year. A very recent paper in the Journal of Petroleum Technology as some very useful information:

### [Advanced Drilling in HP/HT: Total's Experience on Elgin/Franklin \(UK North Sea\)](#)

The paper discusses infill drilling in the Elgin and Franklin fields. After over 15 years of production, these fields are rather pressure depleted (over 800 bar!), which causes sand infiltration problems and liner deformation due to compaction of the sandstone reservoir. It is possible that well G4 had several problems and they eventually gave up on it.

Given the pressure depletion and the fact that both fields seem to be well past their prime, can they possibly still be responsible for 10% of UK gas production? Perhaps not. From [HazardEx](#):

Peak production capacity for the Elgin/Franklin field is 280,000 barrels of oil equivalent per day (around 7% of UK production), 175,000 barrels per day of condensates and 15.5 million cubic metres of gas per day (mcm/d), according to Total.

7% of UK production is less than 10%, but then [this](#):

The Elgin-Franklin fields produced a daily average of 61,386 barrels of condensate in November, according to the most recent government data.

Condensate production is only about a third of original capacity, so gas production might be proportionally lower. Of course, UK production is down overall as well..

Here is more information on the development of the fields:

### [Elgin/Franklin: What Could Have Been Done Differently?](#)

(note: article starts on page 54 of the above)

## The What Next

Given that there is nobody within two miles of the platform at present, and the story is still unfolding, it is prudent to be cautiously skeptical of Total's analysis of the situation. Some questions:

1. 1 kg/sec (reported by several sources) is a very high leak rate from a formation they drilled through to get to the one they were going to produce. In any case, if the report is true, how was this estimate made?
2. BBC has reported that the flare is still burning high above the platform. If the wells have been shut off, why is this?



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