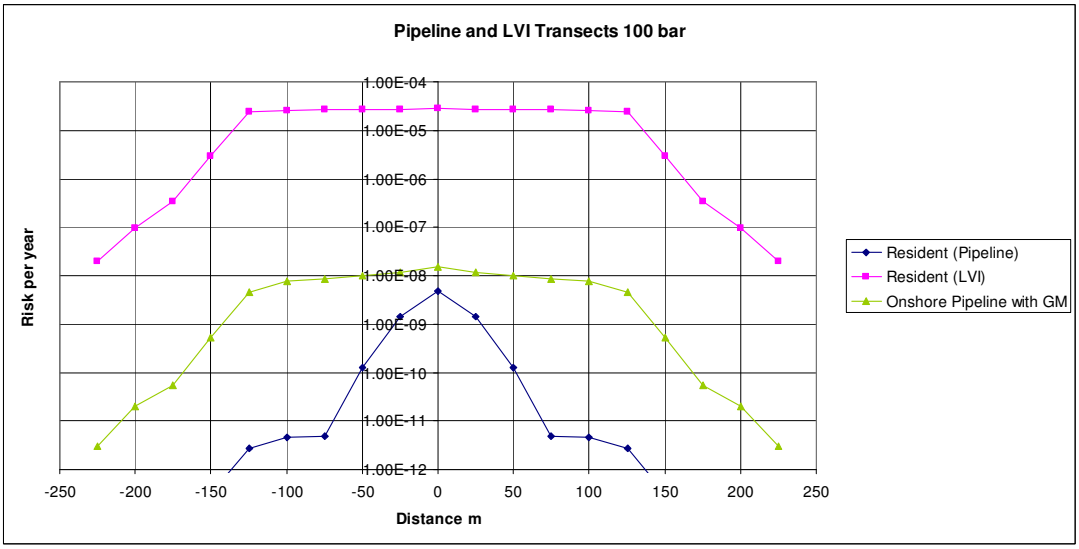
An Bord Plaenala - Oral Hearing- June 9 2009.

Supplementary Information requested by the Bord from Phil Crossthwaite, DNV, QRA

The information given below relates to the effect of incorporating a failure frequency due to ground movement on the risks from the pipeline in the vicinity of the landfall valve installation and the overall risk from the LVI given the various pressure regimes that can occur there. The effect of ground movement on the pipeline downstream of the LVI area was submitted previously.

Normal Operation.

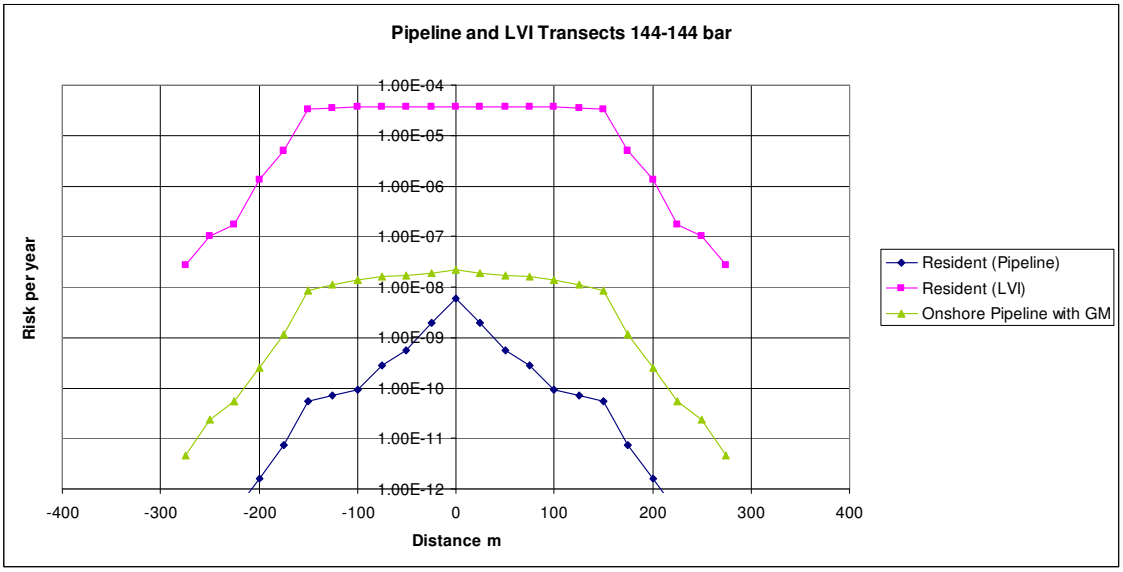
In normal operation the pipeline system will be at a pressure in a range up to 110 bar. Risk transects assuming 100 bar are given below. The green line shows the risk transect from the pipeline incorporating a failure frequency of 9E-08 per km per year for ground movement (the same as that used for the supplementary information regarding ground movement for the pipeline). This can be compared with the blue line which shows the pipeline risks from third party interference. The purple line shows the risks from the LVI itself. The plot is on the basis of an exposure to these risks for one year, and assumes the risks are to a resident (as defined in the EIS, Appendix Q7).



Case 1

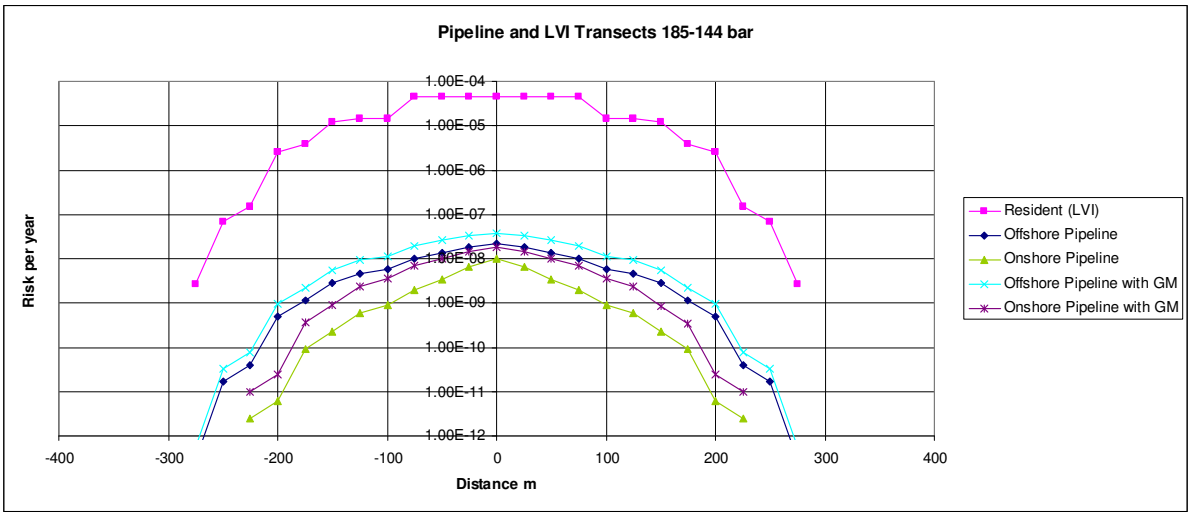
In the event of a shutdown at the terminal, the subsea system would be shut in, thus maintaining the pipeline system at a pressure similar to the operating pressure. There is a possibility that the subsea system will fail to isolate the pipeline. With all wells in operation the likelihood that the system will fail to isolate has been calculated to be less than 1 in 100. The choke valve would normally be closed from the terminal, but for the purposes of this case it has been assumed that the choke valve cannot be closed. Consequently there is one well which fails to isolate and the restriction on flow from the well into the pipeline is the choke valve at its normal position. After approximately 6 hours, the pressure in the pipeline could have risen to around 136-140bar, at which time the LVI would be actuated to close. Note that in the event that the subsea system shuts down as designed, given the small rate that would be

expected to pass through the valves, it would take many years for the pipeline to pressurise to 140 bar. The transect below shows the risk of fatality at distances away from the system at a pressure of 144 bar. The pipeline incorporating ground movement is again shown in green, and can be compared with the blue line which shows the pipeline risks from third party interference. Note that the plot is on the same basis as that above, i.e. it assumes that these pressures exist for one year.



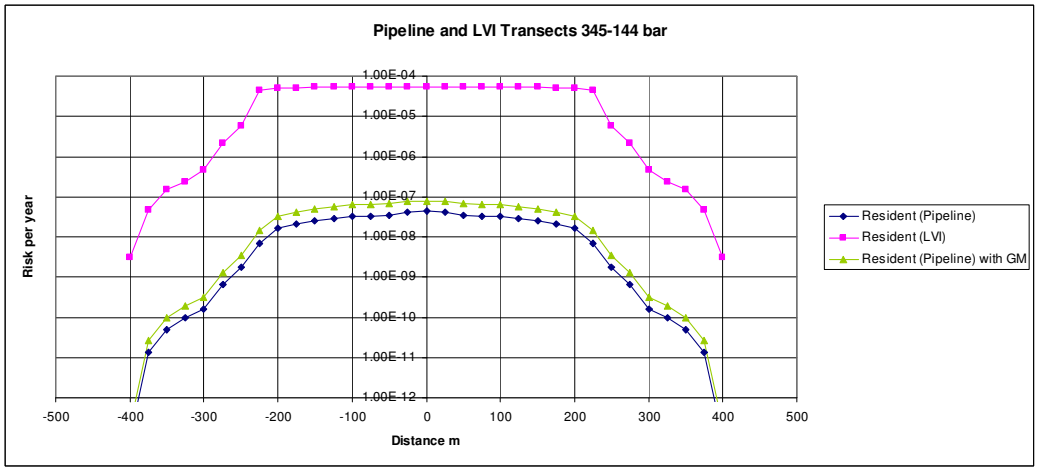
Case 2

The LVI is designed to a very high standard and the predicted reliability in line with IEC 61508 is a failure to close of between 1 in 1000 and 1 in 10000 per demand. Note that after approximately five years the maximum pressure that the pipeline system could be subjected to will be less than 144 bar as the pressure in the wells declines. After closure of the LVI, it has been assumed that the pressure in the offshore pipeline increases due to flow through a single well choke. After a further 12 hours (ie 18 hours in total), the pressure could reach 185 bar. The transect below shows the risks (on an annual basis) for the system with 144 bar in the onshore pipeline and 185 bar in the offshore pipeline, again with the ground movement factor. The offshore pipeline is at a higher pressure than the onshore pipeline so gives a different transect, although as this is laid on solid rock it may be inappropriate to apply the ground movement factor to the offshore pipeline.



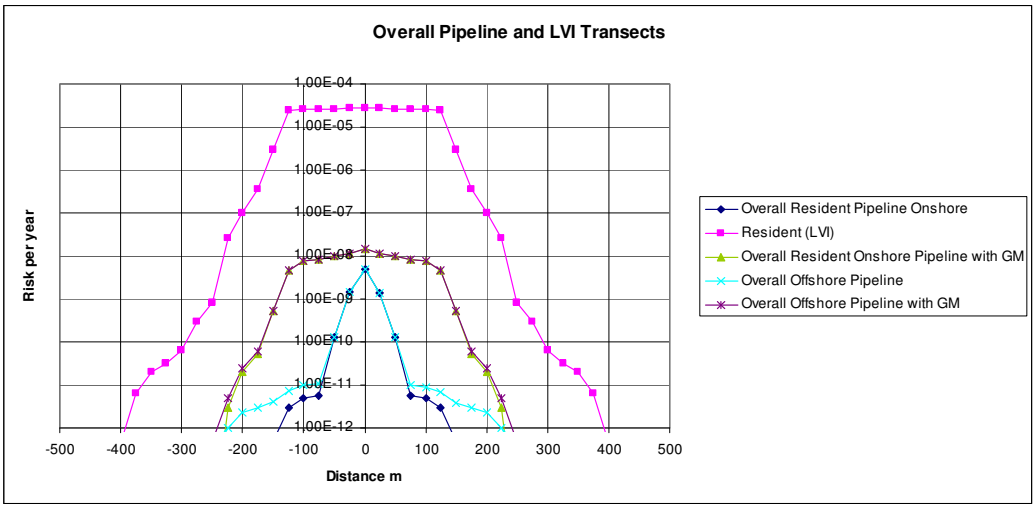
Case 3

Following closure of the LVI, and assuming the terminal has not been returned to normal operation, the pressure in the offshore pipeline will continue to rise. As the pressure in the line increases, the flow from the well to the pipeline decreases, and it would take some 8 days to reach 340 bar. The transect below shows the risks (on an annual basis) for the system with 144 bar in the onshore pipeline and 345 bar in the offshore pipeline, again with the ground movement factor. Again as the offshore pipeline is laid on solid rock it may be inappropriate to apply the ground movement factor to the offshore pipeline.



Overall Case

These transects may be combined taking account of the time that the pipeline is not at normal operating pressure and the reliability of the offshore shutdown system to give an annual overall risk transect in the vicinity of the LVI as shown below. Again the pipeline risks are shown with ground movement and with third party interference only. The risk transects in this plot may be considered to show a realistic risk profile for the area of land in the vicinity of the LVI.


Overall Pipeline and LVI Transects
Risk per year
1.00E-04
1.00E-05
1.00E-06
1.00E-07
1.00E-08
1.00E-09
1.00E-10
1.00E-11
1.00E-12
-500
-400
-300
-200
-100
0
100
200
300
400
500
Distance m
Overall Resident Pipeline Onshore
Resident (LVI)
Overall Resident Onshore Pipeline with GM
Overall Offshore Pipeline
Overall Offshore Pipeline with GM