UPDATED Explanatory Note 1: Consequence Impact Contour Maps

Supplementary information to be read in conjunction with the Consequence Impact Contour Maps presented as additional information to An Bord Pleanála for the Corrib Onshore Gas pipeline Application

At the request of An Bord Pleanála, consequence impact contours have been overlaid on aerial photography for sections of the proposed onshore pipeline as follows:

- proposed pipeline/landfall valve installation at Glengad - Figure 1.
- Rossport area - Figures 2, 3, 4 & 5.
- Aghoos – Figures 6 & 7

The QRA has determined the numerical values of risk associated with the pipeline and landfall valve installation. The methodology used in the QRA is described in the EIS, Appendix Q7, and essentially provides a statistical analysis of both the consequences of failure of the system and the associated frequency or likelihood of failure to be determined. The consequence impact contours presented address **only** the potential consequences, not the combination of consequences and frequency (presented in the QRA as risk, which is the recognised method to determine the appropriateness or otherwise of a proposed pipeline). As such, it is essential to understand that they do not imply any likelihood of an event occurring in the receiving environment of the pipeline, which has been separately stated as being infinitesimal. **It is imperative that this is understood before the Consequence Impact Contour Maps are reviewed.**

All pipelines and equipment that are designed to contain a hazardous material such as natural gas have the potential to impact upon people in the vicinity in the event of the loss of containment from the system. This equally applies to transmission gas pipelines across the country and globally. In the quantified analysis of these systems, the consequences of discrete failures are calculated. Such calculation does not suggest any likelihood of such failure. Indeed, for the Corrib Onshore Pipeline the analysis concludes that there is a negligible likelihood of such failure.

On the basis of all this, it is imperative that the Consequence Impact Contour Maps should are read in tandem with this explanatory note with reference to the parameters and conclusions of the QRA (Appendix Q7 of the EIS).

In respect of the Corrib Onshore Pipeline, the failures used in the calculation are holes and ruptures. In the estimation of risk from pipelines, DNV calculated the distances to consequence impact levels for ruptures and holes.

Ruptures:

The fireball event from a rupture of the proposed pipeline has been calculated to last in the order of 15 seconds. The first impact range (shown in white) is the 'building burn' distance. This represents the distance from the event to where a wooden building (white wood) would be expected to ignite during the duration of the event. It is noted that buildings along the pipeline route are primarily constructed of block or brick and may offer some additional protection over a wooden building in the initial fireball event, thereby giving protection and allowing for subsequent escape.

The second impact range (shown in yellow) is the 'escape distance', when the total dose received by the person is 1,100 dose units (which is equivalent to a 1% probability of fatality). At locations further away from the pipeline than this 'escape' distance, people would not be fatally injured. This calculation assumes that people exposed to the heat radiation would attempt to escape by moving away from the

flame. It is further assumed that the person escapes at a speed of 2.5 m/s for 30 seconds, and during this time is exposed to, and accumulates a dose of heat radiation. The heat radiation falls off with increasing distance from the flame.

The consequences from a rupture were modelled in four different ways (different assumptions about the primary direction of the release and the type of combustion) and eleven hazard ranges were calculated for each pipeline pressure. The Consequence Impact Contour Maps show the range (maximum and minimum) of the calculated 'building burn' distances and the maximum and minimum of the 'escape' distance for 1% fatality. The minimum and maximum distances depend on the orientation of the release. It is once again confirmed that the maps only detail consequences and not likelihood of the event. These distances are a function of the pipeline diameter and the pipeline pressure.

Holes

For holes, two sizes were used - 12mm diameter and 31mm diameter. The inner and outer hazard ranges are based on constant heat radiation levels. The inner distance (25 kW/m^2) is termed the 'building burn' distance assuming a long exposure time (of the order of one hour). The outer distance (6 kW/m^2) represents the 'escape' distance that is considered a safe distance to move away from an event without injury. Again four different ranges are calculated for each pipeline pressure, and the maximum and minimum of the ranges for the larger of the two holes are shown on the contour map.

Conclusions:

Similar Consequence Impact Contour Maps can be calculated for all high pressure gas pipelines. To put the distances shown on the contour maps into context, the 'building burn' distances for the Mayo to Galway pipeline (operating at a design pressure of 85bar) range from 60-200m and the 'escape' distances range from 260-330m. These distances are not used as separation distances from occupied dwellings. It should be noted that the separation distance to the closest occupied dwellings along the Mayo Galway pipeline is approximately 40m. The minimum separation distance between occupied dwellings and the proposed Corrib pipeline is 140m.

The contour maps model holes and ruptures for 100bar and 144bar scenarios. It may be obvious, but the hole scenarios have a far lower consequence than rupture scenarios, although both scenarios are highly improbable. The contour maps confirm that no currently occupied property along the pipeline route is within the potential burn distance for a hole scenario.

The minimum and maximum burn distance for 100bar and 144bar rupture scenarios identify some properties within this contour; however, this does not in itself suggest any likelihood of an event occurring. It has previously been recorded that the likelihood of a pipeline rupture event is less than one in one billion per km, per year.

In addition, consequence impact contour maps have been prepared for 345bar hole and rupture scenarios at the LVI and pipeline upstream thereof. It should be emphasised that the normal operating pressure of the pipeline is approximately 100bar. The likelihood of the pipeline reaching 345bar is virtually inconceivable due to the multiple subsea safety systems. Notwithstanding this, at this pressure for the hole scenario, no dwelling exists within the contours. In a rupture scenario at this pressure, no dwelling exists within the 'building burn' distance; a number of dwellings are located within the 'escape' distance.