

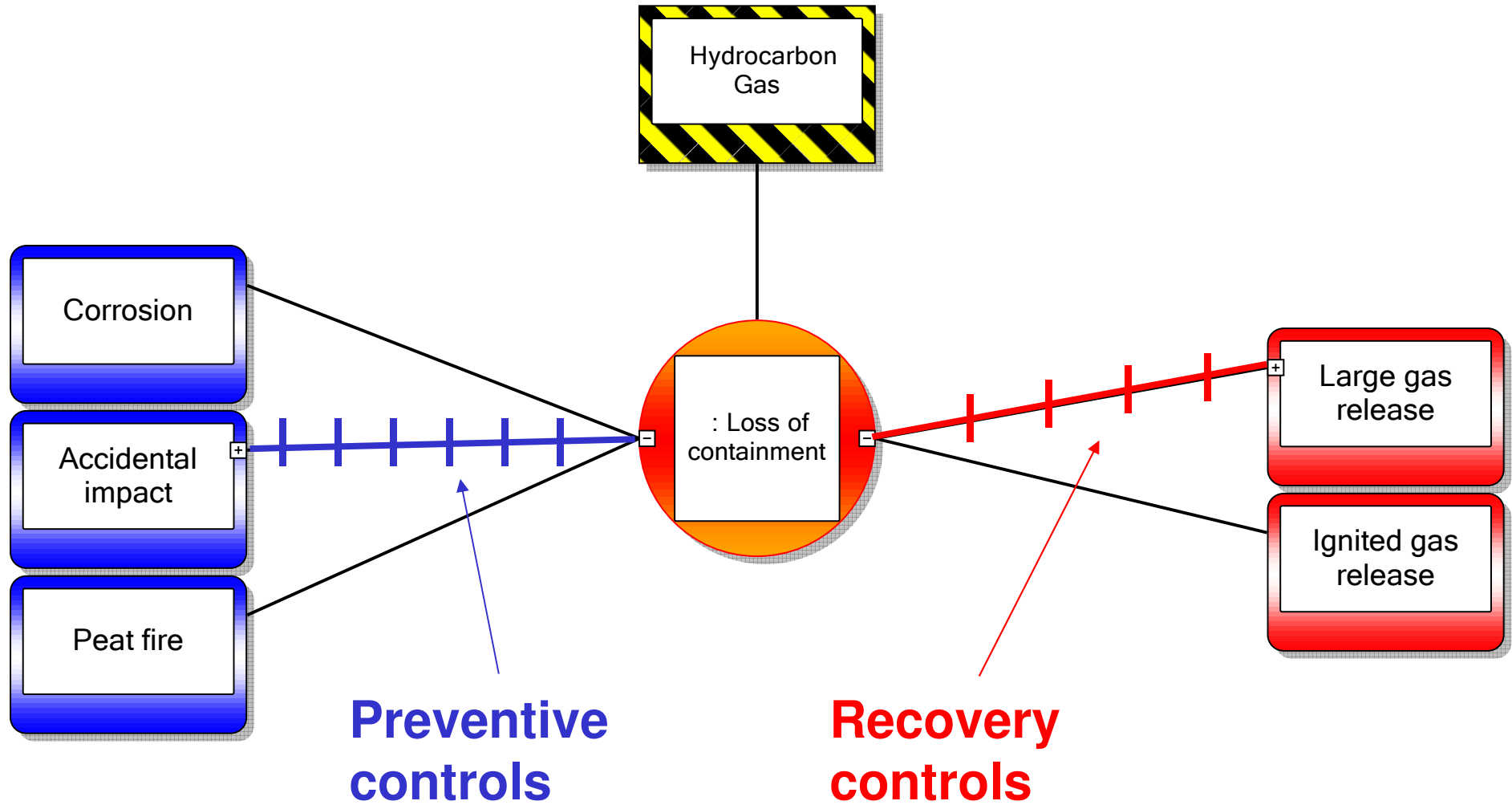


ALARP Demonstration

Meeting at CER offices, 9th January 2013

Shell E&P Ireland Ltd

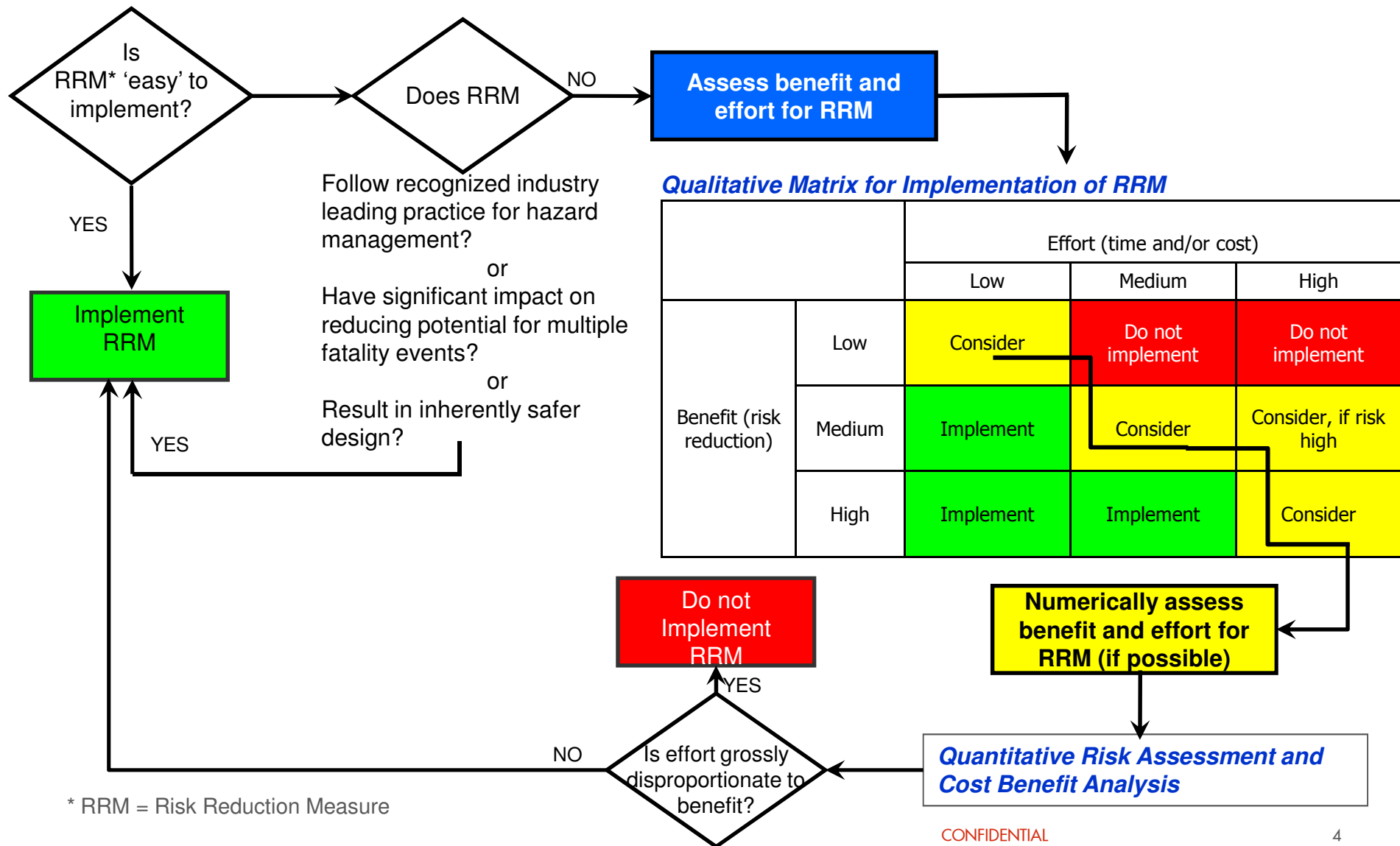
Simplified Corrib Pipeline Bowtie



Why is bowtie methodology appropriate to manage Major Accident Hazards?

- **Multidisciplinary** bowtie workshops involve **active participation** of the workforce & provide a **structured approach** to hazard identification, risk assessment and ensuring that **sufficient controls** are in place to manage the risks to ALARP levels
- A key question during bowtie workshops is '**What more/else can we do?**' (i.e. are there any more controls that can be implemented?). This is a key part of an ALARP assessment and fits well with Safety Cases
- ALARP demonstrations including a combination of Good Practice, Qualitative & Quantitative approaches are **acceptable** in several other **established jurisdictions**
- For **offshore subsea facilities**, as there is no risk to personnel during normal operations, a bowtie approach would be **more appropriate** (than a quantitative approach) to demonstrate ALARP
- The above is outlined in our response to sections CONFIDENTIAL 4.1, 4.5.3/4.5.3.1

Cost Benefit Analysis - ALARP assessment which starts with a qualitative approach (See response to 4.5.5 & 4.5.5.2)

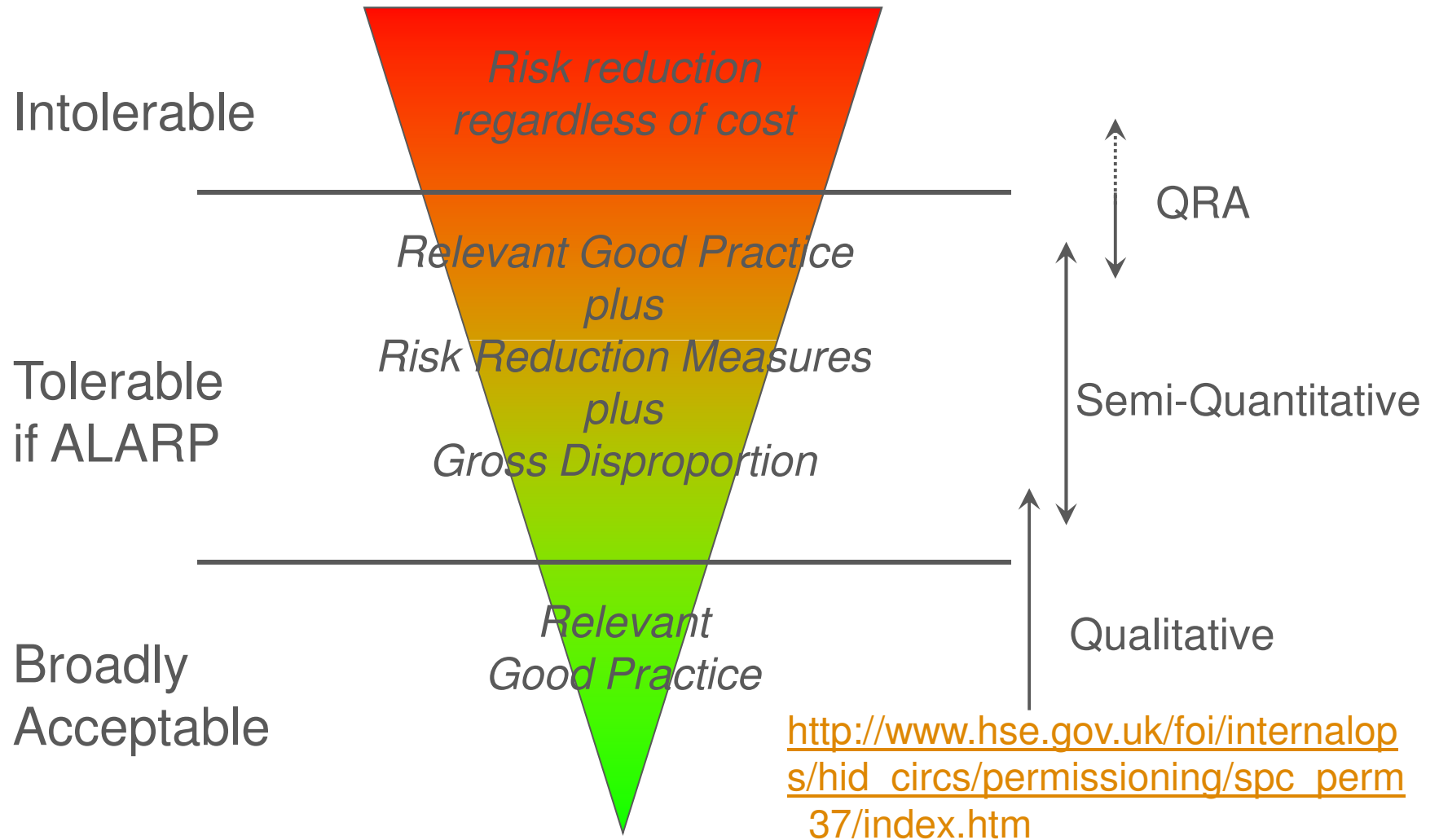


Cost Benefit Analysis - Disadvantages of purely quantitative approach

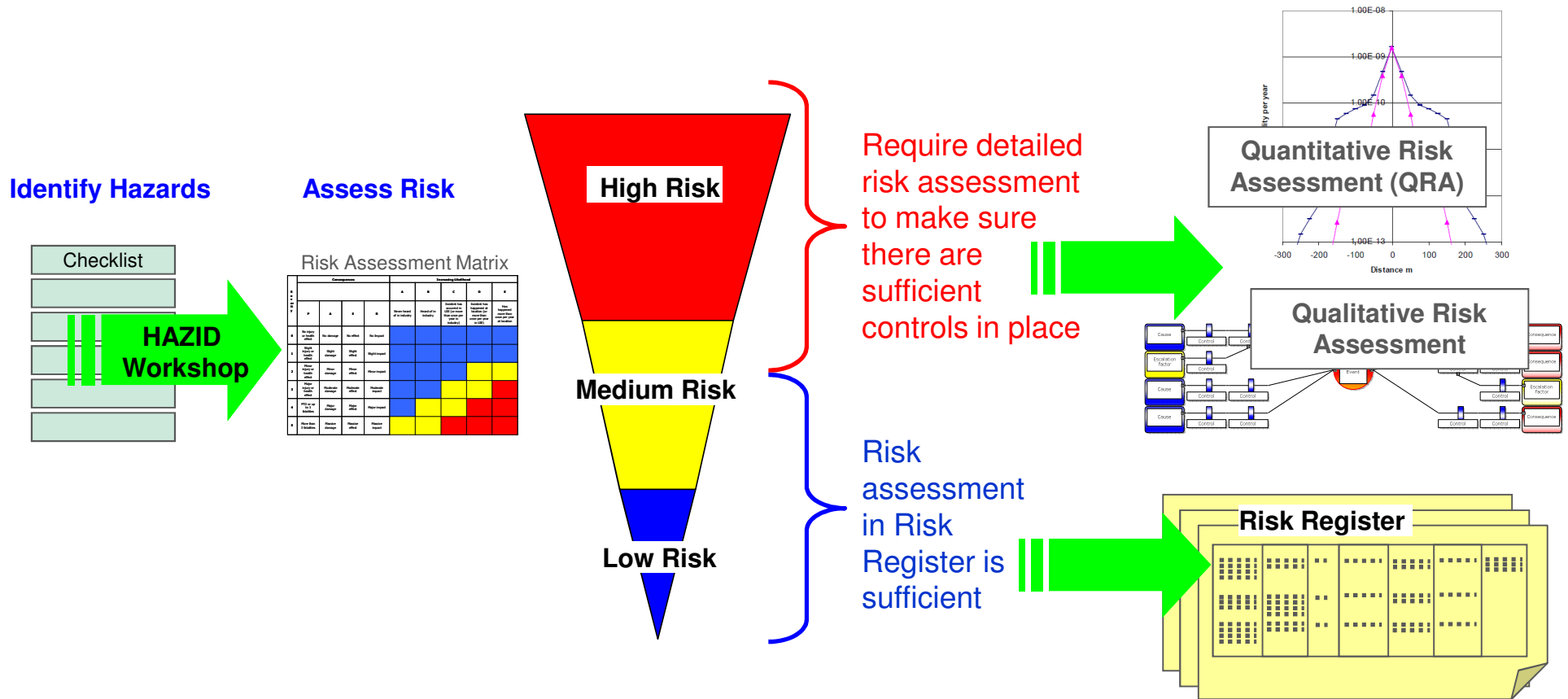
- A QRA looks at what is going to cause a failure. Therefore it would be necessary to quantify the benefit associated with a risk reduction measure in terms of its impact on the failure frequency.
- In many cases, it is **not possible to quantify the benefit of the risk reduction measures**, e.g. how would you quantify the benefit of **operating procedures, traffic management and emergency response plans & contractual HSE controls?** (whereas a qualitative approach would implement these measures as the effort is generally low and the benefit is medium/high)
- In our current qualitative ALARP demonstration, the bowtie approach identified **34** additional risk reduction measures. Our QRA specialist reviewed this list and, in his opinion, there were ca. **3-6** risk reduction measures which he may be able to quantify.
- See our responses to 4.5.5, 4.5.5.2 & 4.5.6.4

BACK-UP SLIDES

ALARP Demonstration Proportional to Risk



Risk Management & Assessment

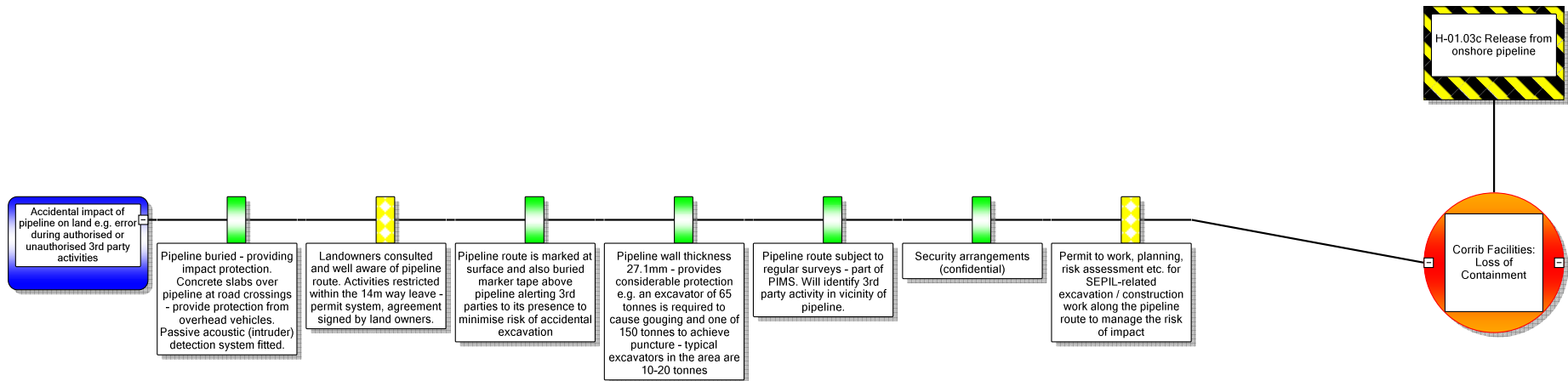


* The risk referred to here is the unmitigated risk

Bowtie extract

Bow tie extract of the left hand side of one onshore pipeline threat (taken from Corrib Onshore Pipeline EIS)

Figure B5.17 - H-01.03c Release from Onshore Pipeline
Detailed Extract – Accidental Impact of Pipeline on Land (Preventive Controls)



Embedding Risk Controls into Operations

