

# DEVELOPING A LOCATION SPECIFIC RISK MODEL FOR IRISH RAIL

## SUMMARY

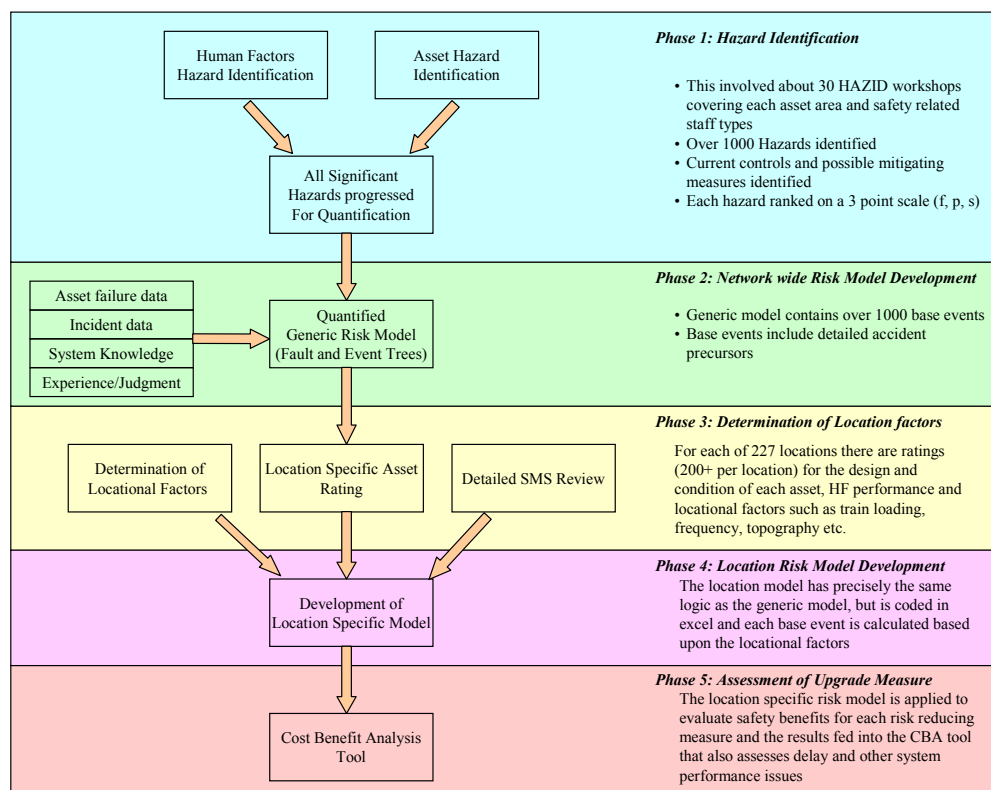
Sotera developed a safety risk model on behalf of Irish Rail in order to help develop and support a sound and defensible investment strategy for the railway, based upon a detailed and comprehensive assessment of the risk together with cost-benefit analysis.

From the outset of the project it was understood that much of the risk on the railway was derived from specific local issues rather than pervasive factors that impact the entire railway, therefore it was decided to proceed with the development of a network risk model that could calculate risk results for each element of the railway on a location specific basis. As far as we are aware this is the first attempt at a comprehensive network wide risk model that can provide results on a location-by-location basis.

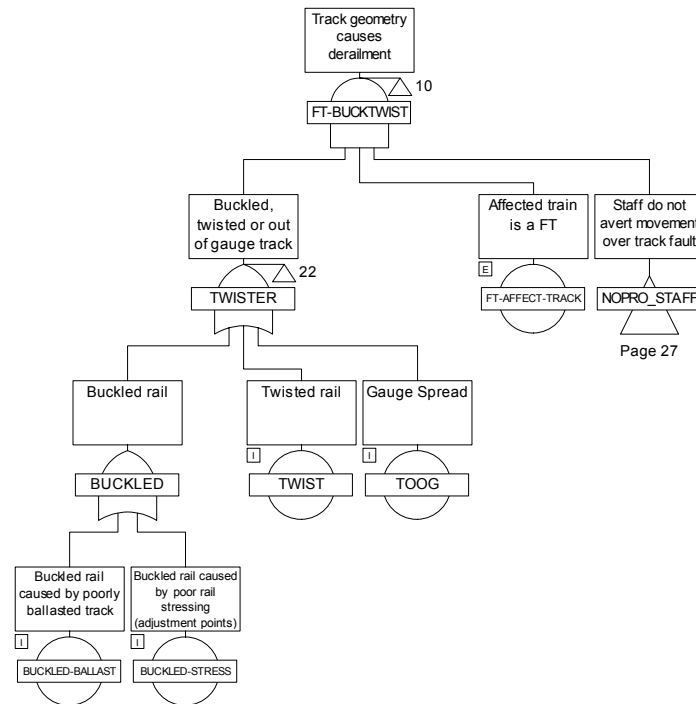
## METHOD

The Risk Model provides risk estimates for passengers, staff, members of the public and trespassers. The Risk Model is predictive; it does not rely on past accident data to estimate risk, but investigates a wide range of precursor events and explores how each of these may escalate to become an accident using fault and event tree analysis. A benefit of the risk model being predictive is that it analyses an array of accident scenarios that have not occurred on the railway but for which there is recognisable potential; this is particularly relevant for Irish Rail as there have been few major accidents. It also enables a detailed assessment to be made of how safety may change in the future due to investment, changed maintenance strategies and asset deterioration.

The diagram below illustrates the approach used:



Example section of fault tree logic.



To ensure the model correctly represented the network, Irish Rail engineers were involved throughout the study by participating in every phase of the project especially the assessment and rating of the assets, the hazard identification and providing failure and incident data.

## BENEFITS

The main benefits of the model over traditional (non-location specific) network models are:

- The safety impact of local and system-wide upgrades can be readily assessed by changing asset design and condition ratings.
- The model can, and has, been used to assess the safety impact of asset deterioration.
- The model can, and has, been used to identify areas with high levels of risk or individual risk.
- The model can, and has, been used to evaluate a wide range of measures, allowing us to explore the relationship between network risk and the overall level of investment. Hence, it is possible to assess the level of (network and individual) risk from a particular level of investment.

## OUTPUTS

The risk model can present results in a range of different ways, such as risk by location, line, by type of asset as well as in individual and collective risk for the various types of exposed individual.

These breakdowns are particularly helpful in identifying where to target expenditure as the location of high risks are known as are the assets that contribute to the risk. Individual risk calculations also identify hot spots where risk may be close to the tolerability criteria for particular exposed groups.

The cost benefit module enables ALARP assessments to be made based upon a range of delay and cost factors

One of the key results found was that traditional investment methods which target busy lines for expenditure, and cascade older assets to lightly used lines can result in relatively high levels of individual risk to the users of such lightly used lines. This caused a shift in Irish Rail's strategy towards investing in the lightly used lines, resulting in significant risk improvements.

**For more information on risk modelling please contact Chris Chapman:  
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