

Guidance Document

G1235 Process for Managing Civils Risk

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MAYOR OF LONDON



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1 Purpose

- 1.1 The purpose of this Guidance Document is to describe the process for managing the risks associated with the Civils assets and the various risk evaluation models that are used to assess these risks.

2 Scope

- 2.1 This Guidance Document applies to all risks including safety, performance and financial risks associated with the Civils assets managed by the Civils Sponsor Team (excluding Track Drainage).

3 Introduction

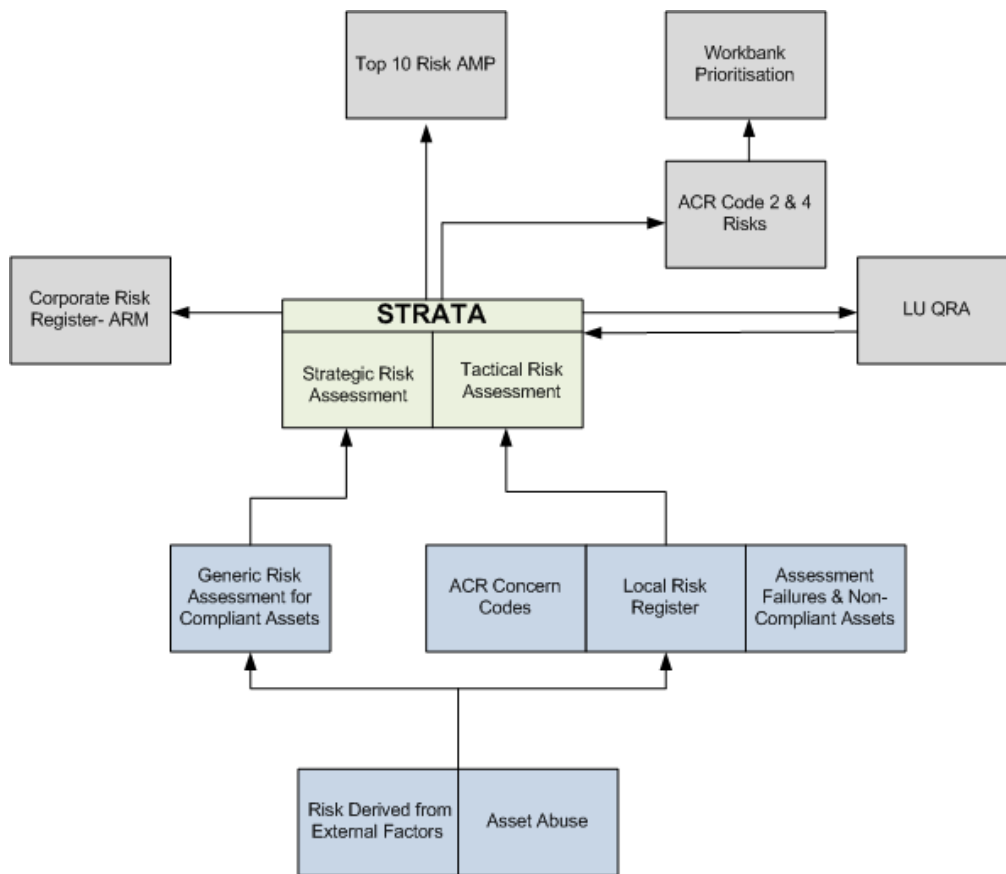
Civils risks may arise from a number of sources including 3rd parties, reputational and environmental issues. Risks are identified and quantified through risk assessments and form an essential input into the planning process for the development of the Civils Asset Plans.

This process ensures that all risks associated with the Civils assets are evaluated and understood and that any necessary control measures to manage these risks are identified. All risks are reviewed and updated on a regular basis, so that work plans can be adjusted or reprioritised where necessary. The management of risk supports the high level business objectives by;

- Demonstrating that the safety risks presented by the Civils assets are tolerable and are managed ALARP.
- Quantifying the performance risk profile attributable to the Civils assets.
- Delivering value through the optimisation of risk reduction against performance and affordability.
- Providing a mechanism that demonstrates that risk is reduced through delivery of the asset plans.

The Civils risks are captured through a suite of risk models, each of which serves a particular purpose; the Civils Risk Model- STRATA (Strategic and Tactical Assessment), the LU Quantified Risk Assessment (LU QRA), Active Risk Manager (ARM) and the Asset Condition Reporting (ACR).

These processes are interlinked to provide a systematic and robust risk management procedure and ensure a single, up-to date and consistent source of risk information for management of the Civils assets. The key relationships between the risk models are shown in the diagram on the next page.



The following sections provide an overview of the risk models listed above and set out the relationship between them.

4 STRATA

The risks associated with the Civils assets are assessed from two perspectives, strategic and tactical, which evaluate risk based on asset behaviours. These behaviours encompass all mechanisms through which Civils assets can present risk and have been agreed by the Civil Engineering Profession Heads. The SRA and TRA processes identify all mechanisms that could give rise to these behaviours. The behaviours and risk outcomes are evaluated in the Civils Risk Model STRATA.

The Civils Risk Model STRATA demonstrates that the risks presented by the Civils assets are understood and managed. The output from STRATA feeds into the asset management plans provides a mechanism to demonstrate benefits of individual projects and provides a method to track risk across the Civils assets in response to change in asset condition or external influence.

STRATA is used to evaluate the system wide risk (both safety and performance) presented by the Civils assets, by line, asset group and asset type. Risk descriptions are generated automatically within STRATA through the systematic selection of the appropriate asset behaviour against the asset type - the behaviour types for Civils assets being;

- Immediate Complete Collapse (ICC)
- Progressive Complete Collapse (PCC)



- Partial Collapse (PC)
- Loss of Integrity (LOI)
- Structure Distortion (SD)

Risks are assessed using a four stage ranking method;

1. Likelihood – the likelihood of behaviour type occurring
2. Conditional probability - how often the behaviours would lead to a defined top event, e.g. derailment, collision hazard, structural failure or flooding. This is only applied to Safety Impact and reflects the fact that not every behaviour will result in harm to persons.
3. Safety Impact – the number of Fatalities and Weighted Injuries (FWI)
4. Performance Impact- the financial penalty incurred due to closure of the railway or station on account of the Civils asset behaviour. This does not have conditional probability applied as the performance impact is assumed to occur for every behaviour event.

The Civils Risk Model STRATA categorises risks across the whole Civils asset portfolio and allows the identification of those particular strategic risks that present the highest contribution to the overall risk profile. Risks can be reported by asset type, location or particular asset condition.

For each strategic risk, the STRATA model considers the contribution of condition (as recorded by the ACR specific concerns) and risk derived from external factors and/or asset abuse (e.g. from outside parties, internal maintenance activities, failure of adjacent assets) to the total level of risk. There is also an inherent risk for asset behaviours, even for assets which are compliant with all standards and good practice (as there is no such thing as zero risk). Inherent asset risks are however small compared to risks presented by asset condition, asset abuse and risk derived from external factors and consequently are currently excluded from the STRATA model.

In addition to risks presented by asset condition, there are also risks associated with assets, or circumstances (such as a vehicle incursion site), which arise purely as a result of asset abuse or external factors, such as adverse weather or the failure of an adjacent asset. As these risks cannot always be related to a specific concern code, they are generally also included in the STRATA model as risk derived from external factors with a separate strategic or tactical risk as appropriate.

The procedure for managing STRATA in conjunction with the above elements is detailed in Appendix C

For further information the Civils TRA and SRA Process, refer to Guidance Document G1299- Guidance on Civil Engineering Asset Strategic and Tactical Risk Models.

4.1 Strategic Risk Assessment (SRA)

Strategic risks are assessed for each asset sub type by line and are generally aligned with ACR specific concerns (which describe the condition and asset behaviour). If a behaviour is attributable to a subset of assets, rather than equally distributed across the asset population, a TRA may be completed (see section 4.2).

For safety risks, impact values are generated directly from mimics of the LU QRA Top Event impact sequences. These are the definitive safety impacts (expressed as line average values in terms of Fatalities and Weighted Injuries (FWI) generated by the business. The nature of performance risks (as determined by NACH's), is such that these are highly location dependent. Each Civil Engineering Asset has a service loss impact derived from NACHs values. These are applied to the portion of SRA likelihood assigned to the asset to generate an asset specific performance risk. In STRATA these can be summed to produce a SRA performance risk value for 'compliant' assets.

Where strategic risks require mitigation measures to control the level of risk, these are identified in the STRATA model, along with the mitigation owner and risk owner, who ensures these measures are implemented.

4.2 Tactical Risk Assessments (TRA)

Tactical Risk Assessments evaluate the safety and performance risks associated with a particular asset at a specific location. The objectives of the TRA are to evaluate the safety and performance risks, to determine whether additional controls or mitigations are required to manage these risks ALARP and to provide risk information to evaluate asset intervention options.

The triggers for undertaking a TRA are;

- Assets that exhibit particular ACR concern codes.
- Assets which are non-compliant
- Assets which are considered to be 'high risk' to the railway as demonstrated through risk assessments e.g. LRR or SRA
- Assets which are due for renewal or heavy maintenance
- Where a Regulatory Notice or Please Assure Me (PAM) has been imposed.

A TRA can be asset specific or generic for assets with similar concerns and behaviours, and where asset locations result in similar performance risks. In fact a 'generic' TRA is replicated for each applicable asset in STRATA to produce an asset specific risk assessment.

While a TRA could be prompted by a strategic risk (and hence a particular behaviour), it must consider the full range of failure behaviours to evaluate the total risk from the asset.

Performance risk is evaluated using asset behaviours, behaviour likelihoods and performance impact. Impact values are location specific and are provided by NACHs data. Performance values are fed back into the STRATA to provide a strategic performance risk profile.

All TRAs produced will have an appropriate author, checker and approver, which will be recorded in STRATA.

4.3 SRA / TRA Linkage

The SRA and TRA are intended to act as an integrated process through the STRATA model, so as to reflect the current best estimate of risk at both system and asset levels. Both the SRA and TRA share a common four stage ranking method comprising likelihood, performance impact, safety impact and conditional probability (applied only in safety risk).

All TRAs are recorded in the STRATA Risk Model in order to understand the contribution of a particular asset to the overall Civils risk profile. TRAs are completed for particular assets and aligned with SRA through the asset type and asset sub-type architecture (derived from the ACR foundation documents).

This linkage allows continuous review and update of the strategic risk values by providing a high level reconciliation of system and asset level risks, which may lead to rationalisation of the SRA / TRA assumptions.

Where an asset has been subject to a TRA, this is revisited and updated if there is any change to the risk level, particularly following completion of asset improvement works. The revised values are fed back into the STRATA Risk Model and the strategic level risk updated and reviewed accordingly.

5 Risk Process Interfaces

The interfaces between STRATA and other risk models are described in the following sections.

5.1 Interface with LU Quantified Risk Assessment (LU QRA)

The LU QRA is used to assess the risk of major hazard that has the potential to cause a fatality to LU Customers and other members of the public, and determines the statistical number of fatalities per year from our operations. This is determined, for each line, by evaluating the risk from major hazards with similar outcomes or 'top events'.

The risk associated with each top event is represented graphically through 'fault trees' in the overall risk profile. Each top event fault tree has a large number of contributors, made up of many assets (not confined to Civils) and also includes external events. The Civils asset behaviours are just one contributor of the many failure paths that could lead to major hazards. The safety impacts may vary, depending on the number of people involved and any mitigation measures that are in place.

The LU QRA evaluates risk at line level, so the principal interface between the Civils asset risk process is with the STRATA Risk Model. However, these approaches are not directly comparable, the main differences being;

- STRATA is based on asset behaviours and uses the best available engineering information to evaluate the likelihood of those behaviours.
- The LU QRA is outcome based (i.e. top events fault tree base events). Asset behaviours are reflected in each base event, where the Civils assets are a potential contributor.

Neither approach is definitive and the information produced from each cannot be expected to be in complete agreement. However, it is important that the data is compared so that gross inconsistencies can be understood and resolved, particularly with regard to conditional probability values (applied only to safety impacts). The result of this comparison improves the assumptions and quality of calculated risk levels in both models.

In general, the STRATA Risk Model is the definitive repository of asset behaviours derived risk. The process of evaluating the Civils asset risks using SRA and TRA may therefore generate behaviour estimates that can be used to update the base event values in the LU QRA.

The LU QRA is the definitive repository for safety impact information. The safety impact values in the STRATA Risk Model are consistent with the impact values in the LU QRA values. This is achieved through use of mimics of the LU QRA top event impact sequences to derive safety impact values in STRATA.

5.2 Interface with Corporate Risk Register – Active Risk Manager (ARM)

‘Active Risk Manager’ (ARM) is the corporate software to record, manage and report all risks across the business, including investment risks, project risks, asset risks and risks from 3rd Parties.

Each risk in ARM is allocated a risk owner who is responsible for managing the risk and for reviewing the risk values on a regular basis, and that any mitigation actions are implemented. As required by the Asset Risk Standard S5044, The Civils Sponsor is responsible for recording and updating the risk in ARM.

The Civils asset risks reported in ARM are outputs from the STRATA Risk Model and represent the total safety and performance risk across the Civils asset portfolio, including the effect of any control or mitigation measures in place to limit risk. The contribution from asset abuse is however excluded, as these risks are reported separately in ARM as a 3rd Party Risk. All risks from 3rd Parties are the responsibility of the Infrastructure Protection Team, within CPD.

The Sponsor shall escalate risks scoring higher than the risk threshold into ARM. The threshold is defined at a post-mitigation value totalling a £100k/yr for Performance Risk and for Safety Risk¹ for an individual asset or a group of assets sharing the same concern.

As the risk associated with Civils assets is nearly always below the threshold, the risk escalation into ARM of is based on the aggregate risk for each asset group. There are six Civils asset risks in ARM, (Bridges and Structures, Earth Structures and Deep Tube Tunnels, duplicated across SSL and BCV), which together represent the total safety & performance risk associated with the Civils assets. The Civils Sponsor is responsible for the asset risks and for updating these on a regular basis, or whenever there is a change to the risk profile in STRATA, e.g. following the completion of renewals works.

¹ The Asset Risk Standard S5044-A3 section¹, 4.3.9. states that threshold for ARM is a post-mitigated score of 8 in the Risk Register Matrix. For Civils assets, any risk entered in the Local Risk Register scoring 8 or above is entered into STRATA. The escalation threshold for STRATA is set at a total of £100k/yr for safety & performance risk for either a single asset or a risk common to multiple assets, at which point the risk is entered into ARM.