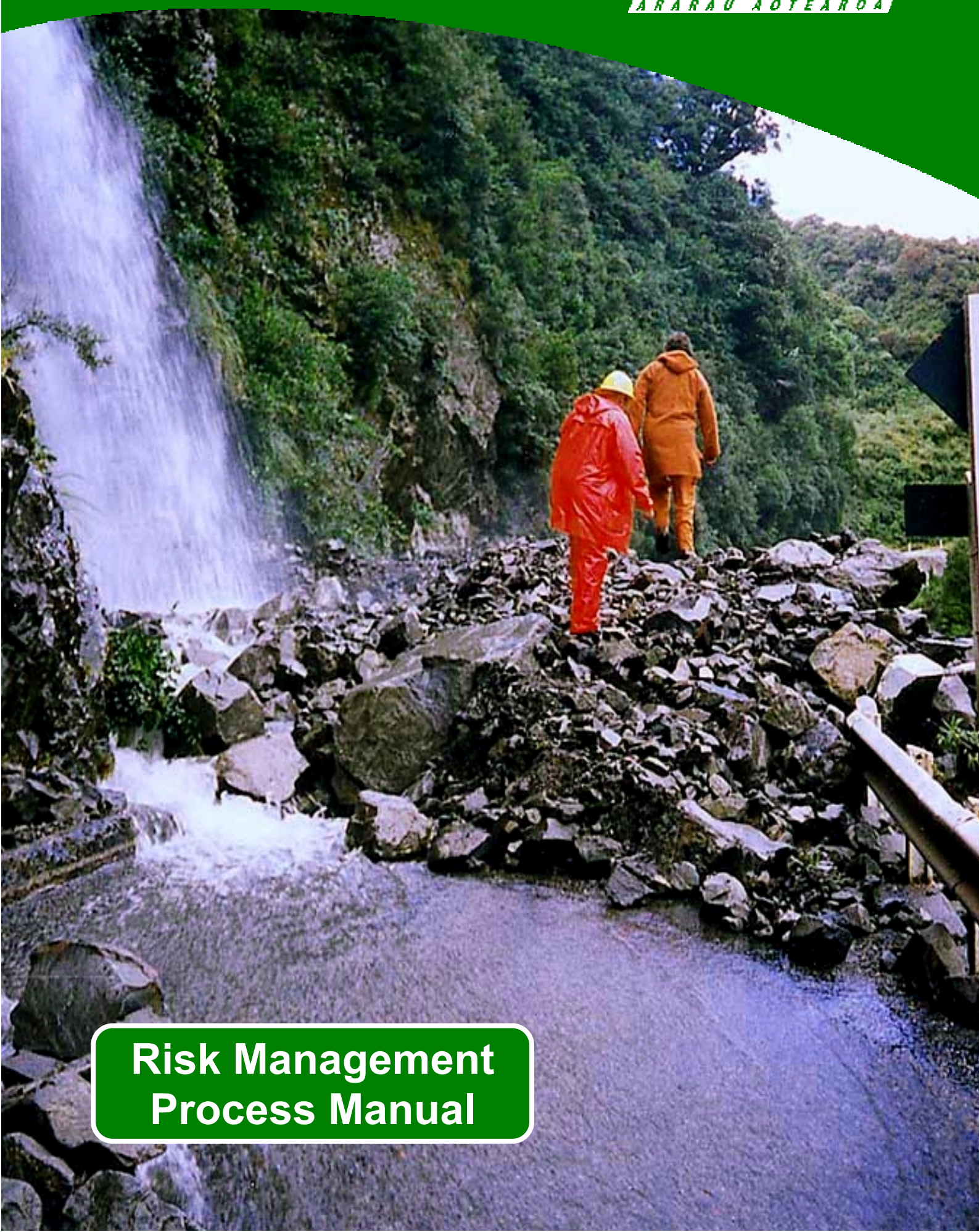
TRANSIT NEW ZEALAND
ARARAU AOTEAROA



Risk Management Process Manual

Risk Management Process Manual

AC/Man/1
ISBN 0-478-10560-6

Manual Number: AC/Man/1
Status: Issue September 2004
Manual Owner: Assurance and Compliance Manager
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Record of Amendments

Amendment №	Subject	Effective Date	Updated By
1	Ref to Appendix 7 added to Section 1	5/11/02	G Butler
2	Appendix 7 added	5/11/02	G Butler
3	Major Review	15/9/04	G Butler

National Office Date of issue: 15 September 2004

Manual Management Plan for the Risk Management Process Manual AC /MAN /1

Manual Owner: Garry Butler **Sponsor Endorsement: Chief Executive**

1. Purpose

This is the Manual Management Plan for the above Manual.
[In accordance with Transits ISO 9001 Quality System, Manual Owners are expected to complete this form for all manuals]

2. Document Information

Manual Name	Risk Management Process Manual	
Manual No.	AC / Man / 1	
Regional Champion	Errol Christianson	
Review Team Members	• Garry Butler	• Susan Chamberlain
	• Richard Quinn	• Ian Walsh
	• Errol Christianson	• Neville Harkness

3. Amendment and Review Strategy

All Corrective Action/Improvement Requests (CAIRs) suggesting changes will be acknowledged by the manual owner.

	Comments	**Frequency**
Amendments (of a minor nature)	June, September, December	Quarterly
Review (major changes)	March	Annual

4. Other Information (at Manual Owners discretion)

There will be occasions, depending on the subject matter, when amendments will need to be worked through by a Best Practice Group under the direction of the Review Team before the amendment is actioned. This may cause some variation to the above noted time frames.

Chief Executive's Statement

Chief Executive's Statement

Transit is responsible for the stewardship of New Zealand's state highways, which comprise approximately 11,000km of roads with an asset value of over $10 billion. In developing, maintaining and operating this asset, Transit has responsibility for the expenditure of more than $0.5 billion of road-sector funds each year. Our activities affect both road users and communities, and our success or failure is measured not just in economic terms but also in social and environmental (triple bottom line) imperatives.

The obligations and expectations that others have placed on Transit, and the expectations for excellence that we have in turn placed on our suppliers, and ourselves are demanding. These obligations and expectations are clearly identified in such documents as:

- the Transit New Zealand Act 1989
- the Land Transport Management Act 2003 and other legislation
- stakeholder performance agreements
- corporate and national strategies
- plans, contracts, standards, and procedures.

Any potential for non-achievement in these areas defines potential areas of risk to Transit. There are also less obvious risks that we face in a changing environment. These may be political or physical, and they include:

- changing transport policies
- natural disasters
- the state of the economy
- changes in local authority structures and politics.

It is important that we understand risks as both threats and opportunities. Too often organisations put emphasis on threats, and so they miss valuable opportunities to improve their performance through effective risk management. We need effective processes in place so that we can be confident of identifying and managing significant risks to our business. Management of risks is not new to us. In one form or another it underpins many of our current business activities – and, for that matter, our everyday lives.

The approach defined in this document, however, adds a systematic overview, focus, and reference point for risk management. Better decisions, processes, plans, and programmes are the intended results. The goal is to enhance our chances of success and to minimise the potential for failure, through greater risk awareness and proactive management.

It is important that the responsibilities, procedures and guidelines defined in this manual are widely understood and rigorously implemented. Risk management – the management of our risks – is not "someone else's problem". It's everyone's responsibility.

Rick van Barneveld

Chief Executive

SECTION 1: OVERVIEW

1.1 Definitions

Purpose To define key terms associated with risk management.

Definitions

Term	Definition
Active Processes	Applied to risk management processes that require planned intervention; eg such as threat treatment and opportunity realisation
Consequence	Outcome of an event.
Controls	The risk treatments that are already part of the organisational culture(s) and which will apply without the need for specific further risk management action.
Enhance	An active treatment strategy targeted at increasing the consequences of an opportunity.
Event	Occurrence of a particular situation or set of circumstances leading to a consequence; including both threats and opportunities. Also further classified as: Emerging – the risk is still emerging and its relevance and/or the extent of its impact is still undefined Live – the risk is defined and it is being actively or passively managed Parked – the risk has been excluded from current management processes. Closed – the risk no longer presents a threat or opportunity (e.g. work has gone beyond the point where the event could have occurred)
Exposure	The suite of risks being carried by a given party at a given time; see Risk Profile.
Gain	A positive consequence, financial or otherwise
Likelihood	Extent to which an event is likely to occur.
Loss	A negative consequence, financial or otherwise.
Maximise	An active treatment strategy targeted at increasing the likelihood of realising an opportunity.
Minimise	An active treatment strategy targeted at reducing the likelihood of experiencing a threat.

Mitigate	An active treatment strategy targeted at reducing the consequences of a threat.
Monitor	To check, supervise, observe critically or measure the progress of an activity, action or system on a regular basis in order to identify change from the performance level required or expected.
Operational Risk Management	The systematic assessment and management of the trade offs made between threat and opportunity to run an efficient and effective organisation
Opportunity	An event that has the potential to move the outcome of an activity to a more favourable position. Refer Event.
Passive Processes	Applied to risk management processes that are not dependent upon planned intervention; eg threat exposure assessment.
Residual Risk	The remaining level of risk after risk treatment.
Retained Risk	A risk that is generally passively accepted, ie without treatment.
Risk	The chance of something happening that will have an impact on objectives. It is measured in terms of a combination of the likelihood of an event and its consequence.
Risk Analysis	A systematic use of available information to determine the magnitude of the consequence of events and their likelihood, to establish the level of risk.
Risk Assessment	The overall process of risk identification, risk analysis, and risk evaluation.
Risk Context	The environment within which risk evaluations (judgements) are made. Includes determination of activity objectives, stated or inferred obligations and stakeholder expectations and risk tolerance.
Risk Evaluation	Process used to determine the acceptability or otherwise of risk, by establishing and comparing the level of risk against predetermined standards, target risk levels or other criteria.
Risk Identification	The process of determining what can happen when carrying out an activity; where, when, why and how
Risk Management	The cultures, processes and structures that are directed towards the effective management of potential opportunities and threats
Risk Management Process	The systematic application of management policies, procedures and practices to the tasks of, establishing the context, identifying, analysing, evaluating, treating, monitoring and communicating risk
Risk Profile	A combination of all the risks pertaining to an activity and being carried by a given party; commonly presented in a graphical form to illustrate changes in exposure.

Risk Treatment	Process of selection and implementation of measures to modify risk.
Sensitivity Analysis	Examines how the results of a calculation or model vary as input assumptions or parameters are changed.
Significant Risk	Having the potential to result in substantial permanent environmental change, large cost changes, extensive programme changes, considerably modified functional performance, death/injury, legal proceedings, or generating a major impact on Transit's image.
Stakeholders	Those people and organisations who may affect, be affected by, or perceive themselves to be affected by, the decision or activity.
Threat	An event that has the potential to move the outcome of an activity to a more unfavourable position. Refer Event.

1.2 Primary Objective, Applicability and Scope

Purpose

To describe how risk management applies to Transit and its business.

Objective

The objective of the risk management process is to provide a set of tools that will help minimise threats to Transit's business and maximise opportunities to enhance it.

Specifically, the risk management process is designed to raise awareness of threats and opportunities and to minimise such risks as:

- programme/project overrun (in cost or time)
- litigation
- network unavailability/delay
- death/injury
- community and road user concern
- environmental damage.

Outcome

The outcome the risk management process strives to achieve is the minimisation of significant risks to Transits business. This is to be achieved by the way we programme and cost our activities.

Applicability to Transit's Business

Risk management helps to ensure that expectations (of quality, time, or cost) are achieved. It provides confidence that Transit's strategies, goals, objectives, plans, processes, and programmes are:

- designed to meet external expectations and requirements
- designed to meet perceived business and operational risks
- achievable.

Scope

The risk management process described in this manual is to be applied to all Transit's business activities:

- outsourced activities
- internal activities
- business-planning activities.

Outputs

The desired outputs from Transit's risk management process are:

- effective and continuous management of all risks
- reporting and elevation of all significant risks
- risk-adjusted programming
- risk-adjusted cost estimation.

Financial Risk

In terms of meeting financial expectations, Transit's risk management process will help in meeting the financial-risk-estimating requirements of the Transit *Cost Estimation Manual* (SM014). The risk management process will also ensure that sufficient information is provided to satisfy Transfund New Zealand's *Project Evaluation Manual Risk Analysis Guidelines*.

Risk management is not limited to the management of financial uncertainty – it includes all sources of uncertainty that may impact upon Transit's ability to meet objectives, obligations, and stakeholder expectations in relation to all anticipated outcomes. These anticipated outcomes are captured in relevant statutory obligations, and further

developed in the triple bottom line reporting obligations covering financial, social and environmental objectives.

Relationship to Existing Operational Processes

Other existing Transit programmes, procedures and systems have a specific focus on the management of risks but do not necessarily use the specific tools described in this manual. These programmes, procedures and systems are nevertheless broadly consistent with *AS/NZS 4360: 2004 Risk Management*. (AS/NZS 4360).

The risk management process described in this manual is intended to provide further support to these programmes, procedures, and systems. It does not replace them.

Refer to Transit's Quality Management System manual (internal to Transit) for current Operational Risk Management Processes.

1.3 Principles of Risk Management

Purpose

To describe the principles behind risk management.

Uncertainty

Uncertainty is inherent in asset creation and asset management. Risk management systematically manages the risks (threats and opportunities) associated with this uncertainty. Risk management procedures should be applied to all activities that have an element of uncertainty in their outcome.

Threats and Opportunities

Risk management has traditionally focused on threats, with opportunities only arising as the incidental outcome of effective risk treatment. Transit's risk management process focuses on both threats and opportunities.

The classification of a risk as a "threat" or an "opportunity" depends substantially upon what objectives have been set or expectations stakeholders may have concerning the outcome of an activity (i.e. optimistic or conservative).

A threat and an opportunity can arise jointly from a common risk driver, or can be quite separate in nature.

Opportunities may be understood to comprise both:

- favourable outcomes within a general range of uncertainty, often dominated by the consideration of threats (i.e. traditional risk management)
- specifically identified enhancements or savings that may have associated threats (i.e. traditional value engineering).

Similarly, threats may be understood to comprise both:

- specifically identified unfavourable outcomes that may have associated opportunities (i.e. traditional risk management)
- unfavourable outcomes associated with pursuing opportunities (i.e. traditional value engineering).

Defining Risk

Risk is defined in terms of both ***consequence*** and ***likelihood***. That is:

- the specific risk event must potentially result in some consequential loss ***or*** gain
- there must be some probability (in the range $0 < Pr < 1$), that the risk event may be experienced during the remaining phases of the activity.

Treating Risk

Individual risk events may well have a degree of uncertainty in their effect on the outcome of an activity. Risk treatment is therefore focused upon limiting the impacts of potential threats ***and*** optimising the impact of potential opportunities. Investment made in actively treating threats and/or pursuing opportunities requires justification in terms of the tangible and intangible returns provided. The value model considering functional performance outcomes relative to resources consumed in pursuing the activity provides a suitable tool for arriving at such justification.

1.4 Key Concepts in Transit's Risk Management Process

Purpose

To describe the key concepts associated with the development and application of risk management within Transit.

Standards

Transit's risk management processes and practices are consistent with the principles defined in AS/NZS 4360:2004

Development

The key concepts in the development of Transit's risk management process are:

- definition of risk management policies
- linkage to strategic plans and key processes
- communication of policies
- appropriate planning and allocation of resources
- management commitment
- implementation and maintenance of appropriate systems
- definition of responsibilities and authorities
- management review

Application

The key elements in applying Transit's risk management process are:

1. Establishing the context within which risks must be managed.
2. Selecting the appropriate approach to risk assessment i.e. informal, qualitative, quantitative, or a combination of approaches.
3. Identifying, analysing and evaluating the risks.
4. Determining the risk treatment plans.
5. Reporting of significant risks to progressively higher business levels.
6. Communication of risks to ensure focus on reducing threats and realising opportunities.

These elements are described in detail in Section 4: Application.

SECTION 2: RESPONSIBILITIES

2.1 Responsibilities

Purpose	To describe a number of specific responsibilities associated with the implementation of the risk management process.
Chief Executive	The Chief Executive is the sponsor of the risk management process.
Corporate Management Group	The Corporate Management Group is responsible for: • identifying, analysing and evaluating significant risks and ensuring that appropriate treatment actions are implemented • ensuring that the development and design of key strategies and processes include appropriate risk focus and principles • reviewing significant risks that have been reported upwards, to ensure confidence in treatment plans.
Regional & Divisional Managers	Each regional and divisional manager is responsible for ensuring the implementation of the risk management process. This includes: • ensuring the timely and effective management of risks associated with the activities they are responsible for • ensuring appropriate resources, systems and controls are provided for the management of risks • ensuring an appropriate level of staff training, awareness and competence in relation to risk management requirements and practices • providing their divisional manager or the Chief Executive with assurance that all key business risks are being managed and that relevant legislation is being complied with • reporting immediately to their divisional manager or the Chief Executive any instances of significant risk or non-compliance • preparing and maintaining each regional/divisional activity risk file (which includes a risk register and risk treatment plans).

Project & Job Managers

Each project and job manager is responsible for:

- ensuring the timely management of risks associated with projects and tasks they are responsible for
- ensuring appropriate systems and controls are implemented to assure that each key risk is being managed appropriately
- providing their manager with assurance that all key risks are being managed and that all relevant legislation is being complied with
- reporting immediately to their manager any instances of significant risk or non-compliance
- maintaining any required activity risk files, which will include as a minimum a risk register, and risk treatment plans
- determining whether or not to delegate risk management responsibilities to a supplier
- assuring themselves that suppliers are acting appropriately in managing all risks that they have been assigned responsibility

All Staff

All Transit staff must:

- be responsible ***either*** for identifying and managing the specific risks associated with the activities they perform ***or*** for immediately reporting the risk to the appropriate level of management for action
- immediately report any significant instance of non-compliance with critical requirements (e.g. legislative non-compliance) to the most appropriate level of management for action
- respond to any significant risk in a timely manner to minimise cost, damage and disruption to the business
- continually strive to identify and implement the most cost-effective way of managing risks
- comply with and achieve risk treatment plans.
- monitor existing risks to ensure that they are effectively managed.

Special Responsibilities	Transit allocates special responsibilities to individuals and committees as follows:
Assurance & Compliance Manager	The Transit Assurance and Compliance Manager is responsible for: • ownership of the risk management process • facilitating the development and periodic review of the process, and identifying and recommending appropriate changes • auditing and reviewing the effectiveness of implementation • assessing the level of compliance with the process, and reporting on this • providing internal assistance and advice to assist in the assessment of risks • providing guidance on risk management training and staff awareness programmes • monitoring significant corporate risks and maintaining the corporate risk register • reviewing and recommending amendments to the Risk Management Process Manual.
Risk Management Committee	Transit's Risk Management Committee is responsible for responding rapidly to liability and insurance issues associated with professional and physical works contracts and reviewing general insurance levels. This committee currently comprises of the: • Assurance and Compliance Manager (as Chairperson) • National Highway Manager • Finance and Corporate Services Manager The committee may communicate, consider and decide issues either by distributed documentation ***or*** by meeting (which may be a regular meeting, or initiated by one of the committee members). Transit's Contracts Coordinator co-ordinates a regular meeting of the Risk Management Committee once every 6 months or on request.

Suppliers

Where an activity is outsourced, the minimum requirements of the supplier are to ensure that:

- all advice and recommendations they give are targeted at achieving maximum value from the activity
- Transit managers are provided with assurance that all risks are being managed and that relevant legislation is being complied with
- any instances of significant risk or non-compliance are reported immediately to the Transit manager.

The supplier has further responsibilities when the activity:

- is a capital works project;
- has an estimated cost of $100,000 or more;
- is new to Transit's business;
- has several stakeholders are involved;
- is of a complex nature;
- has a long term impact on Transit's business, or:
- Transit's image may be affected by the outcome

In such cases the supplier is responsible for ensuring:

- all potential threats and opportunities associated with the achievement of activity outcomes are systematically addressed
- appropriate risk management processes are integrated into all phases of the activity development cycle, with the focus of the risk management in any given phase reflecting the outcomes sought at that phase
- the supplier's prediction of the activity outcome (generally functional performance, programme and cost) is realistically assessed in terms of both threats and opportunities
- there is an activity risk file, that contains at a minimum the risk register, and risk treatment plans for the outsourced activity

Further guidance as to the level of risk management to apply to outsourced activities can be found in Section 4: Application.

All reporting must accord with:

- the requirements and objectives of this manual (*Risk Management Process Manual*)
- the objectives of the *Cost Estimation Manual (SM014)*
- the specific scope of the activity's management services

SECTION 3: KEY TOOLS

3.1 Activity Risk File

Purpose	To describe the activity risk file to be established in the risk management of an activity.
Activity Risk File	The activity risk file contains *all* risk-related documentation – including the risk register and risk treatment plans. There must be an activity risk file kept for every outsourced activity and at each business level.
Risk Register	A risk register is used to record information about risks. It is a consolidated document, with one register being used for all risks managed in an outsourced activity or at a particular business level. The risk register is a live document that will be continually updated. In most circumstances the risk register used for reporting purposes will highlight retained and residual risk. As the risk register is updated, superseded versions should be filed in the activity risk file to maintain a full history of all risks. More detail on risk registers and the information that must be recorded in them can be found in Section 4.2: Using the General Approach. A sample of a risk register is contained in Appendix 2.
Risk Treatment Plans	Risk treatment plans set out the treatment type and treatment actions for a particular risk. An example risk treatment plan can be found in Appendix 3. An estimate of the threat reduction or opportunity enhancement associated with the proposed treatment plan should be completed to determine its cost-effectiveness. This involves comparison between pre-treatment and post-treatment exposures for individual risks and the overall risk, in a particular activity or at a particular business level. More detail on risk treatment plans and an example of estimating an activity's pre- and post- treatment risk exposure can be found in Section 4.2: Using the General Approach.

3.2 Workshops

Risk Workshops

Risk workshops are an effective way to identify risks associated with the specific activity or business level. The level of participation in the workshop will depend on the nature of the activity.

Effective facilitation of workshops is crucial.

For most outsourced projects, this should be a multidisciplinary forum that involves experienced and well-informed participants. Where appropriate, it should include selected stakeholders. Decisions should be made through consensus to make most effective use of the wide ranging subjective contributions to the workshop.

The workshop should at least establish the context for the risk exercise and the identification of risks. In some cases it will be appropriate to progress through the analysis and evaluation of the identified risks and then develop treatment plans.

Value management principles and processes as documented in AS/NZS 4183 can provide useful guidance concerning opportunity identification etc.

SECTION 4: APPLICATION

4.1 Transit's Risk Management Practices

Purpose

To describe the specific risk management practices applied to Transit's business.

Three Approaches

Transit applies three approaches to risk management practices, as follows:

- Informal Approach
- General Approach
- Advanced Approach.

The basic decisions involved in choosing the appropriate risk management approach are depicted in Figure 1.

Informal Approach

The Informal Approach consists of the application of existing procedures and controls.

It is applied where a formal risk management process is not necessary – either because existing procedures and controls are adequately managing the risk or because the risks have minimal effect on the attainment of the activities objectives.

The Informal Approach would usually be appropriate where the activity:

- has an expected cost estimate less than $100,000
- is short term e.g. less than 6 months in duration
- is routine and follows a well proven process e.g. business planning
- has little or no effect on Transit's goals and objectives

General Approach

The General Approach is to be used for all Transit activities where the informal approach is not used. It is to be applied on a continuous basis.

This approach to risk management is a qualitative approach. It is targeted at achieving the appropriate management of opportunities and threats, through the systematic application of generalised risk management processes and qualitative tools.

Advanced Approach

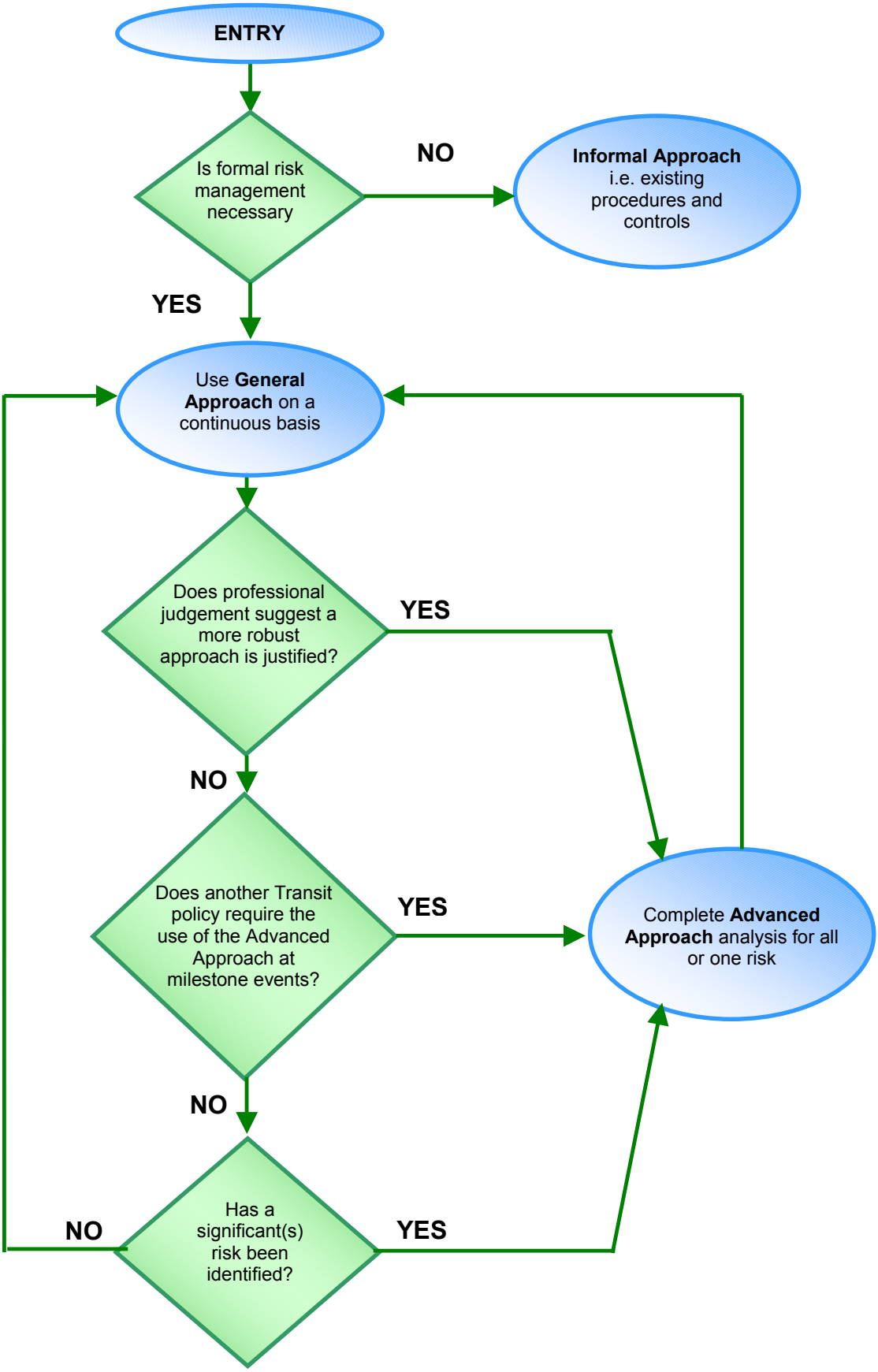
The Advanced Approach is to be used in particular circumstances, as a "one off" or discrete application within a continuous General Approach.

This approach to risk management is quantitative. It is based around the modelling of individual risks, to provide greater levels of certainty and confidence.

The circumstances in which the Advanced Approach is to be used are:

- where professional judgement suggests a more robust approach is required
- where the General Approach reports a ***significant risk.*** The existence of one "extreme" risk or five "very high" risks within an activity or business level indicates a significant risk.
- where other Transit policies mandate its application at milestone events e.g. *Transit Cost Estimation Manual (SM 014)*
- where the activity is high cost, complex or has a high impact on Transit's business e.g.:
    - a new business process/model
    - high information technology content
    - prolonged service disruption
    - corporate threat or opportunity
    - activity value in excess of $5m
    - more than one year in development or delivery

Figure 1 - Choosing the Appropriate Risk Management Approach



4.2 Using the General Approach

Purpose

To describe the process for applying the General Approach to an outsourced activity or at a business level.

AS/NZS 4360: 2004

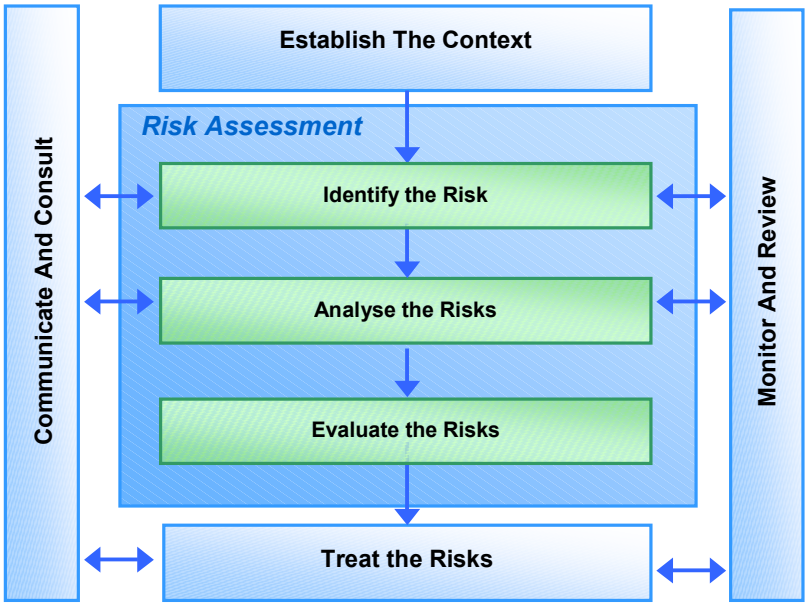
The General Approach is based upon the risk management process and definitions presented in AS/NZS 4360:2004, which should be read in conjunction with this manual.

Key Elements

The key elements of risk management are shown in Figure 2 below.

This section of the manual focuses on the central elements of the diagram.

Figure 2 - Risk Management Process Overview



Establish the Context

Transit's risk management process occurs within the framework of its strategic, internal and external risk management context.

Establishing the risk management context of an activity is a pivotal step in the risk management process. It defines the basic parameters within which risks must be managed and sets the scope for the rest of the risk management process.

When establishing the context of risk management for an activity consideration must be given to the objectives, obligations, stakeholder expectations and risk tolerance involved.

While it is recognised that Transit's suppliers will have their own objectives exposed to risk, it is expected that these risks will be filtered according to how suppliers own risks affect Transit.

Identify Risks

All risks (threats and opportunities) must be identified. Refer Appendix 1 for a prompt list to assist the identification of risks.

The risk must be one that ultimately affects Transit – in terms of both tangible and intangible exposure. Such exposure may cover health & safety, image/ reputation, environment, stakeholders interest, cost or time.

In general, risks are to be recorded as discrete risk "events" that may be experienced at some point.

Knowledge of future risk exposure will be incomplete, so an allowance should be made for "unknown" risks. This allowance is a reflection of the current state of knowledge associated with the activity or business level.

To complete the risk identification, each risk must be recorded in a ***risk register*** for that activity or business level. The recorded risk must:

- be given a unique identifying ***number***
- be given a ***name*** – a short descriptive title
- be clearly ***described*** in the words, detailing the specific event that is leading to uncertainty in activity outcome
- be assigned a ***status*** from the following:

  emerging – the risk is still emerging and the full extent of its impact is still undefined. Plans for the management of the risk are required

  live – the risk has emerged and its full extent defined. It is being actively or passively managed

  parked – the risk has been excluded from current management processes. (i.e. has been excluded from treatment at this level of activity management)

  closed – is no longer a risk to the activity eg work has progressed beyond the point where the risk could have occurred. When a risk is closed, the actual outcome should be recorded in the risk register referring to the degree to which the risk was actually experienced or whether some other event was experienced.

Status is particularly important in communicating risk (eg between project phases, or from asset improvement to asset management). Even risks that are closed in terms of the current activity (eg. asset improvement project) or phase may have latent connotations for a future owner (eg. asset manager).

Analyse Risks

The General Approach provides a qualitative technique for analysing the identified risks. This technique is useful for considering diverse types of risk exposure, which would not otherwise be readily comparable.

The analysis consists of:

- ***Existing controls*** – detailing existing processes, devices, practices or controls that act to minimise threats or enhance opportunities, including an indication of how they might be of influence.

- ***Consequence*** – a description and a rating of the consequence of a risk, in terms of the loss or gain that may be experienced if the risk event occurs (refer table 2 for consequence ratings).
- ***Likelihood*** – a description and a rating of the likelihood of the risk for the full range of risk event consequences (refer table 1 for likelihood ratings). In particular for opportunities it is the likelihood of the stated gain being realised if the opportunity is pursued.

It is expected that the ratings given will be based on professional judgement and by consensus (to remove aberrant results).

The analysed consequences and likelihoods of each risk are those that apply after the application of existing control measures, but before the implementation of further risk treatment actions.

Best-case and worst-case scenarios for any risk are to be considered in the analysis. Any one risk may be analysed as having: both an opportunity and a threat component; an opportunity component only; or a threat component only.

Table 1a: Rating the Likelihood (L) of a Threat

(Generally applicable to a passive process)

Likelihood	Probability (for short term activities such as asset improvement)	Frequency (for long term activities such as in asset management and Corporate business)	Description	Rating
Likely	>50%	Greater than once per year	The threat can be expected to occur *or* a very poor state of knowledge has been established on the threat.	**5**
Quite Common	20%-50%	Once per 1-5 years	The threat will quite commonly occur *or* a poor state of knowledge has been established on the threat.	**4**
Unlikely	10%-20%	Once per 5-10 years	The threat may occur occasionally *or* a moderate state of knowledge has been established on the threat.	**3**
Unusual	1%-10%	Once per 10 – 50 years	The threat could infrequently occur *or* a good state of knowledge has been established on the threat.	**2**
Rare	<1%	Less than once per 50 years	The threat may occur in exceptional circumstances *or* a very good state of knowledge has been established on the threat.	**1**

Table 1b: Rating the Likelihood (L) of an Opportunity

(Generally applicable to an active process)

Likelihood	Probability (for long and short term activities)	Description	Rating
Almost Certain	>90%	The opportunity is almost certain to be realised *or* a very high degree of confidence in delivering the gains has been established for the opportunity	**5**
Expected	75% - 90%	The opportunity is expected to be realised in most circumstances *or* a high degree of confidence in delivering the gains has been established for the opportunity	**4**
Likely	50% - 75%	The opportunity will probably be realised *or* a moderate degree of confidence in delivering the gains has been established for the opportunity	**3**
Unlikely	25% - 50%	The opportunity is unlikely to be realised *or* a low degree of confidence in delivering the gains has been established for the opportunity	**2**
Very Unlikely	<25%	The opportunity is very unlikely to be realised *or* a very low degree of confidence in delivering the gains has been established for the opportunity	**1**

Table 2: Rating the Consequence

Descriptor		Health & Safety	Image / Reputation	Environment	Stakeholder Interest	Cost	Time	Rating
Threat	**Substantial**	Multiple fatalities	International Media Cover	Permanent widespread ecological damage	Commission of Inquiry	+$10M	Many years	**100**
	Major	Several fatalities	Sustained National Media Cover	Heavy ecological damage, costly restoration	Ministerial Inquiry	+ $1M to $10M	Years	**70**
	Medium	Serious Injuries	Regional Media Cover or Short Term National Cover	Major but recoverable ecological damage	Ministerial Questions or 3rd party investigation	+ $100k to $1M	Months	**40**
	Minor	Minor Injuries	Local Media Cover	Limited but medium-term negative effects	Official Information Request	+ $10k to $100k	Weeks	**10**
	Negligible	Slight Injuries	Brief Local Media Cover	Short-term damage	Minor Complaint	+ $0 to $10k	Days	**1**
Opportunity	**Negligible**	Prevention of Slight Injuries	Brief Local Media Cover	Short-term enhancement	Letter of support	- $0 to $10k	Days	**-1**
	Minor	Prevention of Minor Injuries	Local Media Cover	Limited but medium-term enhancement	Submission in support for RMA and LTMA	- $10k to $100k	Weeks	**-10**
	Medium	Prevention of Serious Injuries	Regional Media Cover or Short Term National Cover	Medium to long term ecological enhancement	Champions in community	- $100k to $1M	Months	**-40**
	Major	Saving of Several fatalities	Sustained National Media Cover	Long Term and important ecological enhancement	Small financial contribution	- $1M to $10M	Years	**-70**
	Substantial	Saving of Multiple fatalities	International Media Cover	Permanent widespread ecological enhancement	Large financial contribution	-$10M	Many Years	**-100**

Evaluating the Risk

The General Approach evaluates risk by establishing, for each given risk:

- a ***risk score*** – the multiple of the ratings for likelihood and consequences for that specific risk.
- a ***risk category*** - a description of the risk score in words (i.e. "negligible", "low", "moderate", "high", "very high", "extreme").
- a ***risk ranking*** - established by listing all the risks associated with the activity or business level, in order of decreasing risk score.

The score, category and ranking for each risk must be recorded in the risk register. Tables 3a and 3b detail the category types for the range of risk scores.

The existence of one "extreme" risk or 5 "very high" risks within an activity or business level indicates a significant risk, and triggers the requirement for the Advanced Approach.

Evaluation as to whether the risk requires specific treatment requires judgement, and the judgement exercised shall be documented clearly in the register. Each assessed risk must be considered on its merits, with particular consideration of the adequacy of existing controls. The risk score is intended to provide a clear indication of the need for specific treatment, although the likelihood rating may also provide a useful indication.

Treatment Plans

The development of a risk treatment plan involves the selection of a ***treatment type*** and the identification of ***treatment actions***.

For all emerging and live risks it is required that a treatment plan be developed.

Treatment Type

The decision of a treatment type is the first step in risk treatment planning.

The treatment type may consist of one or more of the following:

- For opportunities or threats:

  Actively Accept – accept the risk and consider options for the treatment of the risk as elaborated below.

  Passively Accept – accept the risk as it is, i.e. no further treatment is appropriate or possible at this time.

  Transfer/Share – pass the risk in whole or in part to others e.g. through contractual agreements or insurance. Appropriate where others are best able to manage the risk.

  Avoid (threats) or Reject (opportunities) – change parts of the activity so that there is no longer any exposure.

- Active treatment strategies for opportunities:

  Maximise – increasing the likelihood of realising the opportunity.

  Enhance – increasing the gains that may be realised from the opportunity.

- Active treatment strategies for threats:

  Minimise – reducing the likelihood of experiencing the threat.

  Mitigate – reduce the consequence of experiencing the threat by means such as establishing "post-occurrence" contingency and disaster plans to reduce the consequence of experiencing the risk.

The decision of treatment type should be made in consideration of the ***risk score***. Tables 3a and 3b suggest a possible treatment type for the range of risk scores. However, the treatment strategy for each risk should be considered on its merits, with particular consideration of the adequacy of existing controls.

Table 3a: Threat Categories, with suggested Treatment Types

MITIGATE WHENEVER POSSIBLE

	CONSEQUENCES (loss)				
Likelihood	**Negligible (1)**	**Minor (10)**	**Medium (40)**	**Major (70)**	**Substantial (100)**
Likely (5)	**5 Low threat** **ACCEPT ACTIVELY** - Enhance systems to minimise potential - Accept - Repair	**50 Moderate threat** **ACCEPT ACTIVELY** - Enhance systems to minimise potential	**200 Very high threat** **AVOID** - Immediate action - Enhance systems to minimise potential	**350 Extreme threat** **AVOID** Immediate action - Cease activity	**500 Extreme threat** **AVOID** - Immediate action - Cease activity
Quite Common (4)	**4 Low threat** **ACCEPT ACTIVELY** - Enhance systems to minimise potential - Accept - Repair	**40 Moderate threat** **ACCEPT ACTIVELY** - Enhance systems to minimise potential - Insure	**160 Very High threat** **AVOID** - Immediate action - Enhance systems to minimise potential	**280 Very high threat** **AVOID** - Immediate action - Contingency Plans	**400 Extreme threat** **AVOID** - Immediate action - Cease activity
Unlikely (3)	**3 Negligible threat** **ACCEPT PASSIVELY** - Repair	**30 Moderate threat** **ACCEPT ACTIVELY** - Enhance systems to minimise potential - Insure - Contingency Plans	**120 High threat** **ACCEPT ACTIVELY OR TRANSFER** - Immediate action - Insure - Contingency Plans	**210 Very high threat** **AVOID** - Immediate action - Avoid - Contingency Plans	**300 Very high threat** **AVOID** - Immediate action - Avoid - Contingency Plans
Unusual (2)	**2 Negligible threat** **ACCEPT PASSIVELY** - Repair	**20 Low threat** **ACCEPT ACTIVELY OR TRANSFER** - Repair	**80 High threat** **ACCEPT ACTIVELY OR TRANSFER** - Monitor - Insure - Contingency Plans	**140 High threat** **AVOID OR TRANSFER** - Monitor - Insure - Contingency & Disaster Plans	**200 Very high threat** **AVOID OR TRANSFER** - Monitor - Insure - Contingency & Disaster Plans
Rare (1)	**1 Negligible threat** **ACCEPT PASSIVELY** - Repair	**10 Low threat** **ACCEPT ACTIVELY OR TRANSFER** - Repair	**40 Moderate threat** **ACCEPT ACTIVELY OR TRANSFER** - Monitor - Insure - Contingency Plans	**70 High threat** **AVOID OR TRANSFER** - Monitor - Insure - Contingency & Disaster Plans	**100 High threat** **AVOID OR TRANSFER** - Monitor - Insure - Contingency & Disaster Plans

MINIMISE WHENEVER POSSIBLE

Table 3b: Opportunity Categories, with Suggested Treatment Types

ENHANCE WHEREVER POSSIBLE

	CONSEQUENCES (gain)				
Likelihood	**Negligible (-1)**	**Minor (-10)**	**Medium (-40))**	**Major (-70)**	**Substantial (-100)**
Almost Certain (5)	-5 Low Opportunity ACCEPT ACTIVELY - ENHANCE	-50 Moderate Opportunity ACCEPT ACTIVELY - ENHANCE	-200 Very high Opportunity ACCEPT ACTIVELY - ENHANCE	-350 Extreme Opportunity ACCEPT ACTIVELY - ENHANCE	-500 Extreme Opportunity ACCEPT ACTIVELY
Expected (4)	-4 Low Opportunity ACCEPT ACTIVELY – ENHANCE/MAXIMISE	-40 Moderate Opportunity ACCEPT ACTIVELY – ENHANCE/MAXIMISE	-160 Very High Opportunity ACCEPT ACTIVELY – ENHANCE/MAXIMISE	-280 Very high Opportunity ACCEPT ACTIVELY – ENHANCE/MAXIMISE	-400 Extreme Opportunity ACCEPT ACTIVELY - ENHANCE
Likely (3)	-3 Negligible Opportunity ACCEPT PASSIVELY	-30 Moderate Opportunity ACCEPT PASSIVELY	-120 High Opportunity ACCEPT ACTIVELY – ENHANCE/MAXIMISE	-210 Very high Opportunity ACCEPT ACTIVELY – ENHANCE/MAXIMISE	-300 Very high Opportunity ACCEPT ACTIVELY - MAXIMISE
Unlikely (2)	-2 Negligible Opportunity REJECT	-20 Low Opportunity ACCEPT PASSIVELY	-80 High Opportunity ACCEPT PASSIVELY	-140 High Opportunity ACCEPT PASSIVELY	-200 Very high Opportunity ACCEPT ACTIVELY - MAXIMISE
Very Unlikely (1)	-1 Negligible Opportunity REJECT	-10 Low Opportunity REJECT	-40 Moderate Opportunity REJECT	-70 High Opportunity ACCEPT PASSIVELY	-100 High Opportunity ACCEPT ACTIVELY - MAXIMISE

MAXIMISE WHENEVER POSSIBLE

Treating the Risk

Once the treatment type has been selected, an appropriate ***treatment action*** should be developed for each live and emerging risk. Details of the resources, timing, responsibilities, and the monitoring and reporting requirements, associated with the treatment actions should also be identified. Progress should be recorded on the treatment plan (Appendix 3) and summarised on the risk register (Appendix 2). The treatment plan should note the current progress of treatment actions, and detail any change.

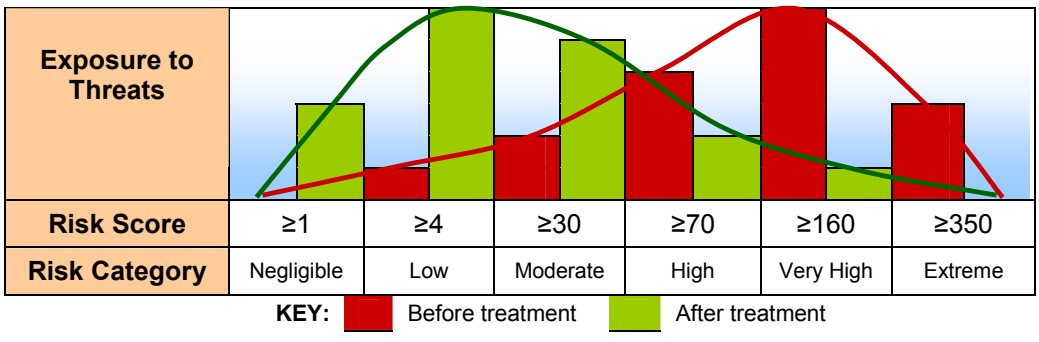
An "example" treatment plan can be found in Appendix 3.

The treatment plan should always aim to benefit the activity and increase the value of the outcome and confidence in achieving the desired objectives. This may be determined by estimating the threat reduction/opportunity enhancement available through active treatment. To estimate the improvement in value to be obtained through active risk treatment, repeat the risk analysis for the risk in a post-treatment context. The post-treatment and pre-treatments exposures are then compared, both in terms of each individual risk and the overall risk (see Figure 3 below). Ensure that any new opportunities arising from threat treatment, and/or any new threats arising from pursuing opportunities are incorporated into this analysis.

Where both the risk treatment investment and the improvement in risk position are measured in financial terms, the return on investment can be assessed in cost-benefit ratio terms. Where the improvement in risk position is measured in other parameters, such as time or reputation, judgement must be exercised in assessing the value offered by the treatment plan. . There is generally an optimum investment in treatment that will provide the best return in terms of reduced risk exposure, and this is the treatment level that is sought.

The proposed treatment plan must be reviewed by Transit before implementation.

Figure 3 – Estimating Risk Reduction
Exposure to threats before and after the implementation of treatment plans



Risk Adjusted Programmes	Time risk is generally taken to apply to the achievement of activity completion and selected intermediate critical milestones, which may relate to phases of the activity. All programme milestones shall include an appropriate provision for time risk as assessed from the risk register. Qualitative assessment based on experienced judgement is presumed under the General Approach, with all risks assessed on a current exposure basis. All programmes shall be presented showing the base, expected (mean) and conservative dates of all relevant critical milestones within an activity Both the inputs and outputs of the time risk assessment are to be reported in a clear and auditable format and are to be consistent with and generally traceable to the information provided in the Risk Register
Risk Adjusted Cost Estimates	All cost budgets shall include an appropriate provision for risk as assessed from the Risk Register. Where required by SM014 the Advanced Approach shall be used. Qualitative assessment based on experienced judgement with reference to contingency management is presumed under the General Approach, with all risks assessed on a current exposure basis. All cost estimates shall be presented showing the base, expected (mean) and 95th percentile estimates of cost for the activity. Both the inputs and outputs of the time risk assessment are to be reported in a clear and auditable format and are to be consistent with and generally traceable to the information provided in the Risk Register
Exceptions Statement	The *exceptions statement* must detail all exclusions, assumptions or limitations made in both the time and cost risk assessments. Generally the exceptions statement shall be common to both time and cost analyses. The statement shall include a description of the exclusion, assumption or limitation, and how it relates to the completed risk assessment. All parked and emerging risks shall be linked to the exceptions statement as appropriate. An example of an item to be included in an exceptions statement is risks to the operating costs of other activities. In some cases it may also be appropriate to exclude threats such as funding decisions, which would be parked and replaced with assumptions for analysis purposes. The exceptions statement is to be a footnote to the risk adjusted programmes and cost estimates. A copy is to be added to the Risk Register.
Monitor and Review	The requirements for this part of the risk management process are detailed in section 4.4 of this manual.

Communicate and Consult	The requirements for this part of the risk management process are detailed in section 4.5 of this manual.
Quality Assurance	A quality assurance record must be provided with the activity risk file. This should include a list of the sources used in doing the analysis, e.g. the people interviewed, the documents used (including previous risk analysis), the checklists used and the sites visited. The quality assurance record must be signed and dated.

4.3 Using the Advanced Approach

Purpose

To describe how to apply the Advanced Approach.

Used in Particular Circumstances

The Advanced Approach is only used in the circumstances described in Section 4.1 of this manual.

Objective

The objective of the Advanced Approach is to improve the quality of risk management through the application of a systematic and consistent quantitative analysis.

Key Elements

The key elements of the Advanced Approach are the time-risk analysis, cost-risk analysis and an "exceptions statement".

Modelling Note

For each risk analysed under the Advanced Approach, there must also be a modelling note entered in the risk register. There must be a modelling note for every risk analysed under the Advanced Approach, and as a minimum it should contain:

- **Defining parameters –** In some cases this will be the assigned optimistic, pessimistic and expected (mean) or most likely values.
- **The probability distribution function** - Select an appropriate probability distribution function (PDF) based on knowledge of the risk. The PDF used may be selected from the following:
  - discrete
  - triangular
  - trigen
  - normal
  - uniform
  - pert
  - log normal
- The **rationale** for selecting the defining parameters and the distribution formula.
- A list of **correlations**, if any, with other risks and an explanation of how the correlation is to be modelled. An example of correlation:

  When risk A distribution returns a high value, the related risk B distribution shall also return a high value, or when risk C distribution returns a value the related risk D distribution shall not.

Time Risk Analysis

This is the analysis of a logic-linked programme with all possible resulting critical path(s) identified. Specific risk events, and their effect on activities productivity, should be considered when identifying the critical path(s). Time risk is generally taken to apply to the achievement of activity completion and selected intermediate critical milestones, which may relate to phases of the activity.

The level of detail in this analysis is a judgement call of the analyst based on their knowledge of the effect of the risks on the activity programme. This may range from an informal consideration of the time related components of each risk on the activity programme, to a comprehensive modelling of all risks and their combined impact on the delivery of the

activity. For many activities subjected to time risk analysis it is expected that discrete scenario programming may be sufficient to obtain an understanding of the time risk.

A risk model that uses a Monte Carlo-type simulation of the work programme may be used, incorporating the appropriate risks from the risk register (i.e. those risks with a time impact). All risks must be modelled on a current exposure basis.

The output of the time risk analysis must be:

- a graph showing the distribution of completion/milestone dates.
- a programme showing the base, expected (mean) and conservative dates of all critical milestones within an activity

Both the inputs and outputs of the risk analysis are to be reported in a clear and auditable format and are to be consistent with the information provided in the Risk Register.

Cost Risk Analysis

The following inputs are required in the cost risk analysis:

- the base cost estimate
- the output of the time risk analysis, in terms of its impact on costs (i.e. integrating the time and cost risk analysis)
- the cost component of all risks with a cost impact

A risk model that utilises a Monte Carlo-type simulation of the risk costs or an equivalent process suited to the scale and complexity of the activity must be used. All risks must be modelled on a current exposure basis for reporting purposes. (Note: post treatment exposure may be considered when assessing treatment investment).

The output of the cost risk analysis must be:

- a graph showing the overall distribution of costs
- a table showing the base cost estimate, the expected value (mean) and the 95^{th} percentile.

Both the inputs and outputs of the risk analysis are to be reported in a clear and auditable format and are to be consistent with the information provided in the Risk Register.

Exceptions Statement

The *exceptions statement* must detail all exclusions, assumptions or limitations made in both the time and cost analyses. Refer Section 4.2 General Approach Exceptions Statement.

Evaluation

The evaluation is to include rankings of all risks affecting the outturn costs and all risks with a time-risk component. This should show the results of sensitivity analysis, and take into account risk correlation and expected value. A clear decision as to the need or otherwise for specific treatment shall be documented in the register.

Where next?

The Advanced Approach provides a quantitative analytical tool. After the analysis and evaluation under the Advanced Approach has been completed, return to the General Approach for ***risk treatment*** procedures and risk management reporting obligations. Generally post treatment quantitative assessment will be required as part of the risk treatment investment value enhancement justification.

4.4 Reporting, Monitoring and Review

Purpose

To describe the monitoring and review of risk management activities through Transit's performance-measurement and reporting systems.

Transit's Risk File

A risk file for the overall organisation will be formed, to provide assurance that Transit's goals and objectives will be met. This risk file is an aggregation of the risk information from activities and business levels within the organisation.

Reporting Trigger

The key reporting trigger is ***significant risks***. All significant risks are to be reported through progressively higher levels within the organisation.

Formal Organisational Levels

The recognised formal organisational levels are as follows:

- Board
- CMG
- Divisions } Business Level
- Regions
- Activities } Activity Level

Amalgamation Required

It is necessary for risk information to be amalgamated before it is reported upwards.

For example, Transit's divisions must report all significant risks to the Corporate Management Group. The Corporate Management Group is required to monitor these divisional risks in addition to monitoring its own risk register.

Frequency of Reporting and Monitoring

The frequency of reporting and monitoring required to each Transit business level is shown in Table 4.

Table 4 –Frequency of Reporting and Monitoring of Significant Risks

Level	Prepare and Review Risk Registers	Report Significant Risks	Monitor Significant Risks
Board	n/a	n/a	Annually
CMG	Quarterly	Quarterly	Quarterly
Divisional	Quarterly	Quarterly	Quarterly
Regional	Quarterly	Quarterly	Quarterly
Activity	Quarterly	Quarterly	Quarterly

Procedure for Outsourced Activities

All identified risks in outsourced activities, where the General Approach has been applied, must be monitored and reviewed throughout the activity's lifecycle.

The supplier's regular progress report must include the current risk register for that activity. In activities where there is a construction phase, monitoring and review must be integrated into the regular activity management meetings held between the supplier and Transit.

Throughout the activity, the supplier must also provide Transit with a quarterly ***significant risk statement***.

The ***significant risk statement*** must:

- state the level of commitment to the activity. For example: committed to professional advice vs committed to consenting/land purchase vs committed to implementation/capital investment/physical works
- list the significant risks and report the respective risk category and score (refer tables 3a and 3b).
- contain a risk assessment, set out as illustrated in this manual at the end of Section 4.3: Using the Advanced Approach
- contain a brief commentary on all changes to significant risks that have occurred since the last quarterly report (including the treatment plan adopted and the progress made on implementing the treatment actions).
- include the exceptions statement

The risk register must be maintained as a live document as part of the monitoring process.

Closed risks are to remain in the register for auditing purposes.

Newly identified risks must be reported upwards immediately (an example significant risk report can be found in Appendix 4), and added to the risk register. Treatment plans must be considered for new risks.

The supplier must provide Transit with a full copy of the current activity risk file at the completion of each phase of an activity.

4.5 Communication and Consultation

Purpose	To describe the objectives and scope of communication and consultation.
Objectives	Good ***internal*** risk communication is important to ensure all staff are well informed and focused on contributing to the reduction of threats and the achievement of opportunities. ***External*** risk communication is also important, because it raises suppliers' and stakeholders' awareness of these issues.
Internal Requirements	All consolidated reports must be communicated back to staff via the same process they were amalgamated – that is: the Corporate Management Group's consolidated reports must be communicated within the respective divisions, and the treatment plans must be analysed by the divisions to identify areas where they can make direct contributions.
Requirements for Outsourced Activities	Where the supplier is required to develop a communication plan it must cover communication of identified risks and the process for managing them. The communication plan must give stakeholders a chance to understand and be involved in the decision-making process. When new parties become involved in an activity, communication of that activity's risk file is particularly important. All risks must be clearly communicated, together with their status and their treatment plans.
Factors to Consider	The following factors should be taken into account when communicating and consulting on risk matters: • degree to which exposure is voluntary and the degree of individual control that is present • natural versus industrial sources of exposure • degree of familiarity with the risk and past experience with the risk management agency • degree to which dialogue is established and stakeholders are involved in the decision-making process • the trustworthiness, competence, values base and responsiveness of the risk management agency. The effectiveness of communication and consultation on risk matters will be influenced by perceptions of risk held by stakeholders or members of the public who do not have industry knowledge. These perceptions may be independent of the quality of the risk management work being undertaken.

Appendix 1: Prompt List of Typical Risk Events for Asset Improvement Projects

This prompt list provides an indication of typical risks to asset improvement projects. It may be of use in assisting the identification of risks for any activity. However it is not intended to be a complete list of all risks to Transit's goals and objectives. The use of this list does not replace the requirement that risks specific to a particular activity need to be identified.

CATEGORY 1 - Benefit Risks:
Base Travel Demand, Growth Forecasts, Assignment, Accidents

1.0 Base travel demand
1.1 Source data out of date
1.2 Data scope does not include all necessary variables for modeling
1.3 Data quality & statistical reliability does not meet necessary standards
1.4 Data validation not carried out
1.5 Traffic composition not quantified
1.6 Other

2.0 Growth forecasts
2.1 Urban population growth exceeds or does not reach forecast
2.2 Development-related traffic as proportion of scheme traffic does not match expectations
2.3 Time series projection based on invalid assumptions
2.4 Other

3.0 Assignment
3.1 Other future projects
3.2 Path derivation method
3.3 Routing parameters
3.4 Supply relationships
3.5 Convergence
3.6 Other

4.0 Accidents
4.1 Proportion of benefits accounted for by accidents
4.2 Observed accident sample size
4.3 Judgmental accident reduction risk
4.4 Other

5.0 Other

CATEGORY 2 - Cost Risks:
Commercial, Legal, Economic, Managerial

1.0 Project scope
1.1 Clarity of functional objectives not clearly defined and desired project outcomes not achieved
1.2 Performance criteria not clearly scoped, thus not meeting client expectations

2.0 Team relationships (performance, communication etc)
2.1 Alliance / joint venture / D&C partners relationship breaks down
2.2 Funder-developer relationship breaks down
2.3 Developer-designer/contractor relationship breaks down
2.4 Contractor-subcontractor relationship breaks down
2.5 Ineffective teamwork will impact on project implementation
2.6 Poor personnel change management
2.7 Project failure due to ineffectual communication between stakeholders
2.8 Industrial action delays programme

3.0 Funding
3.1 Project failure if project funders are hesitant about supporting the project
3.2 Project failure due to uncertain funding criteria
3.3 Project failure if sufficient funding not available
3.4 Alternative funding methods are not available

4.0 Procurement
4.1 Inappropriate tendering/procurement methods
4.2 Inadequate quality or scope of contract documents
4.3 Alternative tender submissions affect project programme/quality
4.4 Project unable to start as tenders exceed budget allocation
4.5 Tender award is challenged, leading to programme delays

5.0 Legislative/regulation issues

6.0 Document control
6.1 Realisation of an error though using superseded documents

7.0 Market issues
7.1 Supply & demand increases project costs / affect programme
7.2 Skilled-labour shortage
7.3 Rate of cost escalation
7.4 Oil price fluctuation
7.5 Increase in insurance premiums (e.g. following major incident or natural disaster)

8.0 Programming issues
8.1 Base programme not realistic
8.2 Staging of construction not considered
8.3 Client imposes unrealistic timeframe
8.4 Productivity assumptions incorrect
8.5 Protracted consultation affects programme
8.6 Late client-approvals delay programme
8.7 Information-supply delays affect programme
8.8 Insufficient resources available to complete the project
8.9 Late or defective material supply delays programme/rework
8.10 Contractor delays affect programme
8.11 Archaeological issues delay programme

9.0 Insolvency
9.1 Contractor becomes insolvent during construction; severely affects project at all levels

CATEGORY 2 - Cost Risks:
Commercial, Legal, Economic, Managerial

10.0 Contractual claim/dispute
10.1 Dispute develops during construction, affecting programme and cost model
10.2 Valuation of variations outside cost model limits
10.3 Professional indemnity insurance not in place or adequate for the project

11.0 Health and safety
11.1 Poor public security leads to member of public becoming injured
11.2 Poorly developed/implemented H&S procedures
11.3 Inadequate temporary/permanent access/crossings
11.4 Emergency service routes disrupted
11.5 Safety audit findings disputed / not completed

12.0 Inadequate QC/QA
12.1 Error in calculations/design assumptions that affect design concept not recognised prior to project funding commitment

13.0 Post-construction liability
13.1 Non-compliance, omission or latent defect discovered after work completed; requires additional funding

14.0 Other

CATEGORY 3 - Cost risks:
Community, Political, Environmental, Land and Property

1.0 Community
1.1 Not identifying/consulting all stakeholders / affected parties
1.2 Iwi issues not identified/resolved
1.3 Impact on local economy & amenity not assessed
1.4 Severance of social & community routes/networks
1.5 Special interest group issues not identified / affect project
1.6 Essential road users disrupted
1.7 Neighbouring business access/parking disrupted
1.8 Unrealistic community expectations
1.9 Community expectations not met
1.10 Poor public relations / breakdown of relationships
1.11 Protest / public opposition
1.12 Vandalism/sabotage/theft/arson

2.0 Industrial action by others

3.0 Ecological issues
3.1 Adverse ecological impact
3.2 Protected flora/fauna found on site
3.3 Inaccurate or inadequate flora/fauna survey
3.4 Watercourse & groundwater protection issues
3.5 Erosion & sediment discharge exceeds consent requirements
3.6 Marine habitat damaged
3.7 Landscape and aesthetic issues damaged
3.8 Impact on special/protected features or environments

4.0 Impact on public health
4.1 Nuisance (e.g. noise, dust, vibration) results in complaints; additional controls need to be employed
4.2 Emission levels exceed consent levels, requiring additional control methods
4.3 Work-hours restrictions imposed on project, resulting in programme delays/cost increases

5.0 Heritage issues – Historic Places Trust
5.1 Significant heritage issues not recognised until late in project
5.2 Special requirements for investigation/survey near or in heritage areas require additional resources (time/cost)
5.3 Heritage issues approval application declined, appeal/design change required
5.4 Heritage issues approval application delayed
5.5 Heritage issue consent expires; renewal required
5.6 Onerous conditions imposed, with time/cost implications
5.7 Accidental damage to artefacts; heritage artefact restoration required
5.8 Heritage issues consent breached, leading to litigation/settlement

6.0 Resource Management Act consents
6.1 RMA consent not identified; time/cost implications
6.2 RMA consent requires notification; time/cost implications
6.3 RMA consent declined, requiring appeal/design change with time/cost implications
6.4 RMA consent delayed (e.g. appeal to Environment Court)
6.5 RMA consent expires, requiring renewal
6.6 RMA consent has onerous conditions imposed
6.7 RMA consent breached; possible litigation

7.0 Building consent
7.1 Building consent approval delayed

CATEGORY 3 - Cost risks:
Community, Political, Environmental, Land and Property

7.2 Building consent expires
7.3 Building consent breached; litigation possible

8.0 Land and property
8.1 Land designation delayed
8.2 Land designation declined
8.3 Unable to advance purchase of land within designation
8.4 Land designation inadequate; construction extends outside designation
8.5 Establishment/borrow/dump area requirements not covered by designation
8.6 Land designation breached; litigation possible
8.7 Property acquisition delayed
8.8 Property purchase/compensation valuation outside budget
8.9 Residual property disposal valuation less than budget
8.10 Compulsory purchase required; has implications for time/cost
8.11 Railway requirements onerous; has implications for time/cost
8.12 Delay in obtaining land entry agreements affects programme
8.13 Entry agreement conditions breached; litigation possible
8.14 Delay to procurement of drainage easements
8.15 Access / way leave approvals delayed
8.16 Project-specific land/property issues not resolved (e.g. tunnelling rights, airport proximity, navigation issues)
8.17 Damage to neighbouring property; time/cost implications
8.18 Post-construction complaints (e.g. property access & drainage)
8.19 Post-construction rectification/mitigation measures required

9.0 Political
9.1 Vulnerability of political support
9.2 Change to project priority
9.3 Adverse reaction of local council
9.4 Pressure group action
9.5 Changes in roading policy / transportation strategy
9.6 Toll charging considerations
9.7 Terrorist action
9.8 Other

10.0 Other

CATEGORY 4 - Cost Risks:
Site Conditions, Engineering, Services, Natural Events

1.0 Project scope definition / unscheduled items

2.0 Design standards definition

3.0 Client initiated changes
3.1 Network interfaces
3.2 Client-initiated variations to scope have time/cost implications
3.3 Client-specified design standards used

4.0 Change in technology / new technology

5.0 Topographical data
5.1 Topographical data coverage inadequate or not extensive
5.2 Accuracy of topographical data questionable

6.0 Site/ground conditions
6.1 Poor/partly complete knowledge of ground conditions
6.2 Uncertainty associated with complex ground conditions
6.3 Unforeseen ground conditions during construction have time/cost implications
6.4 Limited experience of consultant/contractor with materials
6.5 Contamination or hazardous materials found/occur on site
6.6 Complexity of foundations / road design form

7.0 Design issues
7.1 Design preparation delay; time/cost implications
7.2 Design omissions have time/cost implications
7.3 Design errors time/cost implications
7.4 Stability of cut and embankment slopes inconsistent with environment
7.5 Earthworks quantities under/over-estimated
7.6 Material workability issues have time/cost implications
7.7 Adequacy of material sources not evaluated in detail
7.8 Surplus/waste material disposal areas/costs not considered
7.9 Bulking factors incorrect; time/cost implications
7.10 Mass balance / mass haul not considered or fully developed; time/cost implications
7.11 Contractor's alternative proposals accepted without due consideration of time/cost implications
7.12 Failures / poor performance of works; time/cost implications
7.13 Material properties inappropriate; time/cost implications
7.14 Drainage design not adequately justified for design flows

8.0 Design changes
8.1 Design changes resulting from actual field conditions
8.2 Design changes invalidate consents
8.3 Design changes invalidate designation / property agreements
8.4 Design changes cause public dissatisfaction

9.0 Redesign and/or rework
9.1 Redesign and/or rework arising from design errors or omissions
9.2 Redesign and/or rework arising from construction errors or omissions
9.3 Redesign and/or rework arising from breach of statutory obligations, consents, agreements etc

10.0 Buildability issues
10.1 Construction methodology inappropriate
10.2 New/unproven technology/method issues
10.3 Lack of experienced contractors in market
10.4 Haul routes inappropriate

CATEGORY 4 - Cost Risks:
Site Conditions, Engineering, Services, Natural Events

10.5 Nearest centre/railhead
10.6 Construction access not considered
10.7 Lack of appropriate plant available
10.8 Inadequate supply of materials
10.9 Restrictions on transportation of materials

11.0 Traffic management
11.1 Delay in approving TMP
11.2 Ineffective TMP – impact of changes on time/cost
11.3 Failure to comply with TMP
11.4 Temporary works/diversions
11.5 Repairs following accidents

12.0 Impact of value engineering risk/opportunity findings

13.0 Changes arising from safety audits
13.1 Stage 3 (design)
13.2 Stage 4 (post-construction)

14.0 Pavement/surfacing inadequate
14.1 Premature deformation/failure
14.2 Unacceptable noise

15.0 Issues associated with structures
15.1 Engineering complexity
15.2 Dewatering / stream diversion

16.0 Traffic control & lighting
16.1 Temporary signage, marking, lighting requirements
16.2 Traffic control requirements
16.3 New signage, marking, lighting
16.4 Barrier requirements

17.0 Services
17.1 Inadequate data acquisition re existence, location, condition (extent, accuracy)
17.2 Limited site flexibility
17.3 Delayed relocation works
17.4 Un-cooperative utilities
17.5 Un-cooperative consumers
17.6 Dispute over cost-sharing
17.7 Disruption to services
17.8 Failure of utility services
17.9 Other

18.0 Natural events
18.1 Adverse weather
a. Precipitation
b. Wind/cyclone
c. Flood
18.2 Earthquake
18.3 Tsunami
18.4 Fire
18.5 Land instability
18.6 Other

19.0 Other

Appendix 2: Sample Risk Register

Activity	
Contract No.	
Date	

Analysts Name(s)	
Reviewers Name(s)	
Sources of Information	

No.	Name	Description	Status	Threat or Opportunity	Existing Controls	Consequence		Likelihood		Score = C x L[1]	Modelling Note[2]	Treatment Plan Summary	Rank
						Description	Rating (C)	Description	Rating (L)				
e.g													
1	Unforeseen ground conditions under piles	Insufficient bearing capacity is achieved on the driving of the piles under the XYZ pier, which requires lengthening of piles 1 to 16	L	T	n/a	$2M - Severe	70	Likely	5	350	0m and 10m, with a 20% chance that any one pile will require extension. The extended length is modelled by a uniform distribution with Possion used to to model the occurrence of the risk…	Minimise - Further testing in pile locations required	1

A unique identifying number

A short descriptive title

Detail the specific event that is leading to uncertainty in activity outcome

Details existing processes, devices, practices or controls that act to minimise threats or enhance opportunities, including an indication of how they might be of influence.

The outcome of the event.

The extent to which an event is likely to occur.

A full explanation of the approach to be used in both the time risk analysis and the cost risk analysis.

A summary of proposed or implemented treatment plan and the current status.

A numerical ranking of the risks based on the risk score for the General Approach, or sensitivity and correlation analysis for the Advanced Approach

Exceptions Statement
???example

LEGEND

L	Live
E	Emerging
P	Parked
C	Closed
T	Threat
O	Opportunity

[1] The following colours are used to detail risk categories:

Extreme	>=350
Very High	350-200
High	200-70
Moderate	70-30
Low	4-30
Negligible	1-3

[2] To be used only for risks modelled using the advanced approach

Appendix 3: Sample Risk Treatment Plan

Activity	
Contract No.	
Date	

Analysts Name(s)	
Reviewers Name(s)	
Sources of Information	

No.	Name	Threat or Opportunity	Treatment Type	Treatment Progress	Treatment Actions	Responsibility	Timing	Resources	Monitoring & Reporting	Treatment Cost	Risk Reduction
1	Unforeseen ground conditions under piles	Threat	Minimise	Completed	1.1 Complete additional logged bores at every second pile location	F Dagg	by 30 Mar'04	3 days work for 1 boring rig from XYZ-Testing Ltd.		**15,000**	n/a
				Commenced	1.2 Reassess piling systems adequacy in consideration of 1.1 above	A B Cee	Meeting to agree design change on 30 Jun'04		Design review & brief report prepared by consultant where necessary	**5,000**	Likelihood of insufficient bearing capacity reduced by 50%, but with possible increased piling base cost. Target net. saving of $300,000

The type of approach that will be taken in treating the risk. This may be: A. Accept / P. Accept / Transfer / Maximise / Enhance / Avoid / Minimise / Mitigate.

A brief indication of current progress on the treatment plan

A list of actions required to complete the treatment of a risk.

The individual(s) responsible for completing the treatment action.

Deadline for completion of treatment actions

A summary of the resources required to complete the treatment action.

The full cost of treatment (estimated or actual).

The estimated reduction in risk, at the expected level, following completion of the treatment.

Appendix 4: Example Significant Risk Report

Activity		**Analysts Name(s)**	
Contract No.		**Reviewers Name(s)**	
Date		**Sources of Information**	

Risk No.	
Risk Name	
Risk Description	

Consequence	
Description	
Rating (C)	

Likelihood	
Description	
Rating (L)	

Score = C x L	

Risk Modelling Note	

Proposed Treatment Plan	

Risk Ranking	

Comments	