

# BUILDING RESILIENT TRANSPORT THROUGH STRATEGIC ASSET MANAGEMENT

*(This paper has been peer reviewed)*

## Authors:

Andrew Gatland, Principal, Asset Dynamics  
[andrew@assetdynamics.co.nz](mailto:andrew@assetdynamics.co.nz)

Myles Lind, CPEng, Acting Director, Infrastructure & Place, Auckland Transport  
[Myles.lind@at.govt.nz](mailto:Myles.lind@at.govt.nz)

## ABSTRACT

New Zealand's transport network is vital to the nation's social and economic prosperity, yet it faces significant challenges, including an infrastructure investment deficit, rising costs, climate change adaptation, and workforce constraints. Addressing these issues requires a strategic approach to asset management that optimises limited resources while ensuring resilience and stability in critical transport infrastructure.

Asset management provides a coordinated framework to balance cost, risk, and performance outcomes across stakeholder groups and time horizons. The development of an Asset Management Framework is essential for transport infrastructure organisations to align their teams, processes, and systems effectively. This framework offers a precise, end-to-end description of how good-quality asset management is implemented, enabling organisations to manage risks, improve communication, and foster collaboration across diverse teams.

Auckland Transport is an integrated transport entity, spanning multi-lane arterial to single lane unsealed roads, as well as public transport services and facilities management. Auckland Transport's 10-year journey in enhancing its Asset Management Framework demonstrates how such a tool can address resource constraints and infrastructure deficits. By clearly defining the scope, boundaries, and processes of its asset management system, AT has improved organisational alignment, reduced silos, and enhanced decision-making. The framework supports resilience by enabling better planning, lifecycle management, and continual improvement, ensuring that infrastructure investments deliver maximum value.

This Auckland case study highlights the importance of leveraging limited resources through strategic asset management practices. By embedding a robust framework, transport organisations can mature their systems, manage risks effectively, and build investor confidence, contributing to a resilient and sustainable transport network for New Zealand's future.

## INTRODUCTION

New Zealand's infrastructure faces many challenges including an historical investment deficit, changing social and economic requirements, the need to adapt to climate change, workforce constraints, and the rapidly rising cost of development, maintenance, and renewal of infrastructure.

Te Waihangā New Zealand Infrastructure Commission estimates that addressing these challenges through increased investment alone would require current expenditure levels to almost double, from around 5.5% of GDP to 9.6% of GDP (2022, p. 31). To affordably meet infrastructure requirements, New Zealand needs to become increasingly proficient as an infrastructure investor and custodian. Asset management – the coordinated activities to realise value from these assets – has a vital role to play.

In *Taking Care of Tomorrow Today: Asset Management State of Play (2024)*, the Infrastructure Commission provides a snapshot of New Zealand's approach to asset management through an assessment of practices across the infrastructure sectors. The report identifies eight "key issues" that are holding the nation back from achieving better infrastructure asset management outcomes. The first and most fundamental of these is "There is limited awareness of the 'what' and 'why' of asset management" (New Zealand Infrastructure Commission, Te Waihangā, 2024, p. 96).

Infrastructure assets exist to provide value to stakeholders. The 'why' of asset management is therefore to ensure that optimal trade-offs between cost, risk, and performance outcomes are achieved across different stakeholder groups and different time horizons. The 'what' of asset management is how each infrastructure organisation is configured to realise this value.

The Infrastructure Commission's work focuses on lifting asset management awareness at a sectoral level. In this paper we argue that, at an organisational level, improving awareness of the 'what' of asset management requires infrastructure organisations to establish an asset management framework. The asset management framework is a key artefact within the asset management system hierarchy and provides the configuration of the organisation's current asset management system, including its processes, interfaces, and documentation. This is distinct from an asset management plan - which sets out portfolio-level objectives and the future activities required to achieve them. In short, the framework ensures clarity and coherence of the system, while the plan drives strategic direction and improvement.

We begin by explaining the rationale for the development and maintenance of the asset management framework before providing a functional description of this document. We then describe Auckland Transport's work to create its Asset Management Framework, and the early benefits that have been realised. We expect that this material will be instructive for organisations seeking to consolidate their asset management system and enhance their asset management maturity.

## WHY IS AN ASSET MANAGEMENT FRAMEWORK REQUIRED?

Infrastructure organisations are typically large and complex entities with a diverse range of internal and external stakeholders. The physical assets are long-lived and often critical to achieving social and economic outcomes. Successful service delivery and asset care depend upon many teams working together in a collaborative, consistent, and controlled manner over time.

The ISO 55000 series of standards promote the consolidation of an asset management system to facilitate this (International Organisation for Standardisation, 2024). The asset management system comprises policy and objectives and the processes necessary to achieve the objectives. For the asset management system to be effective, all teams must be aware of how their work contributes to achievement of the asset management objectives (vertical alignment) as well as how their work affects other teams (horizontal alignment). This awareness must be maintained in a continually changing environment including changes in personnel, processes and systems,

organisational structure, and external requirements.

The asset management framework provides an established and precise description of the asset management system and its constituent processes. Just as asset management information systems maintain information about the configuration of the physical assets, the asset management framework maintains information about the configuration of the asset management organisation.

The value of the asset management framework is illustrated below by way of a series of example user stories:

- As a chief executive, I want to understand the top-level approach we take to forming the asset investment plan that we will be presenting to directors/councillors.
- As a chief financial officer, I want to understand the key interfaces between the financial management system and the asset management system.
- As an asset management general manager, I want to understand what processes I am accountable for within the asset management system and how responsibilities are allocated to managers.
- As a strategic asset manager, I want to understand which teams need to be involved in solving this issue/making this improvement.
- As a contract manager, I want to understand the process interfaces between our organisation and our service providers.
- As an asset lifecycle engineer, I want to understand the processes that will result in my updated inspection requirements being implemented and how I can support this.
- As a standards engineer, I want to understand which teams will be affected by these proposed technical changes so I can engage with them.
- As the role responsible for producing the asset management plan, I want a clear and precise description of our asset management planning processes.
- As an asset information manager, I want to create linkages between data held in asset management information systems and the processes that consume it so I can prioritise improvements.
- As an asset inspector I want to understand how the condition information I collect is used in decision-making.
- As the management representative for the asset management system, I want to manage the risk of uncontrolled changes.

The asset management framework therefore supports diverse internal stakeholders to understand the organisation and thereby contribute fully to their roles. It also helps to reduce common organisational dysfunctions including “silos”, unclear allocation of responsibilities across teams, ineffective communication and lack of common language, a focus on symptoms rather than root causes in problem solving, and “knee-jerk” changes that do not fully consider wider implications.

## WHAT IS THE ASSET MANAGEMENT FRAMEWORK?

The asset management framework is a comprehensive visual and written description of the asset management system, designed and presented in such a way to aid communication and understanding. Because different stakeholders have different requirements, the asset management framework should be presented at distinct levels of detail. The levels should however fully cohere with each other. Typically, three or four levels or tiers of disaggregation is appropriate, depending on the size and complexity of the organisation.

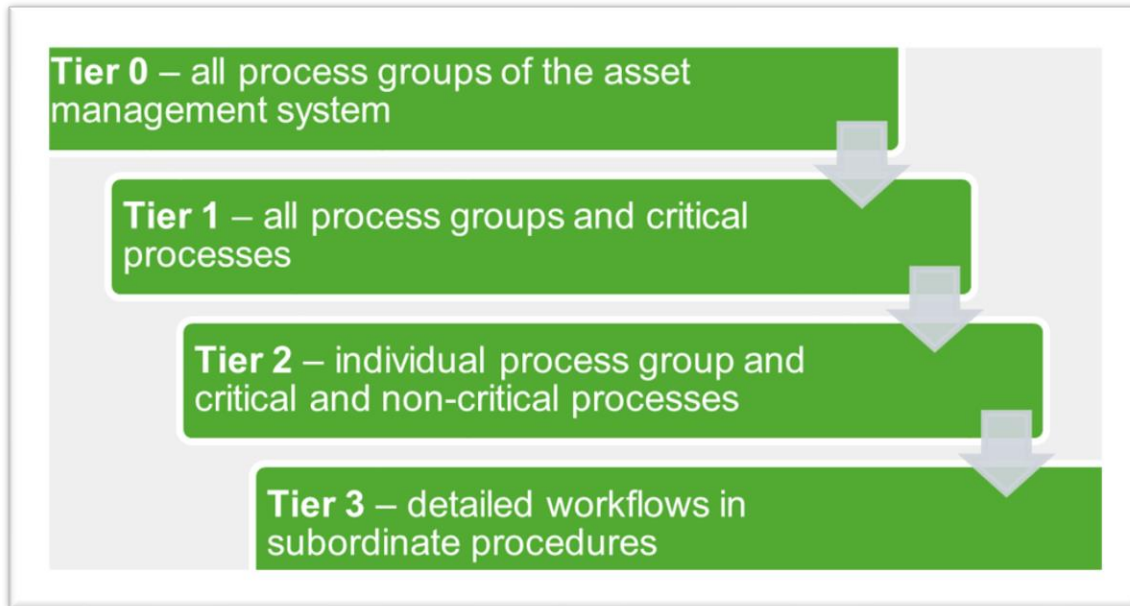


Figure 1: Typical asset management framework decomposition

- Tier 0 presents the entire asset management system at a level that it can be explained to someone unfamiliar with asset management in two minutes. It is simple, highly visual and serves to define the major process groups of the system. All people in the infrastructure organisation should recognise this diagram and its relevance to their role – even those not directly involved with asset management.
- Tier 1 also presents the entire asset management system but expands upon the Tier 0 diagram by identifying the critical processes within each process group and their interrelationships. Those working within or adjacent to the asset management system should be able to identify the key elements they are involved in.
- Tier 2 diagrams individually present each of the process groups defined in the Tier 0 and Tier 1 diagrams. The critical processes shown in the Tier 1 diagram for each process group are also represented in the Tier 2 diagram, alongside lower criticality processes. These diagrams start to expose workflows and interfaces between teams. Each element of these diagrams represents a specific process, system, or artefact.
- Tier 3 are the detailed workflows that exist in lower-level standards and procedures. These are referenced but not included within the asset management framework.

Accompanying these diagrams is a document that provides further explanation of each element. This may also include related reference documents, linkages of diagram elements to relevant clauses of ISO 55001 and other authoritative standards, and a RACI (responsible, accountable, consulted, informed) matrix that shows the role of each team with respect to each element.

It is useful to contrast this tiered representation of the asset management system with the recently launched Austroads Road Asset Data Standard (RADS) and New Zealand's own Asset Management Data Standard (AMDS) through Te Ringa Maimoa Road the Efficiency Group. Whereas the framework tiers describe how the organisation manages assets—its processes, governance, and interfaces—the RADS/AMDS levels define what data is required to support those processes. RADS specifies six Priority Data Set levels, from core inventory and location data (PDS 1) through to advanced predictive and strategic data (PDS 6). Together, these approaches are complementary: the framework provides clarity of roles and workflows, while RADS/AMDS ensure the data feeding those workflows is standardised and fit for purpose. Both are essential for ISO

55001 alignment and sector-wide interoperability.

This approach results in a coherent and internally consistent description of the asset management system that contains information relevant to the full range of stakeholders.

**Asset Management Framework in the Asset Management Hierarchy**

The asset management framework is a key artefact in the asset management system document hierarchy and helps to satisfy the documented information requirements of ISO 55001. It is particularly useful for identifying the relationships between documents and where gaps in documentation may exist.

Its role is sometimes confused with that of the strategic asset management plan (SAMP). This may be addressed by the 2024 changes to the ISO 55000 standards that now provide clearer and more consistent guidance on the SAMP. The role of the SAMP is to state portfolio-level asset management objectives, and the activities that will be implemented to achieve them. It is concerned with future direction. The asset management framework, on the other hand, is concerned with the configuration of the organisation today. The activities proposed in the SAMP may lead to changes in the asset management framework.

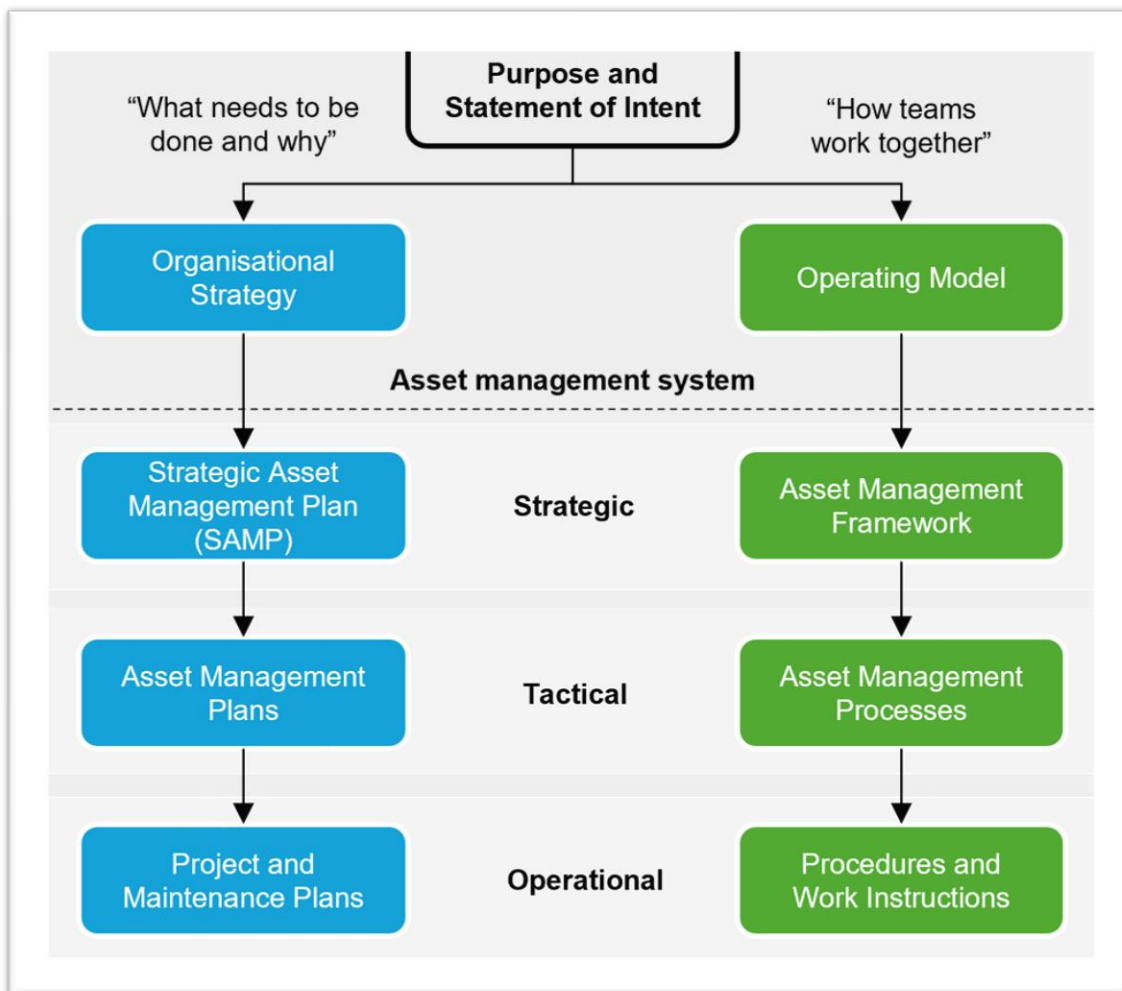


Figure 2: Simplified document hierarchy

This distinction aligns with the three levels commonly referenced in engineering systems management and safety frameworks such as the Haddon Matrix: Strategic, Tactical, and Operational.

- Strategic: The SAMP operates at this level, setting long-term objectives and direction for the asset portfolio.
- Tactical: The asset management framework sits here, defining the organisational configuration, processes, and governance that enable strategy to be delivered.
- Operational: Detailed procedures, standards, and workflows (referenced in Tier 3 of the framework) ensure day-to-day execution and compliance.

Recognising these levels helps clarify roles and responsibilities and reinforces the importance of coherence between strategic intent, tactical configuration, and operational execution.

While these documents have distinct roles, the SAMP should include a high-level description of the asset management system supplied by the asset management framework. This is part of stating the internal organisational context including analysis of the strengths and weaknesses of the asset management system and explaining the role of the system in achieving the asset management objectives.

It is sometimes proposed that the SAMP and the asset management framework be integrated (for example (Hastings, 2014, p. 519)). The authors' experience is that this results in an unwieldy document that compromises the purpose of both artefacts.

## HOW AUCKLAND TRANSPORT DEVELOPED ITS FRAMEWORK

In 2023 Auckland Transport commissioned an independent ISO 55001 maturity assessment of its asset management system. Key opportunities for improvement included clearly stating the scope and boundaries of the asset management system and developing a description of the end-to-end asset management process. This impacted the assessment of clauses 4.3 Determining the Scope of the Asset Management System and clause 4.4 Asset Management System. In the roadmap that resulted, a recommendation was made to "Evolve the AM System Definition & Framework".

In response to this feedback, AT established a project to uplift its existing asset management system document. The approach taken to this project is described in the following sections. The current version of a selection of AT's asset management framework diagrams are reproduced in the Appendix.

### Top-level Design

The starting point for designing the asset management framework was to collate existing descriptions of AT's asset management system and identify external good practice frameworks that were broadly consistent with internal practice and therefore could be adapted.

The Asset Management Landscape (Global Forum on Maintenance and Asset Management, 2024) was selected. Updated in 2024, it defines forty asset management subjects across seven subject areas. It is consistent with ISO 55001 which supports AT's goal of aligning with this standard.

Analysis was completed to align AT's existing top-level asset management description with the subject areas of the Asset Management Landscape to confirm full coverage. A goal was to retain existing language and terminology used in AT where possible.

This analysis resulted in seven process groups being created. These process groups were consistent with existing internal structures and each of the forty asset management subjects could be mapped to a process group.

### Scope of the Asset Management System

With the high-level design of the asset management framework established, analysis was undertaken to rigorously determine the boundaries of the asset management system. Of particular

importance was clarifying the interfaces between internal processes and processes delivered by AT's contracting partners across the different asset portfolios, and interfaces between AT's asset management system and the asset management systems of operators of AT assets and infrastructure.

### **Process Discovery**

An initial mapping of the functions of AT's teams against the process groups was completed. Documentation was collated and categorised, and interviews were conducted to enable processes to be discovered.

### **Development of Tier 0 and Tier 1 Diagrams**

On completion of the interviews, draft Tier 0 and Tier 1 diagrams were produced. Once again, attention was paid to using existing language and terminology wherever possible. Consultation with asset management stakeholders was undertaken to identify and correct errors or omissions.

The Tier 0 diagram (Figure 3) shows the seven process groups. Clearly apparent from the diagram is the closed-loop nature of the asset management system, consistent with the Plan, Do, Check, Act cycle that is fundamental to the ISO management system standards. Representative icons for each process group were selected to assist with communication. Arrows between process groups represent flows of information.

The Tier 1 diagram (Figure 4) presents the asset management system in identical proportion and layout to the Tier 0 diagram which assists people to easily understand the relationship between these two representations. Each of the elements of the Tier 1 diagram is numbered, and the numbers correspond to the sections of the accompanying document containing the description of the asset management system. The grey boxes represent elements that are outside the scope of the asset management system but nonetheless have a critical influence, such as legislation and regulation, AT's corporate strategy, and the Regional Land Transport Plan.

### **Development of Tier 2 Diagrams**

A more detailed Tier 2 diagram for each of the process groups was created based upon the data collected. For the Asset Planning and Lifecycle Delivery process groups two diagrams were required for each to account for the differences between management of Major Projects, and Maintenance, Operations and Renewals.

The Tier 2 diagrams more precisely represent the boundaries of each process group and the information flows between process groups. The relationships between upstream process and downstream processes are clear, for example in Figure 5 which represents the Maintenance, Operations and Renewal Planning process the role of the SAMP from the Strategy & Governance process group in informing the Asset Lifecycle Strategies is shown.

### **Description of the Asset Management Framework**

To accompany the diagrams, a description of the asset management framework was developed. This is a registered document that forms part of AT's control of the asset management system.

The document is structured according to the seven process groups. It states the scope of the asset management system and then provides an explanation of each process group. More detailed information on each numbered element of the diagrams is provided within subsections. Each subsection contains a reference to the related clauses of ISO 55001 and the Asset Management Landscape subjects, as well as a list of references to related internal documents.

A summary of the inputs and outputs of the process group from other process groups is provided at the end of each major section.

### **Communication Plan**

The goal of the asset management framework is aiding asset management communication and

understanding. The asset management framework should become the dominant mental model that people use to understand the organisation.

This goal cannot be achieved if the framework itself is not effectively communicated. A communication plan was formed to build awareness of the framework and assist people to understand how it can help.

The first phase was to provide a high-level briefing on the framework to different teams at all-hands meetings. A short and engaging video was then created to explain the asset management framework and the seven process groups pitched at a level that everyone in the organisation could benefit from. This video was integrated into staff inductions.

Microsoft Visio was selected as the tool to use to develop the diagrams as links can be created between diagrams. An interactive version of the framework was published on AT's intranet 'the Engine Room'. This enables people to explore the framework at whatever level they wish.

Although these specific communication activities are important, the most effective way of communicating the asset management framework is by using it. It has a key role to play in information management, learning and development, communicating asset management strategy, performance evaluation, and continual improvement.

## **BENEFITS OF THE ASSET MANAGEMENT FRAMEWORK**

The most immediate and visible benefit of maturing Auckland Transport's Asset Management Framework has been a cultural shift—from viewing asset management as the domain of specialist planning teams to recognising it as a shared responsibility across all functions. Every team now plays a role in creating and maximising value from AT's asset portfolio for the benefit of Aucklanders.

This shift has driven stronger alignment across teams, fostering richer cross-functional collaboration and breaking down legacy silos. A notable example is the co-development of the refreshed Asset Management Technology Roadmap, where diverse teams contributed to a unified vision, deepening mutual understanding of value creation and enabling more integrated decision-making.

The formal documentation of the Asset Management Framework has also enabled the development of targeted educational resources. A new induction tool, grounded in the framework, has accelerated onboarding, allowing new staff to understand AT's operating model and contribute meaningfully from the outset.

Quantifiable improvements have followed:

- **Asset Management Maturity:** Independent ISO 55001 maturity assessments have shown consistent year-on-year improvement, with AT's overall maturity rating increasing from 59 in 2021 to 78 in 2025.
- **Investor Confidence:** Feedback from key funding partners, including Waka Kotahi and Auckland Council, has highlighted increased confidence in AT's ability to deliver value-driven infrastructure outcomes, contributing to more streamlined business case approvals and funding allocations.
- **Staff Satisfaction and Organisational Pride:** Internal engagement surveys indicate an increase in staff satisfaction related to role clarity and cross-team collaboration since the framework's implementation. Staff have reported a stronger sense of purpose and pride in contributing to a shared, city-shaping mission.
- **Sector Leadership:** AT has been approached by several other infrastructure agencies—both within New Zealand and internationally—seeking to learn from AT's approach to asset

management system design and implementation. This interest reflects growing recognition of AT's leadership in embedding strategic asset management practices and its role in shaping sector-wide maturity.

This leadership is further demonstrated by Auckland Transport's proactive response to the Government's infrastructure reform programme announced in May 2025. Infrastructure Minister Hon Chris Bishop highlighted New Zealand's historically poor asset management performance and set out a comprehensive agenda to improve capability, planning, and accountability across the public sector. In direct alignment with these priorities, AT has accelerated the development and implementation of its Asset Management Framework—clarifying system boundaries, strengthening internal capability, and embedding long-term planning practices. These actions reflect AT's commitment to lifting asset performance and service outcomes and position the organisation as a leading example of how public agencies can respond constructively to national infrastructure challenges.

The Asset Management Framework has become a cornerstone of AT's maturity journey, supporting continuous improvement, enhancing transparency, and reinforcing AT's reputation as a trusted steward of Auckland's transport infrastructure.

## CONCLUSION

Improving asset management maturity across New Zealand's infrastructure sector is essential to addressing the country's long-standing infrastructure challenges. The Government's May 2025 announcement of a new all-of-Government work programme—focused on lifting capability, improving planning, and strengthening accountability—has set a clear direction for public sector infrastructure organisations.

Auckland Transport has responded to this call by developing and embedding a comprehensive Asset Management Framework that clarifies system boundaries, strengthens internal capability, and supports long-term planning. This framework enables all teams within AT to understand how their work contributes to asset management objectives and how it interfaces with other functions—ensuring alignment, reducing silos, and improving decision-making.

This paper has outlined AT's journey in designing, implementing, and communicating its Asset Management Framework. The approach taken reflects the priorities set out by the Minister of Infrastructure and demonstrates how a large, complex transport organisation can lead by example. AT's experience offers a practical and replicable model for other agencies seeking to improve their asset management maturity and contribute to a more resilient, efficient, and accountable infrastructure system for New Zealand.

## REFERENCES

- Global Forum on Maintenance and Asset Management (2024). The Asset Management Landscape. [Online] Available at: <https://gfmam.org/publications/asset-management-landscape-v30> [Accessed 25 February 2025].
- Hastings, N. A. J. (2014). Physical Asset Management. 2nd ed. London: Springer.
- International Organisation for Standardisation (2024). Asset management - Asset management system - Requirements (ISO Standard No. 55001:2024). Geneva: International Organisation for Standardisation.
- International Organisation for Standardisation (2024). Asset management - Vocabulary, overview, and principles (ISO Standard No. 55000:2024). Geneva: International Organisation for Standardisation.

- New Zealand Infrastructure Commission, Te Waihanga (2022). Rautaki Hanganga o Aotearoa New Zealand Infrastructure Strategy, Wellington: New Zealand Infrastructure Commission, Te Waihanga.
- New Zealand Infrastructure Commission, Te Waihanga (2024). Taking care of tomorrow today: Asset management state of play, Wellington: New Zealand Infrastructure Commission, Te Waihanga.
- <https://www.beehive.govt.nz/release/addressing-new-zealand%E2%80%99s-infrastructure-asset-management-challenge>
- <https://www.beehive.govt.nz/release/improving-how-we-care-new-zealand%E2%80%99s-infrastructure>

## ACKNOWLEDGEMENTS

Andrew Gatland would like to acknowledge the contributions to knowledge of Dr. Bob Platfoot of Covaris Pty Ltd in the elaboration of asset management frameworks.

Myles Lind would like to acknowledge Auckland Transport for supporting the development of this paper and the Road Efficiency Group (Te Ringa Maimoa) for their leadership in advancing asset management practices across the New Zealand transport sector. Myles also thanks Te Waihanga (New Zealand Infrastructure Commission) for their sector leadership, and to acknowledge peers across New Zealand and Australia for their openness in sharing experiences, lessons learned, and insights from their own journeys in building asset management frameworks and maturing their systems. This spirit of collaboration has been invaluable in shaping the ideas presented in this paper.

## AUTHOR CONTRIBUTION STATEMENT

Andrew Gatland led the development of the conceptual framework and structure of the paper, conducted the literature review, and contributed to the interpretation of results. He was the principal author of the technical content and prepared the initial draft of the paper.

Myles Lind contributed to the development of ideas and insights from Auckland Transport's asset management maturity journey, provided detailed input on the case study, and reviewed and refined the paper. He was instrumental in interpreting organisational outcomes and aligning them with broader infrastructure sector challenges.

APPENDIX

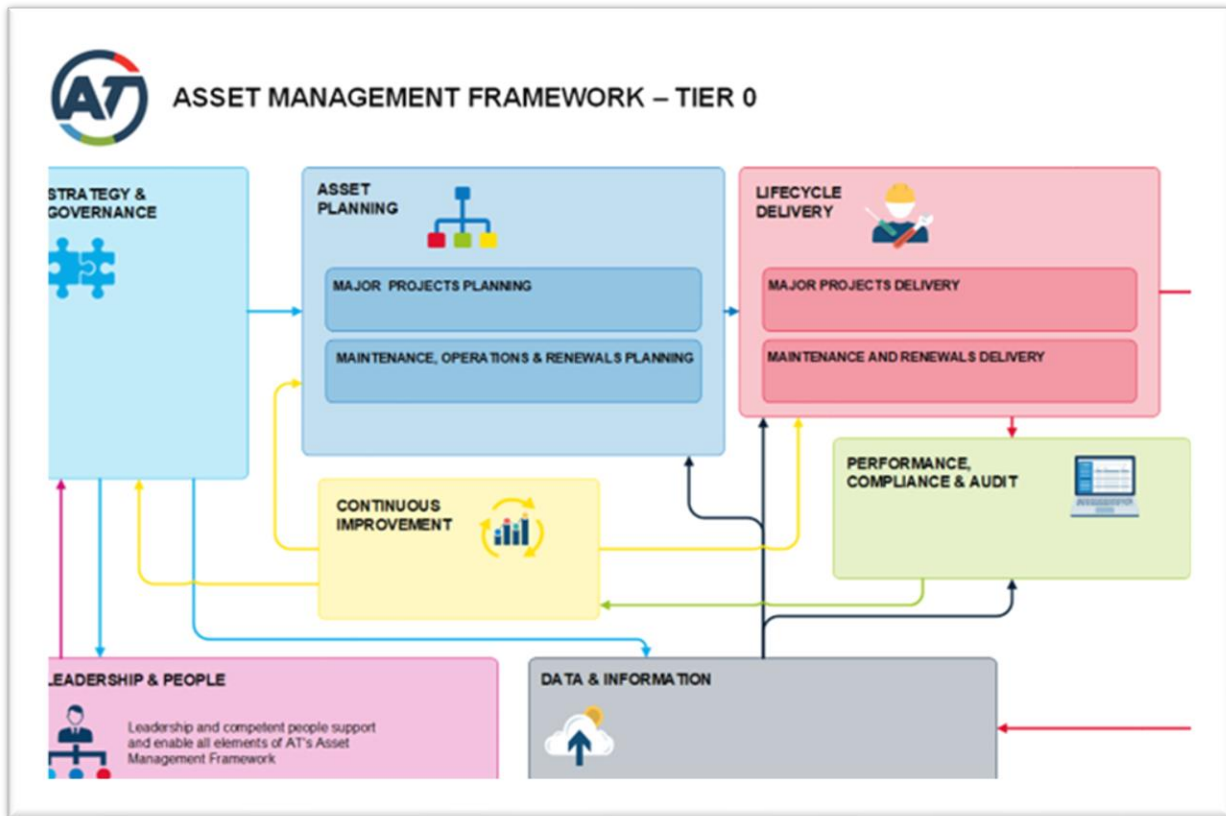


Figure 3: AT Asset Management Framework Tier 0

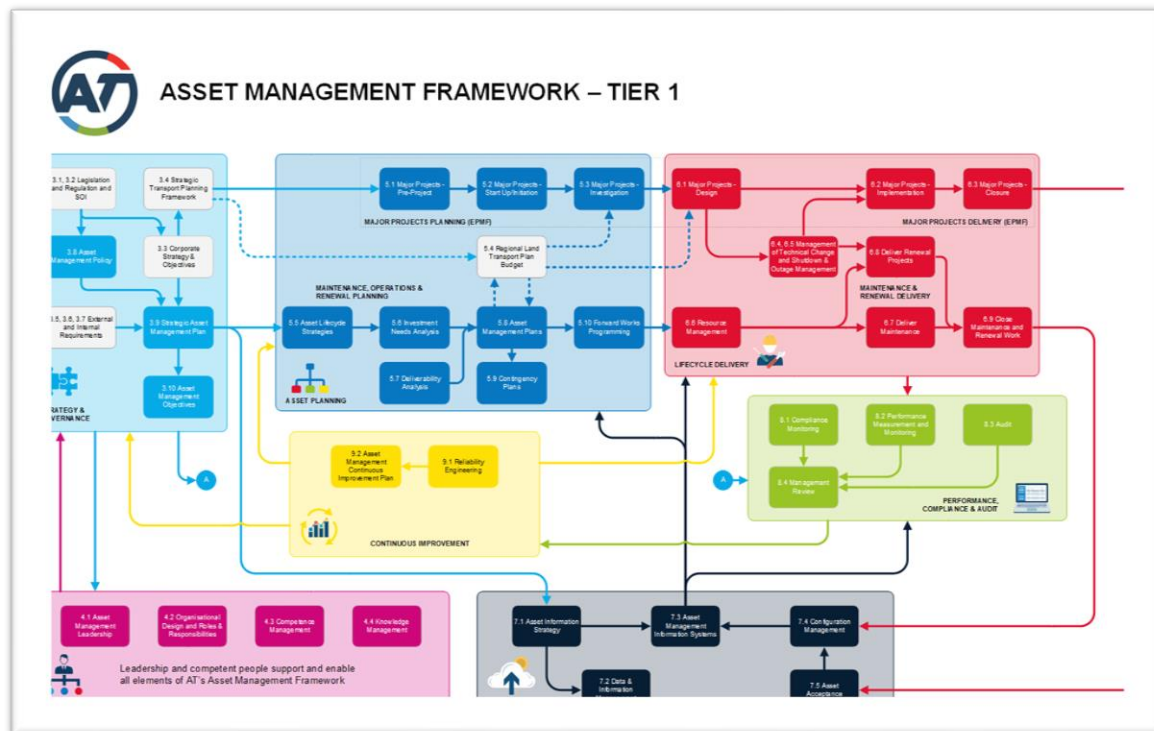


Figure 4: AT Asset Management Framework Tier 1

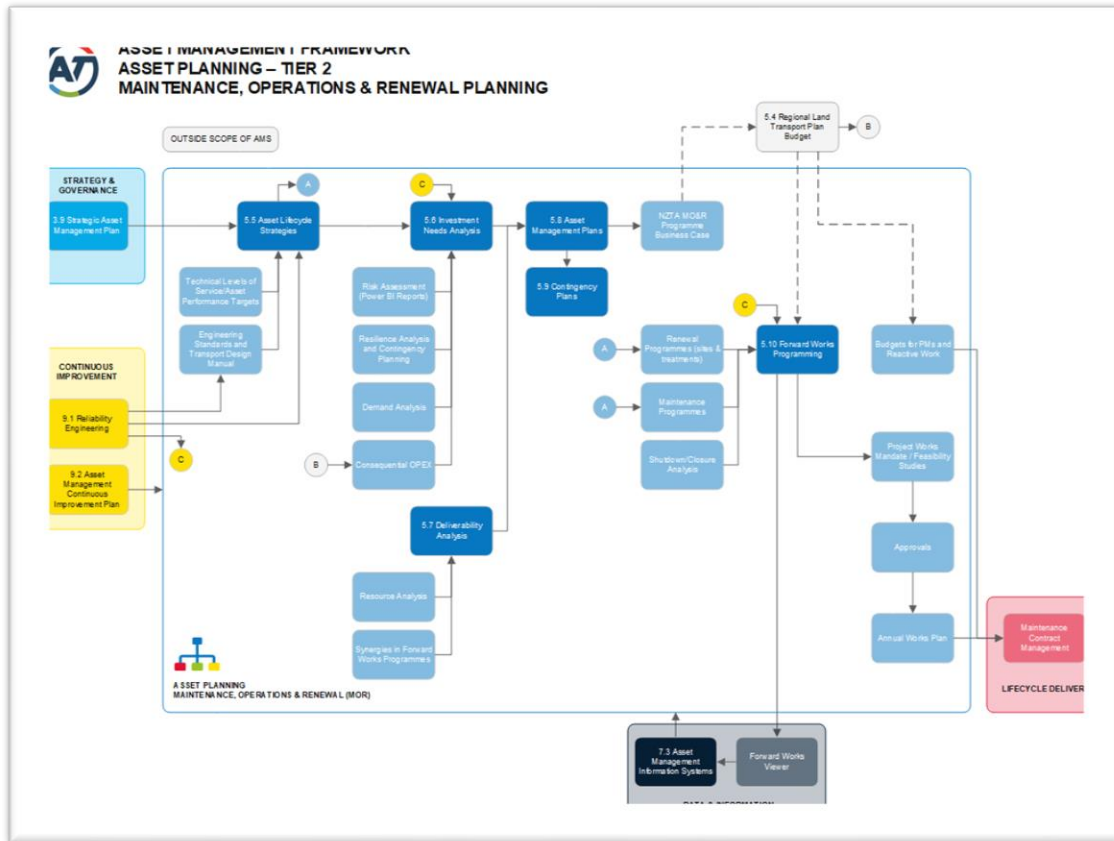


Figure 5: AT Asset Management Framework Tier 2 – Maintenance, Operations and Renewal Planning