



Asset Class Management Plan

Traffic systems, signs and markings

2020



Read me first: what it means that this document has been approved for retention by Auckland Council

Status of this document

On 6 May 2026, the New Zealand Government passed the Local Government (Auckland Council) (Transport Governance) Amendment Act. This legislation changed transport decision-making and responsibility for Auckland.

As part of this legislation, Auckland Council was required to review all transport-related and in-force Auckland Transport policies and plans to decide whether to retain, amend or revoke the policy or plan.

On 21 September 2026, Auckland Council approved the retention and transfer of this document to the council. In accordance with the Act, the document continues in effect until it is reviewed, replaced, or revoked.

This document remains in effect but should be considered alongside Auckland Council's current strategic direction and statutory transport planning requirements.

Alignment with Auckland Council group strategic direction and transport planning requirements

Auckland Council current strategic direction provides the wider context for how this document should now be interpreted and applied. This includes relevant Auckland Council strategies, policies, plans, investment decisions, regulatory settings, and local board direction.

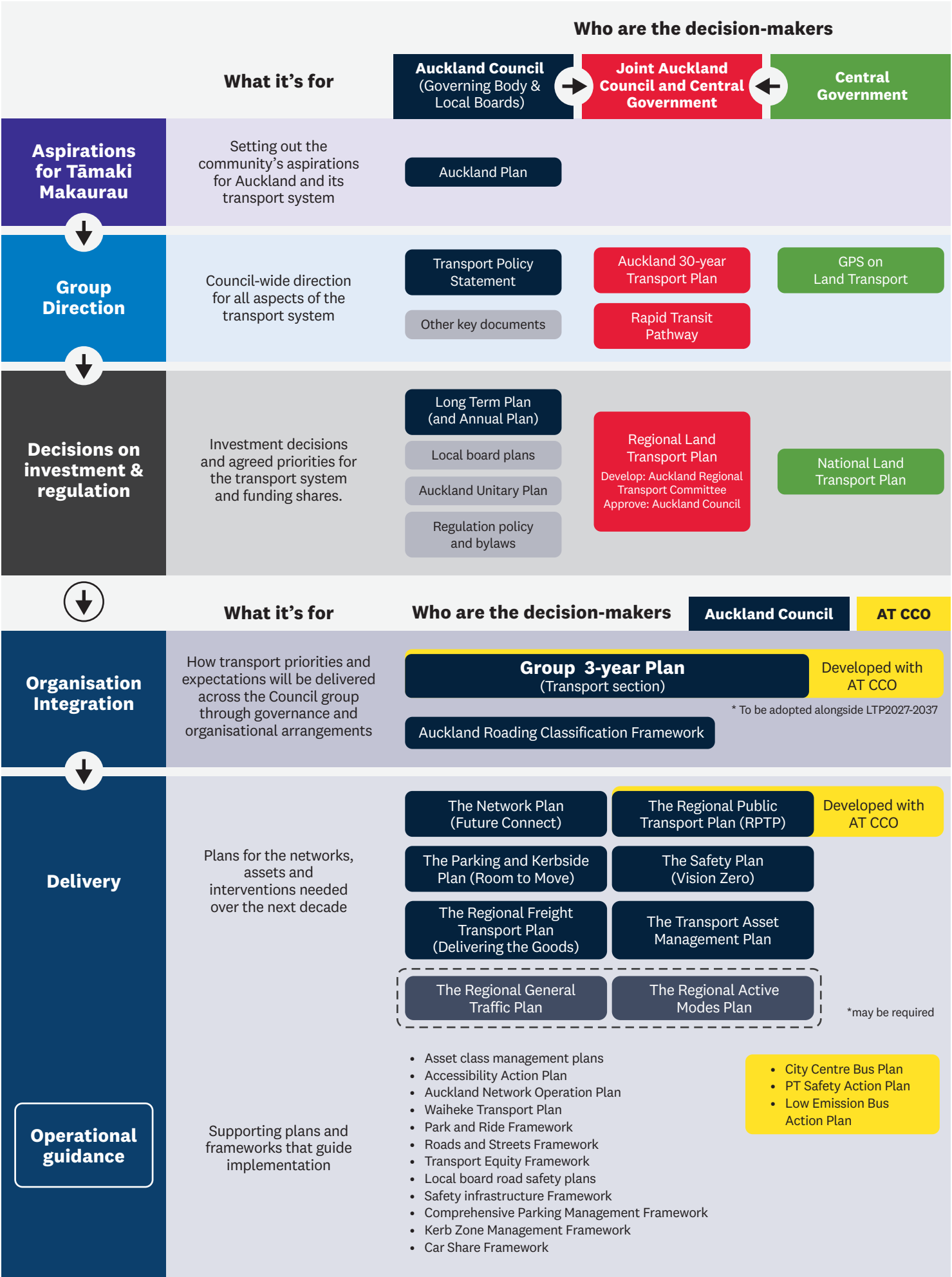
Transport planning is also guided by legislation and related planning documents introduced through the reforms. This includes the Auckland Council Transport Policy Statement, the Auckland Regional Transport Committee, the 30-year Transport Plan for Auckland, the Regional Land Transport Plan, and related transport governance and planning requirements.

The Auckland Council Group Strategic Framework (Transport view), shown below, provides context for how transport-related strategies, plans and frameworks fit together. It is intended as an evolving guide and will continue to be refined as documents are reviewed and updated. The Asset Class Management Plan – Traffic systems, signs and markings was prepared under previous governance arrangements. While it remains in effect, the way it should be interpreted and applied, and its relationship with the broader framework today may differ from how it was originally intended. To ensure accurate interpretation, advice should be sought jointly from Auckland Council's Group Strategy and Transport Policy functions.

Auckland Council Group Strategic Framework

(Transport view)

Simplified view only. Documents often span multiple layers and relationships. Higher-order direction takes precedence. Seek guidance where interpretation is required. Subject to ongoing refinement.



Application within Auckland Council's shared governance model

Auckland Council's shared governance model allocates decision-making responsibilities between the Governing Body and local boards. The transport reform legislation changed how this model applies to transport by assigning additional responsibilities to local boards for local and collector roads, while arterial roads and specific precincts are wholly under the decision-making responsibility of the Governing Body.

The Auckland Roding Classification Framework determines the split in road type and therefore decision making, and shows individual road categories.

By retaining this document, the Governing Body confirmed that it remains part of Auckland Council's approach to transport planning and decision-making. It should be taken into account when Auckland Council plans, funds, regulates, and delivers transport services and infrastructure.

The Allocation of Decision-Making Framework sets out the respective responsibilities of the Governing Body and local boards. Local board decision-making responsibilities for local and collector roads include:

- **Parking and stopping controls:** Such as no stopping restrictions (broken yellow lines), angle parking, time restricted parking, parking zones,
- **Traffic Controls:** Such as community streets (community led play streets), pedestrian crossings, speed humps, speed limits,
- **Road corridor and network access permissions and conditions:** Corridor access approvals for events (excluding Eden Park events that impact arterial roads),
- **Property and landowner (road reserve) decisions:** Such as removal of hazardous encroachments affecting road safety, airspace and subsoil leases,
- **Infrastructure:** Such as footpaths and cycle paths (new or modified), installing monuments, removal of third-party structures.

Where local boards are responsible for decisions covered by this document, they should take it into account when making those decisions. The document does not change or limit local board decision-making powers.

Asset class management plan – traffic systems, signs and markings



Traffic systems, signs and marking Asset class management plan

SharePoint link: [Traffic Systems, Signs and Marking ACMP](#)

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Glossary

Acronym or term	Meaning
LED	Light-emitting diode: A solid-state lamp that uses light-emitting diodes as the source of light. LED lamps offer long service life and high energy efficiency. They emit a white light that provides high levels of scotopic lumens allowing street lights with lower wattages and lower photopic lumens.
LOS	Level of service: The defined service quality for a particular activity or service area, against which service performance may be measured. Service levels usually relate to quality, quantity, reliability, responsiveness, regulatory and environmental acceptability, and cost.
RAMM	Road assessment and maintenance management system: An asset management system for roads, developed as an asset inventory and treatment selection tool.
MFP	Multi-function pole: Pole accommodating a range of accessories required for the urban environment, such as lights, traffic signals, signs, banners, CCTV, etc.
SOI	Statement of Intent: The SOI sets out Auckland Transport's strategic approach and priorities for the next 3 years, and how they contribute to the longer-term outcomes Auckland Council is seeking to achieve.

Executive summary

Traffic Systems Purpose:

Help deliver an effective and efficient transport system by optimising traffic flows and improving road safety at intersections.

The traffic systems network is made up of

- Traffic signals
- Monitoring and control devices
- Electronic signs
- CCTV and cameras

Traffic Signs Purpose:

Guide motorists and contribute to the safety and efficiency of the road network.

Traffic Signs comprises signs and markings.

Key Levels of Service

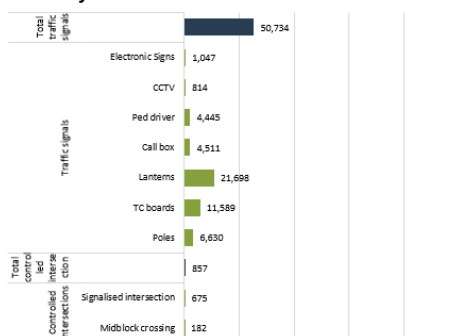
In addition to those that apply to the road network, the following measures are specific to this asset class. Current performance for 2019/20 is also shown.

Asset Management key result area	Asset Management key service value	Performance/ service measure	Current	Target
Safe	Road network safety	Percentage of customers satisfied with overall road safety in the Auckland region	64%	70%
		Number of red-light enforcement cameras	35	
	Condition	Percentage of traffic systems in acceptable condition	99.8%	100%
		Percentage of traffic signs in acceptable condition	99.6%	95%
Efficient	Capacity	Percentage of customers satisfied with traffic flow in the Auckland region	28%	70%

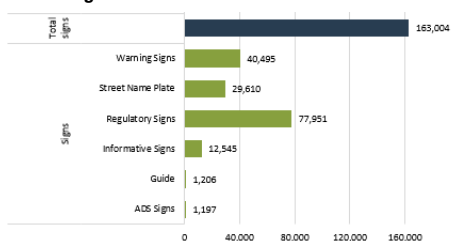
Note: Moderate and above condition are considered acceptable for traffic systems. Poor condition and below are considered unacceptable for traffic signs.

The Asset Portfolio – What we look after

Traffic Systems



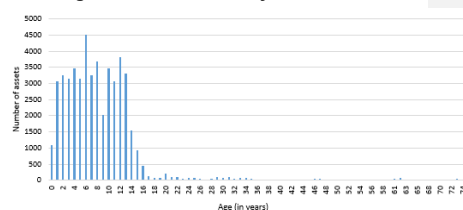
Traffic Signs



Road markings are present on most sealed roads, with around 570km being thermoplastic. "Markings" include RPMs and marker posts as well as painted markings on the road surface.

The Auckland Traffic Operations Centre (ATOC) is primarily responsible for managing traffic systems assets (i.e. other than signs and markings).

Asset Age and Life – Traffic Systems

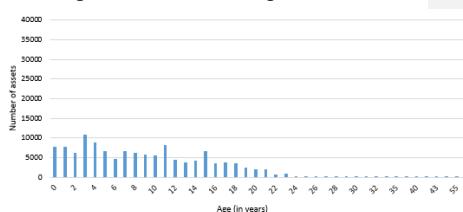


Average lives of traffic signal components (boards, controllers, LED lanterns, etc) are 10-15 years, with poles being 30 years.

CCTV cameras have 5-year life and electronic signs 15 years.

Most assets are currently less than 15 years old, but a number are of unknown life.

Asset Age and Life – Traffic Signs



All signs are assumed to have a 15-year average life, but this is influenced by factors such as location and vehicle damage.

Most assets are less than 20 years old, but a large number are unknown and some are lasting longer than their assumed average life.

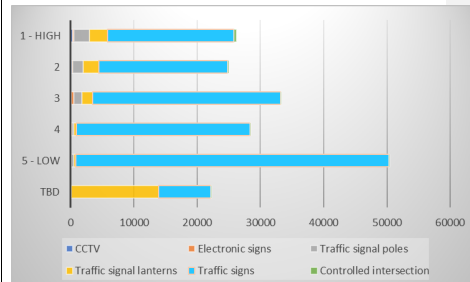
Pavement markings have a 1-year life, with thermoplastic being 7 years.

Asset Valuation

Service potential (economic) consumption of the portfolio is around 39%, with annual depreciation of \$13.5 million.

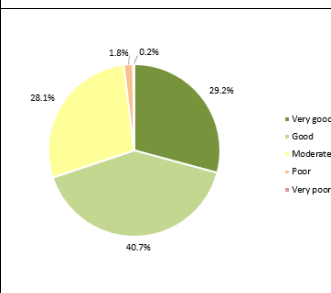
Asset	ORC \$m	ODRC \$m	AD \$m
Signals	\$103.3	\$50.1	\$7.3
CCTV	\$11.1	\$7.4	\$1.9
SCATS	\$6.8	\$3.2	\$0.4
Signs	\$73.1	\$38.8	\$4.5
Electronic Signs	\$12.9	\$6.9	\$0.8
Markings	\$3.7	\$1.2	\$0.2
TOTAL	\$210.9	\$107.6	\$15.2

Critical Assets



CONDITION AND PERFORMANCE

Traffic Systems Condition



Most assets are in good or very good condition with only 1.6% in poor or very poor condition. Being important for safety reasons these assets are maintained so as to avoid assets falling below "moderate" condition.

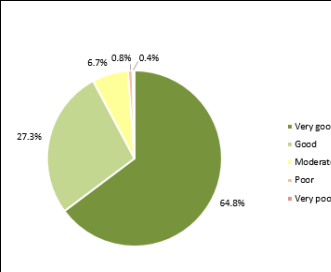
Performance Issues

Traffic signals and electronic signs must operate at all times to maintain the efficiency of the transport system. Traffic signals are controlled through SCATS, and AT, along with Waka Kotahi NZ, uses the Advanced Real-Time Traffic Information System (ARTIS) to deliver journey time information along key arterial routes.

Issues relating to traffic systems include:

- Functional failure or the blacking out of a signalised intersection

Traffic Signs Condition



Most sign assets are in good or very good condition with only 1% in poor or very poor condition. Signs are also maintained at condition level "moderate" or better.

Painted markings are not rated as they are replaced annually.

Performance Issues

Performance is assessed against visibility and legibility criteria.

Concerns relating to traffic signs and markings include:

- Uniformity and consistency – "no surprises"
- Use of frangible poles for safety
- Retro-reflectivity loss
- Moss and lichen growth obscuring signs and markers
- Wear and tear of painted markings

MANAGING OUR RISKS

Asset Integrity

Risks relating to physical state, design standards, construction quality, e.g.:

- Physical damage
- Poor condition
- Functional break-down
- Loss of visibility or clarity

Natural Hazards

Risks arising from exposure to natural hazards and vulnerability of assets, e.g.:

- Storm or wind damage
- Damage due to fallen trees
- Slips and the like

Safety

Safety issues arising from the utilisation of assets, e.g.:

- Fixtures that injure people on impact
- Toxic material used in providing the asset

Financial Risk Exposure

Traffic Systems:

Count	Asset Condition												Total								
	Very good				Good				Moderate					Poor				Very poor		Unknown	
	Qty	%	Qty	%	Qty	%	Qty	%	Qty	%	Qty	%		Qty	%	Qty	%	Qty	%		
Condition Level	Very	5,111	48.3%	5,240	28.4%	1,441	7.2%	343	2.7%	18	0.1%	4	0.0%	4,880	20.3%	26,162					
	Major	1,117	2.8%	1,059	5.7%	1,241	6.2%	112	0.7%	4	0.0%	5,101	24.3%	26,760							
	Significant	15,435	50.0%	5,163	22.8%	1,554	5.1%	161	0.5%	85	0.3%	6,617	20.9%	39,961							
	Minor	15,655	59.2%	4,145	21.7%	1,431	4.3%	160	0.7%	181	0.2%	6,762	22.7%	25,364							
	Local	21,186	57.8%	5,165	20.7%	2,415	4.8%	344	0.7%	117	0.2%	11,551	22.7%	52,461							
TSD	5,105	56.7%	924	9.8%	355	3.2%	44	0.5%	24	0.3%	2,877	31.6%	9,401								
Total	81,881	58.1%	36,453	21.1%	8,441	5.2%	1,852	0.9%	442	0.2%	19,911	22.7%	141,044								

Traffic Signs:

Count	Asset Condition												Total		
	Very good		Good		Moderate		Poor		Very poor		Unknown				
	Qty	%	Qty	%	Qty	%	Qty	%	Qty	%	Qty	%			
UTM	15,117	46.3%	5,353	16.4%	1,441	7.2%	112	0.7%	18	0.1%	4	0.0%	4,055	20.3%	26,162
Major	1,117	2.8%	1,059	5.7%	1,241	6.2%	112	0.7%	4	0.0%	5,101	24.3%	24,718	20.7%	27,882
Significant	15,435	55.4%	5,163	22.8%	1,554	6.1%	161	0.5%	85	0.3%	6,617	20.9%	39,961	32.9%	59,922
Minor	15,655	59.2%	4,145	21.7%	1,431	4.3%	160	0.7%	181	0.2%	6,762	22.7%	25,364	20.7%	30,728
Local	21,186	57.8%	5,165	20.7%	2,415	4.8%	344	0.7%	117	0.2%	11,551	22.7%	52,461	43.4%	60,917
TSD	5,105	56.7%	924	9.8%	355	3.2%	44	0.5%	24	0.3%	2,877	31.6%	9,401	7.8%	12,206
Total	81,881	58.1%	36,453	21.1%	8,441	5.2%	1,852	0.9%	442	0.2%	19,911	22.7%	141,044	116.3%	167,388

This risk exposure matrices show total numbers and proportions of pathways assets by condition and criticality. Only around 3.7% and 1.3% respectively are in the "red zone" – these pose more significant consequences to AT's customers should they fail and become unavailable, so are a priority for replacement.

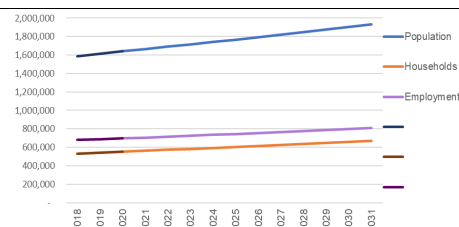
"High" asset risks specific to traffic systems and signs, along with the mitigation plans to treat those risks, are shown in the adjoining figure. These tend to be safety and operational risks, with natural hazard risks not recorded. Electronic assets are however vulnerable to loss of power from any cause, which can result in significant disruption to traffic.

Risk Mitigation

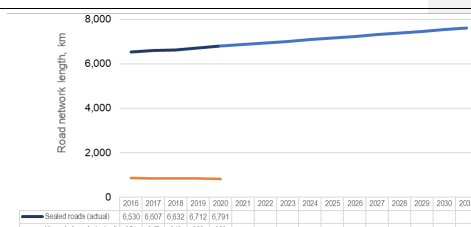
Asset type	Consequence category	Risk detail	Net Risk Factor	Mitigation options
Traffic systems	Finance	Increased costs due to inappropriate design	Medium	Review products and their maintenance plans and make sure whole-of-life costs are considered at the design stage
Traffic signs & markings	Health & Safety	Accidents caused by inadequate lane separation / redundant or inappropriate markings or definition	High	- Monitor and improve current practices. - Ensure that safety traffic measures are implemented.
Traffic signs & markings	Health & Safety	Ongoing theft of signs associated with stops and give way intersections	High	- Undertake regular inspections - Identify hotspot areas for close monitoring
Traffic signs & markings	Service Delivery/ Asset Management	Inadequate traffic control due to incorrect or non-compliant signs and markings	High	- Inspect regularly - Respond to service requests for incorrect or non-compliant signs and markings
Traffic systems	Service Delivery/ Asset Management	Damage to ducts, loops and cables caused by utility works	High	- Ensure Corridor Access Request (CAR) system is used to protect assets by third party contractors - Ensure compliance to National Code of Practice for Utility Operators' Access to Transport Corridor
Traffic systems	Service Delivery/ Asset Management	Damage to traffic system assets due to accidents and vandalism	Medium	- Consider asset integrity and durability when selecting products - Consider asset assurance - Liaise with NZ Police to minimise vandalism and theft
Traffic systems	Service Delivery/ Asset Management	Traffic system becomes non-operational due to failure of power supply and communication services	High	- Develop Traffic Management Plan - Liaise with service providers and develop emergency response plans
Traffic systems	Service Delivery/ Asset Management	Asset failure due to system issues	Low	Develop emergency response plans and minimise duration of system failure

GROWTH AND DEMAND

Population Growth



Network Growth



General Network Impacts – how each growth factor is expected to affect the network as a whole

Increased population will result in greater numbers of journeys being made across the AT network.

A bigger transport network means that there are more assets to manage, with the network also becoming more complex as roads become busier.

Implications for the Assets – how each growth factor is expected to affect this portfolio of assets

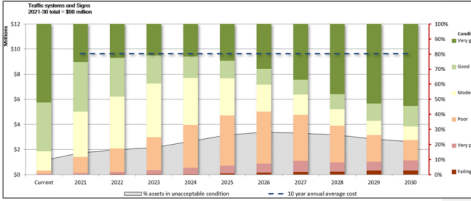
More journeys mean increased travel on Auckland's road network. This may result in increased safety risks and the need for improved levels of service for traffic systems assets. While some new assets will be vested through subdivision, most will come about through investment by AT. These will result in increased consequential operations, maintenance and long-term renewal obligations for AT.

More traffic systems assets will be needed, not only to match the larger network but also in managing increased traffic and providing information in more sophisticated ways. Changing technologies will need to be monitored and used as appropriate to Auckland's growth. As a result, there will be increasing consequential operations, maintenance and renewal requirements in the future.

LIFECYCLE STRATEGIES

How we Manage the Asset – Objectives:

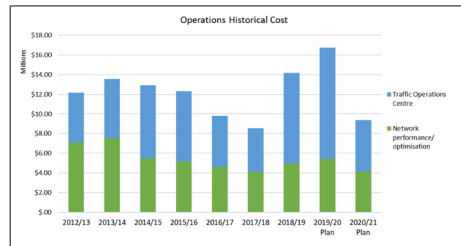
Strategies we use:

• Serviceability – focussed on safety, condition, reliability and customer requirements to meet the needs of different transport modes and users • Prudent risk management – safer roads that are free from potential hazards and obstructions with critical routes always available • Perpetuity of assets – addressing inter-generational loss of service potential due to asset deterioration through appropriate operational, maintenance and renewal activities • Value-for-money – optimising and prioritising investments to achieve best whole-of-life costs, while meeting agreed levels of service	• Using competent and capable people – asset engineers, contractors and customer services staff with specified roles and responsibilities, suitable skills and experience to deliver our services • Establishing asset management systems – processes, information management systems, governance and management structures • Optimising service delivery mechanisms – outsourcing service delivery contracts, using competitive bidding in the open market and industry accepted procurement processes, to effectively and efficiently deliver our programmes • Developing lifecycle management plans
Operational Activities • Regular, ongoing asset inspections, monitoring and testing – identify faults, defects and problems • Customer service and emergency response activities – both through the CRM and to unexpected events and incidents, liaison with service providers (electricity and communications) • Traffic signal operation and fault monitoring (SCATS) • Real Time Travel Information (RTTI) <i>Business as usual PLUS consequential operations</i>	Maintenance Activities • Routine / cyclic maintenance – ongoing repetitive activities to keep the network safe • Planned / programmed maintenance – e.g. faults, defects, utility repairs • Unplanned maintenance and fault management – e.g. CRM reported damage • Emergency work – ensuring health and safety in response to unexpected events <i>Business as usual PLUS consequential maintenance</i>
Renewals Activities • Programmed renewal – address LoS, risk, lifecycle cost • Reactive renewal – e.g. damage due to weather or incident • Other renewals – e.g. via community boards or in association with other capital projects Renewals Drivers • Critical asset failure risk • Baseline LoS • Asset condition and whole-of-life performance • Type and timing of associated road corridor works	 The proposed renewals programme is expected to increase the number of assets in very good condition over the next 10 years, but ROM modelling predicts an increase in poor or very poor condition assets as well. Confirm settings
Asset Improvement Activities Corridor improvement programme, which responds to the following key areas: There is expected to be significant forward investment in helping support Auckland achieve its goal of creating an accessible, well-connected, safe and sustainable region. An important outcome will be managing or reducing congestion and improving the efficiency of the network. Traffic systems have a key role to play and investment in new and / or more sophisticated “smart” systems is likely to be key.	○ safety ○ congestion ○ freight ○ accessibility ○ environment ○ growth ○ value for money

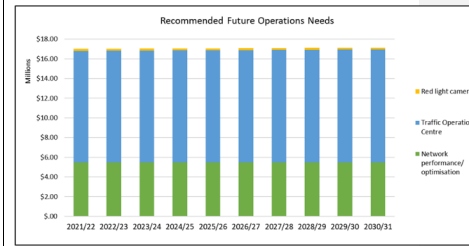
FINANCIAL PROGRAMMES

Historical Costs

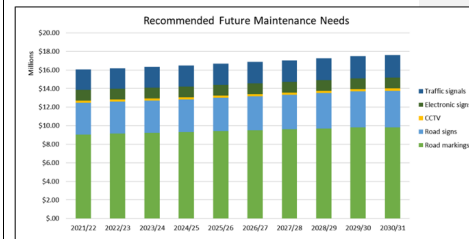
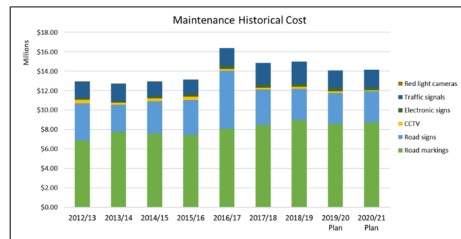
Operations



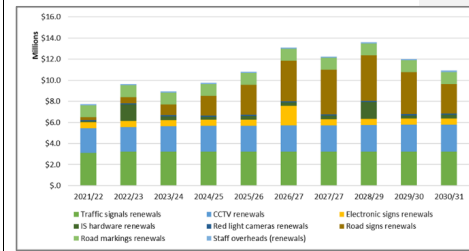
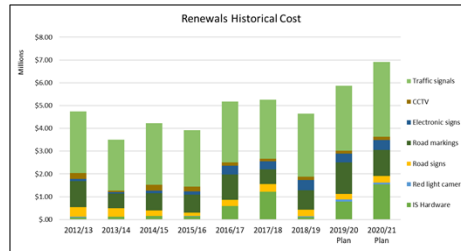
Proposed Programmes



Maintenance



Renewals



Capital Improvements

To be populated

To be populated

IMPROVING OUR PRACTICES

Ref	Key result area	Actions	AMP Section	Priority	Status	
IM TS SD 1	Service Delivery/Asset Management	Use Advanced Real-Time Traffic Information System (ARTIS) to deliver journey time information along key arterial routes	Current status	Very high	In process	The most important improvement projects relate to enhancing the performance of traffic systems and international technologies to leverage efficiencies in road use. Others relate to improving financial and life-cycle management outcomes.
IM TS SD 2	Service Delivery/Asset Management	Improve traffic systems coordination	Current status	Very high	In process	
IM TS HS 1	Health & Safety	Regular monitoring, review and reporting of risk	Current status	High	In process	
IM TS SD 3	Service Delivery/Asset Management	Continually review the advancements in technology of "vehicle detection" from around the world, especially technology that does not require underground loops	Key issues	Medium	In process	
IM TS FI 1	Finance	Reconcile renewals and operations & maintenance (OPEX) programmes to available budgets.	O&M, Renewals	High	Yet to start	
IM TS FI 2	Finance	Clarify capitalisation rules and definitions between OPEX and renewals budgets and provide specific renewals forward works programmes (FWP).	O&M, Renewals	Medium	Yet to start	
IM TS FI 3	Finance	Long-term planning: Prioritise investment for a regional approach for capital expenditure	Renewals, LOS	Medium	Yet to start	

1 About this plan

This asset class management plan explains how Auckland Transport will manage Auckland's traffic systems, signs and marking assets over the coming 3 years.

It draws on what we know about the activities and costs required to manage these assets in the past, to plan how we will continue to manage them in the future.

The plan describes, in depth, the assets it covers, and how we will maintain and develop those assets to provide the services that Auckland needs. This includes information about:

- the asset network
- the levels of service the assets provide
- the impacts of growth and demand
- how we manage risk
- how we manage the assets throughout their lifecycle and the investment needed to enable this
- how we plan to improve particular assets and why.

Auckland's transport system is currently being managed as 'one network', as a collaboration between Auckland Transport, the Waka Kotahi Transport Agency (for the region's state highways) and KiwiRail (for the rail system). Auckland Transport's traffic systems, signs and marking network is being managed as a layer within this one network approach, enabling it to be integrated with other transport modes, including road, rail, bus and ferry.

1.1 How this plan fits in our asset management framework

Auckland Transport manages a significant network of transport assets. Together, they provide safe, efficient and effective transport services for the Auckland region.

Auckland Transport develops plans for these assets to ensure that the network and its services are efficiently managed.

There are two levels of plans:

- an overarching network-level asset management plan, which acts as an umbrella plan, capturing all of the network's requirement
- asset class management plans, which focus on the requirements of each of the 15 asset classes. These asset class management plans are designed to be used in conjunction with the asset management plan.

Figure 1-1 shows how this asset class management plan fits into Auckland Transport's overall asset management framework.

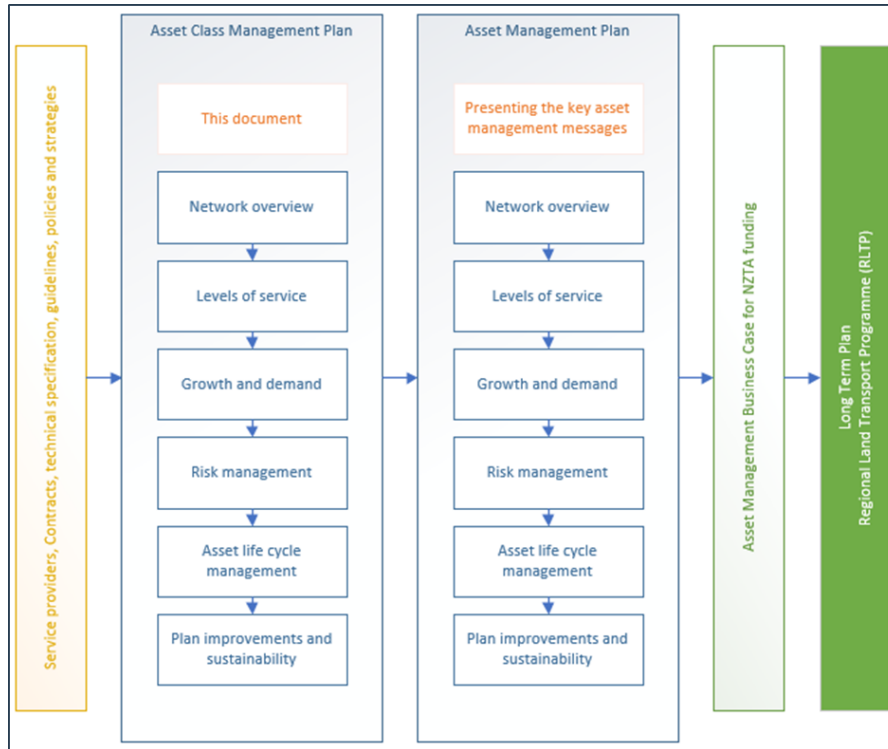


Figure 1-1: Asset management planning document framework

1.2 Relationship to regional and national plans

Auckland Transport's asset class management plans and asset management plan feed into Auckland Council's and the government's asset management regimes. Together, they enable Auckland Transport to deliver a strategic response to:

- the Auckland Plan, which sets out a comprehensive 30-year strategy for Auckland's growth and development
- the Government Policy Statement on Land Transport, which sets out the government's priorities for investment in land transport over the next 10 years
- the Auckland Regional Land Transport Plan 2018-2028, which is a 10-year investment programme of works for transport in Auckland. The regional land transport plan was developed by Auckland Transport, together with the Waka Kotahi NZ and KiwiRail to respond to the growth and other challenges facing Auckland over the next decade.

Figure 1-2 shows how the various strategic and planning documents work together.

Traffic Systems, Signs and Markings Asset Class Management Plan

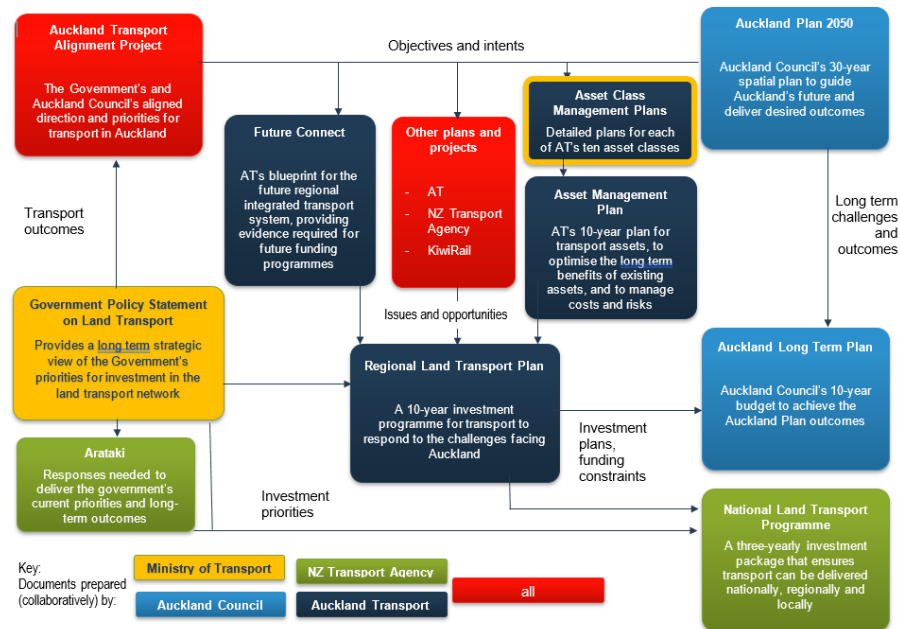


Figure 1-2: National and regional transport asset management planning documents

Source: Asset management team (to be updated)

1.3 The importance of traffic systems, signs and marking assets

Traffic systems, signs and markings, and their operations, are integral parts of the transport network; helping deliver an effective and efficient transport system by optimising traffic flows and improving road safety at intersections.

Traffic systems include traffic signals and other devices that control and monitor the flow of traffic. Closed-circuit television (CCTV) monitor major routes and intersections, enabling a quick response to incidents and minimising their impact on the wider transport network.

Traffic signs and road markings guide motorists and ensure the road network is safe and efficient. Signs regulate and instruct road users, warn of hazards, and provide general information, such as street names.

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2 Assets covered by this plan

In this section we outline the number and classes of the assets covered by this plan, and provide an overview of their current condition, age, performance and valuation.

We also consider the data we need to collect to be able to manage these assets effectively, and describe how that data is collected through inspections.

2.1 Numbers and components of assets

2.1.1 Traffic systems

Auckland Transport is responsible for managing a significant network of traffic systems assets in the Auckland region. This network is made up of:

- traffic signal components
- monitoring and control devices
- electronic signs (used for traffic control and movements)
- ducting, cables and loops.

The Auckland Transport Operations Centre (ATOC) – a joint entity formed by Auckland Transport and the Waka Kotahi NZ – provides integrated traffic management across the region, for both local and state highway networks, managing them as one integrated traffic system.

Auckland Transport-owned assets managed by ATOC include 827 controlled intersections (651 signalised intersections and 176 mid-block crossings), across the region.

Table 2-1 sets out the components that make up Auckland Transport's traffic systems assets.

Asset types	Components
Traffic signals	Includes lanterns, poles and controllers (including logic racks, detector cards, and pedestrian and cyclist call boxes).
Monitoring and control devices	Includes CCTV cameras, SCATS equipment (such as computers and the SCATS server etc).
Electronic signs	Includes 40km/h school speed signs, driver feedback signs, real-time travel information signs, variable message signs and safety warning signs. The asset components include signs, poles, gantries, solar panels, controllers and speed detection equipment.
Ducting, cables and loops	Includes ducts, communications cables, power cables and traffic detection loops.

Table 2-1: Traffic systems asset types and components

Figure 2-1 shows the number of the traffic system assets in the region.

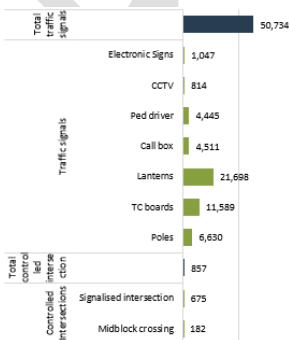


Figure 2-1: Traffic systems network overview

Source: Auckland Transport road assessment and maintenance management system (RAMM) database (March 2021)

There are 35 red-light cameras in the network. These cameras are automated law enforcement tools and are primarily installed by the NZ Police. Auckland Transport is responsible for operating and managing these assets, although information about them is not held in its RAMM database.

Commented [MO(1)]: Information pending (Sarah S)

Commented [CT(1R2)]: Confirmed with Sara S, there are 35 cameras in the network now

2.1.2 Traffic signs and markings

Auckland Transport also manages all traffic signs and markings on the road network, except for on motorways. These include:

- regulatory and warning signs
- general advisory signs (including street name plates, tourist signs, motorist service signs, information signs, guide signs and miscellaneous signs)
- advance direction signs.

Figure 2-2 shows the number of traffic signs in the Auckland region.

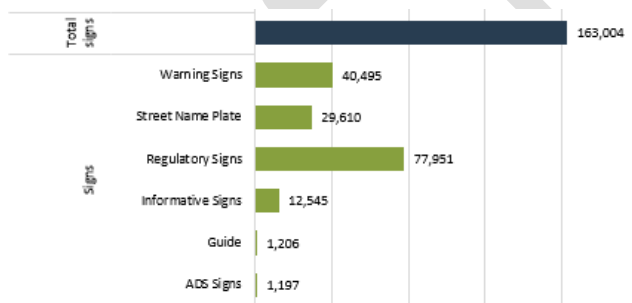


Figure 2-2: Traffic signs network overview

Source: Auckland Transport RAMM database (March 2021)

Road markings assets are used on paved roadways guide and inform drivers and pedestrians, and include all paint surface markings for traffic lanes, crossings, parking and stopping, etc.

Road markings can be categorised as standard pavement markings and high-performance markings (reflective raised pavement markers, thermoplastic marking, etc.). We estimate that 5,110km of urban roadways have road markings and that 570.2km of these are thermoplastic road markings.

2.2 Condition of the assets

Asset condition is the key technical measure that Auckland Transport uses to indicate the quality of its traffic systems, signs and marking assets. Auckland Transport assigns a condition grade, ranging from 1 (being 'very good') to 5 (being 'very poor') to each asset.

Traffic systems are managed so that they provide a high level of service, meaning that there should be no asset in less than 'moderate condition' in the network. This level of service has been selected for traffic system assets, because the consequences of their failure could be serious, including an increased crash risk and delays.

Figure 2-3 shows the current condition profile of Auckland Transport's traffic systems and signs assets.

The condition profile for traffic systems assets takes into account the condition of traffic signal components, electronic signs and CCTVs.

Note that no condition information is collected for markings, as these assets are maintained or renewed annually.

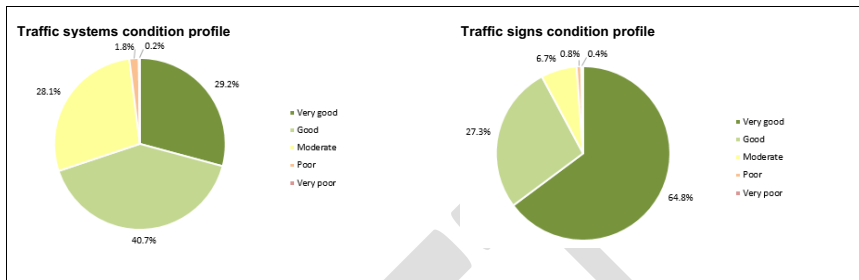


Figure 2-3: Traffic systems condition profile

Source: Auckland Transport RAMM database (March 2021)

Figure 2-3 shows that:

- 98.4 per cent of traffic systems are in 'very good' to 'moderate' condition
- 99 per cent of traffic signs are in 'very good' to 'moderate' condition
- 25 per cent of signs in 'unknown' condition are distributed to the known condition profile on a pro-rata basis
- red light cameras are assumed to be in average condition.

Commented [MO(2): Sarah S to confirm

See Appendix A for a further breakdown of asset condition, for each management category and by asset group.

2.3 Performance of the assets

2.3.1 Traffic systems

Auckland's traffic movements are monitored by ATOC, using a software system called Sydney Coordinated Adaptive Traffic System (SCATS). Auckland Transport uses SCATS to synchronise traffic signals to optimise traffic flow across the region and to monitor faults, such as failures of detectors, lamps or power and controller faults.

The Waka Kotahi NZ and Auckland Transport have also established the Regional Route Optimisation Programme to help coordinate traffic management in the Auckland region. The programme involves assessing the efficiency of the transport network through traffic signal optimisation, as well as corridor operational assessments and minor improvements.¹ All arterial routes are optimised on a 2-year rolling cycle, with performance being continuously monitored and reported against the levels of service measures (see Section 3).²

Auckland Transport is working closely with the Waka Kotahi NZ, using an advanced real-time traffic information system to deliver journey time information along key arterial routes. The system also enables a more integrated response to incidents, using real-time information received from the police.

The most severe scenario, in terms of traffic signal failure, is total functional failure or blacking out of a signalised intersection. The cause of that failure could include loss of power or damage to a controller through a traffic accident. This is considered a critical failure (as opposed to other types of failures,

¹ See <https://at.govt.nz/media/1770881/item11-2-board-report-route-optimisation.pdf>

² See <https://at.govt.nz/media/imported/3890/AT-Agenda-Item-10I-JTOC-Presentation-18May11.pdf>

such as the isolated failure of a lamp or a set of lamps, which are considered non-critical). All types of asset failures are detected by the SCATS systems via the communication link.

2.3.2 Traffic signs and markings

Performance of signs and marking is assessed in terms of their visibility and legibility. Assets must comply with the retro-reflectivity mandate, and improve safety for motorists and other road users. The uniformity of signs and markings is also important to minimise confusion and reduce uncertainty about their meaning.

Factors that affect the performance of traffic sign assets include:

- the material used for poles: frangible poles help reduce the impact, in the event of an incident, and therefore improve road safety
- their retro-reflectivity: reflectivity helps motorists read signs in the dark, but can reduce with age, so needs to be assessed regularly
- their cleanliness: moss and lichen can grow on signs in shaded areas and obscure them.

Road markings can be worn away (sometimes quite quickly, depending on the paint used) with age and by daily traffic and cycles. They need renewing or repainting on a regular basis, depending on the paint life, and after remedial works have occurred.

2.4 Age and expected useful lives of assets

Age information is recorded in Auckland Transport's RAMM database for most traffic systems asset groups (except controllers) and for most traffic signs.

High performance road markings have a longer life (5 to 7 years) than standard markings (1 year) and are replaced as a capital renewal at the end of their useful life.

The average useful lives for traffic systems, signs and markings are shown in Table 2-2.

Asset types		Average useful life (years)
Traffic systems	Controllers	15
	Lanterns	15
	Pedestrian call box	10
	Poles	30
	Target boards	10
	CCTV cameras	5
	Electronic signs	15
Signs	Reflective signs: regulatory, name blade, speed advisory, etc	15 (less if red is the dominant colour)
	Advance direction signs	15
Markings	Pavement markings; centreline: give way, edge line, etc	1
	Thermoplastic markings	7

Table 2-2: Average useful lives for traffic systems, signs and marking assets

Source: Auckland Transport RAMM database, and others

Figure 2-4 shows the current age profiles of Auckland Transport's traffic systems and signs assets.

Commented [MO(3)]: Ducting and cabling

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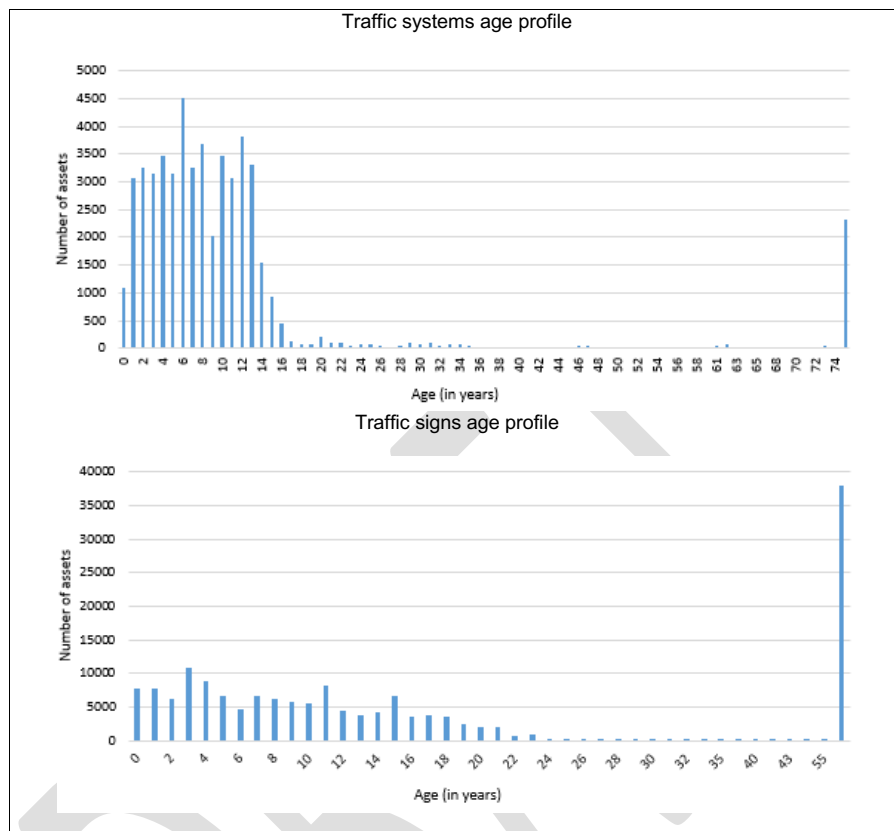


Figure 2-4: Traffic systems and signs age profile

Source: Auckland Transport RAMM database (March 2021)

Figure 2-4 shows:

- 89 per cent of traffic systems assets are known to have been installed within the past 15 years
- approximately 4 per cent of traffic systems assets have unknown age information – this is likely to be mainly made up of controller assets, which have no age information recorded in RAMM
- 26 per cent of traffic signs assets have unknown age information; and most of these assets are guide signs, hazard markings and information signs.

2.5 The asset data we collect and need

Auckland Transport needs good data about the core attributes of its traffic systems, signs and marking assets. Having this data, enables us to manage these assets effectively and robustly.

Table 2-3 summarises the core asset data we collect.

Asset attribute	Description	Data requirements
Inventory	The intrinsic attributes of an asset	• Ownership • Age (construction date) • Location

Unit cost	Cost of managing the asset over its full lifecycle	- Material or model type - Replacement cost - Maintenance cost history - Expected useful life - Expected deterioration profile
Condition	Physical condition of assets and their defects	- Based on recent inspections and asset condition rating surveys - Historical records of asset condition rating surveys
Performance	Measures the asset's safety and accessibility	- Customer satisfaction trends - Safety trends - SCATS
Demand and loading	Measures demand and use of assets and services	- Electricity consumption - Impact of growth

Table 2-3: Core asset data requirements

2.5.1 The quality of our asset data

Reasoned and logical asset management planning requires good quality data. Auckland Transport iteratively assesses its confidence in its asset data, and constantly works to improve it, through quality assurance regimes for data collection and entry, and by maintaining its asset information systems.

Table 2-4 shows Auckland Transport's current confidence in its traffic systems, signs and marking data.

Asset types	Condition known	Age known	Ownership known	Condition updated in past 2 years
Signs	77%	77%	2%	11%
Traffic systems	97%	96%	100%	30%

■ High ■ Medium ■ Low

Table 2-4: Confidence levels for traffic systems, signs and marking data

Source: Auckland Transport RAMM database (March 2021)

Note that:

- ATOC validates one-third of the traffic systems inventory data held in RAMM each year; information about the condition of traffic systems, signs and marking assets is currently being validated, and a new data table has been developed in RAMM
- the condition of traffic signs, except advance direction signs, has not been surveyed in the past 3 years, and as a result overall confidence in that data is low
- the road markings inventory and condition data held in RAMM is not complete and the assessment of that data is yet to be completed
- Auckland Transport has started recording road studs (raised pavement markers) in RAMM and the quality of that data will be assessed in due course.

2.5.2 Asset unit cost rates and valuation

Auckland Transport needs replacement unit cost rates for all key asset components. These rates are used to model asset performance and for investment planning. The rates are updated annually to capture fluctuations and market movements in asset construction costs.

The current unit cost rates and base lives for Auckland Transport's traffic systems and signs assets are shown in Table 2-5.

Traffic Systems, Signs and Markings Asset Class Management Plan

Asset class	Asset types	Unit	Base life	Unit rate
Traffic systems	CCTV	each	5	\$4,500
	Traffic signals	each	16	\$8,929
	Controller and cabling, including temporary traffic mgt (TTM)	full intersection	n/a	\$30,000
	Controller and cabling, including temporary traffic mgt (TTM)	midblock crossing	n/a	\$23,000
	Pole	each	25	\$4,000
Electronic signs	Lantern	each	10	\$2,000
	Pedestrian call box	each	10	\$700
	Advance direction signs	each	15	\$6,978
Signs	Electronic signs	each	15	\$8,250
	Guide	each	15	\$2,030
	Hazard	each	15	\$170
	Informative	each	15	\$170
	Regulatory	each	15	\$170
	Warning	each	15	\$170

Commented [MO(8): Changed from 10yrs as per Vincent's suggestion Feb 2021

Table 2-5: Base lives and unit cost rates for traffic systems and signs

Source: ROM; ATOC

Auckland Transport undertakes a full valuation of its infrastructure assets every 3 years. The valuations are updated annually, based on a fair value assessment.

The latest valuation shows that the total replacement value for traffic systems, signs and markings is \$242 million, with a total depreciated value of \$147 million, and annual depreciation of \$13.5 million, as summarised in Table 2-6.

Asset Group	Unit measure	Quantity	Replacement value	Current value	Annual depreciation
Traffic controlled signals	each	805	\$103,342,888	\$50,092,686	\$7,284,793
CCTV	each	767	\$11,134,777	\$7,365,275	\$1,932,165
SCATS equipment	each	131	\$2,249,866	\$1,776,430	\$318,047
SCATS ducting	M	31,688	\$3,453,345	\$1,055,518	\$97,235
SCATS cabling	M	31,638	\$1,113,845	\$340,704	\$31,377
Signs	each	153,562	\$52,266,227	\$30,169,452	\$3,140,778
Advance direction signs	each	1,826	\$14,449,393	\$5,709,135	\$938,879
Real-time and electronic signs	each	1,044	\$19,272,005	\$9,848,612	\$1,195,073
Thermoplastic	m	1,145,966	\$3,663,932	\$1,205,152	\$220,702
Total			\$210,946,279	\$107,562,966	\$15,159,049

Table 2-6: Valuation and depreciation of traffic systems, signs and markings assets

Source: Auckland Transport Infrastructure Revaluation Report (June 2020)

3 Levels of service

This section describes the levels of services that Auckland Transport aims to provide from its traffic systems, signs and marking assets. The levels of service stipulate how the assets are expected to perform in key areas.

Traffic systems, signs and marking assets are an essential parts of Auckland's transport network. The services that these assets provide contribute to society's need for travel and accessibility, and help achieve social, economic and cultural well-being outcomes.

By maintaining appropriate levels of service, we ensure that traffic systems, signs and marking assets are managed so that:

- the transport environment is safe for all users
- Auckland Transport provides timely and appropriate responses to service requests
- transport assets are in a fit-for-purpose condition
- the transport network accommodates increasing demand.

3.1 Levels of service framework

Auckland Transport's levels of service framework demonstrates how the services that our assets provide align with our overall objectives and outcomes. It also shows how they satisfy the requirements of the national One Network Road Classification framework, in particularly those requirements relating to:

- safety
- amenity
- accessibility
- travel time reliability
- resilience.

The levels of service framework is available through SharePoint.

3.2 How we set levels of service

Auckland Transport's key stakeholders all have different expectations of the levels of service that the transport network will provide. We consult regularly with stakeholders in order to better understand these expectations and what is required to provide them with a better experience.

Figure 3-1 provides a high-level overview of how Auckland Transport links the customer outcomes, network level of service, asset performance and financial requirements for its traffic systems, signs and marking assets, in order to develop levels of service for them.

The starting point is customer outcomes, which provide a clear direction for how the overall network should be managed. This in turn indicates what standard each asset must perform to and the funding required to keep all of the assets in the network performing in line with customer requirements.

Traffic Systems, Signs and Markings Asset Class Management Plan

CUSTOMER	NETWORK	ASSET	FINANCIAL
Outcomes are safe access for travel across the roading network	Level of service to provide safe access across the roading network	Assets perform their service to allow safe access across the roading network	Funding provided to pay for work programmes needed for assets to perform their required service
Customer outcome requirement is for: • safety • accessibility	Network service requirement is for: • traffic systems, signs and marking to provide safe movement and amenity of road users Measured by: • accidents and injuries contributed to by traffic systems, signs and marking • unavailability of the services	Asset requirement is for: • traffic systems, signs and marking condition • traffic systems, signs and marking performance These assets need to be sustained by work programmes of: • operations • maintenance • capital renewals • capital improvements	Funding work programmes: • operations • maintenance • capital renewals • capital improvements

Figure 3-1: Process for developing levels of service

Table 3-1 sets out our key stakeholders, their areas of specific interest, and how we consult or communicate with them.

Stakeholders	Areas of interest and expectations	Consultation or feedback method used
Transport customers (residential)	The main improvements suggested by: • residential road users: ○ smooth roads Auckland-wide ○ quality roads in local areas ○ safety • footpath users: ○ smooth footpaths ○ more and continuous footpaths ○ well-maintained footpaths • cyclists: ○ more provision for cyclists ○ wider cycle lanes ○ improved safety • public transport users: ○ more frequent services ○ reduced fares ○ improved punctuality and reliability (especially of trains).	• Auckland road user satisfaction survey – residential • Auckland Transport research panel findings
Transport customers (commercial)	The main improvements suggested by commercial road users: • improve traffic flow • improve public transport.	Auckland road user satisfaction survey – commercial
Auckland residents and ratepayers	Aucklanders want: • public transport, but it must be convenient, reliable and quicker • to walk and cycle, but it must be safe • better transport, but they have mixed views on how to raise the additional investment required • current funding to be reallocated more favourably towards public transport, walking and cycling.	Feedback on Auckland Council's Draft Long-Term Plan, as summarised in the Auckland Regional Land Transport Plan

Traffic Systems, Signs and Markings Asset Class Management Plan

Stakeholders	Areas of interest and expectations	Consultation or feedback method used
Auckland Council	- Deliver the outcomes in the Auckland Plan and Unitary Plan. - Provide value for money.	- Auckland Transport's annual Statement of Intent - Elected member liaison team
Local boards	- Generally support Auckland Transport projects. - Central local boards favour more walking and cycling projects. - Outer (rural and semi-rural) local boards favour more sealing of unsealed roads.	Elected member liaison team
Other council-controlled organisations	Integrated planning, including: - for the CBD, with Waterfront Auckland and Auckland Council Property Ltd - for events, with Auckland Tourism, Events and Economic Development.	- Direct liaison - Joint working groups
Waka Kotahi NZ Road Efficiency Group (REG)	- One Network Road Classification requirements - Deliver government policy statement outcomes. - Provide value for money. - Partnership projects, including the Auckland Transport Operations Centre.	- National One Network Road Classification levels of service requirements as stipulated by the Road Efficiency Group - Direct liaison - Non-voting member on Auckland Transport's board
KiwiRail	Auckland Transport rolling stock and station assets are well maintained and meet appropriate safety standards.	Direct liaison
Ports of Auckland and Auckland International Airport Ltd	- Arterial road efficiency and reliability for carrying freight. - Integrated planning.	Liaison with industry groups
Mana whenua	Mana whenua want: - a good relationship with Auckland Transport - Auckland Transport to recognise te ao Māori (the Māori world view) - a set of overarching principles for te ao Māori - the Mauri Model method (Māori values) reflected in prioritisation.	- Independent Māori Statutory Board - Tamaki Regional Mana Whenua Forum - Tamaki (Treaty Negotiations) Collective - Auckland Transport Māori relationships team engagement with runanga, iwi and hapu authorities
Industry and customer groups (including the Road Users Forum, Business Forum, and walking and cycling advocates)	- Integrated planning. - Network efficiency and reliability. - Specific network improvements. - Access to properties.	Direct liaison and through industry groups
Utilities (e.g. Watercare, Telecom, Vector)	- Corridor access. - Programming.	Direct liaison and through industry groups
Adjoining road corridor authorities	- Network services alignment. - Standards and protocols.	Direct liaison

Stakeholders	Areas of interest and expectations	Consultation or feedback method used
Transport operators	- Customer service experiences. - Travel time reliability, and bus priority. - Public transport demand. - Network performance. - Scheduling, ticketing and information systems. - Service subsidies.	Through commercial franchising model

Table 3-1: Stakeholder consultation, areas of interest and expectations

3.3 How we measure levels of service

In general, three types of levels of service are measured— each type focusses on different aspects of an asset's performance.

- Governance key performance indicators:
 - are high-level indicators related to governance relationships, such as the statement of intent between Auckland Transport and Auckland Council
 - are established through agreements with our key stakeholders, based on past performance and the impact on decision-making (i.e. alignment with government policies, and the need to achieve a sustainable balance between risk tolerance, available funds and standards of service).
- Customer levels of service:
 - describe what key stakeholders can expect when using the services
 - are mainly related to the performance of assets
 - are established from customer consultation and feedback, benchmarking among peer groups, the One Network Road Classification and industry best practice.
- Technical levels of service:
 - describe the standards of operation, maintenance and renewal activities that relate to an asset or group of assets
 - relate mainly to the condition and operating environment of the assets
 - ensure assets are preserved
 - help deliver on customer expectations
 - build data confidence
 - are established using accepted thresholds of asset condition, operational standards, availability of funds and industry best practice.

3.4 Governance key performance indicators

Table 3-2 sets out the governance key performance indicators that Auckland Transport uses for its traffic systems, signs and markings assets.

Asset management key result area	Asset management key service value	Asset management level of service	Performance or service measure	Current performance (as at March 2021)	Target performance 2020–2024
Sustainable	Environmentally sustainable	Environmental sustainability priorities programmed	Reduction in CO ₂ e (emissions) generated annually by Auckland Transport corporate	6% increase	49% reduction

Traffic Systems, Signs and Markings Asset Class Management Plan

			operations (from 2017/18 baseline)		
Effective	Reliability	Improve or maintain travel time reliability	Proportion of the freight network operating at Level of Service C or better during the inter-peak	92%	85%
			Average AM peak period lane productivity across 30 monitored arterial routes	32,009	25,000
Safe	Road network safety	The road network is safer for all users	Deaths and serious injuries on Auckland local roads	430	Reduce

Table 3-2: Governance key performance indicators for traffic systems, signs and marking

3.5 Customer levels of service

Table 3-3 sets out the customer levels of service that Auckland Transport uses for its traffic systems, signs and markings assets.

These levels of service represent our customer's perceived performance of and satisfaction with Auckland Transport's traffic systems, signs and marking assets.

Asset management key result area	Asset management key service value	Asset management level of service	Performance or service measure	Current performance (as at March 2021)	Target performance 2020–2024
Efficient	Capacity	Network accommodates demand	Percentage of customers satisfied with traffic flow in the Auckland region	28%	70%
Safe	Road network safety	The road network is safer for all users	Percentage of customers satisfied with overall road safety in the Auckland region	64%	70%

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Table 3-3: Customer levels of service measures for traffic systems, signs and marking

3.6 Technical levels of service

Table 3-4 sets out the technical levels of service that Auckland Transport uses for its traffic systems, signs and markings assets.

Technical levels of service aim to interpret customer levels of service into measurable indicators that reflect effective, efficient, safe and sustainable transport services.

Asset management key result area	Asset management key service value	Asset management level of service	Performance or service measure	Current performance (at December 2019)	Target performance 2020–2024
Safe	Condition	Assets are well maintained	Percentage of traffic systems in acceptable condition	99.8%	100%
			Percentage of traffic signs in acceptable condition	99.6%	95%
Safe	Road network safety	Road network user behaviour risk reduced	Number of red-light enforcement cameras	35	0

Table 3-4: Technical levels of service measures for traffic systems, signs and marking

Sources: Auckland Road User Satisfaction Report; Auckland Transport Statement of Intent; One Network Road Classification performance reporting tool; Auckland Transport RAMM database

Traffic Systems, Signs and Markings Asset Class Management Plan

Note: Moderate and above condition are considered acceptable for traffic systems. Poor condition and below are considered not acceptable for traffic signs.

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4 Growth and demand

4.1 Growth of Auckland

Auckland is growing rapidly, and Auckland Transport must keep up with the growing demand for transport assets and services created by population growth and economic development.

Auckland Council has recently revised its growth forecasts to take into account data up to August 2020, including the impacts of Covid-19. The new forecasts paint an optimistic picture of population growth and economic development. Auckland's population is forecast to grow by over 260,000 people over the ten years of this plan, and there will be over 100,000 more jobs, as shown in Figure 4-1.

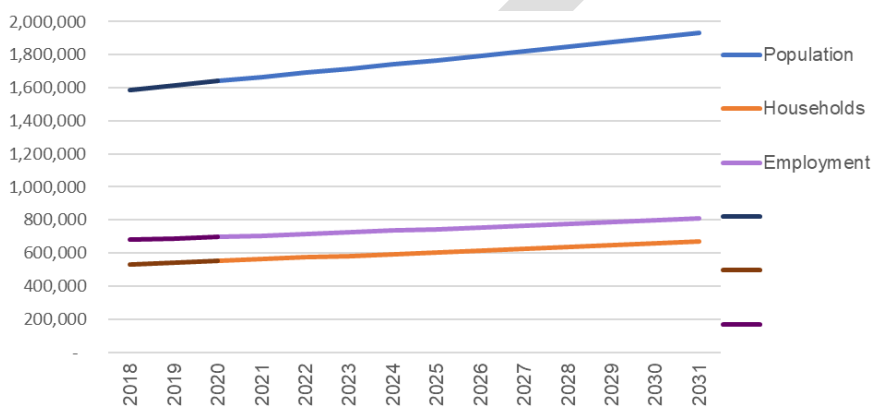


Figure 4-1: Auckland population growth 2018 to 2031

Sources: Statistics NZ; Auckland Council

There will be around 10,000 new households established each year. Figure 4-2 shows the distribution of this growth, and demonstrates that all areas of Auckland are growing. Although the rate of growth as a percentage is highest in the South Rural and North Rural areas (Franklin and Rodney local boards) the biggest growth in terms of absolute numbers of households will be on the Central isthmus.

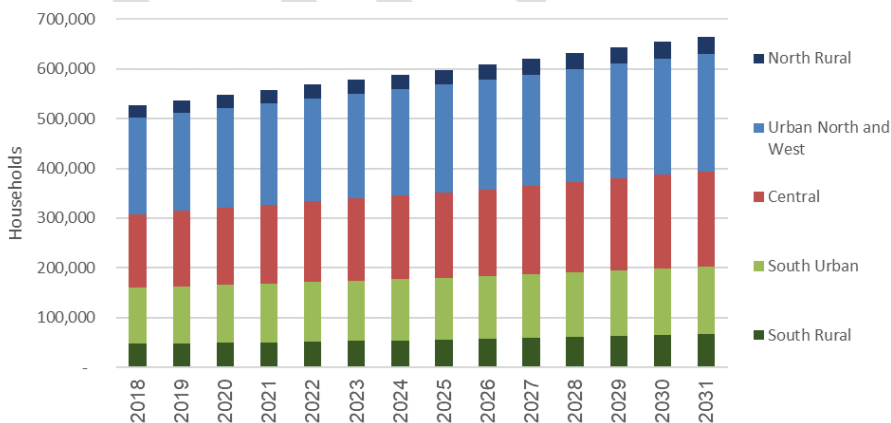


Figure 4-2: Household growth, from 2018 to 2031, by road management area

4.2 Overall response to growth

AT's overall response to growth is developed in partnership with Auckland Council and Central Government through the Auckland Transport Alignment Project. A key output of the project is an agreed programme of new capital investments, including state highway and local road improvements. However the plan recognises that there are few cost-effective options to add significant roading capacity within the Auckland urban area, and that any benefits from added capacity are likely to be short-lived.

To ensure that population growth does not translate into more congestion, reduced accessibility and a poorer quality city, Auckland Transport is investing in public and active transport, and optimising the existing transport network to improve safety and address traffic congestion.

As asset managers, we need to adapt our processes and priorities for a more diverse transport network. We cannot be customer focused if we assume that our customers are necessarily in cars. Over time the role for rail freight and public transport will expand, and more local trips will be made by walking and cycling. This shift is already underway, with more people travelling on key Auckland arterials by bus than by car, as shown in Figure 4-3.

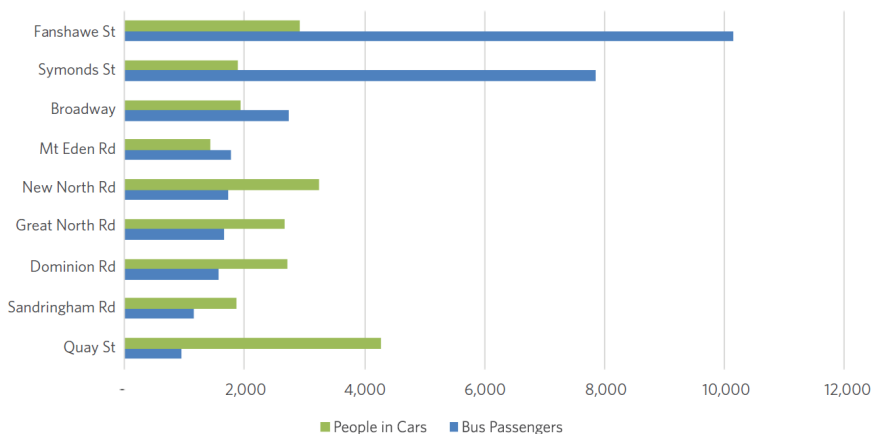


Figure 4-3 Inbound morning peak travel on key Auckland arterials

Source: Auckland Regional Public Transport Plan, Auckland Mode Shift Plan

4.3 Impacts of growth on traffic systems, signs and marking

Growth affects the maintenance and renewal of traffic systems, signs and marking in three main ways:

1. More assets are added to the transport network, leading to consequential maintenance and renewals costs.
2. The network improvement projects involve installation or replacement with high specification quality traffic system assets that are compatible with newer systems.
3. Auckland's construction boom leads to a "seller's market", with higher prices for all of the components of road construction and repair, from aggregate to engineering advice.

These pressures apply across the whole of Auckland, because the whole region is growing as shown in Figure 4-2.

4.3.1 Network expansion

The Auckland traffic systems, signs and marking network is expanding as the sealed road network expands by around 75 km per year, or 1.1%, as shown in Figure 4-4, and the safety requirements within the existing network. The sealed road network expands due to:

- **Urban development.** Traffic systems, signs and marking are installed on new local roads constructed in greenfields growth areas such as Whenuapai and Pinehill. Some new roads are also constructed as part of major "brownfields" developments within the urban area.
- **Auckland Transport capital programmes.** Traffic systems, signs and marking are installed as part of new road pavements constructed by AT. A new Eastern Busway from Panmure to Pakuranga is under construction, and the 2021 Regional Land Transport proposes new roads including Penlink and the Matakana Link Road.
- **Auckland Transport road safety improvements.** Traffic systems, signs and marking are installed as identified by Auckland Transport road safety improvement and network optimisation programmes.

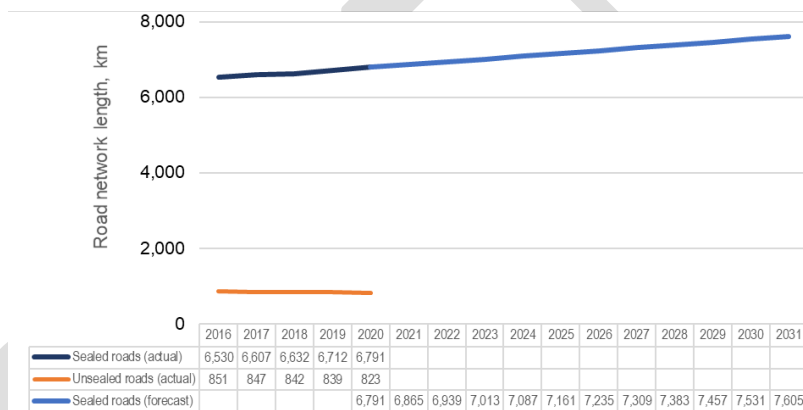


Figure 4-4: Growth in the sealed road network

The Asset Management Plan (AMP) includes a consequential opex model. The model sets out the additional costs of operating and maintaining new road pavement assets created or purchased during the 10 years of this AMP, which then need to be included in operations and maintenance budgets.

4.3.2 Technology changes

Auckland Transport undertakes network improvements to address safety, improve efficiency and optimise traffic flow in the network. This involves upgrading of traffic system assets to higher specification and standards, installation and upgrade of electronic signs and tele communication system to provide real time data, upgrade of school zone signs to improve monitoring and control of assets, installation of red light cameras in high risk areas, provision of speed management system, etc.

ATOC is implementing a test site using infrared detectors instead of a pedestrian push button, and also use infrared detectors and camera based vehicle recognition at some sites instead of loop technology.

4.3.3 Higher unit prices

Prior to Covid-19, Auckland was experiencing a major construction boom, with the value of building consents issued climbing above \$1 billion for the first time, with [more cranes on the Auckland skyline](#) than in any US city.

AT's current contracts for maintenance and renewals of road assets were negotiated in 2011. Even though the prices in these contracts are adjusted over time, the overall costs per unit of work covered by the contracts are still significantly lower than the rates being quoted for new contracts.

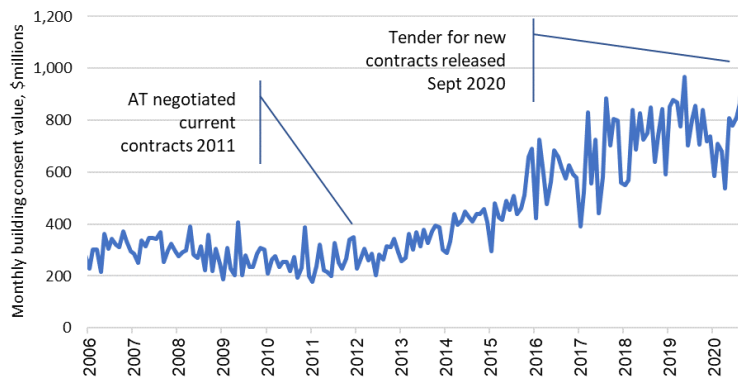


Figure 4-5: Auckland monthly building consent value, 2006 to 2020

Source: Statistics NZ

Although the impact of Covid-19 is clearly visible in the data for Quarter 1 2020, recovery has been swift. In September 2020, the monthly value of building consents issued in Auckland exceeded \$1 billion for the first time.

Auckland Transport is currently procuring its South and Central road maintenance contracts and the regional traffic signal maintenance and upgrade contract, with the new contracts expected to be in place on 1 July 2021.

Although unit prices for the new contracts are not known at this stage in the tender process, it is inevitable that the availability of private sector work will influence the prices being quoted for the maintenance and renewal of Auckland Transport assets.

5 Risk management

5.1 Why we manage risk

Risk can be defined as the “Effect of uncertainty on objectives” – ISO 55000:2018(E), Section 3.1.

Risk events are “events which may compromise the delivery of the organisation’s strategic objectives” – International Infrastructure Management Manual, 2015.

Auckland Transport manages risks across all of its functions so it can achieve its objective of ‘easy journeys’ for all transport users.

Risk management is crucial for achieving the right balance between the costs of delivering services and the levels of service provided. This inter-relationship, and the trade-off involved, is illustrated in Figure 5-1.

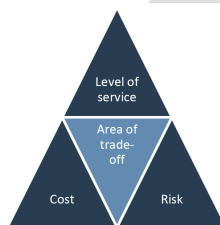


Figure 5-1: Inter-relationship between levels of service, risk and cost

Auckland Transport’s Enterprise Business Plan has two key outcomes related to risk:

- undertake a risk-based approach to delivering safe transport initiatives in to the community
- increase resilience of the current transport network to support response to disruption and provide for continuity.

Asset management is one of 15 key risks that Auckland Transport has recognised in its Organisational Risk Management Framework. The organisation’s risk appetite with respect to asset management is defined in Table 5-1.

Key risk	Appetite Low – Mod – High	Risk appetite statement
Asset management		We have a low appetite for events which may adversely affect our critical assets.
		We have a moderate risk appetite for events which may adversely affect how we maintain our assets at a good operating level.

Table 5-1: Auckland Transport risk appetite for asset management

Source: Organisational Risk Management Framework (Section 2.3: Risk appetite and tolerance)

5.2 How we manage transport risks

Auckland Transport divides its risk management activities into three groups:

- planning risks
- service delivery risks
- management risks.

The key areas of risk within these groups are shown in Figure 5-2, together with avenues we use to identify risks.

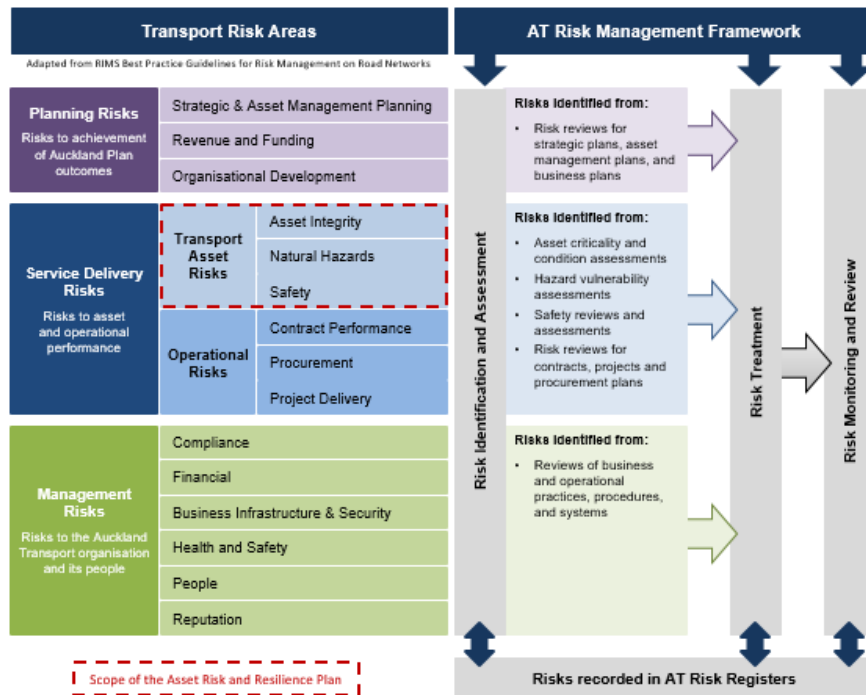


Figure 5-2: Auckland Transport's risk management process

Auckland Transport's Organisational Risk Management Framework defines the overarching policies and procedures we use to identify, assess, treat and monitor risk, at an appropriate level. The process encapsulated in the framework adopts *AS/NZS ISO 31000:2018 Risk Management – Principles and Guidelines*, enabling a structured risk management approach.

Auckland Transport uses the framework to manage organisational risks across the major functional areas, including safety, business continuity, reputation, customer and asset management.

Through formal risk assessments, we analyse and review key organisational risks and their associated mitigation measures, and report on these to management, with the information used to support risk management initiatives.

Auckland Transport uses an organisational risk register to document, manage and monitor risk information. The register provides a central repository for information about transport risks, with details of the risk owners, mitigation plans, and monitoring and reporting requirements. We also use Active Risk Manager risk management software. Our organisational risk management plans are regularly reviewed by the Executive Leadership Team and the Finance, Capital and Risk Committee of Auckland Transport Board.

5.3 Criticality framework and assessments

Auckland Transport has adopted a Criticality Framework for Transport Infrastructure.

The framework defines criticality as 'a measure of the severity of an outcome'; while critical assets are those that are likely to result in a more significant financial, environment and social costs, in terms of their impact on organisational objectives (International Infrastructure Management Manual, 2015).

The criticality framework provides a systematic and structured approach for carrying out criticality assessments on transport infrastructure assets, in both the road and public transport networks. The approach is a two stage one, looking at an asset's:

- network-level criticality
- asset-level criticality.

The combined results from the network-level and asset-level assessments provide the overall criticality of transport infrastructure assets, and are used to support day-to-day decision-making around lifecycle management, including planning, programming and prioritising maintenance and renewal works, risk management and investments.

5.3.1 Network-level criticality assessments

For network-level criticality, assessments take into account different factors, depending on the location of the asset.

For assets located in the road corridor, these include:

- One Network Road Classification – provides an established functional classification for roads, covering traffic volumes, economic criteria, accessibility, connectivity and the like
- lifeline routes – provide access to lifeline utilities (such as water, wastewater, power and telecoms) or a lifeline evacuation route that enables Auckland to respond and recover from hazard events
- essential services – provides access to facilities and services that are essential to the social wellbeing of the community.

For assets that are part of public transport and parking facilities, these include patronage, as the number of people using the facility reflects its importance in facilitating access and connectivity to transport.

The result of the network-level assessment is summarized on a scale of 1 (being 'vital') to 5 (being 'minor'). The numbers of critical traffic systems, signs and markings assets coming within criticality level is shown in Table 5-2.

Asset network	Unit	Network criticality level						Total
		Level 1	Level 2	Level 3	Level 4	Level 5	TBD	
CCTV	no.	319	194	163	42	48	48	814
Electronic signs	no.	220	181	356	182	100	8	1,047
Traffic signal poles	no.	748	682	519	122	84	4,475	6,630
Traffic signal lanterns	no.	2,843	2,493	1,654	382	278	14,048	21,698
Traffic signs	no.	20,192	20,788	30,661	29,294	52,641	9,428	163,004
Controlled intersection	no.						857	857

Table 5-2: Critical traffic systems, signs and markings assets

5.3.2 Asset-level criticality assessments

For asset-level criticality, Auckland Transport adopts a qualitative approach to assessment that considers three key factors:

- impact of an asset failure on safety outcomes

- impact on levels of service and efficiency of operation
- impact on cost to repair or replace – i.e. whole-of-life cost.

5.3.3 Asset condition of critical assets

Auckland Transport inspects its traffic systems and sign assets regularly, and records the severity of defects of their major components using a rating scale ranging from 1 (very good) to 5 (very poor).

The current condition of these assets based on their network criticality assessment is shown in Table 5-3 and Table 5-4. Assets that are located on highly critical corridors and that are in poor or very poor condition are given priority when managing the traffic systems, signs and markings network.

Count		Asset Condition												Total
		Very good		Good		Moderate		Poor		Very poor		Unknown		
		Qty	%	Qty	%	Qty	%	Qty	%	Qty	%	Qty	%	
Criticality Level	Vital	2,885	31.9%	3,069	33.9%	2,754	30.4%	196	2.2%	27	0.3%	117	1.3%	9,048
	Major	1,846	25.6%	2,804	38.8%	2,278	31.5%	162	2.2%	32	0.4%	103	1.4%	7,222
	Significant	1,467	26.5%	2,019	36.4%	1,846	33.3%	119	2.1%	16	0.3%	77	1.4%	5,544
	Minor	431	30.7%	496	35.4%	420	30.0%	36	2.6%	5	0.4%	14	1.0%	1,401
	Local	349	26.6%	542	41.3%	367	28.0%	28	2.1%	4	0.3%	22	1.7%	1,311
	TBD	7,663	28.3%	11,499	42.5%	6,460	23.9%	344	1.3%	16	0.1%	1,078	4.0%	27,060
Total		14,641	28.4%	20,429	39.6%	14,125	27.4%	885	1.7%	100	0.2%	1,411	2.7%	51,591

Table 5-3: Network criticality versus condition for traffic system assets

Source: Network criticality assessment; Auckland Transport RAMM database

Count		Asset Condition												Total
		Very good		Good		Moderate		Poor		Very poor		Unknown		
		Qty	%	Qty	%	Qty	%	Qty	%	Qty	%	Qty	%	
Criticality Level	Vital	9,117	45.2%	5,336	26.4%	1,446	7.2%	142	0.7%	58	0.3%	4,093	20.3%	20,191
	Major	10,137	48.8%	4,054	19.5%	1,248	6.0%	137	0.7%	61	0.3%	5,151	24.8%	20,788
	Significant	15,439	50.4%	6,988	22.8%	1,554	5.1%	186	0.6%	93	0.3%	6,401	20.9%	30,661
	Minor	14,654	50.0%	6,148	21.0%	1,430	4.9%	199	0.7%	69	0.2%	6,794	23.2%	29,291
	Local	27,184	51.6%	11,003	20.9%	2,418	4.6%	344	0.7%	137	0.3%	11,555	22.0%	52,641
	TBD	5,154	54.7%	924	9.8%	305	3.2%	44	0.5%	24	0.3%	2,977	31.6%	9,421
Total		81,685	50.1%	34,453	21.1%	8,401	5.2%	1,052	0.6%	442	0.3%	36,971	22.7%	163,000

Table 5-4: Network criticality versus condition for sign assets

Source: Network criticality assessment; Auckland Transport RAMM database

5.4 Asset management risks

Auckland Transport groups asset management risks into three broad categories:

- asset integrity – risks associated with the physical status of assets (their condition), design standards and construction quality
- natural hazards – risks arising from exposure to natural hazards and the vulnerability of assets
- safety – safety issues arising from the use of assets.

5.4.1 Asset integrity

Asset integrity risks include the risk of assets physically failing, having their function disrupted or providing reduced levels of service, due to their deterioration, issues with their design or construction, or exposure to various types of hazards. These risks are managed through operational activities throughout the asset's lifecycle.

Table 5-5 summarises the risks and mitigation controls Auckland Transport has identified with respect to asset integrity.

Asset integrity risks	Mitigation controls
Assets are designed inappropriately	• Design and construct assets in compliance with Transport Design Manual requirements, the Road and Streets Framework and the asset management policies

Assets are not maintained in good condition	- Inspect and monitor condition of the asset network - Prepare maintenance and renewal plans and programmes to ensure assets are maintained at the correct level of condition to provide the agreed levels of service
Assets do not provide value for money over the life span	- Ensure whole-of-life approach is implemented through planning, design, construction and maintenance phases of assets - Evaluate customer's expectations versus the delivery outcomes, and implement network improvements
Assets are not fit for purpose for the long-term sustainability of the network	- Understand changes within and surrounding the network to address them pro-actively - Plan pro-actively and implement network improvements through emergency management plans and resilience improvement plans

Table 5-5: Asset integrity risks and mitigation controls

5.4.2 Natural hazards

Transport infrastructure and services are prone to damage and disruption from natural hazards, such as earthquakes and liquefaction, coastal inundation, floods and tsunamis. Proactive planning and mitigation controls to address these hazards will improve the resilience of the transport network and help future-proof it and make it more sustainable.

Table 5-6 summarises the risks and mitigation controls Auckland Transport has identified with respect to natural hazards.

Natural hazard risk	Mitigation controls
Assets are damaged or services are disrupted due to unexpected natural hazard events	- Identify hazard types and assess the level of exposure and vulnerability to natural hazards - Identify areas at high risk and implement prioritised resilience improvement activities in these areas - Prepare emergency response plans for natural hazards - Secure emergency funds in response to natural hazard events

Table 5-6: Natural hazard risks and mitigation controls

5.4.2.1 Transport network's exposure to natural hazards

Auckland Transport has assessed how exposed the overall transport network is to particular natural hazards.

The interim result of this assessment is summarised in

Hazard types	Road network likely to be exposed	
Liquefaction susceptibility (low elevation)	17.79%	1,360km
Liquefaction susceptibility (high elevation)	21.55%	1,647km
Floodplain	13.24%	1,012km
Tsunami	3.44%	263km
Auckland volcanic field	22.88%	1,749km
Auckland volcanic field (buffer)	15.55%	1,189km
Coastal inundation (present day 5 year)	0.10%	10km
Coastal inundation (present day 20 year)	0.20%	14km
Coastal inundation (present day 50 year)	0.20%	18km
Coastal inundation (present day 100 year)	0.60%	47km
Coastal inundation (0.5m sea-level rise 50 year)	0.70%	50km

Coastal inundation (1m sea-level rise 50 year)	1.30%	102km
Coastal inundation (2m sea-level rise 50 year)	2.90%	220km
Coastal inundation (0.5m sea-level rise 100 year)	1.10%	86km
Coastal inundation (1m sea-level rise 100 year)	1.80%	140km
Coastal inundation (2m sea-level rise 100 year)	3.20%	242km

Table 5-7. The results will be used to develop a risk and resilience plan for critical infrastructure assets.

Hazard types	Road network likely to be exposed	
Liquefaction susceptibility (low elevation)	17.79%	1,360km
Liquefaction susceptibility (high elevation)	21.55%	1,647km
Floodplain	13.24%	1,012km
Tsunami	3.44%	263km
Auckland volcanic field	22.88%	1,749km
Auckland volcanic field (buffer)	15.55%	1,189km
Coastal inundation (present day 5 year)	0.10%	10km
Coastal inundation (present day 20 year)	0.20%	14km
Coastal inundation (present day 50 year)	0.20%	18km
Coastal inundation (present day 100 year)	0.60%	47km
Coastal inundation (0.5m sea-level rise 50 year)	0.70%	50km
Coastal inundation (1m sea-level rise 50 year)	1.30%	102km
Coastal inundation (2m sea-level rise 50 year)	2.90%	220km
Coastal inundation (0.5m sea-level rise 100 year)	1.10%	86km
Coastal inundation (1m sea-level rise 100 year)	1.80%	140km
Coastal inundation (2m sea-level rise 100 year)	3.20%	242km

Table 5-7: Road network exposed to natural hazards

5.4.2.2 Natural Hazard Risk Management Framework

Auckland Transport is developing a Natural Hazard Risk Management Framework for its transport network. The framework will assess the risks related to natural hazards, and will be used to prioritise risk mitigation measures and network resilience improvements.

Under the framework, natural hazard risks are assessed based on their:

- likelihood – the chance of a natural hazard event happening
- vulnerability – the level of potential damage that could be caused if assets are exposed to the hazard
- consequence – what effect a hazard event would have on transport objectives.

This approach is illustrated in Figure 5-3.

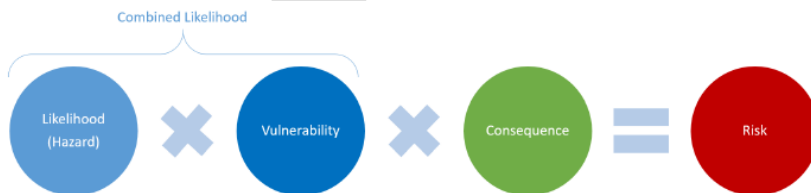


Figure 5-3: Asset risk management framework assessment approach

This natural hazard risk assessment will allow Auckland Transport to identify key risk areas and any assets that are likely to be exposed to natural hazard events, and give them a risk profile ranking from very low to very high.

The information will help decision-makers prioritise risk-mitigation initiatives in the highest ranked risk areas.

Once we have identified the priority risks, we will develop options to improve network resilience. Options will balance the cost and effort of their implementation against the benefits to be gained.

5.4.3 Safety risks

Safety risks relate to the death and injury of transport users, where asset failure or the inadequate provision of assets or services has been a key contributor.

The safety of the transport network depends on a number of factors, including:

- road condition (visibility, traffic volumes, road alignment, materials, design defects, maintenance defects, etc)
- road user behaviour (speed, fatigue, age, etc)
- vehicle condition (technical faults and defects).

Safety issues tend to manifest as incidents or crashes and are likely to involve one or more of the factors listed above.

Table 5-8 summarises the risks and mitigation controls Auckland Transport has identified with respect to safety.

Safety risks	Mitigation controls
Assets create safety hazards	• Review and improve design, construction practices and methodologies • Review and improve asset maintenance and management strategies • Identify critical assets in the network, and maintain and improve asset integrity through operational activities • Identify locations of high crashes or incidents and implement network safety improvements • Ensure all works comply with health and safety standards and regulations
Assets cause adverse environmental impacts	• Ensure environmentally friendly and non-toxic materials are used in construction • Review and improve procedures and disposable methods when handling hazardous substances on sites

Table 5-8: Safety risks and mitigation controls

5.5 Traffic systems, signs and markings risk register

Auckland Transport has identified key risks for its traffic systems, signs and markings assets and developed mitigation plans to address these risks. This information is recorded in a risk register and is summarised in Table 5-9.

Item	Asset type	Consequence category	Risk detail	Net risk factor	Mitigation options
1	Traffic systems	Finance	Increased costs due to inappropriate design	Medium	• Review products and their maintenance plans and make sure whole-of-life costs are considered at the design stage.

Traffic Systems, Signs and Markings Asset Class Management Plan

Item	Asset type	Consequence category	Risk detail	Net risk factor	Mitigation options
2	Traffic signs and markings	Health and safety	Accidents caused by inadequate lane separation, or redundant or inappropriate markings or definition	High	- Monitor and improve current practices. - Ensure that safety traffic measures are implemented.
3	Traffic signs and markings	Health and safety	Ongoing theft of signs associated with stops and give-way intersections	High	- Undertake regular inspections. - Identify hot-spot areas for close monitoring.
4	Traffic signs and markings	Service delivery Asset management	Inadequate traffic control due to incorrect or non-compliant signs and markings	High	- Inspect regularly. - Respond to service requests for incorrect or non-compliant signs and markings.
5	Traffic systems	Service delivery Asset management	Damage to ducts, loops and cables caused by utility works	High	- Ensure the corridor access request system is used by third party contractors to protect assets. - Ensure compliance with the National Code of Practice for Utility Operators' Access to Transport Corridor.
6	Traffic systems	Service delivery Asset management	Damage to traffic system assets due to accidents and vandalism	Medium	- Consider asset integrity and durability when selecting products. - Consider asset assurance. - Liaise with NZ Police to minimise vandalism and theft.
7	Traffic systems	Service delivery Asset management	Traffic system becomes non-operational due to failure of power supply and communication services	High	- Develop traffic management plan. - Liaise with service providers and develop emergency response plans.
8	Traffic systems	Service delivery Asset management	Asset failure due to system issues	Low	Develop emergency response plans and minimise duration of system failure.

■ Low
 ■ Medium
 ■ High
 ■ Very high

Table 5-9: Traffic systems, signs and markings asset risks

Source: Asset management team (February 2020)

5.6 How risk underpins decision-making

The various risk mitigation measures, identified and required under the risk management framework, also need to align with Auckland Transport's capital improvements, maintenance and operational programmes, and will be used to prioritise and justify these programmes and projects.

The information is also useful for developing an evidence-base for funding applications and for assessing the benefits of projects for users.

This process is highlighted in Figure 5-4.



Figure 5-4: Risk-based decision-making process

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6 How we manage assets throughout their lifecycle

Auckland Transport actively manages its assets throughout their lifecycles, using lifecycle management plans. Lifecycle management plans contain several important components, including:

- an operational plan – detailing how we will ensure assets remain fit for purpose, and how we respond to customer service requests and emergency events
- a maintenance plan – setting out how we will identify and repair asset faults
- a renewals plan – explaining our approach for replacing assets as they deteriorate
- a capital improvements programme – detailing our plans to create new assets or improve existing assets
- a disposal plan – explaining when and how we will dispose of assets, once they have reached the end of their lives.

In this section we explain our approach to lifecycle management, and outline the operational, maintenance, renewal and disposal plans, and the capital improvement programme that we have developed for the traffic systems, signs and marking assets in the Auckland transport network.

6.1 Lifecycle management objectives

The objectives of our asset lifecycle management activities align with Auckland Transport's overall asset management objectives, including:

- serviceability – delivering agreed fit-for-purpose levels of service for assets, that are focussed on safety, condition, aesthetic appeal and customer requirements, to ensure the network meets the needs of different transport mode and users
- prudent risk management – providing a safe network, by ensuring the network provides safe movement of road users and is always available for users in critical areas, such as the CBD
- perpetuity of assets – addressing loss of service potential due to asset deterioration, and ensuring the network remains available for future generations by implementing appropriate operational, maintenance and renewal activities
- value-for-money – optimising and prioritising investments to achieve best whole-of-life costs, while meeting agreed levels of service.

Strategies we use to deliver these objectives are:

- using competent and capable people – resourcing a team of asset engineers, contractors, and customer services staff, with specified roles and responsibilities, who have suitable skills and experience to deliver our network operations, maintenance and renewals services
- establishing asset management systems – establishing the processes, information management systems, governance and management structures needed to develop, deliver and monitor our asset management activities
- optimising service delivery mechanisms – outsourcing service delivery contracts, using competitive bidding in the open market and industry accepted procurement processes, to effectively and efficiently deliver our programmes
- developing lifecycle management plans.

6.2 Operations plan for traffic systems, signs and marking

Auckland Transport's operational plan for its traffic systems, signs and marking assets includes:

- operational activities – the activities in managing these assets, including frequencies and response times

- historical operational performance and costs – how these assets have performed in the past and what it cost
- future operational requirements – what assets will be required for the future and the associated costs.

6.2.1 Operational activities

Operational activities (also known as operations) are the day-to-day network management activities required to keep the traffic systems, signs and markings network in a safe and operable state, and to prevent interruptions to the agreed levels of service. They are different from the maintenance and renewal activities associated with the network.

Key operational activities related to traffic systems, signs and markings include:

- asset inspections and monitoring
- customer service and emergency response.

In developing and delivering activities, Auckland Transport takes into account:

- the risk of critical assets failing
- the baseline levels of service required and any changes to the agreed levels of service.

The operations and maintenance of traffic systems are managed, by ATOC, under three area-based contracts. The contract includes inspections, maintenance and repair of traffic signals and associated equipment.

Table 6-1 sets out the operational activities for traffic system assets, including field devices.

Activity	Description	Service provider
Asset inspection, monitoring and testing	Inspection is an ongoing, repetitive activity necessary to ensure that: • traffic systems assets continue to provide effective operational service • asset condition is maintained • operations and maintenance needs are identified. Testing is carried out on traffic system assets once installation is complete, to identify and rectify any faults or malfunctions prior to commissioning.	ATOC maintenance contractors
Customer service and emergency response	• Responding reactively to requests for services through Auckland Transport's customer relationship management system. • Responding to unexpected events and incidents that affect network safety and integrity, or public safety • Providing temporary traffic management, incident and extreme congestion management. • Liaising with service providers to minimise disruption caused by power and communication outages.	Auckland Council's call center ATOC maintenance contractors
Traffic signal operation and fault monitoring through SCATS	• Managing traffic congestion, monitoring faults and enabling public transport priority. • Actively monitoring intersections to improve signal phasing and synchronise signals to optimise traffic flow. • Responding to customer requests, incidents and emergencies.	ATOC
Real-time travel information	• Using signs and other media to communicate with road users about real-time information, travel times, incidents and potential hazards.	ATOC

Table 6-1: Operational activities summary for traffic systems

Source: ATOC maintenance contracts

See Table A 1 in Appendix B for a summary of the traffic systems maintenance contracts managed by ATOC.

The operations and maintenance of road signs and markings are managed, under area-based road maintenance contracts, by Auckland Transport's Road Corridor Delivery group.

Table 6-2 sets out the operational activities for traffic signs and markings assets.

Activity	Description	Service provider
Asset inspection	Inspection is an ongoing, repetitive activity necessary to ensure that: - signs and marking assets continue to provide effective operational service - asset condition is maintained - operations and maintenance needs are identified	Auckland Transport Road Maintenance Contractor
Customer service and emergency response	- Responding reactively to requests for services through Auckland Transport's customer relationship management system. - Responding to unexpected events and incidents that affect network safety and integrity, or public safety.	Auckland Council's call center Auckland Transport Road Maintenance Contractors

Table 6-2: Operational activities for traffic signs and markings

Source: Auckland Transport road maintenance contracts

See Table A 2 in Appendix B for a summary of the road maintenance contracts, including those for traffic signs and marking, managed by the Road Corridor Delivery group.

6.2.1.1 Asset inspections and monitoring

Auckland Transport inspects its traffic systems, signs and road markings assets to identify defects that could cause assets to fail or affect their performance. Defects are recorded, so that maintenance and renewal activities can be programmed to address them.

Table 6-3 summarises the nature and frequency of the inspections carried out for traffic system assets, as required by the ATOC maintenance contracts. Maintenance contractors are required to identify and record any faults, defects and surface displacements of traffic systems, and prioritise and programme maintenance or repairs for assets that require them.

Asset type	Inspection and monitoring for asset components	Area	Frequency
Traffic signals	Lenses – cleaning and polishing	All regions	12 monthly
	Chambers and tobies	All regions	6 monthly
	Ducting and cabling (loose cable, etc.)		
	Pedestrian detectors, vehicle detector loops/video and thermal detectors, buzzers, and audio and tactile facilities		
	Lanterns and poles	All regions	6 monthly
	Controllers and cabinets	All regions	6 monthly

Field devices – road corridor signs	Real-time travel information School signs Speed-activated warning signs Pedestrian warning studs Cameras	All regions	12 monthly
Field devices – road corridor signs	Variable Passenger Information Displays (VPID) Electronic signs	All regions	3 monthly

Table 6-3: Inspection frequencies for traffic systems assets, including field devices

Source: ATOC maintenance contracts

The inspection frequencies for general traffic signs and markings are based on the hierarchy of the road that they are located on, as detailed in Table 6-4.

Road hierarchy	Routine inspection frequency	Detailed inspection frequency
Regional and district arterial routes, primary routes, collector routes (10,000 to 20,000 vehicles per day), local and collector routes (5,000 to 10,000 vehicles per day)	Weekly	3 monthly
Local sealed roads (1,000 to 5,000 vehicles per day) and cycle paths	2 weekly	3 monthly
Local sealed roads (<1,000 vehicles per day), unsealed roads (<1,000 vehicles per day), accessways and carparks	2 monthly	6 monthly
Structure inspections	Superficial inspection frequency	General inspection frequency
Frangible sign bases	6 monthly	6 monthly

Table 6-4: Road hierarchy inspection frequency

Source: Road corridor maintenance contracts

6.2.1.2 Requests for service and emergency responses

Auckland Transport receives requests for services related to its traffic signals, signs and markings assets through its customer relationship management system and emergency callouts. Operational activities in response to these requests may include addressing asset and service failures, and providing temporary traffic management in order to ensure road user safety.

These activities are carried out by Auckland Transport staff and contractors in accordance with the following priorities and response times:

- emergency works – first priority; resources will be diverted to enabling personnel to attend immediately
- routine high works – second priority; resources will be diverted to enable personnel to attend on the next working day
- routine normal works – third priority; activities will be included in the next work schedule
- routine normal works (low priority) – fourth priority; activities will be include in a work schedule when resources permit.

Response times for traffic signs and marking assets are determined based on the hierarchy of the road they are located on and the type of asset involved, as shown in Table 6-5.

Response times for incident investigation by road hierarchy	Routine high	Routine normal	Emergency response
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Traffic Systems, Signs and Markings Asset Class Management Plan

Operations on regional and district arterial routes, primary routes, collector routes (10,999 to 20,999 vehicles per day), accessways and car parks	1 hour	1 day	1 hour
Operations on local and collector routes (5,999 to 10,999 vehicles per day) and general local sealed roads (1,999 to 5,999 vehicles per day)	2 hours	2 days	1 hour
Operations on general local sealed roads (<1,999 vehicles per day) and unsealed roads	2 days	3 days	1 hour
Response times for physical works by asset type	Routine high	Routine normal	Emergency response
Regulatory signs and chevron boards (all roads)	1 day	1 day	1 day
Street name blades, permanent warning signs, advisory signs and others (all roads)	N/A	2 weeks	2 weeks
Destination signs (all roads)	N/A	4 weeks	4 weeks

Table 6-5 Call-centre and emergency physical works response times

Response times for traffic system assets are prioritised based on the nature of the fault, as shown in Table 6-6.

Work type	Description	Activity detail	Response time
Emergency, urgent and reactive response	Priority 1 Faults	Failures affecting the safe operation or safe display of the signals, including: - conflicting signals - no display on one or more approaches - non-appearance of any phase when demanded - all lights out. Damage caused by accident or vandalism, e.g. cabinet damaged or controller not functioning correctly	60 minutes from the time that the fault was first reported to the contractor
	Priority 2 Faults	Failures affecting a local controllers ability to communicate with the SCATS system, e.g. SCATS alarms, faults with push buttons and faults with tactile or vibrating indicators for blind pedestrians.	Between 6am and 11pm, Monday to Sunday (inclusive), within 4 hours
	Priority 3 Faults	Failures or damage that is not affecting safe operation or display.	Monday to Sunday (inclusive), within 24 hours.

Table 6-6: Auckland Transport traffic systems emergency response priorities

Source: ATOC maintenance contract

Table 6-7 summarises the priorities for emergency responses for field devices.

Work type	Description	Activity detail	Response time	Resolution time
Emergency, urgent and reactive response	Priority 1 Faults	Fault, incident or problem affecting the entire location or severely impacting core business functions.	<15 minutes from the time that the fault was first reported to the contractor	<8 hours

Priority 2 Faults	Fault, incident or problem significantly impacting core business operability, e.g. localised infrastructure problem or local system outage.	<30 minutes	<24 hours
Priority 3 Faults	Fault, incident, problem, request or query that has low inherent business impact.	<4 hours	<4 days
Priority 4 Faults	A service request that has low impact on business services and covers minor out-of-scope changes	<8 hours	<5 days

Table 6-7: Auckland Transport field devices emergency responses priorities

Source: ATOC maintenance contracts

6.2.2 Historical operational costs

Historically, the operational costs for Auckland Transport's traffic systems, signs and markings assets averaged \$12.3 million per year.

This level of historical investment delivered the agreed levels of service related to network optimisation and performance for traffic systems, to maintain traffic flow and safety.

Operational costs related to asset inspections and emergency responses are covered under Section 6.5.2.

Auckland Transport uses these historical costs to calculate what the future operational needs for these assets are likely to be, including the financial investment required.

Figure 6-1 and Table 6-8 show the historical operational costs for traffic systems, signs and markings assets for the past 7 years.

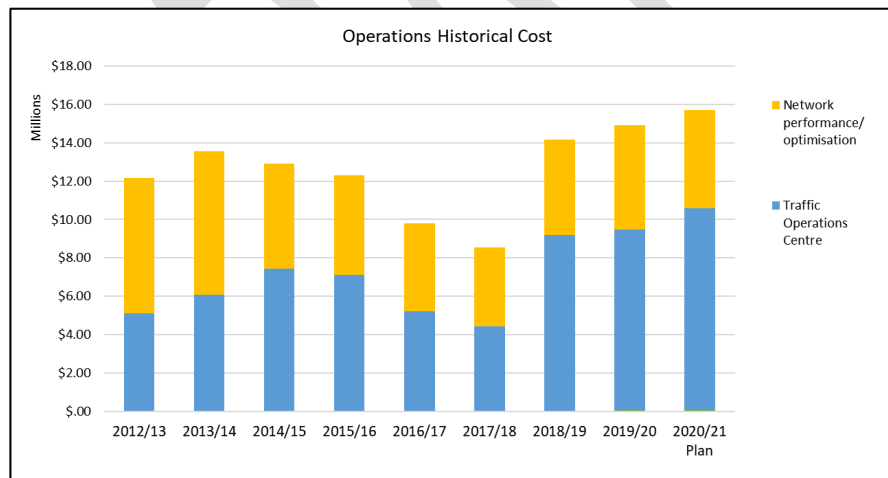


Figure 6-1: Historical operational costs for traffic systems, signs and markings

Source: Auckland Transport SAP database (2020)

Asset type	2012/1	2013/1	2014/1	2015/1	2016/1	2017/1	2018/1	2019/2	2020/2
\$M	3	4	5	6	7	8	9	0	1 plan
Traffic operations centre	\$5.1	\$6.1	\$7.5	\$7.1	\$5.2	\$4.4	\$9.2	\$5.4	\$5.1
Network performance and optimisation	\$7.1	\$7.5	\$5.5	\$5.2	\$4.6	\$4.1	\$5.0	\$9.4	\$10.6

Total	\$12.2	\$13.6	\$12.9	\$12.3	\$9.8	\$8.6	\$14.2	\$14.9	\$15.7
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Table 6-8: Historical operational costs for traffic systems, signs and marking

Source: Auckland Transport SAP database (2020)

6.2.3 Future operational requirements

The future operational investment required for operational activities for traffic systems, signs and markings is \$17.1 million per year. This figure is a yearly average over 10 years and will cover:

- the current baseline level of service for operational activities
- any consequential operational needs arising from the growth of the network
- any other operational needs identified for the network, such as changes to the current levels of service.

Future operational costs are based on current 2019/2020 contract rates, excluding escalation, and are expressed in present-day dollars, as of July 2019. Note that for reporting purposes, future operational and maintenance costs have been combined.

6.2.3.1 Future baseline operational needs

Figure 6-2 and Table 6-9 summarise the future baseline operational needs for traffic systems, signs and markings. These needs have been calculated on the assumption that:

- Auckland Transport will continue to deliver the current baseline operational levels of service in the future for the existing network
- the current level of operational activities will continue in the future
- operational costs incurred during the 2019/2020 financial year will remain the basis for assessing future costs.

Note that other future baseline operational costs related to asset inspections and emergency responses are summarised under section 6.3.3.

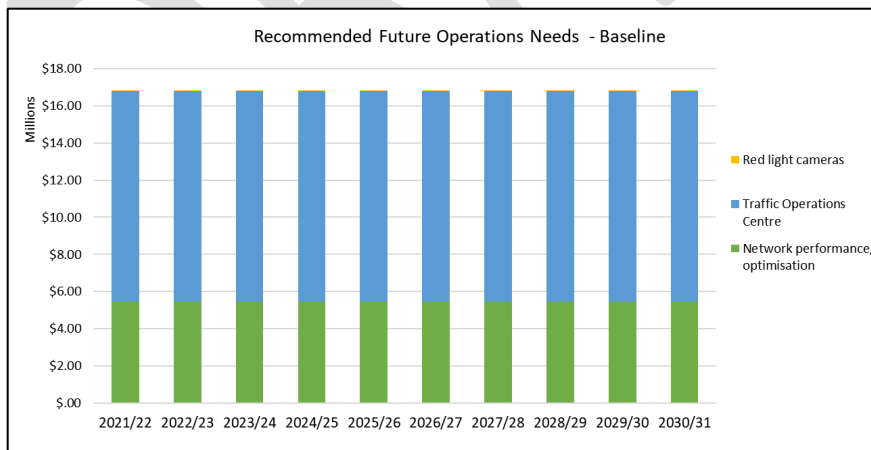


Figure 6-2: Recommended baseline operations needs for traffic systems, signs and marking

Source: Asset management financial model (2020)

Asset type	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	10-year total
\$M											

Traffic Systems, Signs and Markings Asset Class Management Plan

Traffic operations centre	\$11.3	\$11.3	\$11.3	\$11.3	\$11.3	\$11.3	\$11.3	\$11.3	\$11.3	\$11.3	\$11.3	\$113.2
Network performance and optimisation	\$5.5	\$5.5	\$5.5	\$5.5	\$5.5	\$5.5	\$5.5	\$5.5	\$5.5	\$5.5	\$5.5	\$54.7
Red light cameras	\$0.1	\$0.1	\$0.1	\$0.1	\$0.1	\$0.1	\$0.1	\$0.1	\$0.1	\$0.1	\$0.1	\$0.5
Total	\$16.8	\$16.8	\$16.8	\$16.8	\$16.8	\$16.8	\$16.8	\$16.8	\$16.8	\$16.8	\$16.8	\$168.4

Table 6-9: Baseline operational needs for traffic systems, signs and marking

Source: Asset management financial model (2020)

6.2.3.2 Future consequential operational needs

Consequential operational activities, that are extra to the baseline needs activities, may arise if the traffic systems, signs and markings network expands through capital improvement projects, new subdivisions and development, city centre or town-centre upgrades and other streetscape projects.

Auckland Transport establishes the future consequential operational needs for its traffic systems, signs and markings assets by modelling the likely network growth, based on historical and future capital projects and projected vested assets.

Major assumptions in the model include:

- all components in an asset will deteriorate in the same fashion – no allowance has been made for early or sudden failure of the asset
- growth in the number of vested assets will be the same as the average growth per year for the past 3 years
- where projects are not split into phases, the construction cost of the project is assumed to be its full cost
- operational costs will be consistent year on year, and start in the year immediately following the asset's completion
- no allowance has been made to inflate historical costs to current dollar values.

The average historical growth of traffic systems, signs and markings over the past 5 years has been approximately 109 (2.4 per cent) traffic systems, 19,500 (1.5 per cent) signs and 950km (0.7 per cent) of markings per annum.

Using these figures, modelling shows that the average growth each year for these assets, for the next 10 years, will be:

- 15 signalised intersections
- 11 CCTVs
- 1,416 traffic signs
- 25 electronic signs 25 per annum.

The average growth of markings assets is associated growth in road carriageways, which is estimated to be 74km per annum.

The predicted future consequential operational needs for traffic systems, signs and marking assets are given in Figure 6-3 and Table 6-10.

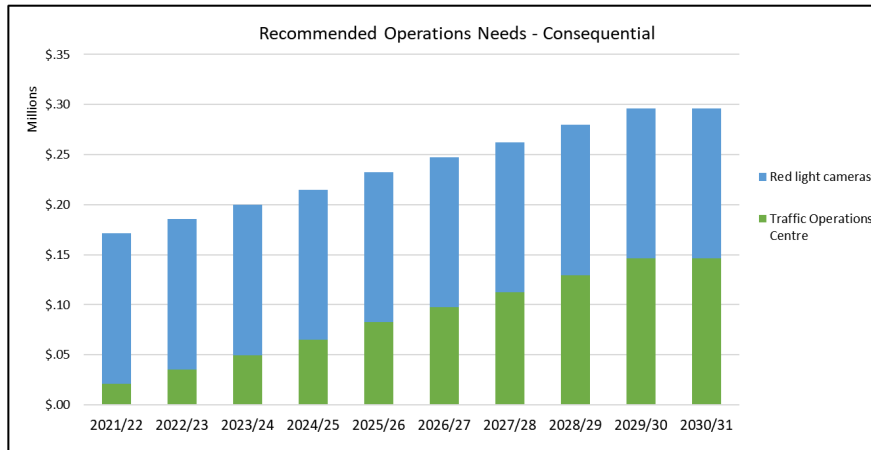


Figure 6-3: Future consequential operational needs for traffic systems, signs and markings

Source: Asset management financial model (2020)

Asset type \$M	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	10-year total
Traffic operations centre	\$0.0	\$0.0	\$0.0	\$0.1	\$0.1	\$0.1	\$0.1	\$0.1	\$0.1	\$0.1	\$0.9
Red light cameras	\$0.2	\$0.2	\$0.2	\$0.2	\$0.2	\$0.2	\$0.2	\$0.2	\$0.2	\$0.2	\$1.5
Total	\$0.2	\$0.2	\$0.2	\$0.2	\$0.2	\$0.2	\$0.3	\$0.3	\$0.3	\$0.3	\$2.4

Table 6-10: Consequential operational needs for traffic systems, signs and marking

Source: Asset management financial model 2020

This level of investment will deliver operational services for traffic systems, signs and markings related to network growth.

6.2.3.3 Future additional operational needs

Additional operational needs may arise due to local requirements, committed activities, increased levels of service or factors such as climate change.

At present, we have not identified any additional operational needs for the traffic systems, signs and markings network.

6.2.3.4 Future operational investment required

The future operational investment required for Auckland Transport's traffic systems, signs and markings assets takes into account all of the above operational needs.

The total recommended future operational investment required for traffic systems, signs and markings for the next 10 years is \$170.8 million. This equates to an average of \$17.1 million per year, and is made up of

- baseline operational needs – \$16.8 million
- consequential operational needs (due to network growth) – \$0.2 million.

Figure 6-4 and Table 6-11 show how this investment will be allocated over the next 10 years.

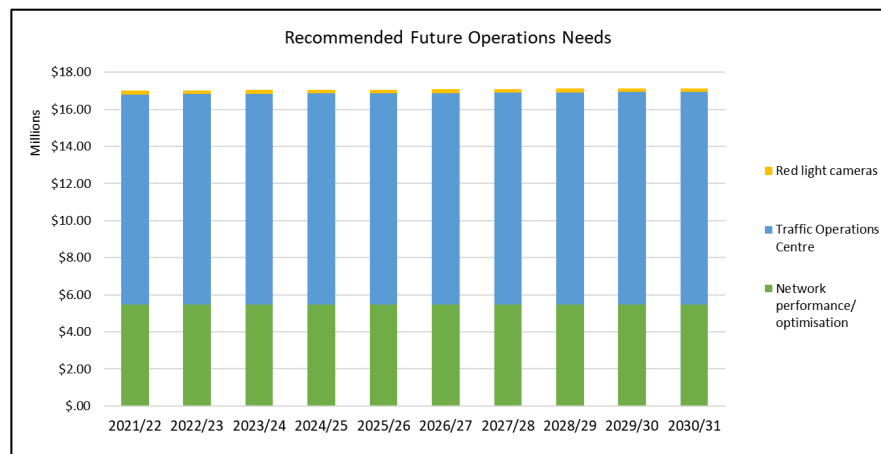


Figure 6-4: Recommended future operational investment for traffic systems, signs and markings

Source: Asset management financial model (2020)

Asset type \$M	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	10-year total
Traffic operations centre	\$11.3	\$11.4	\$11.4	\$11.4	\$11.4	\$11.4	\$11.4	\$11.5	\$11.5	\$11.5	\$114.1
Network performance and optimisation	\$5.5	\$5.5	\$5.5	\$5.5	\$5.5	\$5.5	\$5.5	\$5.5	\$5.5	\$5.5	\$54.7
Red light cameras	\$0.2	\$0.2	\$0.2	\$0.2	\$0.2	\$0.2	\$0.2	\$0.2	\$0.2	\$0.2	\$2.0
Total	\$17.0	\$17.0	\$17.0	\$17.1	\$17.1	\$17.1	\$17.1	\$17.1	\$17.1	\$17.1	\$170.8

Table 6-11: Recommended future operational investment for traffic systems, signs and marking

Source: Asset management financial model (2020)

Note that other operational costs related to asset inspections and emergency responses are included with maintenance expenditure (see section 6.3.3)

These overall long-term operational requirements for the traffic systems, signs and markings network have been split further into 11 contract areas: see [Appendix TBC](#) for details. The requirements for each contract area have been calculated based on historical expenditure trends, contractual requirements and an assessment of future operational needs.

6.3 Maintenance plan for traffic systems, signs and markings

Maintenance is the work carried out to maintain assets and ensure they continue to deliver the agreed levels of service, without any interruption.

Maintenance activities enable the traffic systems, signs and markings network to be used as planned and ensure it fulfils its purpose throughout its expected life span. Without these activities, the network would rapidly deteriorate and become unsafe for users, and would require costly premature renewal works in the future.

Auckland Transport's maintenance plan for its traffic systems, signs and markings assets includes:

- maintenance activities – to describe the maintenance activities needed for traffic systems, signs and markings
- historical maintenance costs – to understand how the network performed in the past and the associated costs

- future maintenance requirements – to forecast and propose future maintenance programmes and the associated costs.

6.3.1 Maintenance activities

Maintenance activities for traffic systems, signs and markings include routine (or cyclic), planned (or programmed), unplanned (or reactive) maintenance and emergency reinstatement.

In planning and developing these activities, Auckland Transport takes into account:

- the risk of critical assets failing
- the agreed baseline levels of service required, and any changes to these.

Maintenance activities include repairs of asset faults and defects or repainting of road marking, and are different from operational or renewal activities associated with the network.

Auckland Transport's maintenance activities aim to use consistent material types, quality, texture and strength to those of surrounding assets.

Maintenance activities for traffic systems, signs and markings are summarised in Table 6-12.

Activity	Description	Requirements	Service Provider
Planned maintenance			
Routine maintenance	Ongoing, repetitive activities necessary to ensure the safety of the network and respond to customer service requests.	Regular weekly activities for maintenance of the network	Auckland Transport ATOC Maintenance contractors
Planned maintenance	Planned or programmed repair or replacement to address asset faults and defects and reinstatement assets following utility works.	As required	Auckland Transport ATOC Maintenance contractors
Reactive maintenance			
Unplanned maintenance and fault management	Responding to requests for services through the customer relationship management system.	As required within specific timeframes	Auckland Council's call centre Auckland Transport ATOC Maintenance contractors
Emergency work	Responding to unexpected events that affect public health and safety	As required by contract	Auckland Transport ATOC Maintenance contractors

Table 6-12: Maintenance activities summary for traffic systems, signs and markings

Source: Auckland Transport road corridor maintenance contracts; ATOC maintenance contracts

6.3.1.1 Routine and planned maintenance

Planned maintenance includes regular, routine and predictable maintenance activities that can be organised, programmed and scheduled in advance. Planned maintenance covers most maintenance needs.

Planned maintenance activities are identified through network inspections, and from non-urgent requests from customers.

Routine (or cyclic) maintenance works involve:

- making safe sites with faults or defects
- making technical level of service improvements relating to accuracy of placement, visibility and conformance with the Waka Kotahi NZ's MOTSAM [which covers reflectivity standards and all markings, including Raised Reflective Pavement Markers (RRPM) and ceramic studs]
- reinstating road assets on the completion of physical works, where required
- responding to customer service requests within the required timeframes.

Planned (or programmed) maintenance works involve:

- fixing defects identified through inspections, and addressing asset failures identified through SCATS and through the customer relationship management system
- checking and repairing wiring and connections for electrical devices
- repairing or replacing assets that are damaged or in poor condition. For markings, this involves repainting existing markings, removing substandard markings, and reinstating markings removed as a result of routine maintenance (including patch sealing).

Maintenance works are prioritised based on the criticality of the assets, the severity of the faults and service level requirements. Where possible, they are integrated with other road corridor works to minimise disruption to the public.

Note that paint markings require repainting every year (on arterial routes, twice a year), while thermoplastic markings have a longer life (5 to 6 years) and provide greater visibility and higher slip resistance.

6.3.1.2 Unplanned and emergency maintenance

Auckland Transport carries out unplanned maintenance to respond to irregular, unpredicted events that require maintenance action. Emergency works respond to unexpected events that affect public health and safety.

Auckland Transport receives requests for unplanned and emergency maintenance services for its traffic systems, signs and markings through the customer relationship management system.

Key maintenance activities in response to these requests include:

- checking and repairing faults and system failures for traffic signals, field devices and signs to restore them to normal operating order and an acceptable condition
- repairing and replacing broken, damaged and vandalised asset components for traffic signals, field devices and signs.

Auckland Transport prioritises and allocates response times for its unplanned and emergency maintenance activities based on the level of criticality of the assets and the severity any impact for road users. These priorities and response times are explained in section 6.2.1.

6.3.2 Historical maintenance costs

Historically, the cost of maintenance activities for traffic systems, signs and markings assets has been \$13.8 million per year (yearly average).

This level of historical investment delivered the agreed:

- levels of service for maintaining traffic systems, signs and markings assets, including maintaining columns, brackets and luminaires
- asset inspection, repair and replacement activities for traffic systems, signs and marking assets

- customer service and emergency responses.

Auckland Transport uses these historical costs to calculate what future maintenance requirements for traffic systems, signs and markings assets are likely to be – both for the maintenance programme and the financial investment required.

The historical costs for traffic systems, signs and markings over the past 8 years are given in Figure 6-5 and Table 6-13. Note that for reporting purposes, some operational costs have been included in this section, and the figures given below include both maintenance costs (for physical asset repair) and operation costs for asset inspections and emergency responses.

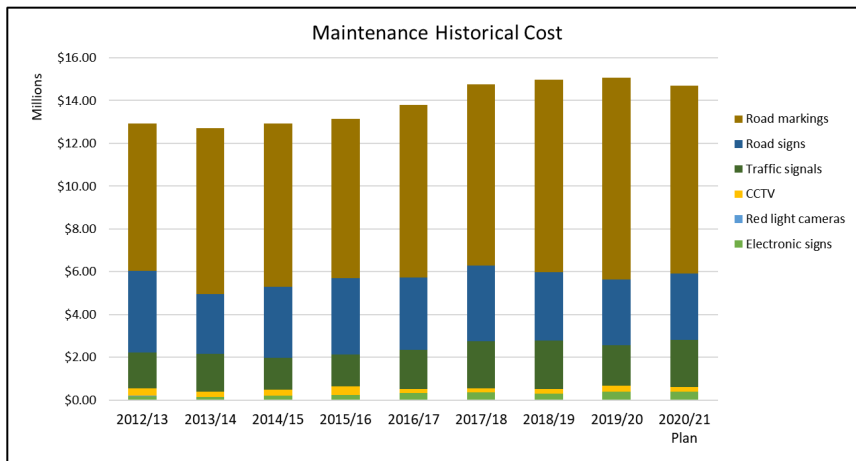


Figure 6-5: Historical maintenance costs for traffic systems, signs and markings

Source: Auckland Transport SAP database (July 2018)

Asset type \$M	2012/1 3	2013/1 4	2014/1 5	2015/1 6	2016/1 7	2017/1 8	2018/1 9	2019/2 0	2020/2 1 Plan
Road markings	\$6.9	\$7.7	\$7.6	\$7.5	\$8.1	\$8.5	\$9.0	\$9.4	\$8.8
Road signs	\$3.8	\$2.8	\$3.3	\$3.6	\$3.4	\$3.5	\$3.2	\$3.1	\$3.1
Traffic signals	\$1.7	\$1.8	\$1.5	\$1.5	\$1.8	\$2.2	\$2.3	\$1.9	\$2.2
CCTV	\$0.3	\$0.2	\$0.3	\$0.4	\$0.2	\$0.2	\$0.2	\$0.3	\$0.2
Electronic signs	\$0.19	\$0.15	\$0.20	\$0.24	\$0.33	\$0.38	\$0.30	\$0.39	\$0.40
Red light cameras	\$0.01	\$0.01	\$0.01	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Grand Total	\$12.93	\$12.70	\$12.91	\$13.16	\$13.80	\$14.77	\$14.98	\$15.05	\$14.69

Table 6-13: Historical maintenance costs for traffic systems, signs and marking

Source: Auckland Transport SAP database (2020)

6.3.3 Future maintenance requirements

The future investment required for maintenance activities for traffic systems, signs and markings assets is \$16.8 million per year. This figure is a yearly average over 10 years, and will cover:

- the agreed levels of service for baseline operational activities
- any consequential maintenance needs arising from the growth of the network
- any other maintenance needs identified, such as changes to the current levels of service.

Future maintenance costs are based on current contract rates, as of 2019/2020 (excluding escalation), and are expressed in present-day dollars, as of July 2019. Note that for reporting purposes, costs for some operational activities are included in this section.

6.3.3.1 Baseline maintenance needs

To establish the future baseline maintenance needs for traffic systems, signs and markings, it has been assumed that:

- Auckland Transport will continue to deliver the current baseline operational levels of service in the future, for the existing traffic systems, signs and markings network
- the current level of maintenance programmes will continue into the future
- maintenance costs incurred during 2019/2020 will be the basis for assessing future costs.

Based on this approach, Figure 6-6 and Table 6-14 summarises the future baseline maintenance needs for traffic systems, signs and markings.

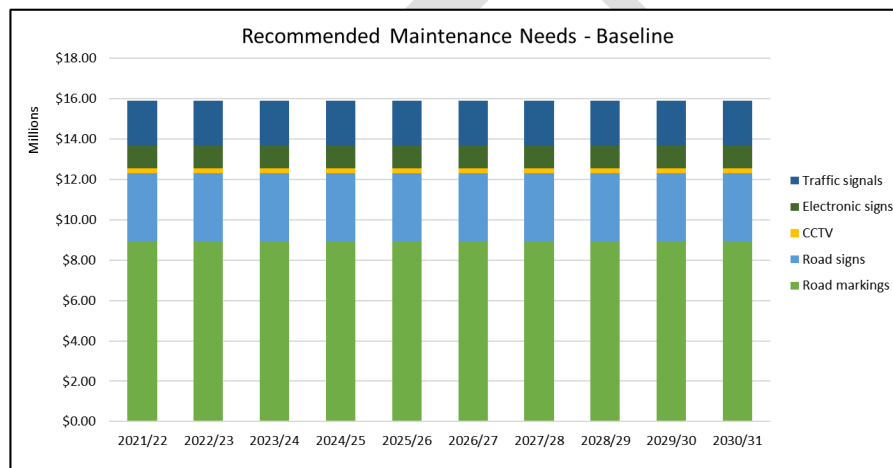


Figure 6-6: Future baseline maintenance needs for traffic systems, signs and markings

Source: Asset management financial model (2020)

Asset type \$M	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	10- year total
Road markings	\$8.9	\$8.9	\$8.9	\$8.9	\$8.9	\$8.9	\$8.9	\$8.9	\$8.9	\$8.9	\$89.3
Road signs	\$3.4	\$3.4	\$3.4	\$3.4	\$3.4	\$3.4	\$3.4	\$3.4	\$3.4	\$3.4	\$33.9
Traffic signals	\$2.2	\$2.2	\$2.2	\$2.2	\$2.2	\$2.2	\$2.2	\$2.2	\$2.2	\$2.2	\$22.0
CCTV	\$0.2	\$0.2	\$0.2	\$0.2	\$0.2	\$0.2	\$0.2	\$0.2	\$0.2	\$0.2	\$2.2
Electronic signs	\$1.2	\$1.2	\$1.2	\$1.2	\$1.2	\$1.2	\$1.2	\$1.2	\$1.2	\$1.2	\$11.5
Total	\$15.9	\$15.9	\$15.9	\$15.9	\$15.9	\$15.9	\$15.9	\$15.9	\$15.9	\$15.9	\$158.9

Table 6-14: Future baseline maintenance needs for traffic systems, signs and marking

Source: Asset management financial model (2020)

This level of investment will deliver the:

- agreed levels of service, as set out in the current maintenance contracts
- asset repairs and replacements, as required, for traffic systems, signs and marking assets

- asset inspections and monitoring, as required, for traffic systems, signs and marking assets.

6.3.3.2 Future consequential maintenance needs

Consequential maintenance needs, in addition to the baseline needs, may be required if the traffic systems, signs and markings network expands, due to capital improvement projects, new subdivisions and development, city centre or town-centre upgrades, and other streetscape projects.

Auckland Transport establishes the future consequential operational and maintenance needs for its traffic systems, signs and markings assets by modelling the likely network growth, based on historical and future capital projects and the projected amount of vested assets.

Major assumptions used in the model include

- all components in an asset type will deteriorate in the same fashion – no allowance has been made for early or sudden failure of the asset
- growth in the number of vested assets will be the same as the average growth per year for the past 3 years
- where projects are not split into phases, the construction cost of the project is assumed to be its full cost
- maintenance costs follow a set pattern, based on the age of each type of asset; these costs are assumed to remain at zero for a number of years initially, before increasing to a maximum cost per year at the end of the asset's life
- no allowance has been made to inflate historical costs to current dollar values.

The average historical growth of traffic systems, signs and marking over the past 5 years has been approximately 109 (2.4 per cent) signalised intersections, 19,500 (1.5 per cent) signs and 950km (0.7 per cent) or markings per annum.

The consequential OPEX model has established that the average growth is likely to be 15 signalised intersections, 11 CCTVs, 1,416 road signs and 25 electronic signs each year. The average growth in markings is associated with the growth of carriageway section, which predicted to be 74km per annum for the next 10 years.

The predicted consequential operational and maintenance needs based on this approach are given in Figure 6-7 and Table 6-15.

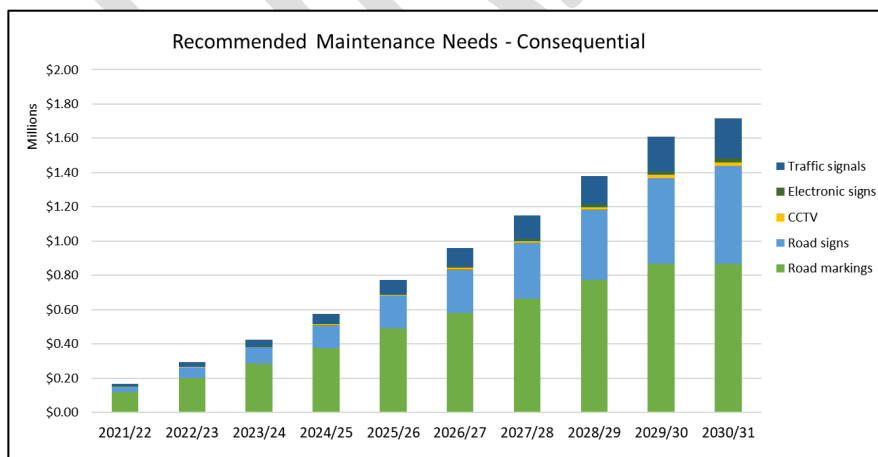


Figure 6-7: Future consequential maintenance needs for traffic systems, signs and markings

Commented [MO(10): Red light cameras is in RLTP, but the model did not use it due to lack of valuation and quantity info

Commented [MO(11): Repeated in 6.2.3.2. consider cross referencing

Source: Asset management financial model (2020)

Asset type \$M	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	10- year total
Road markings	\$0.12	\$0.21	\$0.29	\$0.38	\$0.49	\$0.58	\$0.67	\$0.77	\$0.87	\$0.87	\$5.25
Road signs	\$0.03	\$0.06	\$0.09	\$0.13	\$0.19	\$0.25	\$0.32	\$0.41	\$0.50	\$0.57	\$2.55
Traffic signals	\$0.02	\$0.03	\$0.04	\$0.06	\$0.08	\$0.11	\$0.14	\$0.17	\$0.20	\$0.23	\$1.06
CCTVs	\$0.00	\$0.00	\$0.00	\$0.00	\$0.01	\$0.01	\$0.01	\$0.01	\$0.02	\$0.02	\$0.08
Electronic signs	\$0.00	\$0.00	\$0.00	\$0.00	\$0.01	\$0.01	\$0.01	\$0.02	\$0.02	\$0.03	\$0.11
Total	\$0.20	\$0.30	\$0.40	\$0.60	\$0.80	\$1.00	\$1.20	\$1.40	\$1.60	\$1.70	\$9.10

Table 6-15: Future consequential maintenance needs for traffic systems, signs and markings

Source: Asset management financial model (2020)

This level of investment will enable Auckland Transport to deliver the agreed levels of service for maintenance related to network growth for the next 10 years.

6.3.3.3 Additional maintenance needs

Additional maintenance needs can arise from local requirements, committed activities, increased levels of service or other factors, such as climate change.

At present, we have not identified any additional maintenance needs identified for traffic systems, signs and markings.

6.3.3.4 Future maintenance investment required

The future maintenance investment required for the traffic systems, signs and markings network takes into account all the above types of maintenance needs.

The total recommended maintenance investment forecast for traffic systems, signs and markings for the next 10 years is \$167.9 million, which equates to an average of \$16.8 million per year. This is made up of: (10-year average)

- baseline maintenance needs – \$15.9 million (10-year average)
- consequential maintenance needs (from new assets due to network growth) – \$0.9 million (10-year average).

Figure 6-8 and Table 6-16 show how this investment will be used over the next 10 years.

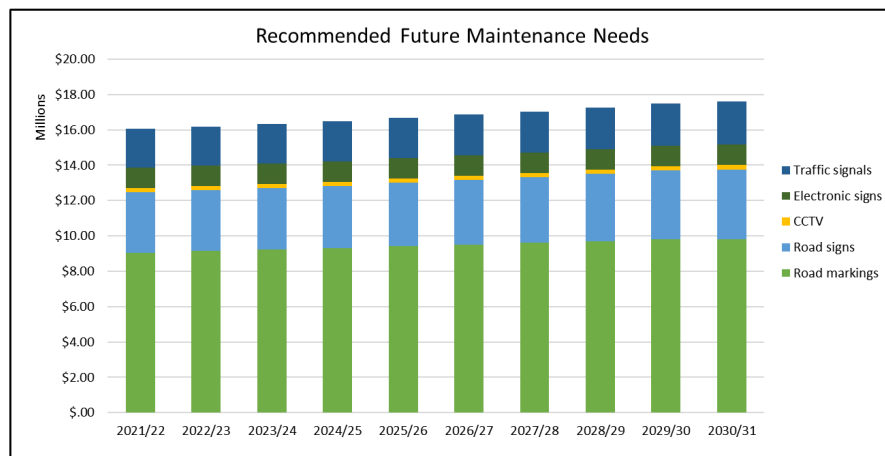


Figure 6-8: Future maintenance investment required for traffic systems, signs and markings

Source: Asset management financial model (2020)

Asset type	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	10-yr Total
Road markings	\$9.1	\$9.1	\$9.2	\$9.3	\$9.4	\$9.5	\$9.6	\$9.7	\$9.8	\$9.8	\$94.6
Road signs	\$3.4	\$3.4	\$3.5	\$3.5	\$3.6	\$3.6	\$3.7	\$3.8	\$3.9	\$4.0	\$36.4
Traffic signals	\$2.2	\$2.2	\$2.2	\$2.3	\$2.3	\$2.3	\$2.3	\$2.4	\$2.4	\$2.4	\$23.1
CCTVs	\$0.2	\$0.2	\$0.2	\$0.2	\$0.2	\$0.2	\$0.2	\$0.2	\$0.2	\$0.2	\$2.2
Electronic signs	\$1.2	\$1.2	\$1.2	\$1.2	\$1.2	\$1.2	\$1.2	\$1.2	\$1.2	\$1.2	\$11.6
Total	\$16.1	\$16.2	\$16.3	\$16.5	\$16.7	\$16.8	\$17.0	\$17.3	\$17.5	\$17.6	\$167.9

Table 6-16: Recommended future maintenance needs for traffic systems, signs and marking

Source: Asset management financial model (2020)

This level of investment will deliver:

- agreed levels of service for maintenance of the growing traffic systems, signs and marking network
- asset inspections, repairs or replacements at a component level for traffic systems, signs and markings
- customer service and emergency responses.

These overall long-term maintenance requirements for traffic systems, signs and markings have been split further into the 11 contract areas: see [Appendix TBD](#) for further details. The requirements for each contract area have been calculated based on historical expenditure trends, contractual requirements and an assessment of future maintenance needs.

6.3.4 Maintenance forward works programme

Auckland Transport takes into account the criticality of the route where its traffic systems, signs and markings assets are located and the severity of any faults when developing and prioritising its maintenance forward works programme.

Check

Commented [MO(12): Lump sum commitments
Other planned maintenance

6.4 Renewal plan for traffic systems, signs and markings

Renewals are planned work activities that respond to asset degradation where the risk of the asset failing and the consequential disruption to services has become unacceptable to road users. This may include the effects of both direct disruption if the asset fails and any subsequent disruption while the asset is being reinstated.

The decline of an asset's condition or performance can be assessed using:

- level of service criteria – the asset no longer achieves the required condition or performance expected at an acceptable risk tolerance level
- economic criteria – it is more cost effective to replace the asset, rather than continue to maintain or repair it³.

6.4.1 Our renewals planning approach

Figure 6-9 illustrates a typical ongoing deterioration pattern for an asset, from its 'as new' state through to its eventual 'end of life' state and failure.

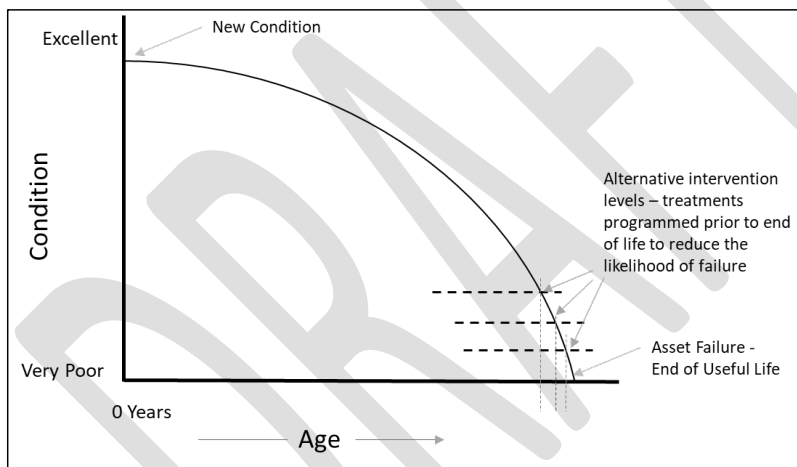


Figure 6-9: Typical deterioration curve for an asset

The decision to intervene and replace an asset, before it fails, might be taken if the risk of disruption from that failure is too great. This means considering progressively earlier interventions, and not allowing the asset to fall below a set condition or performance level that will affect customer safety.

Typically, this approach considers assets on the busier and more important roads to present higher levels of risk, while assets on quieter local roads can be allowed to deteriorate a little more, but not to the point of failure.

Renewals planning can also be viewed from the perspective of exposure to financial risk. This approach involves mapping the asset's replacement cost (from the asset valuation) against risk, taking into account likelihood and consequence of an asset failure.

While the likelihood of an asset failing can be difficult to assess, its condition and age provide an indication of this likelihood. The worse the asset's condition, the more likely it is to fail. Assets that are both very important and more likely to fail should have a higher priority, and be replaced or

³ The net present value (NPV) of the treatment rises above zero, thus balancing future discounted maintenance costs against the cost of the treatment

rehabilitated earlier in their lifecycle, than others. For less important assets, a lower renewals priority is suitable.

By mapping the replacement cost of the asset and its known condition data, by One Network Road Classification category, a picture can be formed of the potential financial exposure or renewal liability for the asset, using its criticality (or importance) and condition as guides.

6.4.1.1 Approach used to analyse 10-year asset renewal needs

Auckland Transport determines its 10-year asset renewal needs for traffic systems, signs and markings by following a comprehensive process using a range of inputs, as shown in Figure 6-10.

This is the common approach adopted for all the assets we manage, although not all inputs are appropriate for all asset classes (e.g. dTIMS does not apply for traffic systems).

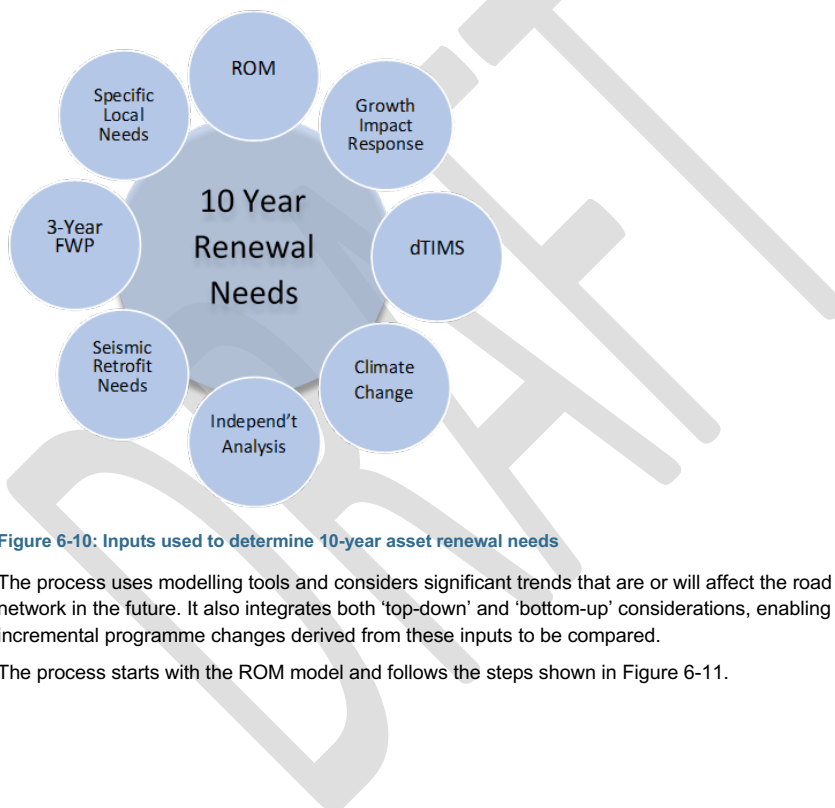


Figure 6-10: Inputs used to determine 10-year asset renewal needs

The process uses modelling tools and considers significant trends that are or will affect the road network in the future. It also integrates both 'top-down' and 'bottom-up' considerations, enabling any incremental programme changes derived from these inputs to be compared.

The process starts with the ROM model and follows the steps shown in Figure 6-11.

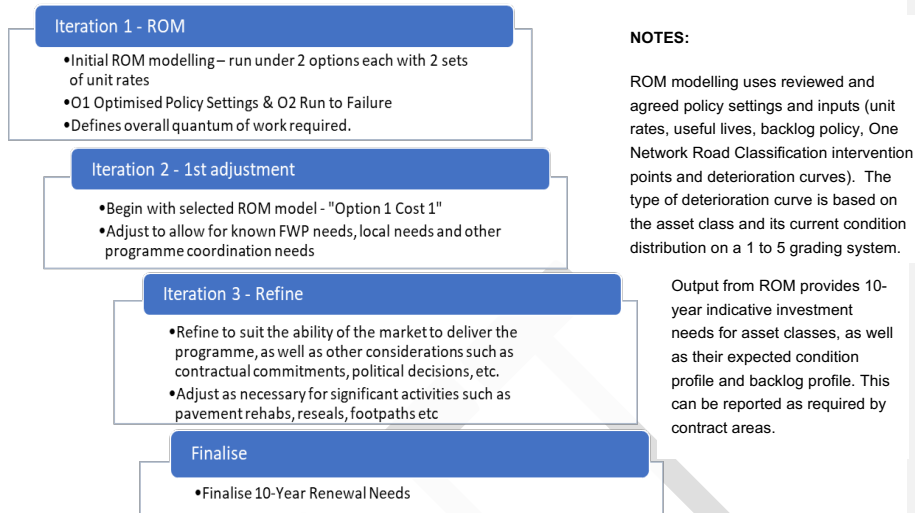


Figure 6-11: Steps taken to determine 10-year asset renewal needs

6.4.2 Renewal activities

Renewal activities involve the planned, like-for-like replacement of components of assets. Replacement occurs when the condition of the asset has deteriorated to the point where it is neither economically efficient nor prudent to continue to maintain it. Likewise, it can happen when an asset has been damaged through natural phenomena.

The average useful life of traffic systems, signs and markings assets also indicates a turning point in their maintenance costs: assets that are older than their average useful life generally require a significant increase in maintenance costs, so that eventually it becomes more cost effective to replace (renew) these assets.

Table 6-17 sets out typical renewal activities for traffic systems, signs and marking.

Activity	Description	Waka Kotahi NZ work categories
Traffic signal renewals	Replaces deteriorated or damaged traffic signals, including poles and lanterns.	222: Traffic services renewals
CCTV renewals	Renews deteriorated and technology-obsolete CCTVs	222: Traffic services renewals
Electronic sign renewals	Replaces deteriorated or damaged electronic signs	222: Traffic services renewals
Information system hardware renewals	Replaces deteriorated and technology-obsolete information systems hardware	222: Traffic services renewals
Red light camera renewals	Replace deteriorated or technology-obsolete red light cameras	222: Traffic services renewals
Level crossing renewals	Replaces deteriorated or damaged level crossings	222: Traffic services renewals
Road marking renewals	Renews road markings, including bus lanes, cycleway markings, road delineations and markings for stock crossings	222: Traffic services renewals

Road sign renewals	Replaces deteriorated and damaged traffic signs	222: Traffic services renewals
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Table 6-17: Renewal activities for traffic systems, signs and marking

Renewal activities for traffic systems, signs and markings can be categorised as programmed, reactive or 'other' renewals, as summarised in Table 6-18.

Activity types	Description	Service provider
Programmed renewals	Programmed replacement to address level of service requirements and risks, taking into account the whole-of-life costs of assets	Auckland Transport ATOC maintenance contractors
Reactive renewals	Unplanned replacement of assets that are damaged by a weather event or incident	Auckland Transport ATOC maintenance contractors
Other renewals	Renewals in response to local board requests for renewals or upgrades Renewals in conjunction with other safety-related road corridor improvements within the area	Auckland Transport ATOC maintenance contractors

Table 6-18: Renewal activity types for traffic systems, signs and markings

In identifying and delivering its renewals activities for traffic systems, signs and markings, Auckland Transport takes into account:

- the risk of critical assets failing
- baseline levels of service requirements and any changes to the agreed levels of service
- the condition of assets and their performance over their life
- the type and timing of any associated road corridor works.

Auckland Transport uses inspections, audits, condition surveys and customer feedback to identify renewal requirements for traffic systems, signs and marking assets.

Table 6-19 summarises the key intervention points for programmed renewals for traffic systems, signs and markings, and the target timeframes for these activities.

Key intervention points for programmed renewals	Renewals approach
Asset in 'very poor' condition Serious faults or defects that are affecting performance and road safety. Lack of significant maintenance or renewal will lead to rapid deterioration and compromise safety. Examples include: • traffic lights with serious water ingress, dirt ingress, corrosion on their housing or a faded diffuser • traffic signal poles with serious corrosion, or that are damaged or bent.	○ Replacement is required within 1 year. ○ Include in the forward works programme for urgent renewals. ○ Urgent maintenance or repairs are to be completed within the specific time scale as described in the contract.
Asset in 'poor' condition Faults or defects that prevent the asset performing at the desired level. Safety is compromised and replacement or remedial work is required. Examples include:	○ Replacement is required within 2 to 5 years, depending on the level of impact or risks to the public. ○ Include in the forward works programme and prioritise for required actions.

Traffic Systems, Signs and Markings Asset Class Management Plan

- traffic lights with visible water ingress, dirt ingress, corrosion on their housing or a faded diffuser
- traffic signal poles with some visible corrosion.

Assets that are below standards or incompatible with today's technologies.

Luminaires that are not sustainable long term or are high energy users

○ Replacement with the appropriate model types is required to comply with the standards and specifications.

○ Replacement with the approved energy-efficient luminaires is required

Table 6-19: Key renewal intervention points for traffic systems, signs and marking

6.4.3 Renewal history

On average over the past 3 years, Auckland Transport has invested \$4.7 million per year in traffic systems, signs and markings renewals.

Figure 6-12 compares historical asset renewals costs with current budgets to 2020/2021.

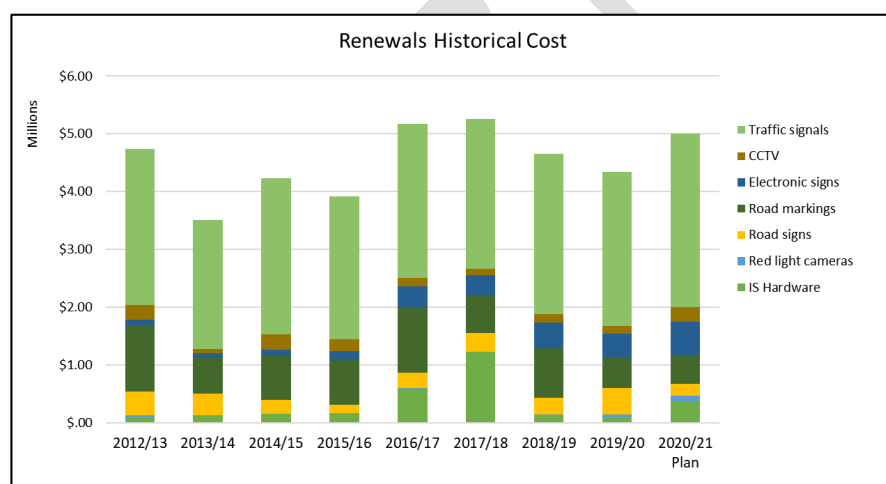


Figure 6-12: Historical and planned renewal costs for traffic systems, signs and markings

Source: Auckland Transport SAP database (2020)

Asset type \$M	2012/1 3	2013/1 4	2014/1 5	2015/1 6	2016/1 7	2017/1 8	2018/1 9	2019/2 0	2020/2 1 Plan
Traffic signals	\$2.7	\$2.2	\$2.7	\$2.5	\$2.7	\$2.6	\$2.8	\$2.7	\$3.0
CCTV	\$2	\$1	\$3	\$2	\$1	\$1	\$2	\$1	\$3
Electronic signs	\$1	\$1	\$1	\$2	\$4	\$3	\$4	\$4	\$6
Road markings	\$1.1	\$6	\$8	\$8	\$1.1	\$7	\$9	\$5	\$5
Road signs	\$4	\$4	\$2	\$1	\$3	\$3	\$3	\$5	\$2
Red light cameras	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$1
IS Hardware	\$1	\$1	\$2	\$1	\$6	\$1.2	\$1	\$1	\$4
Grand Total	\$4.7	\$3.5	\$4.2	\$3.9	\$5.2	\$5.3	\$4.6	\$4.3	\$5.0

Table 6-20: Historical renewal costs for traffic systems, signs and markings

Source: Auckland Transport SAP database (2020)

6.4.4 Renewal issues

This section describes the main issues affecting Auckland Transport's renewals programme.

6.4.4.1 Condition, performance and risk

Table 6-21 shows the current distribution of the replacement cost of traffic systems, signs and markings assets, by asset condition and likelihood of failure.

The top right-hand corner represents an unacceptable financial risk exposure justifying early intervention. A run-to-failure strategy for renewals would result in more assets moving towards the right or into the top-right quadrant.

Road hierarchy	Replacement cost by condition and failure risk				
	As new condition	Good condition	Average condition	Poor condition	Very poor condition
	Failure risk: very rare	Failure risk: rare	Failure risk: seldom	Failure risk: common	Failure risk: frequent
Regional					
Arterial					
Primary collector					
Secondary collector					
Access and low-volume					

Table 6-21: Asset replacement cost, by condition and failure risk

6.4.4.2 Lifecycle economics

Lifecycle economics are considered at a network level in the dTIMS model, using the maintenance cost function, and are implicit in the ROM model.

Net present value analysis is conducted at a project level when making programming decisions for the 3-year forward works programme, allowing for adjustments to forecasts on an economics basis, if required.

6.4.4.3 Growth impacts

Growth issues affecting the road network, including traffic systems, signs and markings, include:

- overall network growth due to population growth, land use changes and safety requirements
- new subdivisions and urban development, which add to the size of the traffic systems, signs and marking asset portfolio.

6.4.4.4 Construction cost trends

Unit rates have increased significantly in recent years, such that current road contract maintenance rates are up to 80 per cent higher than the rates used in the 2018 Auckland Transport Asset Management Plan (the planning rates) for resurfacing work, and 175 per cent higher for rehabilitation work.

A variety of factors have contributed to increased unit rates, including, but are not limited to:

- increased traffic management costs, due to improvements in safety standards and regulations
- rates negotiated for contract extensions taking into account the increased input costs

- changes in the cost of delivery due to inflation.

6.4.5 Renewal drivers and technology changes

Renewals of traffic system, signs and marking assets are primarily driven by deteriorating asset condition and performance. For specialised assets, the timing of renewals can also depend on where an asset fits within the manufacturing lifecycle and the manufacturer's support lifecycle.

However, that approach is not always practised for electronic assets, where new products are often selected to achieve consistent standards (i.e. for interchangeability reasons) and to future-proof the network for technological advances. In these situations, renewals tend to be driven by the criticality of the asset, when its failure may have a significant impact on safety, levels of service and costs.

Table 6-22 summarises the key reasons or drivers for renewals for each asset type.

Asset	Renewal driver	Description
Poles	Condition	Poles renewal is mostly driven by the deteriorating condition of assets and damage from collision.
	Functionality and design	In some cases, Auckland Transport replaces poles to accommodate additional signal equipment, or to meet current design standards.
	Upgrades	Poles renewals are also driven by streetscape upgrades that use decorative or non-standard poles. These poles require higher maintenance.
Lanterns	Technology, sustainability and cost	Auckland Transport has replaced 90 per cent of older quartz halogen luminaires with more energy-efficient light-emitting diodes (LEDs). This will reduce energy consumption, reduce operational costs and improve efficiency. The age of lantern assets needs to be recorded and tracked to ensure the effective management of future renewals.
Controllers	Condition and performance	Renewal of controllers is mostly driven by increases in the number and frequency of faults identified through inspections and damage from collisions.
	Availability of spare parts	Spare parts for electronics become obsolete after the manufacturer stops their production. The inability to maintain such assets warrants renewals.
	Technology	Old controllers which are in good condition are sometimes replaced due to lack of compatibility with newer systems. In this situation, the type defines an asset's life and usability, rather than the make or model. The average useful life of controllers is 15 years. All TSC/3 controllers are out of production and are not supported in terms of hardware and firmware. These controllers are maintained, where possible, by repairing and swapping components. TC/4 are the newer controllers and provide brand interchangeability.
Detectors and loops	Condition	Reinstatement of loops that have been cut off or damaged during road works or by vehicles.
CCTV cameras	Condition, performance and technology	CCTV cameras are replaced when they are not fit for operational purpose. Cameras may be replaced earlier than expected for critical intersections, where a camera with automatic data counting capability is required.
Target boards, and pedestrian and cyclist call boxes and detectors	Condition and performance	Asset components are usually replaced due to faults or damage (such as by vandalism) or the infiltration of water.
Electronic signs	Condition and performance	Electronic signs are replaced when they are in very poor condition or are faulty.
ADS	Condition and criticality	A risk-based approach is used to identify the replacement of ADS. It considers asset condition, network criticality, land use characteristics and the level of inconvenience caused by the failure of an asset.

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Traffic signs	Condition	Signs are replaced due to significant damage due to a road accident or vandalism, or when changes are made to the road network.
Markings	Condition	Markings are repainted as part of cyclic maintenance, or due to the realignment of a road, or to facilitate installation of reflective ceramic studs. Thermoplastic markings have a longer life and are renewed after 5 years.

Table 6-22: Reasons for renewals of traffic systems, signs and markings

6.4.6 Renewals programme development

Auckland Transport develops its renewals programme for its traffic systems, signs and marking assets using ROM modelling.

The modelling takes into account the current condition of assets, the risks associated with the condition profile, and the levels of service to be delivered. Various iterations of the model are run.

6.4.6.1 Iteration 1

The first iteration involves testing two alternative strategies – run to failure and optimised – against two sets of unit rates and the intervention settings shown in Table 6-23.

Scenario	Unit rates input	Renewal intervention level input
O1-C1	Cost 1 – unit rates based on a 3-year rolling average (2017/18 to 2019/20)	Optimised policy settings – intervention level ranges from 12 to 14, based on One Network Road Classification categories
O1-C2	Cost 2 – unit rates based on 2018 asset management plan rates	Optimised policy settings – intervention level ranges from 12 to 14, based on One Network Road Classification categories
O2-C1	Cost 1 – unit rates based on a 3-year rolling average (2017/18 to 2019/20)	Run to failure – intervention level 15 for all road lengths
O2-C2	Cost 2 – unit rates based on 2018 asset management plan rates	Run to failure – intervention level 15 for all road lengths

Table 6-23: Intervention settings used in ROM modelling for renewals

The modelling process produced the scenarios and forecast costs for the renewals programme in Table 6-24. These figures cover all traffic systems, signs and markings renewal costs.

Scenario	Year 1 \$M	10-year total \$M	Comment
O1-C1	\$13.8	\$135.5	Preferred – this is the base case for further iterations of programme needs
O1-C2	\$3.8	\$101.8	Demonstrates the impact of lower unit rates
O2-C1	\$13.5	\$133.5	Run to failure – purpose is to benchmark the preferred option
O2-C2	\$3.7	\$100.3	Run to failure – purpose is to benchmark the preferred option

Table 6-24: Outcomes from ROM modelling for renewals

6.4.6.2 Iterations 2 and 3

These iterations allow the issues described in Section 6.4.4 to be incorporated in the renewals programme forecast, as shown in Table 6-25.

Iteration	Factors and impacts included
Iteration 2 – local needs	Adjustments to scenario O1-C1 base programmes: - added traffic systems to the 10-year forward works programme from the delivery team including CCTVs and electronic signs renewals - added road marking renewals based on the 2018 long-term plan - added red light cameras and information system hardware renewals, based on the 10-year forward works programme from the service delivery team - coordinated CCTV renewal works with other programmes.

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Table 6-25: Iteration to align with the 10-year asset renewal plans

The allocations in these iterations are based on local experience and the filed-validated forward works programme. These will be further refined with more detailed work around asset renewals, including an assessment of the effect of the Covid-19 pandemic.

These iterations resulted in the incremental changes in the renewals programme needs set out in Table 6-26.

Scenario O1-C1 cost element	Iteration 1 - ROM		Iteration 2		Iteration 3	
	Year 1 \$M	10-years \$M	Year 1 \$M	10-years \$M	Year 1 \$M	10-years \$M
Traffic signal renewals	\$11.4	\$85.9	\$3.1	\$32.2	\$13.6	\$93
CCTVs renewals	\$1.9	\$9.1	\$0.3	\$3.4	\$0.3	\$3.4
CCTVs renewal complementing technology improvements			\$2.0	\$21.1	\$2.0	\$21.1
Electronic signs renewals	\$0.1	\$13.6	\$0.6	\$7.2	\$0.6	\$7.2
Information systems hardware renewals			\$0.1	\$5.5	\$0.1	\$5.5
Red light cameras renewals			\$0.1	\$1.3	\$0.1	\$1.3
Road signs renewals	\$0.3	\$25.7	\$0.3	\$25.7	\$0.3	\$25.7
Road markings renewals			\$1.1	\$11.3	\$1.1	\$11.3
Other costs ²	\$0.1	\$1.2	\$0.1	\$1.2	\$0.1	\$1.2
Total renewals	\$13.8	\$135.5	\$7.7	\$108.7	\$7.7	\$108.7

Table 6-26: Iterations considering financial impacts from events

6.4.6.3 Comparative analysis

Figure 6-13 compares the renewal forecast and depreciation.

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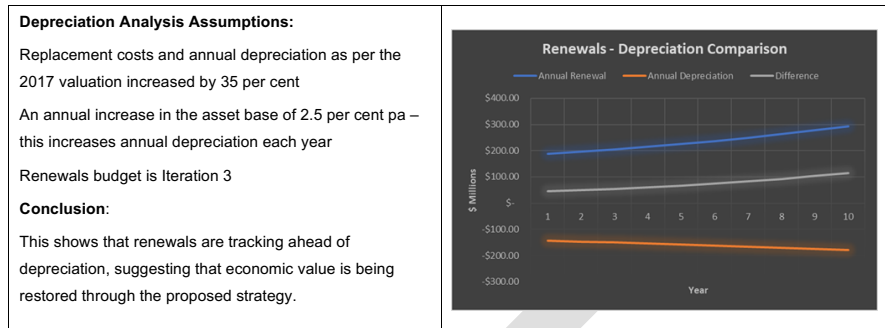


Figure 6-13: Comparison of renewals and depreciation of the assets

6.4.6.4 Refine programme

The ATOC forward works programme (2020 to 2024) has been used to refine the renewal programme for traffic system assets, and the ROM recommendation for traffic signs and marking assets. This is summarised in Section 6.4.10.

6.4.7 Renewals programme recommendation

Auckland Transport recommends that there is a 10-year renewals programme for traffic systems, signs and markings with a total cost of \$108.7 million, an average of over \$10.9 million per year, with \$7.7 million allocated in the first year.

This is an increase over the current 3-year average renewals programme cost of \$2.1 million per year.

The increased figures allow for the increase in the unit cost rates assumed in the ROM modelling. They exclude escalation and are expressed in present-day dollars.

Table 6-27, Table 6-28 and Figure 6-14 summarise how the recommended future renewals costs and quantities will be spread over future years.

Asset type \$M	2021/2 2	2022/2 3	2023/2 4	2024/2 5	2025/2 6	2026/2 7	2027/2 8	2028/2 9	2029/3 0	2030/3 1	10- year total
Traffic signals renewals	\$3.1	\$3.2	\$3.2	\$3.2	\$3.2	\$3.2	\$3.2	\$3.2	\$3.2	\$3.2	\$32.2
CCTVs renewals	\$2.3	\$2.4	\$2.4	\$2.4	\$2.4	\$2.5	\$2.5	\$2.5	\$2.5	\$2.6	\$24.5
Electronic signs renewals	\$6	\$6	\$6	\$6	\$6	\$1.9	\$6	\$6	\$6	\$6	\$7.2
Information system hardware renewals	\$1	\$1.5	\$3	\$3	\$4	\$3	\$3	\$1.6	\$3	\$3	\$5.5
Red light cameras renewals	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1.3
Road signs renewals	\$3	\$6	\$1.0	\$1.8	\$2.8	\$3.8	\$4.2	\$4.3	\$4.0	\$2.8	\$25.7
Road markings renewals	\$1.1	\$1.1	\$1.1	\$1.1	\$1.1	\$1.1	\$1.1	\$1.1	\$1.1	\$1.1	\$11.3
Staff overheads (renewals)	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1.2
Total	\$7.7	\$9.6	\$8.9	\$9.7	\$10.8	\$13.1	\$12.2	\$13.6	\$12.0	\$10.9	\$108.7

Table 6-27: Future renewals costs for traffic systems, signs and marking

Source: Asset management financial model (2020)

Asset type (number)	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	10-year total
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Traffic Systems, Signs and Markings Asset Class Management Plan

CCTVs	75	75	75	75	75	75	75	75	75	75	750
Electronic signs	71	71	71	71	71	228	71	71	71	71	867
Controllers	18	38	35	30	30	30	30	30	30	30	301
Poles	162	33	26	74	74	74	74	74	74	74	739
Lanterns	979	976	1024	993	993	993	993	993	993	993	9930
Pedestrian call boxes	69	133	190	130	130	130	130	130	130	130	1302
Pedestrian drivers	103	213	262	192	192	192	192	192	192	192	1922
Signs	847	1846	3224	6864	11733	16702	20129	21675	20634	14578	118232
CCTV improvements	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Table 6-28: Future renewals quantities for traffic systems, signs and marking

Source: Asset management financial model (2020)

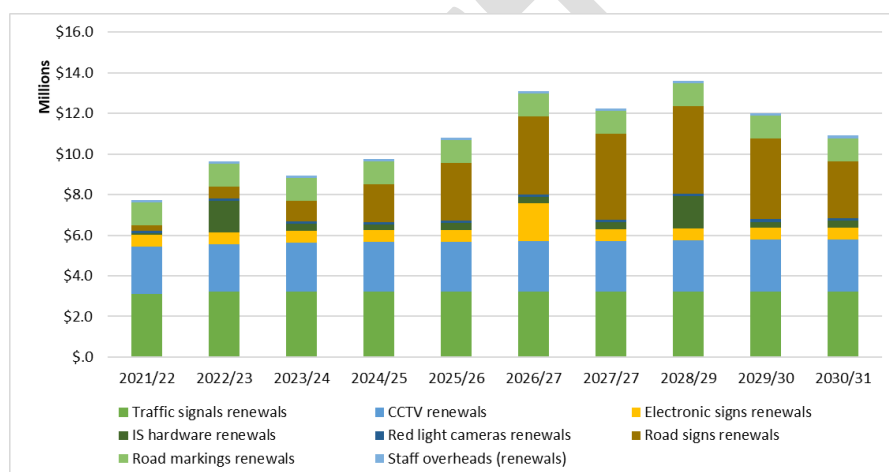


Figure 6-14: Recommended future renewal needs for traffic systems, signs and markings

Source: Asset management financial model (2020)

6.4.8 Comparison with long-term plan

Figure 6-15 compares the recommended renewals for traffic systems, signs and markings with those forecast in Auckland Council's Long-Term Plan 2018.

Overall, the recommended renewals align with the approved renewals budgets in the long-term plan.

Recommendation to increase the first 2 years is to address the rapid deterioration of the pavements due to growth related construction traffic and heavy commercial vehicle usage.

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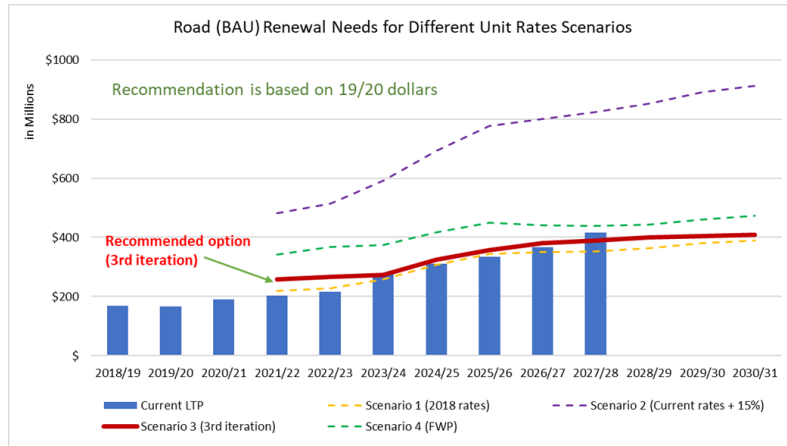


Figure 6-15: Renewal programme cost comparison with the long-term plan (all roading)

6.4.9 Future condition profile

The future condition profile of traffic systems and signs assets, under the recommended renewals programme, is predicted to behave as shown in Figure 6-16.

There is a trend of assets moving from good condition to very good condition. Also, the numbers of moderate, poor and very poor performing assets will stabilise over the next 10 years.

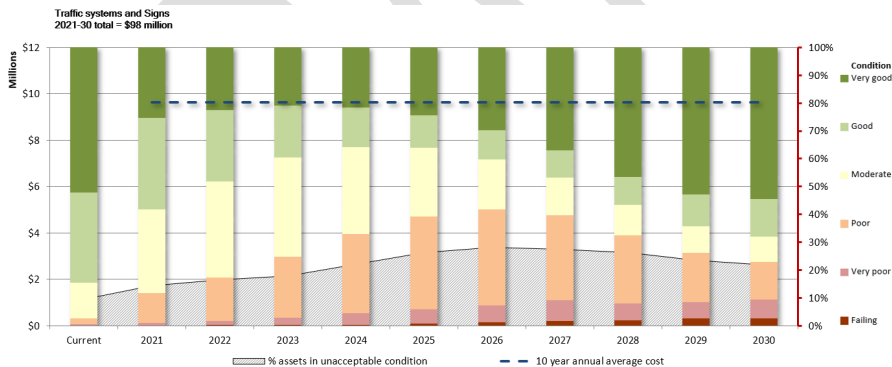


Figure 6-16: Future condition profile for traffic systems, signs and markings

6.4.10 Renewals forward works programme

Auckland Transport has developed its renewals forward works programme for its traffic systems assets through a process of:

- identification – identifying assets for renewal based on their condition, local knowledge and requirements
- prioritisation – assigning a condition-based ranking to assets needing renewal, assuming no budget constraints
- optimisation – making a risk-based selection of assets for renewal, to fit a constrained budget.

Traffic Systems, Signs and Markings Asset Class Management Plan

The prioritisation methodology used to develop renewal forward work programme for ADS are discussed in the Appendix.

Table 6-29 breaks down the renewals forward works programme budget for traffic systems by asset type and contract areas. Signs are not included, as they are replaced reactively to address damage caused by road accidents and vandalism; while markings are repainted as part of road maintenance or road re-alignment.

Asset types	Region	2019/20 Actual	2020/21	2021/22	2022/23	2023/24
Traffic systems	South	\$835,196	\$924,625	\$921,450	\$939,000	\$945,600
	Central	\$1,288,485	\$1,271,025	\$1,399,875	\$1,450,900	\$1,465,800
	North and west	\$724,550	\$728,100	\$791,800	\$816,200	\$825,200
CCTV (roading)	Central and west	\$76,500	\$189,000	\$193,500	\$202,500	\$202,500
	North	\$31,500	\$22,500	\$27,000	\$22,500	\$27,000
	South	\$63,000	\$54,000	\$112,500	\$112,500	\$112,500
Field services (including electronic signs)	Central and west	\$282,112	\$285,121	\$285,121	\$285,121	\$312,708
	North	\$45,019	\$45,019	\$42,594	\$42,594	\$12,581
	South	\$265,119.54	\$265,120	\$262,622	\$267,628	\$267,628
Total		\$3,611,482	\$3,784,509	\$4,036,462	\$4,138,942	\$4,171,517

Table 6-29: Renewal forward works programme budget breakdown for traffic systems, CCTV and field services

Source: ATOC (March 2020)

Note that the current programme includes an element of over- and under-programming and its details are regularly updated by ATOC. ([hyperlink FWP details?](#))

Asset type	Region	2021/22	2022/23	2023/24
ADS	South East Urban	\$5,000	\$20,000	\$5,000
	South West Urban	\$13,000	\$26,000	\$24,000
	South Rural	\$9,500	\$29,500	\$12,000
	West	\$3,700	\$3,700	\$0
	Central	\$24,500	\$10,000	\$19,000
	Central East	\$2,000	\$13,000	\$9,000
	HGI	\$0	\$0	\$0
	North Rural	\$2,000	\$0	\$0
	North Urban West	\$2,250	\$2,250	\$0
	North Urban East	\$14,000	\$1,000	\$0
	Total	\$75,950	\$105,450	\$69,000

Table 6-30: Renewal forward works programme budget breakdown for ADS (Version 6.0)

Source: AT Structures

6.4.11 Process to develop a fundable renewals plan

Unlike maintenance, renewals can be postponed in order to redistribute costs over time, although this will impact on levels of service and increase the level of managed risk.

In the face of funding constraints including the impacts of Covid-19 on both Auckland Council and Auckland Transport revenue, Auckland Transport has developed a set of adjustments to its asset needs renewals programmes.

An overview of the costs of the scenarios considered is shown in Figure 6-17.

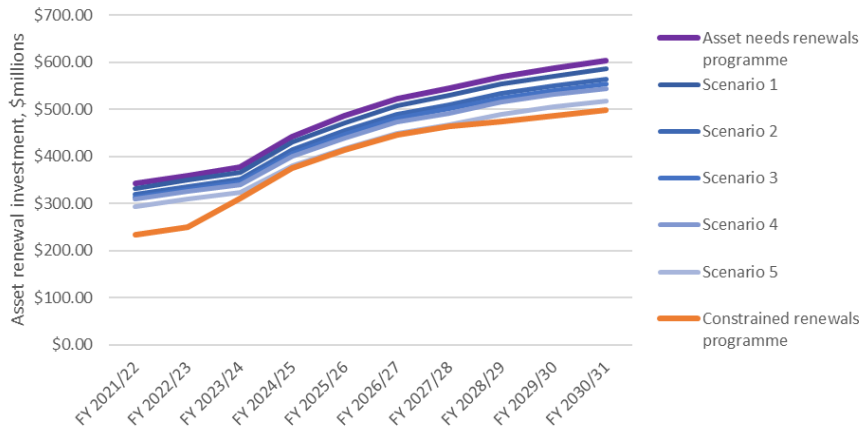


Figure 6-17: Asset investment programmes considered

6.4.11.1 Asset needs renewals programme

The asset needs renewals programme has a total cost of \$4.832 billion over 10 years. It includes the traffic systems and signs programme which has been the focus of this Asset Class Management Plan. The process by which the asset needs renewals programme was developed is described in detail in Section 6.4.6 of this ACMP, and in Section 6.2 of the Asset Management Plan. Renewals are prioritised based only on asset needs and delivery constraints. This programme did not consider affordability.

The asset needs renewal programme will contribute to the RLTP initiatives by:

Supporting growth

Providing \$185 million (inflated) over 10 years for renewals complementing development. This programme would enable Auckland Transport to take up cost-effective opportunities to integrate with developers, especially in brownfields sites, to renew assets with modern equivalent assets in support of a consistent level of service in growth areas.

Providing \$53 million (inflated) over 10 years to address intensification impacts in greenfield and brownfield development areas, where construction traffic has irreversibly damaged existing road pavements.

Providing \$53 million (inflated) over 10 years to renew roads impacted by construction traffic but outside of direct development areas, including key routes to quarries, cleanfill and landfill sites.

Improving safety

Providing \$133 million (inflated) over 10 years for a programme of slip remediation to “build back better” and create a road network that is less prone to disruption and safety risks during extreme weather events.

Providing \$160 million (inflated) over 10 years for seismic retrofitting of Auckland Transport bridges, gantries and buildings to meet earthquake safety standards.

Accelerating better transport choices

This objective is more relevant to the capital improvements programme than to renewals. The renewals programme supports these projects by ensuring that new assets are connected to an effective network of existing transport assets.

Addressing sustainability issues especially climate change

Providing \$100 million (inflated) over 10 years to begin targeted climate change resilience improvements to sealed roads, stormwater systems, and retaining walls on links that have been identified through AT's natural hazard risk assessment as at risk of coastal inundation and/or surface flooding. The investment in slip remediation will also contribute to improving network resilience to climate change impacts.

Improving connectivity

Providing **\$16 million** (inflated) over 10 years to support local needs for road corridor renewals, prioritising those opportunities identified by local boards to complement local board improvement projects. The investment in slip remediation will also contribute to improving connectivity.

6.4.11.2 Scenarios in response to funding constraints

In response to current funding constraints, Auckland Transport has developed a set of scenarios that postpone some renewals activities in order to arrive at a more affordable option. These scenarios are:

Scenario 1 – **\$4.694 billion**

This option addresses the backlog of assets that are below Auckland Transport's current levels of service at a slower rate than the AMP recommendation, but includes all of the initiatives listed above to contribute to RLTP outcomes.

Scenario 2 – **\$4.524 billion**

This option addresses the backlog at the same rate as Scenario 1, and also delays the implementation of AT's climate change response.

Scenario 3 – **\$4.446 billion**

This option is the same as Scenario 2, but also delays Auckland Transport's growth response initiatives. This will reduce the ability of Auckland Transport to invest in renewals complementing development, and to address the impacts of intensification on existing assets, in the early years of the RLTP.

Scenario 4 – **\$4.368 billion**

This scenario delays implementation of almost all of the ATAP/RLTP initiatives listed above, with the one exception of renewals to meet local needs.

Scenario 5 – **\$4.152 billion**

This scenario introduces an additional delay to the programme to address the backlog of assets below levels of service, and postpones investment in all of the identified ATAP/RLTP initiatives.

6.4.11.3 The constrained renewal programme

This represents a sixth scenario, with a total cost over ten years of **\$3,951 million**. This programme has the lowest cost, and the highest level of managed risk, of all of the options considered. It defers all of the RLTP initiatives beyond the first three years, and postpones climate change investments beyond the ten years of this RLTP. Reduction in the backlog of assets already in very poor condition is slower under this option, however the programme has been optimised to:

- restrict impacts on levels of service to less critical assets
- ensure that assets are safe and serviceable

- avoid additional costs caused by unexpected asset failure.

The funding constrained renewals investment plan will be included in Auckland Transport's draft 2021 RLTP.

6.5 Capital improvements for traffic systems, signs and markings

6.5.1 Auckland Regional Land Transport Programme

The Auckland Regional Land Transport Programme takes a strategic approach to the transport challenges faced by the Auckland region.

The programme summarises these challenges under key areas:

- safety
- congestion
- freight
- accessibility
- environment
- growth
- value for money.

The long-term capital investment programme set out in the Regional Land Transport Programme will enable Auckland to address its current challenges and take advantage of future growth, while at the same time enabling the creation of an accessible, well-connected, safe and sustainable region.

The Regional Land Transport Programme will also support the move away from a city where the dominant mode of travel is by single-occupant private vehicles, to a city where public transport, walking and cycling play a more important role. Significant investment in transport infrastructure such as light rail, mass transit, bus priority measurements and cycleways, supported by improvements to bus, rail and ferry services, will support Auckland to achieve these goals. This will be supported by a much greater focus on customer needs and improving customer experience.

Investment in walking and cycling facilities will be supported by the provision of more shared spaces, amenity improvements, cycleways and footpaths, better network connections, end-of-journey facilities, more and improved pedestrian crossings, signal phasing that prioritises pedestrians, and safer traffic speeds.

Addressing the negative impacts of the transport system is a core element of the programme, in particular to reduce deaths and serious injuries. This will be achieved through a comprehensive programme of safety improvements, including targeted initiatives such as improvements to high-risk intersections and corridors, and speed management.

Minimising the impacts of transport on the environment is also a core focus of the programme, and will be achieved through better design, greater use of more sustainable travel options, the rollout of LED lighting, the installation of pollutant traps to minimise the impacts of road stormwater damage, and promotion of electric vehicles.

Improving network capacity and performance by making the most of the existing transport system will also be key. For example, optimising the network through targeted changes such as improving the coordination of traffic lights, using dynamic lanes at peak times, and removing bottlenecks to mitigate congestion. Maximising the benefits from new technology and taking opportunities to influence travel demand by encouraging car sharing and mobility as a service (MaaS) are also important. In the longer term, we will also consider introducing pricing to address congestion.

While the primary focus of the in the **Regional Land Transport Programme** is to reduce people's reliance on private cars, there is still a need to invest in roads. In this respect, the programme addresses congestion on the arterial road network, supports the movement of freight including access to key freight locations, the port and Auckland Airport, and enables public transport to support housing and development.

6.5.2 Traffic systems, signs and marking capital works programme

AT's focus for the road network is on making better use of assets, including by managing Demand, and understanding of the Safe System/Vision Zero approach. The Regional Land Transport Programme includes traffic management projects to enhance safety, optimise traffic flows, support demand and respond promptly to incidents.

- Urban and rural road safety programme – to address the highest risk urban and rural roads and intersections
- Safer communities and speed management programme – to address safety and operational deficiencies and implement speed management across the network
- Safety and red light cameras – to install red light cameras and monitor the high risk areas
- Corridor improvement projects – to improve efficiency and to optimise traffic flow of existing urban corridors while addressing safety and supporting growth
- Auckland Transport Operations Centre integration – to provide a single transport operations centre with the capacity to effectively manage incidents and emergencies and reduce disruption and delay
- Intelligent Transport Systems Programme – to utilise emerging technologies to better manage congestion, improve safety and influence travel demand
- Network Optimisation Programme – to optimise routes through synchronisation of traffic signals, optimising road layout, dynamic traffic lanes and managing traffic restrictions

Details of the programme and the projects are listed in the [2018-2028 Auckland Regional Land Transport Plan](#).

6.6 Disposal plan for traffic systems, signs and markings

6.6.1 Traffic systems

Traffic system assets are generally disposed of when they are damaged, become redundant or have reached the end of their useful lives. Disposal has financial and environmental impacts.

Auckland Transport encourages responsible asset disposal, and reuse or recycling where possible. These are becoming increasingly common practices across the region.

Auckland Transport's maintenance contractors are responsible for identifying and accessing assets for disposal, obtaining any necessary consents, and cleaning up after any disposal operations as part of their contract agreements. Any surplus materials and broken items are disposed of at the maintenance contractors' off-site dumps. Special care is taken when disposing of gas-filled lamps, which contain hazardous substances.

In addition, contractors must remove all excavated material, not required for the completion of works, from the site and taken to a disposal site or facility of their choice. It is the contractor's responsibility to ensure material is disposed of in accordance with the Resource Management Act 1991 and local authority bylaws.

6.6.2 Traffic signs

When traffic signs are replaced, maintenance contractors are responsible for removing and disposing of the old signs and their components, including old sockets, bolts, ground stubs and concrete foundations from.

Auckland Transport encourages contractors to re-use materials from old signs wherever possible. Any re-usable materials from signs that are removed or replaced must be stored by the contractor and reused at the first opportunity. As part of their monthly report, contractors must submit an inventory of all damaged materials that they have recovered from the network, along with the dispatch number and information about its condition (scrap or re-usable).

6.6.3 Road markings

When disposing of road markings, maintenance contractors must remove non-conforming markings from the pavement's wearing surface, leaving a clean pavement with a surface texture and colour comparable to the adjacent pavement surface.

All numerals, letters, symbols and arrows must be removed in such a way that confusing messages are not given to motorists, particularly under wet or poor light conditions.

An engineer must approve the method for removing any markings, including long-life and thermoplastic markings, before the work starts. The specified method must not damage the road surface.

Any spillage, overspray or similar from renewal works must also be immediately removed by the contractor.

7 Improvement initiatives

Asset management practice improvement is an on-going task which has been recognised as essential to achieve excellence in our AM practices.

AT's enterprise business plan outcomes are linked to the asset management goals as illustrated below. The continuous AM improvement programme will ensure these goals are achieved efficiently and effectively.

Enterprise Business Plan Key Deliverables		Asset Management Goal
Deliver Safe Outcomes		We make safety a priority by integrating it into our approach to asset development, maintenance, and management.
Excellent Customer Experience		Our asset management approach supports a "customer-centric" approach and puts accessibility and user-experience at the forefront of decision-making.
Effective Transport Journeys		Our asset management practices enable Auckland Transport to operate a transport system that is optimised, innovative, and progressive.
Integrated Transport Networks		Asset management approaches and practices enable integrated network outcomes across Auckland Transport and its delivery partners to create a stronger network framework and improved service outcomes.
Financial Accountability and Benefit Realisation		We achieve value for money by increasing the efficiency and effectiveness of asset management and delivery.
Collaborative Partnering		We cooperate with other agencies to effectively deliver and manage assets and integrate the transport system region wide.
Enhance Capability		Our asset management practice captures feedback from system performance to improve outcomes whilst continuing to evolve and provide for emergent requirements.
Enable our Business		Our asset framework supports Auckland Transport's strategic direction and provides a robust framework for other parts of our organisation that operate across the asset lifecycle so our strategic outcomes can be achieved.

Table 7-1: Enterprise Business Plan key deliverables and Asset Management goal

A comprehensive asset management improvement programme is currently underway which has been developed over the last three years by taking into account the feedback received from a number of assessments and audits. These include improvements sourced from:

- Waka Kotahi NZ Audits (2018 & 2019)
- AECOM 2018 Business Review
- 2020 Infrastructure Management Assessment
- 2020 Road Efficiency Group Excellence Programme
- Integration with Auckland Transport systems and policies, including Enterprise Asset Management (EAM), Active Risk Manager (ARM) and Central Management System for street lighting.

There are 102 improvement tasks altogether and they will be implemented over a period of time as highlighted in Table 7-2.

The progress highlights achieved so far is summarised below:

Traffic Systems, Signs and Markings Asset Class Management Plan

- AM Risk Deep Dive Review
- Working with Risk & Assurance Team
- Seeking to retender AM Prof Services year early
- Statement of Intents for AM, AM Data, SLAs and Comms plan progressing well
- Asset Management Centre of Excellence Knowledge Hub to be revamped
- Transport for NSW collaboration

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Traffic Systems, Signs and Markings Asset Class Management Plan

IIMM Cat	Improvement Required	Source	Priority	Improvement Owner	Gen 1 Outcome	Gen 1 End Date	Gen 1 Status
AM Policy and Strategy	1.1 Draft / Complete the AT Asset Management Strategy. The AM Strategy forms a major component of the AT Asset Management System and should describe AT's strategy for the management of physical assets over their life cycle and demonstrate the organisational approach to the coordination of asset management outcomes across the various asset portfolios and the organisation as a whole. The AM Strategy should establish the asset management objectives, set out how AT will achieve these objectives and provide direction for downstream activities that are documented in the AT Asset Management Plans.	DHCL IIMM AMMA Apr 20	1	Myles Lind	AM Strategy based on ISO55000 AM Policy reviewed and approved to ensure alignment with Strategy	Dec-20	Underway
	1.2 Develop an integrated ISO 55001 Asset Management System (for either alignment or certification purposes).	AECOM BIP - Roads Apr 18			AM Document Hierarchy (Legislation --> Supporting Elements)	Oct-20	Underway
	1.3 Develop AM policy and strategy using ISO55000	Group Future Work Plan			2020 AM Policy	Jun-20	Underway
	1.4 Strengthen key strategic themes and KPIs to drive "sustaining and maintaining the resilience and integrity of existing infrastructure".	AECOM BIP - Roads Apr 18			Document key strategic themes / principles as they apply to AM. Identify KPIs for AM Identify AM feedback loops (where appropriate)	Dec-20	Underway
	1.5 Develop and review asset related guidelines, policies and strategies	Group Future Work Plan			Document catalogue of guidelines and supporting elements (Sharepoint)	Aug-20	Complete
	1.6 Update the AM Policy to include assets that are currently not included i.e. harbour master and airfield assets.	DHCL IIMM AMMA Apr 20			Confirm asset classes not covered in legacy AM Policy and ensure included within AM Strategy.	Aug-20	Complete
	1.7 Develop a graphic for inclusion in the AM Strategy and AMP that clearly depicts the separate components of the AT Asset Management System. This system can be defined as a set of interrelated or interacting elements of the organisation that establish the asset management policies and objectives, as well as the processes that support them.	DHCL IIMM AMMA Apr 20			Graphical representation of the AT AM System	Jul-20	Underway
	1.8 Once AM Policy has been updated have it independently reviewed prior to final approval.	DHCL IIMM AMMA Apr 20	3	Myles Lind	AM Policy External Review	Sep-20	Assigned

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Levels of Service and Performance Management	2.1	Review the current levels of service for each portfolio, confirm they remain appropriate and where these do not currently exist establish new levels of service and related performance measures.	DHCL IIMM AMMA Apr 20	2	Siri Rangamuwa	Identify Level of Service gaps and where Levels of Service may no longer be appropriate	Dec-20	Assigned
	2.2	Establish a process for engagement both internally and externally to secure acceptance of agreed levels of service.	DHCL IIMM AMMA Apr 20		Siri Rangamuwa	Engagement process designed and documented. (Part of 2.1 above)	Dec-20	Assigned
	2.3	Agree Stormwater levels of service with Auckland Council and introduce governance overview of performance to agreed levels.	DHCL IIMM AMMA Apr 20	2	Cathy Bebelman	Process of agreement and governance developed and documented. (Part of 2.1 above)	Dec-20	Assigned
	2.4	Develop a trade-off model to assess options for increasing or decreasing levels of service, which considers risk, costs and benefits across the portfolios.	DHCL IIMM AMMA Apr 20	2	Siri Rangamuwa	Identify Levels of Service that could benefit from being included in a trade off model (may be all or just some - link to investment drivers, legislation and operational context)	Dec-20	Assigned
Forecasting Demand	3.1	Consider additional resources to increase traffic, pedestrian and cycle counting capabilities.	DHCL IIMM AMMA Apr 20	3	Delia Sahinovic	Following Item 3.1a below. Develop position descriptions / Prof Services scope / training requirements for additional resource requirements (Capacity / capability).	Jun-21	Assigned
	3.1a	R.11.2 Develop and implement an effective, network-wide, activity counting programme, that provides accurate multi-modal volumes and trends.	Waka Kotahi - Investment Audit Report 2019	2	Delia Sahinovic	Complete strategic case for traffic/mode counting (identify benefits to inform investment / SSBC)	Jun-21	Assigned
	3.2	Incorporate the roles of other AT teams in the demand forecasting process in subsequent maturity reviews.	DHCL IIMM AMMA Apr 20	2	Siri Rangamuwa	Identify roles/responsibilities to be included in demand forecasting process for next AMM Assessment.	Nov-20	
	3.3	Monitor and respond to the impacts of rapid heavy vehicle growth on roads and structures	AECOM BIP - Roads Apr 18	2	Delia Sahinovic	Review / GAP on existing AT approaches to understanding HV impacts on AT assets.	Sep-20	On Hold
Asset Register Data	4.1	Develop a data management guideline or policy that provides rules and procedures around data ownership, transfer, management and maintenance of asset data. Ensure the guideline aligns to requirements of EAM Project.	DHCL IIMM AMMA Apr 20	1	Myles Lind	Draft AM Data Policy	May-20	Complete
	4.1a	R.11.1 Ensure appropriate process controls are created to assure all data entering the system complies with the data quality dimensions of timeliness, accuracy and completeness.	Waka Kotahi - Investment Audit Report 2019		Charmaine Okros	Review RAMM reports on data quality and associated socialising and decision making based on these reports.	Jun-20	Complete

Traffic Systems, Signs and Markings Asset Class Management Plan

4.2	General asset data improvements	Group Future Work Plan	1	Brett Elston	Prioritised programme of data improvements across asset classes. Asset data scope/specifications provided to Maintenance contract retender. Asset management data scope reviewed ahead of professional services retender.	Nov-20	Complete
4.3	Make improvements to data across a range of areas – including asset inventory, criticality, condition and maintenance history.	AECOM BIP - Roads Apr 18		Siri Rangamuwa	Part of 4.2 above - Measurable reduction in data quality issues (timeliness, accuracy, completeness)	Dec-20	Underway
4.4	Review the quality of the data that should be used to make tactical and operational decisions and develop improvement actions (including reporting) to improve the quality where required	DHCL IIMM AMMA Apr 20		Myles Lind	Investigate existing sector solutions for data decision making frameworks - expressly with data requirements for operational and tactical decision making.	Sep-20	Underway
4.5	Complete asset ownership review and ensure this is widely understood by key stakeholders.	DHCL IIMM AMMA Apr 20	1	Siri Rangamuwa	Part of 4.6 below - Data Ownership Issues & Options Paper	Dec-20	Underway
4.6	Provide input to improve the AT Guidelines for asset ownership and maintenance responsibilities, including system/database update.	Group Future Work Plan		Siri Rangamuwa	SLAs between CEAM, P&I and RCD teams / (ownership / inputs / deliverables)	Oct-20	Underway
4.7	Review vested assets process to ensure that quality information is secured during the transfer process	DHCL IIMM AMMA Apr 20	3	Delia Sahinovic	Review current vested asset process, identify gaps and information requirements for process update	Jun-21	Underway
4.8	Revise/update the process for check/validation of the As-built Information, AOMs and Data Quality Assurance for PT new Assets	Group Future Work Plan		Delia Sahinovic	Review current as-built validation process, identify gaps and information requirements for	Apr-21	Underway
4.9	Develop an Improvement Plan to review and update the process for the as-built information management associated with the vested assets - AC	Group Future Work Plan	2	Charmaine Okros	Strategic Case for As-Built Information Management (BIM & ISO 19650 Adoption)	Mar-21	Assigned
4.9a	R.11.3 Establishes a control point where the vesting of the asset to Auckland Transport is reliant on the developer providing the as-built data.	Waka Kotahi - Investment Audit Report 2019		Delia Sahinovic	Part of 4.7 above - Programme BC for As-Built Control point.	Jun-21	Assigned
4.10	Review the AT as-building process for renewal works - RCD	AECOM BIP - Roads Apr 18		Charmaine Okros	Strategic Case for As-Built Information Management (BIM & ISO 19650 Adoption)	Mar-21	Underway
4.11	Check and validate as required As-built Information, AOMs and Data Quality Assurance for new and upgraded PT assets (consultant input required) - SPM	Group Future Work Plan		Delia Sahinovic	Part of 4.7 above - Programme BC for As-Built Control point.	Jun-21	Assigned

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	4.12	Check and validate as required As-built Information and Data Quality Assurance for new Roadway and Structures Assets (AT Capital and AC/DE projects) - RAMM	Group Future Work Plan		Delia Sahinovic	Part of 4.7 above - Programme BC for As-Built Control point.	Jun-21	Underway
Asset Performance and Condition	5.1	Review requirements for reporting and consider development of automated dashboard of performance measures to provide more timely indicators.	DHCL IIMM AMMA Apr 20	2	Myles Lind	Develop ELT / Board Level dashboards through Bridges Pilot / EAM	Jul-20	Underway
	5.2	Review and increase transparency on the use of condition and performance data in decision making throughout the organisation	DHCL IIMM AMMA Apr 20	1	Charmaine Okros	Data Quality Reporting (quarterly) Accuracy, completeness, timeliness (from RAMM) Mike Alford	Jun-20	Complete
	5.3	Roadway Structures - Improve condition inspection/assessment reporting	Group Future Work Plan	1	Myles Lind	EAM Report of AMP FWP Programme vs Completed FWP	Dec-20	Assigned
	5.4	PT Metro Assets - Improve condition inspection/assessment reporting	Group Future Work Plan		Myles Lind	EAM Report of PT Facilities Inspection Programme vs Completed	Dec-20	Assigned
	5.6	Stormwater Assets - Improve condition inspection/assessment reporting	Group Future Work Plan		Myles Lind	EAM Report of Stormwater Inspections Programme vs Completed	Mar-21	Assigned
Decision Making	6.1	Review and document the decision-making process. AT is a large and complex organisation with a large budget. This environment makes it more important to have a robust coordinated decision-making process.	DHCL IIMM AMMA Apr 20	1	Myles Lind	Review and document core AT decision making process for AM	May-21	Assigned
	6.2	Establish a formal decision-making process in line with existing processes for stormwater.	DHCL IIMM AMMA Apr 20		Myles Lind	Document the stormwater decision making business process for AM.	May-21	Underway
Managing Risk	7.1	Review the current risk profile for the Integrated Networks Group to ensure all high-level risks across all portfolios are captured, understood, and where necessary escalated.	DHCL IIMM AMMA Apr 20	1	Myles Lind	Review and transfer strategic AM risks into corporate ARM System	Jun-20	Complete
	7.2	In line with the improvement above improve reporting of major asset risks to enable the appropriate level of visibility at senior level.	DHCL IIMM AMMA Apr 20		Myles Lind	Develop AM risk reporting protocols / dashboards.	Sep-20	Complete
	7.3	Elevate risk management and reporting processes to Board level: (1) Convey understanding of broad nature of risks (e.g. slope failure, retaining walls) – "no surprises".	AECOM BIP - Roads Apr 18		Murray Burt	Reporting protocols to be designed / tested through AM.IPSG.	Dec-20	Complete
	7.4	Improve risk management processes: (1) Identification of critical assets – what assets can't be allowed to fail? (2) Develop from current corporate risk management processes, tools and reporting, more granular.	AECOM BIP - Roads Apr 18	1	Siri Rangamuwa	Document existing asset criticality approaches.	Dec-20	Underway

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	7.5	Identify assets at high risk and develop suitable management strategies	Group Future Work Plan		Siri Rangamuwa	High risk / criticality assets identified and reported to FCR.	Jun-20	Complete
	7.6	Develop Resilience scorecards and assessments – test current vs desired (e.g. routes, key sites).	AECOM BIP - Roads Apr 18	2	Siri Rangamuwa	Resilience Scorecards designed.	Dec-20	On Hold
	7.7	Assess the resilience of the critical assets of the transport network against factors such as climate change, sea level rise, extreme weather events, seismic events etc.	Group Future Work Plan		Siri Rangamuwa	First pass resilience assessment completed for priority factors	Apr-21	Underway
	7.8	Create Emergency Preparedness Procedure/Resilience Plan for key assets	Group Future Work Plan		Siri Rangamuwa	Emergency preparedness plans designed (template)	May-21	
	7.9	Develop and Implement a Climate change adaptation plan	Group Future Work Plan	2	Cathy Bebelman	Investigate / research good practice CCA Plans.	Dec-20	
	7.10	Strengthen the AM culture around long term risk and service outcomes – a “stewardship” focus.	AECOM BIP - Roads Apr 18	2	Myles Lind	Ensure stewardship key theme in AM COP ToR	Jun-20	Complete
Operational Planning	8.1	Embed the criticality framework across each of the asset portfolios ensuring that those tasked with delivery operations are fully aware of the framework and what it means operationally.	DHCL IIMM AMMA Apr 20	1	Siri Rangamuwa	Criticality Framework gaps identified, workplan to review, update and/or develop critical asset strategies established	Dec-20	Underway
	8.2	Where budgets do not align with asset requirement ensure this is escalated as a priority risk and the consequences fully detailed and communicated.	DHCL IIMM AMMA Apr 20	1	Myles Lind	Industry research to benchmark AT budgets with sector peers.	Dec-20	Underway
	8.3	Review the process for building maintenance budgets to ensure input from all areas of the business (such as technical input) is considered.	DHCL IIMM AMMA Apr 20	1	Siri Rangamuwa	Maintenance budget development gaps identified (including external review of consequential Opex and unit	Dec-20	Underway
	8.4	Ensure that project work is classified correctly and funded from the relevant Activity Class and Work category.	Waka Kotahi - Technical Audit 2018	1	Matiul Khan	Provide evidence to NZTA that recommendation has been resolved.	Jul-20	Complete
	8.5	Review the consultant's role to improve the development of the structures renewal and improvement programmes.	Waka Kotahi - Technical Audit 2018	1	Matiul Khan	Provide evidence to NZTA that recommendation has been resolved.	Jul-20	Complete
	8.6	Develop diagnostic and forward thinking processes, such as root cause analysis and the application of smart technology, in order to adapt forward AM strategies	AECOM BIP - Roads Apr 18	2	Siri Rangamuwa	Sector research on peers use of RCA and IoT etc	May-21	
Capital Works Planning	9.1	Develop a more integrated planning process that works across AT to optimise the opportunities to renew, improve levels of service or increase capacity for growth.	DHCL IIMM AMMA Apr 20	1	Siri Rangamuwa	SLAs between CEAM, P&I and RCD teams / (inputs / deliverables)	Sep-20	Underway

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	9.2	Improve the project closeout processes to ensure accurate and timely information is passed to AT and captured in appropriate systems.	DHCL IIMM AMMA Apr 20	2	Delia Sahinovic	Review and update the legacy Asset Handover Completion Handbook (2015 version)	Sep-21	Underway
	9.3	Develop more integrated planning process that work across AT to optimise the opportunities to renew, improve level of service or increase capacity for growth	DHCL IIMM AMMA Apr 20	2	Myles Lind	Establish AM COP with ToR	Jun-20	Complete
	9.4	Escalate the vested asset risk within the risk management system and aim to mitigate the issues.	DHCL IIMM AMMA Apr 20	2	Delia Sahinovic	Review current vested asset process, identify gaps and information requirements for process update (TDM)	Nov-20	Complete
Financial Planning	10.1	Complete a review of the renewals model to determine its accuracy.	DHCL IIMM AMMA Apr 20	1	Siri Rangamuwa	External review requirements scoped	Oct-20	Underway
	10.2	Implement ROM improvements- Stable software platform for ROM system, Improved ROM condition profile and cross asset optimisation	Group Future Work Plan		Myles Lind	Investigate pros / cons of including ROM Model within EAM project	Dec-20	Underway
	10.3	Continue to develop scenario planning tools (e.g. Renewals Optimisation Model (ROM)) – to enable strategic use of risk, service and cost levers to test alternative AM investment scenarios.	AECOM BIP - Roads Apr 18		Siri Rangamuwa	Documentation of ROM model and design of maintenance and improvement plan for ROM model.	Mar-21	Underway
	10.4	Review the consequential Opex model to determine its accuracy. Complete a review of the renewals model to determine its accuracy.	DHCL IIMM AMMA Apr 20	2	Siri Rangamuwa	External review requirements for Opex Model scoped	Apr-21	
	10.5	Programme to document and review unit rates model (IIFMM? Watercare approach?)	Group Future Work Plan		Siri Rangamuwa	External review requirements for unit rates scoped	Jul-21	
	10.6	Strengthen the linkage between new Capex and consequential Opex in budgets: (1) Ensure that a standardised whole-of-asset life cost approach is adopted on all projects Options Analysis and Design phases. Ensure the costs of mitigating residual safety-in design risks are include	AECOM BIP - Roads Apr 18		Siri Rangamuwa	Links to Item 8.3. Whole of Life / AT approach designed into Consequential Opex Model	Dec-20	Underway
	10.7	Improve the capture of maintenance expenditure by asset.	DHCL IIMM AMMA Apr 20	2	Myles Lind	Asset data scope provided to Maintenance contract retender. Asset management data scope reviewed ahead of professional services retender	Nov-20	Complete
	10.8	Review the Transport Agency's Lifecycle Management Plan against the Bridges, Structures and Walls ACMP.	Waka Kotahi - Technical Audit 2018	1	Matiul Khan	Provide evidence to NZTA that recommendation has been resolved.	Jul-20	Complete
Asset Management Leadership and Teams	11.1	Develop a communication strategy and plan that enable leaders at all levels to deliver a consistent asset management message across the organisation. The plan and messaging should be approved at ELT level to ensure it has the appropriate level of support.	DHCL IIMM AMMA Apr 20	2	Siri Rangamuwa	Sector research on existing AT, peers use of communication strategy. Design communication strategy ToC.	Dec-20	

Traffic Systems, Signs and Markings Asset Class Management Plan

	11.2	Ensure roles, accountabilities and responsibilities are well defined for the end to end (Structures AM) process	Waka Kotahi - Technical Audit 2018	1	Matiul Khan	Provide evidence to NZTA that recommendation has been resolved.	Jul-20	Complete
	11.3	Review current FTE numbers. Determine what is missing (by number and function) to enable the level of asset management capability required.	DHCL IIMM AMMA Apr 20	1	Myles Lind	GAP Analysis of AM resourcing to support 2024 AMP Development	Dec-20	Underway
	11.4	Review the role of AM in the organisation and develop an AM competences framework. In addition: (1) Implement a comprehensive succession planning process (2) Strengthen internal geotechnical engineering capability. (3) Strengthen internal Bridges and Structures capability	AECOM BIP - Roads Apr 18	1	Myles Lind	Investigate sector solutions for possible competency frameworks. REG? IPWEA? Other	Nov-20	Underway
	11.5	Strengthen in-house capabilities to update the asset inventories	Group Future Work Plan	2	Myles Lind	Complete Strategic Case for AM Capability Investment	Jul-21	
	11.6	Benchmark against like organisation in terms of asset team size.	DHCL IIMM AMMA Apr 20	2	Myles Lind	Identify sector benchmarking initiatives (performance and funding) and/or identify benchmarking peers.	Sep-21	Underway
Asset Management Plans	12.1	Develop the asset management planning processes to more effectively engage other teams within AT such as RCD, Finance and Planning and Investment.	DHCL IIMM AMMA Apr 20	1	Siri Rangamuwa	Establish AMP Development Committee	Jun-20	Complete
	12.2	Develop ways to summarise / aggregate customer information for interpretation in AMPs / AM strategies.	AECOM BIP - Roads Apr 18		Siri Rangamuwa	Investigate sector approaches regarding customer information and AMPs.	Nov-20	Assigned
	12.3	Foster more collaboration across the AM business cycle.	AECOM BIP - Roads Apr 18		Myles Lind	Establish AM COP with ToR	Jun-20	Complete
	12.4	Review the format and content of the AMP and ACMPs, considering the audience, purpose and timing. Develop a more streamlined format that allows each to be updated more efficiently.	DHCL IIMM AMMA Apr 20	2	Siri Rangamuwa	Investigate sector solutions to AMP format and structures. Implement / pilot sector acceptable format / template	Sep-20	Complete
	12.5	Strengthen the main AMP as a roll-up of all transport Asset Class Management Plans (AcMPs) (also known as Lifecycle Management Plans) and align with new Capex.	AECOM BIP - Roads Apr 18		Siri Rangamuwa	Investigate sector solutions to AMP format and structures. Implement / pilot sector acceptable format / template	Sep-20	Underway
	12.6	Document specific asset management business processes (i.e. development and prioritisation of FWPs.)	Group Future Work Plan	1	Myles Lind	Identify business process mapping tools available to AT.	Sep-21	Assigned
	12.7	Improve alignment between AMP and FWP	Group Future Work Plan		Siri Rangamuwa	Report AMP FWP Programme vs Completed FWP	May-21	Underway
Management Systems	13.1	Ensure relevant AM practices are included within the AT Quality Assurance Framework.	DHCL IIMM AMMA Apr 20	1	Siri Rangamuwa	AT Quality Assurance Framework updated	Sep-20	Assigned
	13.2	A number of processes are being reviewed as part of the EAM project. Identify the processes that are not being reviewed through the EAM project and review and update where required.	DHCL IIMM AMMA Apr 20	2	Siri Rangamuwa	Catalogue of non-EAM business processes captured.	Jun-21	

Traffic Systems, Signs and Markings Asset Class Management Plan

	13.3	Develop and implement asset management business processes	Group Future Work Plan		Siri Rangamuwa	Identify and prioritise missing business processes for mapping / documenting and maintaining.	Jun-21	
	13.4	EAM Project Transition	Group Future Work Plan	1	Myles Lind	Identify EAM System owners and include duties into JDs. (BIRST, IPS, & dPEM Modules)	Dec-20	Underway
	13.5	Develop and adopt a common asset management language across the organisation. This can be reinforced by ensuring all asset management documents contain a common glossary of terms and abbreviations aligned to ISO5500 terms and abbreviations.	DHCL IIMM AMMA Apr 20	2	Myles Lind	Engagement with AT COP and National Data Standards team to align data structure / dictionary efforts for AM	Sep-20	Complete
Asset Management Information Systems	14.1	Investigate the benefits of a data standard. Develop in line with EAM requirements.	DHCL IIMM AMMA Apr 20	1	Myles Lind	Engagement with NZTA and National Data Standards team to align data structure / dictionary	Sep-20	Underway
	14.2	Develop an Asset Information Strategy and provide clarity around the implementation of EAM vs the future of RAMM.	DHCL IIMM AMMA Apr 20		Charmaine Okros	Identify AIS used by peers that could be applicable to AT. All AM	Nov-20	Complete
	14.3	Complete the pilot for EAM for bridge assets and agree the next steps forward.	DHCL IIMM AMMA Apr 20	1	Myles Lind	Statement of Work One Review. Inform SOW 2.	Jun-20	Complete
	14.4	Develop more timely ways of providing information and graphical analysis to the organisation (potentially through EAM or through better use of business intelligence tools).	DHCL IIMM AMMA Apr 20	2	Siri Rangamuwa	Develop key (ELT / Board Level) dashboard reporting as part of Bridge EAM pilot project / UAT	Jul-20	Underway
	14.5	Complete the update of the data base information manual.	DHCL IIMM AMMA Apr 20	2	Delia Sahinovic	AT DOM Review for Rooding.	Apr-21	Underway
	14.6	Transfer and maintain the CEAM risks in legacy systems and spreadsheets into the AT Corporate ARM Risk System	AT Business Plan	1	Myles Lind	ARM Training completed. Gain access to ARM System.	May-20	Complete
	14.7	Review and maintain resource consent compliance status and supporting evidence within the AT Corporate CRM System	AT Business Plan	1	Myles Lind	CMS Training completed. Gain access to CMS System. Develop core compliance status reports. Review assignment of consents in CMS.	Jun-20	Complete
Service Delivery Mechanisms	15.1	Develop an internal Service Delivery responsibility and accountability matrix. Identify where key interdependencies and decision points are to ensure successful programme delivery.	DHCL IIMM AMMA Apr 20	1	Siri Rangamuwa	SLAs between CEAM, P&I and RCD teams / (ownership / inputs / deliverables)	Sep-20	Underway
	15.2	Develop a more robust contract performance management framework. This will need to be done prior to contract renewal in order for it to be ready a contract renewal time.	DHCL IIMM AMMA Apr 20	1	Myles Lind	Industry / peer sweep to identify good practice in contract performance management.	Oct-20	Underway

Table 7-2: Asset Management improvement activities

Traffic Systems, Signs and Markings Asset Class Management Plan

Other key improvement initiatives relating to traffic systems, signs and marking are include those shown in Table 7-3.

Asset area	Key result area	Actions	Priority	Status
Traffic systems	Service delivery Asset management	Use advanced real-time traffic information system to deliver journey time information along key arterial routes	Very high	On-going
Traffic systems	Service delivery Asset management	Improve traffic systems coordination	Very high	On-going
Traffic systems, signs and marking	Health and safety	Undertake regular monitoring, review and reporting of risk	High	In process
Traffic systems	Service delivery Asset management	Continually review advancements in vehicle detection technologies from around the world, especially technology that does not require underground loops	Medium	In process
Traffic systems, signs and marking	Finance	Reconcile renewals and operations and maintenance (OPEX) programmes to available budgets.	High	On-going
Traffic systems	Finance	Clarify capitalisation rules and definitions between OPEX and renewals budgets, and provide specific renewals forward works programmes.	Medium	On-going
Traffic systems, signs and marking	Finance	Long-term planning: Prioritise investment for a regional approach for capital expenditure	Medium	On-going

Low
 Medium
 High
 Very high

Table 7-3: Traffic systems, signs and markings improvement initiatives (TBC)

8 Sustainability (TBC)

Auckland Transport aims to ensure the environmental and economic sustainability of its transport network, so that it remains available for and does not compromise the wellbeing of future generations.

Traffic systems-related functions and activities have a significant impact on the environmental and on economic sustainability. These impacts and their related mitigation measures are set out in Table 8-1.

Impacts	Mitigation measures
Energy consumption	LED lanterns are used for most traffic signals (refer to appendices). This is the preferred lamp type as it has low-energy consumption and longer life than conventional bulbs, such as quartz halogen lamps. LED lanterns have a 10 to 15 year life, compared to 2 years for conventional bulbs. LED lamps have reduced maintenance costs and lower power consumption, by as much as 50 per cent. LED lights also have other advantages such as better light distribution, lower light pollution and white light.
Pedestrian amenity	The Regional Route Optimisation Programme takes an holistic approach to the transport network, treating its as a complete route to ensure that it is working continuously and is as efficient as possible for all users, including pedestrians. It directly improves the efficiency and flow of vehicles, public transport, and amenity for pedestrians and cyclists on the arterial roads Signal route optimisation can also be used to favour certain road user groups, depending on current strategies, such as bus priority, key pedestrian routes, cycle lanes or freight. This increases pedestrian amenity as well as increasing safety and reducing public transport travel times. This approach has been used in Queen Street, where there is increased pedestrian time to cross these busy intersections. This has resulted in a higher level of service for pedestrians to attract people into the city centre, in preference to the general vehicle traffic
Traffic movement efficiency	The main benefit with the Regional Route Optimisation Programme is that traffic can travel smoothly without stopping at every intersection along a route
Air pollution	In Auckland, vehicles are the main source of nitrogen dioxides (NO ₂) with concentrations at peak traffic sites often exceeding air quality targets. Although the amount of NO ₂ in the air is declining, levels are still of concern and may cause adverse health problems. NO ₂ and CO ₂ levels are the highest at roadside sites because motor vehicle emissions are the major source of these air pollutants.

Table 8-1: Impacts and mitigation measures

Current sustainability opportunities and issues that are affecting how Auckland Transport manages traffic signs and road marking assets are:

- where areas are being transformed or developed, introducing pedestrian-friendly urban design features, with appropriate signs and markings
- providing appropriate signs and road markings to encourage increased use of public transport
- shifting car use from single-person trips to multi-occupant use, with traffic signs and markings for high-occupancy lanes
- using thermoplastic markings, where feasible, as they have a longer base life of 5 to 7 years, compared to paint
- using lead-free paint (refer to Waka Kotahi NZ M7) for road marking, to minimise pollution entering stormwater channels during runoff.

9 Key issues (TBC)

Table 9-1 summarises key issues that affect traffic systems, signs and markings assets and the services they provide.

Code	Consequence category	Issue	Ranking	Mitigation	Outcome
IR TS FI 1	Finance	High capital investment is required to upgrade assets to their modern equivalent, with improved technology or capability, e.g. upgrading luminaires with LEDs	High	Complete the entire network replacement of LEDs – being done through the renewal programme to be completed by the end of 2017/18 financial year	Whole-of-life costs are considered in decision-making
IR TS FI 2	Finance	Higher expenditure is required for multi-function poles and decorative poles This is becoming more of an issue due to high profile projects such as City Rail link which use nonstandard highly decorative poles that would have to be individually manufactured at high cost if damaged.	Medium	- Consider whole-of-life and long-term impact before designing and procuring assets - Monitor the condition and review maintenance interventions for the assets - Complete a stringent review of multifunctional poles before procuring (for either large-scale or small-scale projects)	Whole-of-life costs are considered in decision-making
IR TS FI 5	Finance	Capitalisation of traffic signs and markings – enforcement and safety signs should last 8 years but historically have not been capitalised. This was based on the high replacement rate of signs due to vandalism, vehicle impact damage, and their low individual value.	Medium	- Collect data to complete the inventory of signs - Include signs in evaluation and depreciation analysis	Whole-of-life costs are considered in decision-making
IR TS SD 1	Service delivery Asset management	Poor planning of projects, e.g. underground works impacting on the location of traffic signal equipment	High	Identify underground services prior to the detailed design being released for pricing	Improved services Effective asset management
IR TS SD 4	Service delivery Asset management	Inadequate provision of communications network for SCATS and CCTV	High	Identify communications availability, prior to the detailed design, for provision of CCTV and SCATS	Improved services Effective asset management
IR TS SD 4	Service delivery Asset management	Non-compliant assets being handed over to Auckland Transport	Medium	Review design and construction plans and complete compliance checks before asset handover	Effective asset management

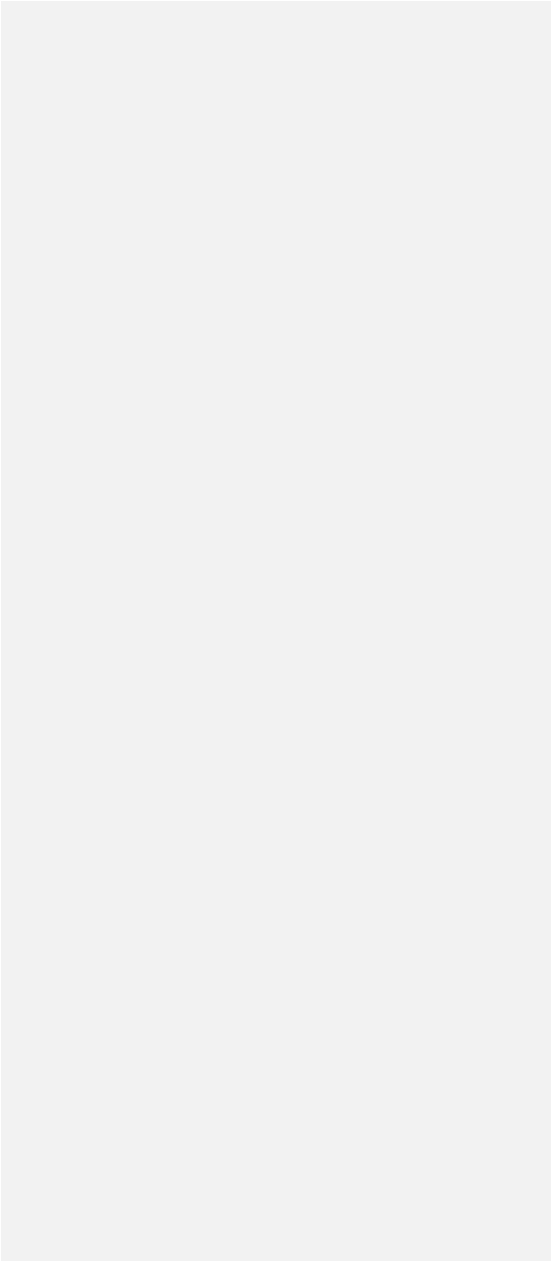
Traffic Systems, Signs and Markings Asset Class Management Plan

Code	Consequence category	Issue	Ranking	Mitigation	Outcome
IR TS SD 5	Service delivery Asset management	Poor or inappropriate standard design leading to unexpected or early failure of assets E.g. Kerbside Junction Boxes have standard specifications that are not recognised by AS/NZS 2276.2 Feeder Cable	Medium	Review products to ensure they are fit for purpose and design standards meet the requirements. Use appropriate process such as Notice Of Materials Exclusion (NOME) for approval of changes in specification for an item or a product	Improved services Effective asset management
IR TS SD 3	Service delivery Asset management	Inefficient navigation around the road network due to inadequate traffic signs and marking	Medium	- Review long-term plan for directing goods and people from local to regional and strategic locations with advance direction signs - Undertake survey to identify incorrect or missing signs in the region	Improved services Effective asset management
IR TS SD 6	Service delivery Asset management	Road markings data – lack of inventory information for high-performance markings in RAMM	Medium	Implement data capture for high performance markings	Increased data confidence. Effective asset management
IR TS SD 9	Service delivery Asset management	Aging telecommunication network – significant gaps and aging in the council-owned communications network is becoming more problematic and reduces the effectiveness of the signals network, with no known replacement programme	Medium	- Work with utility companies, where possible, to address the poor condition of underground ducting in the network - Address gaps in the telecommunication network - Improve the as-built requirements for all future sites and upgrades	Improved services Effective asset management
IR TS SD 12	Service delivery Asset management	Damaged systems equipment – due to vandalism, road accidents, trenching for utility services (e.g. vehicle detection loops), road works and footpath replacement works	High	- Monitor faults and failures of traffic control equipment so that damage is remedied within a set response time - Continually review the advancements in vehicle detection technology from around the world, especially technology that does not require underground loops	Improved services Effective asset management
IR TS SD 14	Service delivery Asset management	Inadequate levels of service for pedestrian dominant areas	Medium	Consider addition of new signalised intersections, improving pedestrian crossings on key pedestrian routes such as the trialling of countdown timers in Queen Street	Improved services

Table 9-1: Key issues

Low Medium High Very high

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Appendix A – Asset information

Traffic systems by asset management area

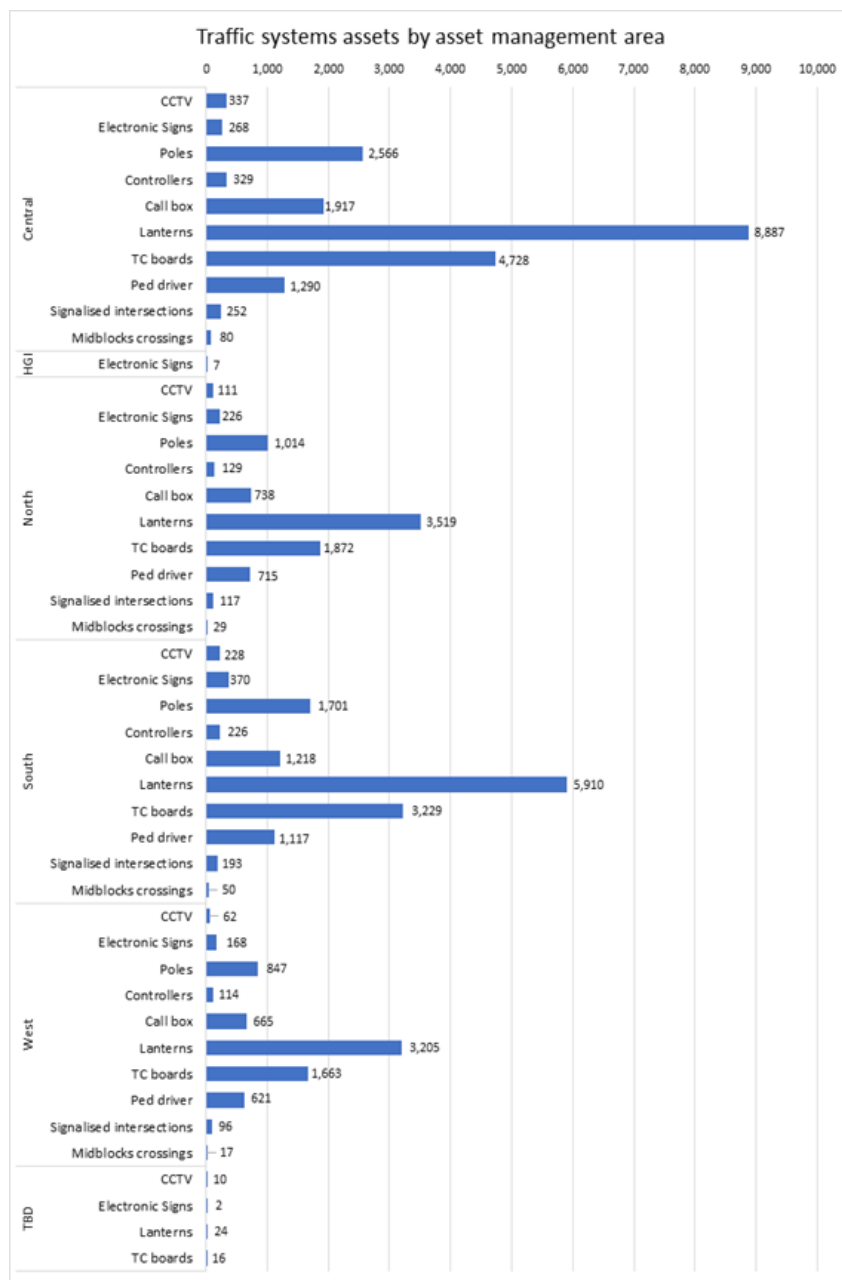


Figure A 1: Traffic systems quantities by asset management area

Signs by asset management area

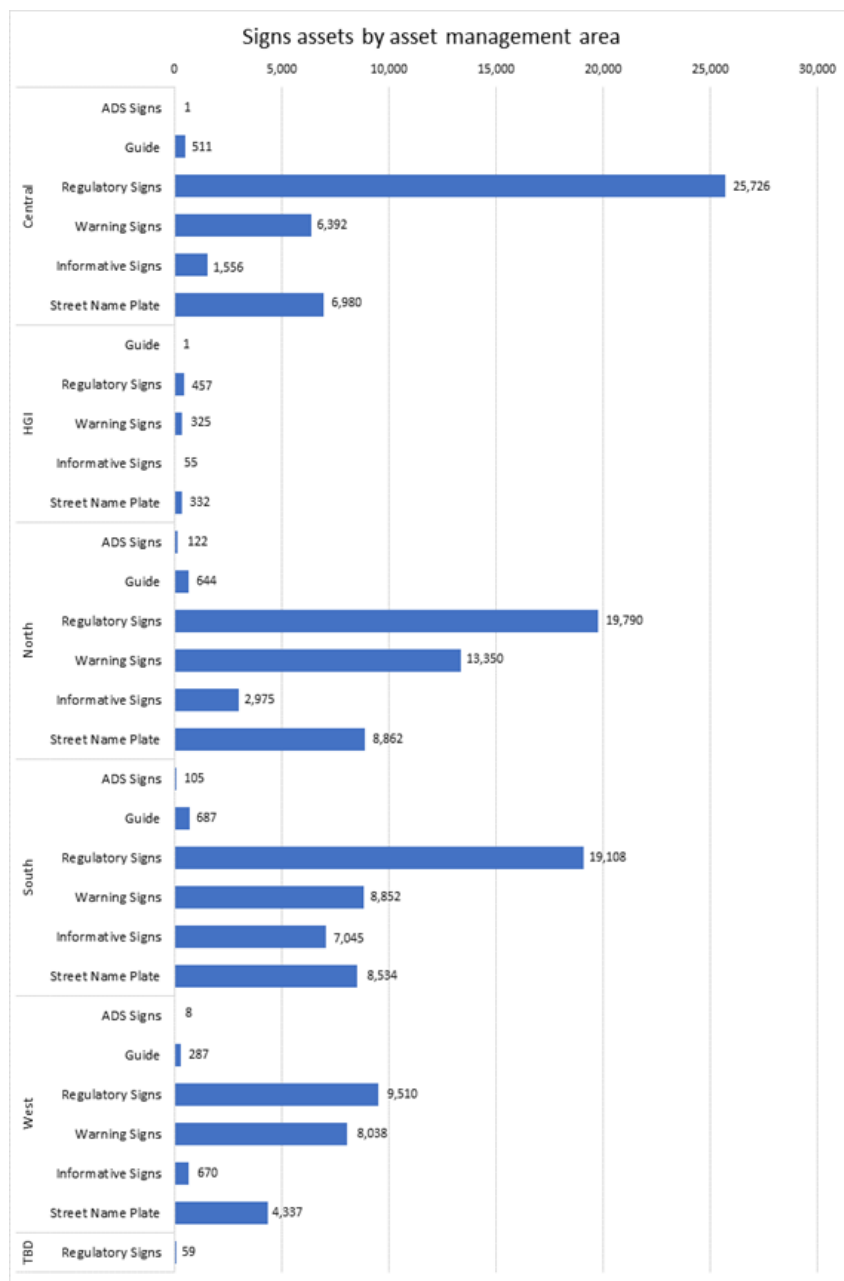


Figure A 2: Traffic signs quantities by asset management area

Traffic systems and signs condition and age profiles

Pole

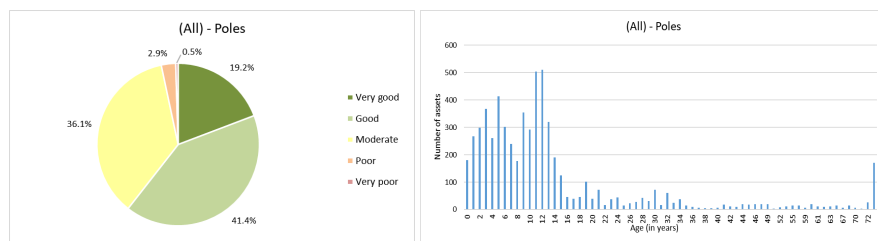


Figure A 3: Pole condition and age profiles

Traffic signal poles have been installed since 1985 and the average expected life of poles is 30 years.

Lantern

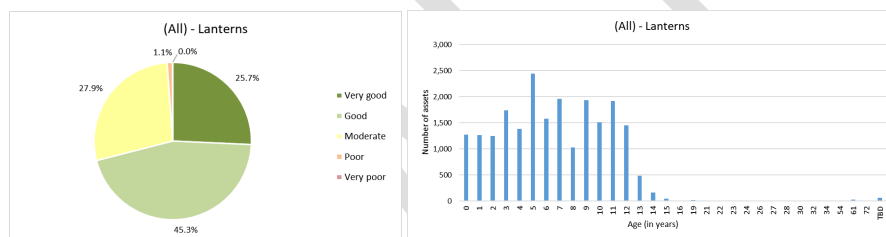


Figure A 4: Lantern condition and age profiles

Lanterns have been installed since 2000. The average expected life of lanterns is 15 years.

Pedestrian call box or driver

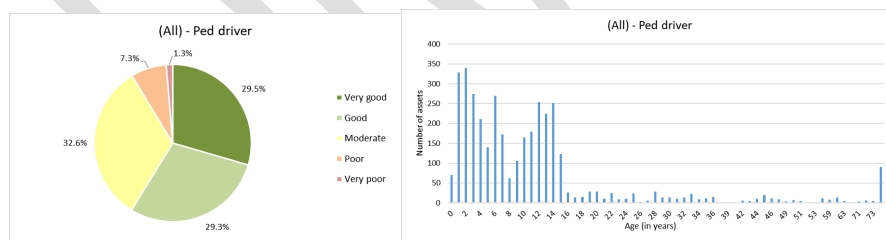


Figure A 5: Pedestrian call box or driver condition and age profiles

Pedestrian call boxes were installed since 2005. The average expected life of pedestrian call boxes is 10 years.

Target board

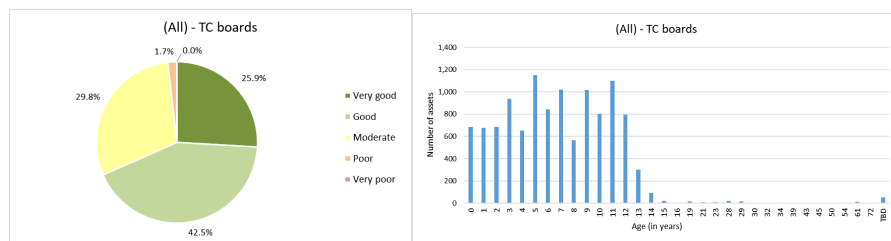


Figure A 6: Target board condition and age profiles

89.4 per cent of target boards were installed since 2005. The average expected life of target boards is 10 years.

CCTV

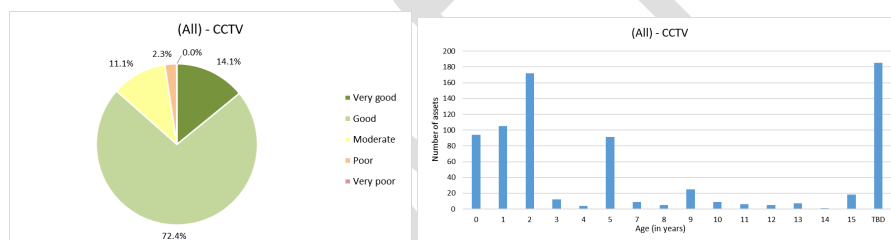


Figure A 7: CCTV camera condition and age profiles

81.2 per cent of CCTV cameras were installed since 2006. The average expected life of CCTVs is 6 years

Controller

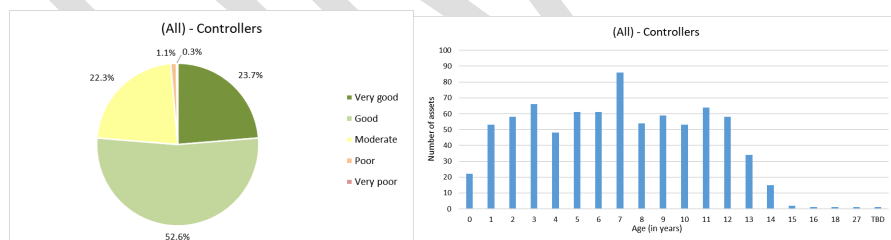


Figure A 8: Controller condition and age profiles

97 per cent of controllers were installed since 2000. The average expected life of controllers is 15 years.

Electronic signs

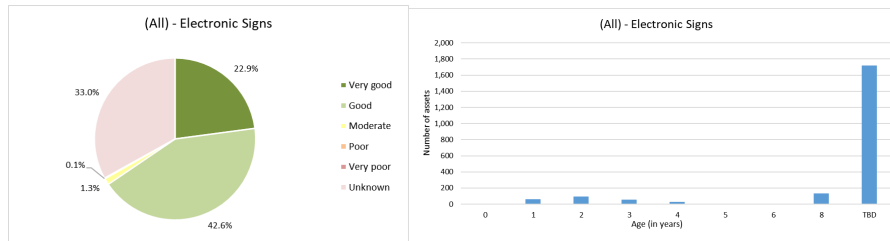


Figure A 9: Electronic signs condition and age profiles

33 per cent of electronic signs have unknown condition. Age of the majority of electronic signs is unknown due to lack of information on installation dates in the system. The average expected life of electronic signs is 10 years.

Traffic signs asset age profiles

Advance direction signs

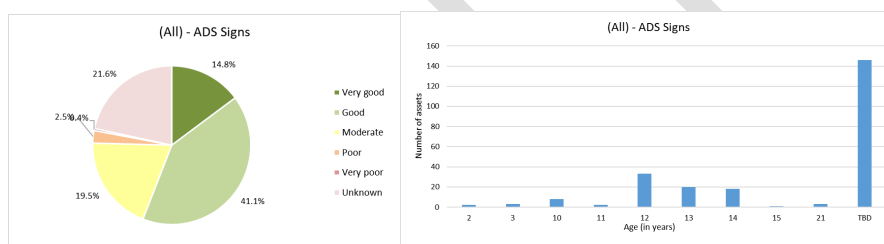


Figure A 10: Advance direction signs condition and age profiles

The advance direction signs asset inventory has 31 per cent unknown age information. The expected life of advance direction signs is 20 years.

Regulatory and warning signs

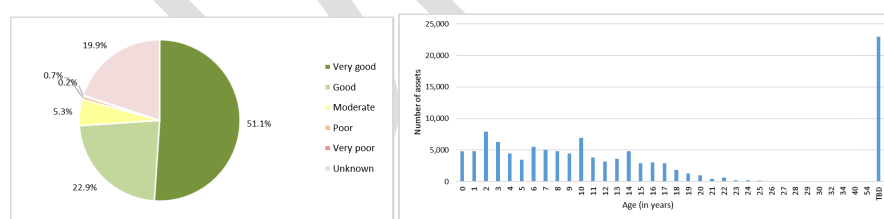


Figure A 11: Regulatory and warning signs condition and age profiles

The asset inventory of regulatory and warning signs has about 20-30 per cent unknown condition and age information. The expected life of those signs is 12 years.

Guide signs

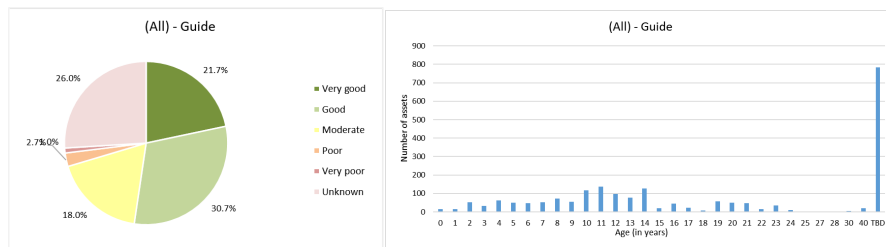


Figure A 12: Advance direction signs condition and age profiles

The guide signs have 26-35 per cent unknown condition and age information. The expected life of those signs are 12 years.

Informative signs

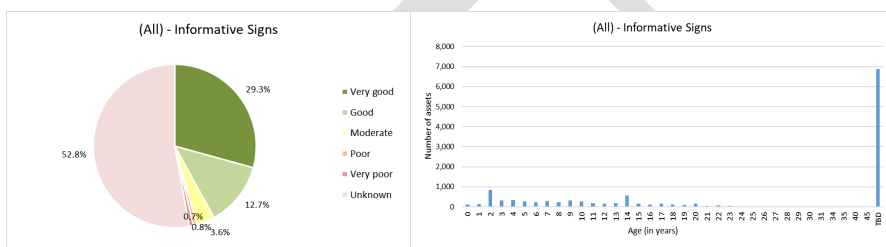


Figure A 13: Informative signs condition and age profiles

The informative signs have 63 per cent unknown condition and age information. The expected life of those signs are 12 years.

Appendix B – Supporting maintenance and renewal analysis

Local knowledge: operations and maintenance requirements for traffic systems

It is expected that operations and maintenance costs will increase due to:

- Increase in traffic systems asset quantity both in new growth areas and on existing roads
- In particular, more controlled intersections and a closer level of management and monitoring of controlled intersections (by the Auckland Traffic Operations Centre)

The planned operational forecasts need to reflect the above changes.

Traffic systems maintenance contracts

	Contract Area	Contract number	Contractor	Award Value (\$)	Initial contract period	Possible extension period	Initial start date
Traffic signals	Central	102-20-092-BT-01	Traffica Limited	\$5,828,245.00	36 months	+ 2yrs	1/11/2020
	North & West	102-20-092-BT-03	CSL Infrastructure Ltd	\$4,145,244.00	36 months	+ 2yrs	1/11/2020
	South	102-20-092-BT-02	Fulton Hogan Limited	\$5,011,343.00	36 months	+ 2yrs	1/11/2020
Technology field devices	Central, North & West	250-15-266-IT-01	CSL Infrastructure Ltd	\$2,113,857.74	36 months	+ 2yrs	1/07/2015
	South	250-15-266-IT-02	Downer	\$1,158,094.49	36 months	+ 2yrs	1/07/2015

Table A 1: Auckland Transport traffic systems maintenance contracts summary

Source: The ATOC team

Road corridor maintenance contracts

Contract Name	Vendor Name	Original Award Contract Value (4-year)	Contract Term	Year Awarded	Start Date
South East Urban Maintenance	Fulton Hogan	78,188,617.85	4+2+2	2012	01-Jul-12
South West Urban Maintenance	Downer New Zealand	128,316,295.69	4+2+2	2012	01-Jul-12
South Rural Maintenance	Broadspectrum	89,398,358.44	4+2+2	2012	01-Jul-12
West Maintenance	Fulton Hogan	140,533,013.69	4+2+2	2013	01-Jul-13
Central Maintenance	Downer New Zealand	129,373,562.78	4+2+2	2013	01-Jul-13
Central East Maintenance	HEB/Higgins JV trading as Liveable Streets	109,982,923.66	4+2+2	2013	01-Jul-13
Hauraki Gulf Islands Maintenance	Downer New Zealand	41,444,029.80	4+2+2	2013	01-Jul-13
North Rural Maintenance	Downer New Zealand	93,786,307.58	4+2+2	2014	01-Jul-14
North West Urban Maintenance	Broadspectrum	67,084,267.99	4+2+2	2014	01-Jul-14
North East Urban Maintenance	Fulton Hogan	76,797,052.90	4+2+2	2014	01-Jul-14
Total		954,904,430.38			

Table A 2: Auckland Transport road corridor maintenance contracts

Consequential opex

Consequential opex includes the costs of operations and maintenance of the assets that will be created in the future. Due to ongoing developments to reduce congestion and improve flow of traffic in the Auckland region, there is likely to be a significant increase in the number of signalised intersections and CCTV surveillance sites. Recent growth rate of signalised intersections are presented in Table 18. This shows significant growth in the North and West areas.

Auckland Transport Traffic Signals average growth rate				
Year	North/West	Central	South	Average
2013	2.42%	0.93%	0.48%	1.28%
2014	0	0	0.95%	0.32%
2015	9.47%	6.12%	5.16%	6.92%
2016	8.11%	2.59%	1.79%	4.16%
2017	1.00%	1.40%	2.19%	1.53%
2018	1.49%	2.22%	2.15%	1.95%
Average				2.69%

Table A 3: Historical growth rates of traffic signals

Source: ATOC (2019)

Depreciation profile

For an individual asset, depreciation is simply the asset cost divided by its useful life. The depreciation of traffic systems (traffic operations assets) increases from \$14 million to \$20 million in 10 years.

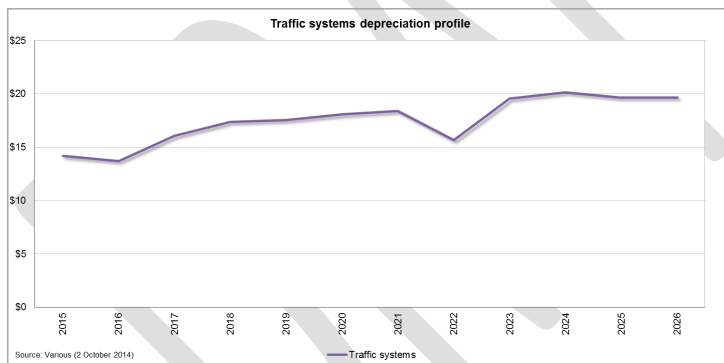


Figure A 14: Depreciation profile of traffic systems

Source: Auckland Transport infrastructure depreciation profiles, Auckland Transport Corporate Finance (2015)

In the real world, assets do not deteriorate by the same amount each year. Auckland Transport represents the deterioration of traffic systems assets by curve B on Figure 10-18. That is, assets are in “good as new” condition for half their useful life, and begin to deteriorate rapidly after 90 per cent of their useful life is expired as shown in Figure 10-18.

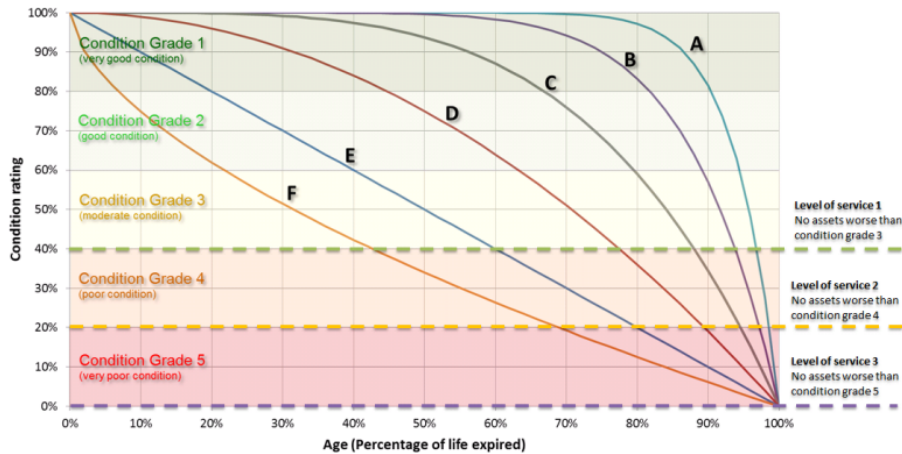


Figure A 15: Auckland Transport's standard asset decay curves

Source: International Infrastructure Management Manual (2011)

Optimum condition profile for traffic systems

The following is the optimum condition profile set for Auckland Transport's Traffic Systems network. This is based on the asset deterioration curves used within the Renewal Optimisation Model.

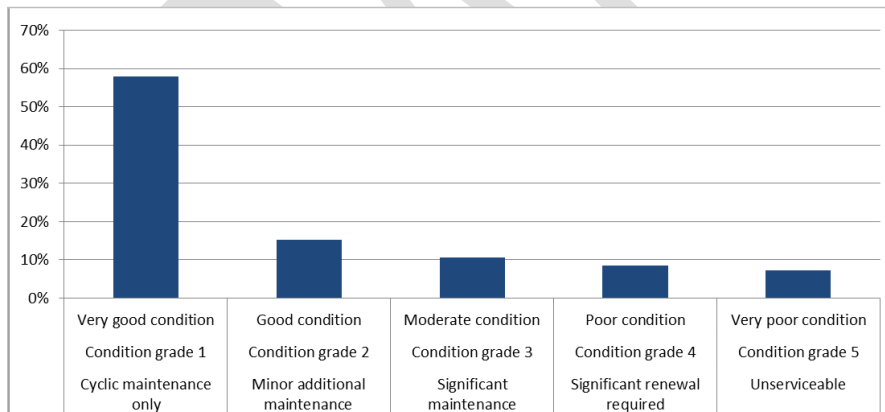


Figure A 16: Optimum condition profile

Asset management settings

The key asset management factors, known as 'Asset Management Settings', are as follows:

- An asset's appropriate asset decay curve
- An optimum condition profile
- The level of acceptable risk
- The condition intervention point
- The consequential renewals due to growth
- The number of years to address any backlog

Traffic Systems, Signs and Markings Asset Class Management Plan

- An asset's base life
- The renewal unit rate.

The modelling of various renewal forecast scenarios used these asset management settings and included traditional age-based and condition-based modelling, and a more sophisticated renewal optimisation model (ROM) developed in-house.

The following asset management settings have been used for modelling the future renewal requirements for Auckland Transport's traffic systems, signs and marking.

Asset class	Traffic systems		Signs							
Asset type	CCTV	Traffic signals	Advance direction signs	Electronic signs	Gantries	Guide	Hazard markings	Informative	Regulatory	Warning
Unit	Unit	Unit	Unit	Unit	Unit	Unit	Unit	Unit	Unit	Unit
Unit rate	\$48,074	\$8,929	\$6,978	\$6,978	\$15,000	\$2,000	\$168	\$168	\$168	\$168
Intervention point	9	9	12	12	12	12	12	12	12	12
Years to address backlog	6	6	8	8	8	8	8	8	8	8
Base life	6	16	15	15	30	15	15	15	15	15
Deterioration profile	2	2	2	2	2	2	2	2	2	2
Growth factor decade 1	0.50%	0.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%
Growth factor decade 2	0.70%	0.70%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%
Growth factor decade 3	1.00%	1.00%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%

Table A 4: ROM asset management setting for traffic systems and signs (to be updated)

Prioritisation Methodology – ADS

4 Prioritisation Methodology – Gantry and ADS

Risk based approach has been adopted for the FWP prioritisation methodology which is based on the following:

$$\text{Risk} = \text{Likelihood} \times \text{Consequence}$$

It is proposed that each structure in the FWP is given an overall 'Risk Score' to provide a high level priority list of structures within the AT network.

The following sections outline factors contributing to the likelihood and the consequence scores.

4.1 Likelihood Factors

The condition has been determined to be the main influencing factor which affect the likelihood of a gantry or ADS failures.

Table 5 provides a summary of weighting and scoring for each band of condition.

Table 5:

Factor	Weighting	Bands	Score
Condition	60%	Very Poor	5
		Poor	4
		Average	3
		Good	2
		Excellent	1

4.2 Consequence Factors

The network criticality has been suggested for the consequence score as below:

- **Network Criticality** is to facilitate assessment of the criticality of an asset and provide a systematic and structured approach in carrying out the criticality assessment of transport infrastructure assets. It is to be defined according to the Network Criticality Level. A lower Criticality classification denotes a higher route importance with higher consequences to network disruption, level of service and financial impact in the event of a structure failure. Network Criticality for various routes can be found in the Criticality Framework for Transport Infrastructure document from AT. The primary criteria in the Network Criticality score uses ONRC, Access to Lifeline Utilities and Access to Essential Services.

Table 6 provides a summary of weighting and scoring of the consequence factor.

Table 6

Factor	Weighting	Bands	Score
Network Criticality	40%	Level 1- Vital	5
		Level 2- Major	4
		Level 3- Significant	3
		Level 4- Local	2
		Level 5- Minor	1

Source: Forward Works Programme Prioritisation Guideline, Roadway Structures, Oct 2020