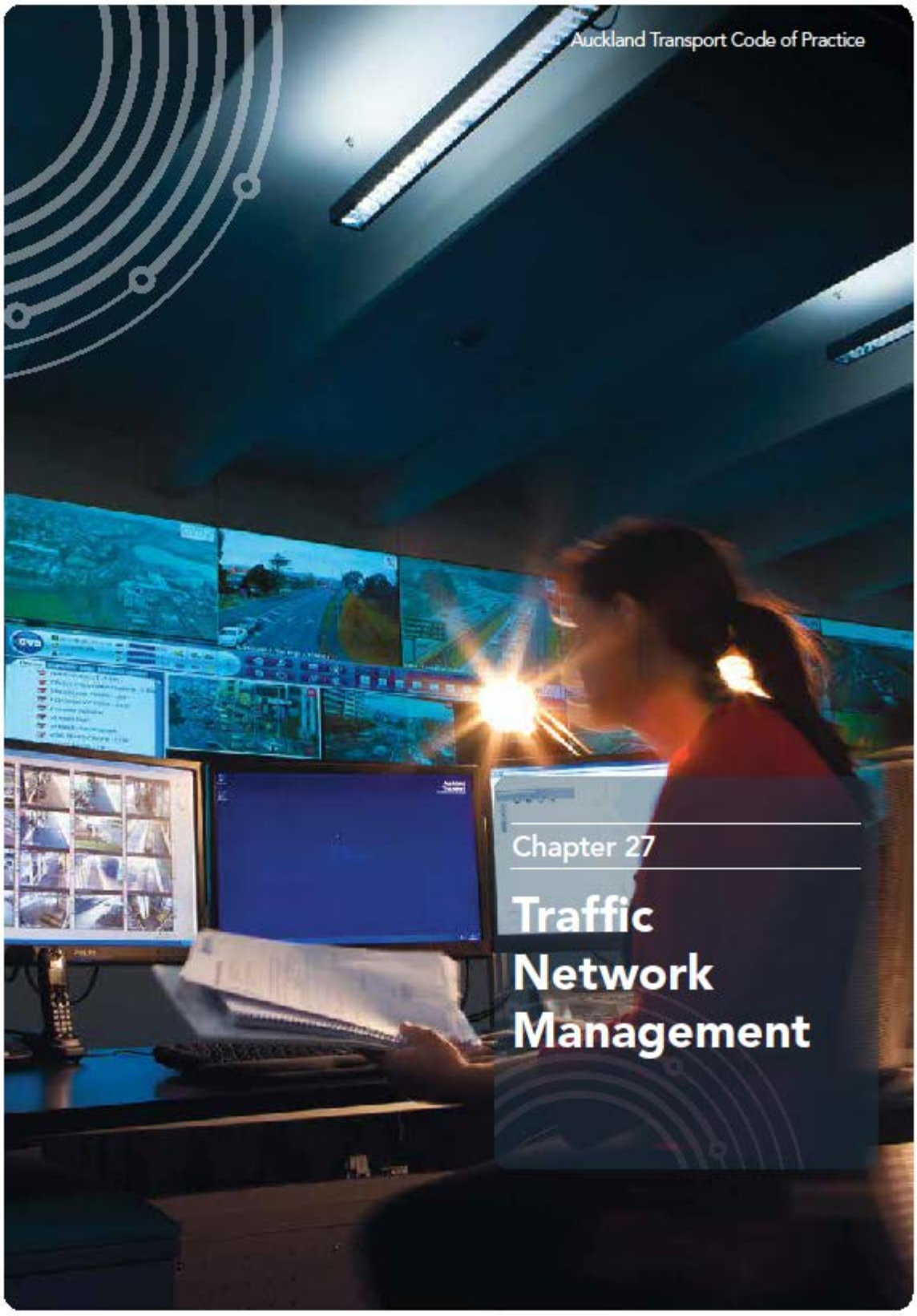

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27 Traffic Network Management

27.1 Introduction

27.1.1 Vision

"In line with the four stage intervention process of the Integrated Transport Programme, with increasing demand for travel and limited opportunities for increasing capacity within urban areas, ***there is a need to make more effective use of the available road space through a process of efficient traffic network optimisation and management aligned to safety outcomes."***

The One System approach to optimise the way networks are operated, used, renewed and developed is summarised in the four-stage intervention process, depicted in Figure 144 below.

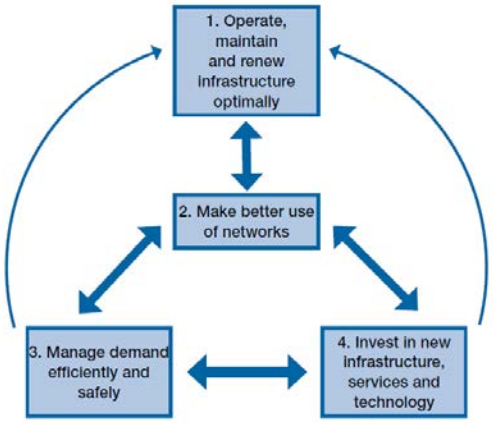

Figure 144: ITP Four-stage Intervention Process

27.1.2 Purpose

To provide a Code of Practice for Traffic Network Management involving network management and optimisation in terms of both efficiency and safety. This recognises that effective traffic network management comprises network efficiency and network safety i.e.

Effective traffic network management = Efficiency + Safety

Consequently, the safety strategy or Network Road Safety Plan, informs the Network Operating Plan, which in turn informs the Network Road Safety Plan.

27.1.3 Structure

The structure of this Chapter is divided into three parts, which are briefly introduced below, while the connections between these various processes (including Road Safety Audits, Safety Impact Assessments, Traffic Impact Assessments and Network Performance Audits) are outlined on Figure 145.

26.2 – Network Road Safety Plan

The Network Road Safety risk management framework will identify high risk routes and road user areas for safety improvement on the existing transport network using the Safe System approach (increasingly free of death and serious injury). Any safety interventions will be aligned with the

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Network Operating Plan. Likewise, efficiency optimisation and management of the network needs to be aligned with road safety outcomes in the Network Regional Road Safety Plan.

It is important that road safety is a key element considered within all capital works projects, and is achieved in two ways:

- all capital projects will be subject to Road Safety Audit procedures, and
- all transport land-use decisions will be subject to a Safety Impact Assessment.

26.3 – Network Operating Plan

The Network Operating Plan, which is discussed in *ATCOP Chapter 2* sets the overarching framework and direction for the efficient management of the traffic network and its' alignment with other Council outcomes, including integration with land use, appropriate quality urban design, a multi-modal and sustainable transport system, and a Safe System.

The Network Operating Plan in turn is used to assess the performance of the network against appropriate benchmark measures. Efficiency optimisation processes identify interventions / projects (both capital projects and land use decisions) on the traffic network enabling implementation of safe, efficient, integrated, sustainable and high quality amenity solutions aligned with the Network Operating Plan, which can be progressed to the Regional Land Transport Programme process.

26.4 – Network Management Plan

The Network Management Plan will enable the continual management of the 'live' network to maintain conditions as close as possible to agreed parameters set out as part of the Network Operating Plan.

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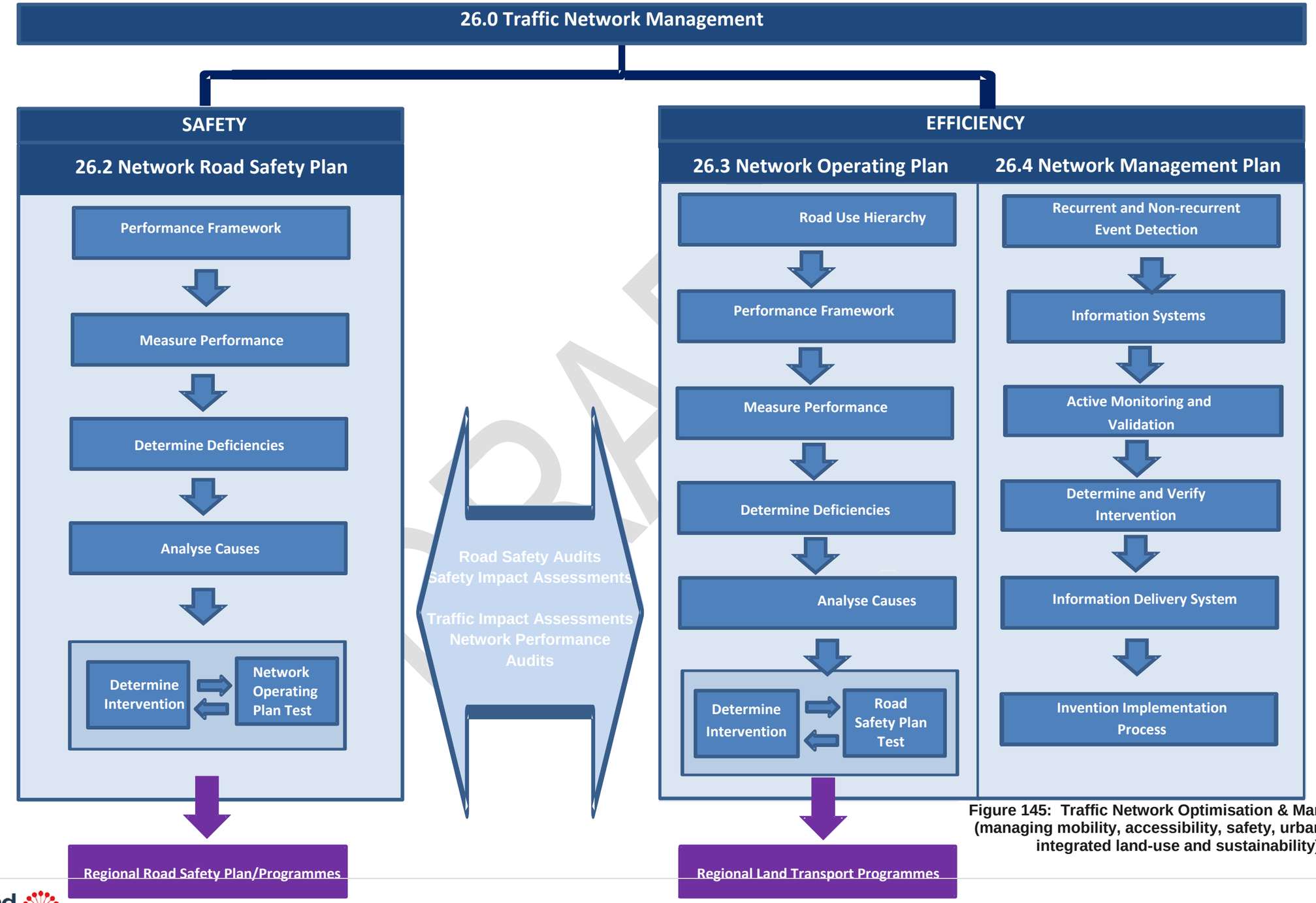

Figure 145: Traffic Network Optimisation & Management (managing mobility, accessibility, safety, urban design, integrated land-use and sustainability)

27.2 Network Road Safety Plan

The Network Road Safety Plan includes the identification of high risk locations and road users across the transport network, followed by investigation, design and delivery of road safety interventions that address fatal and serious injury crashes at these high risk locations and improve safety for all road users. These projects are undertaken primarily by the Auckland Transport Road Safety Team but it will take a whole organisational approach to integrate and improve safety through its projects.

This is not a matter of safety at any cost, but ensuring that a considered balance is struck between safety and efficiency of the network, to deliver an optimised and effective traffic network.

Auckland Transport is aligned with the Governments Safer Journeys Road Safety Strategy that promotes a Safe System approach to road safety. This means that the focus is primarily on reducing fatal and serious injury crashes and locations, routes and road user communities where such crashes may be more likely to occur in the future (high crash-risk rated parts of the network). Notwithstanding this, opportunities need to be considered to also improve safety associated with minor injury and non-injury crashes that could assist in mitigating the potential for more serious crashes to occur.

27.2.1 Road Safety Performance Framework

The Safe System approach of the Governments Safer Journeys Road Safety Strategy forms the basis of AT's safety performance framework and acknowledges the following fundamental principles:

1. Human beings make mistakes and crashes are inevitable
2. The human body has a limited ability to withstand crash forces
3. System designers (planners, engineers, policy makers, educators, enforcement officers, vehicle importers, suppliers, utility providers, insurers) and road users (drivers, passengers, motorcyclists, pedestrians, cyclists) must all share responsibility for managing crash forces to a level that does not result in death or serious injury
4. It will take a whole of system approach to implement the Safe System

It consists of Safe System management strategies and actions that lead to safe roads and roadsides, safe speeds, safe vehicles and safe road users (see Figure 146). The long term objective is to collaboratively create a more forgiving road environment increasingly free of death or serious injury, despite road users inevitably making mistakes.

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Figure 146: Safe System Approach

A Safe Transport System for Aucklanders will be achieved by creating:

- Safe Roads and Roadsides that are predictable and forgiving of mistakes through improved road surfaces, signage, technology and roadside object removal or median barrier installation
- Safe Speeds that suit the function and level of safety of the road through more appropriate speed limits, self-explaining roads, and road users that comply with speed limits
- Safe Vehicles that help prevent crashes and protect road users from crash forces via advanced safety features including electronic stability control (ESC), front and side airbags and head restraints
- Safe Road Users that are skilled and competent, alert and unimpaired, comply with road rules, choose safer vehicles and transport options, take steps to improve safety and demand safety improvements
- Safe Management Systems that encourage collaboration, best practice and innovation between agencies and road user groups, along with transparent accountabilities, value for money, and performance measures for monitoring progress towards a safer road system

This work is strategically linked to the Auckland Plan and Integrated Transport Plan, and driven through a Road Safety Steering Group, Regional Road Safety Plan and four local Road Safety Action Plans to enable Auckland to lead the country in improving road safety outcomes for its communities using a safe system approach.

A key focus for AT is around providing Safe Roads and Roadsides through low and medium cost safety improvement infrastructure projects developed through Crash Reduction Studies (CRS), Safety Around Schools (SAS), Minor Safety, Fatal Crash Investigation, Cycle and Pedestrian safety programmes.

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In the past, the safety engineering focus has been on crash black-spots, but increasingly the focus will be on identifying locations, routes and communities with the highest risk of a fatal or serious injury crash through risk-rating and infrastructure star-rating processes like Urban KiwiRAP. This will add a proactive approach to improving road safety rather than just relying on a reactive approach to addressing historic crash problems.

AT also plays a key role in developing Safer Speeds through reviewing and revising speed limits and monitoring operating speeds. Local area traffic management (LATM) is also used to manage down speeds in high risk road environments, such as town centres, suburban areas, schools and places. Safe Speeds plays a critical role in reducing fatal or serious injury for vulnerable road users such as motorcyclists, cyclists and pedestrians and also for improving the uptake of walking and cycling as a transport mode.

While most of the activities around Safer Vehicles and Safer Road Users are led by the NZ Police and NZTA, AT also have a key role in supporting such activities and in leading regional pedestrian safety campaigns, cycle safety campaigns and training, alcohol and drugged driving prevention, driver licensing, school safety programs and older road user education programs.

27.2.2 Measuring Performance

A number of road safety indicators and performance measures have been developed by AT to assess the effectiveness of the regional road safety program, and progress towards a Safe System. These outcome and output indicators include:

- number of fatal and serious injuries by Safe System theme, road user, and sub-regions
- social cost, ACC claims, hospitalisations, population and vehicle kilometre rates of travel
- percentage of vehicles exceeding speed limits
- safety belt and cycle helmet wearing rates
- perceptions of safety and enforcement
- effects of safety engineering projects
- kilometre lengths of high-risk routes

These indicators and measures are collated annually with a focus on five year rolling trends. Downward trends are sought in each indicator and measure over five years. This removes the random fluctuations that can occur when the system is assessed annually.

27.2.3 Determining Deficient Parts of the Networks

With an increasing focus on reducing fatal and serious injury crashes under the Safe System approach, and a more disperse pattern of crashes, AT plans to increasingly use crash risk-based methods to determine the locations where fatal and serious injury crashes are more likely to occur in future and prioritise them for treatment.

Crash risk-based methods, such as Urban KiwiRAP and RISA, assess the risk of fatal and serious injury crashes from the physical and operating characteristics of a road network site or area . These methods can also be used to assess the relative crash risk by transport mode, so that high risk locations for pedestrians and cyclists can separately be identified.

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The deficiency assessment method produces lists of sites which either historically have a crash problem (during the last five years) or where it has been assessed there is a high likelihood of fatal or serious injury crashes in the next five to ten years (from the risk-based methods).

To date, AT has developed prioritisation lists for:

- High crash-risk general traffic Routes (Urban and Rural)
- High crash-risk intersections
- High crash-risk Motorcycle Routes
- High crash-risk Cycle Routes
- High crash-risk Pedestrian Routes

AT is also developing an urban safety star-rating deficiency assessment for transport infrastructure including intersections, urban arterials, rural arterials, cycle and pedestrian facilities. This tool will in future allow comparison of existing road infrastructure with expected Safe System levels of service.

27.2.4 Analyse Causes

Diagnosis of crash causes at the high crash-risk sites and routes identified in the deficiency stage is undertaken by examining both the crash record and the physical features of the road through Crash Reduction Studies and Investigations. This assessment is undertaken by experienced road safety professionals and the key crash causes at each site can then be identified under the categories of Safer Roads and Roadsides, Safer Speeds, Safer Vehicles and Safer Road Users.

Interventions are then developed by AT for the Safe Roads and Road-side and Safer Speeds areas. The causal factors in the other two categories and enforcement of speeds, when this is an issue, are then discussed with the other road safety partners, who may use this information to initiate other supportive road safety projects.

27.2.5 Determine Intervention

There are a range of safety improvement measures that can be applied to address the Safe Road and Road-sides and Safe Speed crash causes that are identified at each site or route, varying in cost and effectiveness. An assessment is made on how any proposed change will impact, if any, on mobility, sustainability, integration between transport and land-use and quality urban design. The preferred improvement option will consider each of these wider factors and also how effective the option is likely to be in reducing the fatal and serious injury crash risk. In some areas, Demonstration projects are implemented where the effects are unknown but potentially promising.

Annually a large number of improvement projects are developed by AT to address road safety issues. Projects are prioritised for implementation based on their effectiveness in reducing crash risk and their cost-effectiveness. Through this process a program of projects is developed and included within the Road Safety Programme which is updated annually.

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27.2.6 Network Operating Plan Test

Any intervention is to be aligned with the Network Operating Plan. This interaction is critical to the successful management delivery of an optimised and effective traffic network.

Similarly, any road network intervention produced through the Network Fit Assessment in the Network Operating Plan process will also be tested with a Safety Impact Assessment to determine their impact on AT's Safe System targets.

27.3 Network Operating Plan

The Network Operating Plan (NOP) provides the framework against which the optimisation and management of the traffic network in terms of efficiency can be implemented and against which interventions on the network can be tested, while ensuring a considered balance between safety and efficiency. The NOP framework will develop over time to respond to changes within the traffic network and land use patterns across the Auckland Region.

As discussed in *ATCOP Chapter 2*, the Auckland Integrated Transport Programme (ITP) will strategically coordinate, prioritise and sequence the activities of Auckland's road network providers including AT and the NZ Transport Agency (NZTA) so that, over the next 30 years, there is a programme for delivering the spatial development needs set out in the Auckland Plan.

In order to get the most out of the existing road network, AT/NZTA as the network operators must be able to prioritise use of its arterials by mode, place of activity and time of day, while still give effect to strategic network goals. The SmartRoads approach, developed by VicRoads, provides a better understanding of how the integration of the transport elements and land use can be incorporated into an operating plan for the regional road network.

The NOP developed through the SmartRoads approach can inform all decisions that affect the way the road network is operated and optimised in terms of efficiency and safety. The SmartRoads approach involves the following main elements, further discussed below:

- Road Use Hierarchy
- Measure Performance and Determine Deficiencies
- Determine and Assess Interventions

27.3.1 Road Use Hierarchy

A Road Use Hierarchy identifies the relative priority of each transport mode on each route and at each intersection; taking into account factors such as the type of place the route traverses and any future growth or changes in these places, in accordance to the Auckland Plan.

The Road Use Hierarchy is presented as a map showing all routes according to priority by mode and place. These maps can be developed in a series of workshops for each Local Board area, with Auckland Council, Auckland Transport, NZTA and other key stakeholder representation contributing to the process.

These effectively translate to NOP that depict the intent of how the network needs to be operated and managed for the four peak time periods (morning peak, high off-peak, evening

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peak and off-peak), consistent with the strategically determined objectives of the Road Use Hierarchy.

These plans provide a greater level of detail to help practitioners manage the network and make project decisions that align with the agreed Plan objectives.

27.3.2 Network Performance Framework

The Network Performance Framework defines the area-wide multi-modal network performance measures that would be used to determine the current operational performance of the network. This includes the following:

- Travel Efficiency in terms of delay and flows
- Route Productivity in terms of people movement
- Route Performance by mode, including freight
- Intersection Performance
- Cycle Provision and efficiency
- Pedestrian Provision and Delay (at crossings)

These measures include user defined levels of service defined and described in *ATCOP Chapter 4*, for the various road types. These user defined levels of service are similar to that currently being developed nationally as part of the One Network Road Classification (ONRC).

The SmartRoads tool expands on the level of service performance framework, by taking into account place and the road user hierarchy to establish relative priorities and therefore appropriate performance levels of service by time of day.

27.3.3 Measure Performance

There are a numerous means of measuring, monitoring and reporting the current performance of the network to allow this to be assessed against the framework. Typical measures to provide the information needed to quantify network performance include:

- Travel times between nodes (Floating car surveys, GPS and Bluetooth)
- SCATS and SCATS-related Systems, such as TRIPS and ARTIS
- Site observations or CCTV Coverage
- Manual data collection
- Occupancy surveys (general traffic, public transport, cycles, pedestrians and freight)
- Traffic volume surveys (automated or manual) for all modes as above
- Cycle and pedestrian facility provision assessments

27.3.4 Determine Deficiencies

The SmartRoads Network Fit Assessment (NFA) tool includes a system to quantify the operational deficiencies for all modes at a given mid-block location or intersection approach. This system produces an indicator, known as the Network Operating Gap, which factors in all of the elements of SmartRoads approach and presents them as a simple scale that can be used to identify problems and to test proposed treatments. This may be influenced by evolving network operation / performance, implementation of capital projects or land use change.

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The NFA tool can identify opportunities to make improvements across several modes at the same location. The tool has the ability to compare the relative needs of each road user group and to target locations or areas with the greatest overall operational need.

Further to the above, network efficiency is monitored and reported on at both a network wide and route specific level. This is currently undertaken on a monthly basis.

Importantly, network performance involves the efficiency of various modes (the safe movement of people and goods), and therefore applies for the various modes of transport. A multi-modal performance approach is currently used and being further developed, to determine the deficiencies on the network by mode.

These deficiencies are identified by comparing current performance levels with the 'preferred' Level of Service to be achieved for each transport mode defined by the framework.

27.3.5 Analyse Causes

Once the deficiencies in the network are identified, it is important to understand the variety of factors that may be causing an operational deficiency and the options that may be available to mitigate the deficiency.

To analyse the cause/s of the deficiency, it may be necessary to collect further information, under detailed traffic modelling or conduct an audit of the current site conditions.

27.3.6 Determine Interventions & Network Road Safety Plan Test

Once the cause of the deficiency has been established, a number of possible interventions that could be applied to mitigate the deficiency can be developed for consideration. These can be tested through the NFA and other processes that confirmed the deficiency and the causes.

The findings of the NFA, together with other technical assessments including road safety considerations and place functions, would be used to inform the overall decision-making process to confirm the implementation of the preferred intervention. This would include testing the intervention against the Network Road Safety Plan through a Road Safety Audit or a Safety Impact Assessment determine their impact on AT's Safe System targets.

The intervention may then be progressed to the Regional Land Transport Programme process for consideration and implementation.

27.4. Network Management Plan

With increasing demand for travel and limited network capacity, there is a requirement for the continual management of the 'live' network to maintain and optimise efficiency to agreed parameters set out in the NOP in a safe manner, and which covers recurrent and non-recurrent events.

27.4.1 Recurrent & Non-Recurrent Event Detection

Any change which causes a deviation from operation described as normal in the NOP is considered an event. A non-recurrent event is an unplanned incident, such as vehicle

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breakdown vehicle crash, fire, chemical spill, natural disaster. These events are classified in terms of severity from minor through to catastrophic. It is intended that each type of non-recurrent event would have a generic incident management process outlining management steps, actions and responsibilities.

These events are to be detected through a variety of technologies, as well as through communication channels based on direct observation by Joint Traffic Operations Centre (JTOC), Police, emergency agencies and customer alerts. Event detection is intended to capture the impact of these events and their location. Once detected, this information is to be communicated and the event formally classified as appropriate.

A recurrent event is a known recurring situation, such as where the capacity of one or more locations on the network is typically exceeded through travel demand (e.g. at peak hours).

A planned event is a type of recurrent event in that the associated impacts are generally known prior to the event. In these instances, prior planning of interventions required for a given planned event (e.g. sporting, cultural or construction activities) will allow impacts on the NOP to be kept to a minimum. Similarly, temporary traffic management plans associated with major road work projects form a type of planned event.

Auckland Transport require a traffic assessment of any major planned event so that the most appropriate temporary traffic management plan that minimises the impacts on the road network can be approved. These temporary traffic management plans require communication to the public via various information systems.

It is also necessary that JTOC operators be made aware of these proposed temporary traffic management and communications plans well in advance, to enable active monitoring of the impact of the event.

27.4.2 Information Systems

These systems are intended to relay traffic data/information to JTOC and/or customer interface systems through agreed communication procedures. These also include automated information systems that specifically provide raw traffic data to any predictive monitoring system used in JTOC. Both systems will allow monitoring and interventions to take place.

Automated systems will gather information from systems such as traffic detection loops or pods, wireless detection, Bluetooth tracking, in-vehicle transponders, GPS and other technologies, and collate and feed these data streams back as flow, occupancy degrees of saturation and travel time data to a control system. More qualitative data will be transmitted directly to operators via the emergency services and service contractor and the general public. Both of these systems are used to prompt an operator or operational system to actively monitor a live situation on the network.

27.4.3 Active Monitoring & Validation

Active monitoring and validation is intended to establish the type and scale of a given event with the subsequent purpose of determining the most appropriate intervention.

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Active monitoring and validation is carried out by JTOC operators on receipt of prompts from the information systems. Operators actively review the prompts to validate the need for an intervention. Operators will then classify the event, follow the incident management process which in turn will determine which of a series of pre-planned interventions will be the most appropriate to mitigate the situation.

Opportunities exist to develop technologies that allow for the monitoring and modelling of real time traffic flows to determine the preferred intervention plan for JTOC to consider and implement upon the occurrence of an event on the network.

27.4.4 Determine and Verify Intervention

Through the incident management process an operator will be able to identify incident plans that would mitigate the detected impacts of an event.

As part of the active monitoring and validation of an event, operators will confirm that an intervention is required. If required, the operator will either developed or retrieved from a series of pre-approved incident management plans, an intervention that will mitigate the effects of the validated event.

The verification process is intended to ensure that the intervention is appropriate.

Through active monitoring, operators can verify that the selected intervention provides the appropriate level of mitigation for the confirmed event.

27.4.6 Information Delivery Systems

Information delivery systems are intended to transmit instructions and messages or information to road users, as part of the implementation of the intervention.

The incident management plan is communicated to road users via a variety of media (e.g. VMS, SMS, radio, internet applications including social media applications).

27.4.7 Intervention Implementation Process

The intervention developed through the incident management process is intended to mitigate the effects of the event (e.g. via traffic diversions, notification of incidents / delays / alternative routes etc.).

Throughout the above process, the cause and effect of a given intervention should be monitored to continually measure its effectiveness and also to determine when it should be removed to maintain road user's confidence in the process and systems.

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