



Municipal Engineering Foundation Victoria

IPWEA International Study Tour 2006 - Study Report



“International road safety initiatives recommended for consideration by Victorian Local Government”



**Doug Bradbrook
Team Leader Traffic & Road Safety
Mornington Peninsula Shire**

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EXECUTIVE SUMMARY

Report based on the Municipal Engineers Foundation, Victoria 2006 International Study Tour. The research objective was to gain knowledge of international initiatives that would enhance road safety for both drivers and cyclists on rural roads controlled by Victorian municipalities. In addition, some other relevant road safety initiatives have been included that were observed on the tour.

The conclusions from the research established the following recommendations to enhance road safety;

- **greater consistency for local rural road standards and markings to match the road function**
- **lower speed limits on specific rural roads**
- **safer cycling for rural roads with higher standards for on-road bicycle lanes and accompanying lower speed limits**
- **better approach to the delivery of road safety education in primary schools**
- **the need to recognize that intelligent transport systems will have a significant role in the future of road safety**

The majority of these recommendations are based on developments in road safety that have occurred or are being developed in the Netherlands. This Study Tour enabled a focus on road safety in the Netherlands through meeting various agencies and government authorities with associated field trips. In addition, reference to relevant initiatives from current transportation planning occurring in San Francisco and Chicago that considers bicycle planning has been included. Also, some examples of the research that are occurring on the international front particularly in California and the Netherlands with ITS -Intelligent Transportation Systems are discussed.

The insights from the Study Tour have been assessed and those most relevant to address current road safety issues in Victorian Local Government have been recommended for consideration. The observed initiatives are grouped under the following categories:

- **Rural Road Safety:** Presently the Victorian State Government agencies in conjunction with Local Government authorities are investigating methods to improve road safety on rural roads.

The Dutch have chosen to achieve greater consistency with road standards and enhance predictability for motorists to reduce driver error therefore assisting in the reduction of crashes. This has relevance to Victorian conditions.

Lower speed limits are used effectively on rural roads in the Netherlands. Similarly these lower limits have application on some Victorian road types.

Another innovation includes treatment of shoulders with poor soil conditions that reduces problems with errant vehicles along rural roads.

The recommendation is for municipalities, particularly in the outer metropolitan fringes of Melbourne to adopt more consistent road standards including road markings and delineation. Implementation of lower speed limits for rural local roads and undertaking shoulder treatments to reduce run off road crashes are also recommended as further key initiatives to improve road safety. These initiatives should be progressed through assistance from VicRoads and the Department of Victorian Communities through forums provided by the Institute of Public Works Engineering, Australia.

- **Bicycle Safety:** The Dutch have one of the best governments at catering for cycling and given the growing popularity of cycling in Victoria, the recent notification of greater provision for funding by State Government is an incentive for Local Governments to focus on the enhancement of cycling safety and facilities within their municipalities.

Victorian municipalities should consider emulating the high standards that the Dutch have adopted for cycling, including bicycle facilities and on-road bicycle lanes with reduced speed limits on rural roads to make cycling safer.

- **Road Safety Education:** In recent years the delivery of road safety education has been poorly funded in comparison to road safety infrastructure improvements in Victoria. Again, observations were that Dutch Agencies have shown the lead by adopting a commitment to a long term approach to road safety education.

The recommendation is for road safety education in Victorian primary schools to be enhanced through curriculum improvements and adoption of programs that aim for a more a sustainable and coordinated approach to the delivery of road safety education.

- **Intelligent Transport Systems (ITS):** Research and development is in the early stages on the international scene but road safety practitioners have recognised that ITS is the way of the future and will be a significant tool to improve road safety. It is essential that Local Governments monitor international ITS developments and embrace opportunities available to improve road safety on local roads across Victoria.
- **IPWEA facilitation:** In order to promote awareness and develop standards and initiatives in response to the to the recommendations of this study tour report the IPWEA facilitate a “special interest group” for traffic and road safety engineers under the IPWEA. That this group would support and lobby Councils and VicRoads to adopt and implement these measures.

1.0 INTRODUCTION

1.1 Study Tour Overview

The study tour was undertaken between the 3rd and 21st September, 2006 visiting the USA, London and the Netherlands with the group comprising of 10 persons representing 5 states across Australia. In the USA the tour group visited San Francisco, Chicago and Kansas City with attendance at the 2006 American Public Works Association 2006 International Congress & Exposition in Kansas City. The study tour combined technical tours and presentations from many agencies through out these countries.

Tour participants;

Chris	Champion	Chief Executive Officer	IPWEA National
David	Abbott	President	IPWEA National
Mark	Varmalis	Manager Civil Development Services	Shire of Yarra Ranges
Dave	Harris	Director Infrastructure	City of Gosnells
Rod	Kennedy	Infrastructure Manager	Logan City Council
Graham	Bilton	Manager Traffic Mgmt & Operations	Gold Coast City Council
Daryl	Collins	Manager Directorate Business Systems	Gold Coast City Council
Angelo	Catinari	Manager Infrastructure Services	City of West Torrens
Geoff	Metcalfe	Engineering Development Co-ordinator	Port Macquarie Hastings Council
Doug	Bradbrook	Team Leader Traffic & Road Safety	Mornington Peninsula Shire Council

1.2 Research Objectives

The 2006 International Study Tour provided the opportunity for gaining knowledge of various innovative international road safety initiatives that are relevant for consideration by Victorian Local Government Authorities. This report focuses on initiatives that could potentially enhance road safety on local rural roads for both drivers and cyclists. Other initiatives that are discussed include road safety education and Intelligent Transportation Systems which are also seen to be relevant to local issues.

Road safety on rural roads and cycling is currently a primary focus of the Mornington Peninsula Shire and the initiatives presented in this report are currently being implemented or considered as part of this municipality's development of a revised Road Safety Strategy. It is considered that these initiatives are also relevant to many other similar municipalities.

1.3 Key Road Safety Statistics

The Netherlands is a world leader in its endeavours to achieve safer roads for all users. Currently the Netherlands ranks as having one of the lowest road tolls per capita with approximately 50 fatalities per million along with the UK and Sweden with Australia behind at 79 fatalities per million (2004). Refer to Table 1.

Ministry of Transport, Public Works and Water Management 6

Fatalities per 1.000.000 population(2004)

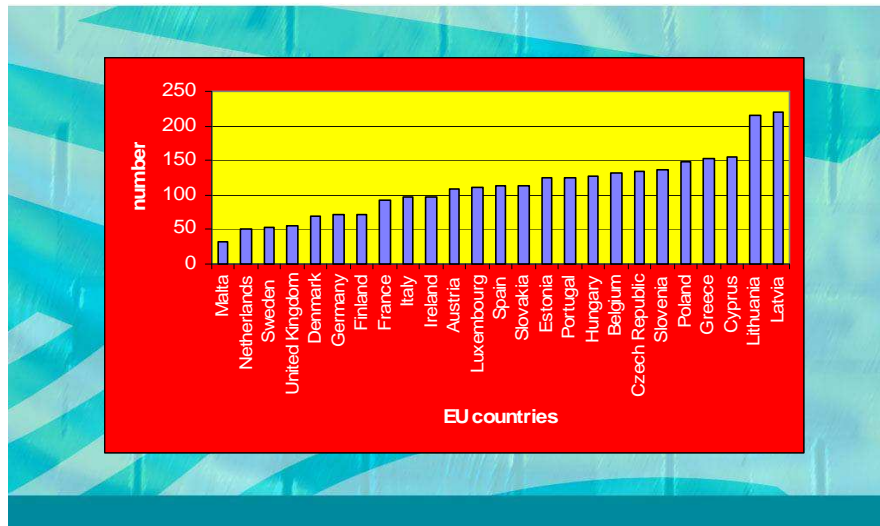


Table 1. Netherlands Ministry of Transport & Public Works graph of road fatalities per capita for various EU countries.

The study tour also visited the USA and it is evident in the USA that there is less progress on road safety programs compared to Australia and the Netherlands and this is reflected in the fatality statistics with the USA having approximately 145.5 fatalities per million (2004) This figure shows the potential for significant improvements in road safety there. An example of where improvement maybe considered was evident from discussions with the City of Leandro’s (San Francisco) Engineers on the treatment of local cross road intersections. It was expressed that there is still reluctance by the community for the use of roundabouts (called circles in this region) with many of the lower order road intersections controlled with 4 way stop signs. This contrasts markedly with the extremely high standard of safety that is achieved with the extensive provision of freeway networks for the major traffic corridors in the USA.

These statistics indicate that comparatively Australia does not have the best performance in road safety and that more could be done. Many European countries are also setting the bench mark for road safety even higher to achieve further significant improvements into the future. The Netherlands Ministry of Transport & Public works has set new road safety targets for 2020 at a 45% reduction in fatalities on the roads.

Whilst it is relevant to have awareness of how countries are performing at the macro scale it more relevant for municipalities to measure their performance in terms of serious injury crash statistics rather than fatalities which can be statistically misleading for short periods and small population bases. In Victoria, VicRoads provides these statistics and comparisons of similar municipalities benchmarked against population should be used for assessing road safety performance. Learning what works to reduce road trauma through networking with other Council’s with lower crash rates should be encouraged. The benefit of this study enables broader input to this challenge from an international perspective.

What this report endeavours to present are some of the initiatives that the Netherlands is undertaking and is proposing to use to achieve reduced road trauma. The report has a specific focus on similar rural road types and activities that Local Government Authorities in Victoria are involved with or responsible for.

1.4 Sustainable Safety Netherlands

On the study tour the Director of SWOV (Institute for Road Safety Research, The Netherlands), Mr Fred Wegman and a Senior Researcher Dr Letty Aarts of the SWOV presented their recently released publication “Advancing Sustainable Safety: National Road Safety Outlook for 2005-2020” report. This latest vision document recommends the future direction of road safety for the Netherlands. Even though the Netherlands has one of the highest levels of road safety in the world, the authority is still advocating the road toll and number of casualties are still too high a cost to society both in monetary terms and to victims’ loss of quality of life.



Study Tour presentation by Dr Letty Aarts- Senior Researcher SWOV

The premise of road safety that this Dutch vision was originally based on when it was first released in 1992 was that;

“In a sustainably safe road system, infrastructure design inherently and drastically reduces crash risk. Should a crash occur, the process that determines crash severity is conditioned in such a way that severe injury is almost excluded.”

This original proposition has been redeveloped and expanded to establish the following guiding **Sustainable Safety principles** to support the updated vision;

- Functionality of Roads
- Homogeneity of mass and/or speed and direction
- Predictability of road alignment and road user behaviour by a recognizable road design
- Forgiving environment for road users
- State of Awareness by the road user

1.5 Research Context

It is of assistance when considering new initiatives to understand how various countries manage road safety, implement policy and delegate responsibilities to the different levels of government. The governance of the Netherlands is not that dissimilar to Australia in regard to the responsibilities of the various agencies and levels of government. On the study tour some of these Netherlands government organisations and agencies were visited.

The national Ministry of Transport and Public Works controls 12 Provinces and 7 Metropolitan areas and establishes policies through a national traffic and transport plan. These provinces are equivalent to the state level in Australia. ROV Zuid –Holland a regional road safety agency controls over one of these provinces in the northern section of the traditional Holland area and acts as a regional authority over 82 municipalities with a population of 3.5 million.

SWOV, the Institute for Road Safety Research in the Netherlands was established by the Ministry of Transport and Public Works, the national automobile club, insurers and the vehicle industry. The outcomes from SWOV have a direct influence on the current national ministry’s Mobility policy for road safety implementation by the provinces and municipalities. This Mobility policy advocates the SWOV’s Sustainable Safety principles program.

1.6 Study Report Methodology

This report examines the Sustainable Safety principles and expands on observations in the Netherlands and other countries visited that specifically relate to issues of interest to Victorian Local Government Authorities under the following categories:

- Rural Road Safety
 - Road markings and standards matching road function
 - Speed limit management
 - Countermeasures for run off road crashes
- Bicycle Safety

- Network facilities/ Bicycle lane treatments
- Road Safety Education
 - Sustainable delivery of a primary school program
- Intelligent Transport Systems (ITS)
 - International proposals

An assessment of each initiative is made on it's relevance for application to Victorian municipalities. Conclusions are derived from assessment of each initiative with recommendations that direct actions towards local government authorities and relevant agencies.

2.0 INTERNATIONAL ROAD SAFETY INITIATIVES OBSERVED

2.1 Rural Road Safety

The recent Victorian State Government’s inquiries into rural road safety have made recommendations that seek to address the unacceptable level of road trauma on rural roads. These include;

- Inquiry into Crashes involving Roadside Objects, 2005
- Inquiry into the Country Road Toll, 2005
- Inquiry into Rural Road Safety & Infrastructure, 2002

In addition, there has been a Review of Victorian Speed limits by the State Government Speed limits Advisory Group.

The need for this research is evident as an example, in the Mornington Peninsula Shire where there are disproportionately high crash rates on local rural roads compared to other road types.

2.1.1 Road standards and markings to match the road function

Study tour experience

In the Netherlands a standardised approach has been adopted to assist motorists to readily identify the type of road they are travelling along by characteristic road markings and road standards. This translates to an expectation of predictable driver behaviour suitable for the standards and corresponding speed limits that match that particular road function. For example, they have adopted certain road markings and lane dimensions that identify in rural areas where there is likely to be agricultural machinery/vehicles travelling along the roads.

More generally a standard of road markings and lane widths has been designated to correspond to each level of road function in the road hierarchy as follows:

- First order/ Through roads
- Second order/ Distributor roads
- Local access

The SWOV principle of “functionality” underpins this initiative.

A notable feature of the standardised delineation is that higher function roads have a gap of varying width between the double centreline. These gaps endeavour to reduce head on crashes through providing separation to opposing traffic flows. The following examples are of delineation standards that distinguish the three levels of road function:

- Rural Main Roads are designated by painted double centre line gap of contrasting colour or a central barrier along with wider line widths of 150 to 200mm.
- Rural Distributor Roads have the double centre line gap ranging in width from 200 to 800mm with no infill painting. On these roads the width of the line marking is 100 to 150mm.
- Rural Access Roads (low volume –low speed roads) have no centrelines for roads generally 4.5 to 6.2 m wide with broken edge lines offset 250 mm to 400 mm from the edge of seal or alternatively where there is a need for bicycle lanes the edge lines are off set 1.25m to 1.50 m from the edge of seal (Refer Ch 2.2 Bicycle Safety).

Refer to following photographs and Table 2 of cross sections of various Dutch road functions.



Rural Through Road (Main Road) –Netherlands (Regionale stroomweg type 1 1x2 – refer to Table below)



Rural Distributor Road- Netherlands (Gebiedsontsluitingsweg 1x2 –refer to Table below)



Rural Access Roads – Netherlands (Erftoegangsweg type 1 – refer to Table below)

**DUTCH RURAL ROAD CLASSIFICATIONS
ROAD PROFILE STANDARDS
(Dimensions in Centimetres)**

**Bijlage I Overzicht wegtypen en
dwarsprofielen met Essentiële
Herkenbaarheidkenmerken**

Wegtypen buiten de bebouwde kom	Dwarsprofiel
Nationale stroomweg (NATIONAL ROADS)	
Regionale stroomweg type II 2x2	165 60 20 325 15 325 20 60 60 20 325 15 325 20 60 165 220 2200
Regionale stroomweg type I 2x1	165 60 20 300 20 60 60 20 300 20 60 165 220 1470
Regionale stroomweg type I 1x2 (MAIN ROADS)	30-60 20 295-300 15-20 20-80 15-20 295-300 20 30-60
Gebiedsontsluitingsweg type I 2x2	195 30 15 310 15 310 15 30 30 15 310 15 310 15 30 195 300 2140
Gebiedsontsluitingsweg type II 1x2 (DISTRIBUTOR ROADS)	195 30 15 275 15 80 15 275 15 30 195 750 1440
Gebiedsontsluitingsweg 1x2	15-30 15 270-275 10-15 10-15 270-275 15 15-30 20-80
Erftoegangsweg type I (ACCESS ROADS)	25-40 of 125-150 10 300-450 10 25-40 of 125-150 450-620
Erftoegangsweg type II	250-450

LEGEND FOR DIMENSION COLOURS:

- **BLACK** - Lane/Pavement Width
- **BLUE** - Line Marking
- **GREEN** - Painted Central Median Width

TABLE 2 Dutch road profile dimensions for the range of rural road functions from national freeways to minor access roads. Refer to preceding photographs for examples.

This initiative provides Dutch drivers with roads that have consistent standards for each different road function which enables the driver to readily recognize the road function by the visual queues e.g. delineation and then adopt the appropriate driving behaviour. For example on a rural distributor road the following road characteristics would be the norm:

- Priority (over intersections with lower functions)
- No bicycles (generally off road paths are provided)
- 80 km/h speed limit applies (Refer to Ch 2.1.2 Lower Speed limits)
- No overtaking permitted

This consistency in standards for each road function category translates to a reduction in the need for decision making by drivers and consequently reduces potential for driver error through readily adopting expected driver behaviour. Less driver error will ultimately reduce the occurrence of crashes. The principle of “predictability” by the SWOV is achieved by this initiative also.

Another innovation that has been implemented in the new City of Almere just outside of Amsterdam and was of particular appeal was the one where buses are given their own separate roads as a further example of the “functionality principle”. The development of Almere is at the early stages with present population of 180,000 expected to grow to 400,000 in the near future as an over flow for nearby Amsterdam. All infrastructure and transport needs have been extensively planned and provide the ultimate in level of service to meet commuter needs both in convenience and safety. This city provides a unique opportunity to observe what can be done with applying all the best practices available in transport, road safety and urban design appropriate for this location.



Roads solely for buses- City of Almere, Netherlands

2.1.2 Lower Speed Limits

Study tour experience

The Netherlands has the highest occurrence of crashes with serious injuries and fatalities on second order urban and rural roads although it's actual crash rates are lower than most other countries. These Dutch roads in the rural areas are typically two way undivided roads and most closely match to rural roads that are controlled by Victorian municipalities.

A speed regime based on crash research by the Dutch Road Safety Research Institute SWOV has been implemented on rural roads in the Netherlands and these limits range from 60-80-100 km/h for the various hierarchy of road functions. The second order roads are allocated the 80 km/h speed limit which corresponds to a speed where head on crashes are survivable taking into account a 20% reduction in travel speed before impact. The recognised researched survivable speeds from for various crash types are;

Head on (cars):	70 km/h
Side impact (car):	50 km/h
Side impact (car into pole/tree):	30-40 km/h
Pedestrian/car:	20-30 km/h

Obviously from this data there is still a safety deficiency with higher speed limits for side impact crashes into poles or trees creating the need for other complimentary crash countermeasures for run off road crashes. Refer to relevant section later in this report (Ch 2.1.3).

The 100 km/h limits are used on major roads that are able to provide the safety standards appropriate for higher speeds and the 60 km/h limit is for local rural access roads with low traffic volumes or with on-road cyclists. Similarly, a three level speed regime is also used in the Dutch urban areas of 30-50-70 km/h.

The **SWOV recognizes the difficulty of establishing speed policies but nevertheless the unequivocal fact remains that the higher the speed the higher the crash risk.** A combination of factors, suggested by SWOV, must be considered to achieve effective speed management including;

- survivability of crashes
- credible speed limits
- speed information to motorists on safe speeds
- physical speed reducing measures
- credible enforcement
- more dynamic speed limits
- intelligent speed assistance systems (future)

However, as the Dutch have already introduced lower speed limit regimes their next objective is to gain greater compliance and credibility for the speed limits.

2.1.3 Countermeasures for run-off road crashes

Study tour experience

The need to reduce prevalence of run-off road crashes on rural roads is an objective of the Dutch road authorities. Standard treatments used in the

Netherlands include shoulder sealing; guard rails and clear zones, these measures are similar to practices used in Victoria. These types of treatments are the basic tools that traffic and road safety engineers are using throughout the USA, UK and Europe with many examples cited. The implementation of mitigating treatments for run off road crashes often result from Road Safety Auditing programs that are undertaken to determine deficiencies in the road network.

These auditing programs are used in many countries and are becoming increasingly popular in the USA. Many of the traffic engineering presentations at the 2006 Kansas City APWA Conference focused on recent Road Safety Audit examples undertaken by various authorities and local counties. Surprisingly, the Netherlands has not yet embraced this process which maybe offset by the progressive nature of their road standards that are rigorously adopted throughout.

One innovative treatment being used in the Netherlands involves the laying of substantial thickness of synthetic sheeting on the road shoulder with a surfacing that assists where there are poor, soggy soil conditions. This treatment enables a suitable shoulder to be constructed for assisting errant vehicles to recover thereby reducing the potential for serious run off road crashes. Another product that is used by the Dutch is interlocking porous tiles that harden the shoulders to assist errant vehicles regain control. The advantage of this product is that grass can grow through it and therefore not change the appearance of the road width which otherwise with sealed shoulders could encourage drivers to travel faster due to the perception that the road is a higher standard.



Road safety improvement to road shoulders

The SWOV principle of “providing a forgiving environment for the road user” is displayed with this initiative.

2.2 Bicycle Safety

The increased focus by Victorian Authorities on cycling has been instigated by the Victorian Department of Infrastructure’s commitment to a long term funding program towards cycling paths and facilities. This is resultant from the rapid growth in popularity of all forms of cycling in our communities. Unfortunately, this brings along with it the need to manage the safety of cycling especially with on-road cyclists and the provision of suitable standards

on the roads. The incidence of cyclist crashes is significant with 43 cyclists killed, and 2,500 cyclists seriously injured in 2005 throughout Australia. This trauma will not decline without attention to road safety practices as more bikes are being sold than cars as recorded in 2005, 1 million cars were sold compared to 1.1 million bicycles in Australia. The need to reduce trauma levels for cyclists is also recognised in the Australian Transport Council, National Road safety Action Plan 2007 & 2008.

Network facilities and bicycle lane treatments

Study tour experience

The Netherlands has one of the most comprehensive bicycle facilities networks in the world which is justified by the large user group riding with over 13 million bicycles. The flat terrain of the Netherlands makes cycling easier but, counter to this there is a relatively cold climate and busier roads. However, with the high cost of owning a car, registration, fuel and with limited parking facilities the demand for cycling is still extremely high as an acceptable form of transport.

The high standard of off-road cycle paths combined with signalised crossings independently operating in parallel with pedestrian crossings provides an impressive standard of safety at intersections along their bicycle networks. These networks are also supported with extensive bicycle storage facilities in town centres with many located at train stations.



Separate signalised crossings for cyclists and pedestrians- Zandaam, Netherlands



Outdoor parking facilities near a station- Netherlands



Multi level bike storage- Amsterdam



Indoor bike storage garage, Zandaam station

An interesting development of traffic management has been established on the Dutch low volume, two way, access roads where **bicycles are given priority use of available road space over vehicles**. For this type of operation to be successful there needs to be a relatively high volume of cyclists and low vehicle speeds which is the case in the Netherlands. Refer to photograph below.



Bikes have priority over cars on low volume low speed access roads.

On-road bicycle lanes are only used where there is insufficient road reserve to accommodate off road pathways for example in towns where canals exist. The speed limit for traffic is lowered to 30 km/h in towns and a maximum of 60km/h in the rural areas to ensure safety for cyclists. The width of on road bike lanes ideally ranges from 1250 to 1500mm where this is physically possible.

The Sustainable Safety Vision from SWOV for cycling operates under the “homogeneity principle”. The objective of this principle is to separate different traffic types according to mass/vulnerability, speed and direction. Where this is not possible, roads have reduced speed limits. This principle is also used to justify provision of the physical separation of bikes from cars and to avoid conflicts at intersections.



Bike racks with efficient utilisation of space having alternate bikes up & down to avoid the clash of pedals

Throughout the world a greater use of bicycles is being encouraged. In Chicago, through the 2040 Regional Framework Plan produced by the North Eastern Illinois Planning Commission, an implementation strategy to promote cycling as an alternative mode of travel was included. Also, the Metropolitan Transportation Commission in San Francisco released in 2005 the Transportation 2030 Plan for the San Francisco Bay Area promotes cycling as an important means of mobility for the future. An ultimate extensive bicycle

trail network, parking facilities and bicycle lanes are planned to provide a complete network in San Francisco with an estimated total cost of US\$1.5 Billion. Funding this vision is earmarked as a challenge over the next 2 decades.

2.3 Road Safety Education

Road safety education has been dwindling in Victoria for many years especially at the primary school level even though authorities may claim there are many programs available the funding and resource commitment to deliver these programs is not evident. The recent release of the National Road Safety Action plan 2007 & 2008 by the Australian Transport Council is underpinned by reference to increased education in many of the recommended action plans.

Study tour experience

Sustainable delivery of primary school program

The decentralisation of road safety education delivery by the Dutch has been facilitated by regional scaled operations. One of these regional road safety authorities is the ROV- Zuid-Holland. Mr Hans Vergeer the regional manager of ROV Zuid-Holland has established an integrated approach to road safety covering engineering; enforcement and education. In the area of education there is a comprehensive approach across the whole community from pre-schoolers to the elderly. The specific program of interest was the permanent education programs that are operating throughout this region targeting primary schools that are managed and funded by ROV Zuid-Holland.



Presentation on the Study Tour by Mr Hans Vergeer –Manager ROV Zuid Holland

Mobile education unit:

The content of these education programs is not much different from those offered in Victoria but the significant difference is in the ongoing delivery arrangement set up by the ROV Zuid- Holland. The delivery of road safety education to primary schools is undertaken by volunteers that are paid small amounts along with having their expenses covered. Each unit is set up with a fully equipped enclosed trailer that has all the necessary materials for the range of education programs to be presented to the pupils. Six of these units operate in this particular region and stay for up to a week at each school depending on the school size. Each trailer is equipped with necessary training and display materials costing approximately AUS\$34,000 in total set up. A ROV staff member arranges the logistics of planning the trailer/volunteers programs and schedules with the objective to reach each school in the region annually.



ROV Road Safety Education unit -trailer



Delivering road safety education in primary schools in the Netherlands

SWOV recognises the importance of education in road safety and although it is not a panacea, it is an essential complement to other road safety intervention measures. It also recognises that road safety education has to compete with numerous other education priorities including crime, social norms and values, health etc., within schools and there is not the same high priority given to it by school administrations. The future challenge identified by the Dutch is to develop teaching formats that are appealing to teachers and pupils that are delivered through appropriate materials established with or using road safety expertise. Decentralising from government to a regional basis appears to have been successful in the Netherlands.

The Ministry of Transport & Public Works in the Netherlands has also recognized road safety education as an integral measure for funding in its national mobility policy along side the provision of safe infrastructure over the next 15 years.

2.4 Intelligent Transportation Systems

The recognition of advances in technology is appearing in Australian road safety strategies with the recommendation for example in the National Road Safety Action Plan 2007 & 2008 to develop support systems for advisory intelligent speed adaptation technology.

International proposals

Study tour experience

Some of the proposals that were presented whilst on tour were:

A. In San Francisco the Metropolitan Transportation Commission are developing a program for “Vehicle Infrastructure Integration” with communication capability between vehicle-to-vehicle and vehicle-to-roadside that will assist safety, mobility and commercial benefits. Some of the potential safety services being considered are;

- Intersection collision avoidance
- Violation warning
- Curve over-speed warning
- Road surface data

B. In the Netherlands the Ministry of Transport & Public Works has identified Intelligent Transportation System applications as the next significant advancement in road safety policy in the next 15 years. Some of the intelligent transport measures that the Ministry and SWOV are suggesting research into include the following;

- Intelligent speed adaptation for vehicles. This technology includes dynamic speed control that maintains a defined distance from the preceding vehicle or simply limits the maximum vehicle speed in certain situations.
- Advanced driver assistance systems. These operate to provide advance warning of a braking vehicle ahead through electronic detection and can provide a 10 times quicker reaction time compared to human capabilities and help to avoid rear end crashes.

3.0 RELEVANCE OF INTERNATIONAL INITIATIVES TO VICTORIA

3.1 Rural road safety

- ***Road standards and markings to match the road function***

In Victoria most municipalities have established their own set of road hierarchy standards that have been broadly based on many similar recognised sources including;

- VicRoads Road Design Guidelines
- Austroads Standards and
- Road Management Act

These standards establish road/lane widths; horizontal & vertical alignment and design speeds that are delineated with a range of markings and furniture with one of the objectives to achieve safe and appropriate driver behaviour. These guidelines and standards are open to wide interpretation and application by a large number of municipal engineers and results in many varied and inconsistent operating conditions with differing road characteristics potentially leading to confusing driver experiences. This is further compounded by widely varying ongoing maintenance practices that over time that further tend to modify safe operating conditions.

The Netherlands could be generally considered as a busier place on the roads than Victoria with more vehicles and bikes using a shorter length of roads in a smaller overall area. The following statistics detail these differences;

	Netherlands	Victoria
Population	16.3 million	5 million
Area	34,000 sq km	227,000 sq km
No. of Vehicles	6.9 million	4.4 million
Road length	120,000 km	200,000 km
Bikes	13 million	1 million

In addition, there are some general differences between Australian and Dutch road networks particularly in regard to local rural roads in the Netherlands. Most residents live within town centres and therefore, there are a low number of properties with direct access onto rural distributor roads. The distributor roads connect to the “First order- though roads” more readily and do not run in “parallel” as often as occurs in rural Victoria where some of these parallel roads are of considerable length. This characteristic of rural Victoria is generally the case where there are larger areas and distances to be covered by the networks. Nethertheless, some closer comparisons exist with the rural roads found in the outer fringes of the Melbourne Metropolitan Area in

municipalities known as the “Interface Councils”. The rural roads in these areas are generally shorter in length and link to the arterial network more readily as is the case in the Netherlands. It is therefore reasonable to propose that the operational hierarchies and vehicle priorities developed in the Netherlands could readily be applied in these localities.

As currently experienced in the Mornington Peninsula Shire (on the south east fringe of Melbourne) a disproportionately high number of crashes are occurring on the local rural roads. Most of the crashes are single vehicle run-off road crashes. This problem could be assisted by application of the Dutch agency SWOV’s principle of predictability which in this case lead to an improvement in the consistency of road standards and will result in less errors occurring because appropriate driver behaviour will be encouraged.

Where more consistent and predictable conditions can be developed in the road standards less ad hoc decision making will have to be made by drivers to determine safe travel speed; or the safe opportunity to overtake; or the likelihood of other more vulnerable road users like cyclists then greater safety will be facilitated.

It is evident in Victoria that there is a need for more consistent standards to assist drivers and other road users to travel more safely. The Netherlands strategy for matching road standards to various road functions is a good model to base a review on by Victorian municipalities. There is also a need to consider the consistency of standards on arterial roads managed by VicRoads and significant local roads managed by Councils. The driver may not appreciate that there are different highway authorities for these roads and although they may have in all essence, similar appearances, they have significantly different functions in many cases. Whilst it is recognised that a great range of factors can determine the road standards it should be an overriding objective that the criteria for simpler driver decision making should be the higher priority. There is a need to achieve consistent road standards to match functional hierarchy rather than to subordinate the principles of predictability to localised design requirements or budget constraints that will lead to inconsistencies.

The Victorian State Government Inquiry into Rural Road Safety & Infrastructure, 2002 made similar recommendations on the need for a uniform approach across municipalities towards the management of roads and consistency of design standards for established road classifications to provide less confusion to motorists and therefore, a safer local road network. This Inquiry also used the Netherlands as an example of where emphasis is placed on the functional use of the road system.

- ***Lower speed limits***

As previously discussed, rural roads in Victoria have a significant proportion of the crashes. Speed management needs to be used as part of a proactive approach to assist with the reduction in serious injury crashes. The default 100 km/h speed limit applies to most rural roads regardless of the road

standards or function. Whilst there is currently a State Government review of speed management in Victoria there has to be significant change of focus by municipalities towards providing for safety of their communities through the more effective use of speed management. To set speeds on the survivability of various crash types (head on/side impact) is the ideal objective however, there also needs to be a realistic compromise to balance mobility expectations and driver compliance with an appropriate speed regime. It is necessary to balance effectively between the introduction of higher road standards including mitigating treatments along road sides to reduce crash severity with speed management to achieve credible justification for reduction of speeds. This also needs to be part of an overall network approach to speed management where there are also appropriate designation of higher speed roads that have suitable higher standards. This proposal is consistent with a road safety risk management approach to determining suitable speed regimes for various standards/functions of roads to effectively improve road safety.

The experience of the Netherlands has seen resultant crash reductions with lower speed limits however, as stated earlier their road network has many different characteristics. Notwithstanding, the Victorian rural road networks close to urban areas including interface councils and adjacent to regional centres should apply the Netherlands model as this where road conditions are the most similar. The Mornington Peninsula has an extensive network of over 40 sealed local rural roads with a combined total length of over 140 km. However, the average length of a local sealed rural road is only 3 km and has a speed limit of 100 km/h in most cases. This would suggest that mobility is not a significant factor on these rural roads. Lowering speeds from 100 km/h to 80 km/h would only increase the travel time up to a minute at worst on these roads before reaching the nearest main road however, it would significantly improve road safety.

The State Government Inquiry, 2005 into Crashes involving Roadside Objects recommends that lower speed limits be used for Victorian roads where the level of safety provided by both roadways and roadsides is low and modifications are not currently possible. Also, the Monash University Accident Research Centre report on Cost-Effective Infrastructure measures on Rural Roads, 2004 focuses on countermeasures to rural road crashes. The consequences of drivers not adapting safe travel speeds to roads that have continually changing road environments and inconsistent design standards are that rural roads have higher crash rates than any other road type.

Research by ARRB has determined that reducing speed limits from 100 km/h to 80 km/h should reduce injury crashes by 15%. A submission for lower speed limits on local rural roads was made to the State Government Review of Victorian Speed Limits by officers of the Mornington Peninsula Shire. These submissions are still under review by the Speed Limits Advisory Group and VicRoads.

It is Council's responsibility to achieve a more appropriate level of road safety risk management to assist with addressing the high occurrence of serious

injury crashes on these roads therefore consideration of speed reduction is necessary.

- ***Countermeasures for run off road crashes***

Run off road crashes are a predominant crash type particularly on rural roads throughout Victoria. Most municipalities are already using road safety auditing to determine effective programs towards reducing the severity of these crash types. Additional innovative methods that can also be proven to be cost effective that can be added to the present treatments should be considered including trialling different shoulder stabilising products where poor soil conditions exist.

The Mornington Peninsula Shire for example has a section of road way with a high crash rate without sealed shoulders that is through a swampy area that in the past has been difficult to construct on with traditional techniques. This road should be considered for trialling a similar product to the thick synthetic sheeting used by the Dutch.

Shoulder sealing to keep vehicles on the road is a recommendation from both recent State Government Inquiries; into the Country Road Toll and, Crashes involving Roadside objects.

3.2 Bicycle safety

The Melbourne CBD is the main commuter destination for cyclists in Victoria while most outer metropolitan town centres have cycling mainly associated with schools and shopping. There is also high demand for recreational cycling throughout the state on the many off-road cycle paths and trails. Another increasing trend of “race training cyclists” that use on-road facilities is now apparent in outer metropolitan/rural areas.

There are still many missing links in the bicycle network that need attention and priority is being developed through State funded programs to address these. It is a concern though, that cyclists are still the poor cousins compared to motorists when on the road. Most bike lanes end at squeeze points and intersections where the most vulnerable situations exist. Continuation of assistance to cyclists through these potentially hazardous situations, as is the norm in the Netherlands, would be a beneficial objective of Victorian municipalities.



Cycle lanes in the Netherlands do not stop where roads narrow or at intersections

On rural roads particularly in Interface Council areas there is a fast growing trend for recreational riding and more serious training for cycle racing occurring. The mix of cyclists with higher speed traffic on lower standard roads is potentially high risk. To develop suitable off-road pathways throughout these areas is often too costly and therefore suitable standards for on-road bike lanes are required. In general sealed shoulders are needed with minimum width of around 1200mm however, presently there is no action with regard to appropriate speed management.

In the Netherlands 60 km/h is set as the maximum speed where there are on-road cycle lanes. In rural areas of Victoria the normal speed limit is 100 km/h. As discussed previously with speed management on rural distributor roads it would be beneficial if a lower speed limit of at least 80 km/h were used to complement on-road cycle lanes to improve safety. This is especially needed where high demand for cycling is occurring such as in the Interface Council areas around Melbourne and possibly around other regional centres across Victoria.

The Mornington Peninsula Shire is currently developing a bicycle strategy with the vision to enhance the needs of cycling for all user types both on-road and off-road. Input from all stakeholders including Bicycle Victoria, bicycle user groups, schools, Amy Gillet Foundation, VicRoads and the general community to ensure all relevant needs are considered with an objective to develop strategies and action plans that target funding opportunities as for instance with the current Department of Infrastructure program for cyclist facilities.

Encouraging commuter cycling is becoming a serious consideration for reducing congestion around schools and for future transport planning of town centres. In the Mornington Peninsula Shire where population growth and demand on schools has increased but the provision for increased parent parking is limited then programs to encourage students to walk and cycle to school are being implemented. Complimentary programs to provide adequate shared paths and suitable facilities for pedestrians and cyclists are on going commitment by the Council. A significant component of the Melbourne 2030 structure plans being created for town centres in the Mornington Peninsula Shire devote to the planning of cycling facilities to balance the travel modes to avoid future car dominance and potential congestion. The existing Dutch

cycling facilities and standards are inspirational to this vision to encourage more travel by this healthier travel mode with an appropriate level of safety.

3.3 Road safety education

The delivery of road safety education within primary schools in Victoria is virtually non-existent on a formal basis. The Mornington Peninsula Shire is possibly one of the most proactive municipalities having 35 primary schools with having attempted to provide a road safety education program over the past 5 years that involved 10 schools each year for a 1 day session per school. This limited program was coordinated and delivered by Council officers through minimal funding support from VicRoads. At present the continuation of this program is in review being dependant on if VicRoads continues to supply the basic kits made up of educational tools to assist the facilitators in these programs. There has not been any serious government support towards road safety education for a long period. The only current programs that are facilitated are those provided by motivated local governments which have been granted limited, project specific funding from State Government or have provided their own funding resources.

The road safety education programs that municipalities do undertake usually only have small funding levels from State government and minimal support from the primary schools. Therefore, the programs are only run for a limited time frame and then generally terminated. This unfortunate scenario could be improved by considering the permanent delivery of road safety education programs similar to the Dutch model undertaken by the regional authority ROV Zuid-Holland. This approach would sustain the programs and enable greater numbers of students to be exposed to road safety education rather than the present ad hoc approach. Pooling resources between regional groups of municipalities would be a cost effective method to enable the viability of this type of program. A pool of volunteers possibly for example of ex-teachers, engineers and police could be established to service the program.

A successful example of a similar type of approach that already operates in Australia is undertaken by the Gold Coast City Council where a permanent program is run through primary schools in that municipality. “Zero the Hero” is a theatre performance that the program is centred around and has received state recognition through road safety excellence awards. Obviously not all municipalities can afford the budget that is necessary to drive this type of program so a more regional approach as discussed above should be viable. Many municipalities have close affiliations with their regional road safety committees and other relevant agencies and these could be approached for support.

What is of concern is the preoccupation with questioning of the value of road safety education. Admittedly, this question can not be categorically answered but there is significant evidence from world leaders in road safety such as the

Netherlands that is beneficial to maintain a strong ongoing commitment for the longer term towards road safety education as a necessary complement to other road safety measures.

3.4 Intelligent transportation systems

In recent times in Victoria an early example of utilising advancements in technology is the widely used speed alert mobile trailers that have proven a cost effective tool in the management of speeds on local roads. Any further developments that become available in ITS that assist road safety should be seriously considered by Councils.

The State Government Inquiry into the Country Road Toll recognises that driver assistance technologies have a significant future to play in reducing road trauma. These technologies should be encouraged but subject to strict standards and codes of practices to ensure safety on our roads.

4.0 CONCLUSION

With the ongoing challenges posed to Victorian Government with the many inquiries and the review of Victorian speed limits to improve road safety performance it is appropriate that all new approaches are considered. This report gives specific recommendations based on international initiatives that are relevant to Victorian Municipalities that should be considered for implementation. Rural road safety is currently a priority on the agenda of State Government and VicRoads, in conjunction with Local Government. Both these levels of governments and VicRoads should be encouraged to give consideration to the initiatives being implemented in the Netherlands.

Research from the Netherlands Institute of Road Safety Research SWOV has established the need for predictability of road designs to reinforce subsequent predictable road user behaviour resulting in less driver error and consequently less crashes. The challenge is to transition existing roads towards road standards that are more consistent with their function whilst recognising the potentially high costs involved. A more readily achievable interim objective is to have more recognizable and consistent markings and delineation for each road function type that facilitates predictable safer driver behaviour.

The greatest gain from these initiatives will be in the outer metropolitan fringe municipalities where drivers frequently travel on both arterial corridors usually controlled by VicRoads and local rural roads controlled by Councils. Road functions and standards change quickly in this region and drivers do not adjust their behaviour sufficiently to match the lower standard roads and different functions therefore potentially increasing risk to all road users.

Research both internationally and here in Victoria shows that lower speed limits will reduce the frequency and severity of crashes. The Dutch speed regime of 60-80-100 km/h has effectively assigned speed limits to the various road functions with the distributor local rural road equivalent in the Netherlands having an 80 km/h speed limit. Whilst recognising the general differences between the Netherlands and Victoria in terms of geographic sizes and traffic densities it is still suggested that a strategy to reduce local rural road speed limits to 80 km/h would be appropriate. This could be commenced in and perhaps linked to rural areas of outer metropolitan fringe councils where road standards and functions would have similarities to the Netherlands. A current recommendation of the Victorian Speed Limits Review by the Speed Limits Advisory Group is for VicRoads to consider the need to reduce speed limits on high speed rural roads where safety problems are demonstrated is consistent with the above proposal.

The Netherlands displays the ultimate in facilities for cyclists which could be inspirational goal for Victorian municipalities to achieve a healthier and safer alternative travel mode to encourage more cycling. Improvement to road standards with suitable bicycle lanes and reduction in speed limits on local rural roads will provide improved safety for cyclists. Also, the provision of convenient and secure bicycle storage facilities at potentially high demand locations will encourage increased cycling. It is obvious from the Netherlands

experience that to sustain the high demand for cycling then the safety and standard of facilities needs to be high also.

A coordinated and sustainable approach from all stakeholders to road safety education in primary schools is needed to improve the currently inadequate and ad hoc delivery of programs. Victorian Councils can learn from the Dutch model that has devolved responsibility to a regional level and provides a relatively cost effective, ongoing program. This will need initiative and leadership to be shown from municipalities to display to the state authorities the commitment and potential benefit in order to gain broader support. This has been evident from the secondary road safety education program- “Fit to Drive” which commenced in the Mornington Peninsula region and is now being supported as a state wide program by VicRoads.

Innovations in Intelligent Transportation Systems are potentially the next significant advancement in road safety. As local governments are responsible for managing a large proportion of the road network then they should be involved in the research and implementation. Any initiatives that improve the effectiveness of managing traffic and improve the driver awareness and ability to control his vehicle that will lead to safer roads should be considered.

There is need to facilitate awareness and the development of the recommendations of this report through the relevant organisations such as the IPWEA and encourage the involvement of Victorian municipalities.

5.0 RECOMMENDATIONS

Rural road safety recommendations

- **Greater consistency for rural road standards and markings to match the road function**

The adoption of more consistent road markings and delineation should be introduced for Victorian local rural roads with the priority on the most needed outer fringe municipalities to Melbourne where the transition from urban to rural is a frequent occurrence. An example of this would be to have coloured (yellow) edge lines and raised reflective pavement markers for all local rural roads that have similar function and standard. A further longer term objective of Victorian municipalities should be to collectively achieve greater uniformity with road design standards particularly with road widths that match the function and classification of the road. The Dutch road standards are an indicative working model that can be a reference for this initiative.

Councils could be encouraged to adopt a set of markings and functional design standards through the review and upgrade of their Road Management and Road Asset Management Plans. The Institute Public Works Engineering Australia could provide the forum for a promotional awareness and development seminar for the development of a set of model standards. Funding for this forum should be sought from VicRoads or the Department of Victorian Communities.

- **Lower speed limits on specific rural roads**

Victorian Local Governments and particularly those being on the outer fringe to Melbourne or those municipalities with rural areas close to regional centres should review the appropriateness of default 100 km/h speed limits on lower volume and lower standard rural roads and advocate to VicRoads for reductions to speed limits to improve road safety risk management. A speed limit of 80 km/h on these road types is recommended to achieve an effective improvement to road safety risk management. For other rural roads with greater lengths where mobility is a significant factor then risk management compromises may need to be considered with relation to appropriate speed limits. The priority aim for local rural roads should be to establish safer but credible speed limits suitable for the road standard and function. This advice will be channelled into the development of the Mornington Peninsula Shire Rural Roads Speed Management plan as part of the overall network strategy to road safety risk management.

- **Shoulder treatment countermeasure for run-off road crashes**

Innovations with thick synthetic sheeting for road shoulder treatment as undertaken by the Dutch in poor soil conditions should be considered for use on local rural roads by Victorian Local Governments to assist with the provision of more forgiving road side conditions for errant drivers. Investigations will be undertaken to trial this in the Mornington Peninsula Shire particularly where road safety conditions would benefit from construction of driveable shoulders that otherwise would not have been effectively achieved through normal construction practices.

Bicycle safety recommendation

- **Safer cycling for rural roads with higher standards for on-road bicycle lanes and accompanying lower speed limits**

That Victorian Councils need to develop strategic plans for the provision of cycling facilities in an endeavour to make this healthier form of transport safer and appealing to all types of cyclists as is experienced in the Netherlands. In municipalities with rural areas that have high demand for on-road cycling then sealed shoulders should be introduced with a minimum width of 1.5m and consideration given to the lowering of speed limits to a maximum of 80 km/h to improve safety for cyclists. Improvements to safety with similar facilities to those provided for pedestrians should also be introduced at intersections or mid block on roads where conflicts with vehicles occur in locations where there are high demands for cyclists on either off-road cycle paths or on-road bicycle lanes. Increased provision of bicycle storage and parking should be provided especially in town centres and at modal interchanges for greater security and convenience. These actions will be incorporated into the development of the Mornington Peninsula Shire Bicycle Strategy.

Road safety education recommendation

- **Better approach to the delivery of road safety education in primary schools**

Victorian municipalities advocate and facilitate the introduction of road safety education into primary schools on a sustainable basis through pooling and sharing funding support with other municipalities and agencies. The Dutch program utilising customised road safety education trailers and staffed with volunteers is an effective example to consider. The establishment of the support of VicRoads initially at a regional level and the Department of Education & Training towards this initiative will be required. This initiative will be investigated for inclusion in the updated 2007 Mornington Peninsula Shire Road Safety Strategy as a key action towards road safety education programs.

Intelligent transportation systems recommendation

- **The need to recognize that intelligent transport systems will have a significant role in the future of road safety**

That Victorian municipalities embrace the future potential of ITS applications and consider any opportunities for the integration of these applications into the improvement of road safety of local roads. The State authorities will need to ensure coordination and standardization on the broader scale however, this does not prevent Local Government from being innovative and proactive in this inevitable new direction in safety and transportation. Initiate a brief for monitoring of international ITS developments in conjunction with VicRoads and IPWEA.

Promotion and development recommendation

- **Facilitation of Study Tour Report recommendations by the Institute Public Works Engineering, Australia**

In order to promote awareness and develop the initiatives in response to the to the recommendations of this study tour report the IPWEA facilitate a “special interest group” for traffic and road safety engineers under the IPWEA. That this group would support and lobby Councils and VicRoads to adopt and implement these measures.

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- ROV Zuid –Holland (Regional Road Safety Bureau South Holland) www.rovzh.nl
- Municipality of Almere, The Netherlands www.almere.nl
- Metropolitan Transportation Commission –San Francisco Bay Area www.mtc.ca.gov
- Chicago Metropolitan Agency for Planning www.catsmpo.com
- City of San Leandro www.ci.san-leandro.ca.us
- Mornington Peninsula Shire Council www.mornpen.vic.gov.au

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