2025 Fellowship Group Project

ENHANCING DRIVER AWARENESS VIA NAVIGATION PLATFORMS– Group 3

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1. EXECUTIVE SUMMARY

Australia continues to face significant road safety challenges, with over 1,300 fatalities and 44,000 serious injuries annually (1). Vulnerable road users and road workers are disproportionately affected, particularly in regional areas and active work zones. This report responds to this important issue by proposing a scalable, technology-driven solution to enhance driver awareness and compliance in roadwork zones.

The research completed identified that while numerous technologies exist to improve road safety, many are underutilised or disconnected from the everyday driver experience. Survey results revealed that driver compliance is heavily influenced by visibility, enforcement, and context, yet current navigation platforms lack proactive, real-time integration of work zone alerts.

To address this, the report proposes a cross-platform enhancement to mainstream navigation apps (e.g., Google Maps, Apple Maps, Waze) that embeds real-time worksite alerts into route planning and live navigation. This solution leverages existing physical and digital infrastructure and data sources (including community campaigns) to deliver timely, context-rich information to drivers, improving situational awareness and subconsciously encouraging safer behaviour.

Key features include:

- **Advance Worksite Alerts** with voice and visual prompts that are not dissimilar to existing voice and visual prompts.
- **Smart Detour Logic** to manage congestion and improve safety (e.g., through in-motion real-time voice prompts).
- **In-Zone Behavioural Nudges,** such as persistent speed limit displays and timely traffic advice, similar to notifications about speed camera detections.
- **Operational Integration** through standardised data formats and real-time syncing.

The solution is designed to be cost-effective and rapidly deployable. It aligns with Roads Australia's safety priorities and supports international goals, including Australia's Vision Zero. Stakeholder and community engagement with industry leaders has confirmed both feasibility and strong interest in implementation.

The solution's objective is to influence driver behaviour around worksites in a proactive manner (i.e., pre-route planning) as well as subconsciously while a driver is in-vehicle, without requiring a driver to need to download an app (or any new app) or search a website(s) to find out what road works may be occurring. Rather, the solution enhances existing technology by adding features specific to road works, utilises existing publicly available data about road works and therefore has the opportunity to encourage more accurate and continual publication of works from industry and government bodies.

In summary, the proposed solution offers a cost effective, practical, human-behaviour centred approach to improving road safety by enhancing the way drivers interact with navigation technology, turning everyday tools into proactive safety assets.

2. INTRODUCTION

2.1. THE ROADS AUSTRALIA FELLOWSHIP PROJECT

The 2025 Roads Australia Fellowship Project explores the theme of safety by posing the important question of how to enhance road user and road worker safety across the transport infrastructure sector. The topic aims to investigate local and global innovations in safety infrastructure, share evidence-based improvements, and identify opportunities to embed best practices into Australia's traffic management systems. Each project team is tasked with developing solutions that address safety challenges throughout the asset lifecycle, considering diverse user groups and evolving technologies.

The project initiative is deliberate in targeting Roads Australia's goals for reforming policy, including:

- Demonstrating and implementing road safety infrastructure that delivers best value outcomes;
- Embedding road worker safety guidance into national systems and standards; and
- Raising awareness and driving policy change to improve safety for all who interact with the road network.

2.2. TOPIC OVERVIEW

In October 2024, Roads Australia published Accelerating Australia's road safety goals, outlining five key strategies to reduce death and trauma on our roads: managing road function through a movement and place framework; recognising infrastructure's role in minimising risk; aligning countermeasures with road type and function; leveraging real-time data and technology to target (2).

These strategies are critical in light of sobering statistics (3) (4):

1,300 deaths

Each year, approximately 1,300 people die on Australian roads, highlighting the urgent need for enhanced safety measures.

44,000 injuries

Annually, 44,000 people suffer serious road injuries, highlighting trauma's scale and need for prevention.

5.6% rise

In 2025, vulnerable road user deaths increased by 5.6%, signalling urgent attention to protect these groups on Australian roads.

70% regional deaths

In NSW, nearly 70% of the 334 road fatalities in 2024 occurred in regional areas, emphasizing targeted safety initiatives there.

40% speeding

Speeding caused 40% of NSW fatalities in 2024, showing the need for better speed management.

954 workplace deaths

Between 2019-2023, 954 work-related deaths were recorded nationally, with many linked to the road construction sector's risks.

71% Vehicle Incidents

Vehicle incidents represent 71% of workplace fatalities in road transport, construction, and civil engineering sectors.

18 Fatal Crashes

Road work zones see 18 fatal crashes & 245 serious injuries yearly, often under-reported safety issues.

Economic & Human Cost

Road trauma and workplace incidents impose profound human and economic costs, calling for urgent reforms to save lives.

2.3. PROJECT OBJECTIVES

To contribute meaningfully to Roads Australia's 2025 safety agenda, our proposal aims to deliver:

- high advocacy potential across Roads Australia's membership, and
- scalable impact on road safety through improved driver experience in work zones.

Our initiative aligns with the project brief in the following ways:

CAPACITY
Enhances driver engagement and compliance in work zones, improving traffic flow and reducing risk.
01

RESILIENCE
Supports safer navigation through temporary environments, reducing stress and confusion for drivers.
02

IMPACT
Small behavioural shifts in high-volume zones can lead to significant reductions in crashes and injuries.
03

IMPLMENTATION
Builds on existing technologies and platforms, enabling rapid deployment with minimal cost.
04

POTENTIAL REACH
Applicable across national road networks and adaptable to various work zone types.
05

INTEGRATION
No infrastructure upgrades required; focus is on smarter use of current systems.
06

EFFICIENCY
Improved compliance and awareness lead to smoother traffic and reduced delays.
07

CROSS-SECTOR
Can be adopted by contractors, government agencies, and industry partners to improve safety outcomes.
08

Alignment to RA policies and objectives:

- Advances the 'Stay Safe' national priority by reducing trauma in high-risk work zones.
- Supports data-driven safety interventions through real-time driver feedback and engagement.
- Encourages continuous improvement by trialling scalable, evidence-based solutions.
- Contributes to reduced congestion and improved air quality through better traffic management.

Other benefits: Enhanced safety, reduced road trauma, and improved health outcomes for workers and road users alike.

3. RESEARCH AND FINDINGS

3.1. RESEARCH METHODOLOGY

The research methodology was developed through a staged and targeted approach, focusing on identifying practical interventions to improve road user and road worker safety as shown in Figure 1 below. It draws on global and national policy frameworks and prioritises strategies that can be embedded within existing infrastructure and digital platforms. By examining behavioural insights, technology integration, and stakeholder engagement, the methodology supports the development of scalable, evidence-based solutions to reduce harm in high-risk environments such as on-road work zones.

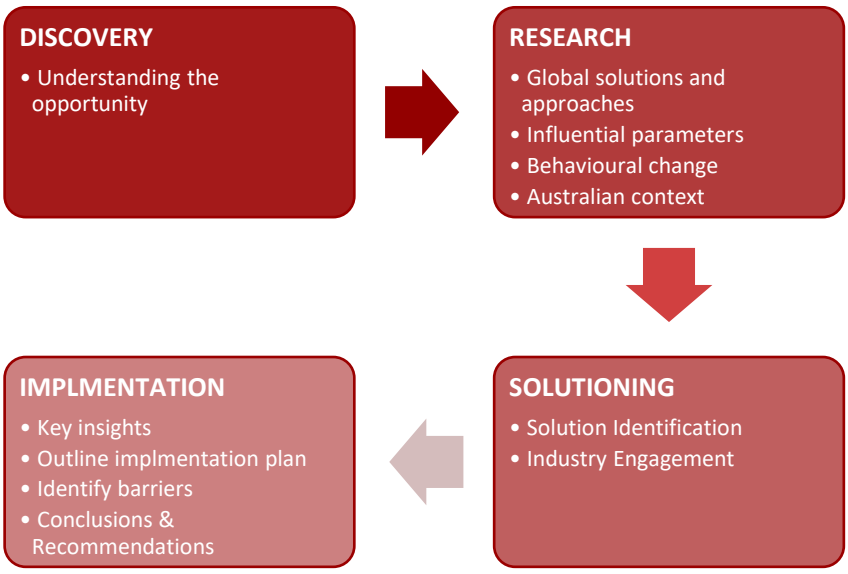


Figure 1 - Research Methodology

3.2. ROAD SAFETY LANDSCAPE

Road safety remains a persistent public health challenge and priority in Australia and internationally. On 31 August 2020, the United Nations (UN) General Assembly adopted resolution A/74/299 on Improving Global Road Safety (5). The resolution includes provisions for the establishment of a Second Decade of Action for Road Safety 2021-2030 (launched on 28 October 2021) to reduce road

deaths and injuries by 50% by 2030. It also contains specific provisions encouraging the adoption of policies and measures supporting including accelerated adoption of standards mandating inclusion of new vehicle technologies (5). Similarly, in Australia the current policy landscape is shaped by the National Road Safety Strategy 2021–2030, which aims for "Vision Zero", zero deaths and serious injuries on Australian roads by 2050.

The continued focus on road safety is unsurprising when most countries are presented with statistics that show a year-on-year increases in the number of road accidents and fatalities. For example:

- In Victoria, Australia, as of September 2025, 217 lives have been lost on Victorian roads alone (6), this is an increase of 4.3% from 2024 (7). On a national basis for the 12 months ending August 2025, the national road fatality rate was 4.9 deaths per 100,000 people, which is 2.8% higher than the same time last year (8);
- in the United Kingdom there were 343 motorcycle fatalities in 2024, which equates to a 9% year-on-year rise (9); and
- in India there has been a 4.3% increase in the number of road accidents when compared to the same time in 2024 (10)

While there are varying causes and contributors (e.g.: speeding, drink-driving, use of seatbelts, age of road user, road location etc) to road accidents and fatalities, it is noted that the increases in road accidents and fatalities and the need for accelerated action and improved implementation, is still increasing despite decades of dedicated and targeted research progress in areas such as law enforcement, community campaigns and initiatives, and the growing use of technologies such as in-vehicle Advanced Driver Assistance Systems and Smart Traffic Lights.

In September 2025, Group 3 undertook a survey to try and gauge drivers' perception and experience of road works, and driving around road works site. Key findings from the survey (of approximately 100 people) revealed the following:

- 43% of participants stated that road works were only annoying when they were "in a rush" or on a route they were taking;
- Participants perception of road works and their likelihood to comply with changed conditions as a result of road works is materially influenced by the visibility of whether works were actually happening;
- 19% said they were only likely to comply depending on the circumstances (e.g.: police presence, unfamiliar with the road);
- Participants ranked the presence of authority (e.g.: police) or enforcement (e.g.: speed cameras), followed closely by harsher penalties (e.g.: fines) and an incentive scheme that rewards good driving as the key factors which would encourage safer driving and speeding.
- Availability of technology (e.g.: smartapps) were ranked as the least effective factor in influencing participants to drive safer and reduce speeding.

Please refer to Appendix A for the survey questionnaire and results.

3.3. KEY TECHNOLOGIES AND STRATEGIES

Specific to safety and driver experiences in and around on-road work zones, Table 1 summarises some of the key technologies and enforcement strategies used internationally, their functions, and the specific risks they address, providing a clear overview of actionable solutions.

Table 1 - Key Technologies and Strategies

Item	Technology	What It Is	What It Targets
Road Features and Furniture	Photoluminescence Line Marking	Self-illuminating line marking showing changed conditions in poor lighting	Work zone set up (poorly lit area) Driver behaviour and awareness (11)
	In Pavement Lighting Line Markings	Adjustable pavement lighting to dynamically control traffic	Driver behaviour and engagement (12)
	Road Environment Pace Lighting	Adjustable road environment lighting to dynamically influence traffic behaviour i.e. mounted on bollards, barriers, etc.	Driver behaviour and awareness
	Musical Road Rumble Strips	Rumble strip or contour installed to the road to play a melody at a pre-determined speed when vehicle drives over.	Driver engagement and compliance (13)
Road Delineation	Smart Bollards (data collection)	Real-time and adaptive bollards that collect data (e.g. speed, traffic, lighting) and adjust dynamically to conditions.	Work zone setup and effectiveness (prior and during works) (14)
	Smart Barriers	Moveable work zone barriers with added possibility for basic real time data collection	Worker exposure to traffic and work zone setup (15)
	LED Barrier Screen	LED customisable barrier screen	Driver experience and engagement through work zone (16)
Signs and Pavement Markings	Optical speed bars	In Japan, transverse lines that visually compress as drivers approach creates a perceptual illusion that encourages speed reduction.	At the approach to intersection and toll booths
	Retroreflective raised pavement markers/temporary retroflective tape	In Victoria and New South Wales, trials involving raised pavement markers and temporary reflective tape improved driver compliance with temporary lane changes and reduced lane drifting and near-miss incidents	Work zone set up (poorly lit/unlit area)
AI and Auto Detection	AI Safety Cameras	Detect phone use, speeding, and seatbelt misuse via smart imaging	Driver violations improving compliance
	Advanced Driver Assistance Systems (ADAS) (17)	Vehicle automation (e.g. braking, lane assist, pedestrian detection)	Collision prevention
	Smart Traffic Lights (18)	Signals that adapt based on real-time data, including cyclist detection	Safety for vulnerable road users
	Smart Tires	Tires sensing rain/ice, integrating with braking systems	Hazard alerts leading to safer stopping
	Road Condition Monitoring (19)	Drones/AI cameras detecting cracks, surface defects	Proactive hazard mitigation

Item	Technology	What It Is	What It Targets
	Driver Monitoring (e.g. Smart Eye)	In-vehicle cameras tracking attention, fatigue, and distraction	Prevents drowsy/disengaged driving
	Live Traffic Updates (20) (21) (22) (23) (24) (25)	Phone Apps and interactive websites setting out worksites, hazards and upcoming works	Proactive hazard mitigation & Driver awareness
Enforcement	Legislation / Law setting out WHS obligations on Principal Contractors (26)	WHS Legislation (e.g., Work Health and Safety Regulation 2011 (Qld)) sets out Principal Contractor obligations on worksites.	Construction Project owners/managers are to, among other things, manage risks associated with traffic to ensure the safety of all persons.
	Legislation / Law regarding speed limits (27)	Legislation (e.g., Road Safety Road Rules 2017 (Vic)) which makes it law to slow down to the posted speed limit around road works and while people are working along the roadside	Road User (particularly driver behaviour)
	Legislation/ Law regarding Traffic violations (including 'risky' driving)	Legislation (e.g., Road Traffic Act 1961 (SA)) sets out penalties for failure to comply with road laws. For example: • Increased fines (3), vehicle impoundment, loss of licence or imprisonment for driving under the influence of alcohol or drugs or driving dangerously or recklessly. • On-the-spot fines and potential license suspensions for serious or repeat offences	Road User (particularly driver behaviour)
	Guidelines / Policies	Industry guidelines (e.g., Austroads Guide to Traffic Management, Vehicles as a Workplace guidelines) (28) and Policies (Road Safety Policy to promote road safety (29)) which set out best practice on how work on roads can be undertaken safely / safer.	Various (workers, employers and drivers)

3.4. KEY INSIGHTS AND COMMON THEMES

Key insights and common themes identified from the above six areas are summarised in table 2 below.

Table 2 -Key Insights and Common Themes

Theme	Example Items	Primary Outcome Metric(s)	Notes / Trial Ideas
Visibility & Guidance	• Photoluminescent line marking • Retro-reflective markers / temp tape • Optical speed bars • LED barrier screens	• Night-time lane-keeping compliance • Lane-drift / near-miss reduction • Mean approach speed • Message comprehension rate	• Target poorly lit approaches • Pair with temporary lane shifts
Dynamic Control	• In-pavement lighting • Pace lighting • Smart bollards • Moveable smart barriers • Smart traffic lights	• Mean speed through taper • Temp lane compliance • Queue length / stop time • Merge conflict rate	• Stage-based profiles • Tether to sensor inputs
Worker Protection	• Smart barriers • Smart bollards • ADAS features (AEB, lane assist) • Smart signals w/ VRU detection	• Worker exposure time at live edge • Intrusion events • Run-through risk proxy • Near-miss frequency	• Mechanise repositioning • Geofence active work area
Behavioural Engagement	• Musical rumble strips • Optical speed bars • LED screens (context prompts) • In-pavement / pace lighting • AI safety cameras • Traffic Apps	• Speed compliance • Headway maintenance • Distraction/phone-use violations • Awareness and alternative route planning	• Use where noise acceptable • Rotate messages; pair with enforcement
Data & Feedback	• Instrumented bollards/barriers • AI safety cameras • Driver monitoring (fatigue/distract) • Smart tyres • Drones / AI road-condition monitoring • Post-implementation reviews	• Data completeness / latency • Time-to-intervention • Before/after deltas • KPI trend (speed, near-misses)	• Establish baseline • Privacy-by-design and governance
Governance & Standards	• WHS duties (Principal Contractor) • Work-zone speed laws • Violation penalties • Austroads & Vehicles-as-Workplace guides • Road safety policies & stakeholder engagement	• Compliance audit pass rate • Enforcement yield • Policy adoption / time-to-approval	• Align early with agencies • Address cost & compliance barriers

3.5. PESTLE ANALYSIS

To better understand external influences which may influence the effectiveness of the abovementioned solutions, we also undertook a further assessment from a Political, Economic, Social, Technological, Legal, and Environmental (PESTLE) perspective. Figure 2 below summarises the PESTLE Analysis completed (30) (31) (32).

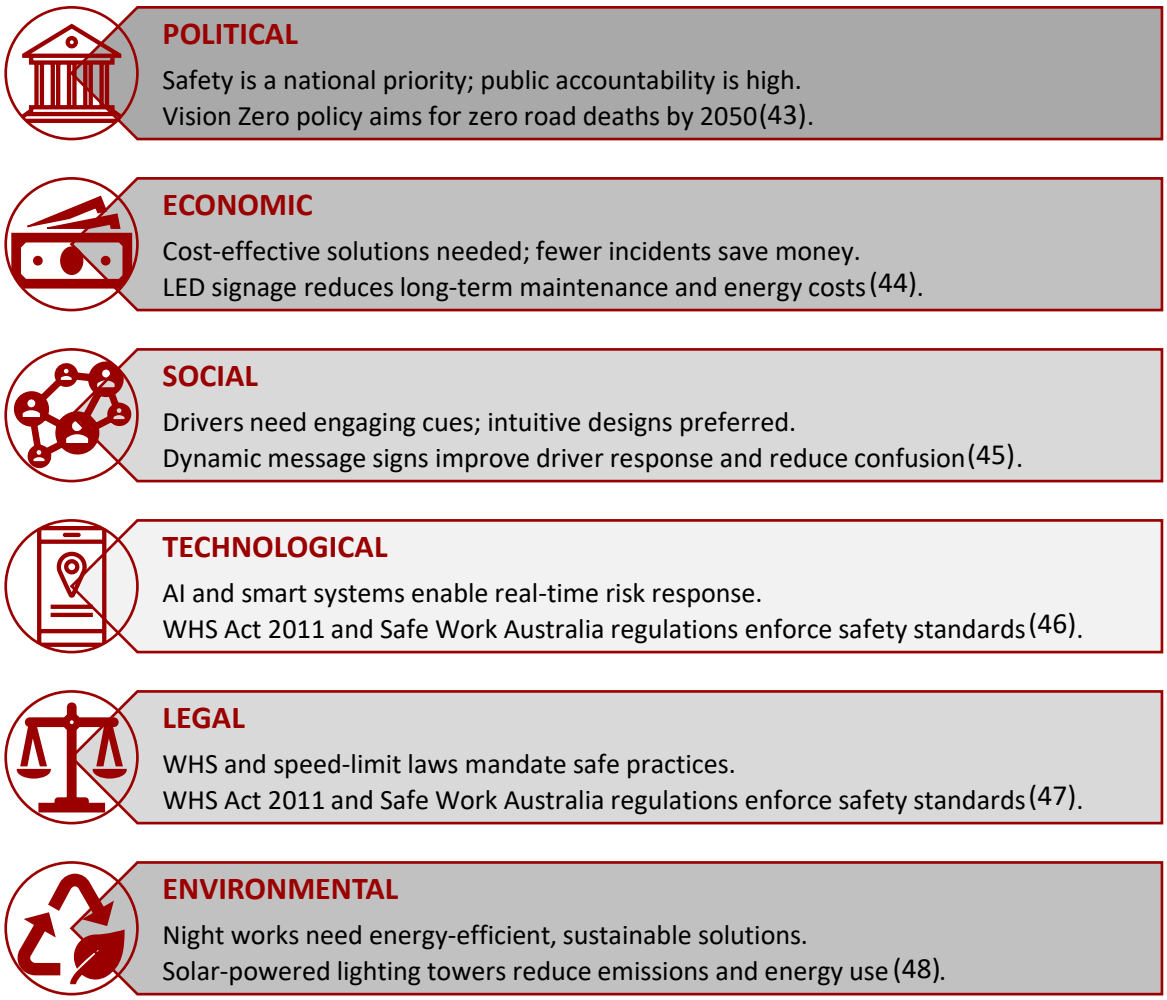


Figure 2 - PESTLE Analysis

Building on these focus areas, the remainder of the report, sets out a solution that is practical in improving driver behaviour, increasing road worker protection, and reducing risks in work zones. Our solution seeks not to introduce a new technology (as there is already a lot out there), but rather focuses on influencing the human factors side of a road user's behaviour, by adapting and building upon existing technologies and initiatives.

4. PROBLEM DEFINITION

4.1. ORIGINAL PROBLEM STATEMENT

In June 2025, when the group first undertook research and investigations into identifying an innovation in road infrastructure or road technology to improve road safety and roadworker safety, our appeal was mainly drawn towards technology and AI in the road infrastructure space.

Our focus was influenced by a combination of limitations (from a time and cost perspective) which traditional methods such as legislative amendments, policy changes and law enforcement generally take from idea conception to implementation (33) and the advancements in and promotion of technology across all industries for efficiency purposes and as a means to adapt to changing market conditions and human behaviours (34).

With the above in mind the original problem statement we sought to find a solution to was "Improving Driver Experience Through On-Road Work Zones". Specifically, we wanted to increase driver engagement within work zones, based on the belief that enhanced driver experience directly improves compliance, awareness, and ultimately, safety, by identifying technologies that could redesign on-road work zones with adaptive, human-centered cues that actively engages drivers, beyond traditional measures such as signage and enforcement.

However, as our research and community and sector engagement evolved, it became apparent that there is a plethora of existing technologies and solutions already available, such that adding an additional one could get 'lost in the mix'. As such, we considered it would be more beneficial to try and tackle the topic from a more holistic (rather than isolated) perspective, that could have immediate results and be sustainable in the long term with little upfront investment and noticeable change for a driver and current industry practices.

4.2. REDEFINED PROBLEM STATEMENT

Group 3's redefined problem statement still seeks to "Improve Driver Experience Through On-Road Work Zones" by using technology and AI. However, rather than seeking a solution focused on road infrastructure our approach seeks to influence the "human behavior" or "human factors" element by leveraging existing technologies and data through a slight interface change to existing 'map' technologies.

Our redefined scope acknowledges the environment within which Australia operates, as well as the various technologies and AI which already exist (refer to section 3 above), and seeks not to impose significant commercial implications, cost implications associated with implementation. For example, in an interview with Altus Traffic Pty Ltd it was highlighted to us that all design, construction and operations and maintenance contracts contain Key Performance Indicators (KPIs) generally associated with measuring performance and disruptions, value for money initiatives, and impact on members of the public. With such KPIs in place, it is unlikely the introduction of 'musical rumble strips' (35) or 'smart bollards' (36) while effective from a safety perspective, would result in KPI satisfaction.

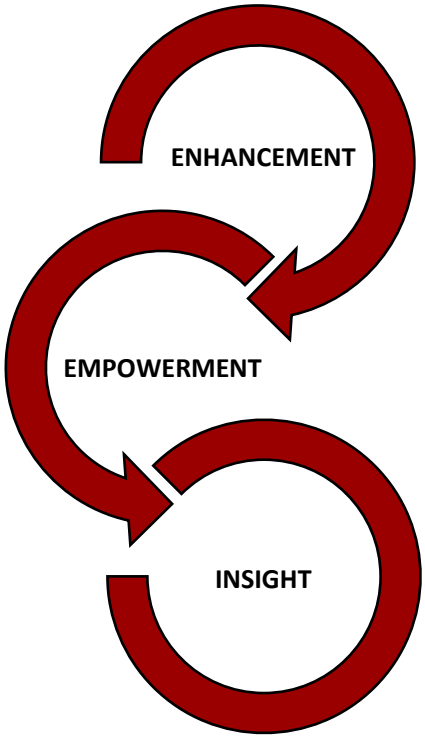
5. ENHANCING DRIVER AWARENESS VIA NAVIGATION PLATFORMS

5.1. WHAT WE ARE PROPOSING

To encourage driver compliance with reduced speed limits in active roadwork zones, we propose a cross-platform enhancement for major navigation apps**,** Google Maps (37), Apple Maps (38), Waze (39), and others, to embed additional real-time worksite alerts directly into route planning and live navigation.

This unified approach ensures broad coverage, consistent messaging, and meaningful behavioural influence across diverse user bases. Furthermore, it has the opportunity to encourage continual and more frequent publication from government and the industry regarding live and upcoming road works.

The solution:



Enhances not only existing technology but also information campaigns about upcoming planned road works (e.g.: works on the West Gate Tunnel, works on Northeast Link project), as opposed to creating another app.

Empowers drivers with timely, context-rich information about upcoming and active roadwork zones to:

- Make informed routing decisions (e.g. detours, lane changes).
- Increase situational awareness.
- Encourage adherence to temporary speed limits and safety protocols.

Provides industry(including) research bodies with data to measure and assess the effectiveness of traffic management and driver behaviour (with more live and real-time information is available to them (without the need for drivers to actively go seeking it through for example downloading an app).

Figure 3 below provides an overview of our proposed solution.

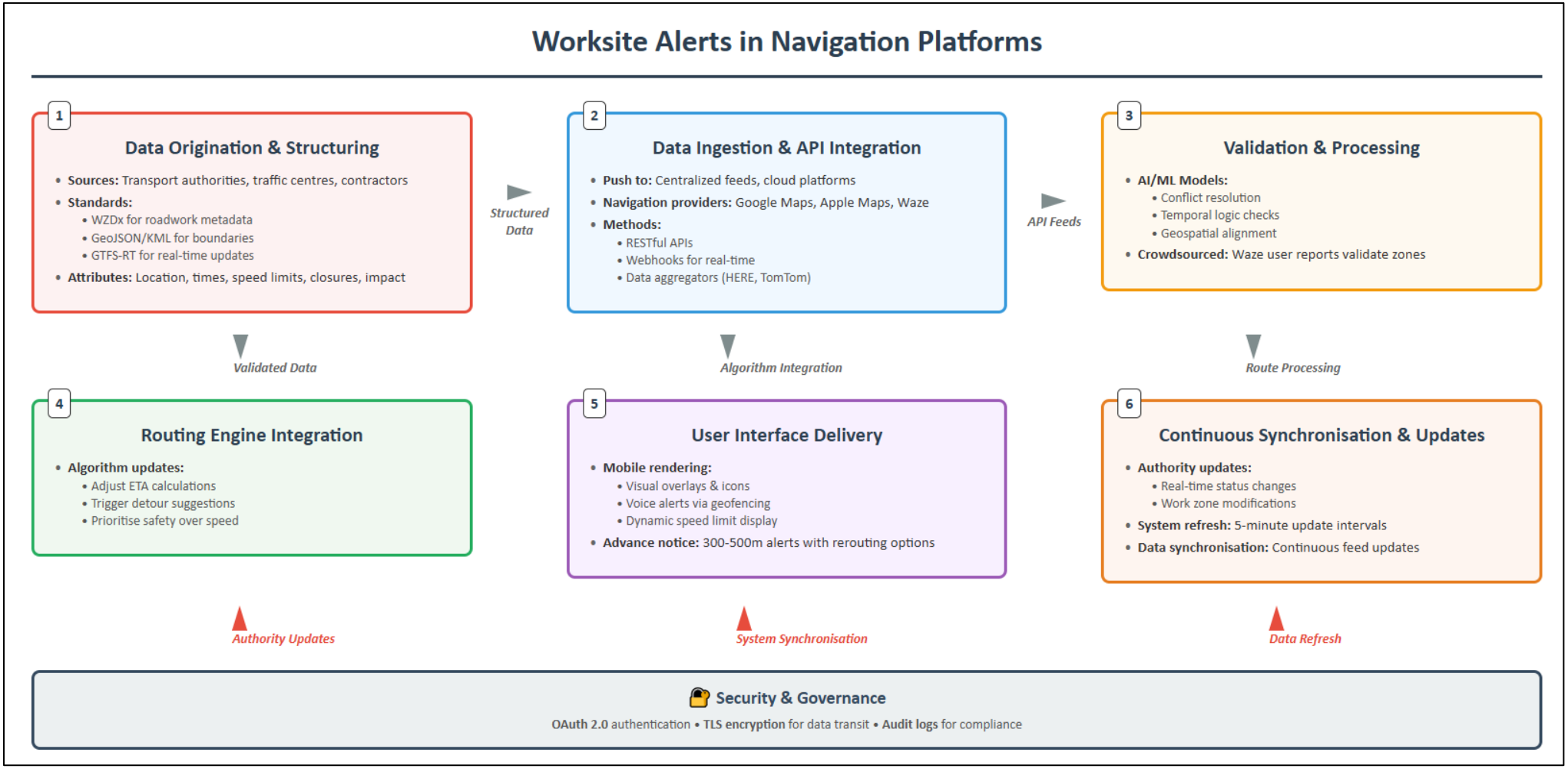


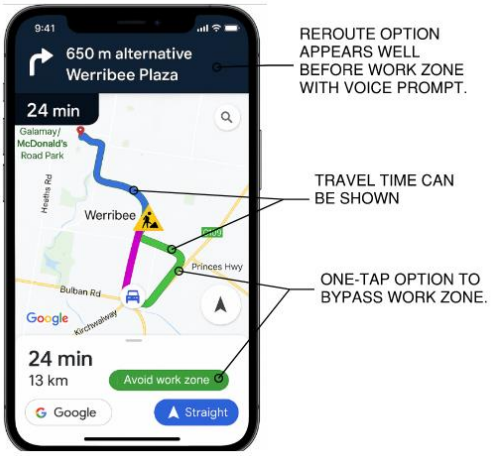
Figure 3 - Proposed Solution Summary

5.2. MECHANISM OF INFLUENCE

This solution influences driver behaviour at two critical junctures:

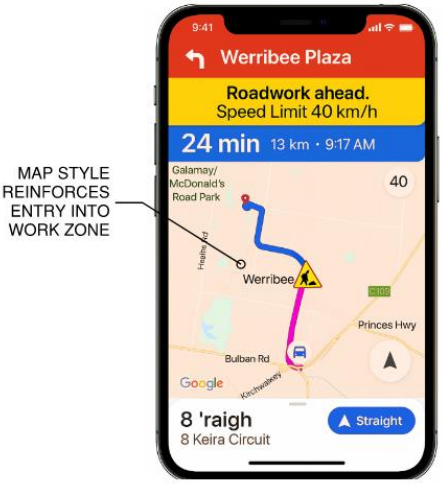
1. Pre-Entry Decision Point

- Encourages route reconsideration before entering the zone (either at the time of route planning or while en-route), reducing congestion and risk.
- Empowers drivers with timely, actionable information.
- Educates and increases overall awareness and engagement of project worksite.



2. In-Zone Compliance Reinforcement

- Sustains awareness through persistent cues.
- Reduces speed violations and improves safety for workers and road users.



Education Campaigns serve as a valuable complement to the proposed solution, reinforcing behavioural change and increasing public awareness**.** Engaging with industry (e.g.: traffic management companies, construction companies, asset holders, operations and maintenance providers (e.g.: Transurban, Eastlink, Ventia, Downer, Fulton Hogan etc) and government bodies to roll-out various education campaigns, including programs targeted at learner / less experienced drivers, or work together to consolidate and/or enhance existing data sources and host one platform advertising upcoming works and existing work zones.

Given the existing data and App functionality already in the market, education could commence immediately to start building awareness, but is also an optional part of the implementation process:

- given the proposed solution leverages off existing technology (e.g.: Google Maps) as opposed to seeking to develop a new technology or app;

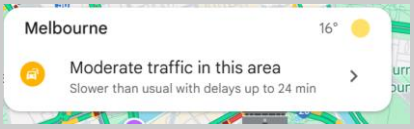
- does not seek to alter any existing planning or construction and road works (other than seeking companies to proactively publish when road works are going to take place);
- given updates to applications are 'organic', based on publicly available information and generally does not require any specific 'mindful' action from a user perspective; and
- as it would not require any upfront monetary investment or commitment from any third party.

Notwithstanding the above, the benefits of investing in an educational/promotional campaign is that it provides awareness of what new features and their benefits are and hopefully encourages the industry to more proactively plan and publish road works on the internet, to allow the community to be more informed.

5.3. CORE FEATURES

To have the most effective reach and uptake, the outputs need to be easy to access, simple to use and free for the user. With this in mind, a summary of the proposed additional App functionality against existing functionalities across supported platforms is set out in Table 3 below.

Table 3 - Core Features

Feature	Benefit	New App Functionality	Existing App Functionality
Advance Worksite Alerts	Prepare drivers before entering a worksite zone	**Voice & Visual Prompts**: "Roadwork ahead in 500m. Speed limit reduced to 40 km/h." / "Right lane closure ahead. Merge left."	**Similar to current notifications about speed camera detections, and lane(s).**
		Boundary Visualisation: Highlight worksite start/end points and expected duration.	Current worksites (generally) visible on maps. For example, following symbols on Google Maps exist: 
		Time-Sensitive Messaging: Alerts adapt based on time of day and worksite activity status.	**Analogous to advance route planning in advance, which advises of current traffic conditions. For example below is available of Google maps:** 
Smart Detour Logic	Reduce congestion and improve safety by offering alternatives.	**Dynamic Rerouting**: Based on traffic flow, worksite severity, and user preferences.	**Similar to 'save time' prompts.**
		One-Tap "Avoid Roadwork Zone" Option.	**Similar to 'avoid tolls' function**
In-Zone Behavioural Nudges	Reinforce safe driving behaviour	**Persistent Speed Limit Display** synced with Lane Use Management Signs.	**As per current 'in-app' speed limit displays.**

Feature	Benefit	New App Functionality	Existing App Functionality
	within worksite zones.	**Voice Reminders**: "Active workers present. Drive cautiously."	**Similar to live and repetitive voice prompts in tunnels about works ahead.**
		Interface Transition: Visual shift (e.g. orange overlay)	**Similar to the day/night transition.**
		Live Data Prompts: Worker presence, lane changes, or hazard alerts.	**As per above.**

5.4. OPERATIONAL INTEGRATION

This solution is designed to be scalable and interoperable across navigation ecosystems. Key integration steps include:

5.4.1. Data Standardisation

Goal: Enable compatibility across systems.

Approach: use open formats like WZDx and GEOJSON.

5.4.2. API Collaboration

Goal: Secure and verified data ingestion.

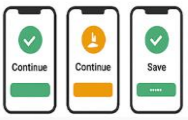
Approach: Partner with navigation providers to share worksite data via secure APIs.

5.4.3. Real-Time Sync

Goal: Keep navigation data fresh and accurate.

Approach: Continuous updates based on traffic authority inputs*.

5.4.4. Cross-Platform Consistency



Goal: Avoid user confusion across apps.

Approach: Ensure alert behaviour and messaging are harmonised across apps to avoid confusion.

**Google Maps provides re-time updates for traffics conditions, which can refresh every 5-10minutes in busy areas, while rural traffic updates may occur every 30-60 minutes* (40).

Further detail on the Implementation Plan is provided in section 7. Implementation Plan.

5.5. PROTOTYPE DESIGNS

Please refer to Appendix B for mock-ups that illustrate the proposed user interface and key user flows for the solution, demonstrating how alerts, prompts, and controls will appear across devices and in typical driving contexts. They are intended to validate interaction patterns, visual hierarchy, accessibility, and messaging tone, provide a basis for stakeholder feedback and usability testing, and guide the next iteration of design and technical integration.

6. STAKEHOLDER/INDUSTRY ENGAGEMENT

To test our solution, we reached out to key stakeholders to understand their support for and involvement in implementation and to gather feedback on:

- ongoing support for development and rollout;
- awareness of any comparable initiatives already in progress;
- potential roles in advocacy and public communication.

Table 4 below summarises the feedback received from stakeholders.

Table 4 - Stakeholder Engagement

Stakeholder	Feedback
TransIA	TransIA is a consultant in the industry, preparing and implementing traffic management work zones. The key feedback provided was that advising and educating drivers on changed traffic conditions was one of the biggest challenges. For long-term changes, it appears to take approximately 2 weeks for expected traffic behaviours to return to normal. So, if the solution was centred around consistently preparing and informing the drivers on changes, but also helping with their decision making, then we should see an improvement in compliance and the removal of the accidental non-compliant behaviour.
Transurban	Transurban operating and maintaining road assets has two key road impacts: planned full asset closures and short-term incident response. For both impacts, a way to improve traffic control room to driver communication is important. There would be a key benefit to being able to real-time sync traffic plans and advice direct to drivers while an incident is being responded to, i.e. “Right lane closed ahead, use left two lanes”, and not just solely rely on the VMS and overhead gantry signs.
Google	To implement any app changes, we would need to contact the local office here in Melbourne, and changes would be implemented similarly to the way that road changes/closures are advised of currently but once the key information and format is accepted, it would be a reasonably consistent process.
Ventia	For larger projects that have ongoing and sporadic work, there can be advantages. However, for smaller roadworks (e.g., graffiti removal or hole corrections), delivery of the works may not always permit publishing online – planning is based around contractual requirements, KPIs and client permissions.
Altus Group	Altus Group are supportive of all innovative approaches that go towards worker safety. Our proposal aligns with Altus’s commitment to safety innovation and digital infrastructure enhancement. They welcome and encourage new ideas that contribute to improving safety outcomes for their workforce.
North East Link (VIDA Roads)	As part of its broader traffic management strategy, NELP has been actively collaborating with digital platforms like Google Maps and Apple Maps to communicate full freeway closures, ensuring their algorithms reflect accurate detour options; addressing previous issues where closures were still shown as the fastest route. NELP also leverages geofencing technology to flag delays and queues in real time.

Stakeholder	Feedback
	Traffic controllers currently activate MOAs by calling the traffic control centre and referencing RTTI numbers at the beginning and end of each shift. These RTTI numbers apply to all traffic works regardless of road type and represent the closest approximation to live data, making integration with the traffic database essential. Consideration must also be given to Connect East and Transurban traffic control centres, which are not currently linked to the DTP database and may require additional data sources. Overall, NELP are supportive of the proposed solution and believe it should be championed and developed in partnership with government delivery agencies. There is a willingness to trial the solution collaboratively with delivery partners to validate its effectiveness and operational value.
McConnell Dowell (MCD)	Links directly with their strong safety-first culture and history of adopting innovative technologies to protect workers and road users. Some MCD projects have already integrated smart traffic control systems, AI-powered safety tools like Blindsight (41), and telematics to reduce speeding and accidents – demonstrating a clear commitment to improving driver compliance and minimising risks in active roadwork zones.
Department of Transport and Planning (DTP) - Health, Safety and Wellbeing (HSW) and Assets & Engineering	The HSW Division oversees the implementation of work site safety standards on arterial network in Victoria. Whilst these solutions may predominately be implemented on VIDA work sites, the solution we are proposing sits outside the policy and road authority approvals as app updates will use data of already approved traffic management setup and so initially, we are expecting limited impact to the road authority.

7. IMPLEMENTATION PLAN

The purpose of this Implementation section is to provide an outline implementation plan and identify and address barriers to implementation.

7.1. IMPLEMENTATION PLAN

This implementation plan outlines a staged strategy to deploy enhanced driver awareness features across major navigation platforms, aimed at improving safety and compliance in active roadwork zones.

Stages:

1. Stage 1 - Short Term (0-6 months)
2. Stage 2/3: (optional) Medium Term (6-12 months)
3. Stage 2/3: Long Term (6- 12+ months)

Categories:

1. Advocacy
2. Tech Development
3. Education Campaign
4. App Rollout

The detailed implementation plan is provided in Appendix C with a summary outlined below,

 **Short Term**

- Stakeholder alignment and governance setup
- Technical infrastructure development (data formats, API, platform integration)
- Procurement of data feeds and campaign assets

 **Medium Term (optional)**

- Launch of public awareness campaign **"Workzones Are Workplaces"**
- Pilot rollout in selected high-traffic corridors
- Initial monitoring and feedback collection

 **Long Term**

- Full operational deployment across platforms
- Behavioural reinforcement features (gamification, multilingual prompts)
- Ongoing monitoring, evaluation, and refinement

To achieve the above implementation plan, ongoing stakeholder engagement and industry expertise is required from key parties as outlined below:

- **Roads Australia:** playing a central advocacy role with tech companies and government. This could involve:
  - Establishing a dedicated working group to oversee standards, data sharing, and stakeholder coordination
  - Lobbying government to support public education campaigns, integrate messaging into learner driver programs, and fund pilot initiatives
  - Developing a business case to present to navigation platform providers for integration of safety features
- **Government agencies:** providing funding for research, education campaigns, and access to verified worksite data feeds to support real-time alert functionality
- **Navigation platforms:** (Google, Apple, Waze) offering insights into existing capabilities and collaborating on UI/UX enhancements, voice prompts, and behavioural nudges
- **Transport authorities:** and roadwork contractors supplying accurate, standardised data on active work zones and supporting integration into traffic management systems
- **Universities and research institutions:** contributing behavioural insights and evaluation frameworks to measure impact and refine interventions
- **Industry partners:** and insurers (e.g., NRMA, RACV) supporting gamification and incentive models, such as safe driving rewards or premium discounts
  Data providers: and analytics firms assisting with the development of dashboards, heatmaps, and performance tracking tools to monitor KPIs such as speed compliance, incident reduction, and user engagement

This collaborative approach ensures the initiative is grounded in evidence, technically feasible, and positioned for broad adoption across Australia's transport network.

7.2. BARRIERS TO IMPLEMENTATION

Through the research and associated findings, implementation barriers were identified and explored. These are summarised as follows:

STAKEHOLDER FACTORS: Success depends on engagement from tech companies (specifically the likes of Google and Apple, who already operate the map platforms), transport authorities, and contractors. Without their support, data integration and feature rollout may stall.

- To overcome this barrier: Build strong partnerships, present a compelling business case, and showcase pilot success to encourage buy-in.

ENABLER: Existing relationships between Roads Australia and key stakeholders provide a foundation for collaboration.

PERSONAL FACTORS: Lack of awareness, knowledge, and confidence in using navigation apps or understanding work zone safety. Many drivers may not realise the risks associated with roadwork zones or the benefits of enhanced alerts and behavioural prompts.

- To overcome this barrier: Launch targeted education campaigns, integrate messaging into learner-driver programs, and use in-app tutorials to build familiarity.

ENABLER: Most Australians already use navigation apps like Google Maps or Waze, making it easier to introduce new features via familiar platforms.

PSYCHOSOCIAL FACTORS: Drivers may resist changing their behaviour due to habits, attitudes, or lack of perceived urgency. Some may not associate work zones with real danger or may feel frustrated by reduced speed limits.

- To overcome this barrier: Use emotional messaging and storytelling (e.g. “Every cone protects a person”) to humanise road workers. Introduce gamification and rewards for safe driving behaviour.

ENABLER: Social influence and peer recognition can be powerful motivators; features like badges, shareable achievements, or insurance discounts can drive uptake. Initial workzone traffic management selection for implementation will be important.

TECHNOLOGICAL FACTORS: Regulatory processes and funding constraints may delay implementation. Safety initiatives may compete with other priorities for government attention.

- To overcome this barrier: Integrate features into existing apps with intuitive design and minimal disruption. Offer opt-in settings and clear privacy controls.

ENABLER: Most drivers already rely on digital navigation, and expanding functionality within these platforms reduces the learning curve. Additionally, existing map platforms ‘feed off’ data which is already publicly available – therefore extent of government approval likely minimal.

POLICY FACTORS: Regulatory processes and funding constraints may delay implementation. Safety initiatives may compete with other priorities for government attention.

- To overcome this barrier: Advocate for inclusion in national road safety strategies and demonstrate cost-effectiveness through pilot results.

ENABLER: Alignment with existing government safety goals and public health outcomes can strengthen the case for support. Additionally, existing map platforms 'feed off' data which is already publicly available – therefore extent of government approval likely minimal.

7.3. SCALABILITY/GROWTH OF APP

As part of our long-term vision, the enhanced driver awareness initiative presents several opportunities for future expansion beyond its initial scope. These scale-up pathways aim to broaden the impact of the app across different user groups, vehicle types, and transport environments. By leveraging emerging technologies, strategic partnerships, and existing infrastructure, the initiative can evolve into a comprehensive safety tool embedded throughout the transport ecosystem. Table 5 below outlines key growth opportunities and the enabling actions required to support their development.

Table 5 - Key Growth Opportunities

Scale-Up Opportunity	Enabling actions and relevant organisations
Extend alerts to school zones and pedestrian-heavy areas	Collaborate with local councils and education departments to identify high-risk zones. Integrate school zone schedules and pedestrian activity data into alert logic. Use geo-fencing and time-based triggers to enhance driver awareness during peak hours.
Integrate with vehicle infotainment systems	Partner with automotive OEMs and telematics providers to embed alert functionality directly into dashboard displays. Explore compatibility with Android Auto and Apple CarPlay. Engage with industry bodies such as the Federal Chamber of Automotive Industries (FCAI) to support standardisation.
Personalise prompts using AI and driver behaviour	Work with app developers to analyse historical driving data and tailor prompts based on individual behaviour patterns. Use machine learning to adapt messaging in real time. Collaborate with behavioural scientists and universities to validate effectiveness.
Expand to freight and heavy vehicle sectors	Undertake a detailed assessment of existing safety initiatives in the freight sector. Collaborate with logistics companies, heavy vehicle operators, and industry associations (e.g. ATA) to tailor alerts for larger vehicles and work zone navigation. Explore integration with fleet management systems.
Enable cross-platform data sharing	Develop shared data protocols with transport authorities to ensure consistency across navigation platforms and information publication. Establish a centralised data exchange hub for verified worksite information. Engage with standards bodies to promote interoperability and compliance.

8. CONCLUSION

This paper presents a practical and scalable solution to enhance driver awareness and safety in roadwork zones by integrating real-time alerts into existing navigation platforms such as Google Maps, Apple Maps, and Waze. Rather than introducing new infrastructure or standalone

applications, our approach leverages existing technologies to deliver timely, context-rich information directly to drivers at critical decision points.

The proposed enhancements include advanced worksite alerts, smart detour logic, and in-zone behavioural nudges, features designed to improve compliance with temporary speed limits, reduce congestion, and protect road workers. These alerts are delivered through voice and visual prompts, dynamic rerouting options, and interface transitions that reinforce safe driving behaviour. Importantly, the solution is built on open data standards (e.g. WZDx, GEOJSON), enabling seamless integration across platforms and jurisdictions.

Stakeholder feedback has confirmed the value of this approach, particularly its ability to reduce accidental non-compliance and improve communication between traffic control centres and drivers. With minimal cost implications and no need for infrastructure upgrades, this initiative aligns with national safety goals and offers a compelling pathway to reduce road trauma and workplace risk.

By focusing on human factors and behavioural influence, this solution represents a meaningful step toward Vision Zero and a safer, more informed driving experience across Australia's transport network.

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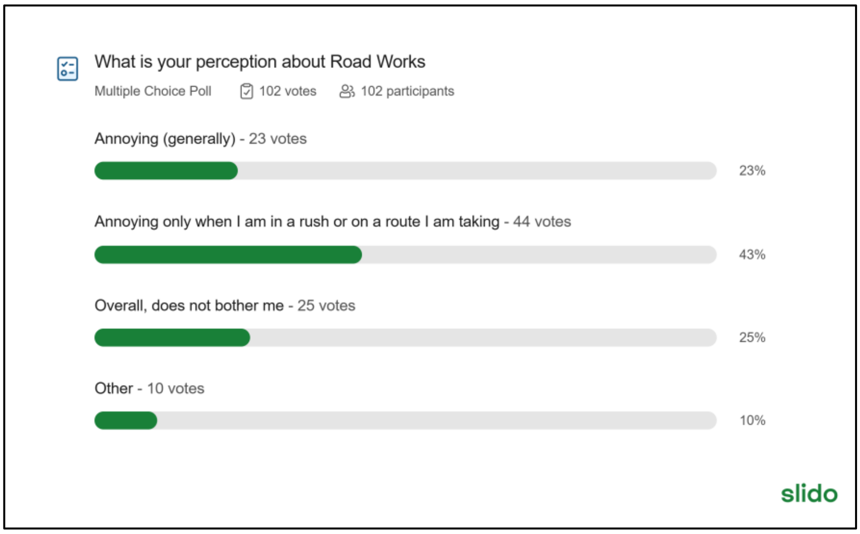
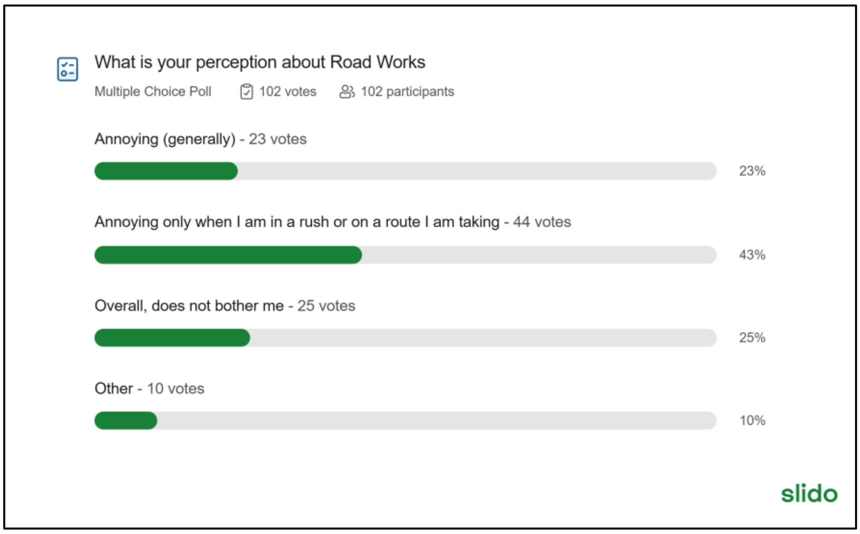
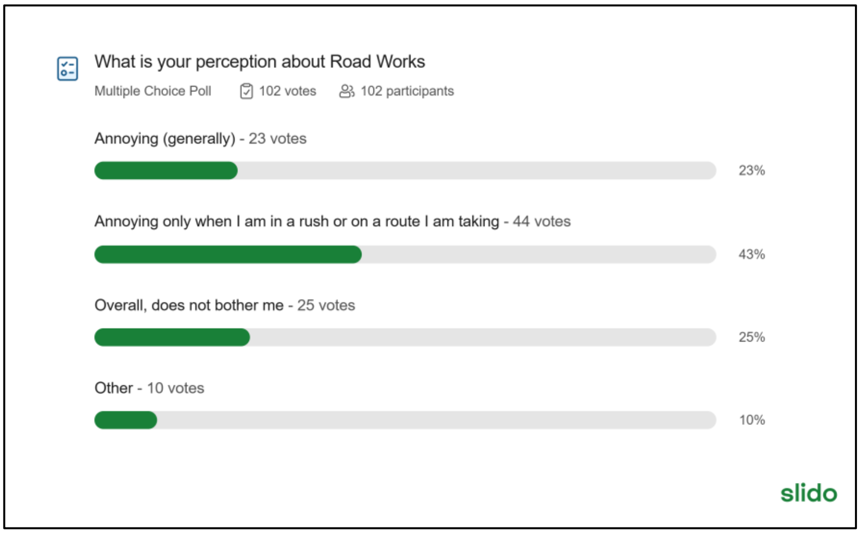
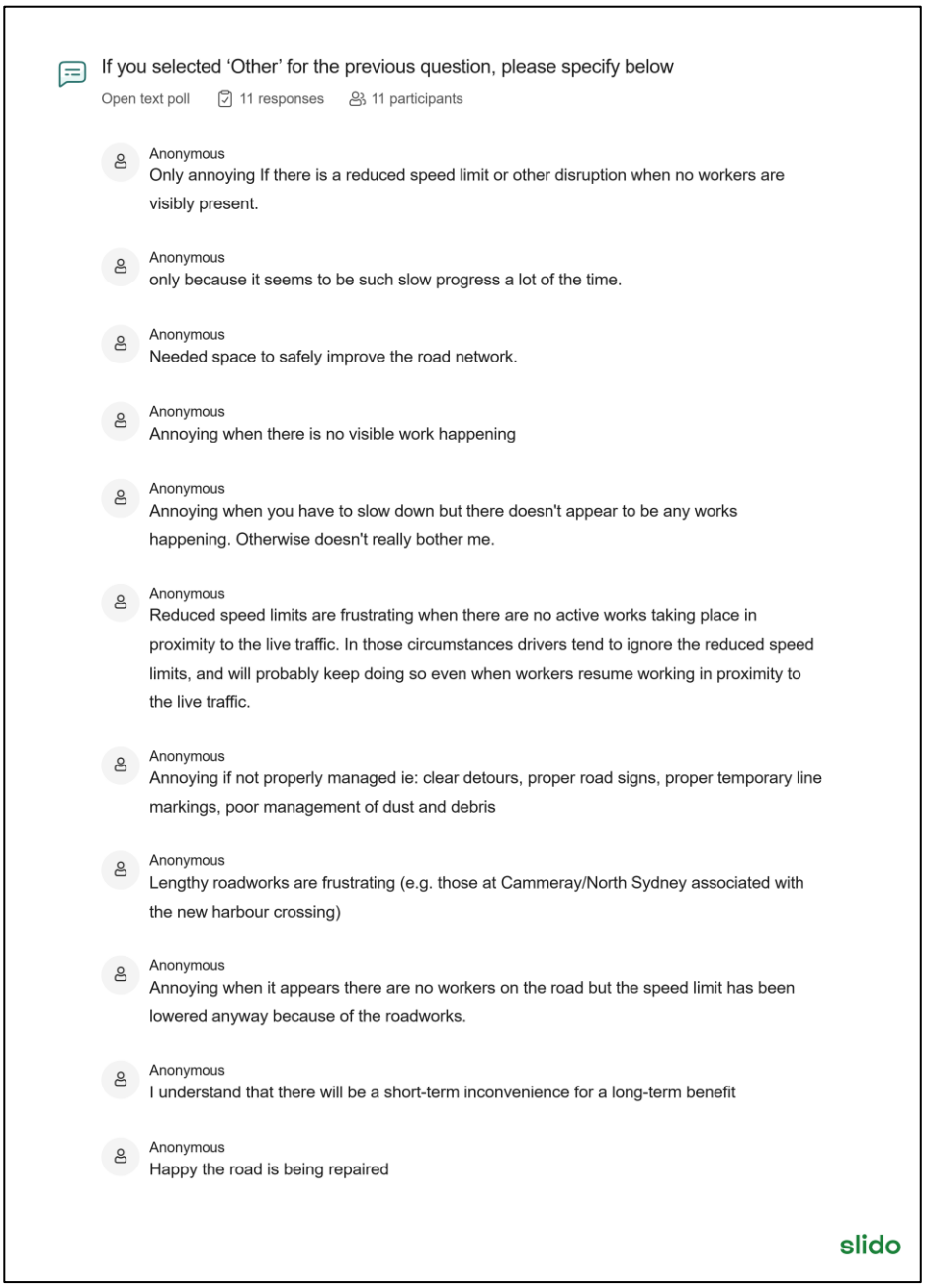
APPENDIX A – SURVEY RESULTS









If you selected 'Other' for the previous question, please specify below

Open text poll · 11 responses · 11 participants

Anonymous
Only annoying If there is a reduced speed limit or other disruption when no workers are visibly present.

Anonymous
only because it seems to be such slow progress a lot of the time.

Anonymous
Needed space to safely improve the road network.

Anonymous
Annoying when there is no visible work happening

Anonymous
Annoying when you have to slow down but there doesn't appear to be any works happening. Otherwise doesn't really bother me.

Anonymous
Reduced speed limits are frustrating when there are no active works taking place in proximity to the live traffic. In those circumstances drivers tend to ignore the reduced speed limits, and will probably keep doing so even when workers resume working in proximity to the live traffic.

Anonymous
Annoying if not properly managed ie: clear detours, proper road signs, proper temporary line markings, poor management of dust and debris

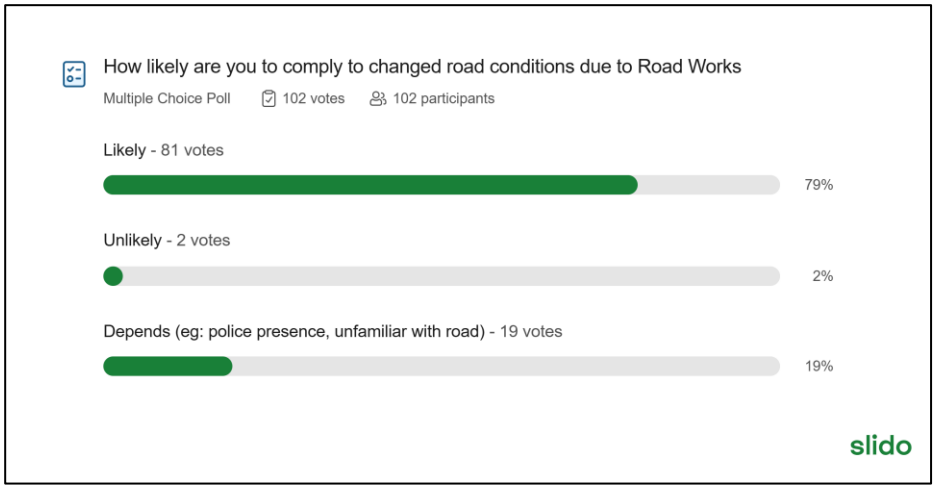
Anonymous
Lengthy roadworks are frustrating (e.g. those at Cammeray/North Sydney associated with the new harbour crossing)

Anonymous
Annoying when it appears there are no workers on the road but the speed limit has been lowered anyway because of the roadworks.

Anonymous
I understand that there will be a short-term inconvenience for a long-term benefit

Anonymous
Happy the road is being repaired

slido



How likely are you to comply to changed road conditions due to Road Works

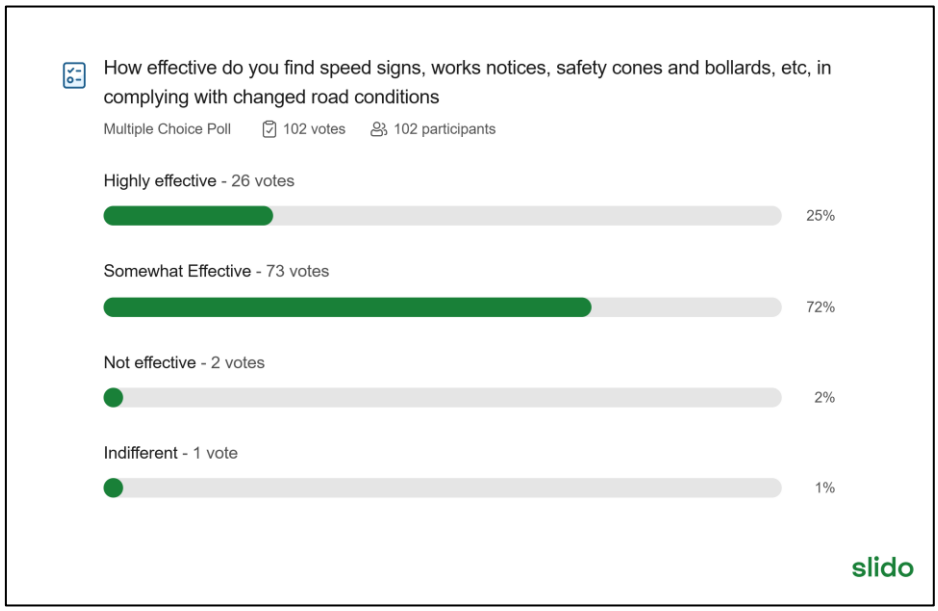
Multiple Choice Poll · 102 votes · 102 participants

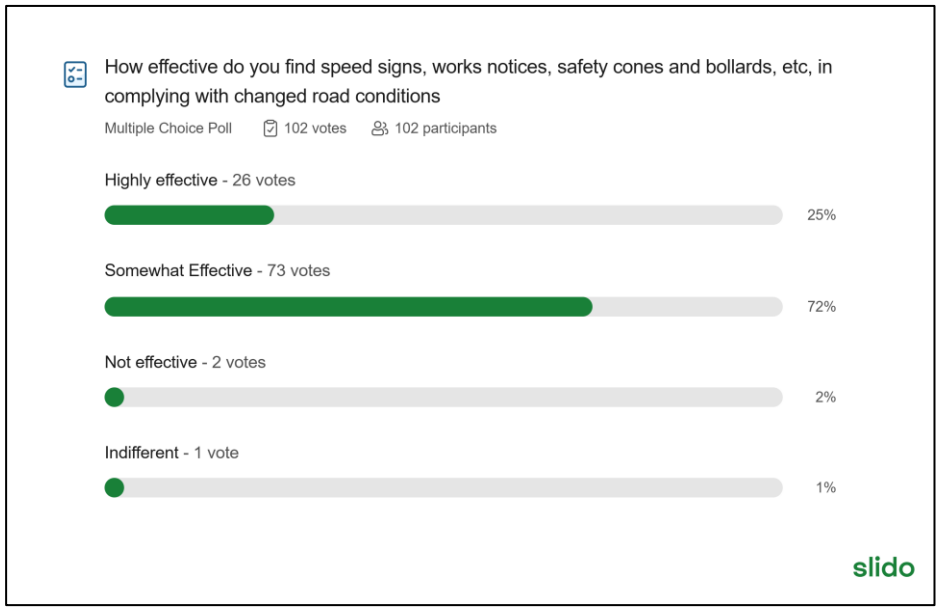
Likely - 81 votes
79%

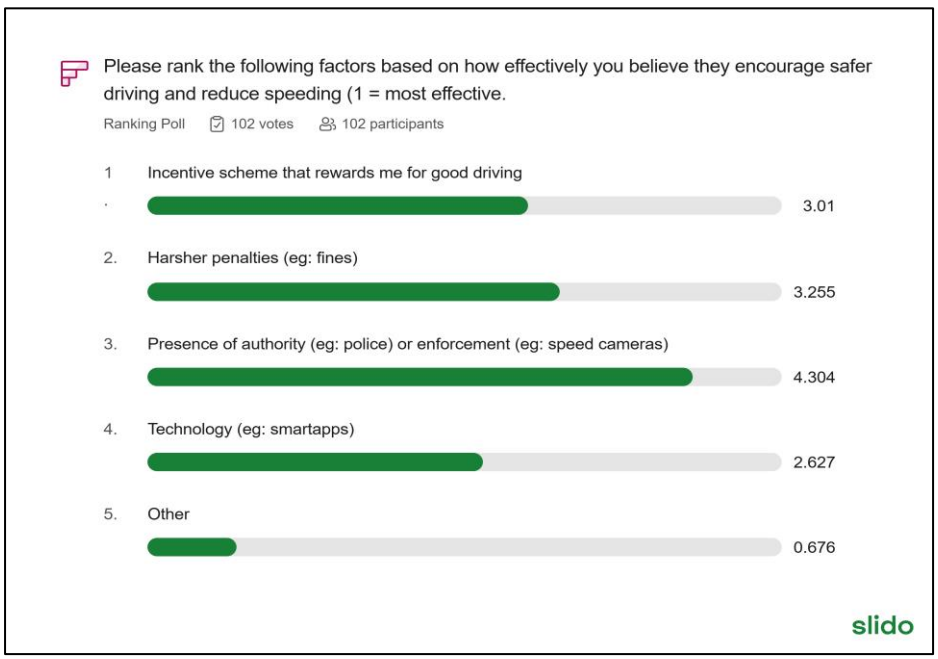
Unlikely - 2 votes
2%

Depends (eg: police presence, unfamiliar with road) - 19 votes
19%

slido


How effective do you find speed signs, works notices, safety cones and bollards, etc, in complying with changed road conditions
Multiple Choice Poll
102 votes
102 participants
Highly effective - 26 votes
25%
Somewhat Effective - 73 votes
72%
Not effective - 2 votes
2%
Indifferent - 1 vote
1%
slido


How effective do you find speed signs, works notices, safety cones and bollards, etc, in complying with changed road conditions
Multiple Choice Poll
102 votes
102 participants
Highly effective - 26 votes
25%
Somewhat Effective - 73 votes
72%
Not effective - 2 votes
2%
Indifferent - 1 vote
1%
slido


Please rank the following factors based on how effectively you believe they encourage safer driving and reduce speeding (1 = most effective.
Ranking Poll
102 votes
102 participants
1 Incentive scheme that rewards me for good driving
3.01
2. Harsher penalties (eg: fines)
3.255
3. Presence of authority (eg: police) or enforcement (eg: speed cameras)
4.304
4. Technology (eg: smartapps)
2.627
5. Other
0.676
slido

If you selected 'Other' for the previous question, please specify below

Open text poll · 15 responses · 15 participants

Anonymous
This is safety issue for me, for both the workers and the other drivers.

Anonymous
Speed alerts in cars, especially ones that are cognisant o the speed restrictions by geographic location or reading of speed signs.

Anonymous
Clear traffic management (signage, approach VMS etc) and visible construction activity (workers actually onsite)

Anonymous
Visibility of roadworks. I'm more likely to comply if I can see why I'm being slowed down. My pet peeve is when lanes are closed but there is nothing happening (which often occurs on the Westgate bridge)

Anonymous
For nightly Traffic closures...long closure lengths with relatively no works activity for kilometres on end can make people complacent and not believe any risk is present. Shorter and more dynamic TM may help this

Anonymous
I think other drivers behavior is most effective. If there are other drivers who have reduced to the temporary limit, it is easy to comply, however if you reduce speed and other drivers try to drive around you at a greater speed, that feels v unsafe.

Anonymous
Smartapps, ie similar to Waze. Waze shows where police cars or speed cameras are. A similar feature to show where roadworks are and alternative routes would be handy.

Anonymous
I think the speed detection radar on newer cars that flash on the dash red saying over speed assists distracted drivers

Anonymous
If road authorities could use variable speed limit signs to change the speed limit depending on whether works are in progress, that would improve respect for and compliance with the road works speed limits. No point in having road works speed limits in place on the weekend when no work is happening.

Anonymous
When using google maps and entering a route, if there are known roadworks on that route, there is a clear message or tone, so that you have the opportunity to change route before setting off.

Anonymous
I can't think of a reason why an app or similar would change my driving behaviour so I've ranked Technology last for that reason. Other things that might make a difference - those signs on the road that tell you how fast you're going sometimes have an impact for me. Sometimes I notice that a really good ad campaign achieves some cutthrough for me as well.

Anonymous
Cones, reroutes

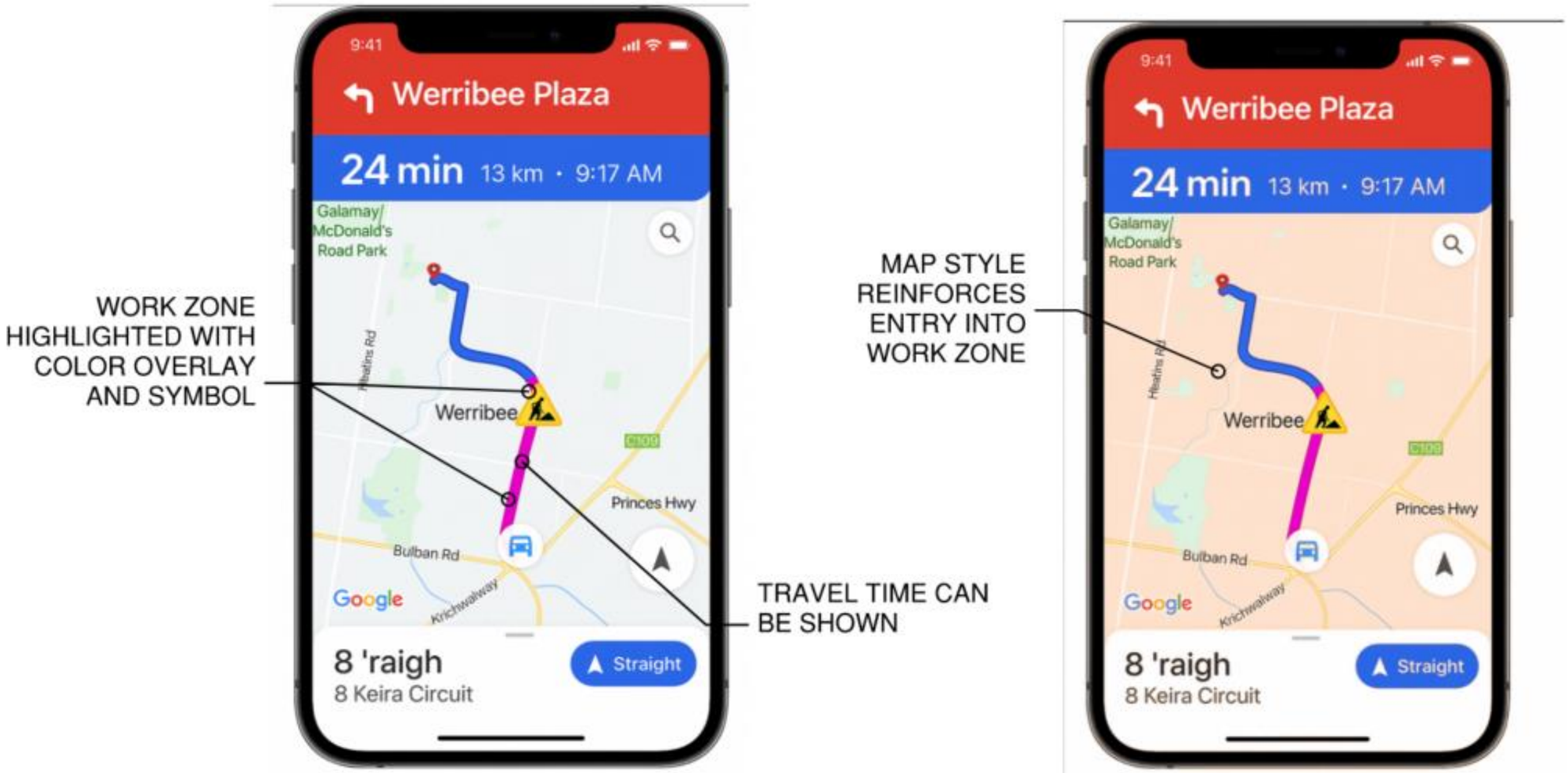
Anonymous
Incentive to actually see people working not just standing around watching someone else do the work - imagine how much faster the work could be done!

Anonymous
The number one thing that needs to be addressed is having the contractor or council (whoever is conducting the works), actually remove the speed limitations when workers are not working. E.g after hours, some weekends etc. So often I see roads that have had no roadwork impact whatsoever, limited to ridiculous speed limits with no worker on the project at all, let alone in the area. Im sure most people would slow down to keep others safe. The way this aspect is currently treated - extremely lazily - by contractors, does nothing to improve compliance.

Anonymous
Clearer rules / directions for drivers

slido

APPENDIX B- PROTOTYPE DESIGNS

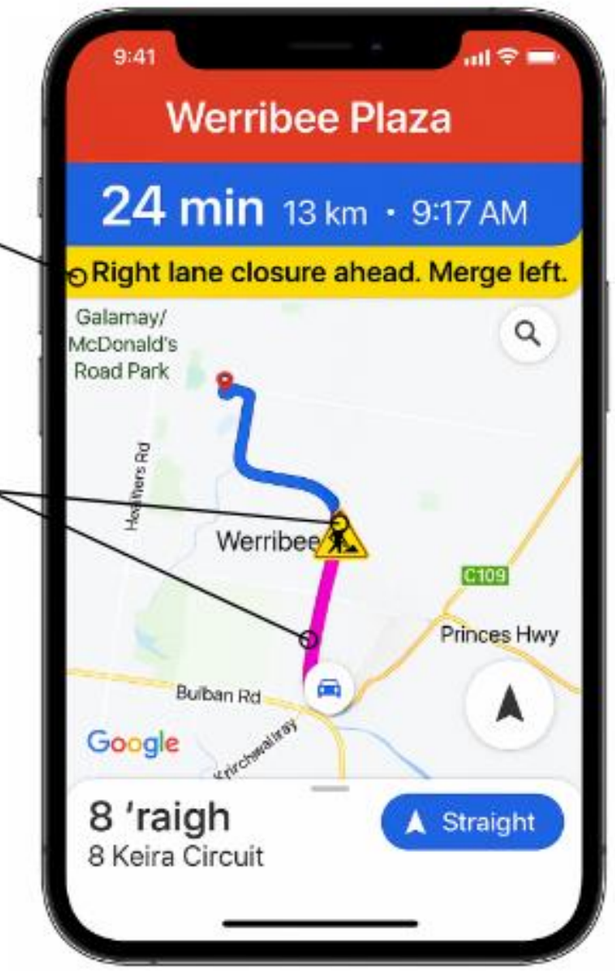


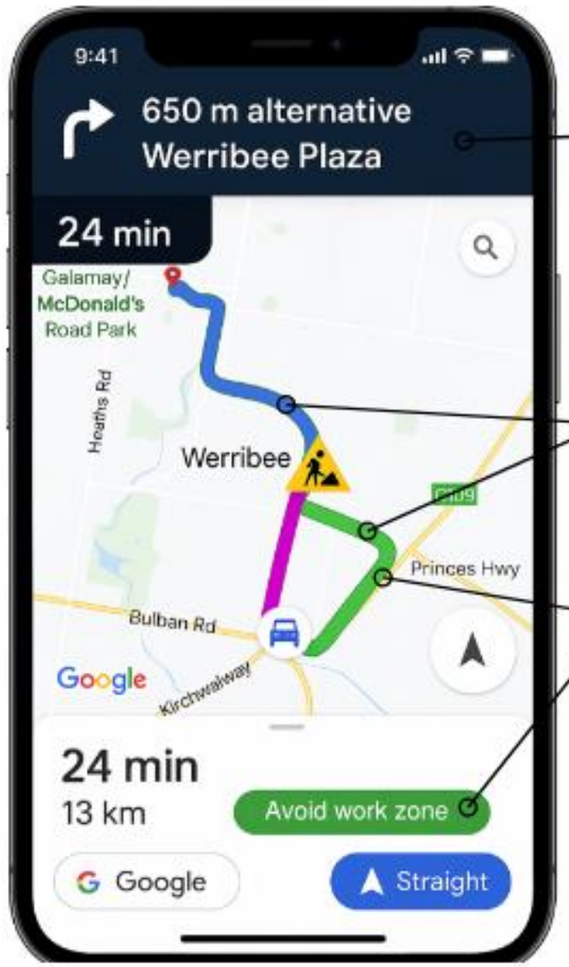
BANNER ALERTS AND VOICE PROMPT NOTIFY DRIVER OF WORK SITE AND SPEED LIMIT CHANGE

MAP STYLE REINFORCES ENTRY INTO WORK ZONE

VISUAL AND VOICE ALERTS ACTIVATED AHEAD OF LANE CLOSURE TO PREPARE DRIVER.

WORK ZONE HIGHLIGHTED WITH COLOR OVERLAY AND SYMBOL





REROUTE OPTION APPEARS WELL BEFORE WORK ZONE WITH VOICE PROMPT.

TRAVEL TIME CAN BE SHOWN

ONE-TAP OPTION TO BYPASS WORK ZONE.

APPENDIX C- DETAILED IMPLEMENTATION PLAN

Worksite Alerts Implementation Plan

Three-Stage Roadmap: Core Activities & Opportunity Activities

STAGE 1
0-6 months

Short Term: Foundation Building

Foundation building and pilot preparation

CORE ACTIVITIES

1 Stakeholder Alignment
- Engage navigation platforms
- Establish steering committee
- Define roles and protocols

2 Technical Infrastructure
- Standardise data formats
- Develop secure APIs
- Begin platform integration

OPPORTUNITY ACTIVITIES

A Research Partnerships
- Engage universities for studies
- Commission behavioural research
- Baseline data collection

B Campaign Asset Development
- Create UX/UI prototypes
- Develop creative assets
- Test messaging concepts

STAGE 2
6-12 months

Medium Term: Pilot & Engagement

Public engagement and pilot execution

CORE ACTIVITIES

1 Pilot Rollout
- Select 2-3 urban corridors
- Activate live data feeds
- Monitor key metrics

2 Monitoring & Feedback
- Deploy dashboards
- Collect user feedback
- Refine alert logic

OPPORTUNITY ACTIVITIES

A Public Campaign Launch
- Geo-targeted digital ads
- Billboards with QR codes
- Media briefings and op-eds

Campaign Messages
- Every cone protects a person
- Reduced speed = reduced risk

B Industry Partnerships
- Engage insurers for incentives
- Partner with fleet operators
- Collaborate with road contractors

STAGE 3
12+ months

Long Term: Scale & Optimise

Full deployment and continuous improvement

CORE ACTIVITIES

1 Full Deployment
- Expand to national networks
- Android Auto & CarPlay
- Vehicle infotainment systems

2 Ongoing Evaluation
- Monthly reporting dashboards
- Track KPIs and incidents
- Continuous refinement

OPPORTUNITY ACTIVITIES

A Behavioural Features
- Gamification elements
- Insurance discounts
- AI-driven personalisation

B Advocacy & Accessibility
- Multilingual prompts
- Inclusive design features
- Worker advocacy integration