BURSTING THE BUBBLE

DISRUPTION AND INNOVATION IN THE WORLD OF RAIL

2020 PWI NSW ANNUAL CONVENTION

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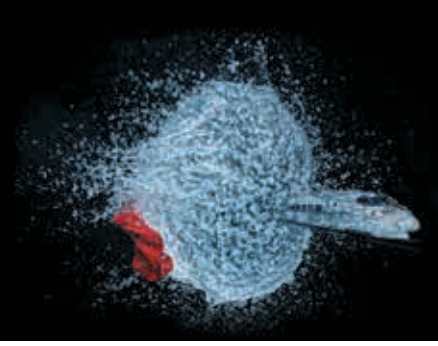
Established NSW 1974
Founded 1884

BURSTING THE BUBBLE

DISRUPTION AND INNOVATION IN THE WORLD OF RAIL

President's Welcome Address 2020



Welcome to the 2020 New South Wales, Permanent Way Institution, virtual Annual Convention.

I start by acknowledging the traditional owners of the land on which we meet today and pay my respects to their elders, past, present and emerging. I pay my respects not as a protocol, but because it's appropriate and the right thing to do.

The PWI has been running our Annual Conventions since it was first established back in 1974. Unfortunately, this year for the first time in our history due to COVID 19 and the ongoing restriction on social gatherings imposed by the NSW State Government, we have adapted our convention to suit a live stream event.

The past six months has indeed been a challenging time for everyone as we battle with and manage the impacts of this global pandemic. All businesses have had to continually adapt and change. Personally we faced the challenges of working from home, home schooling our children or continuing to work on site with strict controls in place. The rail industry has shown significant resilience and leadership to keep moving freight and passengers across the country and to continue to deliver rail projects in a safe and efficient manner despite these serious challenges.

Today we are streaming this event from the Museum of Contemporary Art in Sydney which has replaced one of their traditional event rooms into a purpose-built production studio – a sign of their adaptation to the times we are in. I'm joined here this morning with our keynote speaker, Gary Denman Head of Enterprise Sale Management at Google Cloud Australia and our session chairs representing two of our Platinum members: Julian Sharp, Project Director from CPB Contractors and Steve Butcher, Executive General Manager Rail at John Holland.

Also, in attendance are a number of the presenters and PWI Committee members, as well as other speakers who will be joining us from overseas.

The theme title for this year's virtual convention is:

Bursting the Bubble – Disruption and Innovation in the World of Rail

The rail industry across Australia has long been known as a 'slow turning ship' when it comes to changing the way it operates, and in particular its willingness to adopt new technology. And whilst the operational impacts to a large integrated network of railways can mean new technology is not easy to deploy, the rest of the world seems to be changing at a much more rapid rate than us.

The generational gap across the industry has no doubt played a role in this, however, as we strive to close this gap and encourage more youth into the industry, the younger generation is challenging the industry in this area and questioning why we can't be more advanced in our thinking and, more importantly, in our actions. Through unfortunate circumstances, the 2020 COVID-19 pandemic has highlighted that, when forced to do so, the industry can adapt to new ways of working and deploy these very quickly – so why do we need to wait for a pandemic to force the change?

In keeping with the conference theme, ***"Bursting the Bubble – Disruption and Innovation in the World of Rail"*** we will explore the future of rail through the lens of innovation and technology. Whilst we will be cognisant of the risks and challenges of change management in an industry that is unique for its heavily regulated and political constraints, we will seek to learn from other businesses, industries and international experience, and explore the potential of innovation and technology on efficiency in asset management/operations, skills development, climate change and sustainability benefits.

Today we will learn what some of the technology leaders around the world are doing in other industries, what is available in rail and transport, and where the future of rail innovation might lead us.

Our first speaker, Annika Schmidt who is an expert in artificial intelligence at Siemens Mobility will be joining us from Brunswick in Germany and will be discussing *Demand Responsive Transport for Railway Operators* which looks at the use of a wide range of data to improve rail services.

President's Welcome Address 2020

Mario Dimovski who is the Chief Executive Officer for Tradiebot Industries will be joining us from Chicago in the US. He will give us an insight into some of the fantastic benefits available through the use of Immersive Technologies such as Virtual and Augmented Reality, and how they are being applied within the Automotive Industry where they are experiencing similar challenges to innovation in the space of skills training, repairs and operation and maintenance of vehicles.

Caroline Wilkie, the newly appointed CEO of the Australasian Railways Association (ARA) will join me later this morning to discuss the key issues currently facing the Australian rail industry. Caroline will also share her visions for the ARA, and the major issues the ARA will be focusing on to support the industry. We will also discuss how the ARA is leading working groups to achieve a consistent approach across the country in areas such as tendering, competency assessment and type approval processes.

Gerard Francis CEO and Global Head of Infrastructure at WillowRail will lead us through how the advances in technology are assisting asset management processes through the use of Digital Twin technology with his paper "*Empowering the rail industry to leverage digital twins to improve performance"*

In the final paper for the morning, Jacqueline Linke, who is an enthusiastic and dynamic leader in culture and innovation, will share with us her insights into the key ingredients that support and drive innovation within a workplace and an industry through her paper titled *"An incipient movement in Rail…innovation is not a virus!"* (perhaps somewhat aptly titled given the current global situation).

This year we have decided to postpone the announcement of a number of our major awards until next February as we are planning a networking evening to recognise the entrants and to acknowledge the award winners. However, given its strong alignment to the theme, we have decided to present the Ken Erickson Innovation Award through the panel session and will be announcing our winner of this award today.

My thanks for the ongoing support of our Corporate Members and Enhanced Corporate Members who enable us to make our events affordable, allowing many of our personal members to participate in our events. The past six months has indeed been a challenge and we look forward to 2021 where we can re-establish our face to face meetings and networking events.

In closing, I wish to thank the hard-working PWI committee, volunteers, sponsors and others who have worked to make the PWI's activities during the year such a wonderful success. I would also like to acknowledge the convention subcommittee who have again organised a stimulating group of presenters and topic to challenge and inspired us around the convention theme.

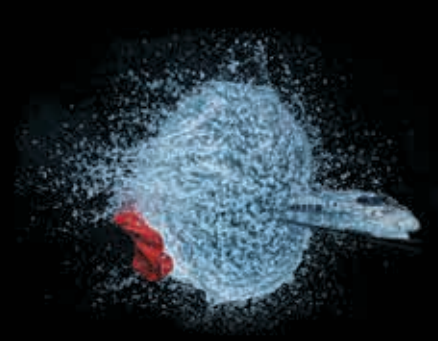
It is now my pleasure to introduce our keynote speaker for the convention, Gary Denman Head of Enterprise Sale Management at Google Cloud Australia.

Most of you will know Google as the source of the answers to all your questions, and Google is indeed a leader in innovation through their ability to provide everyone with access to all the world's information. But Google is but one piece of a network of innovative businesses leading us into the next wave of technology and advancement as part of the global business called Alphabet, worth over an estimated $1 trillion, Alphabet owns not only Google but also Calico, Nest, Google X, the business behind autonomous vehicles and a range of other creative organisations and investment firms.

Gary will share with us what makes Google one of the best innovators in the world, how do they come up with some of these fantastic ideas and turn them into products for everyone to use, and will give us a peek into the future of technological advancement. We are excited to have Gary join us here today to help us set the stage for our theme.

Mark Harris – President, Permanent Way Institution,
New South Wales

PWI 2020/21 Committee



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Background of Permanent Way Institution NSW Inc.

The Institution was formed in 1884 in England by a group of dedicated railway personnel, who were responsible for development of railway track across the British Isles, and who felt the need for an avenue for exchange of track design, construction and maintenance. They realised the educational and social value of communications between all levels of personnel engaged on the railway tracks and associated structures. The safety of rail travel has been brought to the present standards because of a better understanding of the behaviour of the tracks under load; the Institution has played a vital part in gaining this understanding.

Realising this, the New South Wales section was formed in 1974, not only to benefit from those who had gone before, but also to add to the development of still more efficient rail transportation in the years ahead.

Disclaimer
The views expressed by authors and/or presenters are not necessarily the view of the PWI Committee or PWI Members.

2020 Convention Program

Bursting the Bubble – Disruption and Innovation in the World of Rail

FRIDAY 6 NOVEMBER, 2020 – Live Stream Event		
7:45 – 8:00	Live Stream Opens	
8:00 – 8:10	Welcome Address	NSW President Mark Harris
8:10 – 8:40	Keynote Address	Gary Denman Google Cloud Australia
SESSION 1: Chaired by John Holland (Steve Butcher)		
8:45 – 9:05	Demand Responsive Transport for Railway Operators	Annika Schmidt *Siemens Mobility GmbH*
9:05 – 9:25	Changing the Automotive Industry through AR and VR Technologies	Mario Dimovski *Tradiebot Industries*
9:25 – 9:35	Discussion / Questions for all papers	Session Chair
9.35 – 9:50	**LIVE STREAM BREAK**	
SESSION 2: Chaired by CPB Contractors (Julian Sharp)		
9:55 – 10:35	Ken Erickson Innovation Award (Panel)	Gareth Beynon
10:35 – 10:55	Meet Caroline Wilkie, CEO of the Australasian Railway Association (ARA)	Mark Harris
10:55 – 11:15	Empowering the rail industry to leverage digital twins to improve performance	Gerard Francis *WillowRail*
11:15 – 11:35	An incipient moment in rail...innovation is the vaccine not the virus!	Jacqueline Linke *Innovation, Culture, Leadership*
11:35 – 11:45	Discussion / Questions for all papers	Session Chair
11:45 – 11:55	Endnote and Announcements	NSW President Mark Harris
12:00	**LIVE STREAM CLOSES**	

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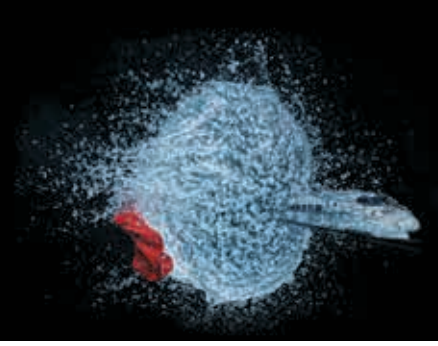

PWI NSW would like to thank all its Corporate Members for their support. We look forward to your continued sponsorship in the future.

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Founded 1884
Start preparing your teams and be ready to tee-off next year!

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Winter Dinner
Friday 18th June 2021
Join your collegues and friends
for fine food, drinks, networking
and entertainment at the
PWI NSW Winter Dinner.

FIRST SESSION

PWI Annual Convention 2020

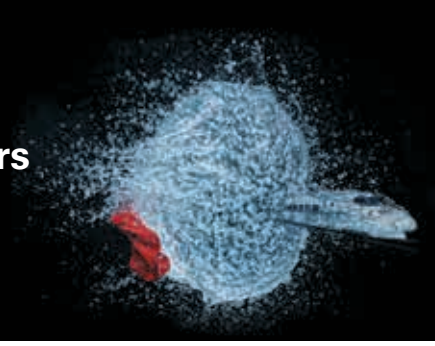
Chairman: **Steve Butcher – John Holland**

Paper 1: **Demand Responsive Transport for Railway Operators, Siemens**
Annika Schmidt, Siemens Mobility GmbH

Paper 2: **Changing the Automotive Industry through AR and VR Technologies**
Mario Dimovski, Tradiebot Industries

Demand Responsive Transport for Railway Operators

Annika Schmidt, Siemens Mobility GmbH



Introduction

Current situation

Timetable planning and scheduling for mass transit systems are derived based on customer demand. Typically, several timetables are prepared for different scenarios, e.g. for workday, weekend, holiday periods and seasons planning for expected passenger numbers and travel times under each different condition. These timetables are prepared in advance based on these typical demand scenarios constructed by analyzing a few historically available data sets. The resulting timetable, reflecting the inherent quality of such static datasets and no other dynamic inputs from other sources are then uploaded onto the Operations Control System (OCS) for daily use.

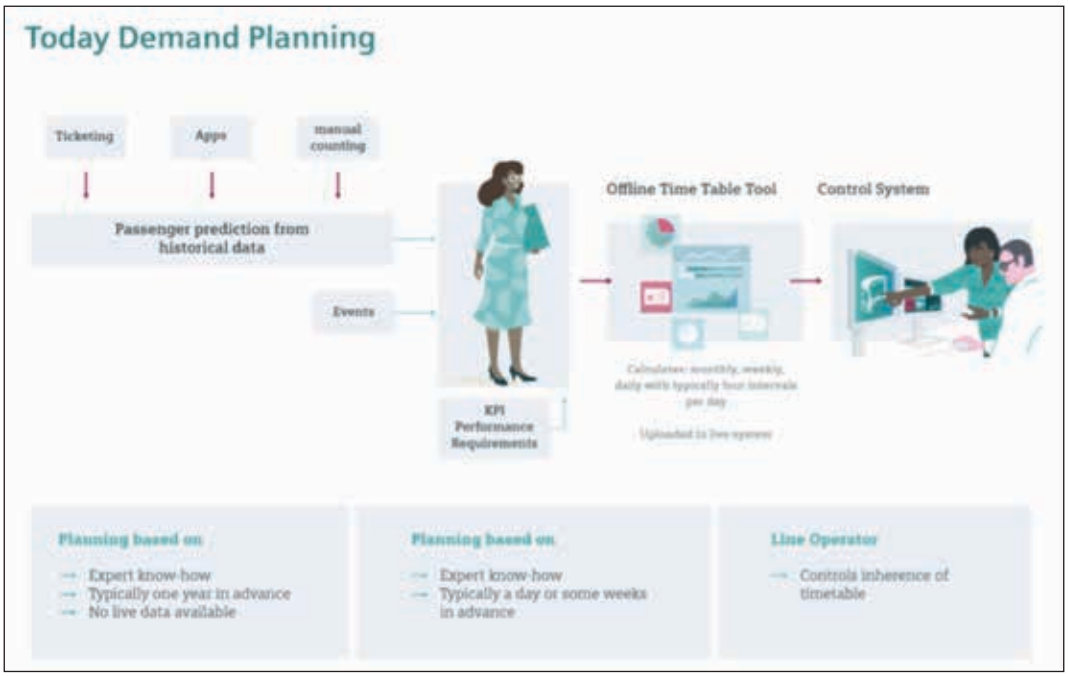
This approach is not only very time-consuming and inflexible, it is unable to tactically adapt to changes in demand throughout the day to match supply resulting in:

- ineffective train scheduling
- unused capacity
- overcrowding
- unsatisfied customers and
- financially overburdened operators

The "quality criteria" an operator may want to apply to the contraction of its timetable is difficult to reflect in the traditional approach to timetabling.

In these quality measures, operators generally want to reflect the relative priorities that it assigns to e.g. average traveler waiting times, train occupancy rates, train punctuality etc. These measures are typically motivated by obligatory and financial Key Performance Indicators (KPIs).

Depending on demand, some of the KPIs can be conflicting and a uniform approach to demand matching may lead to a sub-optimum cost outcome (e.g. short traveler waiting times versus the costs of an additional train run), finding the optimal solution can be a time-consuming task that is prone to errors and can result in sub-optimal solutions, unsatisfied customers and undesirable financial outcomes.

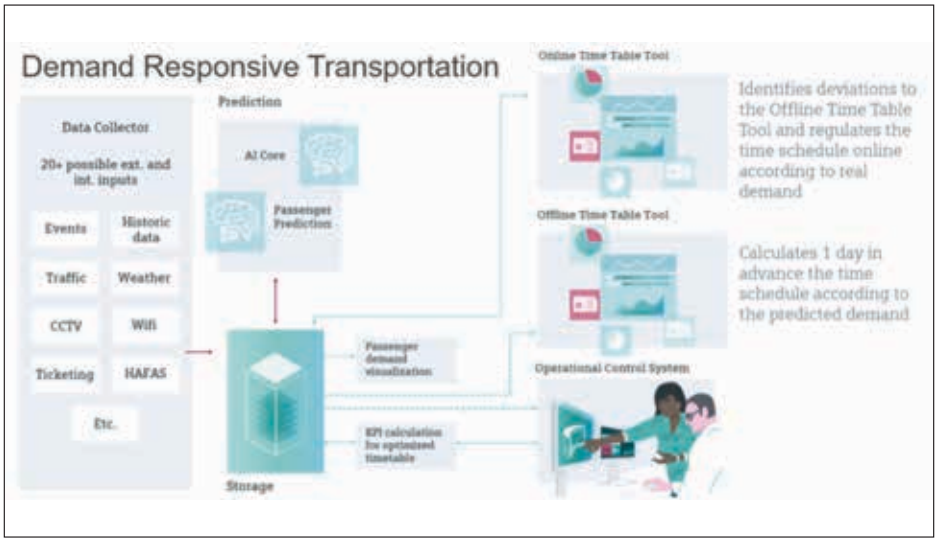


Demand Responsive Transport for Railway Operators

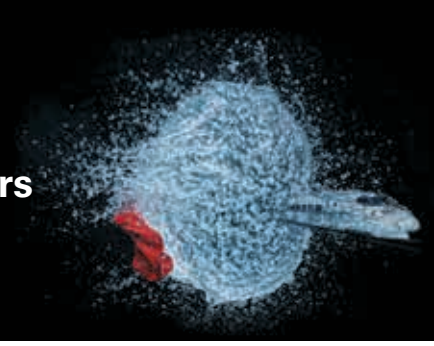
Solution Path

In order to optimize train scheduling as much as possible and allow some flexibility through planning in shorter time cycles, we need to develop a new approach to the development and handling of timetables, i.e. we need a system that is based on the following steps:

- A system that detects and predicts deviations from the originally assumed passenger demand. That detection needs to be in time to allow for changes in the timetable to be executed. As base for that prediction, data from various sources must be used, e.g. train schedule information requests, ticket bookings or even event bookings and the weather forecast. The result of that step is a predicted passenger demand for that day that is based on actual data and reliable prediction algorithms. Customer specific update indicators are provided to the customer informing them that a change in passenger demand requires a change of the timetable.
- A system that decides if and which changes to the timetable are needed to accommodate that predicted passenger demand. As every operator has a different value proposition regarding their customer service and hence determining their optimal train schedule, these KPIs of the operator need to be considered. The result of that step is an optimal theoretical train schedule that reflects the operator KPIs but needs to be adapted to the constraints of the line (e.g. crossover times, buffer times).
- A system that rapidly develops a new executable timetable based on the optimal theoretical train schedule derived in the step above. That executable timetable needs to take the limitations of the line and further optimizations into account, e.g. the availability of trains and drivers, energy optimized train runs etc. The result of that step is now an optimized and operational executable timetable that does not only reflect the operator KPIs but is adapted to the constraints of the line. That timetable can be loaded into the signaling system and can be executed there.
- A signaling system that executes that new timetable. Here any suitable Operator Controlguide System (OCS) can be used. The currently ongoing digitalization efforts play a big role in that approach. Data from various sources are more and more available and can be used for travel demand predictions and innovative data analysis and optimization tools are developed that can utilize these data. Siemens is an active player in the digitalization efforts for mass transit systems and several important data sets are available from Siemens own systems, e.g. the train weight from the signaling system, see below in Figure 2 Demand Responsive Transportation.



Demand Responsive Transport for Railway Operators



DRT Solution

Overview

Demand Responsive Transport (DRT) is a system that allows the timetables of trains to be adapted on passenger demand. That system follows the steps described above in developing and executing an optimal timetable. DRT interfaces to several existing Siemens products and complements them with innovative modules for demand prediction and the development of a KPI based optimized train schedule.

In the steps below the workflow is described and examples based on simulations and real-world data are provided.

Step 1 – DRT Demand Prediction

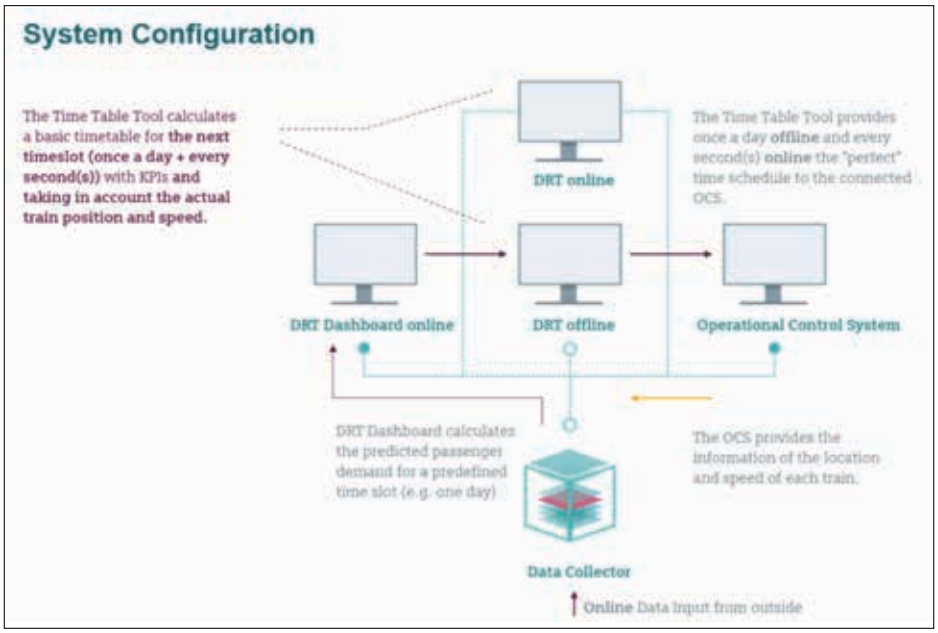
The first step in the timetable optimization process is a system that detects and predicts deviations from the assumed passenger demand:

Passenger numbers can be derived from a multitude of sources including:

- Historic network usage data
- Train weight information (via the OCS)
- Correlation with the date (public holidays, event calendars)
- Weather data
- Classic survey data
- Train schedule information requests
- Ticket bookings
- Current passenger numbers from ticketing systems and access gates
- Google maps traffic information (real time data and forecasts on traffic congestion)
- Urban passenger flow models (e.g. from public authorities)
- Schedule of connected mobility services (e.g. load and delay, long distance trains, bus services)
- Video analysis of camera streams
- Changes in the train punctuality due to network usage
- Use of mobile localization (mobile communication service provider information, WLAN, GPS).

The time range of these data can vary between current data (e.g. when using video analysis or gate data) or even several days in advance when using train schedule information requests. It is important to identify the key passenger demand tracker, i.e. the data that best represents passenger demand. So only a small subset of the above-mentioned source data is needed.

Intelligent algorithms are used to derive trends in the raw data. These trends are then combined to predict passenger demand and a demand curve (describing the overall passenger numbers on the line) and an in-depth heatmap (describing the numbers of passengers per segment of the line and per time) are generated. The accuracy of that prediction is dependent on the quality of the passenger demand tracker used but simulations show that a strong correlation between predicted demand values and real demand values can be achieved.



The demand curve and the heatmap that are derived from the key passenger demand tracker are then compared with the capacity that it is provided by the timetable that is assigned for that day and deviations are highlighted.

The result of Step 1 is a predicted passenger demand for that day and customer specific update indicators are provided to the operator informing them if a change in passenger demand requires a change of the timetable.

Step 2 – Timetable optimization

The second step in the timetable optimization process is a system that decides if and which changes to the timetable are needed to accommodate the predicted passenger demand and develops an optimized theoretical train schedule.

Operators typically have diverse goals for an optimal timetable, e.g. waiting time for the passengers, train load, energy efficiency targets, number of used trains, train kilometers, maintenance costs etc. These goals can also be contradictory and finding the optimum solution manually is not easy. We represent these optimization goals as KPIs and use equation solvers to find an optimal timetable for the train runs.

That solver-based timetable development tool can also be used independently of the demand prediction described in Step 1 of DRT to calculate an optimized train schedule.

The result of that step is an optimized theoretical train schedule that is then converted into an executable train schedule.

Step 3 – Development of an executable timetable

The third step in the timetable optimization process is a system that develops the final executable train schedule based on the optimized theoretical train schedule as provided by the solver-based optimization described in Step 2.

In that step, a new executable timetable based on the optimal theoretical train schedule derived in the step above is developed. That executable timetable takes the limitations of the line and further optimizations into account, e.g. the availability of trains and drivers, energy optimized train runs etc.

The result of that step is an optimized and executable timetable that does not only reflect the operator KPIs as developed in Step 2 of the optimization process but is also adapted to the constraints of the line. That timetable can be loaded into the signaling system and can be executed there. The DRT forecasts when and where passengers will use the train and the train schedule can now be optimized to support exactly that forecast.

The train schedule is now optimized to transport the passengers when and where needed. By pinpointing the train availability to demand, a better traveler experience can be achieved (as expressed by the waiting time for passengers) even when the overall number of trains and the train kilometers can be reduced.

Step 4 – Operation of the optimized timetable

A system must execute that optimized timetable. As the timetabling tool offline is system agnostic, any OCS with an interface to it can be used. That allows entering brownfield projects and entering systems that are equipped with systems by our competition.

For the online timetable optimization, it is recommended to use the OCS from the same company as the timetabling tool.

Step 5 – Online timetable actualization

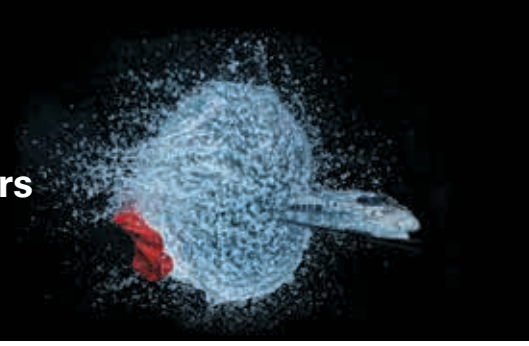
An optional addition can be DRT online. With this step, a redundant DRT system architecture is established, where DRT offline works in the previous explained way.

But DRT online calculates in selectable time frames (e.g. each 10 seconds, each minute, each hour) based on the actual prediction of the passenger demand for the next timeslot the deviations to the timetable, which is calculated one day in above.

The timetabling tool gets also in a configurable frequency the input from the OCS system, where the trains are and with which speed they are driving.

The timetabling tool calculates based on these four inputs (location of the trains, speed of the trains, deviations about the passenger prediction and the basic timetable, which is calculated one day before) the optimal adjustments for the timetable. These adjustments are provided to the OCS system as described in Step 4.

Demand Responsive Transport for Railway Operators



Benefits and advantages

Due to its forward-looking and future-proof system design and architecture, the DRT offers many advantages and benefits compared to conventional and technically outdated system implementations.

- **Forecasting passenger occupancy in trains:** Accurate AI prediction of customer demand based on various IoT data (Precision in prototype: 80-95%) leads to optimized timetable based on the demand.
- **Scalability:** Calculation of optimal train schedule based on calculated demand and operator KPIs or calculation of timetable based on optimal train schedule.
- **Openness and Adaptability**: It can be sold in brown field projects, independent, if the control guide system is from the same company, or not. It can also be sold in green field projects and is not limited to a specific system configuration. It can be coupled as well with several other Digi-products.
- **IT security:** IT-Security: DRT integrates seamlessly into state-of-the-art DMZ infrastructures. DRT is firewall friendly by using predefined interconnections, initiated from the inside. This allows easier implementation into category II networks in regards to EN50159. DRT is developed by certified ISO27001 business sites.
- **Cost saving:** DRT provides an indication, how close the KPI- based solution is to the mathematical optimum of timetable preparation. In sample projects we archived values of saving 18% trains, 28% train kilometers and 24% average waiting time for passengers in prototype, but that depends of course from the individual project. Consultant work can be done to identify the capacity which can be saved.
- **Easy to use**: Direct load into many Control guides is possible in case of one day in advance demand changes.
- **Keeping minimal distance on trains (e.g. in terms of Covid-19)**: The total number of passengers allowed can be compared to capacity of trains and adjusted.
- **Adapting train service to current situation:** Save maintenance cost while there are less passengers travelling without reducing services.
- **Responding to peak times**: Avoid accumulation of passengers while using resources in the most efficient way.

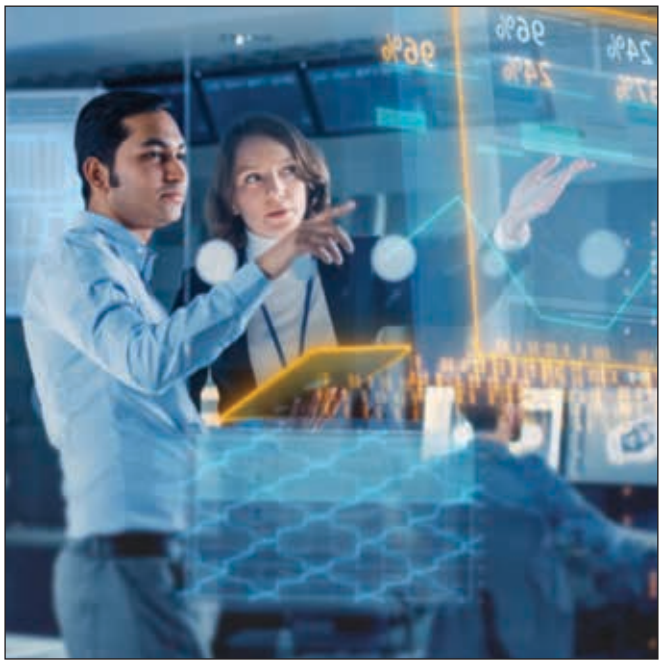
Summary

DRT collects the data about the passenger demand from different sources and provides a passenger demand prediction to the Time Table Tool which calculates then the optimized timetable depending on the passenger demand and on the customer specific KPIs and loads it into the OCS. That uploading will be done typically one day in advance and can be actualized online with the DRT online functionality.

Technology used

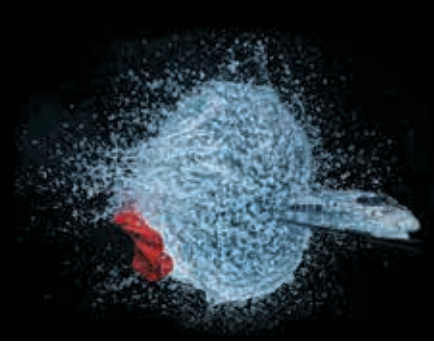
The system used the following innovative concepts:

- IoT based demand prediction: Self-learning and artificial intelligence-based demand calculation based on raw data from various sources. Input data for the demand prediction can be from various IoT (Internet of Things) sources.
- Solver based development of the optimum train schedule based on the predicted customer demand. The solver calculates the optimum based on the predicted demand and on the specific sets of KPIs of the operator.
- Development of timetable based on the Time Table Tool.
- Short term reactions to the demand- one day in advance with DRT offline, realtime with DRT online.



Changing the Automotive Industry through AR and VR Technologies

Mario Dimovski, Tradiebot Industries



About the presenter

Mario Dimovski is the Founder and Chief Creator at Tradiebot Industries, leading the way with his contagious drive, optimism, and unique vision. With 30 years of industry experience, his fascination with continuous improvement and a tenacious focus on knowledge acquisition has resulted in a reputation for being one of the most influential personalities across the Automotive repair industry.

At the forefront of developing technologies such as Industrial Augmented and Virtual Reality, 3D Printing & Robotics, Mario's ground-breaking work has been covered by many industry & trade publications. Driving the advancements in immersive technologies and 3D printing in the collision repair process he has been featured as a key speaker and expert panellist at many International Vehicle Industry events such as IBIS 2020, SEMA 2019, Collision Symposium 2019 and the 2019 Asian Mobility Summit.

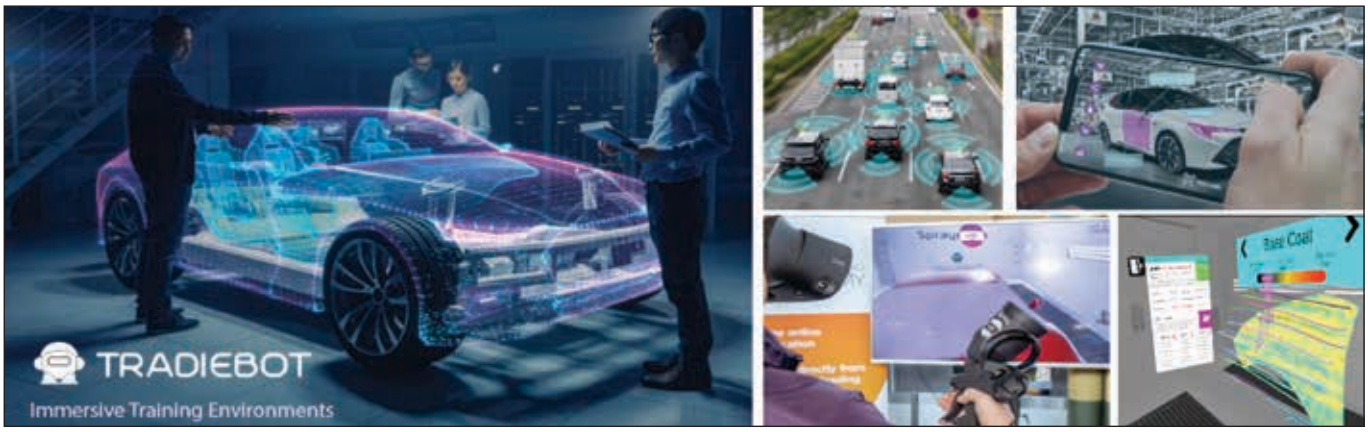
By actively building a global network of like-minded associates, collaborators and government bodies, Mario believes we can better manage the delivery of new technologies, skills, waste management programs & Industry 4.0 processes for the automotive repair sector. He is also a prominent supporter of women in the collision industry, illustrated by his recent launch of "Women 4 Plastic Repairs" program in Australia and New Zealand.

Always on the move and pushing the boundaries of digital transformation, Mario has been recognized as a Circular Economy and plastic repair pioneer, both founding and managing Plastfix, the world's most successful and rapidly expanding automotive plastic repair & recycling service business.

About the presentation

In the last decade, the development of in-vehicle technology and the growth of smart vehicles has been rapid, however other parts of the automotive industry such as repairs and maintenance have been considered slow adopters of new technologies. Practices for training staff and apprentices or for repairs and maintenance have also fallen behind.

Tradiebot Industries (Tradiebot) is an advanced software company that draws on the advanced potential of immersive technology to develop new solutions that meet the needs of this COVID-19 era and beyond. Tradiebot Industries uses specially developed Virtual Reality (VR), Augmented Reality (AR), app-based and web-based technology to help organisations become better recruiters, teachers, trainers, and managers. Tradiebot also offers a multi-skilled virtual platform to help students, trades people and skilled workers from across industries establish and manage their careers, either remotely or within a classroom.



Changing the Automotive Industry through AR and VR Technologies

Tradiebot will demonstrate the power of VR as a tool for learning and skills development, showing how the automotive industry is embracing VR to grow its capability in a safe, simple, and efficient way. VR transports users to spaces that are uncluttered and free from distraction, with engagement and retention between three and four times better than traditional methods. VR is seen as an ideal choice for trades people, helping them to explore career options and develop the required skills.

Considering safety as a top priority for workers within the rail industry, VR is an excellent choice to build knowledge and understanding in the areas such as signalling, high voltage power and other control systems. VR is a safe way to deliver situational awareness without exposing the trainees to real-life risks or relying on written/oral testing to validate a trainee's understanding of the course content.

For example, VR can be used to teach people how to provide safe working, flag trains or protect worksites in a virtual live corridor - no trains, no risk. You can also test and challenge students that want to become Electrical Engineers by allowing them to work around virtual electrical equipment without exposing them to the dangers of a live environment. Using VR as realistic playgrounds is a great tool for recruiting and teaching new people coming into the rail industry.

Tradiebot will also demonstrate the emerging and growing use of AR for explaining complicated work processes. By its nature, AR interacts with its immediate environment, using a smart phone, tablet, glasses, or goggles. It highlights specific actions or tasks and brings forward additional information to assist with the task at hand.

This technology is ideal for identifying and managing rail assets in the field, recording asset inspections and defects. It is especially well suited for calling out overlaying danger zones, identification of vital assets and critical equipment or providing instructions on how to maintain or replace life-expired components. This technology is capable of being used on rail plant and equipment, such as rolling stock parts, repairs, and asset data.

Beyond safety and training, AR technology can be used to build the passenger experience by offering enhanced explanations and tours of trains, stations, or local communities. It can also help passengers connect between different transport modes, such as heavy rail to light rail, buses, or ferries. Other applications include highlighting safety announcements prior to departure, whether on video display or a custom application on a passenger's smart phone.

Building on its success in Australia, Tradiebot has opened business offices in North America and Europe, bringing their exciting technology to customers around the world. Industries traditionally slow to adopt new technologies, such as the automotive and rail industries, now have an opportunity to improve their systems and operations. This will greatly improve efficiency, safety, skills development, and knowledge share.

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SECOND SESSION

PWI Annual Convention 2020

Chairman: **Julian Sharp – CPB Contractors**

Paper 3: **Empowering the rail industry to leverage digital twins to improve performance**
Gerard Francis CEO WillowRail, Global Head of Infrastructure

Paper 4: **An incipient moment in rail...innovation is the vaccine not the virus!**
Jacqueline Linke, Innovation, Culture, Leadership

Ken Erickson Innovation Award

Young Achiever Award

Welders Award

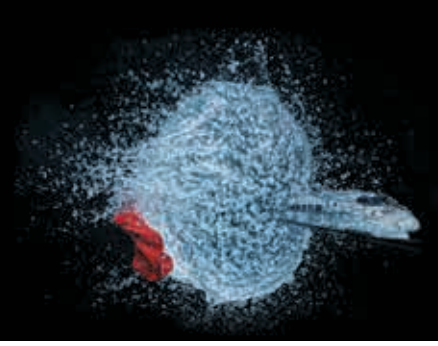
Steve Maxwell Platelaying Award (Minor)

Steve Maxwell Platelaying Award (Major)

Alan Barham Maintenance Award

Empowering the rail industry to leverage digital twins to improve performance

Gerard Francis – CEO WillowRail, Global Head of Infrastructure



Population growth and urbanisation are driving a capacity crunch in rail. With more than two-thirds of the world's population expected to live in urban areas by 2050, there is mounting pressure to enable our existing rail networks to achieve more through increased availability levels and driving the highest levels of productivity possible.

Within this context, Willow has identified two big challenges:

1. The need to connect multiple siloed solutions.
2. Fixing the problem of reactive maintenance.

Today, rail networks are managed by an abundance of disparate tools and measuring devices. The average rail network may use over 20 different software packages, each with its own interface, data set, and process. Owners and operators face a sea of unintegrated data, often left to join the dots on their own and make critical decisions based on incomplete information. This presents a huge challenge for owners and operators. They lack a single, consolidated view of their network along with the real-time data required to make accurate decisions. Additionally, most railways operate in an incredibly reactive manner, and the technicians in the field often do not have the right information at their fingertips to resolve the problems.

1. The future of rail is digital – but how do we get there?

Willow saw an immediate opportunity and developed WillowRail to improve the maintenance and management of rail networks and, ultimately, keep trains running with minimal downtime. WillowRail is a joint venture between Willow and Strukton Rail formed in 2018. Willow's innovative approach and technology expertise pairs with Strukton Rail's deep industry experience. Strukton Rail is a trusted partner to some of the world's largest rail networks, delivering ground-breaking solutions across rail infrastructure. For over a century, Strukton Rail has been accumulating the vital industry knowledge and experience required to make WillowRail a reality. Together they have formed a successful partnership, delivering growth, providing clarity, and ensuring progress within the rail industry.

WillowRail offers an integrated solution to the rail market that combines asset management and maintenance, change management, and a technology platform. It is a consolidated view of all the critical aspects of network health to drive real-time decision making; and, in the future, more preventative and data-driven decisions to optimise network performance. The digital enablement of rolling stock, controls, signalling, and the importance of leveraging big data presents both opportunities and challenges in equal measure. The platform sits above individual proprietary systems and uses rail specific algorithms to turn big data into actionable insights.

2. What are the core benefits of a digital twin?

The digital twin solution that is provided by WillowRail, is focussed on track asset management. WillowRail's "digital twin" combines operational data and asset management information into a simple and intuitive software platform. It overlays static asset information, maintenance information, and track health information onto an intuitive GIS interface.

There are three core benefits to WillowRail's approach:

Firstly, WillowRail drives improved network performance. The platform provides a holistic view of asset performance with embedded algorithms, which supports condition-based monitoring and predictive maintenance. Combining these elements enables us to improve availability by up to 99.9+ per cent, reduce track geometry defects up to 50 per cent, and reduce maintenance costs up to 20 per cent.

Secondly, WillowRail drives improved decision making by providing the right data at the right time. WillowRail delivers a single view of network data for all stakeholders – for both the client/operator and its contracted parties. By giving decision-makers complete real-time transparency into asset performance, they can now accurately track network performance KPIs. This is unique in the market, as the client owns data, and they can measure and rank their operators/maintaining parties accurately.

Finally, WillowRail is also enabling a more connected workforce. As part of the platform, Willow and Strukton developed a mobile application for the maintenance groups that provides navigation to faults, safety information, the seamless transfer of communication back to the headquarters, real-time location tracking, asset repair status, and database updates.

Empowering the rail industry to leverage digital twins to improve performance

3. What are the core features of WillowRail?

Digital Framework

WillowRail is a robust, secure, non-intrusive and scalable platform allowing rail owners and operators to be able to scale up with technology and innovations to suit their business needs.

A Single Interface

A single system drives deeper insights, proactive management, and optimisation of rail networks. Clearly identify availability, punctuality, capacity, speed restrictions, interruptions, and deviations all within a single interface.

Corrective Maintenance

Create, triage, assign, and track faults through their life cycle, decreasing total time to restore and improving visibility for all stakeholders.

Preventative Maintenance

Dynamic schedules allow maintenance to be performed on 'as required' basis, driven directly by live data on asset health. This reduces fixed maintenance costs and provides operational flexibility in the maintenance of rail assets.

Predictive Maintenance

Utilising advanced algorithms and high-quality data, assets can be monitored without human intervention to predict faults before they occur.

Live Integrations

WillowRail integrates with a multitude of widely used rail operating and maintenance systems creating a universal and agnostic tool suitable for all networks.

Mobile Response

Maintenance work groups are armed with the shared knowledge and history of assets in their smart device. With its real-time functionality, the WillowRail app allows ticketing officers and owners alike to view location details, fault progress and actions executed by work groups all while having a direct line of communication, streamlining processes.

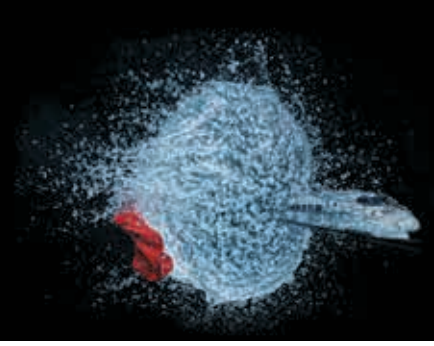
4. How much further can the technology behind WillowRail be pushed?

The platform's long-term vision is that WillowRail will enable a rail network to progress beyond track asset management to a platform that combines all aspects of a rail network in a digital environment, from performance management to passenger experience.

Today, rail networks are managed by an abundance of disparate tools and measuring devices. The average rail network may use over 20 different software packages, each with its own interface, data set, and process. Owners and operators face a sea of unintegrated data, often left to join the dots on their own and make critical decisions based on incomplete information. This presents a huge challenge for owners and operators.

An incipient moment in rail ... innovation is the vaccine not the virus!

Jacqueline Linke, Innovation, Culture, Leadership



The technological revolution has carried us into a global society facing an unprecedented rate of exponential change. Now Covid 19 has thrust us into a new realm, shifting our lives, our businesses, our health and forced us into inactivity (literally and organisationally) and into an opportunity to think differently about what we do and how we do it. Overnight we were all working from home. Changes in work practices and new skills have come out of necessity. Many organisations and employees adapted quickly, with early research showing overwhelmingly positive outcomes from flexible working.

We have rapidly moved to remote based working. We have rapidly increased collaboration. We have rapidly improved our digital literacy. Even the resistant few, suddenly forced to master the teams meeting or the zoom meeting, fumbling through how to be sure the camera is off or on, muted or not, are now comfortably using technology to meet their needs.

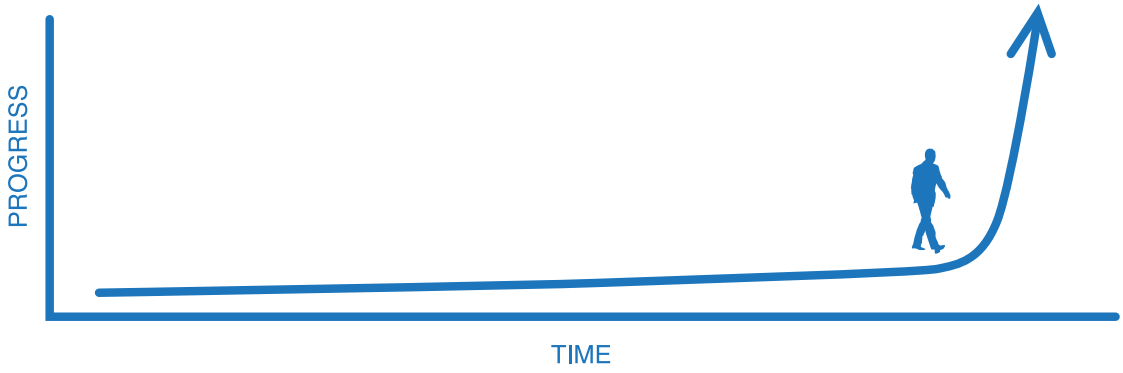
The diagram below shows the trend of human progress over time, and highlights the speed of change that is our current challenge. It underscores the fact that embracing change is crucial for any organisation to survive, as the curve is steep and difficult to climb without a lens of innovation. The nature of change is both exponential and perpetual, and we need to shift the way we think. It is not something we adapt to and then settle down to a new way. The new way is change itself. We have to keep adapting. Adopting a mindset and culture to capitalise on perpetual change allows organisations to develop new processes and operating models that support learning and growth **with** change, not **against** it.

Professor Daryl Mann, CEO of Systematic Innovation in London, likens innovators in organisations to viruses the body tries to fight off, the organisation consciously or unconsciously trying to destroy the innovators who are seeking the step-change (a significant change which leads to ongoing improvement). Research suggests that Innovators are not the virus they may appear to be but are in fact the vaccine to future proof the business.

Everyone can be an innovator and an organisation buzzing with creative thinking is more likely to achieve the step-change themselves rather than external disruption leaving them scrambling for a pathway forward. What if innovators are not the icing on the cake, but an essential ingredient to the cake - the egg white or baking soda, what if without innovation and step-change we don't have a cake?

Think of innovation as a life insurance policy for your organisation - it's an insurance policy against obsolescence. But it is more than insurance, it is life giving.

Crisis offers us an incipient moment, which we can use, to pause, reflect, and select action to progress, to change things - experiment with things - with the possibility of not just surviving the crisis, but thriving as a result of it. It is a time when the balance of life is unsettled and people are more open to exploring new ways of doing things. On the other hand, Covid 19 has seen organisations focus on operational excellence because during this time we need to buckle down and survive so we divest ourselves of innovators, or an innovation focus, as a mechanism for survival. Research tells us this is counter intuitive.



An incipient moment in rail ... innovation is the vaccine not the virus!

McKinsey and Co[i] have surveyed industries during the Covid crisis and found an overwhelming decline in innovation. "This decline in focus on innovation is evident across every industry we surveyed; the sole exception is pharmaceuticals and medical products, where we see an almost 30-percent increase in the immediate focus on innovation". Their research shows that short term safety may not lead to long term gain and that companies which invested in innovation during a crisis outperformed others by 10% during the crisis and over 30% in the post crisis years. The Renaissance flourished post a pandemic. I would take it further and say that the pandemic, by making us stop and think, can provide the kind of space needed to speed up innovation.

When Harvard Business School[ii] examined the financials of almost 5000 companies through three recessions they discovered that the businesses that bunkered down and reduced growth in a crisis, performed badly, with a high number becoming obsolete, and businesses that focussed equally on balancing investment in growth and in innovation, whilst ensuring lean operations, outperformed peers, and were most ready to realise opportunities in the future. Ideal organisational growth involves both operational excellence and innovation. They work as a partnership creating the stepchange for progress, then ensuring the change is operationally efficient, before the next stepchange.

If we look to healthcare as an example of innovation borne of necessity during the pandemic it has shown us that we can collaborate with public and private, respond quickly and adapt to new circumstances. We have experienced the outcomes and benefits from multiple innovations from face masks with ear-savers, ventilation hoods, to plastic shields made from 3D printers.

Businesses are pivoting: Gin distillers are making hand sanitisers; car manufacturers are repurposing their 3D printers to make medical equipment; shops turning to home delivery; the Royal Opera wardrobe department in Berlin are using their sewing skills to make face masks; Armani making hospital gowns - in fact suddenly the domestic sewing machine is back in fashion. A myriad of artists are turning their skills to face masks in a range of fashionable fabrics - you can even get a sequinned mask for a safety conscious night out where you can shimmer at a distance!

Some changes will be far reaching, where the crisis is a starting point to move forward, rather than a major setback. Our country may even benefit from becoming more self-sufficient, taking a different track from depending on global markets. *"Necessity is the mother of invention"* and crisis creates necessity. Humans are good at adapting and creating under adverse conditions.

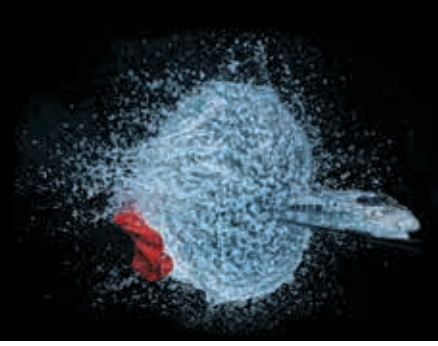
Repeatable innovations come from organisational cultures that foster growth, creativity, and collective intelligence.

History shows us many examples of people seizing an opportunity in a crisis to progress society and change the world through innovative solutions, with far less supports than we have today. Singer sewing machines were nearly bankrupt. They repurposed their sewing machine motors to create heart machines and gained a new life. Pilates training was invented by Joseph Pilates in a POW camp to help with the rehabilitation of injured soldiers. It is now a part of everyday health and fitness in societies across the world. In WWII manufacturer Kimberley-Clark developed a crepe paper filter for gas masks. After the war they turned it into Kotex sanitary napkins. By 1929 the napkins were thinner and softer and they became Kleenex tissues. Innovating the way out of a war time crisis into an innovating future.

One of the greatest results of innovation comes from hundreds of years ago with the invention of the printing press. In Germany, in the 1430s, Johann Gutenberg invented the machine that would, not only give the masses access to printed materials, it led to the invention of the book, publishing, magazines, greeting cards and hundreds of other industries we know today. It led to the way for everyone, rich or poor, to learn to read - to be educated. Prior to the printing press nearly everything was hand written in books by scribes who lived in monasteries, or wood blocks with ink were used. It was slow, expensive and inaccessible to all except a few. The printing press was not born out of crisis, and innovation does not have to be either. In fact it should not be. It should be part of our business model. However, the crisis brings motivation and opportunity to rethink.

Today, printing touches nearly every business, every company, every art, every school and everything we read throughout the day. Everyone uses printed materials. This particular creation that came about during the Renaissance did change the world. And out of the need to read print for everyone came another Renaissance invention - spectacles. Spectacles were invented out of a need to be able to read the small fonts created by the printing press!

An incipient moment in rail ... innovation is the vaccine not the virus!



Mass produced paperback books made information literature cheap and accessible to all. Borders books were an example of an organisation that, hit by digital revolution, focussed on their core business, building operational excellence in expansive book stores. However, they were disrupted by online e-commerce and they chose to outsource their online presence to a small start-up, 'Amazon'. They were bankrupt by 2012 and now Amazon is one of the largest companies in the world.

Who knows what will be next? That is the challenge and joy of innovation.

There are hundreds of examples of opportunity out of crisis. We need to collectively think outside the box. We see from the crises present and past, that when we must make changes we can. We are entirely capable of adapting to new ways of doing things, and doing them quickly. We must not only **see** this. We must **learn** from it. And we can learn to take the initiative to make changes when we are not in a crisis in order to progress, as did Kimberly Clark with Kleenex tissues. They started in a crisis and never stopped innovating.

We can think of the current crisis as a disaster, which in terms of human health it is. But it will not be if it brings new discoveries to overcome this kind of illness.

We can think of it as an invitation or a challenge, to rethink our assumptions, test the evidence for our decisions, entertain the inconceivable and create new outcomes that add value to people, ourselves, our teams, our organisation, our community, our state, our country and our world. Knowing how to be operationally excellent and at the same time to innovate lies at the heart of successful progress but if we are only focussing on the *as is* - then we are at risk of becoming a *was* rather than a *will be*. Bring on the innovators!

Let's have a look at how this could apply to rail.

We can take a lesson from history and combine the creative arts of the innovator to the scientific knowledge of the engineer. Renaissance artists were applying art to science and science to art long before Galileo introduced his world-shattering changes. Painters and sculptors had dissected the human body to make accurate representations in their work, and centuries prior to this the Greek sculptor, Ploykleitos, had introduced ratios to guide his work. Professor of Biology and Neuroscience, Dave Featherstone said on Quora that,

"Science = art…Both science and art are human attempts to understand and describe the world around us. The subjects and methods have different traditions, and the intended audiences are different, but I think the motivations and goals are fundamentally the same." If we apply that principle to rail the sky is the limit.

Is it harder to apply innovation to rail?

Can the bubble we have right now with more people working from home and less people using rail, provide us with an opportunity to rethink the future?

By definition there is a sense of fixedness about rail, heavy, large, expensive infrastructure which once laid down will be there for all of time. This thinking, association with permanence, applies a learned constraint: these are the parameters of rail, this is what is possible in rail, these are the costs associated with rail, these are the confines we are working in. This is where our tracks are laid so this is where we are going. Our thinking determines our ability to look for, or even see opportunities.

Does the name of 'Permanent Way Institute' or 'Perway' suggest it won't change? What if the Permanent Way Institute was called something else instead of the *Permanent Way* - how would that impact the future of rail? Would it change our thinking if it was called the New Way or the Flexible way or the Fast way or the Best Way? Would it remove some of the confines and constraints to how we think about rail, what it is, what it can do and what it might do in the future?

Rail as an industry is one that focuses by necessity on operational excellence. Does that have to be the antithesis of innovation? It is both vital and fundamental to its existence. However, the type of thinking that creates operational excellence, can lie in diametric opposition to the type of thinking that drives innovation. Trains must run on time, trains must be safe, trains must be efficient and these 'musts' drive our focus - we have data and stats and KPI's to push us to operational excellence. Rail interruptions have a wide impact. They hit the front page of the news and this keeps our resources and focus on tightening up the existing processes, to ensure efficiency, to ensure operational excellence, because it is a not negotiable.

An incipient moment in rail ... innovation is the vaccine not the virus!

If we *only* focus on this it is antithetical to progress, to the kind of thinking that leads to the stepchange that shifts what we know, to what we've never imagined possible, and then realises it. Dr George Land describes the two key types of thinking as working in opposition; convergent thinking like the brakes in a car and divergent thinking as the accelerator, and you can't do them both at the same time or you get neural warfare. We are educated into mastery of convergent thinking the one optimal right answer and educated out of divergent thinking, creative, imaginative, out of the box explorations. We need to be cognisant of how we are using our brains and when and what type of thinking is creating our decisions. We need to be able to do both.

Is there a danger of complacency because we know that what we do is needed? We know that nothing can replace rail so we continue to work on improving what we do well.

Perhaps complacency of thinking can be dangerous. 'Electric light did not come from the continuous improvement of candles.' (Oren Harari). It came from having the mind set to see that candles weren't perfect, they were not always reliable and they smoked. And it came from the mindset that saw the opportunity when experimenting with electricity produced a light. It is the innovative mindset that produces step-change progress.

Keeping a business operationally efficient requires a focus inwards on the minutiae, the detail, the tightening of the process that exists. Future proofing a business requires outward looking, tracking possible disruptions, and trends, looking at the broad possibilities of mobility, and the needs of the community who use it, with a view to the future.

We need to open our mindsets, and teach our people the capabilities to think differently. Then, as organisations, we need to at a minimum, get out of the way of the people we employ who can and want to make a difference and ensure we are on the front foot for the future. Traditional business models don't always see this. We look for outcomes on our KPIs, rarely for learning. Edison had some 10,000 trials over years before he succeeded to make the electric light bulb. What would his organisation have had to say over those years? We don't all have to be innovators but we do all have to support and enable the vision, it's in our interest. Getting out of the way, opening the way, smoothing the way is the way to progress. *If you can't remove the roadblock at least don't be the roadblock!*

If we look at the cycle of disaster, it begins with a crisis where we focus on survival, pause all unnecessary projects and just get through. Then we enter a disillusionment phase, we are surviving but not thriving. Then there is this moment that we are in right now, an incipient moment of emerging possibility. We can choose to turn this moment from surviving into thriving by shifting our focus from the bunker down, into the exploitation of opportunity, exploring new ways to do things differently and better. There are less passengers on the network by approx 70% which should mean more availability to learn without disrupting our customer base to trial new ways - small tests that mitigate risk and give data to focus our investment for the future.

Most organisations understand to some extent that they need to innovate, and silo off a few geniuses responsible for the next epiphany, but the power of an organisation lies in all its people, the untapped optimisation of an organisation's people. The more people who are testing the thinking of the status quo, and creating options for new ways of doing things the better. To do this people need a mindset for learning and the capability to tackle problems creatively with both divergent and convergent thinking. This can challenge the learned constraints and find ways to make the impossible possible.

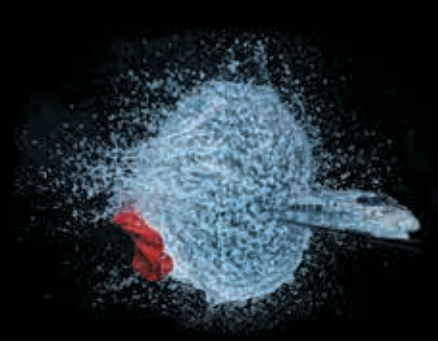
So how can we help make innovation happen faster and better in rail? We can learn from the past. There is so much knowledge behind us and so many people with years of experience we can learn from. For example, we can look at why cities with historical rail infrastructure are slower to innovate than cities where rail is newer.

We can learn from the present. We can observe and examine what is happening now. We can embrace the future. We can look at data: patterns, current trends, shifts and needs and use these to guide our focus.

What the organisation can do?

Organisations need to foster a culture that enables innovation to happen. This includes, providing vision and purpose, allowing people to learn, building skills in capability, encouraging participation, setting up incentives, challenges, or reward and recognition acknowledging the effort and application, the growing as well as outcomes. It includes stimulating creativity, play, fun, and bringing teams of diverse people together to solve something. The research shows that if there is no mechanism to support

An incipient moment in rail ... innovation is the vaccine not the virus!



innovation, or pathways for innovators to test things to try and to learn, and a safety net if something doesn't work the first time, then the innovators will eventually stop, or give up or leave and innovation becomes the virus killed off by the organisation. An organisation implementing even basic support mechanisms gets better outcomes than exceptional individuals working in isolation in an organisation or system that blocks.

What individuals can do?

1. **Manifest the mindset of an innovator!** Take control of your thinking: learn how to be in the driver's seat of your mind rather than a passenger. Observe and be present, question, notice meaning making, be open to possibilities. What if the opposite were true? Develop your inner coach to counter and intercept any fixed mindset self-talk. Foster a growth mindset, an open mindset, an exploratory mindset. Challenge the constraints you apply to yourselves - these are learned skills and learned constraints and you can unlearn them. Do this work on yourself for yourself. It is an insurance policy for yourself, your own career, as well as the viability of your organisation.
2. **Cultivate the capability.** We know we need to be innovative. We are all capable of it. Sharpen your skills in divergent thinking, convergent thinking, creative thinking, lateral thinking, problem solving, and analysing problems. Lateral thinking moves you from a known idea to an unknown idea, and critical thinking assesses it. Divergent thinking is imagination, creating, dreaming. It mobilises experience, knowledge, and subject matter expertise. Convergent thinking provides assessment, judgement, selection and prioritisation. Creativity leads to extraordinary solutions, solutions that you never imagined possible. Seek those solutions and then make them possible. Broaden your experience and expand your neural network by trying new things. Find someone, teach someone, read, experiment, dream, imagine, play, test, try, and learn and learn and learn. It's actually fun and should be. Einstein said "Imagination is more important than knowledge", and it is for innovation.
3. **Collaborate with the Collective.** Margaret Mead, anthropologist said 'never underestimate the power of a small group of committed people to change the world - indeed it is the only thing that ever has'. It is very gratifying being a part of a high functioning team and this could not be more true today, when a small team has a greater reach than ever before. Small groups of individuals integrating technology, can become the super minds[iii] of the industry, the collective intelligence - so if you're not already - then be that!

   'Hebb famously said that "Cells that fire together, wire together" and, more formally, "any two cells or systems of cells that are repeatedly active at the same time will tend to become 'associated,' so that activity in one facilitates activity in the other". We can apply that to people thinking together in teams. Building on one another and having a joint focus.

   Teams add value because they add different intelligence, diversity in thinking and approach. The best collectives are often the most diverse. Not just gender or race but diverse thinking. High functioning teams with difference are made up of people with high social inference or perception - people that can make collectives work through valuing each other, listening to each other and embracing views that are in opposition to their own. Diversity of thought is the greatest inclusion because it provides tests for assumptions and mitigates risk in investments. Capable, creative, collaboratives are actually really fun and exciting to be a part of as well as driving extraordinary outcomes.

You could start by doing things differently. You drive to work a certain way every day, or brush your teeth with the same hand, so drive a different way, brush your teeth with the other hand, explore a new pathway, and create new neural pathways. Your brain is a pattern making machine and once you learn a way of doing something you don't engage your brain in the same way that you do when you learn something new. The vaster your neural network the greater chance you have of solving complex problems. More input = more ideas. Try new activities at home, learn an instrument, dance, play sport, listen to music, listen to others, listen deeply, look outside rail and outside what you know, and you'll be growing your own mind. Create a 'do something you've never done club' and do something you've never done! You can also create your own teams of passionate innovative problem solvers. If you aren't invited to the party, throw one yourself! Invite others. Make the party.

An incipient moment in rail ... innovation is the vaccine not the virus!

There is another outcome from investing in innovation, with one of the most vital returns on investment you could ever hope to achieve, and that is passionate, excited, leap-out-of-bed engagement. I have led and facilitated many change interventions, processes and programs in the public and private sector over many years, and in my experience the best outcome you can get from unhappy people going through change programs is people leaving 'not unhappy'. On the other hand, I have created, led, and facilitated innovation capability programs, creativity programs, hackathons, sprints, cognitive agility workshops, where almost 100% of people leave excited about the future and the role they play in it.

The process of innovation is like coaching, it's a way of optimising human potential. Innovation is a powerful tool to navigate exponential change because it is forward thinking, purposeful, it celebrates effort and application and iterative learning. It creates options when there are none. It puts people back into the driver's seat of their own lives, careers and trajectories. When people have the skills to generate options and alternatives, when they understand how to add value, when problems and challenges become exciting, you see not just individuals thrive but organisations. You are in the running to achieve human synergy, a whole that is greater than the sum of its parts.

The benefit to people and organisations through engagement is as valuable as the benefit through new inventions or innovative solutions. Which organisation wouldn't want 100% of their employees to be actively engaged? Have you ever calculated how much money it saves you to have actively engaged employees? Purposeful engaged employees have grit and stickability, and are best positioned to navigate perpetual shifts. Purposeful engaged employees have greater well-being! Every part of making innovation happen serves humans.

There are many people in this institute who are essentially competitors but you are also team mates - team mates on the ultimate rail team - and you are all collectively working on how we can make rail more viable, more sustainable, more flexible - everyone of us here today are a part of a greater team. And we have other players not here, all over the world. Imagine if we actually work together better what we could create - I challenge you to this - to pulling several people from every organisation represented here to come together, virtually if you like, to create new possibilities for rail - the future of rail! What would we be capable of with our combined resources and assets, and our collective thinking? How might we learn from our global colleagues and fast track our own outcomes?

And that is the legacy you as a collective can leave.

If the culture is right, if your organisation has a sense of community, clarity of vision and purpose, if all staff feel they are valued and have an investment in the future of the organisation, if they grow and nurture the skills of creativity and mindset, are encouraged to put forward suggestions and share ideas, and try things, and learn, you have the context for innovation.

If we work together with a parallel focus of innovation and operational excellence we can seize the incipient moment. Collectively we can realise opportunities and leverage the vaccine that innovation provides for individuals and teams and organisations to protect against obsolescence and ensure a vital contribution to not just the future of mobility but our futures and the generations to follow.

According to Darwin's Origin of Species, 'it is not the most intellectual of the species that survives; it is not the strongest that survives; but the species that survives is the one that is able best to adapt and adjust to the changing environment in which it finds itself.'

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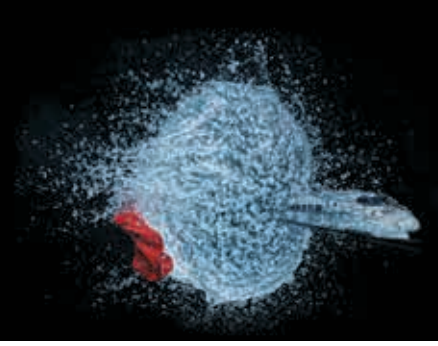
[i] https://www.mckinsey.com/featured-insights/coronavirus-leading-through-the-crisis

[ii] https://hbr.org/2010/03/roaring-out-of-recession Harvard Business Review

[iii] Superminds surprising power of people and computers thinking together. ©2018 Thomas W. Malone (P)2018 Brilliance Publishing

2020 KEN ERICKSON INNOVATION AWARD



Judges

Gareth Beynon – LINK Rail and Civil
Peter Boonstra
Sunail Hasnain – Sydney Trains

Ken Erickson was elected as a Fellow of the New South Wales Permanent Way Institution on 30 November 1981. He was a member of the Committee from 1981 until his untimely death on 25 November 1988. In his 7 years on the Committee he was an Editor, with wry humour and then Secretary, with sparkling wit.

Ken was a dynamic member of the committee and a gifted speaker. His "summing up" of our only conference at Kings Cross will always be remembered by those lucky enough to be present.

Ken was always trying to provide new ideas or concepts to the PWI, hence it is fitting that this Achievement Award, which particularly looks for new ideas, is named in his honour.

This Annual Innovation Award has been incorporated in the PWI Awards to recognise an initiative or significant advance in rail technology which has promoted improvement in any part of the Rail Industry during the last year. The Award recognises the contribution of a business or individual who has implemented a novel approach, strategy, or tool that has improved outcomes in the rail industry. Successful applicants are not necessarily required to have generated a new product, rather, this award equally considers the use of current technologies and approaches in new ways to solve problems within the Rail Industry.

The field is open to all relevant disciplines within the rail industry, this could include perway, stations, systems, management, design, electrical and signaling. Eligible entries may focus on areas such as design, componentry, techniques, construction, maintenance, mechanisation, or automation.

Entries must have been completed in the last financial year by, or under control of, a member of the NSW Section, whether on a government or private railway system.

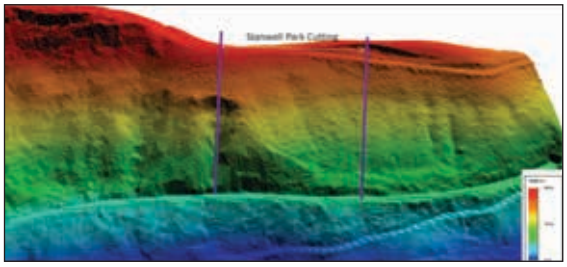
Judging is based on:

Scoring Category	**Available Score**
Difficulties overcome	10
Contribution / Impact to Rail	20
Technical Input	20
Degree of innovation in Rail aspects	20
Contribution to Safety	10
Systems Assurance	10
Commercial benefits	10
Total Score / Marks	**100**

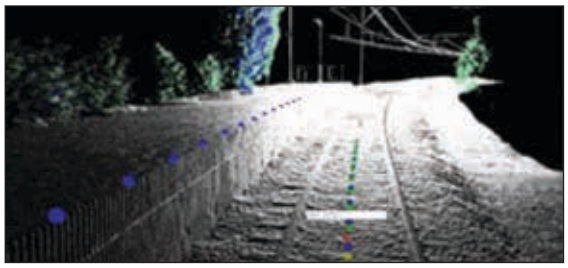
2020 KEN ERICKSON INNOVATION AWARD

2020 Ken Erickson Award Nominations

ETW-V
Company: John Holland Pty Ltd
Entrant: 4 Tel Pty Ltd



The Tweaked Attenuator Barrier with Tail Drapery
Company: Sydney Trains
Entrant: Rezaul Karim (Geotechnical Group Leader) (Geotechnical Services)



LidAR Technology improving Track Worker Safety
Company: Sydney Trains
Entrant: Engineering and Maintenance Directorate

Torsion Bar Backdrive
Company: Sydney Trains
Entrant: Engineering and Maintenance Directorate

Predictive Maintenance of Turnouts from Data Capture of Expanded Detailed Inspections
Company: Plateway Pty Ltd
Entrant: Amel Tokalic (Senior Civil Engineer)

NIF - Blue Mountains Route Clearance
Company: Lendlease Engineering JV in Alliance with TfNSW
Entrant: Continuum Alliance - CPB Contractors

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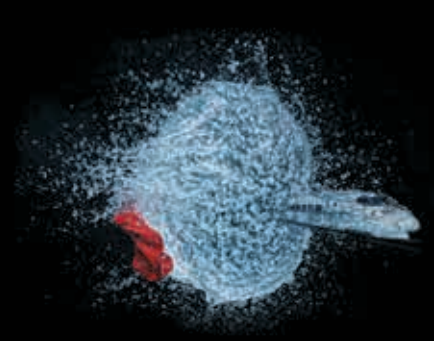


ETW-V

COMPANY: John Holland
ENTRANT: 4 Tel Pty Ltd

JOHN HOLLAND

Executive Summary

ETW-V is an innovative app introduced on the Country Regional Network (CRN) in mid-2020, specifically developed for the issuing of Electronic Track Working authorities for Track Vehicles. ETW-V was jointly developed by John Holland Pty Ltd and 4 Tel Pty Ltd.

The CRN is operated and maintained by John Holland as the accredited rail infrastructure manager (RIM), on behalf of Transport for NSW under a 10-year contract that commenced in January 2012.

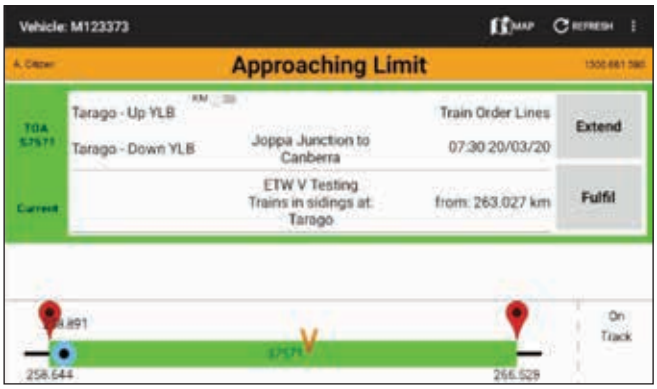
The CRN comprises of just under 2,500km of operational lines within regional NSW. To understand the quantum of the potential risk, track patrols alone account for at least 137,000km of track vehicle journeys undertaken on the network every year. This equates to around 100 rail vehicle trips per week requiring on track authorities.

Prior to ETW-V being implemented there has always been a potential for track vehicles to travel beyond the limits of authority into live sections of track, exposing maintainers to risk of collision and / or derailment. There had also been no visibility of track vehicle position back at the Network Management Centre.

ETW-V successfully delivers on its primary aim to reduce the risks associated with a rail track vehicle operator (TVO) exceeding the limit of their work on track authority by:

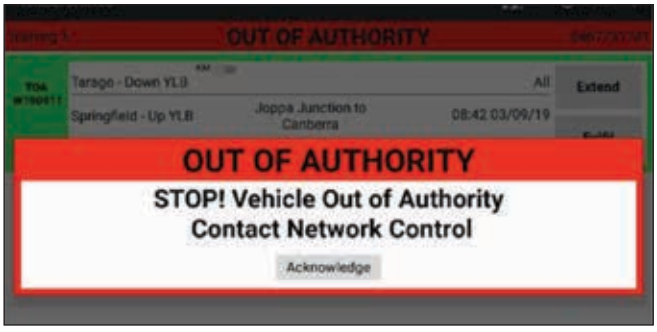
- providing the TVO with a tool to improve their situational awareness in relation to work on track authority limits, including the provision of a warning on approach to the authority limits; and
- monitoring the location of rail track vehicles within a work on track authority and providing an Out-of-Authority alarm to the TVO and controllers at the Network Management Centre should the TVO exceed authority limits.

On Track Vehicle



ETW-V app screenshot

ETW-V Tablet mounted on dash



ETW-V – Providing a Visual and Audible Alarm

The Tweaked Attenuator Barrier with Tail Drapery

COMPANY: Sydney Trains
ENTRANT: Rezaul Karim (Geotechnical Group Leader) (Geotechnical Services)

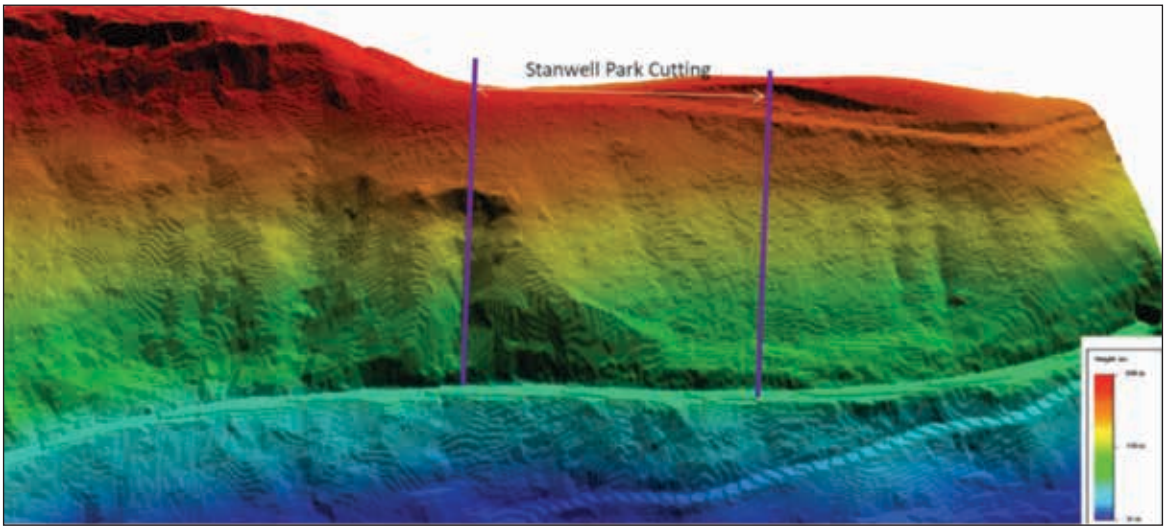
Executive Summary

Sydney Trains have hundreds of railway cuttings which were formed to follow the contour of the land to maintain required vertical alignment for the rail. To meet the high demands for safety and reliability, those cuttings require maintenance as their constituent materials age, weather, dilates and creep with time. These cutting have been being managed through the risk-based 'Fix As You Observe' approach, e.g., through periodic inspections governed by TMP and targeted localized stabilization.

Managing geotechnical risk associated with the potential large-scale rockfalls from steep high cuttings is not straight forward. The Stanwell Park cutting which is located between the Bald Hill tunnel and Stanwell Park station present a unique predicament for hazard management on the railway tracks approximately within 55.100km to 55.400km. Limited access, steepness variations of up to 60 degrees and numerous discontinuous lines of sandstone outcrops, combined with weathering, vertical fracturing and root-jacking of trees, alternate wet and dry cycles due to climatic changes have been the primary triggering factors for the increased fracture densities and dilation of existing fractures for the Stanwell Park cutting. This has rendered the traditional method of stabilization for this cutting being ineffective from both technical and value for money proposition. In fact, the cutting has been subjected to frequent rockfalls since 1988 even though targeted localized stabilizations have occurred in the past.

Protecting the rail system from the possibility of high risk rockfalls required a measurable solution to absorb the potential high energy impacts, with minimal maintenance, while fitting into the existing rail corridor with its strict space constraints. At the same time, the selected measure was needed to yield good value for money and constructible. The recently constructed rockfall attenuator at Stanwell Park cutting meets all these criteria.

The tweaked attenuator barrier with tail drapery at Stanwell Park cutting is a resilient rockfall protection system with extremely low environmental footprint. The attenuator system challenges traditional rockfall solutions through the implementation of a hybrid approach which takes into consideration of the complex terrain of the rail corridor and future-proofing accessibility concerns for ongoing routine maintenance. A few unorthodox tweaking was considered into the system to ensure the system is fit for purpose while economically attractive and practically constructible.



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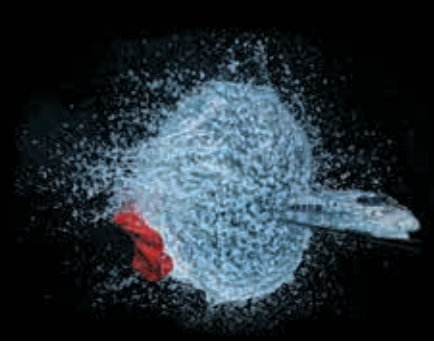

Some of the innovative ideas built into the system include:

- Utilising 'momentum transfer model' to design the attenuator barrier as well as its tail drapery – giving it a theoretical energy rating of 500kJ, a first of its kind ever constructed in AS/NZ.
- Addition of the 'vertical restraint rope' to limit potential large deflection of the attenuator's free and flexible mesh to make the system fit for purpose in a space constraint railway corridor with overhead powerlines.
- Developing a load transfer mechanism for designing anchor forces and cable tensions around the exclusion zones of overhead wire structure (OHWS) – a necessary safety in design element to prevent the spread of stray current in an extremely remote scenario.
- An algorithm to transfer bounce heights from rockfall modelling into an easily identifiable post elevation to match the topographical setting and aesthetically pleasing solution.

The attenuator rockfall protection system at Stanwell Park cutting offers a number of significant advantages over the traditional solutions. It offers optimization of initial and overall life-cycle cost to a large extent, as the design is based on principle of attenuation or weakening the dynamic rockfall energy rather than constructing the absolute energy resistant structure such as the traditional catch fence. The attenuator system has less maintenance requirement as the rockfall debris does not need to be cleaned up from the interception zone at height, instead debris are collected from the bottom of the drapery.

The system has also small environment footprint as the devegetation of the entire 50m high cutting and beyond is not necessary. The attenuator system challenges traditional rockfall solutions through the implementation of a hybrid approach which takes into consideration of the complex terrain of the rail corridor and future-proofing accessibility concerns for ongoing routine maintenance.

The attenuator solution at Stanwell Park cutting is a long-term solution for protecting the track from high risk rockfalls and is a good solution for tolerable risk-based design for very high cutting in a difficult topographical setting. By applying a cost-effective and robust approach to the significant safety problem, Sydney Trains now has a resilient geotechnical solution that will help ensure the reliability of the rail network within the area. The system is an excellent example of building network resilience, being innovative, adapting to natural hazards and environmental constraints, adopting new and emerging technologies and developing practical construction methodologies in difficult settings.

As the attenuator system was installed successfully for the first time in Sydney Trains rail network, it enables constant opportunities for improvement of geotechnical risk mitigation strategy to be more effective in line with the So Far As Is Reasonably Practicable (SFAIRP) framework, as well as providing ample confidence in the future design and adoption of similar rockfall protection systems across the Transport for NSW.

Protecting the rail system from the possibility of high risk rockfalls required a measurable solution to absorb the potential high energy impacts, with minimal maintenance, while fitting into the existing rail corridor with its strict space constraints.

LidAR Technology improving Track Worker Safety

COMPANY: Sydney Trains
ENTRANT: Engineering and Maintenance Directorate

Executive Summary

The challenge of minimising staff exposure in rail corridors

The mission of Sydney Trains is to keep Sydney moving by delivering safe, clean, reliable, customer-focused, and efficient rail services.

One of the five elements of Sydney Trains strategy to meet this mission, is a principle of Safety at the Core of everything we do to protect the safety of our employees, contractors, and customers.

Staff have been encouraged to introduce new technologies to improve safer working conditions particularly for staff working in the rail corridor danger zone when trains are operating.

Each of Sydney Trains 652 platforms are manually inspected and measured by track workers to ensure that any movement in the track over time will not lead to any compromise of safe operations.

These scheduled inspections require track workers to enter the track adjacent to station platforms and take measurements at designated survey points on the platforms. These measurements are used by engineering staff to ensure that the clearances between trains and platforms continue to meet engineering standards.

The engineers will nominate any tracks areas requiring rectification and corrective work is then scheduled and executed.

While these inspections are carried out with assigned safety staff and under prescribed safety protocols, in early 2019 executives challenged staff to evaluate methods of minimising staff exposure within the danger zone for platform clearance inspections.

A cross-functional team was established and within six months the team had evaluated and implemented Light Detection and Ranging (LiDAR) technology to replace manual platform clearance inspections.

LiDAR Technology and platform clearances

LiDAR is a technology that shoots rapid pulses of laser light at an object or surface, and then a sensor measures the amount of time it takes for each pulse to bounce (or reflect) back. This enables the creation of a LIDAR point cloud, a three-dimensional digital representation of the area being scanned.

To enable the LiDAR measurements to be within the accuracy required by Engineering Standards, the linear locations of platform locations must be within +/- 10 millimetres.

Platforms were surveyed to identify LIDAR recognisable features to ensure measurement accuracy to these standards

Twice a year, the LiDAR equipment is mounted on Sydney Trains Mechanised Track Patrol Vehicle (MTPV) which routinely travels the Sydney Trains Network for track and overhead wire automated inspections.

Platforms due for inspection are identified and planning of platform measurements is integrated into the schedule of the Mechanised Track Patrol Vehicle.

The LiDAR point cloud data is downloaded and using advanced analytics the clearance between the track and platforms is calculated.

Using LiDAR as opposed to manual measurements reduces staff exposure to the danger zone.

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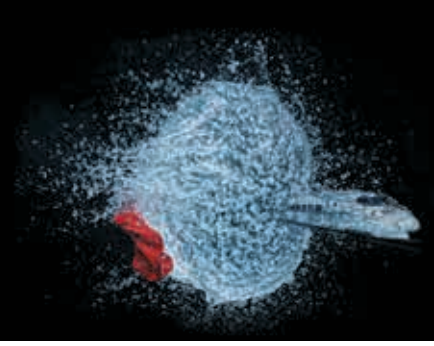

The application of LiDAR for routine inspections for platform clearance measurements was one of the first in the Australian rail industry and the third six monthly data capture has recently been completed.

LiDAR fitted in Mechanised Track Patrol Vehicle

Challenges overcome

The project was executed quickly, within six months, whilst complying with the required Sydney Trains policies and standards.

High levels of teamwork and cooperation enabled the technical input required from cross-functional representatives including project management staff for coordination of project activities and deliverables; Maintenance staff for operational processes; and the selected vendor for provision of equipment and point cloud analysis and reporting of measurement results.

New business processes and data management processes were developed and implemented by the project.

Safety staff assured safe use of LiDAR for the first time in Sydney Trains and Engineering staff assured that platform measuring process and results met Sydney Trains engineering standards.

To ensure that measurements could continue to be captured at the nominated survey points on the platforms, a new methodology was developed to identify LiDAR recognizable features. A survey of 172 platforms creating these recognizable features ensured the accuracy of the LiDAR point cloud within engineering standards

For the first time the schedule of the Mechanised Track Patrol Vehicle, on which the LiDAR was mounted was integrated with the planned LiDAR platform inspections.

Project Approach and Systems Assurance

The project was executed using Sydney Trains Project Methodology with weekly project meetings and monthly project reviews. The project team managed project schedule, risks and issues and costs and provided monthly Project Status Reports.

A Systems Engineering approach was based on a System Engineering Management Plan incorporating a documented Business Requirements, an Installation Plan, Engineering Assurance Plan, and Test Strategy.

Controls included Test Report, Safety Assurance Statement, Safety Change Assessment Reporting Determination, Change Card, and Installation Readiness Checks.

Sydney Trains Network Configuration Assurance was managed through the Sydney Trains Configuration Control Board.

Contribution / Impact of the project

The project has had a significant safety impact largely eliminating the need for track workers to enter the danger zone for Platform Clearance measurement activities saving hundreds of maintenance and engineering worker hours per year.

Local forms and record keeping and associated manual measurement errors and rework, has been replaced with accurate centralised records of measurements.

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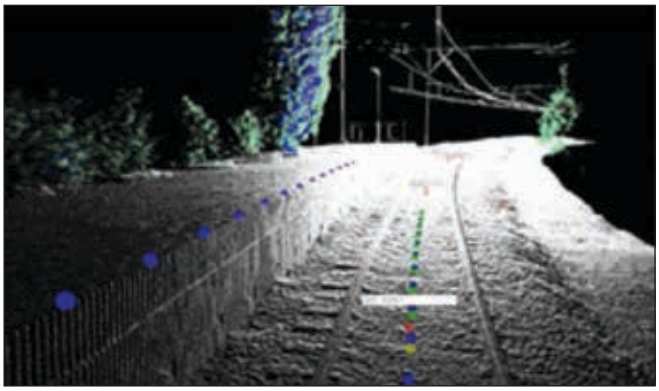
The proven use of LiDAR for measurements to an engineering Standard and the introduction of six-monthly LiDAR measurements and the resulting LiDAR point cloud has enabled Sydney Trains to develop a Measuring and Inspection Digital Twin (MIDT).

The project also demonstrated that new technologies can be safely and quickly implemented in the rail environment with a committed multi-function team and the use of a rigorous project methodology combined with a system engineering approach.

As a result, a follow-on project has been approved to leverage the MIDT and replace human measurements with LiDAR measurements for Track Alignment, Track Centres, Tunnel Clearances, and corridor encroachments and surveys for major asset replacement and renewal projects.

Real world platform



LiDAR Point Cloud Platform Image

The Team

The team represented multiple division within the Engineering and Maintenance Directorate of Sydney Trains.

Key team members were:

- Michael Briggs – Project Manager
- Kamran Kermanshahi – Sponsors delegate
- John McLeod – Professional Head of Track
- Alex Burridge – Principal Surveyor
- Graeme Gaggin – Subject Matter Expert
- Roy Matthews – System Engineering
- Vin Palihakkara – Business Analysis

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Torsion Bar Backdrive

COMPANY: Sydney Trains
ENTRANT: Engineering and Maintenance Directorate

Transport Sydney Trains

Executive Summary

The torsion bar backdrive system was identified as a key innovation to achieving Sydney Trains' long term objective of reducing the possession duration required for major turnout renewal construction works.

The initial driver for the development of the torsion bar backdrive was to overcome clearance issues at Gordon and Turrella where turnout upgrade works were being undertaken. The design was developed in-house by Sydney Trains Signals Mechanical Engineers, led by Andrew Mackenzie, in collaboration with Major Works Delivery.

It uses a torsion bar installed outside the rail gauge to transfer the force from the point machine to the rear of the switch blades, ensuring that the blades are driven to the correct position and secured with each point movement. The torsion bar replaces earlier designs which used more complex arrangements of cranks and rodding to achieve the same result. The design is modular, allowing a small number of subassemblies to be used in different arrangements to support all turnout radii used by Sydney Trains.

The torsion backdrive system allows for a reduction in the critical construction path by eliminating the need to fit and adjust the back-drive on site. The torsion backdrive system has been designed to be robust enough to be left preinstalled on a turnout switch panel resulting in a fully modular turnout renewal construction methodology. Thus, for the first time in the NSW network a switch panel with a backdrive can be pre-assembled and transported to site via work train and installed as one piece – minimising the resource heavy and time consuming in situ mechanical construction during turnout renewal track installation works.

Successful introduction of the new arrangement involved close consultation with manufacturers to review and refine design and specifications to ensure the system was suitable for the Sydney Trains Network as well as consultation with construction and maintenance crews to ensure all requirements were communicated and complied with.

Torsion Bar Backdrive installed at Rhodes 51A points

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Backdrive Pre-Assembled and Fixed to Waterfall 58A Switch Panel for Transportation on Tilt Wagon

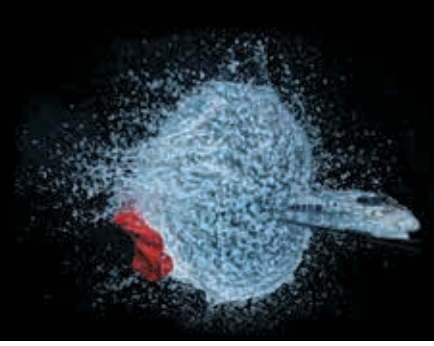
The successful delivery of Waterfall 58A&B in March 2020 demonstrated the durability of the design with the complete pre-assembly of the backdrive occurring off site.

The panels were transported to site via tilt wagon with the signalling equipment affixed to the switch panel and were successfully commissioned into use at the end of the 48 hour possession window.

The torsion bar backdrive received Type Approval from the Asset Standards Authority in July 2020 and, due to the identified benefits for both construction and maintenance, has been adopted as the preferred configuration by both the Turnout Renewal Program and the Signalling Asset Strategy Council when rolling out new turnout infrastructure within the Sydney Trains Network.

The torsion bar backdrive was designed completely in house by Sydney Trains Signalling Mechanical Design with support from Track Design, Major Works Delivery Teams, and Voestalpine Railway Systems Australia Pty Ltd.

The torsion backdrive system allows for a reduction in the critical construction path by eliminating the need to fit and adjust the back-drive on site. The torsion backdrive system has been designed to be robust enough to be left preinstalled on a turnout switch panel resulting in a fully modular turnout renewal construction methodology.



Predictive Maintenance of Turnouts from Data Capture of Expanded Detailed Inspections

COMPANY: Plateway Pty Ltd
ENTRANT: Amel Tokalic (Senior Civil Engineer)

Executive Summary

The Detailed Turnout Examination aims to identify failures arising from several root causes with multiple variables. It is a time consuming and complex examination which traditionally produces a series of paper-based forms containing individual parameter assessment, but are not searchable or easily archivable.

This form of inspection is fit for a reactive run-to-failure maintenance strategy choice. However, for an asset where procurement of wear components involves a long lead time, this reactive maintenance strategy is not optimal. A predictive maintenance strategy is required so that the remaining asset life is quantified and planned intervention made.

This project created a framework for the data collected during the Detailed Turnout Examination including a greater degree of physical measurement, and quantification of asset condition. The data collected is then modelled enabling the root cause analysis, adjustment to repair procedures and prediction to inform a proactive-preventative maintenance strategy. The aim is to reduce operational disruption, improve safety and reduce cost.

INNOVATION

Standard detailed turnout inspections on networks across Australia rely on a qualitative assessment of the condition of the asset. This is suitable for low volume networks where the asset condition is not expected to undergo significant change between detailed inspections allowing the maintenance and/or renewals branches to plan works. This relies on a qualitative assessment of multiple data sources, often including anecdotal data points and reliance on 'institutional knowledge'.

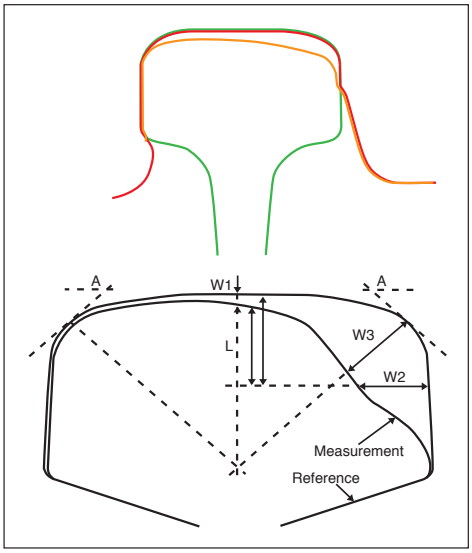
In high traffic volume networks where the asset experiences high rates of wear, this approach is highly inefficient.

The detailed inspection method, the data collected, and the processing model that Plateway has developed utilize the following data inputs;

- Track geometry from a track geometry trolley with measurements taken every 0.1m
- Rail wear measurements recorded on stockrails, switch rails and turnout crossings
- Ballast depth measurements
- Qualitative assessments of turnout components that have been assigned a value and scored to form an asset condition index
- Traffic Volumes

This project brought innovations to the detailed turnout inspection process by quantifying the parameters of standard turnout inspections, and generating a searchable asset database. This data was then used to develop a data-driven maintenance and renewal plan which incorporates forecasted traffic volumes to estimate remaining asset life.

This methodology results in a more consistent set of results for asset inspections.



Rail Profile measurements

COMMERCIAL BENEFITS

The outcomes of this project were used to form the rolling 5-year maintenance and renewal plan for turnouts on the network. This will result in less unplanned maintenance, and critically, result in a more accurately scoped project in a high traffic volume network.

This will lead to the following commercial benefits;

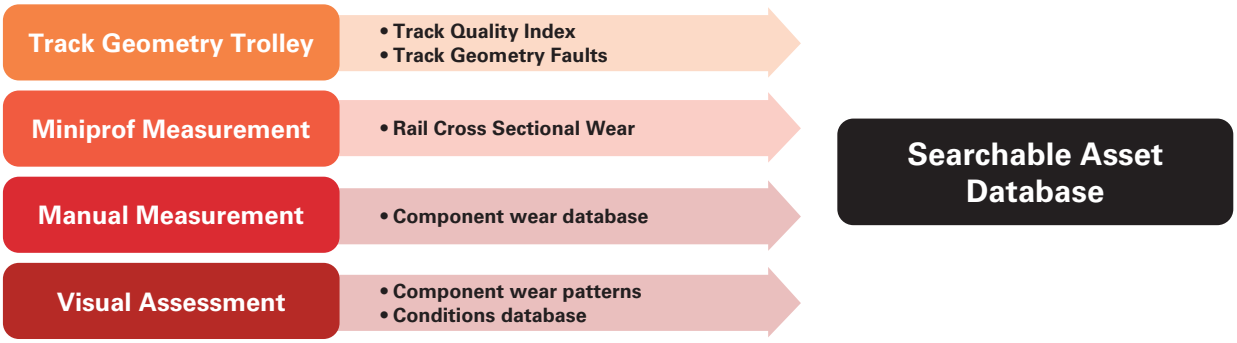
- Less unplanned interventions, effectively increasing rail traffic through the network
- Timely removal of failed components from service
- A reduction in spare inventory levels as stock required can be sourced in advance of expected works, hence fewer spares are required for unplanned works.

The model assigns each parameter a weighting that can be adjusted to target specific configuration changes or maintenance needs. The model and methodology that was developed can be easily customised to suit turnout asset configurations.

CONCLUSIONS

The model was designed to become more accurate with further use. It is expected that each turnout would have a trackable condition score that would deteriorate over time. The rate of degradation can then be fed back into the model to increase the accuracy over the long-term use of the asset.

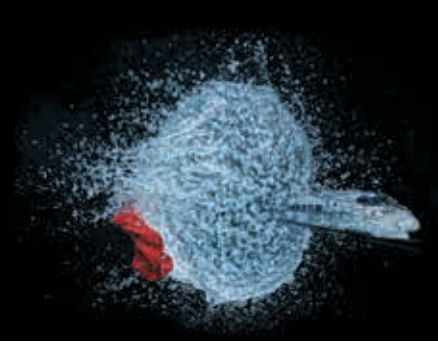
The asset model was designed to be modular, and able to be modified to suit inspection of other assets such as plain track, bridges, level crossings and culverts.



Data Collection

Turnout Aerial

2020 KEN ERICKSON INNOVATION AWARD



NIF - Blue Mountains Route Clearance

COMPANY: Lendlease Engineering JV in Alliance with TfNSW
ENTRANT: Continuum Alliance - CPB Contractors

Executive Summary

The NSW Government is delivering the New Intercity Fleet (NIF) to replace existing intercity rolling stock operating throughout the electric rail network. The Main West Line between Springwood and Lithgow Stations is currently only authorised for Narrow KE trains, therefore infrastructure modifications were required to allow the operation of the Medium/Sub-Medium Kinematic Electric NIF rolling stock. In non-prescribed locations (such as ballasted track) the NIF conforms to the Medium KE Standard whereas in prescribed locations such as the Ten Tunnels Deviation (slab track) it also conforms to the Sub-Medium KE Standard.

INNOVATION

Transport for NSW was a strong supporter for employing innovative solutions on the project and this entry focuses on the modifications to the tunnel lining where a combination of the latest technology and innovation was used to mill/shave the tunnel walls.

The State Heritage listed Ten Tunnels Deviation was constructed between 1908 and 1910 to bypass the Great Zig Zag on which trains made their way down from the Blue Mountains to the inland plains. The tunnels were driven through natural rock and were self-supported which means the tunnel lining was supporting itself only. Furthermore, the drill and blast method used to drive the tunnels resulted in varying tunnel lining thicknesses. In the 1970's, the tracks were lowered by 650mm to accommodate the introduction of V-Set double-deck cars with the ballasted track replaced by a concrete track slab. In addition to the lowering of the tracks, the toe of the tunnel walls were chased/milled as they would have infringed the KE of the V-Sets.

Amberg Rail

Amberg Rail is a modular system developed to conduct rail clearance surveys. The modular rail survey trolley is comprised of a terrestrial laser scanner, internal track geometry sensors and 3D terrestrial positional system from a robotic total station. The rail survey trolley is supported by proprietary software which is used to combine and process the data from the hardware trolley sensor. The software can interrogate the data and automatically produce exports such as heatmaps and cross sections in a variety of formats which assist in the production of design deliverables.

Amberg Rail is a mobile surveying solution, that is 'portable' in the strictest sense of the word. Amberg Rail allows measurements to be made in real-time during construction to confirm that infringements have been cleared appropriately without the need to return to the office for further processing. At the same time the laser scan supports the process to update drawings to an as-built status. Up to five kilometres of track can be surveyed per hour (walking speed).

Machine Guidance

Machine guidance uses a total station, single prism for a 'direct' measurement at the cutting head and a dual-axis level sensor that corrects for tilts of the working up to +-30 degrees from horizontal. Design strings describing the KE (using the known track alignment) are loaded into the machine and the machine then calculates the distance from the cutting head to the edge of the KE using the known location of the total stations and relative distance to the KE. The operator interface is a simple screen displaying the cutting head and distance to the KE.

This system provided a number of benefits related to productivity and safety:

A. Minimal set-out and checking works were required. A survey team checked the set-up and accuracy of the system at the start of a section and then performed occasional checks. This also eliminated the need for surveyors to enter the plant operating zone and the area beneath the crown of the tunnel subject to vibration and potential falling bricks;

B. The excavation process benefited from real-time feedback of the positioning of the cutting tool, it took the guesswork out of the process as a distance to the KE was provided everywhere and not at intermittent points when using traditional survey;

C. By virtue of having the design strings loaded into the system, the system provided a check on survey set-out information; and

D. The increased accuracy allowed construction tolerances in the design to be reduced, minimising the amount of material removed and lessening the impact to the heritage fabric as well as reducing the risk of over-cutting and potential destabilisation of the tunnel walls.

Diamond cutting drum (Wall Shaver)

The Alliance engaged Lendlease Engineering's local plant yard to fabricate a diamond cutting head as an attachment to an excavator arm. The diamond cutting drum attachment was fabricated and combined with a power pack and industrial wet-vacuum mounted on a hi-rail trolley. The drum performed well on vertical sections of the tunnel walls, however, the shroud around the cutting drum for the vacuum and dust suppression prevented the drum from milling the lower sections as it clashed with the concrete plinth at the base of the walls.

While improvements in vibration generated, surface finish and accuracy were achieved with the diamond cutting drum, production rates were lower than expected, placing additional pressure on the program. Also, hi-rail excavators with a twin-header had to mill the base of the walls in the same areas where the diamond cutting drum had already milled the vertical sections of the walls, which was inefficient. Finally, as the existing surface was irregular as a result of chasing works undertaken in the 1970s and the surface finish using traditional twin-header attachments was of similar quality, the twin-header attachments with machine guidance were used to complete the works.

Tunnel lining milling with dust suppression

Diamond cutting drum

Machine guidance prism fitted to cutting drum

Amberg Trolley identifying infringement

Amberg Rail is a mobile surveying solution, that is 'portable' in the strictest sense of the word. Amberg Rail allows measurements to be made in real-time during construction to confirm that infringements have been cleared appropriately without the need to return to the office for further processing.

2020 PWI YOUNG ACHIEVER AWARD

Judges

Julian Sharp – CPB Contractors
Prath Nanthakumaran – Transport for NSW
David Spiteri – Transport for NSW
Anna Murray – Sydney Trains
Matt Jones – John Holland
Rebecca Coffey – Lycopodium
Lee Taylor – Laing O'Rourke
Nagajyothi Lolla – Transport for NSW

The PWI Young Achiever Award is a prize of up to $10,000 for the winner to go towards the cost of attending a relevant international railway conference. To be eligible for this award, an entrant must be 35 or younger at the 1 January of the year of entry. The aim is to encourage younger members into our industry and promote knowledge sharing. We have now broadened the judging criteria to make it more multi-disciplinary so that it includes for all members who are involved in the numerous rail infrastructure projects that are being delivered at the moment.

Judging Criteria

Judging is based on:

Relevant Criteria	Available Score
Relevance to Perway	10
Difficulties Overcome	20
Quality of Paper and/or Presentation	20
Amount of Innovation	15
Ongoing benefit to the transport industry	25
Technical Excellence	10
Total Score/Marks:	**100**

The Award is judged on either a Technical Paper that has been written (and preferably presented) or a Project or Program of Works that has been completed, within the last 18 months.

Following the initial judging of the applications, between 3 and 5 applicants are shortlisted to then present their paper to the judging panel. Each applicant has 20 minutes to present their paper and then answer questions for a further 10 minutes. The judges then make their final determination.

Award

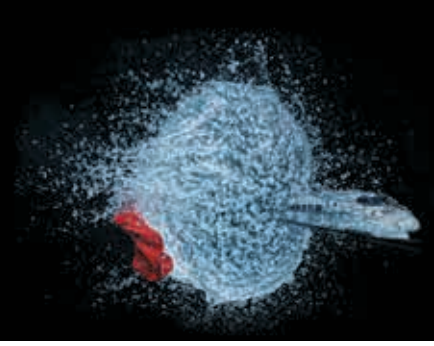
Up to $10,000, to cover:

1. Transport, registration, insurances and accommodation to a relevant railway conference (PWI approves the attendance at the nominated conference).
2. Award must be taken within two years of being presented or agreement reached with the PWI Committee to be deferred for a longer period.
3. The award may not be presented in a given year if entries are not considered suitable.

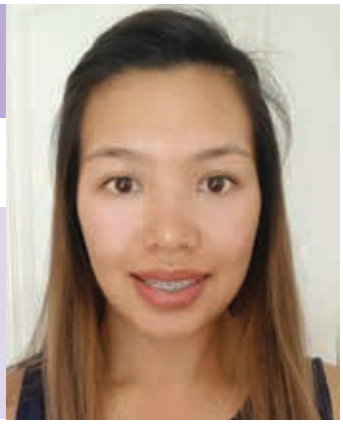
Conditions

Previous winners of this award (or similar such awards, e.g. the RTAA Frank Franklyn Award) will be excluded from re-submitting an application for this award for a period of no less than five years from the time of submitting their application for their winning award. The subject of the award must relate to the applicant's current employer who will be required to provide a reference. The successful candidate will present at the next relevant Technical Meeting, a summary of the attended conference and any associated industry visits.

2020 PWI YOUNG ACHIEVER AWARD



Installation of 1024 FFU Half Sleepers on the ESR Viaduct



Helen Doan
Bachelor of Engineering (Civil) &
Bachelor of Science (Environmental Science)
(University of Technology, Sydney)

Abstract

- Installation of 1024 FFU (Fibre Reinforced Foamed Urethane) half sleeper during a four day/four night possession during the Easter Long Weekend April 2020 (WE41).
- Network record number of FFU half sleepers to be installed during a single possession.
- Up skill in methodology, technique and forensic planning efforts to deliver a network record volume of FFU half sleepers.
- Works were delivered with zero safety incidents, track returned to PPO/operator ahead of schedule, under budget, to a high technical standard of compliance and were fully conducted with strict social distancing measures in place during the early stages of the COVID19 lockdown in New South Wales.

Initial impact assessment on permanent way maintenance activities following the introduction of Digital Systems on the NSW Network

Michael Groves
BEng (Hons),
CEngT NER (Engineers Australia FICE (UK)

Abstract

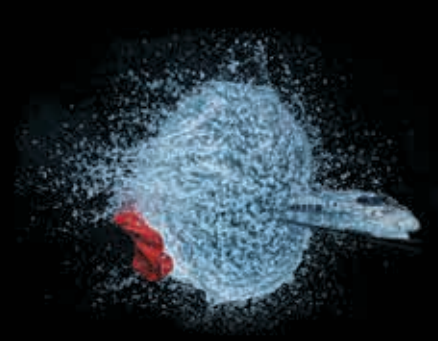
The Digital Systems Program will replace current signalling and train control technology with modern, internationally proven, intelligent systems. It will help improve reliability, increase capacity, and enhance customer experience on Sydney's railways.

Digital Systems will introduce new assets and equipment that will have an impact on Sydney Trains maintenance organisation in a variety of ways. The introduction of any new asset will see changes to maintenance procedures, however the transformation in technology – moving from conventional to in-cab signalling will revolutionise how maintenance is undertaken.

At the early design phase of the program, over 50 impacts have been identified across all areas of maintenance. Collaboratively with subject matter experts and key stakeholders, maintenance impacts have been sorted into the following three categories:

- Trackside
- On-Board
- Control Centre

This paper provides an overview of the permanent way impacts which includes the introduction of axle counters and balises. The former sees impacts to mechanised rail grinding processes, no longer having a requirement for rail cleaning runs and length of planned maintenance windows whilst the latter which impacts maintenance activities in the four foot such as ballast drops, rail drops and use of plant.



Moorgate Branch Bullhead Rail Resilience

Liam Turbet
BEng Hons, MIEAUST

Abstract

The section of railway track between Finsbury park and Moorgate stations in London forms what is known as the Northern City Line. The line terminates at Moorgate station, near the heart of London and passes beneath the affluent area of Islington.

Noise complaints due to ground borne vibration from traffic on this line are among the highest of any area in London since December 2015 when the line extended its operating hours to midnight and began weekend operation. The issue reached a point that the network had to form a budget dedicated to dealing with the number of complaints.

The Northern City Line, also known as the Moorgate Branch, is a peculiarity as it is the only rail tunnel in the London city area which is not part of the London Underground Network.

It is owned by Network Rail, with services run by great northern rail and is the only tunnel beneath central London that is large enough to run mainline rolling stock.

Liam was the engineer in charge of developing a bespoke fastening system to alleviate ground borne vibration issues that had received so many complaints that they had gained the attention of not only the mayor of London but also members of the UK parliament.

Successful digital technologies through effective Asset Management Systems and practice

Maythee Varayudej
Masters Engineering Asset Management, UOW
BEngineering (UNSW) BCommerce (UNSW)
Master Program Manager, Asset Management, Engineering and Maintenance

Abstract

Sydney Trains has a proven track record in advancing asset management, demonstrated through being the first Australian public sector organisation to achieve ISO 55001 certification. The asset systems in place at Sydney Trains, are conducive to innovation and the development of successful digital technologies through decreasing the barriers to innovation, reduced lifecycle costs and aligned project evaluation approaches. A significant contributor to this has been the alignment of investment and asset management frameworks that contrasts against traditional project investment methods based on evaluation of individual projects.

These are typically applied inconsistently without holistic coordination or linkage to an asset lifecycle strategy resulting in inferior long-term outcomes.

Establishing effective asset management systems facilitates innovation in digital technologies and is a crucial stepping stone in the development of current and future artificial intelligence systems. This enables organisations to achieve operational efficiencies, improved decision-making and facilitate breakthrough changes.

The alignment with asset management frameworks ensures current successful digital technologies minimise future obstacles to growth.

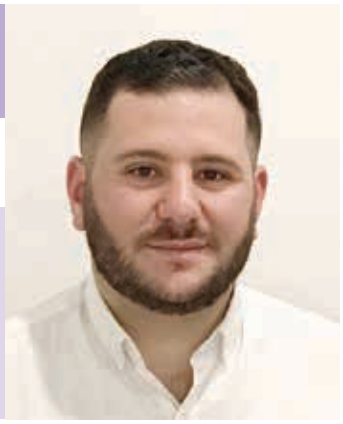
At Sydney Trains, solid foundations in asset management have mitigated many of the risks inherent in technology projects, specifically ambiguous requirements, scope creep, business priority disconnection and missed deadlines.

The alignment of project scopes and benefits to asset management objectives inclusive of managed risk alignment and costs across the asset lifecycle has aided reducing these risks. Furthermore, employing updated development methodologies that complement Asset Management Frameworks has assisted in realising many benefits.

This paper will explore how the established asset management systems and practices at Sydney Trains have contributed to the success of several digital technology solutions. These range from database integration projects through to mobile applications and augmented reality, including discussion on the current artificial intelligence technologies used at Sydney Trains for Track Access Planning.

2020 PWI YOUNG ACHIEVER AWARD

Two Networks, One Goal



JOHN HOLLAND

Jason Ghattas

Abstract

- Engineer responsible for the planning, staging, design development and delivery of 820m of full track reconditioning on the Bankstown Line, 290m of full track reconditioning on the Illawarra Locals and installation of 9 special turnouts, catchpoints an crossovers (including an additional 560m of track reconditioning for turnout installations) to facilitate the Bankstown Line diversion from Sydenham Station Platform 1 and 2 into Platforms 3 and 4
- Extensive use of 3D models to identify and solve complex track geometry and staging issues present at Junctions
- Responsible for identifying and implementing safe working controls as all possessions were undertaken with live running trains on adjacent tracks and within 300m of possession limits. This included Level 5 Applications for working next to live electrical infrastructure and Safe Notices with detailed methodologies for working within 300m of possession limits

2020 WELDERS AWARD

Judges

Mark White, Speno Rail Maintenance Australia Pty Ltd
Ross Ginn, Rogin Ultrasonics
Jason Glasspool, Thermit Australia
Ben Muscatt, Sydney Trains
Mark Stapley, MP Rail Pty Ltd

The PWI introduced this Award in 2002 to recognise the efforts of field workers in the area of rail welding.

This award attracts entries from all over the State, which is testimony to the wide geographic base of PWI members. This Award is proudly sponsored by two of our Corporate Members, Pandrol and Thermit.

Judging Criteria is based on:

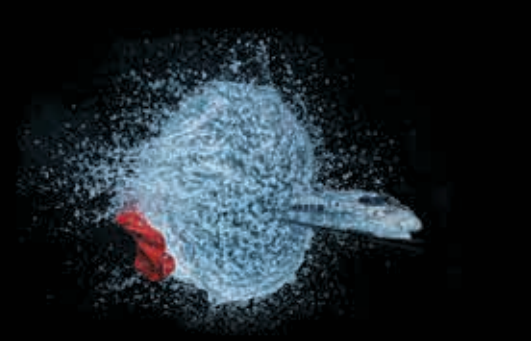
- Must be a qualified Welder with a minimum of 70 welds in the previous 12 months
- Ultrasonic Failure Rates Percentage
- Alignment Rejection Rate Percentage
- Site clean up/consideration of the environment
- Difficulties overcome
- Safety/LTI (Lost Time Injury) Rate for nominees' welding gang

Nominations for 2020 PWI Welders Award

NAME	COMPANY
William Stapley	MP Rail
Zac Pace	MP Rail
Anthony Furness	MP Rail
Geoff Hopkins	MP Rail

NAME	COMPANY
Edwardo Meneses	MP Rail
Noa Kaisuva	Affective Rail
Daniel Young	Affective Rail
Matthew Pearce	Sydney Trains Major Works

STEVE MAXWELL PLATELAYING AWARD
MINOR WORKS CATEGORY



Judges

Mark Harris – Acciona Construction Australia
Stephen Fleck – John Holland
Gareth Beynon – LINK Rail and Civil
Kerry Christie – KC Rail and Civil

Steve Maxwell

Steve Maxwell was a Member of the Permanent Way Institution Committee for many years, and his hard work and dedication enabled the PWI to continue during some difficult times. Steve was an informed Judge of the Platelaying Award, and also an entertaining speaker and presenter.

Steve's rail career began in NSW after graduating in Civil Engineering in 1970 and he progressed from District Engineer to become General Manager Engineering for CityRail, covering the suburban and interurban areas of Sydney. He made a huge contribution to the rail industry through his early advocacy of asset management as a key part of the rail engineering discipline, and with the introduction of numerous new infrastructure maintenance and asset management techniques and capabilities.

Steve's untimely and premature death in 1997 was a great loss to the PWI and took from the industry a great engineer, friend and personable and supportive leader.

The Committee deemed it appropriate to name the prestigious Platelaying Award after Steve Maxwell.

This annual Award is made to encourage excellence in platelaying, and to bring to public notice the skills required to gain such excellence. The Award is made to the staff responsible, who in the opinion of the Judges, best demonstrate this excellence. In other words, the Award will indicate a permanent way job well done.

Eligible projects are any track renewal, or construction work, completed in the last financial year by, or under the control of, a Member of the NSW Section, whether on a government or private railway system.

There are two Platelaying Awards – one for Minor Works (less than $3m in value) and one for Major Works (greater than $3m in value).

Judging Criteria:

Scoring Category	Available Score
Accuracy to Design and Survey	50
Site Presentation	50
Neatness of Fit of Components	50
Difficulties Overcome	25
Safety	25
Consideration of the Environment	25
Closeness to Planning and Timetable	25
Closeness to Budget	25
Level of Client Satisfaction	25
Total Score/Marks:	**300**

STEVE MAXWELL PLATELAYING AWARD
MINOR WORKS CATEGORY

Minor Works Entries – < $3m

John Holland & ARTC – ARTC Port Botany Rail Line Upgrade Chullora Junction Reconfiguration

RKR Engineering – Cockle Creek Bridge Refurbishment

John Holland & ARTC – Sydenham Flyover Bridge Renewal

Laing O'Rourke – Ardglen Tunnel Skim Reconditioning

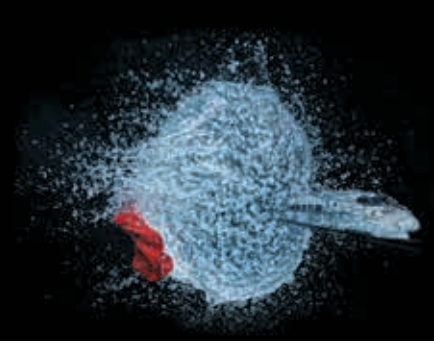
John Holland – Thornton 109 Crossover Renewal

Laing O'Rourke – Watermark 600m Reconditioning Project

Laing O'Rourke – Installation of 1,024 FFU Half Sleepers, ESR Viaduct

Sydney Trains – Rhodes 52A&B Crossover Renewal

STEVE MAXWELL PLATELAYING AWARD
MINOR WORKS CATEGORY



ARTC Port Botany Rail Line Upgrade Chullora Junction Reconfiguration, NSW

John Holland & ARTC
Adam Broome & Paul Sardinia – Senior Project Engineer
Value of works: $2.9m

Executive Summary

The Chullora Junction Reconfiguration Project Stage 3 involves track upgrading between Port Botany and the South Sydney Freight Line. The Project includes renewal of the Track, Civil and Signalling assets within the Junction in order to replace life expired assets, increase line speed and increase freight to the port at Botany. The project overcame some interesting challenges through out the life cycle which include: The locality of Chullora junction in relation to ARTC & Sydney Trains network boundaries and possession configuration extents coupled with private yards meant every LPA had live rail environment associated. The West Junction Construction methodology was revised once survey validated the track and civil design, which increased the scope for commissioning weekend to installation of five turnouts, signal relocation and track slews at West Junction with a 46-hour occupation.

PROJECT SCOPE

- Civil & Signal Enabling Works, combined Services Routes
- Formation Renewal
- Sub Surface Drainage upgrade
- Replacement and Relocation of Signalling Infrastructure
- Removal of OHW structures and assets
- South Junction Renewal of 346 & 347pts and Diamond
- West Junction Renewal of 351pts ,352pts A/B Diamond, 353Pts and 354 A/B Crossover
- North Junction Track and Signalling slews
- Up & Down South Forks slews and realignment
- Link to Construction video http://www.mediafire.com/file/ffk587fpgle7w7v/PB_Upgrade_All-Stages_V1.mp4/file

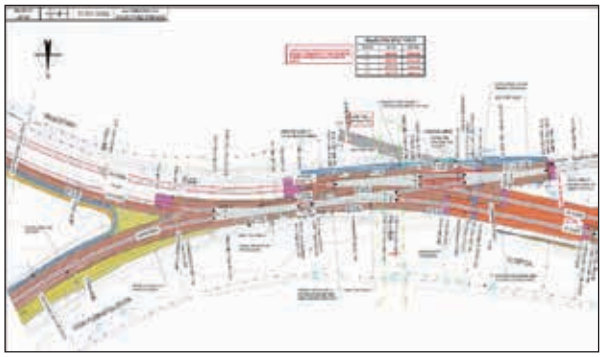
PROGRAM OF WORKS

The Project was delivered over 5 dedicated Local Possession authorities (LPA's), over a 10 month period, the construction methodology involved working around live rail environment with very short possession windows to deliver the large scope of works allocated for track, civil and signalling on each possession. The collaboration between ARTC & John Holland was critical for the success of this project being delivered on time, within budget and to a very high standard.

STEVE MAXWELL PLATELAYING AWARD
MINOR WORKS CATEGORY

ACCURACY TO DESIGN AND SURVEY

The Works were delivered to a very high standard, with zero NCR 's recorded for the project, resurfacing of the new alignment was completed with the ARTC ETF 05- 01 Mainline standards applied. Furthermore the No.160 aluminothermic welds all passed electronic straight edge testing and destress modules validated by Verse testing equipment.



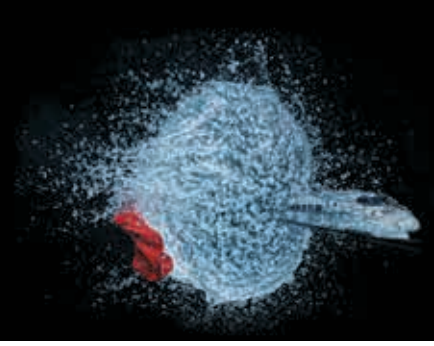
DIFFICULTIES OVERCOME

The project was faced with some interesting challenges, which included track and civil design changes which effected the construction methodology and installation of Chullora west junction turnouts and track slews. The signalling design was delayed which put increased pressure on signal commissioning of 354 crossover and West Junction, furthermore, the commissioning weekend was impacted by a heavily congested worksite and interfacing with multiple work groups and a very tight delivery deadline with possession hand back reduced by 4 hours by network control two days out from the start of possession. Overall, the project was delivered on time and on budget with a very happy client.

SAFETY/ENVIRONMENT

The project was completed with zero WHS injuries for 21,000 Man Hours worked, zero Environmental incidents were recorded, one safe working breach was recorded at the Chullora West Junction.

STEVE MAXWELL PLATELAYING AWARD
MINOR WORKS CATEGORY



Sydenham Flyover Bridge Renewal

John Holland and ARTC
Owen Seabury (JHG) and Tofiq Ahmed (ARTC)
Value of works: $1.8m

Executive Summary

On the country side of Sydenham station is a bridge, this bridge is owned and maintained by ARTC . It only spans 40m but covers six Sydney Trains tracks (two to become metro) and is a critical piece of infrastructure for Australian freight, feeding all rail freight to Port Botany with over 400,000 containers running across the bridge each year.

Prior to the flyover bridge renewal project, the existing was unmaintainable due to the bridge itself being a steel truss transom top bridge with 1500v overhead wiring connected to the underside feeding the Illawarra locals, Illawarra mains and Bankstown lines below. The goal of the project was to limit any openings to reduce the need for any possession requirements below and ensure a safe environment for future maintenance / upgrade works.

The main challenges of the project were programing works to coincide protection arrangements between two different networks across four different possession configs and developing a solution that satisfied the maintainability for future works whilst ensuring electrical separation for wires attached to the bridge.

PROJECT SCOPE

The project involved the installation and removal of catch deck, removal of existing transoms and replacement with NiuDeck bridge panels, repair and drilling of existing bridge members and installation of new rail through the section.

The works that was conducted during the special ARTC 54 hour possession included:

- Installation of 60 individual NiuDeck Panels
- Drilling of approx 120 holes in the bridge members for structural support
- 440m of new rail installation
- Tamping and track re-alignment
- Removal of 160m of guardrail

The core works was completed during the 2019 Christmas shutdown.

STEVE MAXWELL PLATELAYING AWARD
MINOR WORKS CATEGORY

PROGRAM OF WORKS

The project and "idea" for the Flyover upgrade has been on the table for many years, however due to the co-ordination and possession requirements, the works were always deemed as the "too hard basket" case.

The only opportunity to deliver this project was to coordinate the works to occur at the same time as the Sydney Trains closedown below for the Sydney metro project (the "big bang" possession) and also the closedown of the freight line at Port Botany.

The works were delivered between 2000 on the 24th and 0200 27th December 2019. The full scope of works was delivered with no defects or impact to operations of any network.

ACCURACY TO DESIGN AND SURVEY

Due to the uniqueness of the new material (NuiDeck), each panel was able to be made to suit a specific section on the bridge to limit any packing requirements below the plates. This meant that rail heights and line was able to be achieved with very tight accuracy.

The vertical and horizontal alignment is within 3mm of design. This was achieved by real time survey and marking of each plate locations for heights and centreline.

DIFFICULTIES OVERCOME

Unfamiliar product (first time for JHG)

The NuiDeck panel system is a new system which JHG are not too familiar with. To overcome this, testing and trials were planned to ensure all issues are resolved prior to the possession.

The unknown material characteristics meant that different methods of drilling, lifting, installation and checks needed to be developed to ensure timely installation. The material itself and each panel had to be developed specifically for this bridge taking into account the increase in expected rail loading, girder spans and spacing.

Existing track condition

Since the track wasn't able to be maintained the condition of the rail was borderline condemnable, existing transoms were falling apart and hold down bolts and structural steelwork were severely corroded. This created issues in tieing new into existing and the unknown conditions found during the works that had to be rectified during the closedown

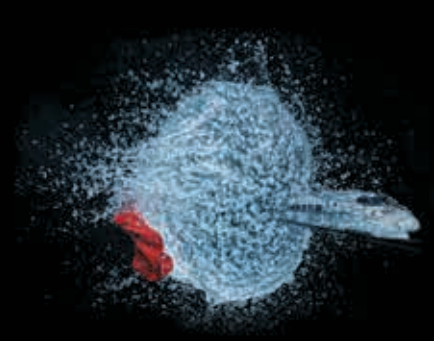
Co-ordination

ARTC / JHG had to co-ordinate not only the core works but also the erection and dismantling of the catch deck required for the works. The staged construction of the temporary catch deck had to be done across multiple shutdowns and in a manner to ensure safety of workers and trains above and below the bridge whilst ensuring electrical separation during non-work periods.

SAFETY/ENVIRONMENT

The key focus for this project for John Holland was the safety of all personnel during the works and for ARTC it was the safety of all personnel for all future works. No Safety, environment or community incidents occur during the lifespan of these works and to date no issues have arisen in this area.

STEVE MAXWELL PLATELAYING AWARD
MINOR WORKS CATEGORY



Thornton 109 Crossover Renewal, Thornton NSW

John Holland
Matt Kauter – Project Manager
Value of works: $810,000

JOHN HOLLAND

Executive Summary

Thornton 109 Crossover renewal project was a removal of the existing 109 A & B PTS Crossover and installation and commissioning of a new 1 in 12 Tangential Crossover. The works were completed during a Mains Closedown in June 2020.

The main challenges of the project included: working adjacent to the live coal lines, unexpected poor ground conditions and restricted access.

PROJECT SCOPE

The project scope completed over one 3 Day possession and 6 total shifts included:

- Implementation of TWA safe working providing minimal impact to train running
- Upgrade of signalling infrastructure
- Full depth reconditioning of the crossover including an additional 140m3 of foundation replacement
- Installation of the 1 in 12 tangential crossover

PROGRAM OF WORKS

The project was successfully delivered in WE49 during the ARTC Hunter Valley June Mains Possession from 1900 Friday 5 June to 0300 Tuesday 9 June (80 hrs).

The John Holland team has been delivering turnout replacements across the ARTC network and the lessons learnt has resulted in increased efficiencies and the capability to deliver complex projects in a short time frame, safely, on budget and defect free.

The scope of works was completed utilising a combination of internally and subcontractor labour and plant and the signalling scope was completed by internal resources.

109 PTS Crossing Excavation Footprint with restricted access

The works were ahead of program after the first shift was executed strictly in line with the detailed planning and by taking advantage of a rail break within the network which resulting in minimal live adjacent traffic.

Due to poorer than expected ground conditions at subgrade additional foundation improvement was required. Program impact and the potential of additional excavation depth on the adjacent line were assessed during the shifts in consultation with the client (ARTC) and mitigation measures were employed. The track was handed back at 9:20pm ahead of schedule and all scope was achieved with no impact on possession handback.

ACCURACY TO DESIGN AND SURVEY

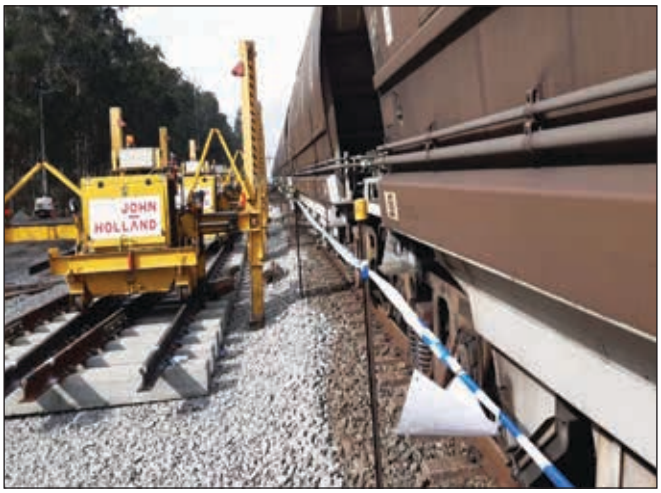
The work was completed within construction tolerances with alignment, super and gauge within design. The work resulted in no defects and with no follow up work required.

STEVE MAXWELL PLATELAYING AWARD
MINOR WORKS CATEGORY

DIFFICULTIES OVERCOME

Working adjacent to the live line presented a major challenge to the project. This was reduced by implementing a TWA that was managed in addition with plant spotters to remove the risk of plant impacting the live traffic.

Poor ground conditions resulted in the need for extra excavation until sound foundation could be found, the already difficult 1.5m BTOR excavation was extended to close to 2m at some locations. JH supervisors and engineers worked closely with ARTC and their geotechnical consultant in order to work on a solution to remove the impact to the adjacent live line during excavation, install permanent works that removed any long term maintenance liability and allow the turnout installation to be completed on schedule. Prior planning and risk mitigation between ARTC and John Holland and a collaborative practical problem solving approach produced a successful outcome.



109 PTS Crossing Panel being installed by PEM LEMs adjacent to live coal lines

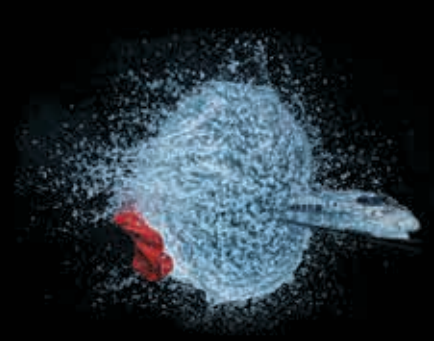
SAFETY/ENVIRONMENT

Over the course of John Holland completing various turnout installations for ARTC in the Hunter Valley a robust suite of Safety and Environmental Plans and Procedures have been developed with lessons learnt applied following each possession.

Feedback from ARTC CPR report on this project included

- John Holland attended and contributed to all TWA planning meetings ensuing a seamless turnout renewal in relation to the adjacent rail traffic impact.
- John Holland Leadership provided ARTC Site Representatives with early notice of impacts to program.
- Multiple issues identified at subgrade depth, methodology adjusted to ensure reliable outcome for ARTC.
- Although wet conditions, no mud was tracked onto roads.
- No enviroline complaints identified from an area with increased sensitive receiver interface.
- Works were completed with competent Supervisors and Site Engineers. Allocation of resources ensured program float was retrieved without risk to handback.

STEVE MAXWELL PLATELAYING AWARD
MINOR WORKS CATEGORY



Installation of 1,024 FFU Half Sleepers, ESR Viaduct

Laing O'Rourke
Company representative – Martin O'Brien
Value of works: $1.6m

LAING O'ROURKE

Executive Summary

These works were undertaken during the Easter 2020 Long Weekend possession. Deteriorated timber sleepers on the UP Eastern Suburbs Railway (ESR) line were successfully replaced by FFU (Fiber Reinforced Foamed Urethane) half sleepers to improve track integrity and quality. This possession seen the largest number of FFU half sleepers installed during a single possession, with works delivered ahead of schedule, under budget and with zero safety incidents.

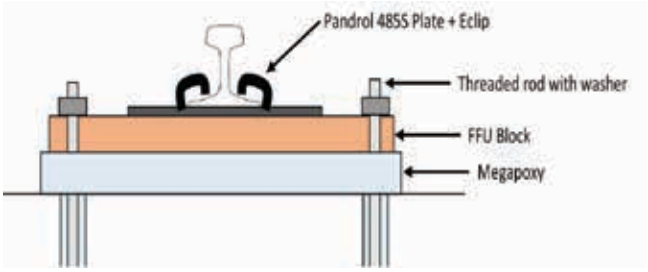
The ongoing refinement of the methodology and corresponding increase in production by a factor of 2.27 (see table below) is welcome in that we can deliver considerably more works in similar sized maintenance windows, benefiting the network and commuting public alike

Year	Possession	Days	No. of Blocks
2018	WE40 - Easter Long Weekend	4	450
2019	WE10	2	296
2019	WE42 - Easter Long Weekend	4	705
2020	WE09	2	448
2020	WE41 - Easter Long Weekend	4	1024

Comparison of FFU blocks with previous years outputs

PROJECT SCOPE

- Removal of guard rail and existing timber sleepers utilising a 3 in 4 pattern
- Setting of track to design alignment
- Preparation of concrete slab for installation of FFU sleepers
- Installation of 1024 FFU half sleepers on the ESR Line between 3.836 KM and 4.478 KM at Rushcutters Bay



FFU Block cross-section

Scope of works location

STEVE MAXWELL PLATELAYING AWARD
MINOR WORKS CATEGORY

PROGRAM OF WORKS

Due to the extensive nature of the works, the sequencing of tasks required thorough planning in order to achieve the most time and cost-efficient methodology possible.

During the planning period it was immediately recognised that it was imperative to access the corridor prior to the shutdown and set up the worksite appropriately. As such, tasks that could be effectively completed prior to the shutdown were scheduled in early on with the client and successfully accomplished. This created efficiencies within the program of works releasing more time for other critical tasks, thus achieving an ideal balance between quality and production.

After completion, the client was beyond satisfied with the final product and it was noted that works were completed prior to the scheduled time of finish.

QUALITY/DESIGN AND SURVEY

The deterioration of the existing timber sleepers made it difficult to align the track in accordance with the design alignment.

Therefore, to achieve this efficiently a three-man survey team was utilised. In order to ensure the gauge of the track was maintained gauge bars were installed every 2.4m. Furthermore, to adjust the height the track 1 in 4 existing timber sleepers were kept in place. The height of the rail was adjusted on the low rail first then the high rail using varying thickness of HDPE packers of 1.5mm, 3mm and 5mm. Once the height of the rail was set to the design height, the line was adjusted by drilling screw spikes into the timber sleeper at an angle next to the Pandrol plate.

This would push the line to the design alignment. In some locations the deterioration of the timber sleepers made it difficult to achieve the design alignment and multiple screw spikes had to be used to lock the alignment. Despite these difficulties the quality of the works was not sacrificed. This was noted by the clients comments, 'The site setup, the controls used onsite and the tidiness and order of the worksite were the best I had ever seen from your work in this area'.

DIFFICULTIES OVERCOME

Initially, with the limited time available and the large scope of works there were 2 major difficulties that were recognised.

- Supply of electricity and water

The use of a 60kVA generator on the worksite with distribution boards along the length of the worksite allowed stable power to be readily available across the entire site. In addition to this, eliminating the use of water cubes by setting up taps/hoses along the length of the worksite, resulted in a major increase in production rate and decrease in hi rail plant and corresponding hi rail movements within the possession

- Accelerated Core drilling. The most successful innovation and primary reason for the success of this possession was the core driller rigs .The composition and refinement of these rigs has occurred over the past few years with the rig having built-in cant to ensure the cores are at the same angle as the rail

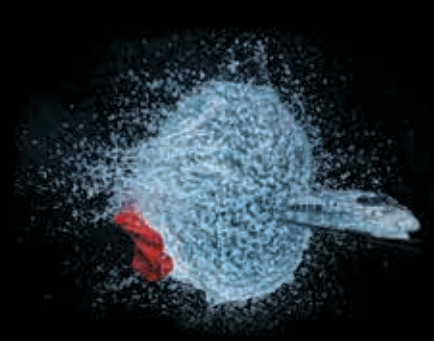
Readily available access to electricity and water

Core Drilling Rig

SAFETY/ENVIRONMENT

Safety was a primary focus as a result of the COVID-19 pandemic that impacted the works. With this particular factor in mind, the installation of 1024 FFU sleepers was completed with zero safety incidences, absolute compliance with social distancing measures, and strict adherence to environmental control plans.

STEVE MAXWELL PLATELAYING AWARD
MINOR WORKS CATEGORY



Cockle Creek Bridge Refurbishment – Internal Containment Structure

RKR Engineering
Company representatives - Alex Rapson, Russell Ricketts
Value of works: $1.5m

Executive Summary

RKR Engineering were contracted to design, manufacture and install an internal containment structure for Sydney Trains on the Cockle Creek bridge. The purpose of the containment structure was to enable steel remediation works to occur outside of track possessions while protecting the workers from both rail traffic and the overhead electrical wiring.

Design began in early 2019 with final approval granted in November 2019. Installation of the structure over the first span of the bridge was completed in March of 2020 with another move to the second span planned for early 2021.

Essential parameters of the design were:

- Structure had to be installed within as much of the bridge structure as possible to allow maximum access to the steelwork for remediation works
- Provide a protective barrier shielding workers from live rail traffic and live overhead powerlines
- Allow the unimpeded movement of trains without any speed restrictions
- Be structurally capable of withstanding loads imposed by internal & external wind forces, train wind loads and for the storage of equipment and personnel on the upper surface
- Be able to be installed within a 36 hour possession window
- Be able to last for at least 2 years

PROJECT SCOPE

The parameters required a novel approach to the tunnel design & construction. Initial assessments of methods traditionally supplying materials in loose or partially completed sections resulted in an overly congested site and unattainable time frames.

It was decided during the design phase that the structure would be made up of 6 individual modules constructed of steel and 18mm plywood.

The modules were made up of over 100 individual pieces that would be prefabricated in the RKR workshop then preassembled on site prior to the possession.

As the design progressed further constraints and requirements emerged. This resulted in a larger heavier construction than previously envisaged. Of greatest importance was the need to fit the tunnel between the train kinematic envelope, the overhead wiring and the bridge structure gauge.

PROGRAM OF WORKS

Prior to the weekend possession all of the separate frames were fitted together on site into the 6 modules ready for installation. This proved problematic as the laydown area was adjacent to live 32Kv powerlines just outside of the rail corridor.

At the commencement of the possession weekend a 110 ton crane was placed at the northern abutment ready to crane the modules up onto the track. The overhead wiring was lowered by the Rhomberg Rail overhead wiring team in readiness for the individual modules which were to be craned up to the track and lowered onto RKR hirail plant.

STEVE MAXWELL PLATELAYING AWARD
MINOR WORKS CATEGORY

This plant included the RKR designed & built "Track Haul" which is a unique piece of hirail plant that is able to access track without the need for a hirail pad.

Unfortunately, the wind picked up almost as the 1st lift was planned to take place so the lifting process was put on hold as the wind speed was blowing greater than the safely allowable level. As a result, lifting didn't commence until 2000 Saturday night. The modules were then moved into place as the plant travelled down simultaneously on both tracks. Once in the desired locations the modules were hydraulically jacked into place. Infill panels & end barriers were then installed prior to sealing up of all the gaps between the various modules.

All works were completed comfortably by Sunday afternoon well ahead of the required track handback.

ACCURACY TO DESIGN AND SURVEY

The design component was the most critical part of the whole project due to the tolerances to the existing infrastructure and the need to fit the new structure to the existing bridge steelwork. What made this project even more challenging was the project was unprecedented. An exemption from the internal standard for temporary structure works adjacent to live overhead wiring was required from the Sydney Trains electrical department.

All modules fitted exactly as per design with no issues encountered throughout the install process. All required clearances and certifications were achieved at the end of the install.

DIFFICULTIES OVERCOME

Unprecedented Project: No project such as this had ever been attempted before so all designs and ideas had to be developed while ensuring full compliance and safety before and after the install. Full engagement of stakeholders during times of innovation can sometimes be tricky but we were able to navigate our way through this with the full support of the Sydney Trains team.

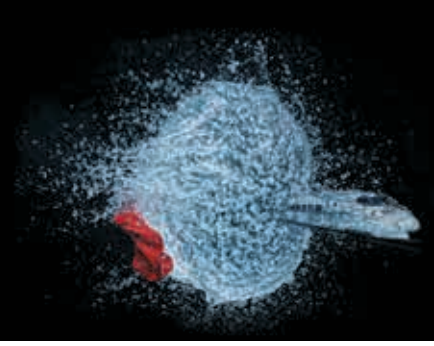
Short Turnaround Following Approval: Approval was received in November with install planned in March. In this time drawings had to be completed, materials procured, 40 tons of steel needed fabricating and coating, 1200m^2 of plywood needed to be prepared for the 100 separate frames, all items needed to be delivered to site and all modules needed to be preassembled on site.

Weather Condition: Unfortunately, we could control most things but we couldn't control the weather with the wind picking up during the most critical part of the possession. Hours lost were not an issue due to the contingency we had allowed within our program.

SAFETY/ENVIRONMENT

With the many challenges faced on this project, the RKR team were able to carry out the work safely and incident free. Additionally, the project involved work over the water which RKR teams were mindful of with no environmental incidents occurring on the project.

STEVE MAXWELL PLATELAYING AWARD
MINOR WORKS CATEGORY



Ardglen Tunnel Skim Reconditioning

Laing O'Rourke – Hunter Valley Rail Operations
Goran Horvat – Project Engineer
Value of works: $1m

LAING O'ROURKE

Executive Summary

The heritage listed 490m Ardglen Tunnel on ARTC's Main North Rail Line was built in 1877 making this single track tunnel the oldest of its type in NSW. The extent of work as described in the Works Description was for ballast replacement / reconditioning, renewal of existing drainage systems, replacement of heavy duty concrete sleepers with new and to reinstate existing rail through the entire tunnel portal.

The complexity of scope delivery was amplified with the requirement that confined space controls be implemented for any works performed within the tunnel limits.

This requirement when coupled with restricted external access and some of the most severe bushfire conditions in recent history challenged conventional work delivery methods and contingency / risk mitigation plans.

PROJECT SCOPE

- Set up of temporary strip lighting and ventilation systems
- Removal existing rail and sleepers within the tunnel and 25m beyond the portal limits at each end
- Full depth excavation of ballast to depth varying from 0.5 to 1.3m and removal of existing drainage systems
- Installation of new drainage systems and inspection pits
- Placement of bottom ballast to survey design
- Installation of new sleepers and reinstate existing rail. Note this activity was completed by utilizing PEM/LEM's to transfer pre-built track panels
- Top ballasting, welding, resurfacing, signaling reconnections and certification activities.

Extract from Rail Express November 21 2019 – Tanya Bisevic

"The Ardglen Tunnel will also be re-sleepered and re-railed. This is an interesting job as it is a heritage-listed tunnel and we have to take those considerations into account while undertaking the works," ARTC group executive for the Hunter Valley, Jonathan Vandervoort, said. "We will also take advantage of the opportunity to undertake a number of works including removing ballast and improving drainage on this section. With tunnels you need to be very efficient as the conditions are difficult to work in and to you need to be very organised to get all the works done in the allotted time."

STEVE MAXWELL PLATELAYING AWARD
MINOR WORKS CATEGORY

PROGRAM OF WORKS

The "as built" programme upon comparison to the submitted programming varied by 4 hours.

Minor program delays resulting from access constraints, sequencing restrictions and slip in production rates were continuously communicated to the client.

This open and transparent communication allowed works to be completed and handed back with no impact to Network Operations and train pathing.

ACCURACY TO DESIGN AND SURVEY

With tunnel dimensions having minimal tolerances accuracy to design and survey was identified as a critical factor in achieving a successful project outcome.

Laing O'Rourke's focus during early works planning ensured the project was delivered with zero nonconformances recorded for survey tolerance and ultrasonic weld testing, with all works completed to client standards.

DIFFICULTIES OVERCOME

The implementation of confined space controls for works in the tunnel resulted a team workshop to identify all necessary personnel and plant requiring tunnel egress. The subsequent training of key personnel was achieved in the days leading up to the possession by specialist trainers running dedicated courses.

Hygienists, who were engaged to continually monitor the working environment in the tunnel throughout delivery acknowledged the meticulous team planning, noting attention to detail with location/ mounting of exhaust fans and strip lighting, so as not to restrict access for plant activity while also maintaining ventilation/ access requirements.

The restricted space within the tunnel portal posed the greatest difficulty for plant access and track build. Laing O'Rourke's solution and methodology utilised our specialised PEM/LEM plant to reinstate the track inside the tunnel, allowing panels to be built offline and not impact critical path ballasting activities. This solution required focus by operators and spotters to maintain machine clearances from tunnel walls which was less than 100mm to portal arches.

This methodology allowed the labour intensive task of building track panels to be completed outside the

tunnel environment, thus removing the risk of harmful atmospheric conditions, people/plant interaction in a tight space, poor lighting, as well as minimising heavy plant movements inside the heritage listed tunnel.

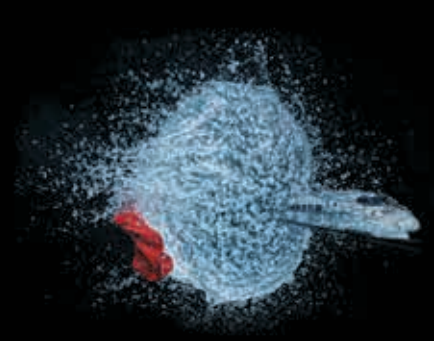
SAFETY/ENVIRONMENT

The major focus while working within the tunnel was maintaining atmospheric conditions to acceptable standards to allow works to continue to program. The controls implemented were monitored by continuous testing and validated by the onsite hygienist.

Heightened controls for hot works during the severe bushfire period, resulted in the site enforcing a no smoking policy with designated smoking areas outside the rail corridor.

The site recording zero near misses and safety incidents, and the heritage listed infrastructure was returned into full service.

STEVE MAXWELL PLATELAYING AWARD
MINOR WORKS CATEGORY



Watermark 600m Reconditioning Project

Laing O'Rourke – Hunter Valley Rail Operations
Alex O'Toole – Project Engineer
Value of works: $1.2m

LAING O'ROURKE

Executive Summary

A section of track on ARTC's Main North West Line in the Upper Hunter Valley between Breeza and Curlewis was renewed to remove track speed restrictions caused by failing formation.

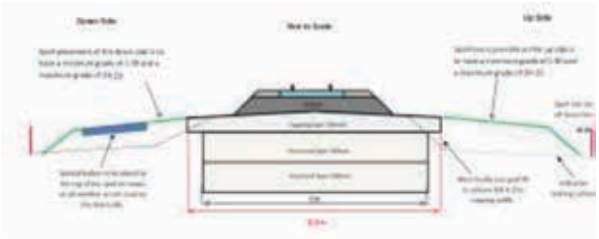
The Watermark Reconditioning Project is of significance as the material volumes transferred (out and in) had not been successfully completed in the Hunter Valley within the allotted possession timeframes.

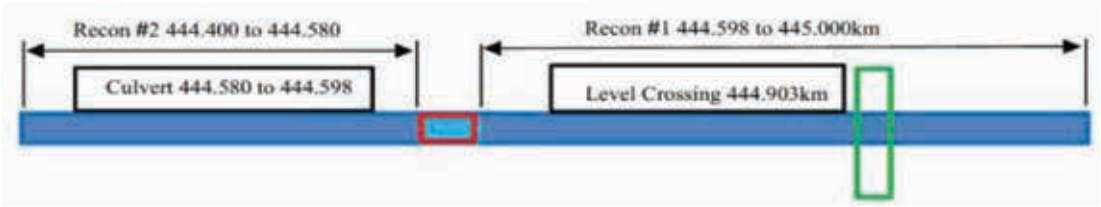
The programme required the transfer of approximately 30,000t of material within a 48 hour period to allow sufficient time for track build, resurfacing and rail adjusting to be completed by the 76th hour.

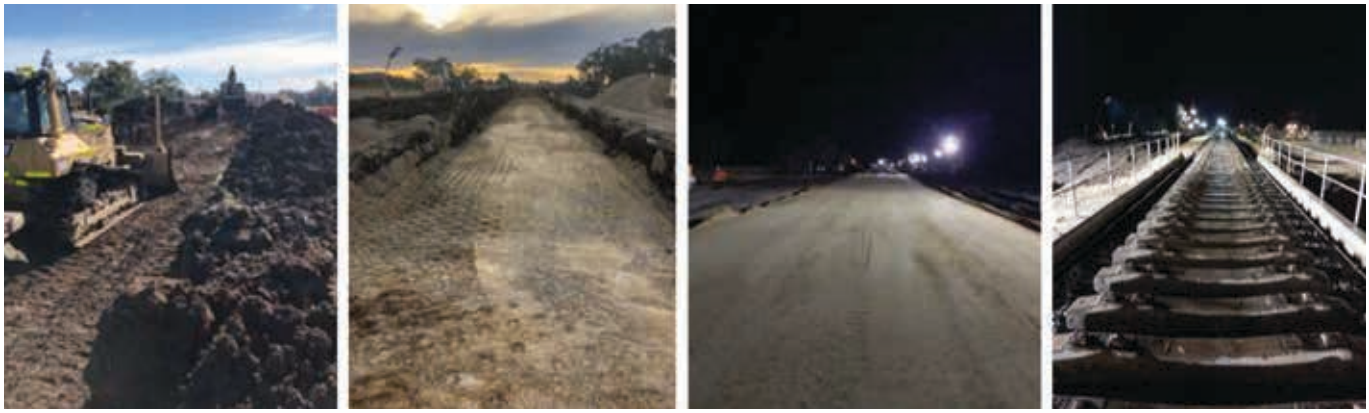
The work site, extending over 600m of track plus transitions each end, and was successfully delivered in the May 2020 possession.

PROJECT SCOPE

- Full depth excavation 1.9m to 2.0m of Formation between 444.400km to 445.000km plus transition zones.
- Placement of A44 Geofabric and TX190 Geogrid
- Placement and compaction of Structural Fill 1.0m in 250mm layers
- Placement of 200mm Capping Layer
- Track built and ballast installed ready for resurfacing by the 60th hr.
- Placement of spoil as per design 3% cross fall to improve access roads adjacent to the worksite.







STEVE MAXWELL PLATELAYING AWARD
MINOR WORKS CATEGORY

PROGRAM OF WORKS

Works sequencing required meticulous program planning to ensure the four (4) concurrent work fronts we able to simultaneously achieve the required excavation and placement production rates.

The program, was closely monitored by the client throughout delivery as it had been recognised there was minimal contingency and basically all activities were "time critical".

Upon completion, it was recognised that the "as built" programme aligned with the submitted programme throughout possession delivery. To complete the works as per programme Laing O'Rourke utilised the following equipment and resources;

Equipment & Resources Summary
Excavators, Drotts, Dozer, Dump trucks, Pozitrack, Rollers, Watercarts, Hi-rail Excavators, Loaders
Survey, Geotechnical, Signalling & Resurfacing
Site Management, HSE, Supervision, Welding & Track Labour
Client Support & Stakeholder Engagement

ACCURACY TO DESIGN AND SURVEY

Laing O'Rourke utilised GPS technology to achieve accuracy during excavation and to minimise plant/people interaction. Material placement and layer conformance were completed and validated by survey in accordance with client standards, particularly regarding Earthworks Formation Construction.

There was zero non-conformances recorded for either survey tolerances or geotechnical testing results.

DIFFICULTIES OVERCOME

As a project of this scale had not been successfully delivered within in this timeframe in the Hunter Valley before, impacts from unknown ground conditions were identified as the biggest challenge. Contingent materials quantities were stockpiled onsite to derisk this scenario. Another difficulty identified during project planning centred around the Fatal and Severe Risk of People & Plant interaction. In the work area there were over 20 various heavy plant and up to 25 ground personnel, all working concurrently across the 600m worksite. Interaction was minimised by utilising GPS technology on equipment and designated pedestrian access points.

Heavy rainfall later in the possession restricted access heavy plant which impacted the ability to complete the spoil placement on the access road.

SAFETY/ENVIRONMENT

Extract from ARTC Contractor Performance Report June 2020 –

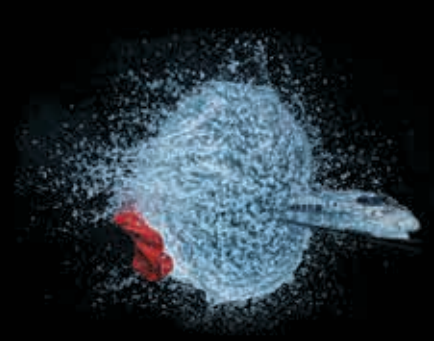
> *"The coordination of multiple work-fronts on the ground was some of the best we've seen, with front line leaders clearly setting expectations in line with ARTC's safety and quality requirements."*

Throughout the project, particular care was taken in regard to protecting environmentally sensitive areas identified within client documents. Environmental control plans were implemented for the site during both site establishments and possession works.

Dedicated pedestrian walkways with Covid-19 cleansing stations at each gateway to the worksite were in place to eliminate the people/plant interaction hazard and improve hygiene onsite.

Safety was never compromised, with the site recording zero safety incidents or near misses.

STEVE MAXWELL PLATELAYING AWARD
MINOR WORKS CATEGORY



Rhodes 52A&B Crossover Renewal

Sydney Trains
Jackson McLeod – Project Engineer
Value of works: $1.4m

Transport Sydney Trains

Executive Summary

The Rhodes 52A&B Crossover Renewal was a challenging multi-disciplinary brownfield project in one of the most testing parts of Sydney's rail network.

This project had added complexity over a standard turnout renewal due to worksite constraints and the coordinated construction methodology, which used two different types of track installation equipment (PEM LEMs and specialised loading machines) and a modular turnout design.

The crossover is located 50m city of Rhodes Station and is continuously in use for both passenger services and heavy freight traffic. The scope of the project consisted of renewing the existing timber conventional crossover to 60kg tangential turnouts with concrete bearers, BWG jointed bearer system and Siemens MK3 Spherolock actuation system.

This project introduced new track components. In steps towards modular turnout renewal construction methodology, the track layout utilised a combination of jointed bearer couplings through the long bearers but also served as a trial for the pre-assembly and fit of the torsion bar backdrive to the switch panels prior to installation on site.

This tested conventional installation methodologies as without work trains available on the delivery weekend, the limited space accessible had to be used for the stockpiling of materials. Thus, the crossover had to be prebuilt across three locations and then combined precisely on install.

The works were delivered to a high quality, with signals commissioning completed early and all scopes completed without incident.

The project budget was $1.474M, with the full scope of works being delivered for $1.431M, 3% under budget.

Rhodes 52A&B Jointed Bearer Crossing Panels

PROJECT SCOPE

- Replace 52A&B crossover, an existing timber 53kg conventional, with a 250:10.5 60kg tangential crossover utilising the jointed bearer arrangement
- Recondition to 910mm below rail level (150mm of subgrade reconstruction) and resurfacing the full crossover to final design alignment
- Construction one 3 track ULX for B end cables and signals route
- 46 aluminothermic welds, with 3 sets of continuous welded rail adjustment.
- Electrical overhead wiring adjustments to suit the new track geometry
- Upgrade signal equipment to Siemens 84MK3 Spherolock and commissioning with torsion bar backdrives

ACCURACY TO DESIGN AND SURVEY

52A&B points were installed to 6mm from design. Vertical alignment was within 20mm from design and super within 4mm, and line was within 10mm from design, meeting ASA standards for track construction. Turnout out gauge measurements were within 3mm and within 2mm at the crossings. Electrical adjustments and all signals commissioning works were completed to construction tolerances. The project was handed over to the Sydney Trains Asset Management without defects or omissions.

STEVE MAXWELL PLATELAYING AWARD
MINOR WORKS CATEGORY

PROGRAM OF WORKS - November 2019 to January 2020

Prebuild, Quality Inspection of Crossover Panels, Site Mobilisation

11th – 15th of November – Prebuild 52 Jointed Bearer off site and complete quality inspections

2nd – 6th of December – Prebuild 52B Switch and closure panels at Blaxland Road, Rhodes

9th – 13th of December – Prebuild 52A Switch and closure panels at Walker Street, Rhodes

8th January – MIH Contractors transport the prebuilt jointed panels from Chullora to Rhodes via road

8th – 10th of January – Site Prep works, including fitting PEM LEMs to the A end at Blaxland Road

Installation: 11th – 12th of January – Installation of 52A&B crossover during weekend possession.

Possession handback was required by 0200 Monday in the 48 hour closedown, with all scope completed by 2322 Sunday evening. The critical path remained within 1 hour of the construction schedule, with efficiencies gained on the Sunday due the efficacy of the tandem resurfacing activities of the two Rhomberg resurfacing teams and the use of the pre-fitted torsion bar backdrive minimising the time required to build and test the mechanical aspects of the points. The key was a highly integrated program across track, signalling and electrical, clearly identifying the critical resource utilisation and their allowable slip, as well as quality control through pre-assembly of components where possible. The track installation consisted of 4 prefabricated panels of various sizes, the largest installed using the John Holland PEM LEMs. Track works were undertaken by internal track teams supported by Affective Rail. Signals works were internally delivered. Electrical adjustments were undertaken by Laing O'Rourke. MCR provided safeworking, Aurecon provided survey support.

DIFFICULTIES OVERCOME

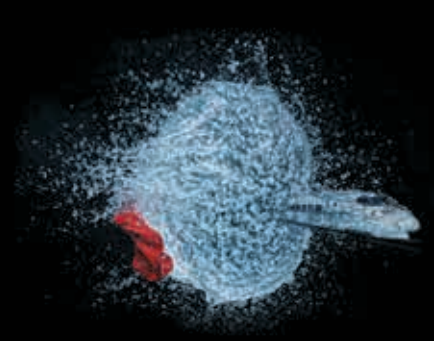
This project had a range of difficulties to overcome including introduction of new track components and associated requirements, prebuild in different locations and stages in order to meet on site demands, and a complex coordinated construction methodology. This installation was used as a trial for the durability of the torsion bar backdrive system in construction. The torsion bar was affixed during the crossover preassembly and installed with the PEM LEMs without its removal, with no impacts to the integrity of the equipment. Further data was obtained and used in order to pursue type approval for its use across the Sydney Trains Network, which was granted in July 2020 by the ASA. The torsion bar backdrive offers many construction and maintenance benefits, and will become 'BAU' for the upgrade of tangential turnouts. Obtaining the buy-in of the project team, the development of a robust project schedule and risk assessment in order to identify contingencies within the program was also critical to the success of this project. These challenges were addressed through conducting thorough risk assessments to identify and control all risks introduced by the new track system, purchasing of new materials / equipment to ensure requirements of the new system were met, coordination with internal and external stakeholders, documented construction and tamping methodologies, and thorough briefings to construction teams.

Rhodes 52 B end switch and closure panel travelling using PEM LEMs with Torsion Bar Backdrive

SAFETY/ENVIRONMENT

Rhodes is a densely populated built up suburb with residents reliant on public transport infrastructure as well as local roads. This project had a significant interface with pedestrian traffic around Rhodes. Therefore, minimising community impact through the qualitative and quantitative noise and vibration assessments, timing of works, management of traffic and pedestrian flows and appropriate environmental controls was imperative. Given the risks and site constraints, a comprehensive traffic management plan to ensure safe approach distances were maintained throughout the duration of the project. Further, the methodology required careful review to ensure that the separation of people and plant was given heavy consideration in order to manage congestion on this on site. Internal safety and environmental audits were conducted on site and the positive results received for both reflects the high quality safety and environmental management of this site.

STEVE MAXWELL PLATELAYING AWARD
MAJOR WORKS CATEGORY



Major Works Entries – > $3m

Fastrak (Taylor Rail Australia Pty Ltd & Fluor Australia Pty Ltd) – Inland Rail, Parkes to Narromine

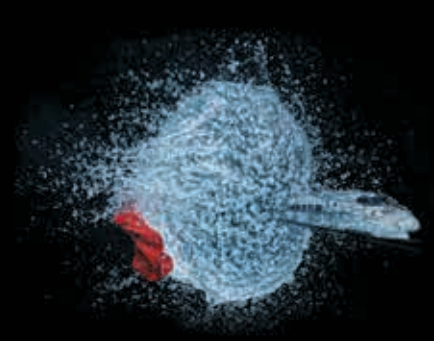
Continuum Alliance – CPB Contractors & Lendlease Engineering JV in alliance with TfNSW – New Intercity Fleet – Blue Mountains Route Clearance

John Holland – TfNSW & ARTC Mount Murray Loop Extension Civil, Track & Signalling

Laing O'Rourke & John Holland – Sydenham Station and Junction Upgrade

Laing O'Rourke Construction Australia – North Shore Corridor Works Portion 7, Temporary DN Shore Slew

STEVE MAXWELL PLATELAYING AWARD
MAJOR WORKS CATEGORY



Inland Rail Parkes to Narromine (P2N) - Rail Component

Taylor Rail Australia Pty Ltd and Fluor Australia Pty Ltd JV (Fastrak)
Peter Kessler – Project Director and James Porteous - Project Engineer
Value of works: $43m

Executive Summary

The ARTC Inland Rail Project is a once-in-a-generation permanent way project that will complete the backbone of the national freight network connecting Melbourne and Brisbane via regional Victoria, New South Wales and Queensland. The Parkes to Narromine (P2N) contract was the first of 13 projects that make up Inland Rail. P2N was classified as a brownfield project where a pre-existing rail corridor was completely reconstructed.

Fastrak was the on-site track construction contractor that has completed this crucial first section in under 18 months using a combination of new and innovative technology and equipment and tried and true track construction methodologies and in a rural NSW setting.

PROJECT SCOPE

While the overall project was inclusive of track formation, culverts, signalling and level crossing infrastructure, Fastrak's scope included 115km of track construction, connecting the ARTC network in four locations and linking in a significant new Pacific National intermodal terminal located in Parkes. The mainline from Parkes to Narromine includes 3 new crossing loops, 5 siding reconstructions, 31 turnouts/catch points, 33 concrete and 15 steel deck level crossings over 158 newly constructed culvert structures.

PROGRAM OF WORKS

Works were programmed in three segments; the A and B Sections (the northern and southern sections of P2N respectively), the North West Connection, (NWC) and a connection between the Main West, Parkes to Narromine and the new Pacific National intermodal terminal.

Fastrak's program of work was scheduled to take 11 months to complete the track construction, but with severe wet weather and other external delays that impacted Fastrak's progress, the job was completed in 15 months. This was an exceptional result given delays outside the control of Fastrak.

Ballast train travelling through newly completed Peak Hill mainline section

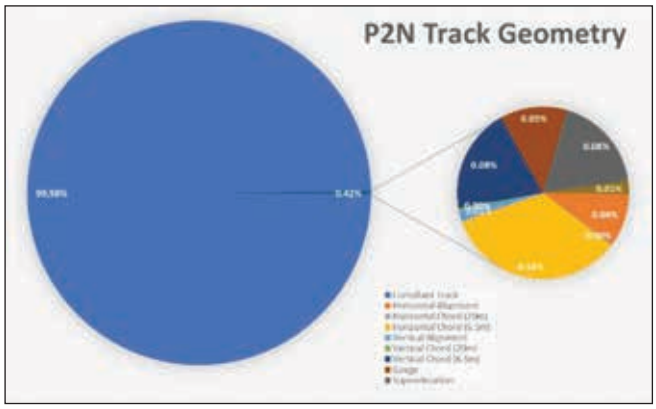
ACCURACY TO DESIGN AND SURVEY

For a project of this scale, a huge focus of the construction team was to maintain a high level of quality, consistently throughout the works. Key activities over the duration of the project were held to the highest standards during construction.

Aluminothermic Welding – To deliver a final product that provides the best possible future maintenance lifespan, Fastrak implemented a number of key initiatives. Welds in open track were completed primarily by the JV's in-house Progress Rail K930 flashbutt welder which limited aluminothermic welds to only 304 over the entire project (not including turnouts). Aluminothermic welds completed were also surface finished by needle gunning, which can improve the individual welds lifespan by up to ten-fold. Finally, all 2,400+ welds across the project were assessed using an electronic straightedge, providing an individual report for each weld, improving traceability and overall quality of the finished weld geometry.

Track Resurfacing – Fastrak deployed two resurfacing teams, the first of which operated a Plasser Theurer 2X.

STEVE MAXWELL PLATELAYING AWARD
MAJOR WORKS CATEGORY



P2N mainline geometry statistics showing 99.58% compliant track

Production Tamper to complete the first and second pass of track, the second operated a Jackson 6700 Switch Tamper completing the final lift, line and superelevation pass. These teams exceeded the required production rates required, with the final product surveyed and found to be 99.58% compliant. Noting that reporting was completed at 1m intervals which is far above the minimum requirement of New Track Construction of an Interstate Line.

Instilling a focus on consistency through the duration of the project, for both the key activities and the remaining processes, was instrumental in delivering a project of this scale to such a high standard.

DIFFICULTIES OVERCOME

Fastrak readily faced numerous challenges on P2N with a positive and determined team spirit. The entire worksite endured weather extremes at both ends of the spectrum, with high temperatures and dust storms during the peak of summer in a national drought in 2019 and then the conditions almost entirely reversed into one of wettest winters on record in the region.

Targeted staging on the project allowed the existing infrastructure to remain in operational use for a portion of the project until shifting works to the newly connected intermodal facility. This required works to be completed commencing from a set point in the middle of the job moving towards the northern limit, then initiating a 2nd work front working south. Critical commissioning milestones were aggressively resourced to ensure best for project outcomes were achieved.

The P2N main line is predominantly a single line bi-directional track, with large distances between sidings and crossing loops (up to 30km). A key challenge was managing on track plant/activities such as the ballast train, resurfacing and track adjusting. Coordinating movements of these work groups to allow daily passage of the ballast train, with the only quarry source, with limited crossing opportunities was critical to maximise production time for each activity.

Maintaining the required sleeper density in the track structure whilst maintaining the high production rates of the project was a challenge that Fastrak met head on by designing and building a first of its kind sleeper spacer, designed to follow behind the fastening installation crew correcting any spacing deviance.

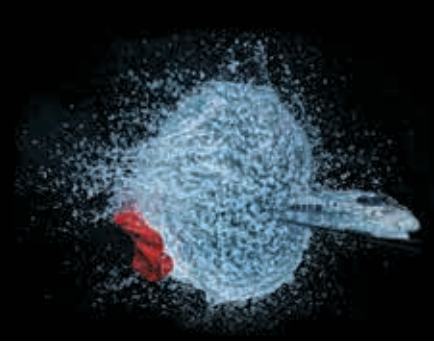
2: 220t crane installing a 1:18.5 turnout panel during scheduled mainline possession

SAFETY/ENVIRONMENT

From the start, Fastrak put safety first, holding a number of safety focussed sessions and follow up sessions, where the management team challenged itself to identify improvements in practices. All workers were brought in to discuss site safety and where positive improvements could be implemented, reviewed and safe work method statements enhanced to reaffirm Fastrak's and each individual's commitment to safety. Through the course of the project, total work hours reached over 240,000 hours, providing a current LTIFR of 4.09 which is well below the industry benchmark.

The ever-changing COVID-19 situation required Fastrak, in coordination with its client, to implement several initiatives to allow the project to continue safely, some of which were selected by ARTC for implementation across the Hunter Valley network during their major shutdowns. The project has adapted to the new 'COVID normal' environment that it had found itself in and has been able to broadly progress the works safely, without incident and with minimum delays.

STEVE MAXWELL PLATELAYING AWARD
MAJOR WORKS CATEGORY



TFNSW / ARTC Mount Murray Loop Extension Civil, Track & Signalling, NSW

John Holland
Adam Broome – Project Manager
Value of works: $5.4m

JOHN HOLLAND

Executive Summary

The Mount Murray loop extension project is being funded by the NSW Government under the Fixing Country Rail program. The project involves extending the existing Mount Murray loop on the Moss Vale to Unanderra branch line from 764m to accommodate 1,000m long trains.

The Moss Vale to Unanderra line and Mount Murray loop are used by regular coal, grain and mineral ore trains and is an alternative route to and from Sydney and Port Kembla.

It has been estimated that by extending the Mount Murray loop and allowing longer grain trains to operate, the cost of transporting grain can be reduced by a $1 per ton, which considering the significant volumes of grain that pass through the line, is a significant cost saving. The project overcame considerable amount of difficulties which include Covid -19, inclement weather (flooding), embankment slips, Late Signal design & signal material supply and limited stockpiling areas onsite. Overall, the project was delivered as programmed to a very high standard with no NCR's or WHS incidents.

Mount Murray Loop Extension, Track, Civil and Signalling Infrastructure

PROJECT SCOPE

- Extension of existing loop 258 meters to 1000m
- 13,600T of Cut / Fill
- Cart & Dispose 11,200t of Spoil
- Supply, importation of 6,600t of new Quarry Materials
- Install New 1:15 R500 Tangential Turnout
- Install box culvert, headwalls & rock treatment
- Relocation of 5 signals
- 2,400 meters of Signalling Infrastructure CSR
- Manufacture, construct and Install two LOC's
- Manufacture, Construct and install relocate UAT
- Install and Terminate 8000 meters of signalling cable
- 305-meter directional drill, under bore in igneous rock
- Construction of Level crossing and phone comms

STEVE MAXWELL PLATELAYING AWARD
MAJOR WORKS CATEGORY

PROGRAM OF WORKS

The construction program duration of works was initially allocated 5 months during the tendering and preferred tenderer negotiation phase. The subsequent outbreak of Covid-19 in Australia delayed the contract signing until May 2020, with Funding from TFNSW fixed for PC in August 2020 resulted in the loss of 2 months of construction phase. John Holland project teams accelerated the program of works and delivered the construction phase of the project within 12 weeks (3 months) whilst working under a live rail environment , safe working consisted of utilising TOA's and ASB for Mid-week construction and two LPA'S to complete the Civil, Track and Signalling scope. The new loop was commissioned into service on time and project scope was completed to achieve PC as programmed.

ACCURACY TO DESIGN AND SURVEY

The Works were delivered to a very high standard, with zero NCR 's recorded for the project, resurfacing of the new alignment was completed with the ARTC ETF 05- 01 Mainline standards applied. Furthermore the No.90 aluminothermic welds all passed electronic straight edge testing and destress modules validated by Verse testing equipment.

DIFFICULTIES OVERCOME

The project encountered incredible difficulties throughout the entire project which included, Late contract execution, Covid- 19 Outbreak, 468mm of rainfall from site mobilisation to PC, water discharge into class 1 catchment areas, very minimal stockpiling areas onsite to allow spoil stockpiling, transportation and importation of new materials. The project leased crown land outside of the rail corridor which incurred double handling of all spoil, cut and fill and quarry materials. An embankment slips on downside resulted in closure of haul road and alternative route negotiated through adjacent landowners' property. Signal Design and cable supply was late from the client, furthermore a variation to under bore the new CSR route encountered igneous rock seam that threatened the cancellation of the commissioning possession and resurfacing machine availability. The confined work site required an outstanding construction methodology and sequencing of track, civil and signalling resources in order to achieve completion of large scope in short time frame.

SAFETY/ENVIRONMENT

The project was situated in the Sydney water catchment area and environmental sensitive class 1 region, which brings additional controls for water discharge and sediment on site. An inspection from water NSW of site was coupled with a very impressive comments and implementation of erosion, sediment controls and water discharge for the amount of rainfall recorded onsite (468mm). Zero WHS injuries or incidents recorded for the project

STEVE MAXWELL PLATELAYING AWARD
MAJOR WORKS CATEGORY

North Shore Corridor Works Portion 7 – Temporary DN Shore Slew

Laing O'Rourke Construction Australia
Martin O'Brien
Value of works: $103m

LAING O'ROURKE

Executive Summary

The North Shore Corridor works (NCW) is a standout example of a project delivered ahead of time, under budget and achieving unrivaled outcomes in terms of Safety, stakeholder satisfaction and positive environmental impact.

The complex staging required to deliver the Temporary Down North Shore (DNS) Track Slew, to ensure no negative impact to Sydney Trains Operations, serves as a testimony to the importance of buildable and cost-effective design, transparent plus operationally focused stakeholder engagement and collaboratively driven possession planning and delivery processes.

The realignment of the North Shore line was essential for the expansion of the Chatswood Metro Dive site and the future, ultimate segregation of the future Metro and Sydney Trains networks at Chatswood. The Project has been described as the cartilage that links (like the gristle) between the two major multi- billion-dollar projects (i.e. Sydney Metro's Northwest rail link and the City and Southwest tunnels at Chatswood). The project has been recognized as a key early enabler for the ongoing progress of the wider Sydney Metro program of works.

PROJECT SCOPE

The P-Way specific scope of NCW Portion 7 project was the realignment of the T1 North shoreline between Chatswood Station and Brand St, Artarmon to accommodate the new Sydney metro and the future construction of the Chatswood tunneling dive site and ultimately the final segregation of the Sydney Trains and Sydney Metro networks. The project resulted in an upgrading of the North Shore Line signaling capability to allow for an increase in traffic to 20 trains per hour between Hornsby and North Sydney and to support the transition of the Epping to Chatswood Rail Link to Sydney Metro operations.

The demolition of Nelson Street Over Bridge, the revision of the corridor drainage, the construction of a new underground

120 million-litre Onsite Detention Tank (OSD) and associated Spillway structure at Drake Street, plus associated signaling remodeling, HV relocations, new cables and comms, electric train-stops installations and complex OHW modification works were all necessary activities to allow the track slews to take place.

PROGRAM OF WORKS

Works on NCW project commenced in June 2017 primarily design related until physical works commenced on site in earnest with the installation of the shared OHW portals at the Chatswood end of the Works WE47 2018, this allowed the construction of the UP Shore Slew track to commence and was completed on WE03 2019, with the Temp DN Shore Slew then coming firmly into focus.

As works progressed, so did the realisation that the key to de-risking the construction of the Metro tunnel Portal was the early completion of the Temp DN Shore Slew, which would release key brownfield areas for the construction of the metro tunnel dive structure to tunnel face.

Originally WE44 2020 was mooted as the date for completion of the Temp DN Shore however this was challenged and a stretch target for completion of Temp Dn Slew on WE32 2020 was accepted by the project team, with WE36 2020 as a contingency possession, if needed.

STEVE MAXWELL PLATELAYING AWARD
MAJOR WORKS CATEGORY

WE20 (Nov 2019) saw the Recon of both City and Country Ends of the Temp Dn Slew section, with an approx. 100 metres section of the old redundant UP (Post UP Slew) repurposed as the new Temp Dn straight section. City End slew section skeleton track and bottom ballast was also installed in this possession.

WE27 – January 2020 (24-hour possession) saw the installation of the Country End skeleton track on a ballast mat at the clients request to mitigate the effects of ground borne noise to surrounding residents.

WE32 2020 saw the actual slew come together during what was the worst rainfall Sydney had experienced in 30 years.

Midweek works WE32 to WE36 saw the removal of the old DN Shore track, leading to early handover of the Site to the Sydney Metro Tunnel works Contractors.

In total, we worked 20 Weekend Possessions and 21 Mid-week Possessions to complete the complex works.

Whilst WE36 saw the removal of redundant structures, the scheduled handover date of the area to client (Sydney Metro) was 15th March 2020 and this was achieved on the 11th March 2020 allowing works to commence in the Brownfield area of the old North Shore DN track in line with the stretch schedule challenge accepted by the team.

ACCURACY TO DESIGN AND SURVEY

Tolerances achieved on the North Shore Temp DN Slew Track alignment – +/-9mm

Track height – +/-10mm Track gauge – +3mm/-2mm Super Elevation - +2mm/-3mm

DIFFICULTIES OVERCOME

Commissioning

During the Temp DN Shore Slew event heavy rainfall was predicted which could have major impacts if all track welding was not completed. Through contingency planning with Sydney Trains a well-documented approach was developed and the results of this can be seen as there was no delays experienced in the delivery. This was through the use of planning the weekend resources to the hour by hour forecast and ensuring dry periods were maximised with numerous weld crews and tasks which could not be completed in the rain were scheduled accordingly within the weather windows.

Removal of WE44 Possession

Despite the complex staging involved with the track slews construction, the careful planning allowed the works to be completed within the revised and compressed schedule. This created significant benefits for the wider delivery of the Sydney Metro Programme of works and ultimately reduced network disruption.

Reuse of Track Components

Multiple instances off the reuse of materials assisted in keeping costs down for the client whilst still providing a robust engineered solution. Items such as OHW footings, rail sections, OHW sections were assessed by our team and all relevant approvals and testing completed to reuse these materials. Specific examples off this are the previously mentioned reuse of the original UP Shore track as the straight section of the Temp DN shore track.

Ballast Mat Install

Local stakeholders raised concerns around vibration via the Sydney Metro resident engagement forum , following the escalation of these matters after design discussions involving project team, design team, Sydney Trains, Sydney Metro and ASA, LORA was able to express and accelerate the installation of a Ballast Mat. This was very much a late addition to the scope which was nonetheless delivered on time and at nil adverse effect to schedule or cost. The benefits to the public was greater noise and vibration attenuation outside off the rail corridor.

SAFETY/ENVIRONMENT

With safety being at the core of operations, the works were completed with no PC1 incidents in 2019/2020. A key to these statistics was the open safety culture on all Laing O'Rourke Sites. By having an 'open to all' culture , anyone is able to raise issues to ensure everyone is part of the solution. Further to this, through the use of Collective Insights any lessons learnt were shared not only with the project team internally but the wider rail construction industry, bettering the industry as a whole. We feel this is a significant achievement given the total cumulative hours worked on the project was 403,827

In addition to this the Project achieved a 21% reduction in their carbon footprint – the equivalent to 253 return flights from Sydney to Melbourne! The project also achieved the Gold Sustainable Design Guidelines rating for the works. Other key enviro and sustainability highlights are the use of 100% Australian Made Steel and the reuse of multiple OHW structures.

STEVE MAXWELL PLATELAYING AWARD
MAJOR WORKS CATEGORY

New Intercity Fleet - Blue Mountains Route Clearance

Continuum Alliance - CPB Contractors, Lendlease Engineering JV in Alliance with TfNSW
Company representative – John Langford, Continuum Alliance
Value of works: Not disclosed

Executive Summary

The Continuum Alliance safely completed the Blue Mountains Route Clearance project (BMRC) in July 2020, on time and under budget. The project consisted of modifying the Main West Line from Springwood to Lithgow, currently constructed for Narrow Kinematic rolling stock, to facilitate the operation of the New Intercity Fleet trains (NIF). The Narrow Electric kinematic envelope (KE) was modified to a Medium Electric kinematic envelope, excluding the track slab area of the State Heritage listed 110-year-old Ten Tunnels Deviation which was modified to a Sub-Medium kinematic envelope. This revised standard applies to prescribed locations of which the Ten Tunnel Deviation is the first such example.

This challenging project was delivered predominantly in a prescriptive possession regime covering over 70km of rail corridor. Adoption of new technology and innovative solutions were vital to completing the works despite snow, catastrophic bushfires and torrential rain, to meet the testing regime for the new trains.

PROJECT SCOPE

The key items of project scope were:

Corridor modifications along a 70km rail network including:

- circa 13kms of track slews
- overhead wiring (OHW) modifications with 8 new OHW structures
- crossover removals
- track circuit relocations
- magnetic lock installation to pedestrian level crossing gates
- signalling data changes.

Ten Tunnels Deviation works to allow dual line running of the NIF trains including:

- 780 rockbolts
- 1,044m of underpinning/milling tunnel walls
- 149m of haunch treatment.

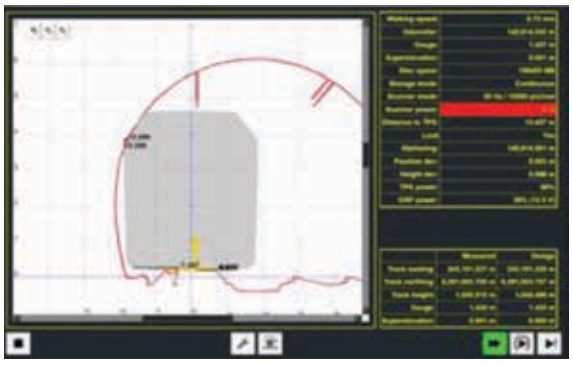
Tunnel lining milling with dust suppression and machine guidance

Station modification works including:

- platform canopy cutbacks
- a platform extension at Katoomba Station
- platform coping cutbacks and build-outs.

PROGRAM OF WORKS

Due to the nature of the work, most of the Alliance activities could only be safely carried out during Sydney Trains rail track possessions and power outages. Project milestones were defined by the closedown/possession regime, with the major milestone of clearing the route by mid-2020.
A time-chainage chart was developed during the Project Development Phase to map the logic of delivering project milestones with the P6 programme based on such logic. A high-level strategic programme was also developed and formed the basis of managing changes to the programme throughout the life of the project.



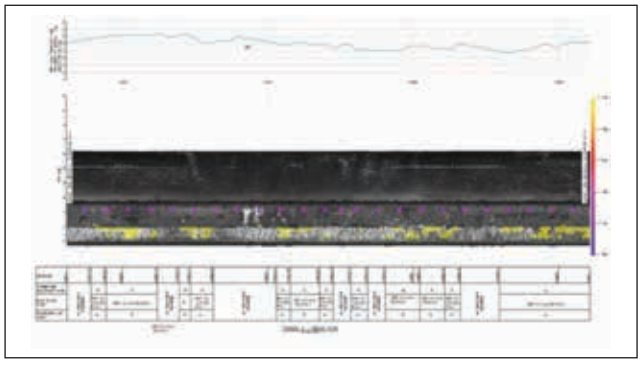
Real-time screenshot of Amberg Trolley control panel in tunnel

STEVE MAXWELL PLATELAYING AWARD
MAJOR WORKS CATEGORY

ACCURACY TO DESIGN AND SURVEY

An open track transit space infringement assessment to lineside infrastructure for the Medium Electric KE rolling stock was undertaken using proprietary software including Bentley Rail Track, Navisworks and Amberg Rail.

Heatmaps were used to identify the location and extent of infringements on station platform canopies and the tunnel lining. Utilising the KE model developed, the passing clearance between medium electric rolling stock and all authorised rolling stock was identified. This includes operation of the Medium Electric trains on the Up and the Down Main, with checks to all permutations of authorised rolling stock on the adjacent line including sidings.



Heatmap of tunnel wall showing rockbolts and milling areas

The nature of route clearance required a high degree of design and survey accuracy. Designs were optimised to minimise the impact to platform copings and tunnel walls, many being of State Heritage significance. The survey and construction teams utilised machine guidance systems on excavating equipment, guide rails on concrete saws, Amberg Trolleys and traditional survey to accurately measure the works and minimise the excavation and cutting required to achieve clearance. For the track slews, the Alliance achieved 93.0% conformance to the design tolerance for horizontal alignment and 95.3% for superelevation. Concessions obtained from the Asset Standards Authority addressed the differences.

DIFFICULTIES OVERCOME

Bushfires – 16 possession days were originally scheduled between Springwood and Katoomba. A quarter of these were cancelled due to bushfires in December 2019. Prior to the planned Christmas possession, the Alliance was forced to cancel all works except for Katoomba Station and critical clearance surveys for which additional safety controls were introduced. The bushfires caused significant damage to the infrastructure west of Mount Victoria and provided unforeseen possessions which the Alliance had to mobilise at compressed time scales to make use of.

Torrential Rain – Heavy rain in February 2020 caused a landslip at Leura that again forced the Alliance to mobilise quickly to make use of the opportunity presented by disaster recovery works to complete platform works at Leura and Wentworth Falls.

Vibration - The Alliance designed and developed a diamond cutting drum excavator attachment for tunnel lining milling to improve the surface finish and minimise vibration compared to a standard twin-header attachment. While improvements in the finished surface were achieved, production rates were lower than expected placing additional pressure on the program. Therefore, traditional twin-header attachments were used to complete the works as they were within the allowable vibration limits.

SAFETY/ENVIRONMENT

There were no serious injuries to the workforce resulting in a TRIFR of 0.00 achieved with over 160,000 hours worked, many in very challenging conditions. This achievement was supported by selecting several elements that acted as lead indicators for safety performance including Critical Risk Reviews and Positive Investigations. Through this approach, the Alliance exceeded its obligations in relation to the lead indicators.

Maintaining safe exclusion zones around mobile plant and providing dust suppression were challenges in the tunnels. The Alliance worked with the plant supplier to develop a mist sprayer attached to the cutting head of the excavators to eliminate the need for a worker providing dust suppression from within the plant operating zone. Similarly, the machine guidance attached to cutting heads eliminated the need for surveyors to enter the plant operating zone to take measurements.

Continuous monitoring of air quality by occupational hygienists was undertaken in the tunnels. To alleviate concerns around silica dust and diesel particulates, the Project implemented fit testing of P2 masks and mandatory use thereof was required. A tracking system was also established to monitor the location of all personnel and plant in the tunnels. This was critically important given the limited access and egress points in the tunnels and was a successful system for keeping our people safe.

STEVE MAXWELL PLATELAYING AWARD
MAJOR WORKS CATEGORY

Sydenham Station and Junction Upgrade, Sydenham NSW

Company submitting award – John Holland / Laing O Rourke
Company representative – Jason Ghattas (SPE), Michael Wu (SE), James Lawton (Superintendent)
Value of works: $16m

JOHN HOLLAND

LAING O'ROURKE

Executive Summary

Sydenham Station and Junction (SSJ) Project is a key component of Sydney Metro City & Southwest that is located at the interface between the tunnel from Chatswood to Sydenham and the Bankstown line conversion.

In terms of Perway scope, facilitating the conversion of Platforms 1 and 2 at Sydenham for the operation of Sydney Metro City & Southwest services, the existing Bankstown line and XPT Maintenance Centre access tracks were temporarily diverted through Platforms 3 and 4 via installation of eight special turnouts and crossovers.

PROJECT SCOPE

The track works at SSJ can be broken down into two key areas:

1. Plain line track reconditioning and installation
2. Turnout installation and reconditioning

The plain line track reconditioning included:

1. 820m of full track reconditioning on the Bankstown Line including structural fill tie into new Bankstown Line embankment
2. 290m of full track reconditioning on the Illawarra Locals

Turnout installation and reconditioning included:

1. 2 x standard crossovers – 735AB and 802 Pts
2. 3 x special crossovers – 736AB, 741AB and 800AB
3. 3 x special Turnouts - 740,742A and 801
4. 1 x special containment catch point – 742B

Includes a total of 560m of track reconditioning for the installation of the turnouts.

PROGRAM OF WORKS

The project was undertaken over a series of 48-hour possessions using Sydney Trains configuration 1, 12 and Bankstown Lines and Configuration 10 ARTC Possessions (approx. 30)

Christmas 2019 – bottom ballast installation via engineering trains

WE52 2019 – 736 Pts PEMLEM install next to live Bankstown Line

Due to the recognised site constraints in relation to possession management/configurations and final horizontal and vertical alignment clashes with existing and operational infrastructure, the delivery strategy adopted for the Perway construction fell into three distinct categories:

1. Works that could be undertaken with no impact to existing geometry or relocation of infrastructure
2. Works that required existing infrastructure to be relocated, and could be undertaken prior to the 2019 12-day Commissioning Event
3. Works that required to be undertaken during the Commissioning Event since the existing infrastructure could not be replaced/removed until the 12-day Commissioning Event.

The trackworks were undertaken from November 2018 to August 2020. A summary of the possession required included:

1. WE21 2018: Installation of 735AB using engineering trains for earthworks due to site constraints and PEMLEMs for turnout install
2. WE39 2019: Track reconditioning of 736AB and 741A – Track recondition works only
3. WE52 2019: Installation of 1 x 250:8.25 special crossover (736AB) and 1 x 250:8.25 special turnout (741A)
4. WE06 2019: Dual Track Reconditioning on Up and Dn Bankstown 5.868km-5.795km
5. WE13 2019: Dual Track Reconditioning on Up and Dn Bankstown 5.795km-5.657km Commence prebuild of 1 x 500:12 special crossover (800AB)
6. WE19 2019: Dual Track Reconditioning on Up Bankstown 5.657km-5.549km
   Rail set delivery in preparation for 12-day commissioning shutdown 801 Points delivery via DESEC Engineering Trains to Meeks Rd Triangle Complete pre-build of 1 x 500:12 special crossover (800AB)
7. Wk26-Wk27 2019 – 2020 (12 day commissioning event):
   Track strip, skim recondition and straight rail of 737 and 738 Points
   Track strip of 739, 740, 742A, 742B
   Track strip of Up Bankstown Line 5.420km – 5.868km
   Track strip Dn Bankstown Line – 5.420km – 5.640km
   Track reconditioning and installation of 740, 742A and 742B – Illawarra Locals and XPT Entry Road via engineering trains and PEMLEMs
   Track reconditioning of Up and Dn Bankstown Line 5.549km – 5.420km via engineering trains
   Track reconditioning of Up Metro and Up Bankstown 5.626km – 5.550km via conventional hi-rail dump trucks
   Track construction of new Up and Dn Metro 5.868km-5.420km including installation of 801, 800AB and 741B via PEMLEMs
   Track resurfacing of 2060m of track including 735AB, 736AB, 740, 741AB, 742A, 742B CP, 800AB and 801
   230 free and adjustment aluminothermic welds
8. WE44 2020: Pre build of 802 crossover between Bankstown Line and ARTC Goods Lines
9. WE06 2020: Track reconditioning and installation of 1 x 500:15 crossover (802AB)

ACCURACY TO DESIGN AND SURVEY

Due to all works being undertaken in possession-based environments, it was crucial that detailed QA processes were implemented as NCRs could have had the potential to risk hand back to Sydney Trains possessions or require increased costs of reworks.

Major emphasis was placed on ensuring that all turnouts, crossovers and catchpoints had extensive testing requirements to ensure that all special track works complied with standards and design prior to installation.

Key tolerances adhered to included:

1. Gauge dimensions at the switch tip shall conform to the design ± 2mm
2. Gauge at crossings, Main and turnout roads shall conform to the design ± 2 mm
3. Points to crossing and crossing to crossing measurements +/- 10mm
4. Horizontal and Vertical alignment +/-15mm

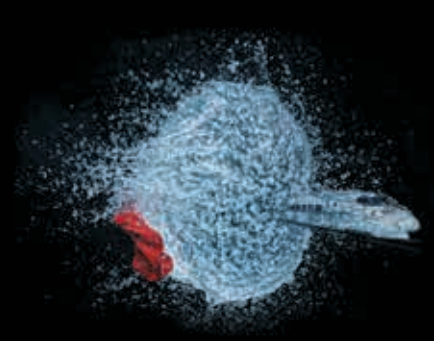
Christmas 2019 – Track Recon next to live Up Illawarra

DIFFICULTIES OVERCOME

Working in an existing live railway junction presented many difficulties in itself. The two main difficulties overcome during the design and construction of the project were the innate logistical and possession issues present at complex junctions and the design integration of new and old networks and infrastructure.

Laydown areas and space were sparse within the Inner West rail corridor and presented a huge challenge as to where to

STEVE MAXWELL PLATELAYING AWARD
MAJOR WORKS CATEGORY



pre-build all turnouts and crossovers and how they would be installed during track possessions. Early on in the project, construction methodologies were tailored to suit PEMLEM installation of turnouts. This allowed turnouts to be pre-built along access tracks prior to possession, and within the confines of the possession configurations.

Pre Build of 802 Pts between Bankstown and ARTC Goods Lines

Working within the existing possession configurations provided many difficulties that could not be overcome without consultation with key Sydney Trains and Sydney Metro possession planning personnel. The configurations used resulted in difficulties including:

1. Configuration 1 possessions resulted in all track works being undertaken next to adjacent live lines as the Bankstown Lines were still operational to rail traffic
2. Configuration 12 possessions resulted in working within 300m of possession limits
3. Bankstown Line possessions requiring hand back of Illawarra Locals country side of Sydenham Stations twice per possession for running of XPT trains and also working next live rail traffic on the Illawarra Mains

Overcoming these difficulties included identifying the possession constraints 26 weeks prior to the works being undertaken to allow for consultation with Sydney Trains and ensuring existing track geometry around fixed-point infrastructure (platforms, bridges, and turnouts) was maintained in the interim stage for all scope that was to be delivered prior to the 12-day commissioning event was a multi-discipline problem that was resolved though cross collaboration between the construction, design teams and turnout suppliers.

Incorporating the staging methodologies of the project into the earthworks models as to not affect Sydney Trains existing formations during SSJ planned possessions was an ongoing difficulty to overcome. Installing final capping formation levels prior to the 12 day commissioning event without affecting bottom ballast and existing top of rail levels in the interim was overcome by temporary staging works of raising the overhead wire and installing medium duty sleepers in the interim, where the final design specified heavy duty.

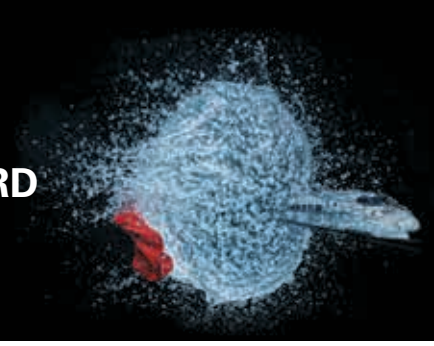
In-situ construction of 800 Pts during Christmas 2019 shutdown

SAFETY/ENVIRONMENT

Safety played a critical role in the successful delivery of the project. As all works were adjacent to live running roads, implementation of Level 5 Assessments to manage plant within the SADs of live electrical infrastructure and implementation of safe notices with specific methodologies to manage working within 500m of possessions played an integral role in delivering the scope of works within the confines of the possession configurations.

Key environmental considerations included out of hours notifications for all turnout deliveries due to the requirement for extendable semi-trailers and recycling of spoil from work trains. As a result, nearly 5,000 tonnes of spoil was recycled at Chullora Waste Facility by project completion

2020 ALAN BARHAM MAINTENANCE TEAM AWARD



Judges

Ken Lingabala, PWI Member

Scott Chapman, General Manager Operations Services Hunter Valley, Australian Rail Track Corporation

Rodney Masman, Civil Maintenance Engineer Country Regional Network, John Holland Group

Kirsty McGeachie, Maintenance Operations Manager – City North, Sydney Trains

Anthoni Elmargi, Managing Director, Vertex Group Australia

Alan Barham

Alan Barham commenced service as a trainee Civil Engineer with the NSW Government Railways in 1965.

He spent time at Cowra as a District Engineer before becoming Division Engineer Tamworth, a position he held for several years.

When FreightRail was created in 1989 Alan became the Infrastructure Engineering Manager and continued in that position until June 1996 when he joined the newly created Rail Access Corporation as Senior Asset Manager for the Hunter, North Coast and North West areas.

Alan died in early 1997 from cancer.

Alan was an advocate of the importance of the local routine maintenance performed by fettling gangs to deliver safety and reliability for the Railway. It was for this reason that the PWI named the Maintenance Team Award (or Best Kept Length as it was formerly known) in his honour.

The Award was established to recognise Maintenance Teams and the pride taken in maintenance of the track and associated structures. While Alan was a Committee Member of the PWI he promoted this Award throughout New South Wales and was also involved in the judging.

A typical Routine Maintenance team undertakes surveillance inspections, servicing, minor corrective maintenance and emergency response, for track, bridges, right of way assets and possibly signal assets. The team needs to be operating in NSW.

Judging Criteria

Applicants are assessed against People, Safety, Organisation and Leadership, and Achievement criteria. Judges evaluate outcomes and conditions which are within the Maintenance Team's control as far as possible. It is recognised that track configuration, investment programs, operating parameters and to a large extent general infrastructure condition are outside the Maintenance Team's control.

The Judges seek to identify the best use of management and technical expertise, and the most effective use of resources in maintaining the track to meet operational requirements. With the Convention theme of *Bursting the Bubble*, innovation was a particular focus during judging. Due to Covid restrictions this year all judging was undertaken virtually with each entrant presenting to the judging panel and then a Q&A session.

Both in their nomination and during judging Maintenance Teams describe the reasons why they deserve to be recognised for excellence in Routine Maintenance, and provide supporting documentation where available. The judging criteria is detailed on the following page.

2020 ALAN BARHAM MAINTENANCE TEAM AWARD

1. Team Leadership, Readiness and Engagement

- Capability
- Responsiveness and Commitment
- Engagement
- Succession Planning
- Leadership

2. Productivity (Effectiveness and Efficiency)

- Scoping
- Short term work plan (2-3 weeks)
- Long term work plans (12+ months)
- Strategic Engagement
- Efficiency Strategies

3. Compliance and Assurance

- Workplace Safety
- Infrastructure Compliance
- Operational Assurance
- Environmental Compliance

4. Achievement

- Innovation
- Challenge

Alan Barham Maintenance Team Award – 2020 Entries

This year, seven teams nominated; Four from Sydney Trains, two from ARTC, as well as one nomination from John Holland Group CRN. As always, the judges were extremely pleased with the calibre of the teams judged, and their commitment to work was outstanding. All the teams who have nominated for this year's award are to be congratulated for their outstanding performance.

Metropolitan

Sydney Trains – Western Territory Civil Team

Sydney Trains – City South Civil Team

Sydney Trains – South Coast Civil Team

Sydney Trains – City North Civil Team

Regional

JHR CRN – West Wyalong Routine Maintenance Team

ARTC – Goulburn Provisioning Centre

ARTC – Muswellbrook Provisioning Centre

2020 ALAN BARHAM MAINTENANCE TEAM AWARD

Sydney Trains – Western Territory Civil Team

The Sydney Trains Western Territory Track team is staffed with the Team Manager, Structures Coordinator, 3 Team Leaders, 6 Work Group Leaders, 2 Bridge Examiners, 25 Infrastructure Workers, and are supported by the Track Engineer, Maintenance Planner, Track Access Coordinator, Stores Officer, 2 Maintenance Officers and Admin Support.

The Western Territory Track team has been built from a diverse group of skilled, passionate individuals who, under the nurturing of the leadership team have formed a high performing team. Team Leadership has fostered a learning environment built on teamwork, with experienced skilled staff providing on the job guidance and upskilling to other team members.

The Western Territory Civil team have not incurred a Lost Time Injury within the last 12 months.

Safety is seen in many forms for the Western Territory, safety of compliance works, safety assurance, safety discussions, safety for customers and safety of your teammates. System wide audits were also conducted to review safety and system safety within the territory with no non-conformances identified.

FIRES, FLOODS & COVID-19, 12 months the Western Territory and especially the Civil team will not forget!

December brought devastation from fire for many areas of NSW including the Blue Mountains. Mt Victoria to Lithgow caught the brunt of the firestorm that ravaged the area. Many team members were affected by this outside of work as the fires threatened their own livelihood, including staff who are volunteers to the Rural Fire Services. The Civil team not only performed their own remedial works throughout the area, identifying geotechnical risks due to the scorched vegetation, they also supported other disciplines with inspections via hi-rail as the rail corridor was closed to normal access routes due to fire damage.

As the effects of the bushfires were realised the Territory was struck by significant rain events across multiple days in February. Flood damage occurred in multiple wash away and land slip locations including significant land slip damage to Blacktown, Medlow Bath, Mt Victoria and the largest being at Leura. The Civil team lead by their Team Manager worked around the clock to protect the houses below the land slip and were successful to preventing the erosion from entering the land owner's homes below.

March moved the territory into the world of COVID-19. As the threat of the pandemic widened the team was forced to split into 4 different locations to mitigate the risks of cross infections of team members. Although the team has been split, they have continued their role with continuous drive and passion to achieve preventative works compliance and defect removals totalling 240 Infrastructure Affecting Defects (high priority defects).

2020 ALAN BARHAM MAINTENANCE TEAM AWARD

Sydney Trains – City South Civil Team

The Sydney Trains City South Civil Team is located across two depots one at the multi-discipline Sydenham Network Base situated 5.5 kilometres south of Central Station. Sutherland multi-discipline Satellite Network Base is located at 24 kilometres south of Central Station. City South Territory is also home to the XPT Maintenance Centre and Mortdale Maintenance Centre, as well as Waterfall and Cronulla Stabling Yards, coming to overall approximately 156km of track. City South's territory also includes 13 diamonds, 171 turnouts, 16 catchpoints and 7 cuttings.

The City South Civil team is made up of a wide range of competencies coming from a diverse group of staff. Knowledge ranges from new staff to staff with over 35 years' experience in Civil. With a diverse group, the senior staff provides strong leadership, mentoring and coaching to the new employees. This ensures that the intellectual property is passed on through to the next generation of civil workers.

The City South team environment is very supportive and understanding of our workers. New workers are fostered and taught through leadership by doing hands on inspection and defect removal. The Sydenham Civil team works cohesively and collaboratively to ensure they deliver a safe and reliable network. The team prides itself on a high-quality standard.

Transport Sydney Trains

City South had one LTI where a staff member rolled their ankle requiring time off work treatment and one MTI where a staff member attended hospital to have a large splinter that pierced their glove removed from their hand. The employee returned to work to finish the shift.

City South Territory achieved 100% compliance across all inspections in the financial year 2019/2020, carrying out 12,497 inspections in total.

Over the 2019/2020 period City South has undertaken an aggressive defect removal program. This is our greatest achievement over the last year, not just the result, but the process we have created in order to not just remove defect but to continue to reduce our defect numbers. By minimising inspections during weekend possessions and redirecting effort towards defect repair and removal, this has increased network reliability and meant that City South has removed more defects that any other Sydney Trains territory.

2020 ALAN BARHAM MAINTENANCE TEAM AWARD

Sydney Trains – South Coast Civil Team

The South Coast Territory extends just south of Waterfall in the North to Bomaderry in the South. The region encompasses some of the most picturesque rail scenery in Australia, with the track winding through villages and small country stations such as Oak Flats and Wombarra, as well as large regional centres such as Wollongong and Nowra.

The South Coast Track, Civil and Structures team provides routine maintenance and repair work to the 180km of track and 290 turnouts, as well as delivers contract services to the Port Kembla freight terminal.

The proud and dedicated staff ensure that the safety of the public and of the team is their first priority. They take delivery of outcomes seriously, and with a sense of pride deliver on their maintenance plans 100% of the time.

There are 30 staff in the South Coast Track, Civil and Structures team providing 24/7 coverage for the rail network. This diverse team is made up of men and women from varying backgrounds. The team is highly motivated and takes its commitment to its role in the local community to heart. An example of the team going above and beyond is when staff provided emergency first aid to a disabled community member this year.

South Coast Track and Civil achieved 100% compliance to the Technical Maintenance Plan in 2019/2020.

Recently, extreme weather washed away the South Coast line south of Gerringong when over 350mm of rain fell in a 48hr period. While our commuters were tucked away home in bed, the team swung into action re-ballasting and repairing the line with rail traffic operating within 48hrs, a great effort in trying conditions with no safety incidents. Similar events occurred twice this year alone, with the Northern Illawarra suburbs receiving over 250mm of rain in 24hrs in February. Due to the response of the team delays to rail traffic were extremely low.

2020 ALAN BARHAM MAINTENANCE TEAM AWARD

Sydney Trains – City North Civil Team

The City North Civil Team is one of the three discipline teams that make up the City North Territory located at the Hornsby Network Base. The City North Civil Team consists of: Team Manager, 2 Team Leaders, 4 Work Group Leaders and 20 Infrastructure Workers.

City North Territory covers from North Strathfield to Berowra on the Main North as well as Waverton to Hornsby on the North Shore and the Epping to Chatswood Rail Link. The team is responsible for the track assets and maintains 130km of track and 196 turnouts, with key functions that include preventative inspections, defect management and removal as well as incident response.

In 2019/2020 the team had two LTI's and zero MTI's.

The overall Technical maintenance Plan compliance for 19/20 for the Civil team was 100%. Sydney Trains classifies high priority defects as Infrastructure Action Defects (IADs) – as of the end of 2019/2020 the team had 177 track IADs. City North have reduced both IADS and Defect overall and have had no misalignments or broken rails through 2019/2020.

City North Civil responded to 64 callouts or extension of shifts and 13 emergencies. The largest being the Slip at Pymble during heavy down pours over a weekend. City North Civil, with the help of Blacktown Network Base sourcing the blocks, temporary repaired the North Shore line having it operational for the first train Monday morning after slip was reported 1130 Sunday afternoon.

2020 ALAN BARHAM MAINTENANCE TEAM AWARD

John Holland Country Regional Network – West Wyalong Routine Maintenance Team

The John Holland Country Regional Network West Wyalong team is a close-knit team that has a great team focus and culture. West Wyalong team has kept its great work ethic and 'can do attitude' that continues to inspire each other and are always very respectful of each other. The diverse range of tasks this team perform ensures that staff do not get bored or complacent in their duties. Examples of the team wanting the best for their area is the desire to take on major projects in their area, so they have ownership of the outcome.

David Scealy, Maintenance Superintendent has created a tight knit family in his time as manager at West Wyalong. When a new member starts at West Wyalong, they quickly become part of the family. David's passion and pride for the rail network shines through all the team members with this shown in their work ethic and production.

The West Wyalong team holds a highly diverse skills profile with no training required. With experienced track Supervisors who can mentor new staff, as well as the qualified and competent leading hands. West Wyalong can offer new and existing employees' guidance in the rail industry. In the last year we have lost 40 years' experience including a track inspector, welder and operator, but have employed 3 new starters.

There has not been an LTI, MTI or reportable incidents in the West Wyalong team since 2001. Having introduced many new team members during this period, the team is very proud of this achievement. This team is very safety conscious and it is instilled in all employees the importance of working safely in the workplace, as well as in the home. Leaders in the team stress the importance of safety daily. The push to 'rethink any task before you jump in' has paid off immensely.

Compliance for Safety Critical and Safety Significant inspections was 100% for the judging period. Where required by the John Holland Country Rail standards waivers were put in place to cover any examination variances.

Our team structure was broken down to stop/slow the transmitting of COVID-19. Smaller teams worked together to complete inspections that were bought forward through a waiver process. This provided extra work in our own district to complete inspections like Level Crossing, detailed walking etc.

2020 ALAN BARHAM MAINTENANCE TEAM AWARD

ARTC – Goulburn Maintenance Team

The ARTC Goulburn Provisioning Centre (PC) consists of 18 team members who actively manage the railway assets from Moss Vale to Yass, covering 348.040km of track. The PC is one of the five within Sydney to Ivanhoe & Albury (SIA) Corridor; Interstate Network.

The team has a multi-skilled workforce enabling maximum productivity outcomes from signalling, safe working, track and construction. The team is comprised of a diverse mix of people from different industry backgrounds. This has proved to have a significant impact on the continuous improvement of the team's performance to efficiently and effectively meet our Customers' expectations by providing a safe, reliable, and sustainable asset throughout the area.

During the 2019/2020 financial year the Goulburn PC had no incidents recorded within the team. Goulburn's compliance throughout this financial year is 100% and during this period a significant amount of work has been carried out in MSTs smoothing process mainly for the signalling discipline.

In January 2020 the Goulburn Team experienced some horrific fires that devastated townships such as Wingello and Bundanoon. During this period, the team developed very strong relationships with emergency services and the local residents in the affected communities.

During 2019/2020 Goulburn Team members experienced one of the toughest and challenging years to date where we dealt with extreme weather events, COVID-19 and a comprehensive independent audit by Network Rail Consulting via video conferencing and field visits. The team have performed extremely well throughout these challenges and managed to safely continue with the day-to-day operations. In addition to this, the team provided assistance to other Provisioning Centres across the corridor as well as participating in projects during corridor planned shutdowns.

Given these challenges during the year, the Goulburn PC still managed to deliver their maintenance program safely with no incidents or accidents as well as achieving 100% compliance.

2020 ALAN BARHAM MAINTENANCE TEAM AWARD

ARTC – Muswellbrook Maintenance Team

The ARTC Muswellbrook Provisioning Centre operates in the heart of the Hunter Valley network. The diverse team repairs and maintains over 400km's of track including all facets of the right of way with over 150MGT's passing through Muswellbrook junction a year. The track section services a large portion of the Hunter Valley coal customers and provides a vital link for passenger, grain and freight services. Within the track section we are fortunate and privileged to have a spectacular playground across open country, mountain ranges and residential areas, however, this does not come without its challenges. With a multitude of challenging grades, large tunnels, tight curves and aging infrastructure this makes the recipe for an extremely busy maintenance team.

The asset is serviced by a mixture of signal electricians, infrastructure maintainers, planners, asset data administrators, leaders and an asset assurance engineer totaling 49 FTE's of which a quarter are female employees.

The team has shifted the dial in a positive direction in terms of its safety performance, reporting and culture. The last recorded lost time injury was October 2016 and with only one First Aid Injury for the year in review. Field leadership has nurtured a positive turn around in team members safety behaviors while on task and around the depot. With the safe work interaction program as the vehicle to helping leaders engage with team members on a personal level and demonstrating the care and commitment for them and others around them for safer outcomes. This program has enabled rich discussions and insightful learnings for both leader and team member.

The team has made a deliberate step in engaging with the local community. The team have helped in terms of volunteer labour for specific tasks and continue to support the local areas and build on the relationships with our community partners.

One of the many achievements for the Muswellbrook team has been the significant improvement in the number of heat related track buckles. In the 2017 year the Muswellbrook team responded to 18 track buckles over the summer months. In the 2020 year relevant to this submission the team have been able to reduce this down to only 2 events through a systematic approach to improvement the management of rail stress and the teams understanding of the tasks required to manage this year-round. The team are most very proud of is this achievement as it has been a result of 3 years of sustained effort across 4 specific hot spot locations.

2020/2021 Enhanced Corporate Members

The PWI recognises the continued support we receive from our Enhanced Members:

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ACCIONA in Australia

ACCIONA is a global company headquartered in Spain with a presence in more than 40 countries. With a business model based on the sustainable development of the communities in which it operates, ACCIONA's aim is to respond to society's main needs through the provision of renewable energy, infrastructure, water and services. Its vision is to meet the challenge of achieving sustainable development in all business areas, so that the generations of today and the future will have a better life.

Since establishing a presence in Australia in 2002, ACCIONA has invested more than AUD$1 billion through local investment opportunities and project development. As a national business ACCIONA employs more than 1,000 people across the country.

In April 2017, ACCIONA acquired leading diversified civil engineering services business, Geotech Group. The investment saw the formation of a new company, ACCIONA Geotech Holding, which is led by Bede Noonan. This acquisition built upon and brought together ACCIONA's future construction pipeline in Australia and New Zealand and Geotech's complementary businesses (Geotechnical Engineering, Coleman Rail and John Beever Australia).

ACCIONA Subsidiary: Coleman Rail

Subsidiary Coleman Rail provides construction services for major rail and transport infrastructure projects Australia-wide.

The expertise covers construction, upgrades and maintenance, complemented by an in-house capacity to undertake civil, mechanical, utilities, services relocation and building works. Most projects are delivered within live operating environments and constrained sites. The highly skilled and experienced resources include a large permanent direct labour workforce as well as experts in engineering, commercial, construction, safety and environmental management.

Our teams are currently involved in major infrastructure projects for both the public and private sectors in several states. These include Victoria's flagship level crossing removals and upgrades to some of Victoria's regional rail network, multiple upgrades to sections of Melbourne's extensive tram network, works programs across South Australia's rail system and in Western Australia, the Koodaideri North Rail project, which involves extending the rail infrastructure from Rio Tinto's Koodaideri mine to the company's existing rail network.

Since it was established in 2002 Coleman Rail has grown to maintain a strong presence throughout Australia supporting and supplying the country's rail infrastructure and has offices in Melbourne, Sydney, Adelaide and Perth.

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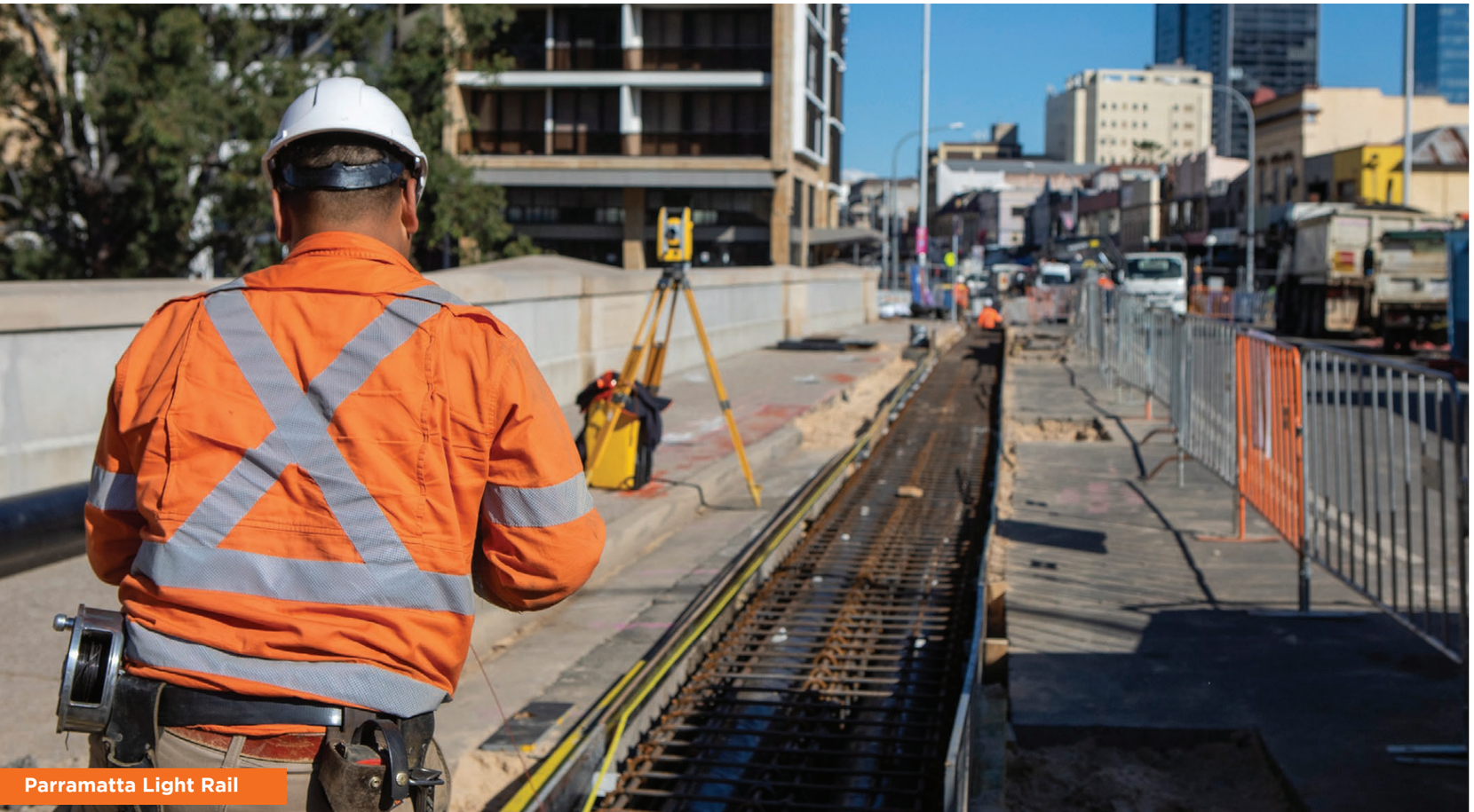
Moorebank Intermodal Terminal Rail Link



Parramatta Light Rail

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- Sydney Metro & Southwest Line-wide Works
- Parramatta Light Rail
- Dubbo's Regional Rail Maintenance Facility
- Sydney Metro Northwest – Tunnel and PPP Packages
- Canberra Light Rail
- Moorebank Intermodal Rail Link
- Melbourne's Metro Tunnel Infrastructure and Systems Alliances
- Melbourne's Level Crossing Removal Project including the Caulfield to Dandenong project
- Cross River Rail Tunnel, Stations and Development PPP and Rail, Integration and Systems Alliance
- Moreton Bay Rail Link
- Metronet – Yanchep Rail Extension & Thornlie to Cockburn Link

For more information, please contact:

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John Holland has driven positive change in Australia for 70 years, as the nation's leading rail, property and infrastructure company.

We work with government and industry to deliver safe, sustainable, and efficient transport solutions that make our cities smaller, and our communities more connected.

From our urban hubs, where we deliver more than 530,000 passenger journeys each day, to the regions, where we maintain more than 2,300km of rail track and associated infrastructure, we are supporting communities to not just grow, but thrive.

In 2019, we led the delivery of Australia's most significant transport projects, including the construction and operation of:

- Our capital's first major public transport infrastructure project, Canberra Metro.
- Australia's first fully automated passenger railway, Sydney Metro Northwest.

With an integrated team of experts who can construct, maintain and operate transport networks, John Holland is creating people-centred transport solutions that move Australia forward.

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Laing O'Rourke
Engineering Excellence

Laing O'Rourke is a global engineering enterprise with 50 years of involvement in Australian construction and infrastructure including more than a decade under the Laing O'Rourke banner.

Central Station Metro Works, NSW

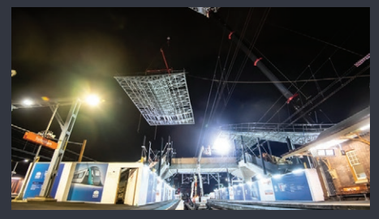
The $955 million project will see Laing O'Rourke renew Australia's busiest commuter hub, transforming it into a gateway to the new 66km Sydney Metro network. The contract involves construction of the new Sydney Metro platforms approximately 27m below the existing platform level together with the new pedestrian concourse Central Walk providing connectivity directly from the new metro platforms.

More Trains More Services (South Works Package), NSW

In 2020, a partnership between Laing O'Rourke and KBR was selected to deliver the South Works Package within the next stage of the NSW Government's More Trains More Services program of works. Forming a new organisation to deliver this important work - 'Transport for Tomorrow' - Laing O'Rourke & KBR will upgrade the T4 Eastern Suburbs and Illawarra Line and the South Coast Line as part of the first package of works.

South Eastern Program Alliance (SEPA), Vic

SEPA is developing and delivering value-for-money engineering solutions for multiple level crossing removal projects across the greater Melbourne region. SEPA's current pipeline of works includes major station upgrades, track duplications and a range of other critical rail infrastructure works. SEPA comprises Laing O'Rourke, Jacobs, Metro Trains Melbourne and the Level Crossing Removal Project.



Sydenham Station & Junction, NSW

A joint venture partnership between Laing O'Rourke and John Holland was awarded the contract in 2017 to upgrade Sydenham Station for Sydney Metro – Australia's biggest transport project. Construction has commenced on the $240m contract which will upgrade Sydenham Station to be able to operate as part of the new metro, including signalling works, utility relocations and train control systems installation.

Laing O'Rourke
Our gender agenda

WGEA Employer of Choice for Gender Equality

As we strive to achieve our mission to become the recognised leader for innovation and excellence in the construction industry, we are committed to developing and nurturing a more diverse workforce that reflects the society and communities we serve.

In February 2020 Laing O'Rourke Australia was awarded the prestigious Workplace Gender Equality Agency's (WGEA) Employer of Choice for Gender Equality citation, this followed the release of our Gender Diversity Action Plan in 2019 which set a number of deliberate and bold targets and initiatives that will see us attract more women into our business and importantly, see more women promoted into leadership positions.

We have a proud record of advancing gender equality across our organisation and equipping all employees to reach their potential within the construction industry – but there is still a lot to do be done.

Our industry is best when we have diversity across all business and project roles, including more women represented at senior levels. We must change the way we design and deliver work to attract a broader demographic of people to the industry and provide them with meaningful and long-term careers.

That's why we are committing to our Action Plan which includes setting targets for the number of women in leadership roles across our business, tripling our internal referral bonus scheme for female candidates, and delivering construction projects with flexible working as a requirement. We must take tangible action and hold our leaders to account for driving this change.

As a business that is engaged on some of Australia's largest and most complex infrastructure projects, we have a responsibility to demonstrate that meaningful and rewarding career paths are available in this industry, regardless of a person's gender.

Other initiatives introduced at Laing O'Rourke include:

- Pay parity across all like-for-like roles in the organisation, as well as a commitment to continue to lessen the organisational wide pay gap by 5% per year by increasing the number of women in senior roles;
- A paid parental leave policy providing both male and female employees with access to 26 weeks of paid leave;
- Flexible work programs, including a flexibility toolkit and flexible work practices training for all people managers to enable our people to think differently about the way we go to work and redesign the outdated work practices inherent with the construction industry;
- Inspiring STEM+ - a school engagement program designed to encourage more girls into STEM courses at university and ultimately careers in construction and engineering; and
- A Connecting Women network designed to build engagement and greater visibility of our female leaders and to provide a forum for connecting our women, role modelling careers, and building new networks for support and advice.

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ENGINEERING THE FUTURE

BRIMBLE RAIL

CUSTOMISATION. PRECISION. COMMITMENT TO EXCELLENCE.

RAIL EXPERTS

YOU CAN TRUST

Brimble Rail is focused on increasing safety & performance of rolling stock operations through innovation & technology.

The Brimble name is synonymous with rail resurfacing. This family-owned business spans three generations bringing with it over 100 years of local rail construction and maintenance experience.

- TRACK RESURFACING
- HIGH SPEED TRACK RECORDING & PATROL
- MACHINE MODIFICATION AND UPGRADES
- RESURFACING IMAGING
- CIVIL WORKS

QUALITY CONTRACTING AT COMPETITIVE RATES

BEST PRACTICE CERTIFICATION AS/NZS4801 OH&S MANAGEMENT SYSTEM

BEST PRACTICE CERTIFICATION ISO14001 ENVIRONMENT MANAGEMENT SYSTEM

BEST PRACTICE CERTIFICATION ISO9001 QUALITY MANAGEMENT SYSTEM

HUNTER Safety AWARDS WINNER 2019

With a proud history of providing excellence in track tamping and resurfacing, Brimble Rail provides tailored services of the highest quality to clients throughout Australia and across networks.

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MP Rail PTY LTD

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Combining world-class technicians, engineers and project managers with specialist plant and equipment, MP Rail delivers end-to-end solutions for even your toughest rail challenges.

4-TIMES WINNER
PWI WELDER OF THE YEAR

Integrated rail solutions:

- Award-winning Aluminothermic Welders
- Project Management & Engineering
- Track Construction & Maintenance
- Track Inspections & Certification
- Rail Welding & Adjustment
- Plant & Equipment
- Skilled Labour
- Safeworking

Key projects:

- Sydney Metro Northwest
- Mount Victoria Area Remodelling Project
- New Intercity Fleet Maintenance Facility
- Sydney Metro Sydenham Station Upgrade
- Novo Rail Alliance Hornsby Junction

Working as part of your team, we get it right first time.

Call 0407 930 158 | **Email** mark.stapley@mprail.com.au | **Visit:** www.mprail.com.au

Trusted by the best

Transport Sydney Trains · CPB Contractors · Auscott Limited · Laing O'Rourke · ARTC · Viterra · John Holland · novo rail alliance

PANDROL

A world of knowledge

With millions of Pandrol products in use across 5 continents and over 100 countries, our expertise spans the globe. We use this knowledge and expertise to partner with you to overcome your challenges. Helping you to maximise efficiency and deliver rail infrastructure availability, safety and lifetime value.

Partners in excellence

www.pandrol.com

PANDROL

Over 250 reasons to partner with Pandrol

Pandrol is a global company that is committed to keeping Australia's people and its economy on track.

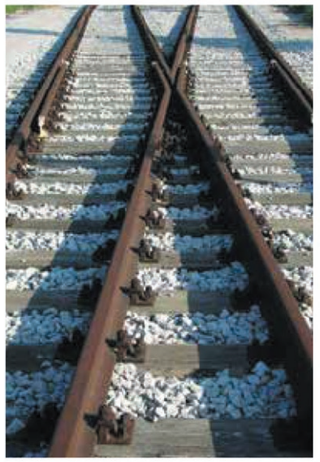
Established in Australia over 70 years ago, we're proud to employ 250 people across the country and support almost 3,000 jobs Australia wide.

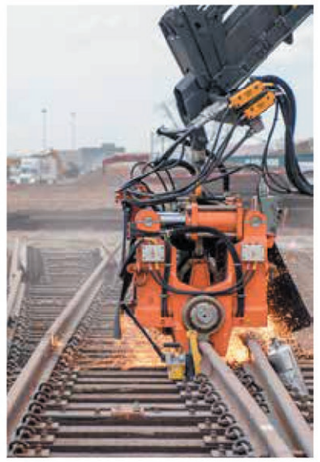
Our commitment to hard work and innovation is the benchmark of how we help the rail infrastructure industry excel right across the Asia Pacific region.

Partners in excellence

www.pandrol.com

INFRASTRUCTURE





MAINTENANCE-OF-WAY
RAIL SERVICES
SIGNALING
TRACKWORK & FASTENERS
ASSET PROTECTION

Progress Rail
A Caterpillar Company

INFRASTRUCTURE

Progress Rail covers the complete value chain for railroad infrastructure. As one of the largest suppliers of infrastructure products and services, we deliver a comprehensive line of solutions with a highly specialized focus on track structure and maintenance.

This includes specialty trackwork, rail and other track material (OTM), fasteners, signals and signal engineering, rail welding and Maintenance-of-Way (MOW) equipment.

TRACKWORK & FASTENERS

We offer a full line of trackwork, components and fasteners for heavy haul and transit railways, with state-of-the-art manufacturing facilities located strategically around the globe. We are a leading manufacturer of specialty trackwork in North America, the United Kingdom and Australia, and have 100-plus years of experience designing and manufacturing cast manganese crossings for our global customer base.

Our high performance fastening solutions serve as fundamental components for rail infrastructure, playing a crucial role in enhancing reliability and minimizing track downtime.

TRACKWORK PRODUCTS
Complete Turnout Panels
Crossing & Switch Components
Asymmetric Switch Points
Solid Monoblock Crossings
Fixed and Sliding Buffer Stops
Rodding Solutions - Design and Supply
Stretcher Bars
Hollow Steel Sleepers

FASTENER PRODUCTS
Rail Anchors
Bonded Direct Fixation Fasteners
E-clips
ME Series of MACRO Armor for Concrete Ties

RAIL SERVICES

RAIL WELDING

With more than 25 million welds completed for Class I railroads over a 60 year history, Progress Rail has rail welding covered. Our fixed plant and mobile welding units feature a robust design and modern control systems for unmatched productivity. We also offer continuously welded rail trains, rail unloading and specialized welding support equipment.

Our newly designed narrow head welder can accompany our extended boom trucks while welding turnouts in tight spaces. Our 250-ton AC mobile welders have external pullers for closure welds, expanding our mobile offering of 180-ton fully integrated heads, extended boom units and excavator mounted welders.

RAIL SALES

Whether you need new or recycled rail, Other Track Material (OTM), complete turnout packages or a single trackwork component, our facilities can fulfill your requirements. As an authorized distributor for ArcelorMittal and Evraz Rocky Mountain Steel, we carry extensive new rail inventory at two steel mill locations – in Steelton, Pennsylvania, and Pueblo, Colorado – and can supply customized rail lengths to meet your specific requirements.

MAINTENANCE-OF-WAY & VEGETATION MANAGEMENT

Progress Rail is a global supplier of Kershaw Maintenance-of-Way (MOW) equipment, helping maintain rail infrastructure around the world. With the flexibility to lease or buy, we supply MOW equipment ranging from our industry leading Kershaw Ballast Regulator to tie cranes, scarifiers, tie replacers, shoulder ballast cleaners, sand and snow removal machines, utility and vegetation control machines and Hi-Rail equipment.

We also have dedicated aftermarket parts and service to ensure the reliability and extended life of your equipment.

SIGNALING

With more than 15,000 systems installed worldwide, Progress Rail has signal technology designed to keep trains running safely, while protecting vital infrastructure. We serve the signal industry from start to finish – whether you need signal engineering and project management support, signal design or software, train inspection, asset protection or installed grade crossing and wayside structures. We also offer specialized signal integration solutions, and can deliver comprehensive wayside packages to meet your needs, including on-site installation, commissioning services and quality control.

Our predictive condition-based monitoring for wayside structures takes innovation to the next level.

TrackSales.AUS@progressrail.com • progressrail.com • @Progress_Rail • @progressrail

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V4_10_2019

Quickway provide services for Transport and Utilities Infrastructure. Since our establishment in 2006, we have been delivering high-quality complex infrastructure projects across Australia. We are a trusted contractor with a solid reputation for delivering integrated project solutions from concept to completion.

Our services include contract and construction management and supervision, design and construction, quality assurance, health and safety assurance. We provide project management of multidisciplinary construction and maintenance services for Road and Rail Networks, Power and Communications Infrastructure. Quickway work closely with our clients for successful delivery of projects with “Safety” and “Quality” as our priority.

COLLABORATIVE

Our collaborative team ethos reinforces the strong working relationships for which we are known - we partner with our clients to deliver positive outcomes without compromising our core values.

MULTI-DISCIPLINARY

We specialise in bridge construction, multi deck structures, complex structural concrete, road infrastructure, highway upgrades, tunnel works, rail projects, drainage projects, fibre installation, upgrade of telecommunication and electrical networks, and traffic management services.

SPECIALISTS

As a multi-disciplinary service provider, we offer integrated solutions within the core capabilities of road and bridge construction, rail, tunnel works, multi deck & complex concrete structures, water infrastructure, electrical, communications and traffic management.

Quickway

Transport & Utilities Infrastructure

QUICKWAY

WE ARE RENOWNED FOR CAPABILITY, PEOPLE, SAFETY AND CULTURE

Quickway has delivered numerous projects for ARTC on the Interstate and Hunter Valley Regional Networks. The scope of works included rerailing, resleepering, retransoming, ballast train drops, turnout refurbishments, destressing and verse testing, unloading rail sets and traffic management. All projects were delivered successfully.

Quickway have been involved in the decommissioning of 7km of the Carlingford Rail Line, in additon to building an impact wall for the MTPV train shunnting. Moreover, the installation of all CSR around Clyde station and multi-function pole foundation construction and CoPC Low Voltage Network installation as part of the Parramatta Light Rail, Stage 1 - Main Works.

Quickway was awarded the contract for the demolition of the existing bridge and construction of a new road bridge over the main western rail line at Bells Line Road, Clarence. The old bridge, built in 1943, was nearing the edge of its lifespan. The new bridge, located north of the existing bridge, provides a safer and wider crossing.

QUICKWAY.COM.AU

2020/2021 Enhanced Corporate Members

The PWI recognises the continued support we receive from our Enhanced Silver Members.

Silver Corporate Members

ABERGELDIE COMPLEX INFRASTRUCTURE

agonis GROUP

ARCHARTIFEX STRONGER TOGETHER

ARUP

HAYS Recruiting experts in Engineering

JMDR

Lycopodium

Plasser Australia

protech GROUP

RailPlanning Services

SMEC Member of the Surbana Jurong Group

SPENO

NSW GOVERNMENT

wsp

ABERGELDIE
COMPLEX INFRASTRUCTURE

Abergeldie designs and delivers multi-disciplinary rail projects including rail formation rehabilitation, points and crossing renewals, 1500V OHW, HV Traction, station infrastructure, bridges and rail infrastructure: the complex infrastructure to build better communities.

- Track, points and crossing track slab reconstruction
- Rail civil works
- Railway station upgrades
- Geotechnical works
- Bridge and culvert construction
- Rail OHW and HV power works

WATER BRIDGES TRANSPORT UNDERGROUND ENERGY REMEDIATION

AUBURN MAINTENANCE CENTRE 'ZERO' ROAD

"Possession of works were delivered in a safe and timely manner. Thank you for the effort that was provided in securing a great outcome." - Downer EDI

Abergeldie delivered heavy civil, building services, rail drainage remediation, HV services and retractable OHW wiring works.

To provide access to maintenance road "Zero" from the West, Abergeldie supplied and installed a 1 in 9 turnout and approximately 280m of new AS60kg track. Abergeldie was responsible for all resurfacing and shunt testing arrangements as well as overhead wiring and signalling construction. Testing and arrangements occurred over a staged programme over two possessions and included supply and installation of approximately 500m of system 9 overhead wiring, the installation of two shunt signals, one route indicator and the provision of electrical interfaces between the signalling interlocking and depot protection systems.

The Auburn Maintenance Centre operates 24 hours a day, 365 days of the year for the on-going maintenance for Sydney Trains along with driver training and fleet modifications. An integral asset of Sydney Trains' rail operations, the upgraded maintenance centre caters to the new fleet of Waratah Trains allowing for either two four-car trains or one eight-car train and enables use of the road for both maintenance and shunting.

HUNTER VALLEY TRACK RECONDITIONING WORKS FY19/20

"Abergeldie worked collaboratively with ARTC to successfully deliver both projects [and] demonstrated they are capable of delivering two large and complex track reconditioning projects in the one Closedown to a high-quality standard" - ARTC

As part of ARTC South Works FY19/20, Abergeldie delivered two track reconditioning projects over a three-day possession during the Hunter Valley Major August shutdown.

Farley - 330m track recon involving excavation and replacement with new formation to a depth of 1.9m BTOR on the Down Main. The site possessed many constraints including a haul route of 7600 metres for material backfill during the recon, significant infrastructure proximity issues, a heritage culvert, significant subgrade soft spot impacts and adjacent worksite interfaces.

North Fork - 230m dual track recon involving excavating 1.4m dual top of rail in tight confines, rail adjustment in a tight radius curve, installation of new steel level crossing panels, new culvert handrails and earthworks.

Abergeldie continues to collaborate with ARTC delivering major track reconditioning projects across the Hunter Valley region.

www.abergeldie.com

Creating Collective Success

Agonis Group was formed out of a desire to assist clients to develop, design and deliver their projects safely and efficiently while still achieving a profitable outcome.

We are able to do this by combining our decades of rail experience in technical, commercial and managerial disciplines.

We will show you how to reduce project cost and manage risk with minimum contingency, through our range of specialist services:

- Constructability Assessment
- Estimating and Value Engineering
- Risk Management and Safety Assurance
- Commercial and Contract Management
- Project Management
- Business and Continuous Improvement Programs
- Asset Management

Agonis Group's expertise lies in connecting all parts of the railway system from project initiation through project development, delivery and the asset management phases.

We do this through the lens of construction and project management professionals which enables us to identify risk and create opportunity.

Realising innovation is a key factor in our success and a reason many organisations partner with Agonis Group. Our team has proven abilities to add real value through their depth of experience in both development and delivery of some of the largest railway projects in the country.

agonis GROUP

Systems Engineering & Safety Assurance

CORE CAPABILITIES

Systems Engineering

Requirements Management

Safety Assurance

RAM

Configuration Management

AEO Authorisation

2.5K SAFETY HAZARDS CONTROLLED

160K REQUIREMENTS MANAGED

"We at Haslin have utilised the ARCH Artifex team on our TfNSW infrastructure projects and have found their skills in Safety Assurance and Requirements Management, Design Management and P6 Programming to be exemplary. Their expertise assists us in delivering quality projects for the people of NSW" **Colin Woods, Managing Director – Haslin Constructions Pty Ltd**

Project Services

CORE CAPABILITIES

150+ PROJECTS DELIVERED

Project Controls

Programming

Comms & Stakeholder Management

Engineering Management

Project Management

Constructability

We are better partners because we have been consultants, contractors and clients.
We have a deep understanding of what you need to succeed and how to deliver it efficiently.
Our clients prefer working with us because we make it easy. **STRONGER TOGETHER.**

ARCH ARTIFEX
STRONGER TOGETHER

Arup is at the forefront of transformative rail, helping shape tomorrow’s sustainable travel.

Rail can transform lives, businesses and communities – we believe that we have a joint-responsibility with our clients, to do the best possible job for current and future generations.

Working in more than 140 countries, more than 15,000 designers, engineers, architects, planners, consultants and technical specialists collaborate with clients on projects of the highest quality and impact. We work across every mode of rail including light rail, metros and heavy rail. Our approach combines systems-thinking, the latest digital technologies and decades of experience.

Rail projects demand a complex mix of skills and insights – from initial strategy and economics, through to engineering, people-centred design, operations and asset management. Success depends on bringing all these elements together – brilliantly. That’s why our technical expertise is always backed by sharp strategic thinking, whether we’re optimising existing assets and services, or designing whole new railways.

We are a client-centric organisation with a reputation for pioneering innovations and for fresh approaches to age-old challenges. We bring together diverse professionals from around the world, as well as local experts from railways and maintenance backgrounds. We offer a range of services across rail structures (tunnels, bridges, station boxes), rail systems (track, electrification, signalling and train control), operations modelling, depot planning, and systems engineering and assurance.

Arup established a presence in Australasia over 50 years ago when entrusted with the structural design of the Sydney Opera House. The firm opened its first office in Sydney in 1963 and has been operating in New Zealand for over 30 years. We now employ over 2,500 staff in the region working from 13 offices across Australia, Singapore, Indonesia, Malaysia and New Zealand.

Arup seeks ever better ways to imagine, reimagine and reshape the built environment.

For more information contact
Anna Squire
Australasia Rail Leader
anna.squire@arup.com

We shape a better world | www.arup.com

HAYS Recruiting experts in Engineering

FAST-TRACK YOUR CAREER
RECRUITMENT EXPERTS IN RAIL

Hays are the largest recruitment agency in Australia and New Zealand and are the market leader in rail recruitment. We have long-term partnerships with both public and private sector organisations across Australia and our 1,000+ recruitment consultants across 38 locations allow us to provide unrivalled expertise.

Our recruitment methodology and our Find and Engage model applies our long-established best practices in understanding essential requirements of each organisation, building relationships deep into talent pools, and underpinning them with the most sophisticated technology to enable us to identify, connect and attract the highest quality candidates for any given role. Each year we make over 14,000 permanent hires and 71,000 temporary/contract assignments, with a database of over 3 million candidates built over 41 years across Australia, making us true experts.

Within the rail industry we specialise in the recruitment of qualified and experienced professionals from Site Engineers through to Senior Executives. Our local and global expertise covers both design and delivery across all types of rail projects and with particular focus on the following disciplines:

- Track and civil engineering
- Signalling
- Systems assurance
- Traction power
- Rolling stock
- Safety
- Automation and CBTC
- Digital engineering
- Project engineering
- Project & program management

Contact us for further information.

Hays Sydney
T: 02 9249 2210
E: eng.sydney@hays.com.au

hays.com.au

Rail Signalling Services

CONCEPT TO COMPLETION

Rail industry provider of choice for people, signalling services, training and competence management.

JMD Railtech (JMDR) is an experienced rail engineering company with more than 345+ staff globally over 12 operational offices and providing total Signalling solution from concept to completion.

Our Values: Accountability, Customer Focus, Integrity, People and Value for Money

Our Services:

- Signal Design from Concept to Completion, Relay to CBI, CBTC, ATP
- Microstation / CAD works (Documentation Updating / As-Builts)
- Installation and Construction Works including Cable Route
- Wiring / Location Cases / Relay Racks
- Testing & Commissioning (Total Solution from Plans to Handover)
- Signalling Training, RISI
- Signalling Management
- Competency Services
- Engineering Assurance and Independent Verification Works
- Worksite Protection Panel (TfNSW)

Current Major Projects Austalia:

- ATP Area 1, 7, 6 & 8 - Detailed Signalling Design
- ATP Area 6 and 8 - Construction
- MTMS Design (STAR & Waterfall) - Detailed Signalling Design
- MTMS South Package - Construction, Testing & Commissioning
- Ararat Junction (Murray Basin) - Detailed Signalling Design & Construction
- Moorebank Intermodal - Maintenance Contract
- Merrylands & Granville Rationalisation, Blacktown ATRICS - Design
- Kangy Angy ATRICS - Design & Testing
- Queensland Signalling Infrastructure Auditing Services - 2020-2021
- Mount Pleasant Coal Loop - Design, Construction, Testing & Commissioning
- Central Sydney Metro - All Signalling enabling works (construction, testing and commissioning)
- Gosford Area Resignalling and Mount Victoria Area Resignalling - Detailed Signalling Design

RISQS AUDITED · DNV·GL ISO 9001 · Nationally Recognised Training RTO 45417 · AEO Transport for NSW Authorised Engineering Organisation

JMD Railtech Group
(AEO, RTO, IRSE Licensing Agency, ISO 9001, 14001, 18001 and RISQS Certified)

+61 2 9299 5637 | +61 3 9614 3390 | +61 412 521 362 | mail@jmdr.com | www.jmdr.com

Rail Signalling Services

Concept to Completion

GLOBAL OPERATIONS & ASSETS

We have our offices in UK (York), Australia (Sydney, Minto, Brisbane, Melbourne and Perth) and India (Noida, Mumbai, Hyderabad, and Bangalore) and New Zealand. We are also operating in South East Asia (Singapore, Thailand, Indonesia, Taiwan and Malaysia).

JMDR's is an experienced Rail Engineering Company and an Authorised Engineering Organisation (AEO) providing signalling services across a broad engineering spectrum.

RISQS AUDITED · DNV·GL ISO 9001 · Nationally Recognised Training RTO 45417 · AEO Transport for NSW Authorised Engineering Organisation

JMD Railtech Group
(AEO, RTO, IRSE Licensing Agency, ISO 9001, 14001, 18001 and RISQS Certified)

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Level 12, 477 Pitt St, Sydney NSW 2000 Australia	Unit 4/5, Merryvale Road, Minto, NSW 2566 Australia	Level 2, 838 Collins St Melbourne VIC 3008 Australia	41-45 Williams Rd Dandenong South VIC 3175 Australia	Level 14, 10 Market St Brisbane QLD 4000 Australia	231 Adelaide Terrace Perth WA 6000 Australia

Operating in Australia, India, U.K. and South East Asia & New Zealand

The science of solving engineering problems.

From design, engineering and construction, right through to asset management and maintenance services, we enable infrastructure projects to fulfil their life-changing, community-enriching potential.

Who are we?

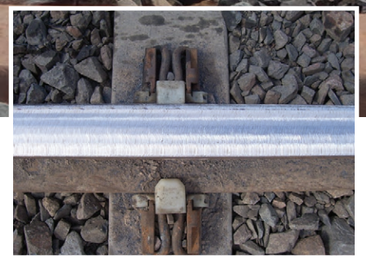
Lycopodium is a leading project management and engineering consultancy committed to providing timely and cost effective infrastructure solutions. We are trusted by private and public transport operators across the nation. Lycopodium staff have direct management experience across a range of rail and port infrastructure from Heavy Haul coal networks to mixed Freight & Passenger Interstate networks, rail and port terminals as well as Restricted Grain Lines.

What do we do?

Lycopodium specialises in rail engineering and operations that delivers quality through the provision of fit-for-purpose services and provides innovative solutions for integrated rail logistics.
We provide a full suite of rail engineering design, rail project management and rail infrastructure management services.
Our extensive rail delivery experience includes a host of projects for both major rail network owners and private rail operators.

- Engineering advisory services
- Track and civil design
- Operational modelling
- Asset management services
- Independent Inspections
- Rail Maintenance
- Transport and logistics studies
- Defect identification and mapping
- Rail Maintenance Management

Engineering Design



RIM Services

Project Services

Lycopodium

Newcastle **Melbourne** **Brisbane** **Perth**

Level 1 / 20 Newton Street, Broadmeadow, NSW **T** +61 2 4920 5800 **W** lycopodium.com/rail

HIGH CAPACITY I PRECISION I RELIABILITY

Plasser Australia

This year, Plasser Australia has some momentous events to recognise and celebrate! On 9th June 2020, Plasser Australia proudly celebrated our 50th Anniversary. From humble beginnings to today being a renowned supplier of track maintenance machinery to the rail industry in Australia and New Zealand, it is astonishing to think how far we have come. Plasser Australia was incorporated as a company back in 1970; manufacturing railway machinery for the construction and maintenance of rail track, with the original facility located in Girraween.

In 1980, the company moved to its present location at St. Marys, with rail siding access to the New South Wales standard gauge rail system and has since evolved to the site it is today. Plasser Australia has delivered solutions and innovations for the past 50 years and will strive to do so for the next 50 years. Companies are made up of people, to have a company last & be successful for 50 years, you need to have great people. To the team at Plasser Australia, both past and present, we thank you. Our achievements are strengthened and supported not only by our team, but by our extensive range of after sales services. However, our success and longevity would not be possible if it were not for the trust and support of our customers who have been with us since the beginning – we are proud to partner with you.

50 YEARS
Plasser Australia

In June, we saw machine 600 (M600) loaded, leave the factory and begin the arduous route across the country to the Pilbara region, Western Australia. It is a fantastic looking machine and again a demonstration of the quality of work produced here at Plasser Australia.

Special recognition was also attached to this machine by naming it the 'John Gurney'. In collaboration with Rio Tinto Iron Ore, M600 was named after John to pay tribute and acknowledge a great man and his contribution to the construction and maintenance of heavy haul rail in the Pilbara region of Western Australia.

The year 2020 has also brought about our new Managing Director, Michael (Mick) Keefe. Mick brings with him an extensive amount of rail and business knowledge and provides outstanding vision and communication.

50 Years of Plasser Australia – what an outstanding achievement.

What a Year!

At Plasser Australia, it is our mission to continuously offer innovations, coupled with increased safety, precision, reliability and cost efficiency.

Plasser Australia Pty Limited • 2 Plasser Crescent • North St Marys NSW 2760 • PO Box 537 St Marys NSW 1790
Telephone: +61 2 9623 9033 • Email: sales@plasser.com.au • Website: www.plasser.com.au

www.plasser.com.au
"Plasser & Theurer", "Plasser" and "P&T" are internationally registered trademarks

Rail Planning Services is an experienced and knowledgeable team who are capable of assisting you in the delivery of your project or the management of your asset.

We will be your trusted partner in planned, current or future projects, whether you are the end client, designer, deliverer, operator or investor.

Our experienced team are capable of supporting your activities, supplementing your team or undertaking specific commissions.

We specialize in optimizing the outcomes for our clients.

Glenn Dewberry
info@railplanning.com.au
railplanning.com.au
+61 (0) 400 177 487

OUR SERVICES

Feasibility and concept design

Taking a transport project from concept to finished product is where Rail Planning Services excels. Optimal planning is achieved through the clear identification of the staged changes required to deliver the project while maintaining safe and reliable operations. Rail Planning Services has proven multidisciplinary experience and integration capability to develop any rail project.

Procurement and tendering services

Rail Planning Services has the depth of knowledge and diversity of experience to identify and support the optimal procurement method and project delivery stream. Whether developing or responding to a tender, Rail Planning Services has the team that can unlock the best for project alternatives that provide a winning edge.

Procurement and tendering services

We can support you with the full range of Project Management resources and Interface Managers to form part of your team or we can undertake specific tasks to help manage the delivery of your project.

Rail Planning Services can also use its construction staging, possession planning and scheduling expertise to review and improve the delivery of your works program.

Operation and maintenance

Rail Planning Services expertise covers the operation and maintenance of rail infrastructure. We have team members well versed in Reliability Centred. Maintenance and Asset Management approaches who can assist you with getting the optimal results from your assets. Our people are pragmatic and use the combination of real world experience and technical expertise to get workable outcomes.

AREAS SERVICED

Light Rail | **Metro** | **Heavy Rail** | **Freight**

KEY PROJECTS

Sydney Metro – Northwest Constructability Advisor

Sydney Metro – City & Southwest Project Management

Regional Rail Project Management Support

More Trains More Services Constructability Advisor

Sydney Light Rail Project Management

Canberra Light Rail Stage 2 Constructability Advisor

Northern Sydney Freight Corridor Constructability Advisor

RailPlanning Services

Member of the Surbana Jurong Group

local people
global experience

Advancing Australia's Infrastructure

Sydney Metro North West - Surface and Viaduct Works

SMEC Sydney is the lead consultant on the Sydney Metro North West Surface and Viaduct Works (Sydney Metro North West SVC) for the Impregilo Salini Joint Venture (ISJV). The project consists of the design and construct of 4.2 km of viaduct, 270m long cable stayed bridge, formation works and local road modifications. When finished, the viaduct will be the longest railway viaduct in NSW and the first cable stayed railway bridge.

Major Projects. Great Outcomes.

SMEC is an Australian based professional services firm that provides high-quality consultancy services for major infrastructure projects. SMEC has over 5,000 employees and a network of over 55 offices throughout Australia, Africa, the Middle East, the Pacific, North America and South America.

SMEC provides cost-effective, practical project outcomes to private and public sector clients in a wide range of transport disciplines, including: rail infrastructure, roads and highways, bridges and structures, traffic and transport planning, ports and airports.

Projects

- Sydney Metro North West
- South West Rail Link
- Scone Yard Reconfiguration Design
- Togar North CTC Loop Design
- Gosford Passing Loops
- Sydney Trains Multidisciplinary Panel
- Epping to Thornleigh Third Track
- Regional Rail Link
- Surat Basin Rail
- Marrickville Railway Station Upgrade
- Epping Electrical Sub-Station Upgrade
- Gold Coast Light Rail
- Capital Light Rail, Canberra

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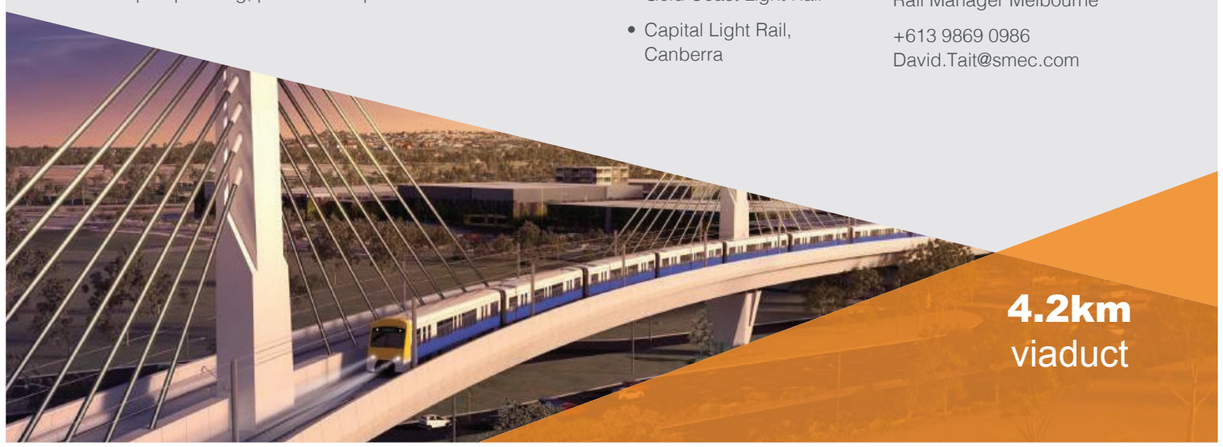

4.2km
viaduct

Operations, Trains and Systems

(Sydney Metro North West),NSW

Sydney Metro North West, formerly the North West Rail Link is Australia's largest public transport infrastructure project and a priority project for the Government of New South Wales.

Sydney Metro North West will be Australia's first fully-automated rapid transit rail network, delivering eight new railway stations, 4,000 new commuter car parking spaces and five existing railway stations upgraded to rapid transit status. This includes computer based train control, full length platform screen doors, improved information displays and upgrades to fire and life safety systems.

The project is being delivered in three major contracts: Tunnels and Station Civil Works; Surface and Viaduct Civil Works; and Operations, Trains and Systems.

The $3.7 billion Operations, Trains and System (OTS) contract is the largest of the three contracts. The OTS package comprises: the design, construction and commissioning of rail infrastructure (including underground, open-cut and elevated stations at eight locations, a rapid transit rail facility, and all associated track, overhead wire structures and combined services routes); procurement of rolling stock; operation and maintenance; and financing of 23km of new rail network from Cudgegong Road to Epping and the upgrade of 13km of existing rail network from Epping to Chatswood.

SMEC was engaged in association with Mott MacDonald and KBR as the Design Joint Venture (DJV) for the OTS package. The DJV is providing civil engineering, structural, mechanical, electrical, public ultities and vertical transport design services.

Fast-track design works are being undertaken over a 24 month period. This includes full engineering design and coordination with the project architects, system provider, and operations and maintenance personnel.

Designed to meet the current and emerging transport needs of Sydney's rapidly growing North West suburbs, Sydney Metro Northwest features a new generation of reliable, automated rapid transit trains, and will transform public transport in Sydney.

Sydney Metro North West includes eight new railway stations, five upgraded stations and 4,000 commuter car parking spaces.

$3.7 billion
OTS contract

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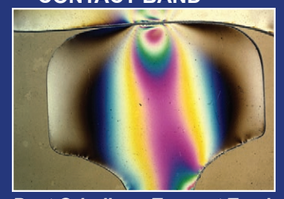
1. RAIL CENTRE LINE CONTACT BAND

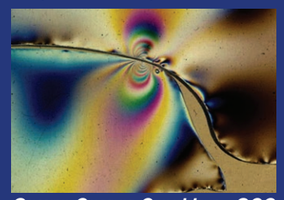


Post Grinding - Tangent Track = Von Mises' Stress 500 MPA

2. FIELD SIDE CONTACT

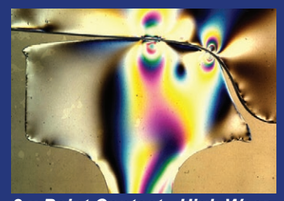
Low Rail - Rail Flow = Von Mises' Stress 850 MPA

3. HIGH RESIDUAL STRESS GAUGE CORNER (HIGH RAIL)



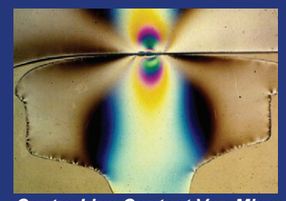
Gauge Corner Cracking - GCC = Von Mises' Stress 850 MPA

4. HIGH RESIDUAL STRESS 2-POINT CONTACT = MPA



2 x Point Contact - High Wear Rate Due to Poor Rail Profile = Von Mises' Stress 850 MPA

5. CENTRE LINE CONTACT



Centre Line Contact Von Mises' Stress = 500 MPA (Tangent)

Over the past decade the steady increase in train speeds and traction power at the wheel-rail contact patch triggered growing problems of rolling contact fatigue which had previously been seen in heavy haul applications. Today RCF has become the biggest concern for most rail infrastructure managers and suppliers.

Characteristic of rail grinding requires metal to be removed from the surface of the rail head. On one side this eliminates surface defects; on the other side it creates artificial wear.

Technical requirements and economic benefits are not isolated, and both can contribute to a sustainable railway strategic goal to reduce life-cycle costs.

Cost Effective Maintenance for Rolling Contact Fatigue

Finding the most efficient and cost effective way of maintenance will help to further prolong rail service life. Fatigue and wear limits should be reached at the same time. A longer rail service life spreads investment costs over a longer period and thus reduces life-cycle-costs to a minimum.

RCF defects are even more critical as "head checks" grow into the rail head and, if left untreated, lead into more severe failure modes, such as shelling, spalling and under specific circumstances, rail fractures.

It is widely accepted that controlling RCF through isolated corrective actions is not effective. Leaving RCF untreated, eventually results in premature re-railing. Thus, cyclic preventive rail grinding interventions have become a standard measure for both heavy haul and passenger rail applications.

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Image: Sydney Metro City & Southwest, courtesy of Sydney Metro

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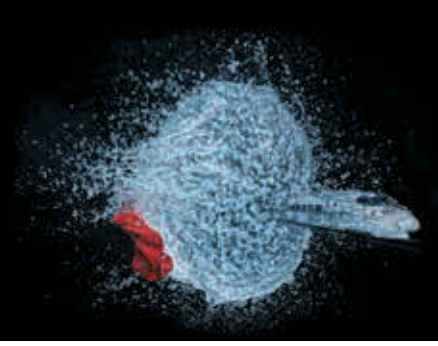

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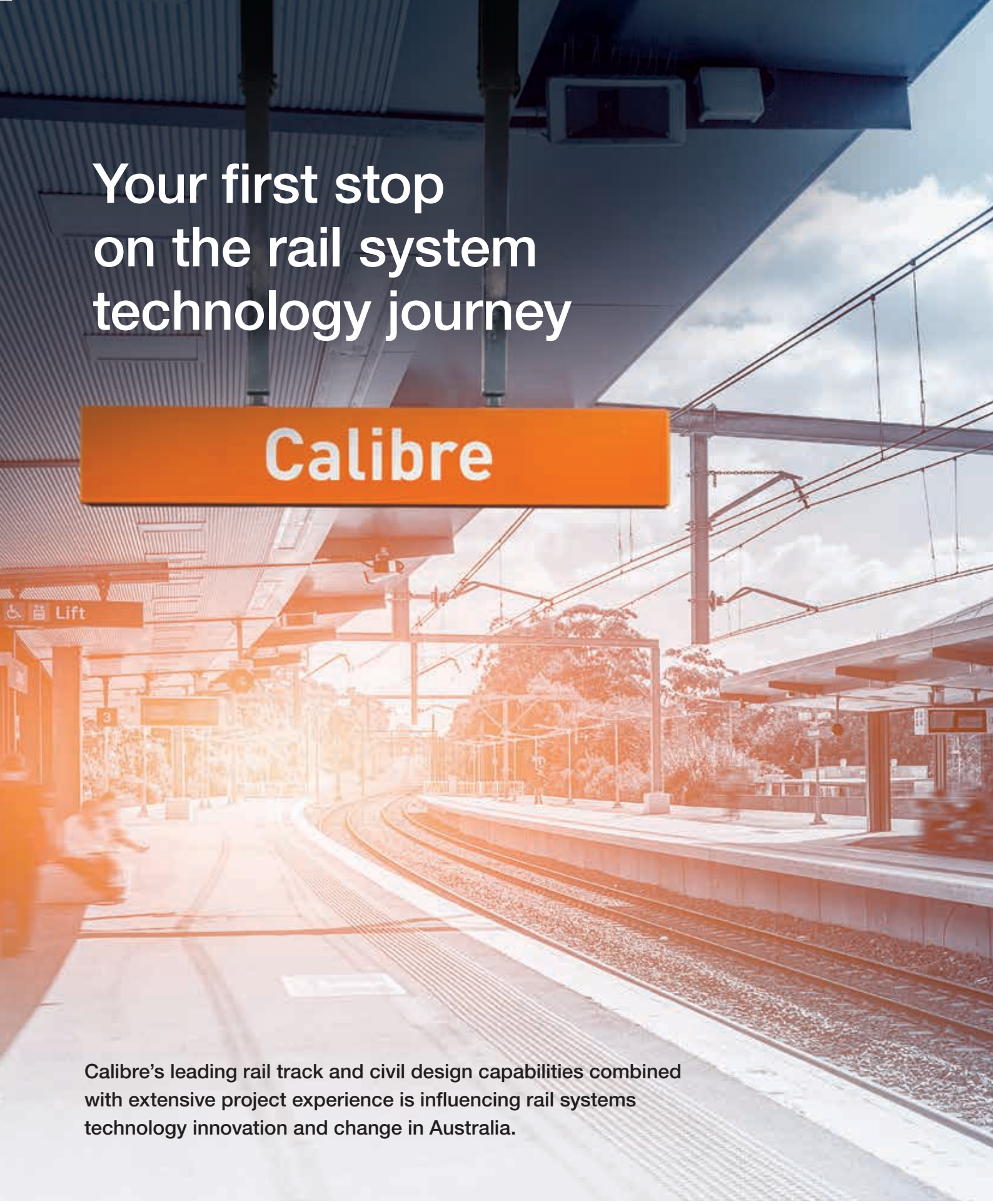

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If you have any questions or would like to get directly involved with the union, contact us directly on (02) 92642511 and ask to speak to one of the RTBU's organisers.

RTBU NSW BRANCH

Level 4, 321 Pitt Street Sydney NSW 2000

Tel (02) 9264 2511 • Fax (02) 9261 1342

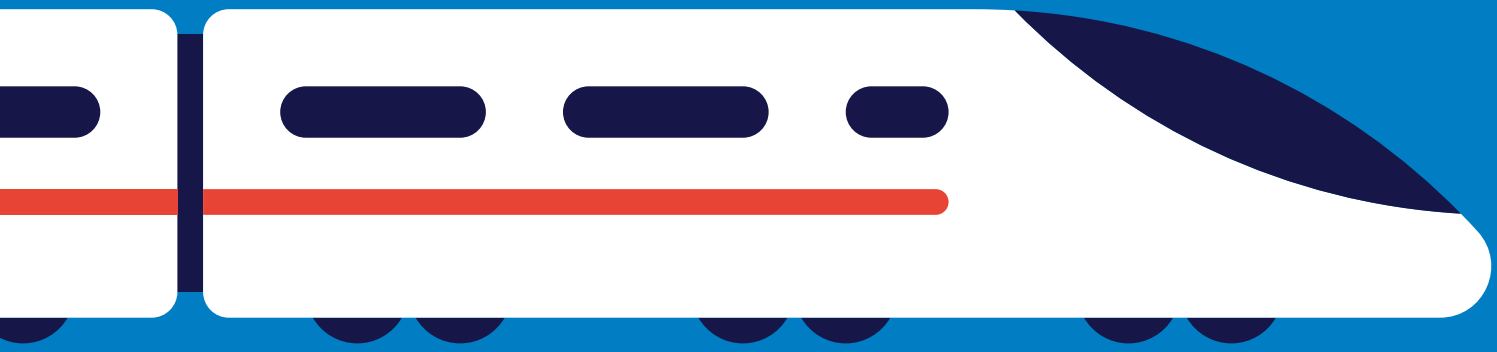
Email nswho@rtbu-nsw.asn.au

Website www.rtbuexpress.com.au

- **Enterprise Bargaining** Working with members to bargain for enterprise agreements that provide fair pay and conditions.
- **Disciplinary Matters** The RTBU provides advice and representation for members involved in disciplinary matters.
- **Workers Compensation** The RTBU's solicitors represent members, at no cost, in workers' compensation matters.
- **Workplace Bullying and Harassment** The RTBU can assist members experiencing workplace bullying or harassment
- **Representation Before Industrial Tribunals** The RTBU provides experienced advocates to represent members before the Industrial Tribunals in relation to unfair dismissal, disciplinary and promotional appeals.
- **RT Health Fund** As an RTBU member you have access to this health fund with highly competitive contribution rates. Members can transfer from other health funds with no loss of continuity.
- **Discounted Home Loans** As an RTBU member you have access to discounted home loans through Endeavour Bank.
- **Members' Union training** Training programs are regularly conducted by the RTBU for members and workplace activists to assist them to get involved in organising their local workplace.
- **Funeral Benefit (on application)** Families of deceased financial members are entitled to a funeral benefit of $2,500 to assist with funeral expenses.
- **Wills** Members have access to a free will service.
- **RTBU Holiday Cabins** RTBU members have access to the RTBU Holiday Park located at Jervis Bay within the national park. Members can also book holidays at the USU Aquatic Resort Port Macquarie at discount rates.
- The **RTBU Womens Campaign Committee** works across all sectors of the industry to identify, challenge and improve the working conditions of women members.

"The purpose of the RTBU is to organise workers in the transport industry to protect and build their rights at work"

specialised project teams.



Randstad Projects provide a personalised, managed service offering led by an industry professional. We guarantee the supply of proven, specialist engineering teams to help you deliver on a bid, business case or project.

what we do

- Placement and management of specialist, vetted engineering teams on a project basis.
- Guaranteed managed services for a specified duration.
- Advise on strategic workforce planning and a cohesive people strategy.
- Provide high-quality talent through our large proven contractor base.

our offering

- Provision of a dedicated Delivery Manager with specialised industry experience.
- Flexible pricing options to suit specific client requirements.
- Flexible payment terms made possible through financial backing from the world's largest recruitment agency.
- Provision of partial or complete bid teams with the option of a free permanent transfer for part or all of the team at the end of the assignment.
- A proven bench of experienced and relevant professionals.
- Support of a large global specialist resourcing team allowing us to quickly expand teams in line with project demands.

randstad projects.

contact us on 02 9233 9900 or
randstadprojects@randstad.com.au

RHOMBERG SERSA RAIL GROUP

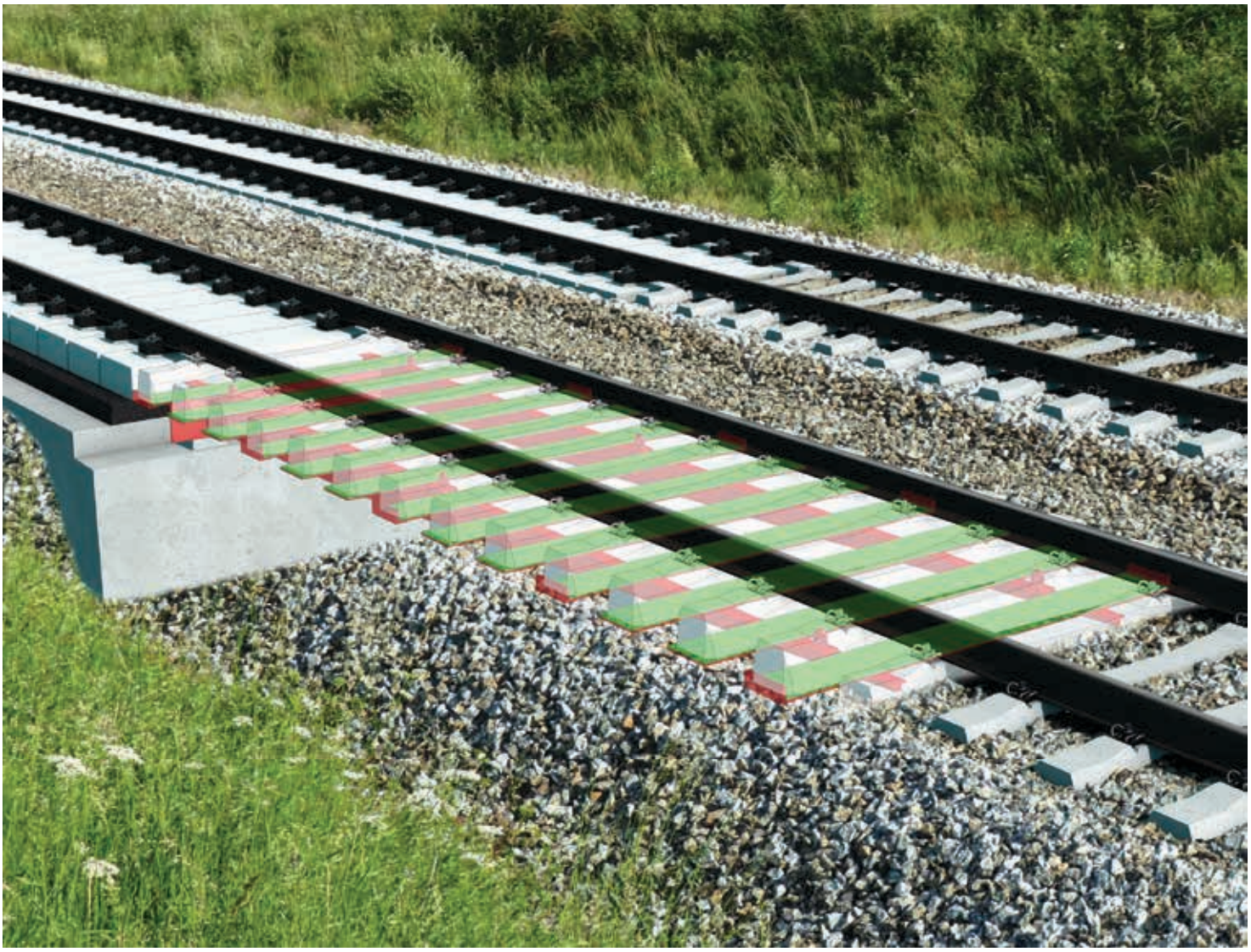
VTRAS – slab to ballast transition module

Bringing engineering excellence to slab track installations

Prefabricated, precision-made, floating support provides even distribution of different settlement of sub- and super-structures.

Simple, integrated and sustainable structure acts like a cushioning pontoon bridge between slab track and ballast roadbeds.

Universal usage irrespective of whatever types of track construction involved.



Delivering high quality integrated civil construction services to the rail sector for over 50 years

Partnering with customers who value quality, safety and expertise

Investing in our people to maximise their potential and improve business performance

Enquiries to info@robsoncivil.com.au

Phone: 02 4324 6888

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Safety | Environmental | Quality | Risk

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100 Barangaroo Avenue, Sydney, NSW 2000, Australia
P: (02) 8046 6876
E: enquiries@seqrtalent.com.au
W: seqrtalent.com.au
Li: linkedin.com/company/seqr-talent/

SEQR Talent is a specialist Recruitment and Consultancy Firm; focusing on the Safety, Environmental, Quality and Risk Management sectors.

"We aim to value add along the entirety of the recruitment & consultancy process and develop long-term partnerships".

CAPABILITIES

- Safety, Environmental, Quality and Risk Management Staff Recruitment; Fulltime, Part-time and Contract roles
- Consultancy Services:
    - Safety, Environmental, Quality and Risk Management services
    - Key areas of industry support include; Rail, Mining, Civil, Renewables, Infrastructure and Utility projects
    - Frontline safety leadership support
    - Independent audit and inspection regimes
    - Lead investigators and investigation subject matter expert support
    - Systems development & gap analysis; Rail Safety Accreditation (RIM/RSO), FSC, ISO9001, ISO14001 and ISO45001
    - Risk assessment & profiling
    - High-risk plant and subcontractor systems development
    - Tailored risk-based training solutions

Know today how your rail assets perform tomorrow.

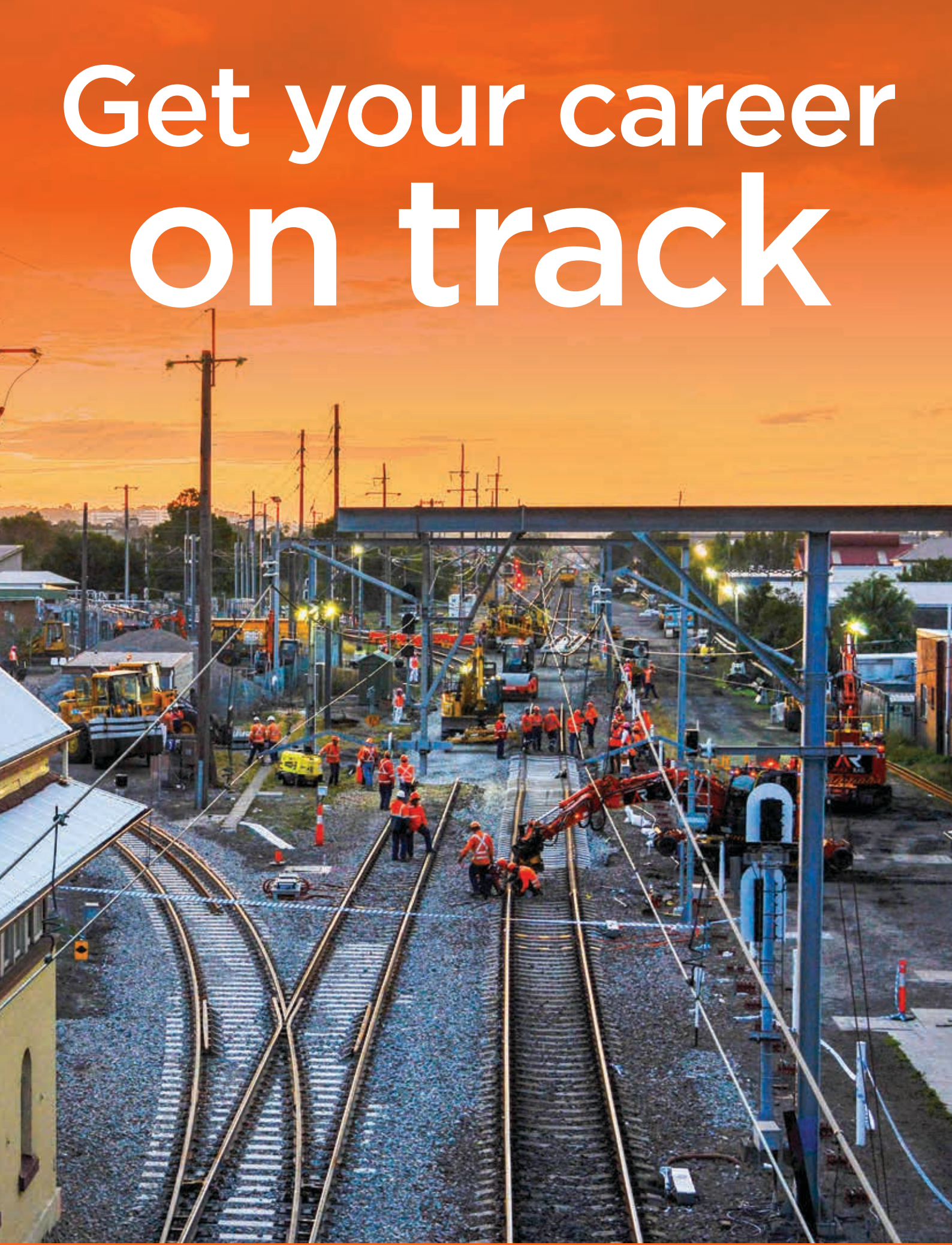
Making rail more competitive, safe and reliable.

We work in partnership with our clients to provide solutions to manage networks and maximise availability, reliability and safety. When operating a rail network, data is critical. The future of rail operations and maintenance is in using the vast amount of data a network generates to proactively manage that network, driving greater efficiency through availability and ultimately reducing operating costs.

For more information contact
Marije Potter **struktonrailaustralia@strukton.com**
strukton.com.au

Strukton

Get your career on track



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For an exciting and challenging career, search for ‘Sydney Trains careers’ online.

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Taylor Rail Australia has the experienced resources and capacity to deliver rail infrastructure solutions to all government, public and private rail clients.

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- / RESURFACING
- / INSPECTION
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10 Luso Drive, Unanderra, NSW 2526
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Thermit Australia Pty Ltd has been supplying aluminothermic welding consumables and glued insulated joints to the railways of Australia, New Zealand and South East Asia for over 50 years. As a member of the global Goldschmidt-Thermit Group, Thermit Australia is part of a dynamic network of companies leading the way in innovation in rail joining and related technology.

Rail Joining
Weld kits and consumables
Glued Insulated Rail Joints

Rail Measuring

Lubrication Systems

Rail Services
Training, auditing and recertification of welders
Installation of our products

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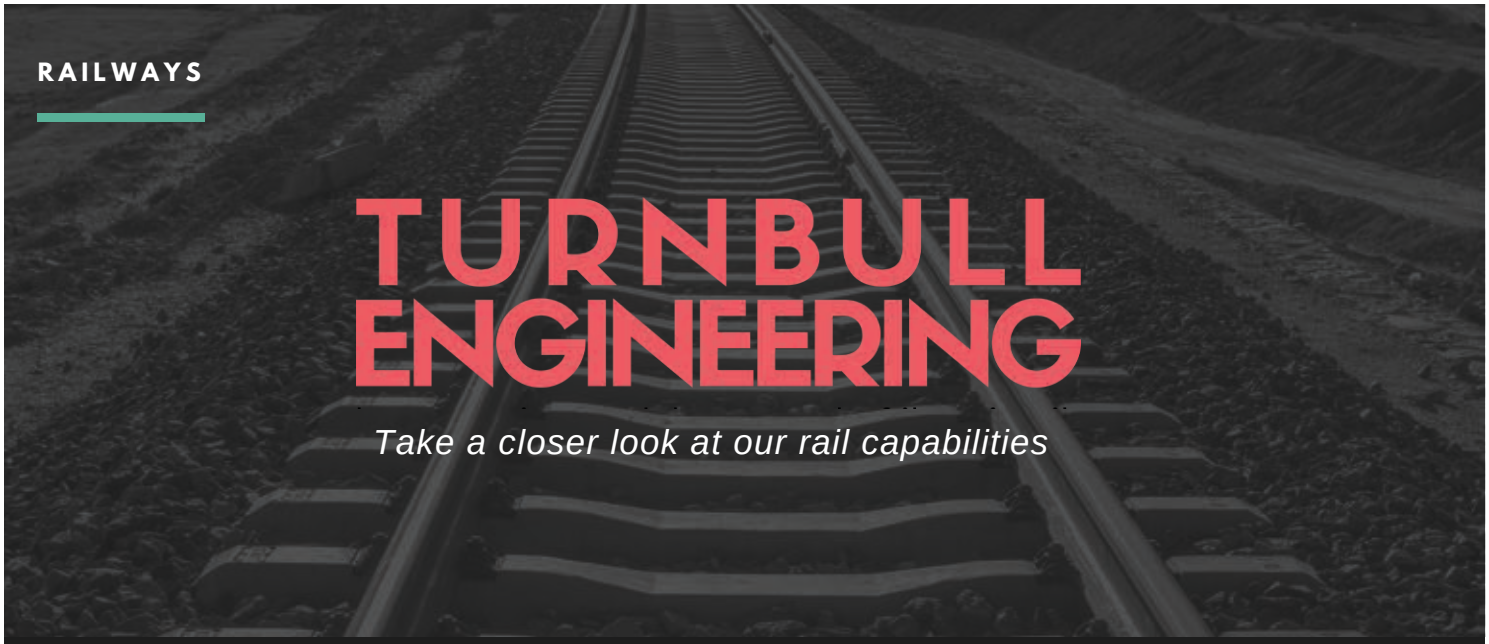

RAILWAYS

TURNBULL ENGINEERING

Take a closer look at our rail capabilities

OUR RAIL DESIGN DISCIPLINES

- Permanent Way
- Civil
- Structures
- Utilities
- Drainage/Flooding
- Geotechnical

WE KNOW YOU LIKE NUMBERS...

40

Our team have experience in 40 different areas of rail design and asset management.

67%

More than two thirds of our people have worked on major rail infrastructure projects.

80

We have a team of 80 people who are ready to work on rail projects.

50

Our team have experience in over 50 rail projects in the last 10 years!

DID YOU KNOW?

We're accredited
Our company is a TfNSW AEO and holds ARTC competencies.

Our team have worked for many rail clients
Sydney Metro, TfNSW, ARTC, Sydney Trains, QUBE, Country Rail Network and Pacific National.

And we're big on technology
We use the latest 3D tools to integrate our technical processes and communication methods on projects.

VAE

For other people
this is a railway line.

For us, the factory for our
customers' success

New on the horizon:
After the SPHEROLOCK®
VAE Railway Systems now
introduces in-bearer
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with a new generation of
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What first appears simple, reveals itself upon closer inspection, to be the key for the success of our customers. A product that fulfills the highest technical and safety requirements and that secures economic success over its entire life cycle through the lowest possible operating costs. A product that is tailor-made for our customers. And for the future.

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ONE STEP AHEAD.

willow
know your world

Willow is the digital twin for the built world

Willow has formed a Joint Venture with Strukton Rail to transform the creation and operation of infrastructure networks:

WillowRail – The digital twin for the rail industry.

WillowRail provides an integrated software solution for all rail network types including trams, light rail, metro, (high speed) trains and heavy haul.

This industry first digital solution improves the management, maintenance, and performance of rail networks.

By integrating existing disparate and isolated systems from multiple operational elements into one interface, WillowRail creates a single view of network performance, compliance, and maintenance status, and delivers deep insights to owners and operators.

WillowRail was formed in 2018 and has offices in Utrecht, Sydney and Perth.

information@willowrail.com **willowrail.com**

BENEFITS

Agnostic ecosystem

In-house data and tools are converged to create a single, seamless and intuitive platform. No longer viewed in isolation, all assets are liberated to co-contribute to a dynamic, integrated network platform.

Efficient maintenance

The WillowRail solution integrates asset condition monitoring data to detect and forecast failures. This reduces reactive maintenance and the high associated costs by up to 20%. WillowRail's analytical engine enables the progression from preventative to predictive maintenance to optimise the lifespan of network assets.

Towards 100% availability

The complementing combination of cutting-edge platform technology and the high level of rail industry knowledge increases network availability up to 99.9+%.

Established NSW 1924

Founded 1884

PERMANENT WAY INSTITUTION NSW

PWINSW.ORG.AU

THE PWI IS PROUDLY SUPPORTED BY ITS PLATINUM MEMBERS

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