



**John Holland Pty Ltd on behalf of
The Horizon Alliance**

Darra to Springfield Transport Corridor – Stage 1

**2012 Australian Construction
Achievement Award (ACAA)**

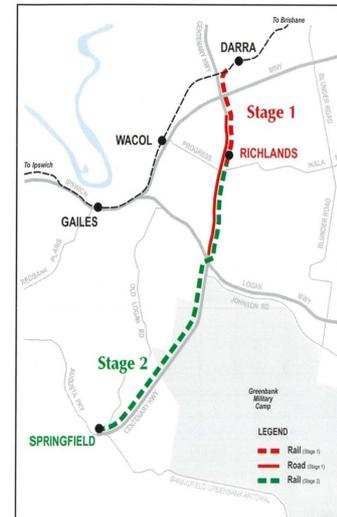
Technical Paper

1 Abstract

Darra to Springfield Transport Corridor (DSTC)—Stage 1 was the first integrated road and rail project for south-east Queensland. It was a major transport initiative of the Queensland Government to service the future needs of Brisbane’s growing western corridor region.

Stage 1 of the project involved:

- Building a new passenger railway line from Darra to a station at Richlands
- Constructing a railway station, bus interchange and park and ride facilities at Richlands, north of Progress Road
- Upgrading the Centenary Highway to motorway standard, increasing it from two to four lanes from Richlands to meet with the existing Logan Motorway interchange at Carole Park.



Darra to Springfield Transport Corridor Stage 1 & 2

Stage 1 reached practical completion in November 2010, four months ahead of schedule and significantly under the allocated budget of \$800 million.

The project was delivered by the Horizon Alliance (Horizon) which was established in March 2007 and consisted of Queensland Rail and the Department of Transport and Main Roads (TMR), John Holland Pty Ltd, GHD Pty Ltd, and Kellogg Brown & Root Pty Ltd (KBR).

Horizon combined the expertise, resources and experience of established industry leaders in infrastructure design and delivery. As the constructor, John Holland provided a full range of engineering, construction and support services, with the primary goal of delivering world class integrated infrastructure to the booming south-east Queensland community.

2 Keywords

ACAA, Horizon, Darra to Springfield Transport Corridor, rail infrastructure, road infrastructure, Queensland Rail, Queensland Department of Transport and Main Roads, project alliance, integrated public transport, Western Corridor projects, railway station construction, station architecture, John Holland.

3 Introduction

The Darra to Springfield Transport Corridor (DSTC) – Stage 1 was the first major integrated road and rail project for south-east Queensland. Valued at \$800 million, Stage 1 involved building a new passenger railway line from Darra to a station at Richlands, constructing a railway station at Richlands, north of Progress Road and duplicating the Centenary Highway from two to four lanes north of the Logan Motorway interchange.

The project is part of the Queensland Governments strategic plan to manage growth in south-east Queensland (SEQ) and contributes to several of the Governments targets and ambitions such as:

- Queensland is Australia's strongest economy, with infrastructure that anticipates growth (Toward Q2 2020 Target)
- Cut by one third Queenslanders' carbon footprint with reduced car and electricity use. (Toward Q2 2020 Target)

Springfield is identified in the SEQ Regional Plan as a principle regional growth area. Constructing Stage 1 was an important first step to delivering the intended outcomes identified in the SEQ plan and meeting the Toward Q2 2020 target of delivering infrastructure that anticipates growth.

DTSC- Stage 1 was completed four months ahead of schedule and significantly under the allocated budget. This significant achievement allowed the Government to provide hundreds of new public transport customers with train services ahead of the planned opening date. The actual opening of the Richlands Station was fortuitously timed as it helped thousands of people travel from the flood-hit western suburbs to the city during the December 2010/January 2011 floods.

The project also reduces carbon footprint by reduced car and electricity use. Each passenger train takes approximately 625 cars off the road and uses an average of one tenth of the carbon emissions per person of the equivalent number of cars. Rail has clear environmental advantages. To facilitate the uptake of rail patronage, the design solution included the following outcomes:

- An architecturally attractive station to encourage users and provide them with a good travelling experience
- Integrated bus interchange facilities to provide a total public transport solution for users
- Wide public spaces and functionally to cater for large football crowds (close proximity to the Lions Football Club at Richlands)
- Integrated shared user path (pedestrian and cycle) and cycle lockup facilities to encourage walk-up and ride up patronage
- Providing improved vehicle access to the station precinct and a multi storey car park (over 600 car spaces) to cater for park and ride passengers
- CPTED principles (Crime Prevention Through Environmental Design), good lighting and 160 CCTV cameras were included to ensure user safety in the public space.

Long term operational costs and maintenance costs were also considered in the delivered design and building solution to ensure that the right balance of initial cost vs. ongoing costs was achieved. Future proofing outcomes were also included in the design solution such as the ability to include additional levels of car parking to the already multilevel car park and the ability to construct Stage 2: Richlands to Springfield with no disruption to Richlands Station services.

Project Participants

The Horizon Alliance consisted of two Owner Participants (OPs) and three Non-Owner Participants (NOPs).

The OPs included:

- Queensland Rail Ltd – was the principal owner participant in the Alliance. Queensland Rail funded the Project and their workforce procured and constructed the track and rail systems elements of the works.
- Department of Transport and Main Roads (TMR) – TMR provided the funding for the road component and were involved regularly in reviewing and commenting on Traffic Management Plans and technical aspects of pavement construction. TMR also had a number of engineering staff seconded to the Project team. The Deputy Project Director was a representative of TMR and oversaw all road elements of the works.

The NOPs included:

- John Holland– John Holland undertook all the physical construction work excluding the track and rail systems.
- GHD – GHD formed a joint venture with KBR to design the Project. GHD provided the majority of the senior design management staff and engineers.
- KBR – KBR formed a joint venture with GHD to design the Project. KBR provided the majority of drafting and junior design staff.

Project Governance and Management

The overall Horizon governance structure combined both alliance and project specific functions. The central governance body for Horizon was the Alliance Leadership Team (ALT). This team was made up of OPs and NOPs who provided overall project direction and formed a critical client interface function. Alliance activities were managed by an Alliance Manager and project specific activities were managed by a Project Director.

All governance decisions made account for impacts at both the alliance and project level. This was achieved through the Alliance Manager and the Project Director both being key members of the Project Management Team (PMT).

4 Project scope

The following key elements were delivered as part of the DSTC - Stage 1:

- 4.3km of new Centenary Highway from the southern extent of the Centenary Link Alliance (CLA) works to just north of the Logan Motorway Interchange
- 4.5km dual track rail line from Darra to Richlands



- Railway station and bus interchange at Richlands including 650 carparking spaces
- 2km of local road upgrades
- 7 road bridges
- 3 rail bridges
- 1 shared access bridge at Springfield
- 5.6km of pedestrian and cycle path.

The following quantities of materials were used during construction of the project:

- 45,000m³ of concrete
- 677,429m³ of earthworks
- 134,332 tonnes of asphalt
- 7,420m of culverts
- 8,042m² of reinforced soil structure walls
- 7,795m² of soil nail walls.



The budget for the delivery of the Stage 1 works was \$800 million.

This budget excluded a number of 'Below the Line' costs which were not included in the Target Cost Estimate. These 'Below the Line' costs included:

- Property acquisition
- Work by other alliances (Trackstar, Safelink, Centenary Link)
- SEQIP RAIL and TMR program costs.



Innovations in construction

Innovative and thorough management of the scope of works and risk management was the foundation for successful project cost management. Under an alliance model where the participants agreed to jointly share the risks and the opportunities, early scope and risk management was critical. This was especially true where most, if not all, changes related to design development and evolution, or clarification of the project works, without variation to the agreed financial target cost for the project delivery.

The Horizon Estimate Review Group (HERG) was tasked to deliver value-for-money in the project definition phase. An innovative HERG process at Horizon clarified the scope definition, and in doing so set up a framework for scope cost and risk management before project delivery. This was supplemented by ALT pre-agreed scenarios setting the foundation for instances where a change would be a variation.

At the outset Horizon also conducted a week of value management workshops with key stakeholders to challenge the scope, specifications and emerging solutions.

During project delivery the Project Management Team (PMT) implemented an up front and early “red, amber, green” process for innovations and scope changes. When combined with robust cost planning, this process gave early cost/benefit scenarios and the PMT time to make best-for-project management decisions. This provided true value-for-money in the scope management without incurring unnecessary and expensive time consuming costs on wrong solutions.

An innovation register was also kept and presented each month in the project monthly report. Indicative saving or costs were assigned to each innovation where possible. Note, that the ability to continue to challenge design beyond the TOC was somewhat unique to Horizon, with many alliances limiting the period for innovation to the TOC development period. A total saving of \$16.2 million was made through over 100 documented innovations incorporated into the project. Benefits of innovation were also achieved in the non-cost KRAs.

Without doubt the biggest difficulty to the successful completion of the project was the ability of the alliance to adjust and respond quickly to significant scope change. The project scope needed to align with multiple stakeholders whose requirements were often competing with each other and extended beyond typical scope.

Key to addressing these challenges was the excellent relationships with key stakeholders. Aware of the critical importance of managing complex political and stakeholder issues, the alliance embedded owner participants in key positions to ensure owner objectives were achieved. This gave the owner participants the ability to directly influence and control project outcomes. Embedding personnel into the alliance also ensured the owners’ standards and objectives were met not only in terms of lowering long-term maintenance and operational costs, but also in terms of behaviours demonstrated in the delivery of the project.

Another challenge facing the project was dealing with procurement and engineering resources during a period of intense competition. Innovative design and well-managed cost and risk outcomes resulted in good budget control and significant savings. The project team also applied innovation in the construction technique of the project. Although the alliance could not control specified standards and certain owner participant requirements, there was scope to improve construction methods, select material or component alternatives and change geometric positioning, all at the discretion of the design team.

A number of significant outcomes were delivered in this way including: optimising road and rail alignments to minimise earthwork costs and retaining wall costs; substituting alternative retaining wall systems with more cost effective ones (e.g. reinforced earth walls in lieu of bored pier walls); revising drainage design and traffic control to eliminate pipe jacking and; avoidance of tree clearing by realigning cycle paths to suit.

Horizon demonstrated its use of innovative thinking and practices to deliver significant changes in performance compared with industry ‘business as usual’. The DSTC-Stage 1 project was required to conform to Queensland Rail specifications for the rail portion of the works and Transport and Main Roads specifications for the road elements. Rationalising these different standards for elements that were common to road and rail presented significant challenges. Notwithstanding such challenges, Horizon delivered innovative solutions within set parameters and controls of the alliance framework.

4 Complexity, Difficulty and Optimisation of the Construction Task

Leading the way for construction – the first integrated road and rail project

Road and rail alignments are not typically constructed in the same corridor at the same time. Often one will precede the other dictated by demand and available funding. Whichever mode comes first will then largely set the horizontal and vertical alignment constraints for the latter, often resulting in construction cost inefficiencies because of incompatible geometric standards. One of the common outcomes of this sequential development, as opposed to parallel, is the need for significant quantities of cost retaining walls and the duplication and suboptimal location and of road and rail systems infrastructure.

In the case of DSTC- Stage 1, the engineering teams were able to overcome these deficiencies by designing and constructing both road and rail alignments at the one time. However, the team still faced significant challenges to fit both the road and rail alignments within the existing corridor, given the sometimes incompatible vertical and horizontal alignment parameters of road and rail.

The development of the road and rail in an alliance environment allowed the interfaces between road and rail to be optimised. Working in an environment where Queensland Rail and Department of Transport and Main Roads (TMR) have equal status allowed decisions to be made in the best interest of the overall project. Some examples of the benefits of this process included:

Construction cost benefits – by agreeing common standards (specifications) for the road and rail earthworks, both the road and the rail formation could be constructed at the same time, more cost effectively. This allowed considerable construction efficiency in areas where the rail alignment were close to the road and particularly in the case of retaining wall and noise wall designs and where the future rail corridor was used for temporary traffic diversions. Judicious use of reinforced concrete road rail separation barriers (first use on a combined project in SEQ) allowed closer separation distances between road and rail alignments thus reducing earthworks and the extent of transverse drainage elements.

Operational benefits – coordination between the road and rail requirements for items such as security fences, noise barriers, environmental treatments, drainage etc. delivered overall efficiencies by agreeing sensible asset ownership allocation and eliminating duplication of treatments. This also allowed the delivery of higher quality outcomes e.g. improvement of road and rail runoff water through common sedimentation treatment ponds.

Maintenance benefits – by considering the future maintenance tasks, access could be provided in such a way that maintenance could be conducted more efficiently (e.g. allowing access to the rail corridor from motorway emergency stopping bays). In addition, the boundary fences were located so that the need to maintain areas, where access is

problematic, was minimised e.g. avoiding allocating vegetated areas to the railway in the middle of the motorway interchanges.

Meeting the challenges and complexities

Integration challenges

Successful integration of the requirements of two transport infrastructure agencies, Queensland Rail and TMR challenged the ability of all the Horizon partners and personnel at all levels to influence project outcomes via innovative ideas or perceived opportunities for improvement.

With multiple local and state road upgrades requiring design, procurement, construction and commissioning across multiple sites, the challenge for Horizon's project management was to engender a culture of innovation and strategic thinking within an environment of budget and timeframe constraints, safety consciousness, environmental sensitivity and community awareness.

Horizon was required to meet and overcome a number of integration challenges that included:

- Responding to two owners (Queensland Rail and TMR)
- Integrating two modes of transport (rail and road) in the one corridor – for the first time in Queensland
- Combining the expertise and systems of two large design houses and a contractor, resulting in greater innovation and access to complementary skills
- Developing systems and processes that combined value from all the parent organisations
- Developing and implementing an independent verification model that eliminated the need for man-marking and duplication of effort
- Coordinating with eight other large construction projects occurred simultaneously and nearby, including the Ipswich Motorway upgrade and the Corinda to Darra rail upgrade
- Being a strong and reliable participant in the Western Corridor Guiding Coalition, created to manage the numerous interfaces between the major projects being undertaken within this 'hot spot' of activity.

Economic complexity

Construction commenced at a time of high-level scrutiny of government delivery of public transport, a construction 'boom' in Queensland and the Global Financial Crisis (GFC). Construction workers were in short supply and commodities prices were high, which placed an increased focus on the recruitment and retention of workers and procurement of engineering resources.

Horizon's delivery model allowed the team to innovate and value-engineer design to ensure budgets were not exceeded while still delivering the required functionality. The sudden halting of escalation due to the GFC, and the ability of the project to procure plant, materials and subcontracts at lower prices than were available from the market when the TOC was being developed, resulted in good budget control and significant savings.

Geographic complexity

The project took place in a busy area, directly impacting thousands of households and businesses as well as schools and community groups. Eight other large construction projects occurred simultaneously and nearby including the Ipswich Motorway upgrade and the Corinda to Darra rail upgrade. This presented challenges around project confusion and community and stakeholder engagement fatigue.

With multiple local and state road upgrades requiring design, procurement, construction and commissioning across multiple sites, the challenge for Horizon's project management was to engender a culture of innovation and strategic thinking within an environment of budget and timeframe constraints, safety consciousness, environmental sensitivity and community awareness.

This had to be done while keeping the existing integrated road and rail infrastructure fully operational to ensure minimal impact on traffic and commuters during construction.

Horizon met the challenge head on. In addition to a mammoth, overarching project management challenge, there were myriad complex issues requiring skilful and innovative resolution by project managers and at an individual level.

Flexible and responsive

A unique challenge for Horizon was the need to respond to multiple asset owners (two state Government and one local Government). This was further complicated by a major mid-project restructuring of the client government departments. Horizon transformed itself many times in focus and size during the DSTC Project's definition phase due to a range of client-driven factors such as project scope, ultimate project cost and cash flow constraints. It was initially set up to deliver the full DSTC project, then redirected to deliver just Stage 1, a reduction to one third of the original scope.

Horizon demonstrated its ability to progressively and dynamically respond to these changes in a timely and cost effective way by proactively developing organisational frameworks for alternative futures ready for when decisions were made. In doing this the alliance adapted the Alliance Charter, organisational structure and commercial arrangements in response to each new challenge.

Construction Methodology

Construction management was undertaken in accordance with the requirements of the Construction Management Plan. The plan reflected the requirements of the Project Brief and detailed the methods and personnel to be utilised to control the quality, cost, timing and integrity of the construction activities.

The project was divided into discrete geographical portions with each portion overseen by an Area Construction Manager and supervised by a Construction Superintendent.

Construction activities for the Stage 1 project were managed via Construction Activity Packs. Construction Activity Packs are created to ensure all documentation required for construction are finalised prior to the commencement of the works.

The Construction Manager with the assistance of relevant Discipline / Area Managers developed Construction Activity Packs for specific locations and / or construction activities.

Construction Constraints

The main constraint to the construction of the project was the need to maintain traffic flows through the site whilst keeping the worksite safe for workers. A comprehensive Traffic Management Plan was developed, in conjunction with TMR, and successfully implemented for the project.



Other key constraints were the need limit environmental impact of the project upon the community and upon local flora and fauna. To address these issues, environmental and community management plans were developed and successfully implemented.

Project Staging

The project site was divided into discrete work sections according to the following features: Garden Rd, Progress Road, Waterford Road, Julie Road and Bullock Head Creek and its tributary. These features formed natural boundaries and imposed restrictions to access to the work zones. The project program structure was developed to align with these discrete work sections.

In order to construct the project whilst keeping the road network functional, it was necessary to break the job down into a series of stages. Through an iterative process of design and constructability reviews, it was decided to construct the project into six individual stages.

The main body of work for the project was undertaken in Stage 2 and Stage 5.

The six project stages were then further defined or divided by traffic switches/configuration changes which were required to allow work to transition to the next work area. The construction program was driven by these milestones.

The alignment of the existing Centenary Highway essentially crossed from the west side of the corridor to the east side of the corridor mid way along the length of the project (i.e. south of Bullock Head Creek the existing Centenary Highway was located on the western side underneath the future rail alignment). To the north of Progress Road the existing centenary highway was located underneath the south bound side of the future alignment. This effectively divided the project into quadrants of work with the north the mirror reverse of the south.

Due to limited space within corridor and with the need to have temporary diversion road alignments in accordance with acceptable design standards, it was also necessary to stage the construction of the bridges. The following sections provide additional detail on the works associated with each project stage.

Stage 1 – Construction of diversion roads enabling the construction of bridges

Stage 1 was essentially the enabling works or temporary works providing access to the site and creating space enough to build as much as possible of the permanent works. Specific element included:

- Garden Road off-ramp – the existing ramp’s meandering alignment was straightened and pushed against the eastern corridor alignment to provided access for construction of the new ramp RSS walls
- Garden Road on-ramp – the existing ramp was diverted to create space required to allow piling of the bridge to be undertaken
- Centenary Highway through under existing Garden Road on-ramp – to enable construction of the western abutment of the Garden Road bridge the highway was diverted to the east
- Centenary Highway through under existing Progress Road bridge – to construct Stage 1 of Pier 1 of the Progress Road bridge the Centenary Highway was diverted to the west
- Progress Road off-ramp – A widening was installed at the top of the Progress Road off-ramp to enable construction of the new ramp. Although this work was originally planned and shown in Stage 1, this work was not critical and performed at a later stage.

Stage 2 – Construction of sections north and south of Bullock Head Creek

Stage 2 entailed works directly to the north and south of Bullock Head Creek. Specific elements included:

- **Southern section- South of Bullock Head Creek to Logan Motorway**
Bridges in the southern section including the road bridges over Bullock Head Creek and Waterford Road were constructed entirely off-line during Stage 2.

- **Northbound and Southbound Centenary Highway**

The alignment of the existing highway meandered such that it encroached upon the southbound side of the permanent alignment between Bullock Head Creek and Waterford Road. The whole of the northbound carriageway, with the exception of the short section just north of Waterford Road was constructed in Stage 2. Due to the need to stage a new deep drainage line across the whole alignment (without using pipe jacking), a batter slope was required to be left in the first stage that encroached upon the northbound carriageway. A minor deviation and narrowing was installed at the culvert crossing location. The remainder of the southbound carriageway between Bullock Head Creek and Waterford Road was built at a later stage (Stage 5).

- **Northern Section – North of Bullock Head Creek**

North of Bullock Head Creek the existing Centenary Highway alignment was situated on the opposite side or western side of the corridor. This meant that the north of progress the south bound carriageway was constructed first in Stage 2 and similarly, the northbound at a later stage (Stage 5).

The following bridges commenced during Stage 2; Bridges - Progress Rd on-ramp over Centenary Highway - top-down construction. Piling and superstructure, Progress Road Bridge Stage 1 over Centenary Hwy, stage 1 top-down and Garden Road on-ramp and part of Garden Road off-ramp commenced during Stage 2.

Temporary ramp connections were required due to overlapping alignment of existing and new ramps. An innovative solution was employed whereby the RSS wall was constructed and backfilled over. The face of the RSS wall was protected with geofabric so that when uncovered it would be clean and unmarked. A number of precast parapet sections were left out of the first installation in the area where the temporary ramp alignment crossed the permanent parapet line. However, the footings for the parapet were constructed and covered over in the temporary pavement. The pavement transitioned off the partly completed permanent pavement at the top of the bridge departure onto the temporary pavement of temporary embankment.

Stage 3 – Garden Road on-ramp, Progress Road on-ramp

Stages 3 and 4 contained less work than Stages 2 and 5 and effectively were the transition to moving traffic to permanent pavement by completing pieces unable to be reached in Step 2. Specific elements included:

- Opening of the new Garden Road on-ramp, removal of the existing on-ramp and the continuation of the construction of bridge walls. Once the new Garden Road on-ramp bridge was completed traffic was diverted onto it allowing removal of the old ramp and bridge. This in turn allowed completion of the remainder of the off ramp bridge.
- Progress Road on-ramp opening and excavation for the rail formation below. The original plan was to open the Progress Road on ramp in Stage 3 and to commence excavation underneath. However, to accelerate the program by excavation underneath quicker it was decided to excavate the first two- three metres under the bridge before the girders went on. The excavation could then effectively commence earlier and would also incorporate the preparation of the crane pads for the lifts ensuring an overall reduction in the program duration for bridge construction and opening.
- Excavation between the piers commenced and it was discovered once uncovered that the piles were not entirely sound. Investigation and remediation works had to be undertaken on the piers.
- The issue with the piles resulted in the requirement for the additional time that it would take to expose and fix the problem. As a result the staging was changed to suit. The north bound and south bound traffic were split temporarily in this stage to allow the south bound connection. The south bound traffic remained on the existing pavement.

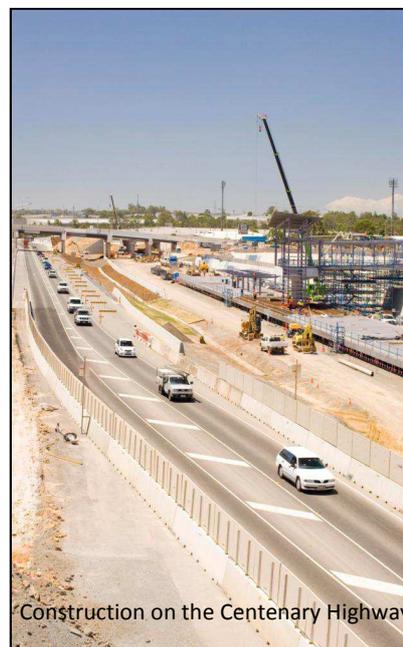
Stage 4 – Progress Road on-ramp

Step 4 works were essentially a continuation of Step 3 however, key changes were made to complete the lateral switches in Zone 4 at the base of the Progress Road on-ramp. Traffic was basically moved over in a sequence between Stages 3 and 5 as works were completed.

Stage 5 – Centenary Highway Works

During Step 5 the bulk of the remainder of the scope of the civil works was completed. To enable Step 5 the traffic was switched onto the new permanent pavements completed in previous steps. Specific elements included:

- Construction of the Northbound Centenary Highway between Progress Rd off-ramp and Garden Road on-ramp.
- Completion of the remainder of the Garden Road on-ramp.
- Construction of the rail formation from Bullock Head Creek to the south.



Stage 6 – Remaining Road and Rail Works

At the completion of Stage 5, all road areas required to complete the projects' scope of works had been accessed and works essentially completed, except Garden Road on-ramp departure. Pavement had been completed in all main line areas to the underside of wearing course level. Therefore, in Stage 6 the roads team's efforts were focused on laying the final wearing course over the most of the completed work areas. The only earthworks and drainage component of road works left to be completed in Stage 6 was the Garden Road on-ramp departure. The overlap of the permanent and existing ramps design had meant that the steps to be completed ran out until Stage 6 for that particular ramp.

A variation had been agreed for the use of Stone Mastic Asphalt (SMA) on the main line pavement areas i.e. Centenary Highway. Originally the pavement wearing course for the main line areas of the project was an Open Graded 10mm mix (OG10). Ramps pavement designs remained as originally specified; Dense Graded 14mm mix (DG 14).

To complete the main line SMA areas, a staging based on the use of traffic cross-overs was developed whereby two-way traffic was diverted onto the northbound or southbound side of the permanent carriageway leaving the other side free for pavement overlay works. The crossovers were only in place in the day time during asphalt works. Traffic was split during the night to address TMR's concern in leaving opposing traffic on the same side of the permanent works during non-work times and when the project's full resources were not in attendance.

The other key component of work undertaken in Stage 6 was the rail systems work. At the completion of Stage 5, the rail capping and conduits were completed. The rail team could then come in to install the overhead traction power, track work and signaling. This work basically commenced from the north and worked south. Overhead work was done first with rubber tyre vehicles, followed by track and signals.

Adjustments required to the staging during construction

In late 2008, the ALT challenged the project team to commit to completing the project five months early, i.e. to bring the completion date from April 2011 to November 2010. The project team subsequently committed to the challenge. The willingness to commit to the revised milestone date was achieved after scrutiny of the program and staging revealed opportunities to accelerate the program.

One critical change was the realignment of the temporary diversion under the Progress Road bridge so that the second stage of Pier 2 could be constructed with the traffic along side. Previously the switch was delayed until the pier was completed. This saved approximately two months in the program.

The most notable or main change to the staging and program that was required during construction came from the geotechnical problems experienced during construction of the Progress Road on-ramp bridge. Progress Road on-ramp bridge was planned to be constructed using a top-down method. This was because the existing ramp was to remain open whilst the new ramp was constructed beside it.

Once the new bridge was complete, traffic would be diverted onto it and excavation of the ground under and the existing ramp beside would then take place.

However, due to delay caused by the problems with the piles, the ramp could not be opened on schedule and traffic remained on the existing ramp for approximately four months longer. To accommodate this change without adversely affecting the remainder of the project program, the staging of how the ramp tied in to the main line centenary road works below and to the local road works above had to be adjusted. This was achieved, effectively isolating the problem and avoiding delaying the whole project.

5 Targets and outcome

Time outcomes

The initial program developed for the project identified the end of April 2011 as the target for project completion. Following the commencement of construction, the Alliance Leadership Team proposed that the completion program be accelerated by five months to complete at the end of November 2010. Horizon successfully rose to the challenge and reached practical completion on 23 November 2010.

Cost outcomes

Innovative and thorough management of the scope of works and risk management was the foundation for the successful cost management of the project under the alliance delivery model and this allowed the project to be completed significantly under the allocated budget.

In addition, strong risk management processes in accordance with Australian standards and cutting-edge industry practice (set up during the project definition phase and undertaken throughout the project delivery to completion) underpinned the strong scope management process to place the Horizon PMT in position to provide reliable cost reporting at every level.

Environment outcomes

Horizon achieved excellent results in the management of environmental risks. Good outcomes included the project response to alligator weed discovered at Bullockhead Creek. Horizon was able to liaise with Brisbane City Council (BCC), TMR, Queensland Rail and the Queensland Government to develop a long-term management plan to eliminate and control the potential return of alligator weed at this location. Horizon also performed well in obtaining timely state environmental and planning approvals.

Environmental factors played an important role in the design and construction of Stage 1 and were grouped into two major categories: Sustainability and Environmental Care.

Sustainability - range of civil structures were designed to incorporate additional features that would minimise whole-of-life energy use and provide a measure of future proofing. Sustainability initiatives were incorporated throughout the 6.4km corridor at site crib rooms and storage areas as well as the main site office. These sustainability aspects were incorporated into the construction initiatives such as site office design and fit out – e.g. natural cooling options (high roof shading over entrances and common areas, use of natural ventilation where possible), rainwater tanks, energy efficient lighting, and readily de-constructible design to minimise the difficulties and energy required to move the buildings upon completion of the project, recycled water use, recycling waste and haul routes – were selected to minimise the impact upon local residents and motorists and assist in reducing emissions by maintaining a smooth, efficient traffic flow. The project used cutting edge newest methods of construction intended to improve efficiency, performance and reduce construction waste.



Richlands Station public concourse

Environmental care - upgrading of the Centenary Highway and a new rail link that formed the Stage 1 project brief required the removal of almost all remnant vegetation within the corridor. Offset of these losses in the medium to longer term was addressed by initiatives such as re-vegetation, maintenance of fauna migration patterns (including cross-corridor fauna crossings) as project based investigation of movement patterns of larger native fauna confirmed Bullockhead Creek as a major east–west corridor for a wide range of larger Australian fauna, maintenance of short term and long term water quality in local waterways. Civil works were compliant with best standard practice in construction management, including longer term compliance with Water Sensitive Urban Design principles. The project was delivered without a single discharge violation.

Quality outcomes

Horizon’s quality performance on this project was exemplary as demonstrated by the final KRA results achieved, which are shown below

Key Performance Indicator	Actual performance
Effectiveness of the quality process	OUTSTANDING
Cost impact of defects in project works	OUTSTANDING
Timely close-out of conforming primary lots (including all Secondary Lots)	BEST PRACTICE
Timely disposition of NCR's	OUTSTANDING
Quality of presented works at hold point	OUTSTANDING
Quality audits	OUTSTANDING

The above represents an outstanding result on a project of the scale and complexity of DSTC - Stage 1. An Independent Verifier was used on the project by the client to ensure compliance with specifications and client expectations, often not the same thing. Throughout the project, the Independent Verifier and his team audited 100% of work lots amounting to tens of thousands of documents. Each work lot was deemed 100% compliant by the end of the project ensuring an easy and hassle-free handover to the client.

Safety outcomes

Some of the greatest safety achievements for the project came in the form of Lost Time Injury (LTI) hours. LTI-free hours were highly regarded on the project with major milestones recognised and celebrated by the whole team. In September 2010, the project reached the significant milestone of achieving one million man hours LTI-free. By the end of the project, this figure had surpassed 1.2 million man hours.

Some of the key challenges facing the project were:

- Integration of different safety systems – for example, Queensland Rail’s safety specifications were different to the constructor’s standards and needed to be adapted to jointly meet legislative requirements in a consistent manner.
- The project took place in a busy geographic area, directly impacting thousands of households and businesses, as well as schools and community groups. Eight other large construction projects occurred simultaneously and nearby, including the Ipswich

Motorway upgrade and the Corinda to Darra rail upgrade, presenting challenges in terms of the management of public safety.

- The project involved a number of different subcontractors. Horizon needed to ensure contractors did not introduce unacceptable risks to the workplace and different levels of supervision were required.
- As an integrated road and rail construction project there were multiple potential hazards within workplace activities and therefore establishing, implementing and maintaining the right processes for hazard identification, assessment and control was critical.

Community outcomes

Horizon led a comprehensive stakeholder and community engagement program from inception to delivery - informing, consulting and engaging more than 25,000 local households, businesses, special interest groups and government stakeholders. Over the past 12 months, John Holland has won seven state and national awards for community engagement and communications excellence, placing Horizon at first place in the industry, for the delivery of this integral component of project work.



A final independent survey of local residents and businesses in September 2010 revealed: project awareness 98% (community); satisfaction with timeliness and information received 91% (community), 100% (business).

The extensive and genuine consultation process resulted in: community support for the project and consequently no construction delays; Positive or neutral media coverage of the project; and general acceptance by all parties of the changed scope.

Communication initiatives on the project were excellent, with a number of different social activities, team building exercises and awareness campaigns over the course of the project. Social occasions, fundraising initiatives and staff BBQs were integral communication initiatives providing a positive work culture amongst the workers.

The project not only proved to be an outstanding commercial success but also achieved excellent outcomes in employee relations. The positive culture and atmosphere that existed within the project team was truly a highlight of the project.

The sense of stakeholder and community ownership and satisfaction was evidenced in market research and praised when Richland Station was opened early to assist in the south-east Queensland flood recovery effort.

Built as part of the South East Queensland Infrastructure Plan and Program (SEQIPP), the project has been described as a success and a win for the Government and the community which has been seeking alternative transport options for years. The benefits to the community have been abundant, including new transport options for residents and businesses, improved safety, improved traffic flow, local access, and shorter travel times. The new rail service is complemented by new bicycle, road and pedestrian transport options enhancing the role as a public transport interchange development.

Stakeholder testimonials

- “Great to see the work that has been done - HUGE IMPROVEMENT and can’t wait to be able to catch the train from just up the road from my house” – C Spencer
- “Our community has been greatly looking forward to the station opening and residents can now start using this line” – Member for Inala Annastacia Palaszczuk
- “It’s part of a vital new rail corridor that will service one of Brisbane’s fastest growing regions and ultimately extend to Springfield by 2013” – Member for Inala Annastacia Palaszczuk
- “I think the 650 car parks are going to be particularly important in helping cut non-essential car travel into to the city” – Transport Minister Rachel Nolan
- “...residents in this area...will have convenient access to fast and efficient public transport for the first time” – Member for Inala Annastacia Palaszczuk, and
- “Just 15kms from Brisbane’s CBD, Richlands is a small, yet steadily expanding suburb between Darra and Inala. Construction has begun on the new railway line with 650 car spaces, assuring the suburb of future development in the future!” – QMT Realty on www.domain.com.au (2009)
- “The Ipswich line is the only rail link still not operating fully...the early opening of Richlands Station will provide another option for local residents to access the CBD” – Premier Anna Bligh.

People outcomes

The DSTC –Stage 1 was an exemplary project, clearly demonstrating excellence in leadership, behavior and innovation while providing outstanding value-for-money for the client and delivering world-class road and rail infrastructure for the public.

The alliance was formed pre-GFC, when capable people were in high demand and the owners wanted to ensure continuity of the team over the life of the project. To address the resourcing issue, Horizon established a workplace agreement with inbuilt worker retention strategies.

Horizon also implemented a comprehensive program to manage and support the development of a peak performance alliance culture, which was maintained throughout the project and life of the alliance. Horizon maintained the team’s unity, enthusiasm and focus on its vision when some of the most challenging economic, political and commercial situations tested individual and team motivation.

Leaving a positive legacy

Horizon delivered world-class industry education and training. Horizon demonstrated a commitment to delivering continuity and development of its people to ensure it left a positive workforce development legacy for the local community.

Horizon completed more than 300,000 hours of training for compliance with the Queensland Government's Building and Construction Structured 10% Training Policy, with more than 75% of Horizon's workforce enrolled in formal training within the construction industry.

Horizon invested strategically in the training and development of the project team, through the delivery of a range of different training initiatives, including:

- 53 staff members completed Diploma of Project Management qualifications
- 28 supervisors and leading hands completed Cert IV in Civil Construction
- 39 workforce members completed Cert III in Civil Construction courses in Bridge, Road, Plant & Pipe-laying
- Four indigenous trainees completed Cert II in Civil Construction, and
- Two indigenous trainees completed Cert III in Business Administration (Bremer TAFE).

Horizon also delivered outstanding sustainable outcomes and support to the local industry by purchasing the majority of goods and services within the local area. Horizon recognised the vital importance of developing a more productive local economy.

6 Conclusion

DSTC - Stage 1 was the first major integrated road and rail project for south-east Queensland. Integration was a crucial accomplishment due to the fact that many elements of work were common to both road and rail (such as cross drainage and overpass bridges) and were not easily separable during construction.

The project was constructed as a single process even though half the assets were located in the road corridor and the other half in the rail corridor. Efficient construction processes were created instead of undertaking one half of the operation under one set of standards and the other half under a different set of standards. The acceptance of a common standard will be a long-term benefit to the Government where future projects have similar road and rail interfaces.

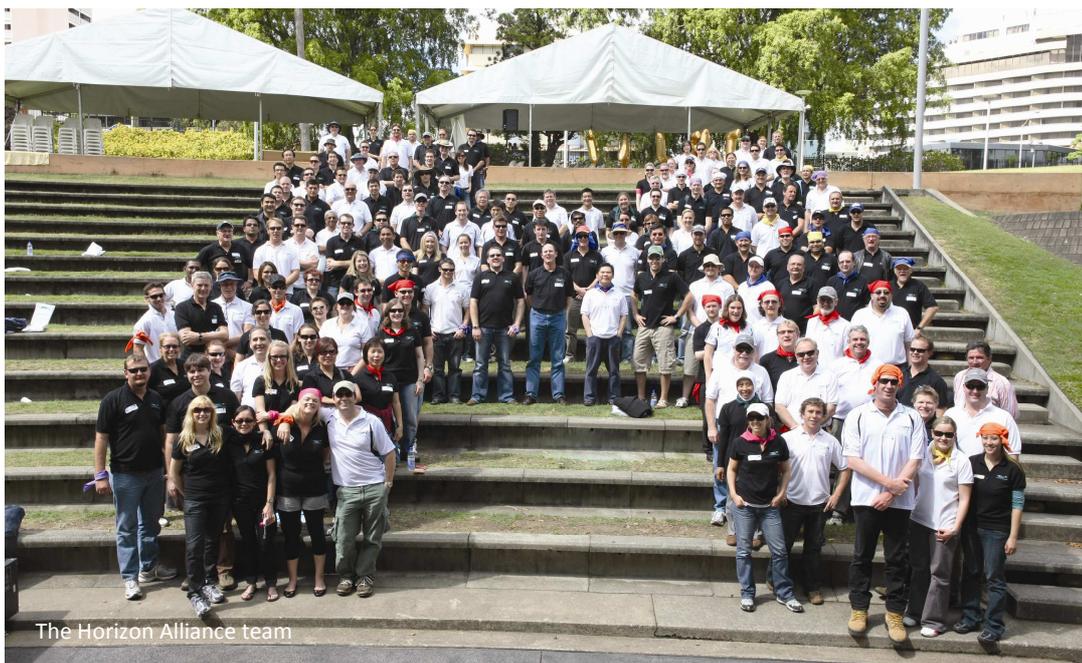
The construction works were located beside and over the busy Centenary Highway and around local roads and businesses presenting significant challenges to maintaining high safety, quality and environmental standards and excellent community relations.

In respect of the engineering aspects of the project the team produced a myriad of outstanding results as would be expected on an \$800 million multidisciplinary infrastructure project.

The DSTC-Stage 1 project represents best practice in a range of areas, which have been described in the previous section on benchmarks for Australian engineering. In regard to world's best practice the following areas would qualify for this accolade:

- The engineering of a combined road and rail facility within a constrained single corridor and the construction of the facility under traffic and the influence of multiple adjoining projects,
- The project's outstanding safety culture and performance,
- The project's significant contribution to the community and the professionalism of the stakeholder engagement processes , and

- Delivery of the project within a complex environment and for two independent transport infrastructure agencies.



The Horizon Alliance team