

## Ipswich Motorway Upgrade Dinmore to Goodna Project



### **LOCATION:**

Brisbane, Australia

### **SUBMITTING FIRM:**

Parsons Brinckerhoff (PB) and  
SMEC Australia (SMEC)

### **FIDIC MEMBER:**

Consult Australia



International Federation of Consulting Engineers



# Ipswich Motorway Upgrade: Dinmore to Goodna Project



## Contents

- **Project Summary**
- **Key Features of the D2G Project**
- **Key FIDIC Judging Criteria:**
  1. Innovation
  2. Quality
  3. Professional Excellence
  4. Transparency
  5. Integrity
  6. Sustainability
  7. Respect for the Environment
- **In Summary**



## Project Summary

- The \$1.95 billion Australian Government funded Ipswich Motorway Upgrade: Dinmore to Goodna (D2G) Project was one of the most complex road infrastructure projects ever undertaken in SE QLD, Australia;
- The D2G Project was delivered 6 months early and approximately 10% under budget by Origin Alliance (OA) despite the devastating impacts of the January 2011 floods in QLD;
- During the floods, 40% of the motorway was submerged for 4 days. The main project site offices were inaccessible for 4 weeks. The potential lengthy delays these issues created were overcome through innovative construction programming and scheduling as well as OA's excellent working relationship across the entire project team;
- Established in June 2008, OA was the largest road alliance in Australia. On the D2G Project, it faced a number of key challenges including:
  - » An extremely narrow construction corridor, with QLD Rail Assets / Brisbane River on one side and established industrial / business / residential premises on the other;
  - » Upgrading the motorway under live traffic conditions of around 90,000 vehicles per day, with a mandatory requirement to keep 2 lanes of traffic open in both directions during peak travel periods;
- As part of OA, Parsons Brinckerhoff (PB) and SMEC Australia (SMEC), both of which are members of Consult Australia, were responsible for the design of the D2G Project working as part of a fully integrated on-site team;
- Other members of OA included Abigroup Contractors, Fulton Hogan, Seymour Whyte and the QLD Department of Transport and Main Roads (DTMR);
- Given the size of the alliance, it was vital the 6 OA partners and 1,200 strong workforce (at peak production) worked collaboratively to solve the D2G Project's complex design, engineering, and construction challenges;
- Prior to commencement of the D2G Project, 5 Key Results Areas (KRAs) were agreed by OA / the client. Upon Practical Completion (June 2012), OA had achieved the following performance:

Key Result Area	Scores Out of 10
KRA 1 – Traffic Flow Safety	10 (classified as outstanding)
KRA 2 – Traffic Flow Reliability	9.5 (classified as outstanding)
KRA 3 – Community & Stakeholder	8.4 (classified as outstanding)
KRA 4 – Connectivity & Access	7.8 (classified as outstanding)
KRA 5 – Design Optimisation & Maintenance Minimisation	7.5 (classified as outstanding)

## Key Features of the D2G Project

- The original Ipswich Motorway had evolved over many years. It was subject to significant periods of peak traffic congestion and had one of the worst motorway accident records in QLD.
- Although the motorway no longer met modern roadway standards, there was little room for OA to drastically change the motorway alignment. Instead, OA had to improve the motorway's operation through improved design, geometry, engineering, and construction solutions.
- **Key features of the upgrade included:**
  - **Widening of existing motorway corridor** – from 2 to 3 lanes in both directions, with room for 4 in the future using network managed hard shoulder running;
  - **7kms of new service roads adjacent to the motorway** – to separate local slower moving traffic from fast flowing motorway vehicles;
  - **24kms of shared pedestrian / cyclist facilities** – to improve local connectivity, provide better access to public transport;
  - **26 new bridge structures** – including 5 over-motorway shared pedestrian / cyclist bridges (with anti-projectile containment steel throw screens) plus 2 under motorway connections;
  - **2 motorway-to-motorway upgraded interchanges** – to provide safer, more effective vehicle access to the Warrego / Cunningham Highways; and
  - **Intelligent Transport System (ITS)** – to provide increased driver safety / road conditions information to motorway users, ensure more effective future motorway management.

## Key FIDIC Judging Criteria

### 1. Innovation

Innovation was a key factor in OA delivering the D2G Project 6 months early / approximately 10% under budget. The range of design, engineering, construction, OH&S, and project management solutions developed by OA have the potential to significantly improve key aspects of the Australian construction industry in the long term:

#### Proprietary Project-Wide Information Sharing System (OriginMap)

- OA developed its own unique information sharing system, OriginMap, which was based on a unique mix of Virtual Design & Construction, Building Information Models, and Geographical Information Systems technology;
- During the life of the project, there were 72,000 recorded sessions of OriginMap and production of around 17,000 PDF maps and drawings, all of which delivered significant benefits across the entire project including:
  - Cost saving of approximately \$3.7 million;
  - Significant time savings;
  - Improved planning of works to optimise workforce / public safety;
  - Better support for planning of works to minimise overall impacts on motorway / local traffic during construction;
  - Faster response to external issues due to the community being able to 'experience' what it would be like to drive on the upgraded motorway via realistic, gaming style, 3D visual models;
  - Improved design feedback / final design due to the entire project team having quicker / easier access to all project data;
  - Easier identification of alternate routes for local traffic during major construction works; and
  - Use of OriginMap as an effective desktop review tool which allowed environmental sensitivity / other key environmental criteria to be overlaid on proposed work zones to confirm / mitigate any potential issues / conflicts.

### Successful Remediation of Abandoned Underground Coal Mines

- OA formed a highly effective sub-alliance to protect the Ipswich Motorway from future subsidence due to 3 abandoned coal mines being located under the construction zone;
- The required mine fill elements were on D2G Project's critical path with the risk of daily delay penalties of up to A\$1 million;
- At a cost of A\$78 million, this was the largest mine fill operation ever undertaken by the Australian road industry. It required OA to work at the forefront of engineering practice due to there being no previous project of a similar size/scope in Australia;
- The mine remediation works required significant innovations across rock mechanics, mine engineering, soil/structure interaction, soil mechanics, geotechnical, management of mine gas and groundwater;
- Successful remediation of the 3 mines eliminated the risk of a potential motorway collapse and potential project delay of up to 12 months;
- The unique mine remediation technologies developed by the sub-alliance set new benchmarks in the management of aged underground coal mines in Australia / globally;
- The mine remediation works were completed on time and approximately 10% under budget.





### Unique Alliance Structure

- From the outset, DTMR designed the alliance framework to allow the 6 partners to work collaboratively together and effectively share lessons learnt from across a large, geographically widespread project;
- In an Australian first, DTMR selected the 5 organisations it wanted to work with (2 designers, one principal contractor, 2 medium sized contractors) and then asked them to establish an alliance;
- DTMR chose this approach in order to ensure the alliance members gained new skills, knowledge, and experience from working with each other. This was particularly true for the 2 medium sized contractors which were exposed to a 'mega' billion dollar project;
- As part of the alliance establishment process, a decision was taken to improve project governance by separating the customer / funder / project delivery roles. This enabled OA to focus more intensely on project and scope management.

### Highly Effective On-Site Culture

- This unique approach taken by DTMR created a real pressure for people to work together cohesively / collaboratively even though they did not necessarily know or trust one another. They also had to deal with the challenge of having to embrace new processes, policies, and procedures as part of a totally new on-site culture within a very short period of time;
- In order to bring 1,200 people together from 6 very different / diverse organisations, the project team developed the 'OA Way' which required everyone on site to leave their home organisation persona at the site gates and commit 100% to being part of OA.
- The 'OA Way' was based upon 3 key criteria:
  - » **Respect** – for team members; alliance partners, project, stakeholders;
  - » **Accountability** – for your own safety / those around you with the training, knowledge, resources, tools needed to work safely provided by OA. Everyone was encouraged to question processes/report all incidents. Creation of a no blame culture. People worked safely because they understood the risks not because they had to.
  - » **Pride in your work /your contribution to project** – demonstrated daily through quality of work, state of construction site, positive interactions with community, site wide collaboration.
- The 'OA Way' gave everyone on site a voice / chance to be heard / have input into the project. It also included use of an OA Charter / 10 Golden Rules (which everyone had to sign up to as part of their induction process), which highlighted the desired behaviours everyone was expected to demonstrate on a daily basis. Both of these documents were displayed prominently / frequently across the entire project site;



- Other key elements of the 'OA Way' included:
  - Mandatory requirement for everyone (including Alliance Manager) to wear the OA uniform while on site;
  - Use of an on-site dedicated Alliance Health Coach to reinforce OA's unique culture;
  - Implementation of a comprehensive internal communications program;
  - Regular formal / informal team building activities team by team / across the entire project team;
  - Use of a behavioural change (Finishing Strongly / Don't Drop the Ball) program to ensure everyone worked safely / productively during the final 12 months of the project (when incidences tend to spike due to people pushing hard to reach completion);
  - Development of specific education campaigns to mitigate identified behavioural issues as they arose during construction (eg working in / around electrical cables);
  - Regular employee events at the on-site Visitor Experience Centre to celebrate people's individual / team contribution to the project. These allowed the workforce to 'show off' to their family / friends;
  - 6 monthly site-wide OH&S / wellbeing surveys to track the effectiveness of OA's unique on-site culture.
- During the life of the project, the Alliance Manager / AMT / ALT led from the front by:
  - undertaking a minimum of 2 x site inspections/ safety observations per month;
  - attending a minimum of 1 x 6am tool box per month;
  - attending a minimum of 1 x 6am pre-start meeting per month;
  - participating in the site-wide SafeSpine program;
  - undertaking OA's Pinnacle Safety Leadership training which was compulsory for the entire Project Team);
  - participating in all internal on-site events;
  - providing in-person weekly/monthly project updates to the workforce/project team;
  - attending daily, weekly, monthly Construction/Design/Quality/Community Engagement/ ITS/Environmental Management/Commercial team meetings to ensure they were fully aware of what was happening at all times;
  - using mentoring / coaching as an integral part of the OA Way (this helped achieve 8 internal promotions of field / office staff during the D2G Project);
  - publicly acknowledging / rewarding those who went 'above and beyond' to achieve 'best for project' outcomes (total of 400 people were rewarded during life of D2G Project);
  - being vocal/active champions of innovative thinking. Despite D2G Project being a high risk project, the ALT / AMT / Alliance Manager actively encouraged people at all levels to introduce new ideas / innovative work processes.
- The successful creation of a unique OA culture was a major contributing factor to the D2G Project being delivered early / under budget. It was also one of the major reasons why OA was able to recover so effectively from the impacts of the QLD floods.

### Award Winning Work Health & Safety Management System

- OH&S was a major focus for OA due to the size / complexity of the D2G Project. OA used the following innovative programs to protect / enhance the wellbeing of its 1,200 strong project team / on-site workforce and project team:
  - » **Pinnacle Safety Leadership Program** – provided 300+ key site personnel with the skills to engage/ educate/motivate their teams to work safely;
  - » **Effective incident investigation program** – supported by ICAM training of 88 key site personnel;
  - » **Safety Observer Program** – formalised the 'spotter' role to a position of control/responsibility. Within 3 months of it being rolled out, on-site near misses between people/vehicles had reduced by more than 75%. This approach is now being used on other major infrastructure projects in QLD;
  - » **SafeSpine** – mandatory, site-wide stretching / warm-up program designed to significantly reduced strains / sprains, helped maintain construction productivity. Between June 2009 / May 2012, an analysis of reported Lots time Injuries (LTI) and Medical Treatment Injuries (MTI) indicated that compared to industry averages for a project of the same size / scale, OA's sprains and strains were approximately 30% less;
  - » **Verification of Competency (VOC) process** – this extremely stringent approach set new benchmarks in competency levels for the QLD infrastructure industry;
- The D2G Project delivered 8 million man hours with no major incidents by continually monitoring its safety performance, using a framework that reflected lessons learnt, and implementing a detailed incident investigation process to prevent reoccurrences;
- As of practical completion OA's key safety criteria were classified as 'outstanding' based on the following statistics:
  - » **Project Frequency Rates (12 month rolling) – June 2012:**  
LTIFR = 0.0 MTIFR = 18.59
  - » **Project Lifetime May 2008 – June 2012:**  
LTIFR = 0.5 MTIFR = 17.1
  - » **Safety Observations = 3,792;**
  - » **Safety Inspections = 4,053;**
  - » **Site Inductions = 10,803;**
  - » **Total man hours = 8,266,639.**





### Multi-Million Dollar Investment in Training

- A key client requirement for the D2G Project was for OA to significantly up-skill its workforce / provide industry training for the local community;
- OA invested \$6.38 million in training, delivered 550,000 man training hours and achieved 2,683 accredited qualifications plus 95 traineeships which helped ensure everyone on site had the skills / knowledge they needed to work safely, effectively, and productively;
- OA also developed 2 unique training programs (Constructive Kids / Constructive Mob) targeted at local long-term indigenous unemployed / Year 12 students with obvious barriers to employment. These programs have now been adopted by DTMR as a key requirement for future major infrastructure projects.

### State-of-the-Art Traffic Management System

- Innovative traffic staging was used to minimise the impact on more than 90,000 daily motorway users as well as local roads. The overall traffic management plan involved more than 40 major traffic switches plus
- In order to meet the client's requirements that two motorway lanes (one in each direction) had to remain open during peak traffic periods, OA implemented the following innovations:
  - Use of US based technology to track travel times through the construction corridor via the Bluetooth signals from individual vehicles to ensure OA was delivering an acceptable traffic reliability / flow performance;
  - Use of 15 VMS to display high profile road safety messages along the motorway. Some of these messages have now been adopted by the Brisbane Metropolitan Traffic Management Centre;
  - Use of ROADMEMORY technology to further gauge traffic flow reliability via video, an accelerometer, and GPS to measure bumps in the road from irregularities / potholes
  - Installation of digital photography technology on traffic management vehicles to enable photos / other data to be gathered to identify maintenance issues as they occurred.

### Unique Approach to ITS

- In an Australian first, the entire ITS system was built on site. Enabled all aspects of the central control system, high / low speed networks, primary interfaces, individual devices, software, hardware and connectivity/integration with the Brisbane Metropolitan Traffic Management Centre to be comprehensively tested PRIOR to deployment;
- This approach is easily transferable, interoperable, sustainable and likely to have a significant impact on the way ITS systems are constructed, tested and installed as part of future road infrastructure projects in Australia;

### Site-Wide Use of Mobile Technology

- To help reduce OA's reliance on paper documentation / provide easy access to real time data, OA used mobile devices (iPads / SMART Phones) to share vital project data between the Project Team and site workforce while in the field;
- Use of these devices / technologies was a major contributing factor to OA recovering so effectively from the devastating impacts of the QLD floods when the majority of paper documentation was destroyed.

### Phased Project Handover Process

- Given the complexity of the D2G Project, OA developed a tailored handover process which was a major contributory factor to the project being delivered six months early;
- This approach broke the D2G Project down into 12 parcels of work which were progressively signed-off (including final acceptance by the Independent Verifier / DTMR Inspectors) prior to practical completion.

### 2. Quality

- OA met all of its required quality benchmarks within the agreed time / cost parameters by establishing QA as a High Performance Zone and setting itself challenging quality KPIs which were measured on a monthly basis. These included:
  - Inspection & Surveillance;
  - Lot Management; and
  - Non-Conformances.
- As of practical completion (June 2012), OA had achieved the following:
  - 98% lot closure rate;
  - 99% NCRs closed;
  - 99% defects closed;
  - 85% of all 'Work as Executed' drawings redlined;
  - 80% of archiving completed.
- OA's approach to QA included use of:
  - » **Quality alerts** – were distributed site-wide to reduce incidences of non-conformances;
  - » **Monthly trend development monitoring** – which identified specific issues, root causes, required rectification actions;
  - » **Weekly QA reports** – were distributed to the Construction Team to ensure an integrated approach to QA;
  - » **QA training modules for the Construction Team** – focused on specific QA processes / overall project requirements, ensured a consistent approach to OA;
  - » **QA awareness sessions** – ensured the project team/workforce understood OA's QA obligations, QA systems, and their personal responsibilities;
  - » **Weekly tool boxing of work crews** – which kept QA top of mind across entire workforce;
  - » **Robust auditing regimes** – with a total of 158 internal / external audits plus desktop supplier audits being undertaken;
  - » **Assignment of specific construction zones to Quality Team members** – which improved surveillance, site, lot verifications, auditing, IWMS / ITP reviews;
  - » **Development of responsibility matrix** – including a hold point schedule given the QA team was responsible for 55% of total hold points;
  - » **Allocation of hold points across the entire QA Team** – plus other key project Personnel which allowed the Independent Verifier to concentrate on structural integrity of motorway verifications / issues;
  - » **Stringent review / approvals systems** – which ensured full QA transparency, generated client confidence in OA's QA systems.



### 3. Professional Excellence

#### Risk Management

- OA adopted a robust risk management approach which included development of a detailed Register of All Risks & Opportunities (R&O Register) that was updated on an ongoing basis;
- This Register was not limited to financial / technical risks but also included Community, Stakeholder, Environmental, plus all other external risks associated with D2G Project (planned / unplanned / opportunities);
- Quantifiable unplanned R&O profiles were priced up using 3 different values (pessimistic, best guess, optimistic);
- At commencement of the D2G Project, total risks were calculated as the 'difference between the value of P50 confidence level (derived from the Monte Carl analysis) and project's raw cost;
- 3 months prior to practical completion, the latest modelled risk profile was compared to the original model / post flood model to gauge effectiveness of OA's risk management controls;
- OA's R&O P50 contingency had been reduced by more than 97%.

#### Project Management

- The D2G Project was centrally governed by an Alliance Leadership Team (ALT) which comprised representatives from the 6 alliance partners who provided overall strategic project direction;
- Day-to-day project activities were managed by an Alliance Manager supported by an Alliance Management Team (AMT) which included senior DTMR personnel who were seconded full time onto the D2G Project;
- OA implemented a robust structure of project management reporting which included:
  - Monthly presentations by the Alliance Manager to the ALT which comprised:
    - » comprehensive internal written reports;
    - » independent cost / performance audits by the IV / other external advisers;
    - » updates on OA's performance versus key cost, time, and 5 non-cost related KRAs;
    - » detailed cost report (estimated versus actual costs);
    - » construction report (actual progress versus critical required milestones, highlighted any changes to the construction schedule no matter how small);
  - Use of a range of consultative mechanisms to manage the relationships between the AMT, project team and field site workers. These ensured everyone could access project wide information quickly and effectively. Examples of these mechanisms included:
    - » Project 'Risk Assessment' process;
    - » Risk & Opportunity Register;
    - » Safety in Design process;
    - » Standard Operating Procedures;
    - » Specific Construction Hazard Identification & Risk Assessments;
    - » Sub-Contractor reviews / assessments on a quarterly basis;
    - » Safety Observations / Inspections on a monthly basis;
    - » Tailored onsite induction process (undertaken by 10,000 people);
    - » Monitoring of lag / lead safety statistics weekly / monthly.



## Design

- During the design phase, OA put in place highly effective operating protocols which enabled the co-located on-site Design/Construction Teams to work more productively together;
- Because everyone was located on site, problem solving / information sharing was much more effective as both teams could see the challenges each other faced on a daily basis.
- From a design perspective, when OA was originally established in June 2008, there was no firm project scope;
- What evolved over time, due to the effective collaboration between OA and the client, was an initial works package to which significant additional works were added which had to be constructed in parallel;
- Design of the upgraded motorway was sub-divided into various packages covering different aspects of the assets / stages of development (concept, detailed, final designs);
- Principal design disciplines included roads / alignments, structures, drainage, geotechnical, ITS/lighting, landscape/urban design, temporary traffic management, environment, PUP;
- An integrated design / construct program was maintained to track package delivery against construction timeframes. The Design Team also maintained a deliverable schedule which tracked package milestones. In total, 515 design packages were successfully delivered on time;
- Throughout the design development process, Value Engineering, Safety-In-Design, Innovation, constructability were heavily emphasised;
- Workshops were held to ensure all key stakeholders were involved in the design process and that the design intent was 'best for project';
- Construction / Engineering Teams were highly involved in the design process, with constructability reviews held to discuss all issues. Both these teams were also consulted regarding any innovations / new options which were incorporated into the design;
- Meetings were also held with key stakeholders to discuss program / design progress and gain a better understanding of construction priorities / adjustments to the design or construction program.

## Planning

- Although OA used numerous detailed operating protocols to successfully deliver the D2G Project, the one that provides the best example of Professional Excellence is the collaborative planning approach;
- OA developed its Master Planning Program as an integrated design / construction program using Primavera 3 Project Management Software (expanded to include design, public utilities diversions, procurement, property resumptions, and civil/structural works);
- At the start of construction, OA moved to Asta Powerproject, a software not well known in the Australian construction industry. OA made the move because this software was more robust, cost effective, and better met the needs of the Design, Planning, Construction teams due to its:
  - powerful coding, filtering and sorting facilities which helped effectively manage over 13,000 activities;
  - ability to meet the long term needs of the planners / short term needs of the Construction Team; and
  - complimentary viewer which enabled the wider Project Team to access the Master Program (not normally a feature of this type of software);
- Overall the planning on the D2G Project was a major success because of the close working relationship between the Planning, Design, and Construction Teams as well as the up-front work done to ensure the overall traffic staging was robust enough to see construction through to a successful conclusion.

## 4. Transparency

- From the outset, OA was committed to achieving transparency / effective engagement with all key stakeholders (Internal and external);
- OA achieved this by adopting a back-to-basics approach which maximised the opportunity for all stakeholders to interact in person with the Alliance Manager, ALT, and Project Team;
- Key activities undertaken to achieve this included:
  - Establishment / maintenance of strong working relationship with State/Federal MPs & Local Councillors through monthly detailed briefings;
  - Appointment of a full time Rail Interface Manager to co-ordinate \$100 million of works associated with QLD Rail assets located adjacent to the motorway to ensure there were no delays to the construction program;
  - Funding a full time Ipswich City Council Project Manager to help obtain the necessary approvals, resolve conflicts, plan/ co-ordinate commissioning activities more easily and effectively;
  - Use of an on-site Visitor Experience Centre to educate more than 3,000 key stakeholders about the benefits, progress, quality, innovations, overall professionalism of the D2G Project / OA Team. OA also offered guided mini-bus tours of the major works, 3D high-tech 'drive thru', time-lapse photography, plus various other project relevant information;
  - Because DTMR was the client and a member of the Alliance, all reports were logged as 'controlled documents' and tracked electronically from original preparation through to final approval and implementation. This approach enabled DTMR to easily identify best practice achievements / innovations that had the potential for use on future infrastructure projects;
  - Monthly site inspections by the DTMR Program Director with a focus on current issues/challenges/mitigation actions;
  - Attendance by the on-site DTMR Project Manager at monthly site-wide Tool Box Talks to gain valuable insights into OA's unique culture / overall project morale;
  - Quarterly update site visits by senior DTMR representatives not directly involved in the project. Focus was on progress to date / potential for innovations to be used on other DTMR projects.



## 5. Integrity

- OA's Alliance Manager led a team of professional, highly-talented engineering and construction professionals to solve some of the most complex construction challenges and deliver a world-class product;
- From the outset respect/integrity/pride were a key part of OA's shared vision and goals. Key examples of this approach and the integrity shown by everyone on site included:
  - The Alliance Manager keeping the playing field level to ensure there was no single 'lead' member within the Alliance and ensuring strong AMT / ALT leadership through a hands-on approach;
  - Key personnel, including the Design and Planning Teams, being co-located as part of one cohesive team on site which ensured a more effective, easier, productive day-to-day decision making process;
  - Appointment of 2 Area Manager's / 4 Integrated Zone Managers to optimise communications across such as a large, geographically spread construction site;
  - Creation of team pride from the outset. Not just pride in the work people were doing but also their overall contribution to the project / OA;
  - Ensuring everyone on site had a voice and respected each other's contribution / role based on their knowledge / skills not their status or position.





## 6. Sustainability

- The approach taken by OA to sustainability included a focus on:
  - » **Effective environmental management of areas surrounding the motorway** – to ensure these were either returned to their original condition or improved where possible;
  - » **Up-skilling of its workforce** – to help raise the bar across the QLD infrastructure industry with a focus on sustainable innovations;
  - » **Creation of job opportunities** – for local community members to further expand the skills pool within the QLD infrastructure industry;
  - » **Construction of a motorway which improved traffic flow** – as well as reliability, safety, and access for not only vehicles but also pedestrians and cyclists;
  - » **Inclusion of sympathetic / appropriate urban design elements** – which not only significantly improved the visual amenity of the upgraded motorway but reflected the history, flora, and fauna of the surrounding areas;
- In addition, OA also significantly reduced its landfill emissions by recycling as many construction materials as possible;
- As of practical completion, OA had achieved the following:
  - » **Concrete** – approximately 6,500 tonnes (equivalent to the weight of 24 QLD Rail 6-car city train);
  - » **Metal and steel** – over 300 tonnes (equivalent to the weight of 30 Brisbane City Council buses);
  - » **Aluminium** – approximately 2 tonnes (equivalent to the weight of 1,292,517 empty soft drink cans);
  - » **Timber** – approximately 320 tonnes (equivalent to the weight of 119 dual cab Toyota Hilux utes);
  - » **General recycling** – over 330 tonnes (equivalent to the weight of 223 demountable buildings);
- As a result of this recycling, OA was able to reduce its landfill emissions by 2,200 tonnes of CO<sub>2</sub> (equivalent to annual greenhouse gas emissions of 250 Toyota Prado vehicles);



## 7. Respect for the Environment

- From the outset, OA's vision was to achieve the highest level of environmental stewardship during the 51-month design / construction program;
- A key factor in OA's environmental management success was the very positive relationship it established / maintained with the environmental regulators including the QLD Department of Environmental Resources Management (DERM);
- As a result, OA was selected to participate in a 3-year Erosion Sediment Control Compliance Program (ESCCP) conducted by DERM in partnership with local governments to improve the water quality in SE QLD's waterways;
- Key environmental management activities / innovations developed / implemented by OA included:
  - Ground breaking environmental management trials – included use of vetiver grass for erosion / sediment control, automated flocculent dosing systems for treatment of water in sediment basins, Tiffblair grass as a low maintenance / increased germination option;
  - Creation of positive local environmental legacies – these included dry fauna passage in local creeks, weed treatment of local creeks, translocation of 30 Mangrove lilies as part of bank stabilisation works, and protection of a rare Cooneana Olive tree;
  - Preservation of Indigenous / Non-Indigenous heritage – these included stone kerbing, the original timber piles at Six Mile Creek Bridge, both of which are now popular new heritage items of interest;
  - Development of a new proprietary Erosion & Sediment Control Risk Assessment Tool (ESCRAT) - which combined 3 volumes of the IECA guidelines relating to erosion risk levels, sedimentation design standards / techniques into one, easy to use spread sheet;
  - Extensive remediation works to restore Goodna / Six Mile Creeks – these were significantly damaged during the January 2011 QLD floods;
  - Construction of a multi-million dollar underground drainage system – designed to significantly increased storm water run-off capacity from the Brisbane River. A lack of such capacity was a major contributing factor during the QLD January 2011 floods;
  - Design / construction of a series of natural sediment ponds along the motorway - to improve storm water run-off management as well as further protect / improve the quality of the local waterways;
  - Development / implementation of innovative landscape / urban design program - which included streetscape treatments, feature plantings at high profile locations, re-vegetation / remedial landscape works for areas disturbed by the construction works, landscaped drainage systems, pavements for pedestrian use, rest stops, seating / shade structures at critical locations, and pedestrian way-finding signage.

## In Summary

- The upgrade of the Ipswich Motorway was one of the most successful road infrastructure projects ever undertaken in QLD;
- During the 3 years of construction, a significant number of innovations in engineering, design and construction were developed which are now being shared across the Australian infrastructure industry;
- At its peak, some 1,200 people worked on the project, many of whom have significantly improved their core skills as part of OA. These people are now sharing this knowledge and wisdom as they continue their careers in the Australian infrastructure industry;
- The success of the D2G Project and OA are best reflected by the 25 industry awards won to date across the key disciplines of safety, engineering, spatial technologies, community engagement, project management, cost control, training, internal communications, alliance management, civil contracting, and road building;
- OA also won 3 x Gold Awards and 1 x Highly Commended at the 2013 Consult Australia Excellence Awards in the Collaboration, Development of People, Client Focus, and Technological Innovations categories, competing against 80 other entries;
- OA also won a highly prestigious 2013 Silver Prime Minister's Award for Excellence in Public Sector Management.

