


<b>Trial project:</b> <b>Connect Plus Sustainable Business Culture Model</b>	<b>New delivery model / procurement route:</b> <b>Two Stage Open Book with particular focus on the Intelligent Client</b>
<b>Cost savings targeted:</b> £29,000,000 (8%) over the five year framework	
<b>Other key benefits achieved:</b> Mature and collaborative working relationships throughout the project teams; Faster and more consistent delivery of projects; Reduced impact of highways works on road users; Reduced disputes.	

<b>Trial report sequence:</b>	Kick off meeting	Brief / Team Engagement	Decision to Build	<b>Build and Occupy</b>
<b>Cost saving basis:</b>	Outline saving aspiration	Challenging cost target	Award Cost	<b>Outturn Cost</b>

Trial project details		
<b>Project title</b>	Connect Plus Sustainable Business Culture Model illustrated by M25 Concrete Paving Works, M25 Gade Valley Maurer Joint Replacement and M4 Strengthening Programme	
<b>Clients</b>	Connect Plus (M25) Limited Highways Agency (now Highways England)	
<b>Project value</b>	£350 million (estimated value of total framework programme)	
<b>Form of project</b>	Highways asset management programme	
<b>Main contractor</b>	Jackson Civil Engineering Limited Aggregate Industries Lafarge Tarmac Balfour Beatty (Geoffrey) Osborne Limited Skanska UK plc	
<b>Lead designer &amp; Contract Manager</b>	Atkins Consultancy Services Limited Flint & Neill Limited Parsons Brinckerhoff Limited Connect Plus Services	

<b>Collaborative Change Consultant</b>	Temporal Consulting	
<b>Key suppliers</b>	Maurer (UK) Limited P.J. Davidson (UK) Limited Power Plane TAG Construction Axtell FGS Plant AJ Willcock NRP LMS Highways Roadtechs Contracting DBJ Services Wilson & Scott Freyssinet	

**Executive summary:**

Connect Plus has created and implemented an innovative “*Sustainable Business Culture Model*” (“*the Model*”) through which it has created integrated teams that are delivering a highways asset management programme (“*the Programme*”) in an efficient and collaborative manner under Two Stage Open Book within the 30 year concession awarded by the Highways Agency in respect of the M25. The Model uses Two Stage Open Book combined with cultural change to align and integrates the client with the first, second and third tier supply chain members in order to enable greater transparency, innovation and joint risk management. Joint ownership of the Model by the client and supply chain members has enabled transparent and timely transmission of information throughout the supply chain and the early identification and solution of potential problems. The implementation of Two Stage Open Book under the Model is supported by Connect Plus' adoption of a collaborative culture in accordance with BS11000 Collaborative Business Relationships.

The Model has enabled the collaborative delivery of urgent, high risk projects to improve the motorway network. The early integration of the contractor and second and third tier supply chain under the Model uses Two Stage Open Book to implement a joint design process which has secured demonstrable benefits including cost savings, improved programming, lower risks for statutory authorities and lower life cycle costs.

Connect Plus and its supply chain have invested significant time and resources in establishing a community culture and in developing shared ownership of that culture with supply chain partners. The Model has included the training and personal development of people to work in accordance with a collaborative skill-set plus the development of facilitators from the supply chain community to establish and maintain more transparent and robust business relationships. A “*Balanced Scorecard*” system is used to monitor relationships throughout the supply chain, identifying areas of strength and providing a focus on matters where improvement is required. The culture promotes continuous improvement dialogues, including the “*Collaborative Cost Review*”, ensuring that good practice is repeated and that lessons are learnt and applied to subsequent projects.

Three specific Connect Plus projects forming part of the Programme have been selected to demonstrate the successful implementation of the Model as a basis for Two Stage Open Book are:

- Concrete paving renewal works on the M25
- Renewal of the Maurer Joints at the Gade Valley Viaduct
- The programme to strengthen the M4

## Project summary

### Sustainable Business Culture Model

Connect Plus has created and implemented the Model, in order to create and maintain a collaborative working culture in recognition of the system and behavioural complexity of the M25 and its DBFO Contract. The Model is now accredited in accordance with BS11000 Collaborative Business Relationships. Connect Plus has sought to behave as an *"Intelligent Client"* in seeking to use this sustainable business culture as a basis for lean and efficient working across the supply chain.

The Model has been developed to enable:

- A focus not just on what is delivered but also on how it is delivered
- Alignment of the supply chain to a common vision, values and behaviours
- In depth face-to-face engagement
- Mature relationship management and capability
- Robust and timely feedback
- Evidence based performance monitoring on a range of issues, including relationships.

Connect Plus recognised that all parts of the supply chain need to participate in the Model in order to ensure:

- Capacity and appetite for collaboration
- Aligned leadership
- Honest challenge, feedback and real continuous improvement
- Meaningful contractual performance measurement tools
- Performance linked to long term reward
- Creation and maintenance of relationship management plans
- Joint approach to risk and opportunity management
- Joint approach to innovation
- Continuous training to maintain the culture.

Connect Plus envisages that development of the Model as a basis for Two Stage Open Book procurement will enable the supply chain to operate as a fully integrated unit, as demonstrated in respect of the three projects set out in this Case Study.

To deliver the Model, Connect Plus engaged Temporal Consulting as its collaborative change consultant in order to identify what was required to adopt an integrated and sustainable collaborative approach and to support its implementation. The leaders of Connect Plus, Connect Plus Services and the supply chain came together to create a Collaborative Transformation Steering Group (*"the CTSG"*). A number of framework facilitators were then selected from key influential roles (such as project managers and commercial managers) and trained and accredited from across the supply chain to ensure that there are sufficient appropriate individuals with the attitude and competency to deliver a collaborative working culture. The training took place over a year and ongoing supervision is required to maintain the accreditation to act as facilitator. This in depth approach to people selection, skills training and psychological development in these key roles has proven critical to the outcomes achieved on the ground. Both the CTSG and the facilitators groups meet quarterly to maintain their leadership and guardianship of the Model.

Connect Plus has established a *"Balanced Scorecard"* process to allow the whole supply chain to input into monitoring performance across the Connect Plus community.

The supply chain is regularly invited to score performance against these objectives by reference to *"Critical Success Factors"*. Scores are given on a 1 to 12 scale, allowing the whole M25 community to give feedback on the programme, understand areas of strength and improve areas of weakness. Crucially, the Balanced Scorecard process also generates greater understanding of why things are working well or not through greater understanding of the participants' perspectives and subsequent relationships.

There are 26 Critical Success Factors, each separated into 7 weighted categories. Those categories are:

- Innovation
- Collaborative relationships
- Environment protection
- Programme delivery
- Commercial and financial
- Quality
- Health and safety.

### M25 Concrete Paving Works

Just less than 9% of the entire M25 network is concrete paved and this creates significant challenges in respect of maintenance.

This element of the Programme involved the repair and replacement of significant sections of the concrete paving on the M25 using rapid cure concrete materials and techniques such as vacuum lifting. The surface texture of the concrete was also addressed using a new methodology of concrete fine milling.

**Estimated Contract Value: £24,100,000**

**Team selection: May 2010**

**Preconstruction start: January 2011**

**Start on site: March 2012**

**Completion: December 2015**

### **M25 Gade Valley Maurer Joint Replacement**

The Gade Valley Maurer Joint Replacement project relates to the urgent repair of a key part of the UK motorway network. Four Maurer joints were installed at the Gade Valley viaducts in 1986 and these have now reached the end of their useful life, meaning that urgent repairs are required. There is a high risk of significant disruption to an important part of the transport network in carrying out the repairs, making the need for efficient and accurate programming paramount.

The repair works follow up a programme of similar repairs successfully carried out in 2014 to the QEII Bridge at Dartford Crossing. The project team used the benefit of the lessons learned on the QEII project to inform decision-making at Gade Valley.

**Estimated Contract Value: £8,500,000**

**Team selection: January 2014**

**Preconstruction start: September 2014**

**Start on site: March 2015**

**Completion: December 2015**

### **M4 Strengthening Programme**

The M4 Elevated Pier Strengthening project seeks to address strength deficiencies in the cantilever crossheads of the piers supporting the elevated section of the M4.

Specific works include installation of temporary external post tensioning, construction of crosshead cantilever strengthening, concrete repair, installation of cathodic protection and drainage realignment works.

There are particular programming sensitivities with this project, given that the works must complete by the end of 2015. The Model has been used to identify key risks early, including steel ordering and traffic management.

The NEC3 contract for Package 3 was awarded to Osborne in December 2014 with a start on site date in March 2015 and a completion date in November 2015. The Cathodic Protection works under discussion will be treated as an NEC3 "compensation event" when their scope, cost and timing are agreed.

There has been a joint design/risk management session between Connect Plus, Connect Plus Services, Osborne, Atkins and Freyssinet to resolve an agreed approach to Cathodic Protection and related investigations/works on the 14 piers comprising Package 3 of the M4 strengthening programme. It showed a positive collaborative approach and a high level of mutual confidence between the client, project manager, consultant, main contractor and specialist sub-contractor.

Osborne works closely with its sub-contractors Holemasters, Chevron, Structural Systems and Volker Laser, including best practice meetings with performance measurement scores displayed in the site meeting room.

**Estimated Contract Value: £6,700,000**

**Team selection: November 2014**

**Preconstruction start: January 2015**

**Start on site: March 2015**

**Completion: November 2015**

### **Client objectives and vision**

Connect Plus have sought to create a sustainable business culture for the M25 Community. It sought to emphasise the importance of collaborative working led by an intelligent client in the adoption of a sustainable approach to Two Stage Open Book.

The Balanced Scorecard approach enables Connect Plus to understand and measure progress towards its declared objectives of :

- Create and maintain a group of directors and facilitators empowered with the skills and behaviours to support and lead the cultural change and role model collaboration
- Delivery of a whole life approach

- Minimising the impact of maintenance works
- Maintaining project facilities
- Enhancing knowledge of project facilities
- Respect for the environment
- Reduced risk

Connect Plus were able to make use of its long term M25 DBFO contract as a foundation on which to develop healthy, long-term relationships throughout its supply chain. It was recognised that commercial and technical capability is not enough in isolation to operate the DBFO contract successfully and that the supply chain will be able to work more efficiently with a better understanding of the working environment as part of an integrated team. The problems an ageing brownfield site like the M25 creates cannot be solved by standard risk management approaches alone. Connect Plus needed a model that had buy-in and understanding of a common purpose and strategies to cope.

In establishing the Model, the client sought to:

- Build and maintain a "*community*" culture supporting collaborative supply chain relationships led from the top
- Create a group of trained and accredited facilitators from throughout the supply chain that are responsible for promoting and maintaining a collaborative culture
- Operate the Balanced Scorecard system, allowing the identification of strengths and weaknesses in performance and working relationships to encourage the honest and transparent resolution of differences

In delivering projects using the Model, the client sought to:

- Maintain road network resilience
- Manage existing assets effectively in a changing environment
- Deliver an optimised Programme to minimise disruption to the road network
- Keep key stakeholders, such as the Highways Agency, Network Rail and local residents, informed at all key stages.

### New procurement techniques and processes

Connect Plus used the Sustainable Business Culture Model to secure emotionally and commercially mature relationships throughout all levels of the supply chain.

Connect Plus are undertaking a structured process of early contractor involvement through Two Stage Open Book, enabled by the Model, to maximise contributions from all levels of the supply chain to design, cost, programme and risk management decision making, with particular focus on sharing lessons learned from similar projects.

### Cost targets and savings

#### Sustainable Business Culture Model

One of the key features of the Model has been the establishment of a key collaborative process in the procurement and delivery of works known as the "Collaborative Cost Review".

This is a key milestone within a project, allowing all parties to work together in order to balance design, programme, resources and cost. This process can be used to identify potential risks with particular processes or materials (and associated costs) and help to gain a greater understanding of value as opposed to cost.

This allows the parties to change or adapt designs or works programmes so as to offer the same quality solution at lower cost and/or with lower risk. The collaborative process enables "buy-in" from all parties and the removal of subsequent doubt about why particular solutions had been chosen.

#### M25 Concrete Paving Works

Use of the Model as a basis for Two Stage Open Book has enabled the supply chain to develop innovative proposals that enable delivery of the repairs with time and cost savings.

Significant savings were targeted from enabling the repair of the structure of the concrete road surface within a single night shift. To date over £500,000 investment has been made in research and development off site to identify materials and methods of working that would reduce the repair time from 12 hours down to 7 or 8 hours. Development of the method and additional innovation has resulted in a further reduction of the repair time to 6

hours and proposals are being investigated that could reduce this even further.

The ability to significantly reduce the time taken for repairs will have considerable effect over the contract term. It costs approximately £50,000 per night to close lanes and the reduced time to complete the repairs could provide savings of approximately £20,000,000 over 30 years as well as reducing additional costs to the economy resulting from traffic congestion.

Improving the surface texture of the concrete road has achieved a better whole life cost on managing the pavement over the contract term. Improving skid resistance and reducing noise on concrete does not have a standard solution and simply overlaying it is costly both to achieve and maintain. The methodology proposed by the supply chain was to “fine mill” the surface – a method of closely controlled concrete removal with closely packed picks on the milling drum producing a new surface texture. Projected savings are approximately £150,000,000 over 30 years.

#### **M25 Gade Valley Maurer Joint Replacement**

Early contractor involvement through Two Stage Open Book has identified savings estimated at £780,000.

A number of savings were identified in early discussions by reference to their recently completed projects of a similar nature. This allowed the specification of alternative washers and grout, each producing substantial cost and time savings.

Substantial savings were also identified as a result of improvements to the temporary access ramp provided for access to the site.

In addition, significant improvements were identified in relation to the installation of temporary and permanent lift systems.

#### **M4 Strengthening Programme**

The project has been split into three packages. Savings for package 1 are in the region of £14,000 and the simple access and design solutions selected for this package have resulted in lower prices for packages 2 and 3 than would otherwise have been expected.

### **Additional benefits**

#### **Sustainable Business Culture Model**

The Model facilitated delivery of numerous additional benefits on individual works projects, some of which are recorded in the three illustrative projects identified in this Case Study.

In addition, the Model has delivered benefits across the Programme through:

- Working with fewer suppliers in a more settled supply chain
- Encouragement of innovation to enable cost-effective solutions
- A collaborative culture that enables the identification of the best solution in respect of design, buildability and environmental performance
- Enabling data sharing to reduce waste in the design and construction process
- Facilitating Two Stage Open Book early contractor involvement and value engineering processes
- Client working collaboratively with the supply chain to identify and manage risks and opportunities
- Suppliers’ visibility of forward programme to plan and invest
- Establishment of benchmarks for continuous improvement through the Balanced Scorecard system.

These techniques have contributed to:

- Greater investment in new technology
- Reduction in variation orders and Compensation Events
- Reduction in disputes
- Improved lifecycle performance
- Reduction in contract administration.

#### **M25 Concrete Paving Works**

Connect Plus recognised the need to engage with its supply chain early in order to move away from the traditional maintenance processes that require 24 hour traffic management and extensive network closures.

As the scope of work expanded, further improvements have been identified. Vacuum lifting techniques were introduced, meaning that damaged concrete could be removed eight times faster than the traditional pneumatic drill method, with a substantial reduction in noisy work.

The project team has also worked collaboratively to improve safety standards for the works. The new systems require fewer plant and operative interfaces and over 30,000 labour hours have been worked without injury.

In addition, one of the key local suppliers has been able to expand its business as a highways contractor (having previously operated predominantly in the housing sector) based on the long term certainty generated from the innovative solutions employed on the project.

As these works have engaged all of the main contractors on the supply chain, this project has also helped to embed the collaborative culture identified in the Model. There are numerous examples of traditional behaviours being removed and solutions for the benefit of all being proposed through the Balanced Scorecard process.

#### **M25 Gade Valley Maurer Joint Replacement**

As a result of the efficiencies identified on previous projects and adopted to the Gade Valley project through early contractor involvement under Two Stage Open Book , the indicative build programme was cut by 12 months.

Improvements to the design were also identified that reduced whole life costs and improved the long term reliability of the works. Such improvements included rationalisation of bolt sizes, improvements to the noise damping systems and additional packing to base plates.

The contractor's expertise in potential demolition solutions (including the advantages and disadvantages of hydro-demolition) was applied to develop a bespoke solution for the project that maximised available resources, reduced cost, mitigated the impact on the local community and reduced the time that the works would take.

The adopted solutions enabled noise reduction, and improved anti-skid qualities created better ride quality and reduced component wear.

The Two Stage Open Book processes have allowed for improvements in engagement with key stakeholders, particularly with regards to

taking possession of the public highway for works and potential diversion routes.

The preceding project at QEII bridge established a "Value Register" and a "Lessons Learned" paper that were discussed at an early stage between the client and the main contractor.

#### **M4 Strengthening Programme**

A "deep dive" meeting involving the client, contractor and key sub-contractors facilitated the creation of an Agreed Action Plan, setting out involvement of the supply chain in the planning of future work phases and also use of pre-site advance inspection and team planning to improve safety, smooth flow of operations and minimise proximity working.

#### **Overall assessment**

Connect Plus (M25) Limited has developed combined Two Stage Open Book with a particular focus on the role of the Intelligent Client in creating robust, effective collaborative relationships between the client and the first tier contractors, and has begun to demonstrate how these relationships can be developed throughout the wider supply chain. Clear systems have also been implemented to maintain these collaborative relationships throughout the term of the Programme.

The project teams have a clear process for exchanging information on a collaborative basis at an early stage, with participants in early contractor involvement meetings working together to agree solutions that promote the best method of delivering the project. Often such discussions are led by the tier 1 contractor (with tier 2/3 support), so as to utilise experience from recent similar projects and to offer clear and well considered methods for the efficient delivery of the works.

#### **Key Lessons**

This Trial Project has demonstrated the power of a strong collaborative culture and of direct client involvement in sustaining and developing that culture. It has also shown the importance of enabling contractor leadership in a collaborative governance system .These cultural investments have supported the agreement of savings and added value on a series of demanding projects. They have been combined with a well-structured approach to

early contractor involvement under Two Stage Open Book, whereby increasingly tier 1, 2 and 3 supply chain members have been able to contribute their proposals to improved design, programming and risk management sufficiently in advance of start on site to ensure the proposals can be taken into account.

### Miscellaneous

#### Authors:

- This case study has been developed for Constructing Excellence by Professor David Mosey of King's College London Centre of Construction Law and Stuart Wilson of Trowers & Hamblins LLP as joint Project Mentors, in consultation with Alison Ahearn of Imperial College London as Academic Partner

#### Key contributors include:

- Connect Plus (M25) Limited, Temporal Consulting, Connect Plus Services

### Background: Trial Projects programme

The Government Construction Strategy aims to change the relationship between clients and the entire supply chain within the industry. The trial projects perform a central role in delivering the Strategy's sustainable 15-20% reduction in costs and are currently testing three new procurement models (Cost-Led Procurement; Integrated Project Insurance; Two Stage Open Book) that were proposed by industry and developed by a joint task group. Case study reports are therefore an output of monitoring the progress and outcomes of the trial projects. They are produced at four stages: Kick-off Meeting; Brief/Term Engagement; Decision to Build; Build and Occupy. Other case study reports can be found at:

<https://www.gov.uk/government/publications/government-construction-strategy-trial-projects>

### Project contacts

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