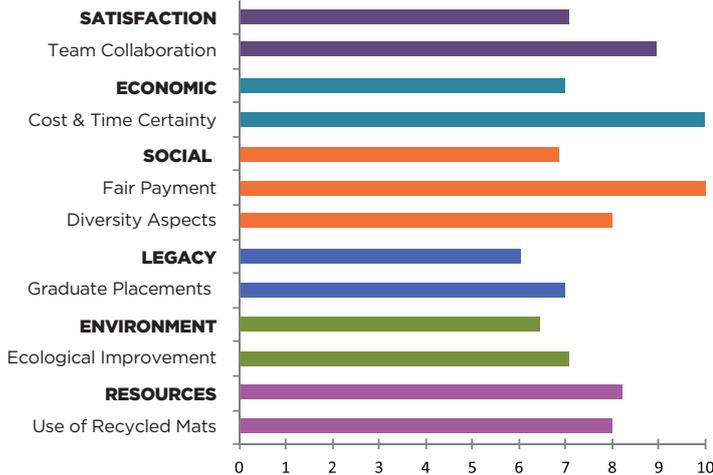


A4232 Cardiff Eastern Bay Link

May 2018

CONSTRUCTION PHASE



The Eastern Bay Link (EBL) scheme extends the A4232 link road around the southern perimeter of Cardiff from Queensgate Roundabout to Ocean Way Roundabout through Cardiff docks, providing the next section of the link and removing the need for traffic to negotiate the current 3½km route via Central Link, East Tyndall Street and Ocean Way.

The strategic link road is a 1.2km long elevated dual carriageway and the conceptual design was based on the provision of two approach embankments and a 300m long viaduct of composite construction. Alteration works including additional signalisation were required to both roundabouts together with diversion of the main dock road.

The main risks at the outset were considered to be negotiations to procure the required land, the poor ground conditions including areas of contamination, site restraints due to the immediately adjacent CELSA live railway and working dock roads, and major service diversions. An ECI contract for the design and construction of the road was let to the Dawnus Ferrovial Agroman JV in January 2015.

Due to the above and poor ground conditions enabling works on site started in June 2015, even though the preliminary design was not completed for another three months. Collaborative working between all parties was key in the delivery of the scheme with Key Stage 3 and Key Stage 6 being overlapped by 10 weeks. This allowed detailed design to progress with construction following close behind to complete the scheme within the prescribed timescales.

PROJECT DETAILS

Client: Welsh Government
Employers' Agent: WSP Parsons Brinckerhoff
EA Cost Advisor: Corderoy
Environmental Consultant: TACP
Contractor: Dawnus Ferrovial Agroman (DFA) Joint Venture
Designer: Capita and Cass Hayward
Total Project Value: £57.3m
Project Size: 1.2Km of Dual Carriageway and 1.5km of community route
Contract: NEC Target Cost Option C - ECI
Duration: ECI Award: January 2015; Advance Works Start Date: July 2015; Construction Start Date: February 2016
Completion Date: 15th June 2018



KEY CONTACTS

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What is an Exemplar project?

An Exemplar is defined as **'something worthy of being copied'**. The Exemplar programme has been developed to help identify the reasons why certain projects are successful in a standardised, quantifiable way and to share with the industry what enabled these successes.

An Exemplar considers all aspects of sustainability, including economic, social and environmental, demonstrating that the

scheme is well rounded and has incorporated best practice and collaboration.

Case studies are prepared at 3 Key Stages Design Stage; Construction Phase; Post Occupation

This ensures that lessons learnt can be demonstrated throughout the development of the project.

What will make this project Exemplar?

1 Collaboration. The project was delivered using Ministerial Powers to construct a new highway under Section 24 of the Highways Act. Issues with the acquisition by negotiation of the neighbouring land were quickly resolved and delivered. Other benefits included improving the local surface water drainage capacity by working closely with DCWW and EMR. Collaboration was also key in managing the risks associated with the fundamental design change required to resolve issues with the services existing on site. The team also worked flexibly to agree and commence delivery of Advance Works in parallel with the on-going preliminary design, and commence detailed design of the viaduct prior to the completion and acceptance of the preliminary design, all of which were carried out to safeguard the overall project programme. The delivery of the design was managed and progressed collaboratively with Cardiff City Council (CCC) with the implementation of regular focus group meeting with all departments within the adopting authority.

Collaborative working was possible through the use of an Early Contractor Involvement (ECI) Contract, and the willingness of the team to work together throughout all stages of the scheme, and resulted in the scheme being delivered on time and under budget despite real challenges during all stages of delivery.

“The challenges and solutions delivered on this scheme have kept us busy for the last two years. It is a story of the benefits of Early Contractor Involvement and collaborative working at its best” - Rhys Griffith - Project Manager for Welsh Government.

2 Project Bank Account (PBA). Eastern Bay Link is the first infrastructure scheme in Wales to trial a Project Bank Account (PBA). The Welsh Government aim of their adoption within public procurement is to improve payment practices throughout Wales and thereby facilitate faster payment to sub-contracting suppliers. Setting up of the PBA proved to be reasonably difficult as not all banks are able and/or willing to provide the service. Once in place and available for use, it was noted that nationally operating companies favoured its use as they are already experienced in their use from Highway England schemes. However, SME's and local companies raised concern as they were unfamiliar with the service. Once the process was explained and understood, most were happy to progress with its use particularly with

the knowledge that they would receive payment at the same time as the Principal Contractor. The team believe that the Project Bank Account has been a success but does require time at the outset in order to sell it to SME's and set it up properly.

3 Utilities Incentivisation Clause in the Contract: Major difficulties were identified early in the preliminary design process in relation to the Victorian Sewer, which on detailed investigation could not be diverted within the site boundaries. In order to resolve these difficulties, the conceptual design was changed to lengthen the proposed viaduct from 320m to 750m. This meant that the length of the sewer diversion could be reduced and major diversions of high voltage and communication cables and a medium pressure gas main could be avoided altogether. The utilities incentivisation clause facilitated the design change through utilising monies saved from the service diversions to fund the additional cost of the viaduct. This fundamental design change, therefore resulted in substantial time and cost savings.

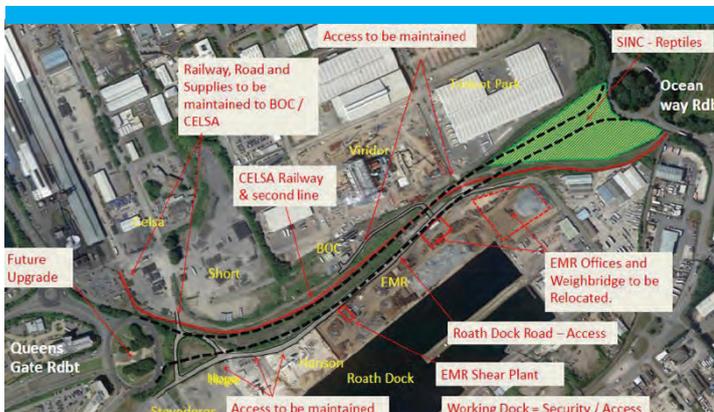
4 Community Benefits. Working in partnership with The Prince's Trust Cymru, the team developed a 'Get Into Construction Programme' for young people to gain new skills through training to enable them to find work in the construction industry. Fifteen individuals took part in the first two week project, which was based at the Splott Community Hub (The Old Library). The project included exercises centred on team building and development of skills, health and safety training including CSCS tests and practical application. The team provided materials and supervision, which allowed the trainees to deliver new paved and landscaped areas with benches and seating which is now being used by the local community. Of the 15 trainees, 10 went on to find permanent employment with two being selected to work on Eastern Bay Link. **“I would like to say a massive thank you to the team for all their help, my life has completely changed because of this and I can't wait to start working“.** - Dayle, Labourer on EBL Scheme.

Following the success of the first project, another project has recently been completed at the Moorlands Community Centre in Splott, with similar results. In this case Dawnus have been able to employ four people on another one of their schemes in Cardiff, as the Eastern Bay Link scheme draws to a close. **“The guys have been amazing, and have been really committed to the job and the local community.”** - Dot Templeman - Moorlands Community Centre.

Targeted Recruitment & Training (TR&T)

- **1886 TR&T wks** achieved against an initial target of **1768 wks** equating to **55 wks/ £1m** of contract spend.
- **13 Apprentices, 383** Apprentice weeks.
- **28** Job starts, including **27** long term unemployed people.
- **2** Educational work experience placements.
- **9** Graduates, **587** graduate weeks.

Other training and sustainable employment opportunities have also been provided directly on the site and in the design offices. The team has worked closely with Willows High School in Tremorfa, and again through close collaboration with Cardiff City Council, transferred a complete Multiple Use Games Area (MUGA) worth approximately £120,000 from a redundant site and re-erected it in the school. **“We can’t thank you enough as a school. We simply couldn’t afford for this to happen.”** – **Gareth Ritter - Deputy Headmaster.**



5 Dealing with design challenges through innovation Due to technical problems at preliminary design stage associated with the location of an existing Victorian sewer and time constraints associated with electricity cable diversions, the original conceptual design could not be accommodated within the tightly constrained site resulting in the need for fundamental changes being required to the preliminary design. The requirements for additional Traffic Modelling and a revised Environmental Statement which could have seriously delayed the scheme also had to be dealt with at this stage.

The preliminary design therefore incorporated two approach viaducts and a transition structure to replace the filled retaining wall sections. The overall length of the viaduct was increased to 714m, constructed within the site constraints imposed by the Celsa railway, Roath Dock Road (which runs alongside and crosses under the new viaduct) and significant live services. This meant that the diversion of a 300m length of the sewer, and other major services could be avoided.

Through working collaboratively, and through the use of bespoke incentives clauses included in the contract, the team therefore managed to totally re-vamp the conceptual design such that the scheme could still be constructed on time and to budget.

In order to achieve this however, it was necessary to introduce an additional delivery stage to the overall scheme in the form of enabling works. This meant that the remaining service diversions including diversion of the sewer and the

reconstruction of Roath Dock Road and the Celsa Access Road had to take place alongside the ongoing preliminary and detailed design work.

The design of the viaduct was constrained not only laterally but vertically by railway height clearance requirements and the road alignment above and had to be designed around the existing services including electricity and communication cables, sewers, water mains, a medium pressure gas main and an oxygen main.

The viaduct design utilised structural beams, manufactured off site with permanent formwork to support the concrete decks. Prestressed pre-cast concrete beams were used for the primary members of the approach spans and steel plate girders for the longer more complex spans required for the heavily skewed crossing of the railway.

Two of the intermediate supports to the railway viaduct had to be designed as long span portals to avoid interference of foundations with the railway and underground services, and to avoid closures of the Celsa railway during construction.

Due to the very poor ground conditions, the embankment section of the road was susceptible to settlement of up to 200mm. In order to accelerate this, a design solution utilising wick drains and the application of surcharge over a period of approximately six months was adopted.

6 Dealing with Construction Challenges through Innovation

The enabling works included the reconstruction of Roath Dock Road and construction of the new Celsa Access Road to make room for the new link road. This work together with significant diversion of services was completed by February 2016. At the same time, tar contamination on the site was cleaned up and piling platforms prepared for the major geotechnical works to follow.

The geotechnical works including all the piling and the installation of the wick drains was completed in only 17 weeks despite encountering numerous obstructions and having to avoid the existing live services.

Throughout the main construction works, access was maintained to the businesses along Roath Dock Road and to BOC and Celsa. In addition, the construction of the viaduct was undertaken over and immediately adjacent to the Celsa railway which operated on a 24/7 basis.

Health & Wellbeing Programme

The Eastern Bay Link Health and Wellbeing programme gave workers an opportunity to use the workplace to improve their health through health education and one to one health checks and consultations.

The health checks were very popular. Appointments were 20-30 minutes long, results were provided on the day and the consultation was confidential. The nurse was on site for two consecutive days each month which enabled flexibility with appointments around planned works and workers breaks.

Interactive workshops were presented during each visit. The presentations were comprehensive to make them more engaging and conducive to learning they incorporated interaction and innovative wellbeing tools.

60% of those who attended a health MOT made improvements to their initial health outcomes on their return check.



Sustainability

Ecology Update: The Ocean Way Site of Interest for Nature Conservation (SINC) located on the site presented challenges and opportunities. Proper environmental management during construction resulted in not only successfully preserving the calcareous grasslands but also improving the local environment, particularly the scrubland situated to the north between the SINC and the northern boundary. The existing redundant overhead gas pipeline with its antiquated gantry support system running parallel with the proposed new road was completely removed and the surrounding scrub land was then reclaimed and landscaped.

In addition, the JV all but eliminated the use of primary aggregates by sourcing recycled aggregates from local sites, including slag from CELSA. Transport miles for the delivery of key materials such as concrete and reinforcing steel were significantly reduced through the procurement of reinforcement from CELSA and batching all concrete "on-site". Walking and cycling have been actively promoted and one of the key deliverables of the project has been to facilitate the link up of the Wales Coastal Path and local cycling routes at both ends of the new link road.

Construction Facts

- **Over 400,000 man hours worked** without any reportable Safety or Environmental incidents
- **16,000m³ of concrete**, all sourced from the on-site batching plants
- **3000 tonnes of steel reinforcement** produced in the adjacent Celsa Works
- **120 no. Pre-cast beams** and **300 no. Pre-cast edge parapets**
- **1500t of Structural Steelwork** shipped directly into Roath Dock.
- **6 no. Shafts** constructed over the 7m deep Victorian sewer in order to locate, de-silt and carry out a 150m long diversion using pipe jacking
- **Piling platforms construction** using recycled slag from Celsa for piling rigs with operating weights over 155 tonnes
- **256 no. Bored piles**, 1200mm diameter up to 30m deep installed to the viaduct
- Top 2m of bored piles removed by de-bonding from the reinforcement and crushed to produce **1000 tonnes of aggregate** which was re-used on site, and **75% of bored piling arisings (400m³) re-used as landscaping fill**
- Settlement of a **250m long embankment in 22 weeks (38 weeks envisaged)**, utilising 13,000 wick drains and surcharge material which was then re-used
- **300 no. 300mm square pre-cast piles installed** to the transition structure
- **1200 tonnes of lightweight fill** (Lytag) used to prevent the existing sewer settling and backfill the east abutment, as a result of the poor ground conditions

NOTABLE ACHIEVEMENTS / PROJECT AWARDS

CEEQUAL - 81% - Excellent

CECA Wales Awards 2017

Ben James - Winner of Most Promising Young Graduate

Kyle Mitchell - Highly Commended for Most Promising Young Graduate

Rhiannon Lewis - One of three shortlisted for the Most Promising Non-Graduate

Constructing Excellence in Wales Awards 2017 - Young Achiever - **Matthew Myerscough (Site Engineer)**

CIHT Cymru Wales Transportation Project of the Year 2017

British Safety Council Awards - **International Safety Award 2017 - Merit**

NEC Contract Awards 2017 Contractor of the Year & Highly Commended Project of the year

Concrete Society Awards Shortlisted - All UK Projects Award

