



Briefing Note

FBC Briefing Note – Structures Status

Edinburgh Tram - York Place to Newhaven

City of Edinburgh Council

1 Purpose

This paper outlines the structures along the route of the Edinburgh Tram – York Place to Newhaven project (the Project) and how these are being managed.

2 Background

The Project consists of a 4.69km route commencing at York Place and terminating at Newhaven.

The route continues from the existing York Place tramstop, crossing the Broughton Street Junction to an island Stop adjacent to the new Picardy Place island. From Picardy Place the line heads north east passing over the London Road Junction which will be reconfigured to a fully signalised junction from what is currently a roundabout, and then continues north down Leith Walk with stops at McDonald Road and Balfour Street and crossing the Leith Walk Railway Bridge just north of McDonald Road.

The line then passes over Great Junction Street to a side platform stop at the Foot of the Walk in Constitution Street before continuing down Constitution Street passed the South Leith Parish Church and graveyard wall. The line then continues to the bottom of Constitution Street before the line turns westward at the Casino to the Port of Leith Stop on Ocean Drive. The line continues along Ocean Drive in a shared running corridor over Tower Place Bridge and Victoria Dock Entrance Bridge before turning south to an island platform Stop directly outside Ocean Terminal.

From Ocean Terminal the alignment turns onto Melrose Drive until it reaches North Leith Sands where it rises to meet Lindsay Road through a new set of retaining walls from where it will run in a tram only corridor adjacent to Lindsay Road until reaching the new terminus at Newhaven located just before the Sandpiper Drive junction.

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3 Structures

As detailed above, the project passes over or past a number of structures. The below details how the project is managing the development of these structures during design and construction:

3.1 Leith Walk NWR Bridge

The Leith Walk Network Rail Bridge is an existing structure owned by Network Rail on Leith Walk just north of McDonald Road. The bridge is a double span arch bridge. Recognising the risk this structure had to the project, the team commissioned Atkins to carry out a design options appraisal for the tram infrastructure as it crosses over the Network Rail masonry arch bridge on Leith Walk.

Site inspections and investigation were carried out to determine the existing condition of the bridge, and any below ground constraints that would impact on the infrastructure design. A desk study was also undertaken to determine the effect on the structure from tram loading

Following the desk study and site investigations the following was concluded:

- The structure is in good condition, with no significant structural damage visible;
- Tram loading has less of an effect on the structure compared to HB loading;
- Cover from the top of the masonry arch to the road surface level is shallower than what was anticipated in the initial design, with a depth of 430mm as a minimum;
- A shallow trackform solution of minimum 350mm depth as currently provided by Edilon Sedra, sat upon a bed of either no fine concrete or selected coarse aggregates can be accommodated;
- A tram traction ducting solution that steps out into the central reserve, with draw pits provided at either end of the structure, with consideration given to clashes with existing utilities which will determine the final location of ducting can be accommodated;
- Communications ducting can be accommodated within the surfacing;
- OLE masts are set back from either end of the structure, so as not to clash with tram ducting; and
- The only utilities identified in the carriageway are believed to be relics from the previous tram system in Edinburgh.

The above analysis was provided to the contractor in the tender documentation to demonstrate a solution being available to be taken forward by the contractor during its detailed design.

It should also be noted that the project team have entered into a Basic Asset Protection Agreement with Network Rail regarding the works to the structure.

3.2 Constitution Street Wall

This A-listed wall dates from the 1790's when Constitution Street was constructed across the eastern side of the graveyard associated with the 15th century Parish Church of South Leith. Excavations carried out in advance of the tram route in 2008 unearthed the remains of approximately 400 individuals, dating to between the 14th and mid-17th centuries, extending across the road and beneath the graveyard wall. These remains were buried along with evidence of the 16th century town defences and also the medieval town, predating the construction of the Church in the 1480's.

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Due to the level of archaeological risk in carrying out these works the scope has been split between the SPC contractor and ISC contractor. In broad terms the SPC will remove and excavate and the ISC will rebuild. The below narrative provides further detail of this.

The SPC Contractor shall undertake a detailed historic building survey (HBR) of the wall and attached / associated memorials. This will necessitate a laser scan of the wall and photographic survey to be undertaken in advance of works commencing on Site. This survey shall provide both an accurate historic record of these structures and to inform its reconstruction by the ISC.

The SPC Contractor shall then take down and set aside (within a secure compound, and within a 10 mile radius of the Site to be agreed with the Project Manager) materials from the removal of the listed South Leith Parish Graveyard Wall located in Constitution Street, as well as removing all below ground obstructions (including utilities) human remains and archaeology from the footprint of the wall foundations (foundation footprint to be determined by ISC contractor during ECI).

The SPC Contractor shall then install temporary measures to retain the churchyard ground. The extent to which the temporary retaining measures shall encroach into the graveyard grounds must be kept to the minimum possible. The extent of excavation and the locations of the temporary retaining measures within the graveyard shall be confirmed with the Project Manager and CEC archaeologist prior to any works at this location commencing.

These element of the works, including the construction of a retaining structure for the listed graveyard grounds, shall provide a clear footprint for the ISC to construct the wall foundation, tram infrastructure and re-build the wall.

The ISC contractor has been provided with a design previously developed which was granted planning approval as a reference design for consideration by the contractor.

3.3 Tower Place Bridge

Tower Place Bridge, built circa 1993, is located in the Albert Dock area and consists of a 79.5m long four span composite bridge deck comprising of cast in-situ reinforced concrete slab and precast prestressed concrete Y3 beams.

During the first phase of the Edinburgh Tram Project, the Parsons Brinkerhoff (PB) design proposed a widening of the deck, copes refurbishment with OLE mast inclusion, parapet upgrade, construction of shallow trackform and abutment ballast wall modification for the Tram ducting. The deck configuration was altered circa 2010 by widening the structure on the south verge. The original width of 8.75m was increased to 11.15m by constructing piles to support a widened abutment and piers and installing additional prestressed concrete beams. The parapet containment on the south verge was also upgraded in accordance with TD19/06 and the height increased to 1.4m to accommodate cyclists. The rest of the modifications designed by the Parsons Brinkerhoff (PB) circa 2008 were not implemented

Recognising the risk associated with this structure, the team commissioned Atkins to carry out a review of the design issues associated with the structure and propose solutions available. The design review included a review of the following:

- Movement joints and bridge movement relatively to the Tram tracks.
- Bearings and feasibility to switch the fixed and free end of the bridge deck.
- Utility services and Tram ducting incorporation into the footpath and existing abutment ballast wall.

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- Integration of OLE mast over the structure.
- Trackform options from Rail Track System.
- Establishing Specialist opinion on the Trackform.
- Derailment containment options and proposal for parapet upgrade.
- Loading comparison between existing and design proposal to assess load effect on the structure

To allow this review to be carried out, inspection work has been conducted on the visible part of the structure at the road level and below the deck. The overall structure was found to be in good condition with some degree of corrosion noted on some of the bearings on the abutments.

Overall, the review concludes that the bridge could be retained to accommodate the tram infrastructure with some modifications detailed as follows:

- Switching the bearing fixity and associated constructability to be verified by the Contractor, however, at this stage, it is considered feasible.
- Shallow trackform of 250mm maximum to be adopted.
- Parsons Brinkerhoff alteration design of north cope and raised kerb to be conducted as part of the new phase of work subject to Tram derailment containment verification.
- Location of OLE mast plinth to be adjusted so that it can be accommodated in to the stiffer elements of the bridge deck or the over the piers.
- Construction of runoff slab to limit the risk of differential settlement which would otherwise have an impact on the rail alignment.
- Some bearings at the abutment are considered corroded and may require replacement.

The above analysis was provided to the contractor in the tender documentation to demonstrate a solution being available to be taken forward by the contractor during its detailed design.

The review of existing as-built documents and bridge inspections suggests that the existing bridge could integrate the tramline over the deck subject to the verification of the bridge deck capacity to sustain the additional load from surfacing.

3.4 Victoria Dock Bridge

Victoria Dock Bridge, built circa 1993, is located in the Albert Dock / Victoria Dock Basin area and consists of a 23.7m single span composite bridge deck comprising of cast in-situ reinforced concrete slab and precast prestressed concrete Y6 beams.

During the first phase of the Edinburgh Tram Project, the Parsons Brinkerhoff (PB) design proposed that both bridge copes were reconstructed to account for an increase in surfacing depth to integrate the tramway trackform and reinforced concrete ground beams introduced on the approaches. The existing P2 parapets were also proposed to be upgraded to 1.4m high N1/W4 parapets in accordance with TD19/06. The end beam diaphragm also required modification to allow for the passage of Tram ducting near the north and south side. The Approval In Principle ULE90130-SW-REP-42 V6 and its addendum ULE90130-SW-REP-00160 V1 established by Parsons Brinkerhoff (PB) provides description of the proposed work. This design proposal has not yet been implemented.

Recognising the risk associated with this structure, the team commissioned Atkins to carry out a review of the design issues associated with the structure and propose solutions available. The design review included a review of the following:

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- Asphaltic plug joints and road surfacing;
- Bearings;
- Utility services and tram ducting incorporation into the footpath and existing diaphragm wall as per initial Parsons Brinkerhoff design;
- Shallow trackform options from rail track system specialist;
- Derailment containment options proposed with parapet upgrades;
- Loading comparison between existing and design proposal to assess load effect on the structure.

Two inspections were carried out during stage 1:

- Road level inspection: Cracking was observed in the road surfacing at the approach and in the asphaltic plug joint which suggests differential settlement of the road construction;
- Below Deck Level: The bearings and the overall structure were found to be in good condition

A high level assessment was carried out to validate the capacity of the superstructure of accommodating a suitable track form. The assessment confirms the superstructure can accommodate a carriageway construction depth of up to 250mm and a rail track systems specialist has advised that a suitable shallow trackform shall be available to accommodate within this depth.

Overall, the review concludes the structure to be in a serviceable condition which can accommodate the proposed tramway line with modifications. The following recommendations have been identified for the next phase:

- Alteration to copes, beam end diaphragm for tram ducting and parapet upgrades as identified in the previous phase;
- Trackform construction limited to 250mm;
- Construction of runoff slabs required at both bridge approaches;
- Further analysis into rail expansion joint to be conducted;
- Potential bearings replacement as part of the assets maintenance regime

The above analysis was provided to the contractor in the tender documentation to demonstrate a solution being available to be taken forward by the contractor during its detailed design.

3.5 Lindsay Road Retaining Wall

The Lindsay Road retaining wall was partially constructed during the first phase of the project.

Lindsay Road Retaining Wall consists of a set of four independent reinforced concrete walls and was partially constructed during the previous tram project:

- Wall 1A: Partially built during previous tram project. Section A3 to A6 are yet to be built due to clash with Scottish Water Sewer.
- Wall 1B: Not built, as construction sequence requires partial demolition of Lindsay Road.
- Wall 1C: Built as part of previous tram project.
- Wall 1D. Built as part of previous tram

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There is the requirement to complete the full scope of the wall construction including, but not limited to, reinforced concrete wall construction, engineering backfill, parapets and general roadway and tramway construction.

Recognising the risk associated with this structure, the team commissioned Atkins to investigate the condition of the already built wall units and also check the adequacy of the remaining wall units for buildability and their original design for compliance to Eurocodes.

A general inspection of the wall indicated that:

- Wall 1C and Wall 1D were generally in a serviceable condition except for missing base plates for fixing of the vehicular parapet and graffiti covering parts of the exposed wall faces.
- Built sections of Wall 1A, were observed to be in satisfactory condition, although minor defects were observed at places. Typical defects observed were, bitumen paint coat with graffiti, patches of vegetation growth at the toe of the wall, surface blowholes along the length of the wall, crazing on the parapet edge beams, hairline cracks around the weep holes and tie bars left in places.

Following a review of Lindsay Road retaining wall the following was concluded:

- The built sections of retaining wall are fit for purpose to accommodate the proposed tram project, although minor repairs are required to ensure the integrity of the structure is maintained over its proposed design life.
- The built sections require finishes and installation of the parapet protection system. Currently, the majority of the cast in sockets are exposed and may require protection to ensure their condition is appropriate for future use. Cast in socket are considered appropriate
- A check of Parson Brinkerhoff design conforms to Eurocode Standards.
- Unbuilt wall sections 1A (section A3 to A6) and 1B (section 5) shall require modification to accommodate the Scottish Water sewer line. Discussions were held with Scottish Water to agree in principle a solution that addresses the clash between their sewer line and Wall 1A Sections A3 to A6 and Wall 1B Section 5. The solution identified was to accommodate the sewer in the wall, by lowering the foundation level.

The above analysis was provided to the contractor in the tender documentation to demonstrate a solution being available to be taken forward by the contractor during its detailed design.