

REPORT

Castlefield Viaduct

Summary Feasibility Report

Client: National Trust

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Appendices

Appendix A - Services and Utilities Information Pack

1 Introduction

Royal HaskoningDHV has been commissioned by the National Trust (the Trust) to undertake three studies and procure services and utilities information for Castlefield Viaduct, Manchester, M3 4RU centred at Ordnance Survey National Grid Reference (NGR) 383005, 397626 (herein referred to as the 'site'). The studies comprised:

- Flood Risk Appraisal
- Contaminated Land Assessment
- Drainage Assessment

This report provides a summary of the services and utilities information, and the opportunities and constraints that have been identified for each of the studies undertaken. It also describes the likely requirements for future phases of work and recommendations for next steps. This report should be read in conjunction with the following reports:

- Site Vision Services (SVS) services and utilities information pack (presented as Appendix A)
- Royal HaskoningDHV, 2021a Castlefield Viaduct Flood Risk Appraisal (Ref. PC2387-RHD-ZZ-XX-RP-Z-0003), April 2021
- Royal HaskoningDHV, 2021b Castlefield Viaduct Contaminated Land Assessment (Ref. PC2387-RHD-ZZ-XX-RP-Z-0002), May 2021
- Royal HaskoningDHV, 2021c Castlefield Viaduct Drainage Review (Ref. PC2387-RHD-ZZ-XX-RP-Z-0004), May 2021

The studies will be used to inform proposals to develop the historic viaduct structure into an elevated urban park with integrated active travel hub.

1.1 Proposed Scheme

Castlefield Viaduct is an unused, 330m long, historic structure in the heart of Manchester. The Trust wish to bring the viaduct back into use by repurposing the structure into an elevated urban park and integrated active travel hub. The Trust's vision is for the urban park to be utilised in a variety of ways, ranging from exhibitions, fruit and vegetable growing, sculptures, work space, onward travel information, community meeting and green space.

A Phase 1 Pilot Scheme 'micro park' will be delivered on the eastern section of the viaduct, for a 12 week period during the summer of 2021. This temporary scheme will be undertaken to test the design possibilities and opportunities at the viaduct and generate momentum and support for the permanent scheme. The temporary scheme will comprise the use of the viaduct as a 'micro park' for community events and organised walking tours. An architectural narrative booklet has been produced for the scheme, referred to as the Castlefield Story Book by Twelve Architects in July 2020, and visualisations included within the booklet indicate installation of a footpath across parts of the viaduct, the erection of weather shelters and placement of planting containers.

The Phase 2 'permanent urban park and travel hub scheme' will comprise a permanent development on the viaduct inclusive of food and beverage stands, garden areas, exhibition stalls, seating areas, an events space and toilet facilities.

2 Services and Utilities Summary

The SVS desk top study was supplemented with a service tracing exercise, undertaken from 19th to 23rd April 2021, and a site walkover, carried out by Royal HaskoningDHV on the 19th April 2021. The following observations were noted:

- Gas mains are not shown as being present on the viaduct and the records indicate the closest low pressure mains are along Potato Wharf road, which services Giants Basin and the Youth Hostel to the north of site. Low pressure gas mains are also present to the south of Catalan Square to the south of the viaduct, and also along Collier Street to the east.
- British Telecommunications (BT) cables are shown below the viaduct along part of Castle Street, Duke Street and along Beaufort Street where a cable is shown connecting to the lift on the Deansgate-Castlefield car park. A BT cable is also shown to the north-west of the viaduct associated with a residential apartment block.
- Drainage guttering is shown on the platform of the viaduct and down spouting on the columnar struts. Further details can be found in the Drainage Assessment (see Section 5).
- Electricity cables were recorded on the viaduct in two places along the northern boundary of the viaduct. Both lengths of cable are located from the castellated towers on the northern length of the viaduct to the east and west of Castle Street below, as presented in Figure 1-1 below. Low voltage electricity cables are shown below the viaduct along part of Castle Street and Duke Street. They are also shown close to the eastern end of the viaduct to the north of Castlefield-Deansgate car park, associated with the lift which connects the car park to Beaufort Street on the ground level below. 6kV – 6.6kV electricity cables cross Dawson Street at ground level, approximately 70m west of the site. The closest 33kV electricity cables are shown to be located along Bridgewater Street, approximately 140m north of the site.
- United Utilities wastewater and water distribution plans do not indicate mains pipes to be present on the viaduct. Foul sewer manholes are shown on land below the viaduct to the north of Catalan Square.
- Clean water mains pipes are shown below the viaduct along Castle Street, to the north-east of the viaduct, and also on Duke Street and Beaufort Street. Clean water pipes connect to the residential apartment block to the north-west of site from the mains pipes along Potato Wharf.
- An EUnetwork cable crosses Dawson Street to the west of the site.

Services and utilities information is presented as Appendix A.

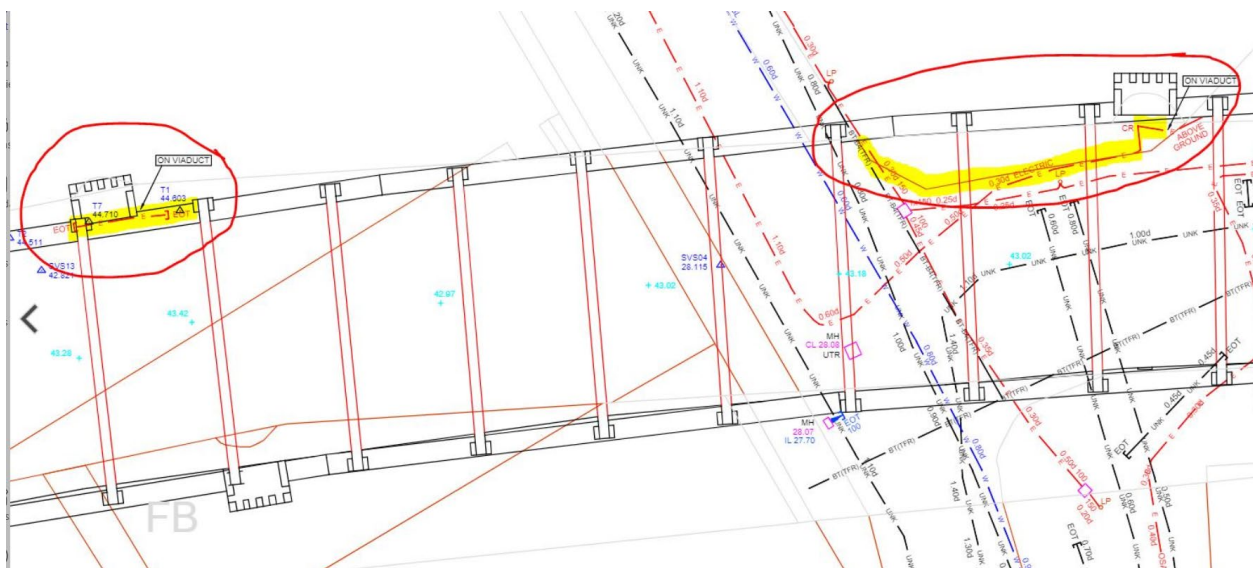


Figure 1-1 Electricity Cables Located on the Viaduct (shown in yellow highlight)

SVS prepared a drawing following the service tracing exercise undertaken on the viaduct and the land below and surrounding the viaduct (drawing Ref. 0421-RH-14204) presented as Appendix A.

2.1 Opportunities and Constraints Associated with Services and Utilities

Future use of the viaduct during Phase 2 'permanent urban park and travel hub scheme' is likely to require the permanent installation of services such as electricity, drinking water pipes and a fire hydrant system. It may be possible to reuse and repair, if required, the exiting electricity infrastructure, noted as a cable riser, located on the northern boundary of the viaduct. It is possible that the base of the viaduct is uneven, allowing water to accumulate. As such, the installation of new services may require conduit/ducts. Should permanent connection be required from the viaduct to mains pipes, research into viable connection points should be undertaken via consultation with the respective asset owners. Reestablishment of the drainage network is discussed in Section 1.5.

3 Flood Risk Assessment Opportunities, Constraints and Recommendations

The ground below the viaduct is primarily located within Flood Zone 2; however, this is based on the modelling representing the ground levels beneath the viaduct and its elevation is such that it is actually above the level of the flood risk. The viaduct is located approximately 15m above the watercourses that lie beneath it. As such, the viaduct itself is at low risk from all sources of flooding (i.e. fluvial, surface water, groundwater and sewers). Deansgate-Castlefield car park is located topographically higher than the existing viaduct and as such this is also at low risk of flooding from all sources.

It is proposed that as part of Phase 2, an elevated walkway would be built from the canal tow path beneath. Although there is a fluvial flood risk at the access location onto the elevated walkway, it is noted that safe access and egress can be maintained from the site via the Deansgate-Castlefield car park.

The site is located within the Environment Agency's Flood Alert and Flood Warning Service Areas. It is recommended that following the provision of the additional access, the Trust sign up to this service and

that access and egress via the elevated walkway is suspended during flood events, and Deansgate-Castlefield car park is used instead.

4 Contaminated Land Assessment Opportunities, Constraints and Recommendations

Following Phase 2, a potential moderate risk to future site users was identified and further investigation and assessment should be undertaken to understand whether this presents a development constraint and to identify appropriate mitigation measures.

The following potential development constraints and uncertainties relating to contaminated land were identified:

- The ballast which covers the viaduct has not been sampled or tested and it is uncertain whether the material contains concentrations of contaminants which have the potential to cause harm to human health or the environment.
- It is unknown whether the paint which covers the viaduct contains lead or other metal contaminants which have the potential to cause harm to human health and the environment.
- If earthworks or piling is required at ground level as part of the proposed scheme, ground conditions are unknown. There is the potential to mobilise contamination during construction and cause harm to human health and the environment.

4.1 Recommendations

In order to determine whether the railway ballast present on the viaduct is suitable to remain in place following development, it is recommended that a sampling exercise is undertaken on the fine-grained soil matrix surrounding the coarse stone of the railway ballast. The chemical characteristics of the ballast material can then be characterised with the analysis of soil and soil leachate samples. A paint sampling exercise of the flaking paint on the viaduct structure is also recommended in order to determine whether metal concentrations within the paint present a source of contamination and support the potential management requirements during redevelopment and operation. It is anticipated that this intrusive investigation will comprise:

- a series of hand dug pits in a grid system along the width and length of the viaduct; and,
- paint sampling exercise from the viaduct structure.

Following analysis, the data can be interpreted and an assessment of risks to human health with respect to the potential future use of the site and risks to drinking water pipelines and the Conceptual Site Model (CSM) be refined. If the assessment concludes that the material is not suitable to remain on site, land contamination mitigation methods should be recommended, which can be used to repurpose the design, or a waste classification assessment can be undertaken to inform suitable disposal options.

The soil sampling exercise can also be used to understand the potential risk to workers during any construction works. As such, it is recommended that ballast fines/soil sampling is undertaken prior to any construction works.

The following recommendations should be considered by the Trust during the evolution of the feasibility study and permanent design. The list is non-exhaustive and all recommendations are considered to be conditional on the final design and use of the site:

- Civil engineering – it is currently assumed that the bridge proposed for Phase 2 can be supported from the viaduct, and piling to provide support is not required. This assumption has the potential to change should Historic England find this design unacceptable on a Grade II listed structure (the viaduct). Should this situation arise and piling into the ground beneath the viaduct be required, an intrusive investigation to obtain soil samples for both geo-environmental and geotechnical purposes would need to be undertaken, along with an assessment of potential risks to controlled waters.
- Creating an opening in the base of the viaduct platform - the proposed new bridge would be formed by a gap in the lattice girder structure; however, other options, such as the creation of a hole in the base of the viaduct, may be considered. In this case, water that collects in the base of the viaduct would need to be contained to ensure a run-off pathway is not created that could pose a risk to human health of site users below any aperture.
- Should drainage system alterations or improvements from the viaduct need to be installed, the soil leachate analysis from the ballast fines/soil sampling exercise described above can be used to support the understanding of the possibility of mobilisation of contaminants from the ballast during installation of any new system.
- Installation of drinking water mains – assessment of contaminants present within soils to understand whether the isolation drinking water pipes via barrier pipe or conduit system is required.
- The accumulation of vapours in permanent poorly ventilated buildings or structures constructed on ground level should be considered.
- Installation of 'green stuff' such as vegetable plots or fruit growing areas –any planting is recommended to be within raised beds disconnected from ballast.
- Painting of the viaduct structure is not currently planned. Deteriorating condition of the paint works may cause the release of metals such as lead; future painting works may require the removal of old paint which could cause a short-term rapid release of metals. Consideration should be given to any proposed method of paint removal and dust management controls should be incorporated if required.
- A detailed UXO study is recommended prior to the start of any intrusive works at ground level, as the land underlying the site has been classified as a medium to high risk in relation to UXOs.

5 Drainage Assessment Opportunities, Constraints and Recommendations

A drainage assessment for the site was undertaken, its findings are summarised below.

The viaduct's drainage networks were identified. These comprise collector drains sunken below the ballast, connected to metal channels beneath the deck which convey the flows to downspouts before discharging to the canal below. At the deck level, the layer of ballast acts as a permeable surface, offering attenuation volume during heavy rainfall, and as hydrocarbon removal layer. The existing drainage network is unlikely to be suited for the rainfall intensities that are observed at present.

The drainage strategy for the pilot scheme offers a solution that has minimal disturbance to the existing ballast and viaduct structure and requires limited enabling works. The use of surfacing drainage solutions for temporary events, such as modular pavements, timber decking or temporary sports surfaces is recommended, which would maintain the current drainage in place whilst creating a suitable working surface for the proposed use. Portable chemical toilets are recommended as a temporary solution for the provision of toilet facilities.

Given the historic and heritage importance of the viaduct, it is proposed that no alterations take place below the viaduct's deck, so as not to change its appearance. The strategy will follow the principles of blue and green roof solutions. A blue roof is defined as a roof that is designed to store rainwater either as open water surfaces, storage within or beneath a porous media or modular surface, or below a raised decking surface or cover. A green roof is defined as a roof with a vegetated surface that provide a degree of retention, attenuation and treatment of rainwater and promotes evapotranspiration.

The proposed permanent scheme will require a drainage system that is suited for the lifetime of the development, and which can offer attenuation at deck level. This should include for climate change provision to future proof the development.

Depending on the volume of attenuation required, the ballast may be suitable for reuse. Alternatively, a solution offering a better volume per area ratio will need to be considered. It is likely that the existing impermeable membrane protecting the structure will require replacement across the viaduct.

The foul water network serving the proposed toilet facilities could discharge by gravity down the viaduct or be pumped to the east end of the viaduct where it would flow by gravity to the level below. Possible connections into the public sewers are available locally. United Utilities must be consulted regarding the suitability for connecting into their sewers.

It is recommended that the Planning Authority is consulted to understand their requirements for both the pilot and permanent schemes. Furthermore, a full survey and maintenance of the viaduct's drainage is recommended prior to installation of the pilot scheme. Finally, further development of the drainage strategy and design is recommended to ascertain the drainage requirements using the hydraulic modelling.

6 References

Royal HaskoningDHV, 2021a Castlefield Viaduct Flood Risk Appraisal (Ref. PC2387-RHD-ZZ-XX-RP-Z-0003), April 2021

Royal HaskoningDHV, 2021b Castlefield Viaduct Contaminated Land Assessment (Ref. PC2387-RHD-ZZ-XX-RP-Z-0002), May 2021

Royal HaskoningDHV, 2021c Castlefield Viaduct Drainage Review (Ref. PC2387-RHD-ZZ-XX-RP-Z-0004), May 2021

Appendix

Appendix A - Services and Utilities Information Pack



Royal HaskoningDHV is an independent, international engineering and project management consultancy with over 138 years of experience. Our professionals deliver services in the fields of aviation, buildings, energy, industry, infrastructure, maritime, mining, transport, urban and rural development and water.

Backed by expertise and experience of 6,000 colleagues across the world, we work for public and private clients in over 140 countries. We understand the local context and deliver appropriate local solutions.

We focus on delivering added value for our clients while at the same time addressing the challenges that societies are facing. These include the growing world population and the consequences for towns and cities; the demand for clean drinking water, water security and water safety; pressures on traffic and transport; resource availability and demand for energy and waste issues facing industry.

We aim to minimise our impact on the environment by leading by example in our projects, our own business operations and by the role we see in “giving back” to society. By showing leadership in sustainable development and innovation, together with our clients, we are working to become part of the solution to a more sustainable society now and into the future.

Our head office is in the Netherlands, other principal offices are in the United Kingdom, South Africa and Indonesia. We also have established offices in Thailand, India and the Americas; and we have a long standing presence in Africa and the Middle East.



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