

REPORT

Castlefield Viaduct Land Quality Remediation Strategy

Client: National Trust

Reference: PC2387-RHD-ZZ-XX-RP-Z-0013

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Revision history

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Executive Summary

Royal HaskoningDHV has been commissioned by National Trust (the Trust) to prepare a Remediation Strategy for the proposed redevelopment of Castlefield Viaduct, Manchester. A Phase 1 Pilot Scheme is planned for a 12 week period in the summer of 2022. The temporary scheme will be undertaken to test the design possibilities and opportunities at the viaduct and generate momentum and support for the proposed main scheme. This strategy has been formulated to support the temporary scheme.

The railway upon which the viaduct was originally constructed in the 1890's and subsequently dismantled in the late 1960s. An intrusive investigation was undertaken by Royal HaskoningDHV which included a ballast/soil sampling exercise with subsequent quantitative risk assessment. Pollutant Contamination Linkages (PCLs) were identified as presenting a potentially unacceptable risk to human health and the environment and as such require mitigation to reduce the risk to an acceptable level.

The strategy has been designed to practically minimise the risks to receptors whilst emphasising a sustainable and cost beneficial approach. The strategy is therefore one of environmental risk reduction which seeks to reduce the impact on receptors by covering contamination source and the breaking of PCLs.

In preparation of this document, additional water samples have been collected on three occasions in October and November 2021 from downspout water draining from the viaduct. The laboratory test data obtained following analysis of these samples was assessed in order to inform feasible remediation options associated with the potential identified risk to controlled waters.

The proposed remediation methods constraints by the height and weight loading restrictions on the viaduct and are summarised below:

Source	Receptor	Pathway	Comment
PAHs, predominantly benzo(a)pyrene and lead originating from soils/track ballast across the viaduct	Future site users	dermal contact, ingestion or inhalation	Pathway interruption due to installation of cover system comprising: membrane, subbase, footpath, existing vegetation, building and planters.
Metals (lead and zinc) within paint dust or flaking paintwork of the viaduct	Future site users	dermal contact, ingestion or inhalation	Pathway potential interrupted due to management via barriers, existing vegetation and site infrastructure to avoid contact with paintwork on viaduct structure.
PAHs and metals originating from soils/track ballast across the viaduct	Development workers during construction and maintenance workers	dermal contact, ingestion or inhalation	Pathway reduced due by avoidance and management where contact is unavoidable via appropriate working methods and usage of PPE.
Metals (lead and zinc) within paint dust or flaking paintwork of the viaduct	Development workers during construction and maintenance workers	dermal contact, ingestion or inhalation	Pathway reduced due by avoidance and management where contact is unavoidable via appropriate working methods and usage of PPE.
Metals (lead and zinc) originating from soils/track ballast across the viaduct and possibly viaduct structure	Surface waters	leaching and run-off	Pathway reduced due to installation of drain guards during enabling works and due to a reduction in rainfall infiltration.

In addition to the above, the following requirements have been included in order to manage the repurposing works for the Phase 1 Pilot scheme:

- Identification and remediation of any unexpected contamination encountered during the development works.
- Import of topsoil or suitable growing medium for any proposed planters/landscaping to be suitable for use to ensure contamination is not introduced to site.

This Remediation Strategy is likely to be revised substantially for the proposed Phase 2 'permanent urban park and travel hub scheme' and will incorporate any lessons learnt from this temporary Phase 1 Pilot scheme.

1 Introduction

Royal HaskoningDHV has been commissioned by National Trust (the Trust) to prepare a Remediation Strategy for the proposed redevelopment of Castlefield Viaduct, Manchester, centred at Ordnance Survey (OS) Grid Reference 383005 Easting 397626 Northing (herein referred to as the 'site'). This strategy will inform proposals to repurpose the historic viaduct structure into an elevated urban park with integrated active travel hub. Preparatory works (herein referred to as the 'Works') are proposed to repurpose the site. A site location plan is provided in **Figure 1.1**, at the end of this report.

The following information sources and reports have been reviewed to inform the Remediation Strategy and should be read in conjunction with this report:

- Royal HaskoningDHV (2021a) Castlefield Viaduct Land Quality Desk Study and Preliminary Risk Assessment Report, Ref. PC2387-RHD-ZZ-XX-RP-Z-0002, dated 10 May 2021; and
- Royal HaskoningDHV (2021b) Castlefield Viaduct Land Quality Interpretative Ground Investigation and Generic Quantitative Risk Assessment Report, Ref. PC2387-RHD-ZZ-XX-RP-Z-0009, dated 13 August 2021.

This report has been prepared by Royal HaskoningDHV for the sole benefit of the Trust.

1.1 Proposed Development

Castlefield Viaduct is an unused, 330 metres (m) long, historic structure in the heart of Manchester. The Trust wishes 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, workspace, 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 in the summer of 2022. The temporary scheme will be undertaken to test the design possibilities and opportunities at the viaduct, 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. Architectural drawings for the Phase 1 Pilot Scheme have been prepared by Twelve Architects, in September 2021. Visualisations included within the drawings indicate the installation of a footpath across parts of the viaduct, retention of existing vegetation cover, the erection of temporary buildings/weather shelters and the placement of planting containers. The Masterplan is presented as Appendix A.

1.2 Legislative Context

The Remediation Strategy is undertaken in the legislative context of:

- Part 2A of The Environmental Protection Act (1990); and
- The National Planning Policy Framework (NPPF) (2021).

1.2.1 Relevant Planning Conditions

The planning application was approved on 23rd November 2021. Planning conditions for permission reference 131621/FO/2021 (Temporary change of use to an urban park (F2(c)) for a period of 20 months) related to contaminated land are:

5) a) *Before the development hereby approved commences, a report (the Preliminary Risk Assessment) to identify and evaluate all potential sources and impacts of any ground contamination, groundwater contamination and/or ground gas relevant to the site shall be submitted to and approved in writing by the City Council as local planning authority. The Preliminary Risk Assessment shall conform to City Council's current guidance document (Planning Guidance in Relation to Ground Contamination).*

In the event of the Preliminary Risk Assessment identifying risks which in the written opinion of the Local Planning Authority require further investigation, the development shall not commence until a scheme for the investigation of the site and the identification of remediation measures (the Site Investigation Proposal) has been submitted to and approved in writing by the City Council as local planning authority.

The measures for investigating the site identified in the Site Investigation Proposal shall be carried out, before development commences and a report prepared outlining what measures, if any, are required to remediate the land (the Site Investigation Report and/or Remediation Strategy) which shall be submitted to and approved in writing by the City Council as local planning authority.

b) When the development within each phase commences, the development shall be carried out in accordance with the previously agreed Remediation Strategy and a Completion/Verification Report shall be submitted to and approved in writing by the City Council as local planning authority. In the event that ground contamination, groundwater contamination and/or ground gas, not previously identified, are found to be present on the site at any time before the development in each phase is occupied, then development shall cease and/or the development shall not be occupied until, a report outlining what measures, if any, are required to remediate the land (the Revised Remediation Strategy) is submitted to and approved in writing by the City Council as local planning authority and the development shall be carried out in accordance with the Revised Remediation Strategy, which shall take precedence over any Remediation Strategy or earlier Revised Remediation Strategy.

Reason - To ensure that the presence of or the potential for any contaminated land and/or groundwater is detected and appropriate remedial action is taken in the interests of public safety, pursuant to policies DM1 and EN18 of the Core Strategy.

1.3 Consultation with Manchester City Council

Consultation was undertaken with Manchester City Council (MCC) during the planning application process. Consultation correspondence is provided below:

From Royal HaskoningDHV for MCC's Planning Case Officer, dated 2 December 2021

Planning application ref. 131621/FO/2021 (Temporary change of use to an urban park (F2(c)) for a period of 20 months. Contaminated Land (condition 6)

Please share this request for consultation with MCC's Environmental Health Team in reference to Contaminated Land. We would like this in order to establish what are plausible options to discharge the planning conditions associated with Phase 1 Pilot and take account of in our forthcoming Remediation Strategy and revision of the masterplan.

Some exceedances of C4SLs and S4ULs have been identified in the track ballast/soils, as noted in Royal HaskoningDHV's Generic Quantitative Risk Assessment (GQRA) report. The current plan is to retain some exposed areas of existing track ballast/soils which benefit from, for the majority of the areas, being covered by vegetation and moss. These areas will be fenced off from public access with low level fencing (12Architects can share detail from a drawing if required). The reason for this is the Trust wish to retain the existing vegetation to:

- Retain biodiversity in these areas;
- Allow visitors to experience the character of the industrial heritage of the viaduct without detracting caused by high fencing or covering;
- Tell the story of the evolution of the viaduct from former industrial use to dereliction and potential future use as an urban park;

The Trust are aware of the presence of contamination in the track ballast/soils and they plan to reduce the potential contaminant linkage (PCL) during the Pilot scheme with the following management:

- 1 The Pilot is a temporary 12 month scheme and visitors will book onto a timed, guided tour in order to access the site. They will be supervised and escorted on site by trained National Trust staff members at a ratio no greater than 1:20 visitors for a period of less than 1 hour (managed by a booking in advance system);
- 2 There will be a low level fence to restrict access to areas of existing vegetation and bare track ballast/soils;
- 3 Staff will be trained to provide safety briefings which clearly acknowledge the risk associated with contamination and reasoning for staff to prevent visitors from stepping over the low level fence;
- 4 Safety briefings will be given to visitors via pre-visit information confirmed with their booking, and upon arrival to the viaduct, which clearly state they expect no attempt to access the areas of existing vegetation;
- 5 Clear signage will inhibit access to these areas;
- 6 Vegetation (buddleia plants mainly) grow and inhibit and deter access to these areas, as plants (which will be in leaf/flower) are envisaged be too wide to physically allow anyone to walk through;

As this is a Pilot scheme, the Trust will proactively manage any elements of the repurposing which have not worked and make contingency for non-adherence to the rules associated with attempts to access areas of existing vegetation.

We would be grateful in the first instance of your opinion regarding whether this proposed management is deemed acceptable to progress the temporary repurposing scheme. If it is possible to discuss informally, we would be very grateful of your time this week.

From MCC, Environmental Health via Planning Case Officer, dated 9 December 2021

I can accept much of the justification and responses for the phase I temporary / trial use only, although we will need a response to the following:

1. A footpath is being created so we will need details of how any potentially contaminated arisings will be stored and disposed of and the contractor will need to retain and submit waste transfer notes for any removed ground
2. We will need details of what material will be imported for the footpath and how contractor safety will be maintained during its creation
3. We will also need to ensure any new plants or shrubs are embedded in planters rather than dug in to the soil for the temporary phase so further comment and confirmation will be required to address this
4. The full scheme is likely to require more intrusive ground work and proposals so a full remediation strategy will be required for the scheme beyond the trial proposal.

1.4 Remediation Strategy Objectives & Methodology

This Remediation Strategy summarises the principles, strategy and general method of approach to the proposed redevelopment of the site.

The strategy has been designed to practically minimise the risks to receptors whilst emphasising a sustainable and cost beneficial approach. The strategy is therefore one of environmental risk reduction which seeks to reduce the impact on receptors by covering contamination source and the interruption of potential contaminant linkages (PCLs).

It is intended that this document will be submitted to Manchester City Council to support the discharge of pre-commencement conditions set out above.

The Strategy has been completed in general accordance with the recommended approach in:

- Manchester City Council (MCC) 'Planning & Contaminated Land: Technical Guidance, February 2021; and
- Contaminated Land Report 11, 2004 DEFRA and Environment Agency (EA) 'Land Contamination: Risk Management Framework', 2021.

1.4.1 Key Parties

The key parties involved with the Remediation Strategy are as follows:

- Client: National Trust;
- Viaduct owner: Department for Transport;
- Principal Designer: Stace LLP
- Designer in relation to contaminated land management: Royal HaskoningDHV;
- Principal Contractor: to be confirmed (TBC);
- Local Planning Authority: Manchester City Council.

1.5 Report Limitations

This report has been produced subject to the following exclusions and limitations:

- The information contained in this report is intended for the use of the Trust and Royal HaskoningDHV can take no responsibility for the use of this information by any third party or for uses other than that described in this report or detailed within the terms of our engagement.
- This report is prepared and written in the context of an agreed scope of work and should not be used in a different context. Furthermore, new information, improved practices and changes in legislation may necessitate a re-interpretation of the report in whole or in part after its original submission.
- This report draws upon data from the intrusive ground investigation and monitoring of a relatively small proportion of the sub-surface site conditions. Therefore, this information is not necessarily exhaustive and further information relevant to the site may be available from other sources. Inferences drawn from these assessments are subject to the inherent limitations of any such study.
- This assessment has been made on the basis of the current ground conditions and the current information provided on the development design. Changes to the ground conditions could result in further assessments being required.

- Royal HaskoningDHV have undertaken preliminary informal discussions with MCC which has been considered when formulating this strategy. Ongoing stakeholder engagement may constitute a fundamental part of any future work undertaken at the site.

2 Environmental Setting & Ground Investigation

2.1 Site and Environmental Setting Summary

A summary of relevant background information is presented below in Table 2-1. The information is presented in full within the Desk Study (Royal HaskoningDHV, 2021a) and the Generic Quantitative Risk Assessment (GQRA) report (Royal HaskoningDHV, 2021b).

Table 2-1 Environmental Setting Summary

Categories	Details
Site Location	The site is 330 m long and 14 m wide comprising eight spans located 16m above ground level at approximate OS grid reference 383005 Easting 397626 Northing. The viaduct is accessed by Deansgate-Castlefield car park. The land below and adjacent to the viaduct is occupied by land parcels, roads, canals (Rochdale Canal and Bridgewater Canal) and a railway line.
Site History	The viaduct was constructed in 1893, was closed by 1969 and has remained derelict since.
Hydrology	The Bridgewater Canal basin is located below the viaduct extending north and south. The land below the viaduct is at a high risk of flooding (Flood Zone 2)
Geology & Hydrogeology	The bedrock is the Chester Pebble Bed Formation (Principal Aquifer). The groundwater vulnerability is high to low.
Sensitive Land Use	The viaduct is a Grade II listed structure.
Pollution Incidents to Controlled Waters	None attributed to the viaduct. The nearest recorded incident is 172 m north west: June 2001; diesel which had a minor impact to water (category 3 incident).
Registered landfill, historical landfill or other waste disposal sites	Local Authority mapping identifies that there were two scrap yards adjacent to the northern boundary and to the south west of the site (at ground level). There are three records of mobile plant licences being issued 164m north west to R E M Mobile Plant and Rec Remediation Ltd.
Waste exemptions	There are six recorded waste exemptions with multiple activities recorded at the same address within 250 m of the site. The nearest is 69 m south of the site (at ground level) and is recorded as sorting of controlled drugs for disposal.
Historical garages	There are three records of historical garages located below the site.
Historical tanks	There is one record of an unspecified tank located below the site recorded on the map of 1922.
Historical industrial land uses	Various historical industrial land uses are recorded on or underlying the site including wharves, railways buildings and sidings, unspecified depots and unspecified ground workings. Within 250 m of the site historical industrial land uses include railway land, depots, ground workings, mills, yards and a chemical works.
Unexploded Ordnance	Moderate Risk within the general vicinity of the site at ground level.

2.2 Ground Investigation July 2021

An intrusive ground investigation comprising the excavation of 10 hand dug pits, 10 paint scrapes and collection of one surface water sample was undertaken. The findings of this sampling exercise were reported in the Royal HaskoningDHV 2021b report and salient points are given below.

Ground conditions comprised track ballast surrounded by a soil matrix recorded on the deck of the viaduct to be 0.30 m thickness. The material is described as a dark brown sandy clayey Gravel with occasional rootlets. Observations of contamination were noted as an oily/greasy feel on soil. Some fuel/oil hydrocarbon staining was noted on the track ballast.

2.3 Contaminant Pollutant Linkages

The following sources, pathways and receptors have been identified pre mitigation and discussed in the below Tables 2-2 and 2-3:

Table 2-2 Sources of Contamination on the Viaduct Structure

Potential Source	Refined Contaminants
Railway land and ballast/soil matrix (on viaduct structure)	Soils (human health) - lead, chrysene, benzo(a)pyrene and other PAHs
	Soils (water pipelines) - hydrocarbons and PAH
	Soil-Leachate (surface water receptors) – primarily lead, fluoranthene and benzo(a)pyrene
Metals and paint flaked off from viaduct structure (on viaduct structure)	Lead and Zinc (and other metals)

Note: Off-site sources of potential contamination below the viaduct identified in the GQRA Royal HaskoningDHV 2021b report are not included as they are not considered applicable in respect to the repurposing strategy and design.

Table 2-3 Pathways and Receptors

Receptors	Pathways	Phase 1 - Pilot Scheme CSM	Comments regarding sources
Human Health			
Site users (visitors, trespassers, maintenance, future workers and visitors)	Direct exposure through dermal contact, ingestion or inhalation of contaminants within the ballast cover across the viaduct.	✓	
	Direct exposure through dermal contact, ingestion or inhalation of contaminants within the paintwork.	✓	
	Inhalation of volatile contaminants.	X	Not identified in investigation
Development workers during construction	Direct exposure through dermal contact, ingestion or inhalation of contaminants within the ballast cover across the viaduct.	✓	
	Direct exposure through dermal contact, ingestion or inhalation of contaminants within the paintwork.	✓	
	Inhalation of volatile contaminants.	X	Not identified in investigation
Chester Pebble Bed Formation – Principal Aquifer	Migration via preferential pathways caused by piling (if required).	X	Specifically, at ground level

Receptors	Pathways	Phase 1 - Pilot Scheme CSM	Comments regarding sources
Bridgewater Canal (below the viaduct and in immediate surrounding area)	Leaching, dissolution and migration of contaminants from the ballast covering the site via surface drainage and discharge into surface water receptors.	✓	
River Medlock (40m west of the site)		✓	
Future utilities (on the structure and below)	Direct contact and permeation of water supply pipes.	X	High level assessment identifies a risk

A contaminated land risk assessment was undertaken in accordance with CIRIA C552 guidance in order to derive the following pre mitigation Pollutant Contamination Linkages (PCLs) which have been identified as presenting a potentially unacceptable risk to human health or the environment and require mitigation to reduce the risk to an acceptable level:

- The risk posed to future site users, development workers during construction and maintenance workers from dermal contact, ingestion or inhalation of polycyclic aromatic hydrocarbons (PAHs) and metals predominantly lead originating from soils/track ballast across the viaduct.
- The risk posed to future site users, development workers during construction and maintenance workers from dermal contact, ingestion or inhalation of metals (lead and zinc) within the flaking paintwork of the viaduct.
- The risk posed by contaminants (such as lead, benzo(a)pyrene and fluoranthene) which have the potential to leach at concentrations which may pose an unacceptable risk to surface waters.

Drinking water will either be supplied to the site via containers and stored in a refillable canteen or water pipes will be installed above the membrane and isolated from the soil/track ballast therefore has not been considered further.

Hexavalent and trivalent chromium were recorded in the soil/track ballast leachate, but concentrations were not in exceedance of the EQS. As a cautionary approach, these determinands were tested in the downspout sampling exercise, although chromium is not considered to be a potential contaminant of concern.

2.4 Additional Investigation Works – Downspout Water Sampling

In order to further refine the risk posed to surface waters and provide 'real time' data relating to water quality discharging from part of the site, downspout sampling was undertaken on three occasions:

- 20 October 2021;
- 21 October 2021; and
- 1 November 2021.

Each of these sample rounds was undertaken either during or immediately after rainfall to ensure water flow and sufficient sample was available to sample from the downspout. It was not possible to determine what the construction material of the downspout was, however, it appeared to be of metal construction. Photographs taken of the downspout during this exercise are presented as Appendix C.

A total of ten samples, which included six samples and four trip and field blanks were scheduled for the following analysis:

- pH;

- Metals: hexavalent chromium, trivalent chromium, copper, lead, zinc; and
- PAHs speciated (EPA 16).

The laboratory analysis was undertaken by i2 Analytical UK Ltd and laboratory certificates of chemical analysis are presented as Appendix D.

2.4.1 Laboratory Quality Control

A duplicate sample was collected during each sampling round in an identical manner and scheduled for laboratory analysis as part of a quality assurance process.

Trip blanks were also taken during each round. A trip blank comprises distilled water provided in laboratory sample bottles and were analysed in order to indicate contamination which may have occurred during transportation and laboratory analysis. Trip blank sample containers were not opened on site.

A field blank was collected on the 1 November 2021 to understand reliability of the data. The collection of a field blank comprised pouring distilled water provided by the laboratory into a sample container during the sampling works on site. It allows identification of potential contamination which may have occurred during transportation, in the laboratory, and unlike the trip blank, via exposure to atmosphere on site.

2.4.2 Downspout Water Sample Assessment

The downspout water samples were:

- Screened against Water Framework Directive (WFD) and Environmental Quality Standards (EQS) for inland surface waters; and
- Compared to the potentially leachable determinands identified in the recent soil sampling exercise undertaken on the track ballast.

The Water Framework Directive United Kingdom Technical Advisory Group (WFD-UKTAG) (WFD-UKTAG, 2013) river and lake assessment method for specific pollutants (metals) Metal Bioavailability Assessment Tool (M-BAT) was used to derive Tier 2 site specific EQS values for copper, lead, zinc, and nickel. Parameters for pH, dissolved organic carbon (DOC) and calcium were used to alter the EQS and these were obtained from analysis of a surface water sample recovered from the surface water receptor (Bridgewater Canal) during the July 2021 sampling and reported in the Royal HaskoningDHV GQRA, 2021 report.

The WFD-UKTAG ambient background concentration (ABC) for 'all other freshwaters not listed' of 1.4 µg/l was added to the zinc EQS.

Table 2-4 below summarises the downspout water assessment with respect to data recorded above the EQS.

Table 2-4 Downspout Water Data EQS Assessment

Determinand	Total Number of Samples	EQS (µg/l)	Data Range min to max (µg/l)	Number of Results above EQS	Comment
Fluoranthene	6	0.0063	<0.002 to 0.08	1	DP1 sample records exceedance which is not replicated in the duplicate sample, and there is presence recorded in the trip blank
Lead	6	4.99	8.5 to 14.0	6	Exceedances are recorded one to three times greater than the EQS

Determinand	Total Number of Samples	EQS (µg/l)	Data Range min to max (µg/l)	Number of Results above EQS	Comment
Zinc	6	24.66	100 to 590	6	Exceedances are recorded four to 24 times greater than the EQS

A surface water sample taken from the Bridgewater Canal as part of Royal HaskoningDHV's GQRA, 2021b presented the same set of determinands noted in exceedance, with the following concentrations recorded:

- Fluoranthene 0.02 µg/l, three times greater than the EQS.
- Lead 8.4 µg/l, two times greater than the EQS; and
- Zinc 25 µg/l, marginally above the EQS.

Table 2-5 below presents the concentration range comparison between track ballast leachate data and soil matrix leachate data and the downspout samples, where samples record data above the laboratory LoD:

Table 2-5 Leachate and Downspout Water Data Comparison Summary

Determinand	Track Ballast Leachate Data Range (µg/l)	Soil Matrix Leachate Data Range (µg/l)	Downspout Water Data Range (µg/l)	Comment
Copper	1.6 to 7.5	5.2 to 24.0	6.8 to 8.3	The concentrations of copper recorded within the soil leachate samples are marginally above the site specific EQS. The downspout data indicates concentrations below the EQS. It is not considered that copper poses an unacceptable risk to surface waters.
Lead	1.4 to 30.0	2.1 to 9.6	8.5 to 14.0	Exceedances of the lead EQS in track ballast are widespread across the site and could potentially represent an unacceptable risk to surface water receptors.
Zinc	4.5 to 14.0	3.4 to 28.0	100 to 590	The concentration of zinc recorded within the soil leachate sample was marginally above the site specific EQS is considered a localised issue. It is considered unlikely that the recorded concentration of zinc at the site represents an unacceptable risk to surface water receptors. Zinc concentrations are much greater in the downspout water than the soil is indicated to be capable of leaching. This suggests a secondary contaminant source.
Fluoranthene	0.01 to 0.1	0.03 to 1.6	<0.002 to 0.08	The soil matrix and to a lesser extent the ballast have the potential to leach at concentrations which may pose a risk to surface waters. The downspout data indicates one exceedance in the sample and no exceedance in the duplicate. It is not considered that fluoranthene poses an unacceptable risk to surface waters.
Benzo(a)pyrene	<0.002 to 0.09	<0.002 to 0.81	< 0.002	The soil matrix and to a lesser extent the ballast have the potential to leach at concentrations which may pose a risk to surface waters. The downspout data indicates that none of the samples are above the LOD. It is not

Determinand	Track Ballast Leachate Data Range (µg/l)	Soil Matrix Leachate Data Range (µg/l)	Downspout Water Data Range (µg/l)	Comment
				considered that benzo(a)pyrene poses an unacceptable risk to surface waters.

2.4.3 Lead

Lead concentrations are recorded above the M-BAT value within track ballast leachate, soils matrix leachate, downspout water and surface waters samples from the Bridgewater Canal. The greatest concentrations are recorded within leachate data from the track ballast. Lead concentrations recorded in the downspout water are similar orders of magnitude as the track ballast and soil matrix (and surface water sample taken in July 2021). This indicates that lead may pose a potential risk to surface waters albeit the concentrations are generally in the same order of magnitude as the calculated M-BAT EQS value.

2.4.4 Zinc

Zinc concentrations are much greater in the downspout water than the concentrations that the soil matrix or track ballast are indicated to be capable of leaching. This would indicate that there is a secondary source of zinc contributing to water within the downspout.

The secondary source maybe attributable to other factors, such as any galvanised metal (which is coated within zinc) which water is passing through in the drainage system. The main structure is cast iron but the drainage gutters and pipes which were fitted at a later date may be galvanised.

This data has introduced uncertainty between soils/track ballast as a potential source of zinc contamination and it is likely that a secondary source is a contributing factor.

2.4.5 Duplicate Sample & Blank Sample Comparison

In general, trip and field blanks did not record determinands above the laboratory limit of detection (LoD), with the exception of the following, summarised in Table 2-6 below (potential contaminants of concern (PCOC) only considered):

Table 2-6 Trip and Field Blank Summary

Determinand	20 October 2021 Trip Blank (µg/l)	21 October 2021 Trip Blank (µg/l)	1 November 2021 Field Blank (µg/l)	1 November 2021 Trip Blank (µg/l)
Copper	1.7	0.8	2.1	1.4
Zinc	1.9	4.9	3.6	2.9
Fluoranthene	<LoD	<LoD	<LoD	0.02

Variation in data between the duplicate samples within the rounds is noted. It is possible this is attributable to a number of reasons and comment is made in the variations noted in the comparison table below (PCOC only considered):

Table 2-7 Duplicate Sample Comparison

Determinand	20 October 2021 (µg/l)	21 October 2021 (µg/l)	1 November 2021 (µg/l)
Copper	DP1 8.0 and DP2 8.3 4% difference	DP1 7.4 and DP2 7.1 4% difference	DP1 6.8 and DP2 7.2 6% difference

Determinand	20 October 2021 (µg/l)	21 October 2021 (µg/l)	1 November 2021 (µg/l)
Lead	DP1 14.0 and DP2 12.0 14% difference	DP1 9.7 and DP2 8.5 12% difference	DP1 9.2 and DP2 9.5 4% difference
Zinc	DP1 120 and DP2 140 14% difference	DP1 590 and DP2 410 31% difference	DP1 140 and DP2 100 29% difference
Fluoranthene	0% difference	0% difference	DP1 0.08 and DP2 0.002 98% difference

2.5 Controlled Waters Contaminant Linkages

Metals do not readily break down in the way an organic chemical could and minimal dilution or attenuation has taken place between the rainfall event, percolation and leachate through the ballast and soil matrix and the downspout outfall. It is possible the metal concentrations in the downspout water are not from the track ballast/soils and are due to an unknown contributing factor, possibly the structure of the viaduct.

When soil and track ballast was sampled in July 2021, there was no evidence of water within the exploratory holes. It is possible the viaduct is subject to 'flash' rainfall events, and the timeframes between raining and drainage of the viaduct may be insufficient for leachate to be generated.

The following has been discounted from further consideration due to an interruption in the pollutant linkage i.e. the source is not considered to pose a risk to surface waters:

- Copper;
- Benzo(a)pyrene; and,
- Fluoranthene.

The following are considered to pose a potential risk to surface waters and a potential pollutant linkage may be present:

- Lead albeit the risk is minimal; and,
- Zinc albeit there is a secondary source of potential contamination contributing to the impact.

2.6 Summary of Contaminant Linkages

The following PCOCs have been carried through to the remediation strategy on the basis that a PCL may exist which will require further mitigation:

- PAHs and lead originating from soils/track ballast across the viaduct.
- Lead, zinc and other metals within the flaking paintwork of the viaduct.
- Leachable lead and leachable zinc plus a secondary source.

3 Contamination Remediation Strategy

3.1 Aim & Objectives of the Strategy

The primary aim of the scheme is to repurpose the viaduct for use in a POS_{park} scenario and the objectives are to:

- Promote the sustainable use of materials and to enable suitable material to be retained on site as far as possible;
- Outline measures required during the Works to reduce contamination risks to acceptable levels; and
- Outline verification reporting requirements.

3.1.1 Objectives & Options Appraisal

Mitigation is required to interrupt the source-pathway-receptor pollutant linkages. Therefore, the following contamination sources and pathways require remediation / mitigation measures to reduce the risks posed to acceptable levels:

- Future site users from dermal contact, ingestion or inhalation of a PAHs and lead originating from soils/track ballast across the viaduct.
- Future site users from dermal contact, ingestion or inhalation of metals (predominantly lead and zinc) within paint dust or flaking paintwork of the viaduct.
- Development workers during construction and maintenance workers from dermal contact, ingestion or inhalation of PAHs and lead originating from soils/track ballast across the viaduct.
- Development workers during construction and maintenance workers from dermal contact, ingestion or inhalation of metals (lead and zinc) within paint dust or flaking paintwork of the viaduct.
- Surface waters from contaminants within soil/track ballast on the viaduct and a secondary source in relation to zinc which have the potential to leach at concentrations which may pose an unacceptable risk.

The Works also include the following requirements:

- Identification and remediation of any unexpected contamination encountered during the development works.
- Import of topsoil or suitable growing medium for any proposed planters/landscaping to be suitable for use so contamination is not introduced to site.

An options appraisal has not been undertaken due to the nature of the site and the proposed temporary repurposing works there are limited feasible options. Following discussion with the Trust in September 2021, retention of the track ballast is the option the Trust are progressing. As part of the high level balanced decision making process, this was considered to be the optimum remediation solution. Other options discussed such as stabilisation, processing of track ballast to remove the fine gained soil matrix and return track ballast for use on the viaduct or the complete removal of track ballast and soil matrix are not considered to be sustainable at this temporary stage.

3.1.2 Sustainable Remediation & Climate Change

Remediation has the potential to cause environmental, economic and social impacts. With consideration to the outcome of the downspout water sampling exercise and the sustainability goals, complete removal

of the soil/track ballast from the site is not considered to offer significant environmental benefit to be considered as a sustainable option due to the potential secondary unidentified contributing factor to zinc concentrations within downspout water.

Consideration has also been made to adverse effects on climate change. Remediation activities, in some cases may cause greater adverse effect than the contamination it aims to address and through incorporation of design to break PCLs where possible and through sustainable use of materials, the Phase 1 Pilot scheme seeks a passive approach.

3.1.3 Human Health PCL

The following describes what requires mitigation and how it will be addressed for this temporary phase of use of the site:

- The protection of future site users from dermal contact, ingestion or inhalation of a PAHs and lead originating from soils/track ballast across the viaduct. The pollutant linkage will be broken via the implementation of pathway interruption i.e. a membrane covering the ballast overlain by either Type 1 material for the construction of the path, planters, temporary buildings or sub / topsoil materials and cover formed by the existing vegetation.
- The protection of future site users from dermal contact, ingestion or inhalation of metals (lead and zinc) within paint dust or flaking paintwork of the viaduct. The pollutant linkage will be broken via the implementation of pathway interruption / reduction i.e. placement of barriers, temporary buildings structures, planters and existing vegetation cover to prevent site users interacting with the paint work etc.
- The protection of development workers during construction and maintenance workers from dermal contact, ingestion or inhalation of PAHs and lead originating from soils/track ballast across the viaduct and from dermal contact, ingestion or inhalation of metals (lead and zinc) within paint dust or flaking paintwork of the viaduct. The risk will be managed / reduce through the implementation of method statements and where contact cannot be avoided appropriate PPE/working practices are to be implemented and, if required, damping down will be implemented.

3.1.4 Controlled Waters PCL

The following describes what requires mitigation and how it will be addressed for this temporary phase of use of the site:

- The protection of surface waters from zinc and to a lesser extent lead originating from the soils/track ballast across the viaduct by the implementation of a drain guard / capture crate to trap soil fines. This will result in a reduction in fines entering the surface water system and hence a potential betterment. The drain guard allows water to drain through whilst trapping solids, soil fines and oils.
- The protection of surface waters from zinc and to a lesser extent lead originating from the soils/track ballast across the viaduct by the implementation of areas of pathway. The areas of pathway will reduce the infiltration of rainwater into the underlying materials which should result in a net reduction of potential leachate generation.

4 Contamination Strategy & Verification Protocol

4.1 Scope Overview

The following Preparatory Works requirements have been identified to mitigate contamination risks via implementation of the above remedial mitigation:

- Cover system via a footpath, bedding plants (grown in imported soils above membrane) and retention of existing vegetation cover in areas fenced off from site users;
- Installation of barriers, temporary building structures and planters;
- Appropriate working methods and PPE for construction and maintenance workers where contact with soils/track ballast is unavoidable;
- Installation of drain guards during construction works;
- Tool box talk for contractors working in ballast to identify and manage potential unexpected contamination; and
- Importation criteria for soils proposed to be imported to site.

4.2 The Works

To enable the temporary Phase 1 Pilot scheme, some degree of vegetation clearance (in area of proposed footpath for example), drainage system clearance and levelling of the ballast surface is anticipated. Preparatory works can be undertaken within minimal disturbance in discreet areas across the viaduct and largescale riddling of ballast is not considered likely to be required. The drainage guards should be installed as part of the proposed works to uncover drainage inlets on the viaduct surface and assess the condition and repair if required ahead of commencement of the surfacing works for the footpath.

The existing drainage layout is presented on Royal HaskoningDHV drawing Ref. PC2387-RHD-XX-ZZ-DR-D-0500, presented as Appendix F.

4.3 Supervision & Method Statements/Tool Box Talk

A Construction Health and Safety Plan and Construction Environmental Management Plan (CEMP) will be prepared prior to commencement of the Works. During the Works detailed method statements and risk assessments will be produced by the Contractor.

An Environmental Consultant will check that the Works are being carried out in accordance with this Remediation Strategy at key points in the project, such as when drain guards have been installed and when the membrane has been laid. It will be the Contractor's duty to inform the Environmental Consultant to allow them to be present on site as a minimum during the initial Works to a point where the viaduct ballast is covered and soils imported.

4.3.1 Encountering Unexpected Contamination Hotspots

In the event of encountering unexpected contamination, the Regulatory Bodies will be notified. If necessary, changes to the Remediation Strategy will be made initially with the Environmental Consultant who will then agree them in consultation with MCC (or the Environment Agency if necessary) in accordance with the Planning Conditions.

Areas of significant contamination not previously identified will be excavated and stockpiled separately in a quarantine area to prevent cross contamination and environmental impacts. Testing of the materials will be carried out and the materials will be dealt with according to the levels of contamination recorded.

The contractor will provide a brief to workers, in the form of a tool box talk or initial induction on how to identify unforeseen contamination. It should be noted in these briefings that during the soil/track ballast sampling exercise in July 2021, the sampler noted a 'greasy/oily' texture to the soils with some soil staining. Gross contamination is defined as and considered to be more notable than these observations.

4.4 Material Management

Materials likely to be imported to site include:

- Compost, topsoil and subsoil (within planters);
- Type 1 Ministry of Transport (MOT) gravel to be used as a subbase and placed above a geotextile membrane to prevent mixing with the pre-existing soils/track ballast; and,
- Gravel proposed to be bound in resin for the surface of the footpath.

4.4.1 Cover System & Importation Criteria

The cover system in the form of the footpath design comprises a membrane capillary break layer at its base above the existing soils/track ballast. This is overlain Type 1 MOT subbase gravel, which is in turn overlain by 50 mm gravel retention system and finishing layers of various depths and type. Fenced off areas to the north and south of the footpath will retain existing vegetation. These areas will not be seeded further or have plants imported and dug into these areas.

The viaduct structure constrains the cover system design as follows:

- The thickness of the cover system design has to take into consideration the height loss between the surface of the footpath and the overhead beams on the viaduct.
- Loading on the viaduct deck plates has also been taken into consideration.

The capillary break layer inhibits bio-turbidation from soil mixing by biological organisms between the existing soil/track ballast and imported material. This allows the material to be reused elsewhere following usage within the temporary scheme. This also interrupts the PCL between contaminants in the soil/track ballast and areas of planting (such as the camomile lawn), which are proposed to be covered within at least 75 mm of soil. The soil depth is considered sufficient to act as a growing medium for the specific type of plants which have been selected for this environment following consultation with horticultural specialists, as shown in the Figure below:

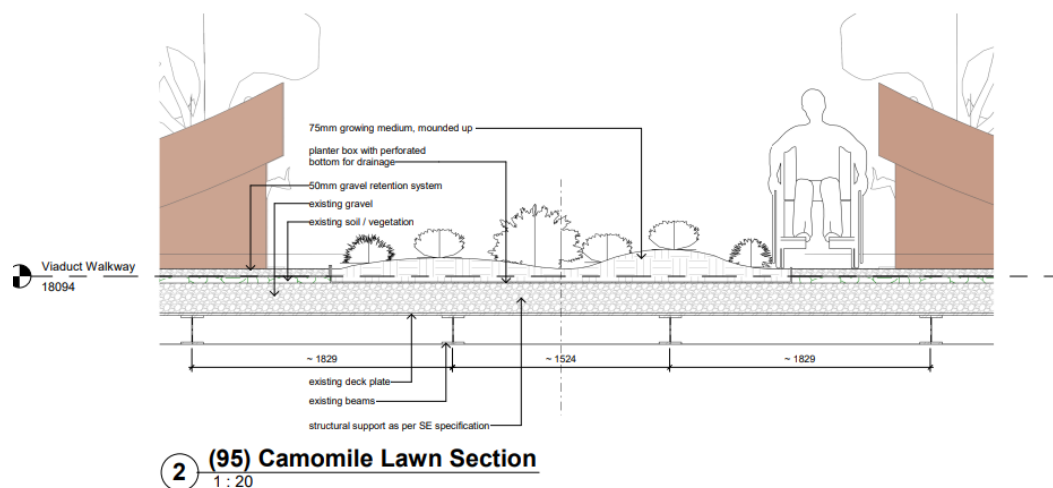


Figure 4-1 Excerpt from Twelve Architects Drawing (94) 004 Camomile Lawn Details

The installed membrane and solid nature of the footpath finishing layers ensures that the PCL is interrupted between contaminants within the existing soil/track ballast and human health receptors in the POS_{park} scenario and justifies diversion from MCC's 2021 guidance which indicates 450 mm for public open space end use. An excerpt of the footpath design is presented in the Figure below:

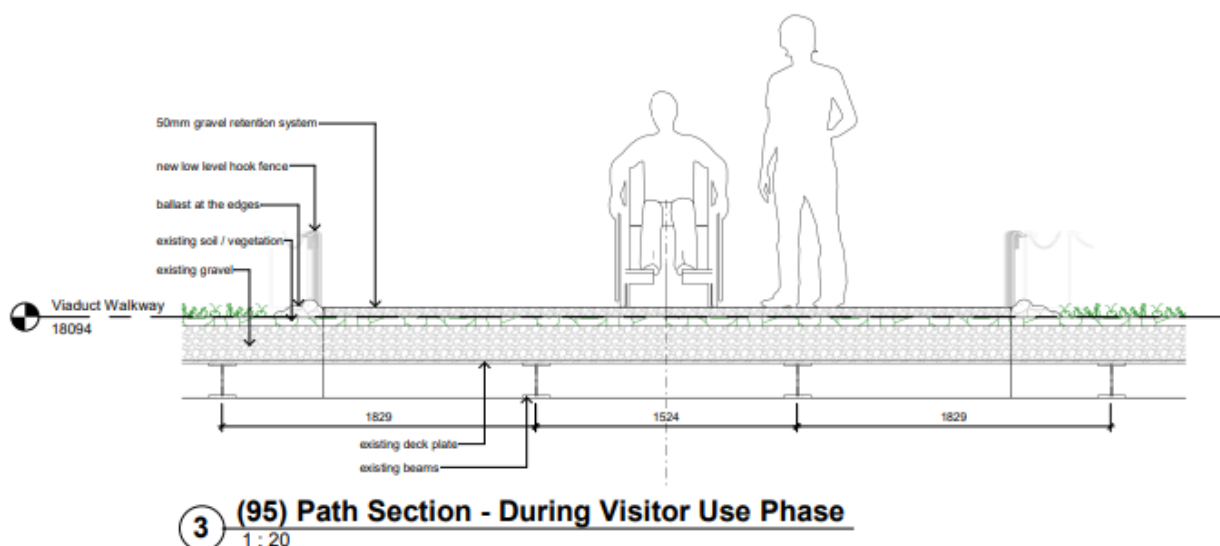


Figure 4-2 Excerpt from Twelve Architects Drawing (95) 001 Central Pathway Details

4.5 Validation Sampling Strategy (Imported Soils)

All imported soils will undergo a visual/olfactory inspection by the Contractor (in addition to any Earthworks Specification requirements) to ensure:

- The material is free from obvious contamination and odours;

- Is free from unsuitable material e.g. brick ties, timber, glass; and,
- There are no signs of asbestos containing materials (ACM).

Confirmation will be required that imported soils has not come from a site where Japanese Knotweed or other invasive species are present.

It is envisaged that soils/materials will be imported as follows:

- Type 1 material.
- Compost.
- Topsoil.
- Subsoil.

It is possible that some of the material likely to be imported to site complies to a specific standard, and some of the required testing has been undertaken already. For example, Publicly Available Specification (PAS100) for Composted Materials is certification for compost produced by recycling and a product data should be provided by the supplier ahead of purchase.

It is not proposed that Type 1 material will be tested if it is from a quarried source. If it is manufactured then it needs to be tested at the brownfield frequency.

The recommend rate of sample testing frequencies for imported material is provided within MCC's 2021 contaminated land guidance and is summarised below:

Table 4-1 MCC's Recommended Sampling Frequencies for Imported Fill Materials

Intended End-use	Greenfield source/origin sample:volume m ³	Remediated source/origin sample:volume m ³	Brownfield source/origin sample:volume m ³	Unknown source/origin sample:volume m ³
Soft-landscaping	1:200	1:150	1:150	1:150
other	1:200	1:200	1:200	1:200

Due to the nature in which the planters would be tended in a gardening scenario, the generic assessment criteria for allotments is considered to be appropriate to screen any samples against, rather than the POS_{park} GAC for the site visitors. Importation criteria for is presented as Appendix G.

Site won materials are not to be re-used except below the capillary break layer. There is no requirement to retest these materials.

4.5.1 Perched Water Management

Perched water is not anticipated but could be encountered within possible excavations into the track ballast ahead of drainage repair/clearance works. In such cases, it should be removed, tested and discharged to foul sewer wherever possible after passing through the drain guard, under an appropriate discharge consent or removed from site via a tanker. Should free phase hydrocarbon product be encountered at any point during intrusive works on site, this will be removed via pumping/excavation with disposal off-site.

4.6 Completion / Verification Report

On completion of the Works, a verification report will be compiled and copies supplied to the Local Planning Authority. The report will provide verification that all works associated with dealing with the

contamination issues have been carried out in accordance with this Remediation Strategy. A residual risk assessment will be provided as validation. The verification report will comprise a combination of the Contractors' factual information and the environmental consultant's interpretation.

In summary, and with reference to the Environment Agency LCRM 2021 guidance, the report content will include, as minimum the following information:

- Background information (basic site details, overall remediation objectives, brief summary of former use, previous investigations, ground conditions, hydrogeology and hydrology and other receptors).
- Details of the project and the roles and responsibilities of those involved (include any statutory and regulatory requirements information).
- Details on remediation including:
 - A general description of methodology and sequence of activities.
 - Volumes of any materials excavated and removed off-site.
 - Monitoring and testing regime.
- Details of verification including:
 - Validation of imported soils including visual inspection records, photographs, depth and thickness of cover layer and assessment of chemical test results.
 - Validation of the implementation of the capillary break layer.
 - Any necessary and agreed variations to this strategy.
 - Statement regarding unforeseen contamination.
 - An assessment of residual risks.
- Environmental Permits, consents, exemptions (if relevant).
- Environmental monitoring including what was undertaken, chemical assessment and test results pertaining to downspout water samples during construction phase, as presented in Appendix G.
- Details of all wastes sent for off-site disposal including copies of waste transfer notes (if relevant).
- A residual risk assessment.

5 Health, Safety & Environmental Protection Considerations

All remediation works will be conducted in accordance with the Construction (Design and Management) Regulations 2015 and Stace, the Principal Designer have been appointed. Consideration will be given to the potential short term impacts of the scheme to allow the works to be undertaken in a manner which will minimise potential for pollution of the environment and/ or nuisance to neighbouring land users.

Remediation operating procedures will be based around guidance contained within the HSE document entitled “Protection of Workers and the General Public During the Redevelopment of Contaminated Land” (HS(G)66) (no longer current but cited within Building Regulations for England and Wales). The Contractor will be required to provide information regarding their Environmental Management Systems. Environmental protection controls and monitoring schedule is detailed in the section below.

A watching brief will be undertaken by the Contractor for the presence of potential asbestos containing material and currently unidentified areas of contamination.

Although asbestos has not been identified in soils on-site in sampling works undertaken in July 2021 it should be noted that the protection of workers and the general public from exposure to asbestos from work activities is regulated by the Control of Asbestos Regulations (CAR) 2012. The Principal Contractor is responsible for the control of risk of exposure to asbestos during Enabling Works. Appropriate procedures should be implemented to prevent exposure to asbestos, should it be encountered during Enabling Works.

At all stages of the Enabling Works/Groundworks the management of materials and waters on the site will be closely controlled.

5.1 Environmental Protection Arrangements & Monitoring Schedule

It shall be necessary to implement a scheme of environmental monitoring to demonstrate suitability and efficacy of the environmental controls. Environmental monitoring shall be completed at the site boundaries and to comply with the environmental monitoring schedule and intervention levels described in Table 5-1. The specific location of the environmental monitoring points will be confirmed by the selected contractor and agreed with MCC's representative.

Should any threshold be exceeded, then works causing the exceedances in the affected area will be ceased or work levels reduced to achieve acceptable levels. Practices will be formally reviewed by the Contractor's Site Supervisor and any necessary additional control measures will be implemented.

Environmental considerations will be assessed and monitored with control measures put in place to limit the impacts from such. Emphasis will be placed on prevention and control at source rather than mitigation following release. Site operations will be conducted in order to reduce such environmental impacts to a practical minimum. Full details of and method statements for environmental control measures can be provided to the regulators if required once these have been received from the relevant contractor.

5.1.1 Environmental Monitoring Schedule

Before the commencement of works, monitoring will be undertaken to establish baseline conditions. Environmental control measures will be carried out in accordance with CIRIA Publication C741 'Environmental Good Practice on Site' and will incorporate the following:

Table 5-1 Proposed Monitoring Schedule for the Enabling Works

Parameter	Equipment and Monitoring Location(s)	Criteria/Trigger Level
Dust	Three sticky pads and holders for supporting measurements of dust deposition rates, analysed/replaced weekly	Damping down, covering of exposed work faces, litter screens, noting wind direction to reduce nuisance to local site users. Dust monitoring at site boundary for the period ahead of viaduct ballast being covered.
Noise and vibration	Handheld noise monitor giving data in real time, such as 3M NoisePro noise dosimeter or similar. At the 3 No. monitoring points to be undertaken daily during working hours.	≥5dB above background levels considered a potential nuisance. Follow recommendations as detailed in BS5228 (Noise Control on Construction and Open Sites). Any significant noise above normal background levels may generate complaints from local receptors.
Odour	Experienced operative undertaking (daily during working hours) boundary surveys throughout the day (minimum of three occasions).	- 3 unpleasant odour. Relates to the Hedonic Tone Scale and the qualitative score range used for odour samples compared to an offensiveness scale, (Environment Agency, 2007 Science Report) . A score of 3 has been chosen, as this is deemed unpleasant.
Surface water quality	Experienced operative undertaking observations of the visible areas of the drainage system on the viaduct (drainage grids). Downspout sampling for determinands similar to those tested for in October and November 2021 suite of analysis: - pH; - Metals: lead, zinc. At weekly (subject to dynamic nature of rainfall events) intervals during construction. The data obtained to date serves as a presentation of baseline conditions and the data obtained during monitoring should be screened against this 'baseline' in order to determine whether there is a significant diversion from the trendline.	Visual inspection of grids for visible evidence of contamination release of soil fines or oils. Appendix G baseline data collected to date to screen downspout water data. As minimum one sample from the downspout should be taken at the end of the construction phase to evidence to efficacy of the drain guards. Should diversion from the proposed 1 sample per week occur due to dry weather conditions, meteorological data in a file note will be required as reasoned evidence for this sampling not being undertaken.
Mud	Experienced operative undertaking observations of plant leaving site.	Visible soils at the site access point on the car park area to the east of the site. Wheel washing of deployed plant may be required if this is observed. However, it is not anticipated as plant is likely to be brought to site via low loader or similar and haulage of soils is also not likely.

Other parameters have been considered and not included above due to the following reasoning:

- Air emission monitoring is not proposed as volatile contaminants have not been identified at the site during the intrusive ground investigation (Royal HaskoningDHV 2021b).
- Asbestos airborne fibre monitoring is not proposed as asbestos has not been encountered during the intrusive ground investigation (Royal HaskoningDHV 2021b).
- Stockpiles of contaminated soils/track ballast are not anticipated during this Phase 1 Pilot Scheme. Unforeseen contamination and the necessity to quarantine such material is considered separately and contaminated run-off is therefore not considered above.

In order to manage risk to the public and workers the remediation site works will be carried out under an appropriately detailed health and safety plan pursuant to the CDM Regulations. Suitable PPE as required by site conditions will be identified in risk assessments and will be worn by site workers and visitors where appropriate.

5.1.2 Notifications, Consents and Permits

During the temporary Phase 1 Pilot scheme consents or Environmental Permits are not envisaged to be required. However, the Contractor is to hold appropriate Environmental Permits or exemptions should any associated earthworks and stockpiling activities including any sorting, screening or crushing of soils and demolition arisings be required that are not considered within this document.

5.1.3 Waste Management

There is no current plan or requirement to remove soils/track ballast from site. Should any soils required to be removed from site pre-existing soil sample data included within the Royal HaskoningDHV, 2021b GQRA report could be used by a waste management organisation to facilitate removal.

5.1.4 Re-use of Site Won Materials

Site won material is not proposed to be used within the scheme. Existing soil and track ballast will be left in situ.

5.1.5 Soil Quarantine

Prior to any works commencing and as a precautionary approach, it will be necessary to establish a controlled and segregated area for the storage, management, and characterisation of grossly contaminated materials. In taking this approach it allows any grossly contaminated material to be excavated quickly without inhibiting progress of works. A quarantine area as a minimum shall comprise;

- An impermeable layer to prevent infiltration.
- System for managing potentially contaminated runoff (e.g. perimeter bund, covering so to shed rainwater outside of quarantine area).
- Fencing and segregation (including appropriate warning / hazard signage adored to the fencing).

Grossly contaminated materials, if encountered are not likely to be significant volume and on this basis, off-site disposal of such material would be feasible.

5.1.6 Invasive Species

An ecological appraisal was carried out by Urban Green and their 2021 report records at least two cotoneaster plants which are listed under Schedule 9 of the Wildlife and Countryside Act 1981 (as amended) as non-native invasive species. One of the species was identified as rockspray cotoneaster. The Urban Green report recommends these species are eradicated from the site following Environment Agency guidance¹ for control of such species.

It is noted within this guidance that should approved herbicides be used near water, agreement must be sought from the Environment Agency.

¹ Natural England, DEFRA and Environment Agency non-native invasive plant control guidance:
<https://www.gov.uk/guidance/prevent-the-spread-of-harmful-invasive-and-non-native-plants#treat-invasive-non-native-plants>

5.2 Further Refined Conceptual Site Model (Post Works)

Following on from the proposed mitigation measures it is envisaged that the previously identified risk associated with the identified pollutant linkages will have been reduced or pathways interrupted or not considered to be of concern for this Phase. The refined CSM with the mitigation is presented in the table below:

Table 5-2 CSM Post Enabling Works (with Mitigation)

Source	Receptor	Pathway	Comment
PAHs and lead originating from soils/track ballast across the viaduct	Future site users	dermal contact, ingestion or inhalation	Pathway interruption due to installation of cover system comprising: membrane, subbase, footpath, existing vegetation, building and planters.
Metals (lead and zinc) within paint dust or flaking paintwork of the viaduct	Future site users	dermal contact, ingestion or inhalation	Pathway potential interrupted due to management via barriers, existing vegetation and site infrastructure to avoid contact with paintwork on viaduct structure.
PAHs and lead originating from soils/track ballast across the viaduct	Development workers during construction and maintenance workers	dermal contact, ingestion or inhalation	Pathway reduced due by avoidance and management where contact is unavoidable via appropriate working methods and usage of PPE.
Metals (lead and zinc) within paint dust or flaking paintwork of the viaduct	Development workers during construction and maintenance workers	dermal contact, ingestion or inhalation	Pathway reduced due by avoidance and management where contact is unavoidable via appropriate working methods and usage of PPE.
Metals (lead and zinc) originating from soils/track ballast across the viaduct and possibly viaduct structure	Surface waters	leaching and run-off	Pathway reduced due to installation of drain guards during enabling works and due to a reduction in rainfall infiltration.

On completion of the Works a post mitigation risk will be posed to future maintenance / development works from the soils which remain below the cover at the site and paint which remains on the viaduct structure. The health and safety file completed for the site must include a residual risk assessment to enable employment of the correct working methods and PPE. The risk will be low but to maintain this adequate Risk Assessments and appropriate method statements and PPE needs to be in place.

6 Conclusion & Remaining Mitigation Measures

6.1 Conclusion & Remediation Durability

The objective the Remediation Strategy and enabling works is to allow the temporary usage of the viaduct in the summer of 2022 as an 'micro park'. The masterplan design has been undertaken in a way to achieve this within the constraints of the viaduct structure. The consultation comments made by MCC's Environmental Health Department with respect to this Phase 1 Pilot scheme have been addressed within this document, as summarised in the table below:

Table 6-1 Response to MCC's Environmental Health Consultation Comments

Environmental Health Comment	Our Response
1. A footpath is being created so we will need details of how any potentially contaminated arisings will be stored and disposed of and the contractor will need to retain and submit waste transfer notes for any removed ground	This is reiterated in Section 5.1.3 (Waste Management) and Section 4.6 Verification/Completion. There is no proposal within this scheme to store or dispose of potentially contaminated arisings and any 'incidental' waste will be subject to waste management rules and transfer noted retained and reported within the Verification/Completion report.
2. We will need details of what material will be imported for the footpath and how contractor safety will be maintained during its creation	Section 4.4 (Materials Management and Table 4-1 (MCC's Recommended Sampling Frequencies for Imported Fill Materials) and Appendix G (Importation Criteria) indicate required testing to be undertaken according to proposed imported materials.
3. We will also need to ensure any new plants or shrubs are embedded in planters rather than dug in to the soil for the temporary phase so further comment and confirmation will be required to address this	Any new plants will only be grown within planters and isolated from the existing track ballast/soils. Existing vegetation currently growing on the viaduct will not be add to.
4. The full scheme is likely to require more intrusive ground work and proposals so a full remediation strategy will be required for the scheme beyond the trial proposal	This remediation strategy is likely to be revised substantially for the proposed Phase 2 'permanent urban park and travel hub scheme' and will incorporate any lessons learnt from this temporary Phase 1 Pilot scheme.

The pollutant linkage with respect to human health has either been interrupted or reduced to a level where the risk is manageable by the remediation measures.

The remediation mitigation measures for the protection of controlled waters are designed to reduce the risk in a sustainable way with pathway reduction via the installation of remedial measures

7 References

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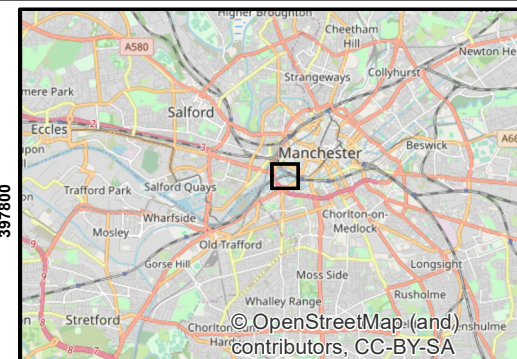
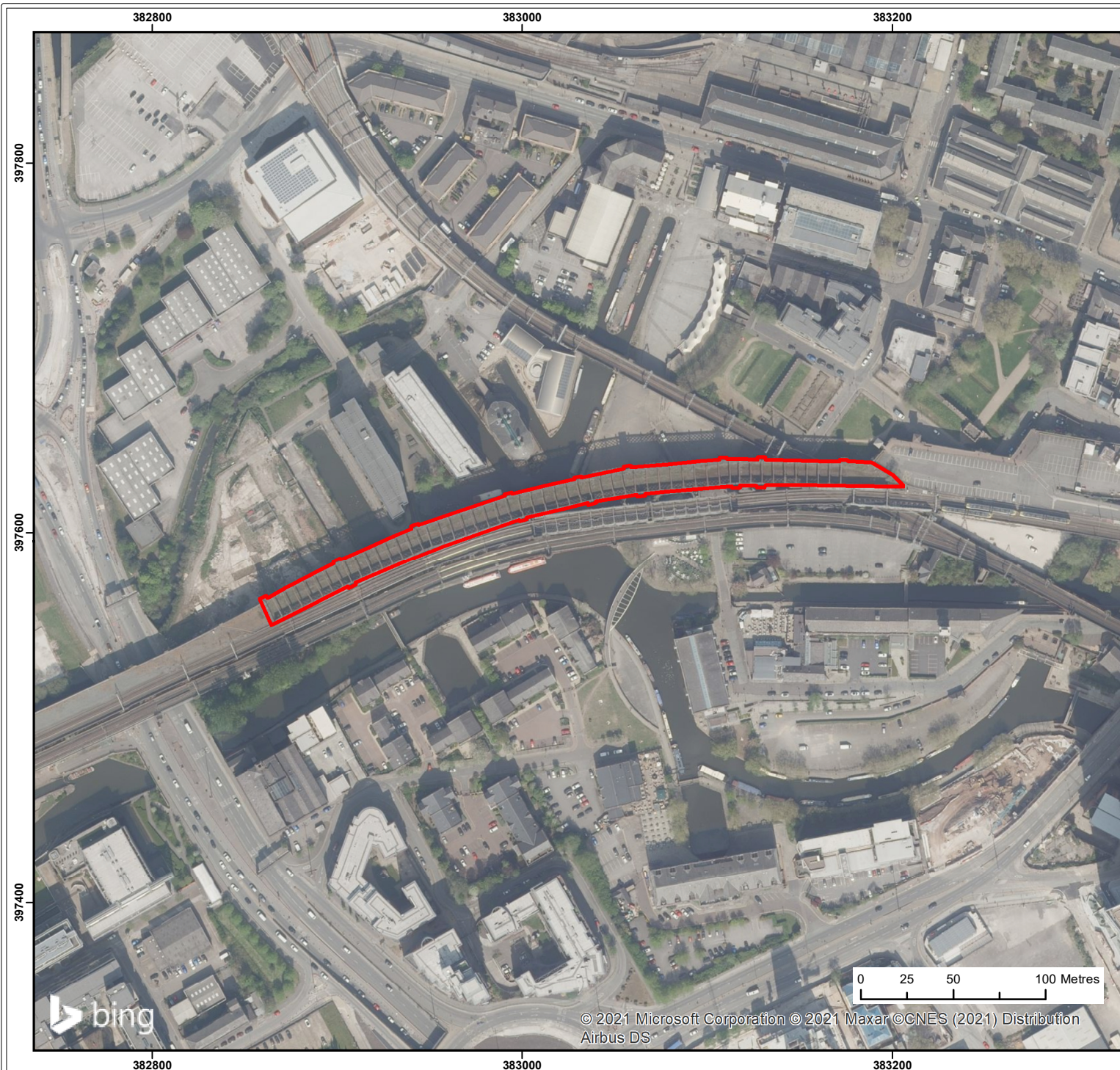
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Figure



Legend:

 Red Line Boundary

Data Sources: © HaskoningDHV UK Ltd, 2021

Base map: © OpenStreetMap (and) contributors, CC-BY-SA.

Client:

National Trust

Project:

Castlefield Viaduct

Title:

Site Location Plan

Figure: 2.1

Drawing No: PC2387-RHD-ZZ-XX-DR-Z-0001

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
01	28/04/2021	GC	KD	A4	1:3,000

Co-ordinate system: British National Grid



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