

OVG Manchester:

Appendix 16.1 – Summary of Mitigation Measures

Appendix 16.1: Summary of Mitigation Measures

Adverse Effects	Mitigation Proposed	Avoid, Reduce or Compensate	Integration With Other Effects	Anticipated Effectiveness	Confirmation of Deliverability	Method of Environmental Monitoring
Air Quality						
Construction						
	Best practice construction phase mitigation measures as outlined in "IAQM guidance- Guidance on the assessment of dust from demolition and construction"	Avoid and Reduce	Yes- linkages to minimising transport impacts from construction traffic and minimising noise pollution from construction site.	High effectiveness	Yes	Monitoring complaints to the local authority and/or on site contractors. Carrying out automatic particulate matter monitoring on the site to ensure concentrations do not exceed thresholds set by the local authority.
Communications						
	Develop and implement a stakeholder communications plan that includes community engagement before work commences on site.	Reduce	No	Medium effectiveness	Yes	Monitoring complaints to the local authority and/or on site contractors. Carrying out automatic particulate matter monitoring on the site to ensure concentrations do not exceed thresholds set by the local authority.
	Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/ engineer or the site manager.	Reduce	No	Low effectiveness	Yes	Monitoring complaints to the local authority and/or on site contractors. Carrying out automatic particulate matter monitoring on the site to ensure concentrations do not exceed thresholds set by the local authority.
	Display the head or regional office contact information.	Reduce	No	Low effectiveness	Yes	Monitoring complaints to the local authority and/or on site contractors. Carrying out automatic particulate matter monitoring on the site to ensure c

Adverse Effects	Mitigation Proposed	Avoid, Reduce or Compensate	Integration With Other Effects	Anticipated Effectiveness	Confirmation of Deliverability	Method of Environmental Monitoring
						concentrations do not exceed thresholds set by the local authority.
	Develop and implement a Dust Management Plan (DMP), which may include measures to control other emissions, approved by the Local Authority. The level of detail will depend on the risk, and should include as a minimum the highly recommended measures in this document. The desirable measures should be included as appropriate for the site. The DMP may include monitoring of dust deposition, dust flux, real time PM10 continuous monitoring and/or visual inspections.	Reduce	No	High effectiveness	Yes	Monitoring complaints to the local authority and/or on site contractors. Carrying out automatic particulate matter monitoring on the site to ensure concentrations do not exceed thresholds set by the local authority.
Site Management						
	Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken.	Reduce	No	High effectiveness	Yes	Monitoring complaints to the local authority and/or on site contractors. Carrying out automatic particulate matter monitoring on the site to ensure concentrations do not exceed thresholds set by the local authority.
	Make the complaints log available to the local authority when asked.	Reduce	No	Medium effectiveness	Yes	Monitoring complaints to the local authority and/or on site contractors. Carrying out automatic particulate matter monitoring on the site to ensure concentrations do not exceed thresholds set by the local authority.
	Record any exceptional incidents that cause dust and/or air emissions, either on- or offsite, and the action taken to resolve the situation in the log book.	Reduce	No	Medium effectiveness	Yes	Monitoring complaints to the local authority and/or on site contractors. Carrying out automatic particulate matter monitoring on the site to ensure concentrations do not exceed thresholds set by the local authority.

Adverse Effects	Mitigation Proposed	Avoid, Reduce or Compensate	Integration With Other Effects	Anticipated Effectiveness	Confirmation of Deliverability	Method of Environmental Monitoring
	Hold regular liaison meetings with other high risk construction sites within 500m of the site boundary, to ensure plans are co-ordinated and dust and particulate matter emissions are minimised. It is important to understand the interactions of the off-site transport deliveries which might be using the same strategic road network routes.	Reduce	Yes- minimisation of construction traffic	High effectiveness	Yes	Monitoring complaints to the local authority and/or on site contractors. Carrying out automatic particulate matter monitoring on the site to ensure concentrations do not exceed thresholds set by the local authority.
Monitoring						
	Carry out regular site inspections to monitor compliance with the DMP, record inspection results, and make an inspection log available to the local authority when asked.	Avoid	No	High effectiveness	Yes	Monitoring complaints to the local authority and/or on site contractors. Carrying out automatic particulate matter monitoring on the site to ensure concentrations do not exceed thresholds set by the local authority.
	Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.	Reduce	No	High effectiveness	Yes	Monitoring complaints to the local authority and/or on site contractors. Carrying out automatic particulate matter monitoring on the site to ensure concentrations do not exceed thresholds set by the local authority.
	Agree dust deposition, dust flux, or real-time PM10 continuous monitoring locations with the Local Authority. Where possible commence baseline monitoring at least three months before work commences on site or, if it is a large site, before work on a phase commences. Further guidance is provided by IAQM on monitoring during demolition, earthworks and construction.	Avoid	No	High effectiveness	Yes	Monitoring complaints to the local authority and/or on site contractors. Carrying out automatic particulate matter monitoring on the site to ensure concentrations do not exceed thresholds set by the local authority.
	Record inspection results, and make the log available to the local authority when asked. This should include regular dust soiling checks of	Reduce	No	Medium effectiveness	Yes	Monitoring complaints to the local authority and/or on site contractors.

Adverse Effects	Mitigation Proposed	Avoid, Reduce or Compensate	Integration With Other Effects	Anticipated Effectiveness	Confirmation of Deliverability	Method of Environmental Monitoring
	surfaces such as street furniture, cars and window sills within 100m of site boundary, with cleaning to be provided if necessary.					Carrying out automatic particulate matter monitoring on the site to ensure concentrations do not exceed thresholds set by the local authority.
	Undertake daily on-site and off-site inspection, where receptors (including roads) are nearby, to monitor dust.	Avoid	No	Medium effectiveness	Yes	Monitoring complaints to the local authority and/or on site contractors. Carrying out automatic particulate matter monitoring on the site to ensure concentrations do not exceed thresholds set by the local authority.
Site Maintenance						
	Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible.	Avoid	Yes- minimisation of noise pollutoin	High effectiveness	Yes	Monitoring complaints to the local authority and/or on site contractors. Carrying out automatic particulate matter monitoring on the site to ensure concentrations do not exceed thresholds set by the local authority.
	Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site.	Avoid	No	High effectiveness	Yes	Monitoring complaints to the local authority and/or on site contractors. Carrying out automatic particulate matter monitoring on the site to ensure concentrations do not exceed thresholds set by the local authority.
	Fully enclose site or specific operations where there is a high potential for dust production and the site is actives for an extensive period.	Avoid	No	High effectiveness	Yes	Monitoring complaints to the local authority and/or on site contractors. Carrying out automatic particulate matter monitoring on the site to ensure concentrations do not exceed thresholds set by the local authority.
	Keep site fencing, barriers and scaffolding clean using wet methods.	Avoid	No	Medium effectiveness	Yes	Monitoring complaints to the local authority and/or on site contractors. Carrying out automatic particulate matter monitoring on the site to ensure

Adverse Effects	Mitigation Proposed	Avoid, Reduce or Compensate	Integration With Other Effects	Anticipated Effectiveness	Confirmation of Deliverability	Method of Environmental Monitoring
						concentrations do not exceed thresholds set by the local authority.
	Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below.	Avoid	No	Medium effectiveness	Yes	Monitoring complaints to the local authority and/or on site contractors. Carrying out automatic particulate matter monitoring on the site to ensure concentrations do not exceed thresholds set by the local authority.
	Cover, seed or fence stockpiles to prevent wind whipping.	Avoid	No	Medium effectiveness	Yes	Monitoring complaints to the local authority and/or on site contractors. Carrying out automatic particulate matter monitoring on the site to ensure concentrations do not exceed thresholds set by the local authority.
Vehicle Operation and Sustainable Travel						
	Ensure all vehicles switch off engines when stationary - no idling vehicles.	Avoid	No	Medium effectiveness	Yes	Monitoring complaints to the local authority and/or on site contractors. Carrying out automatic particulate matter monitoring on the site to ensure concentrations do not exceed thresholds set by local authority.
	Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable.	Avoid	No	High effectiveness	Yes	Monitoring complaints to the local authority and/or on site contractors. Carrying out automatic particulate matter monitoring on the site to ensure concentrations do not exceed thresholds set by the local authority.
	Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials.	Avoid/Reduce	Yes- minimise impact of construction traffic	High effectiveness	Yes	Monitoring complaints to the local authority and/or on site contractors. Carrying out automatic particulate matter monitoring on the site to ensure

Adverse Effects	Mitigation Proposed	Avoid, Reduce or Compensate	Integration With Other Effects	Anticipated Effectiveness	Confirmation of Deliverability	Method of Environmental Monitoring
						concentrations do not exceed thresholds set by the local authority.
	Impose and signpost a maximum-speed-limit of 15 mph on surfaced and 10 mph on unsurfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate).	Reduce	No	Low effectiveness	Yes	Monitoring complaints to the local authority and/or on site contractors. Carrying out automatic particulate matter monitoring on the site to ensure concentrations do not exceed thresholds set by the local authority.
	Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing).	Reduce	Yes- minimise impact of construction traffic	Medium effectiveness	Yes	Monitoring complaints to the local authority and/or on site contractors. Carrying out automatic particulate matter monitoring on the site to ensure concentrations do not exceed thresholds set by the local authority.
Operations						
	Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems.	Reduce	No	High effectiveness	Yes	Monitoring complaints to the local authority and/or on site contractors. Carrying out automatic particulate matter monitoring on the site to ensure concentrations do not exceed thresholds set by the local authority.
	Ensure an adequate water supply on the site for effective dust/particulate matter suppression/ mitigation, using non-potable water where possible and appropriate.	Reduce	No	High effectiveness	Yes	Monitoring complaints to the local authority and/or on site contractors. Carrying out automatic particulate matter monitoring on the site to ensure concentrations do not exceed thresholds set by the local authority.
	Use enclosed chutes and conveyors and covered skips.	Reduce	No	Medium effectiveness	Yes	Monitoring complaints to the local authority and/or on site contractors.

Adverse Effects	Mitigation Proposed	Avoid, Reduce or Compensate	Integration With Other Effects	Anticipated Effectiveness	Confirmation of Deliverability	Method of Environmental Monitoring
						Carrying out automatic particulate matter monitoring on the site to ensure concentrations do not exceed thresholds set by the local authority.
	Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.	Reduce	No	Medium effectiveness	Yes	Monitoring complaints to the local authority and/or on site contractors. Carrying out automatic particulate matter monitoring on the site to ensure concentrations do not exceed thresholds set by the local authority.
	Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.	Reduce	No	Low effectiveness	Yes	Monitoring complaints to the local authority and/or on site contractors. Carrying out automatic particulate matter monitoring on the site to ensure concentrations do not exceed thresholds set by the local authority.
Waste Management						
	Avoid bonfires and burning of waste materials.	Avoid	Yes – good ensuring good waste management strategy is implemented	High effectiveness	Yes	Monitoring complaints to the local authority and/or on site contractors. Carrying out automatic particulate matter monitoring on the site to ensure concentrations do not exceed thresholds set by the local authority.
Mitigation measures specific for Construction						
	Avoid scabbling (roughening of concrete surfaces) if possible.	Avoid	No	High effectiveness	Yes	Monitoring complaints to the local authority and/or on site contractors. Carrying out automatic particulate matter monitoring on the site to ensure concentrations do not exceed thresholds set by the local authority.
	Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is	Reduce	No	Medium effectiveness	Yes	Monitoring complaints to the local authority and/or on site contractors.

Adverse Effects	Mitigation Proposed	Avoid, Reduce or Compensate	Integration With Other Effects	Anticipated Effectiveness	Confirmation of Deliverability	Method of Environmental Monitoring
	required for a particular process, in which case ensure that appropriate additional control measures are in place.					Carrying out automatic particulate matter monitoring on the site to ensure concentrations do not exceed thresholds set by the local authority.
	Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery.	Avoid	No	Medium effectiveness	Yes	Monitoring complaints to the local authority and/or on site contractors. Carrying out automatic particulate matter monitoring on the site to ensure concentrations do not exceed thresholds set by the local authority.
	For smaller supplies of fine powder materials ensure bags are sealed after use and stored appropriately to prevent dust.	Avoid	No	Medium effectiveness	Yes	Monitoring complaints to the local authority and/or on site contractors. Carrying out automatic particulate matter monitoring on the site to ensure concentrations do not exceed thresholds set by the local authority.
Mitigation measures specific for track out:						
	Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require sweeper being continuously in use.	Reduce	No	Medium effectiveness	Yes	Monitoring complaints to the local authority and/or on site contractors. Carrying out automatic particulate matter monitoring on the site to ensure concentrations do not exceed thresholds set by the local authority.
	Avoid dry sweeping of large areas.	Reduce	No	Medium effectiveness	Yes	Monitoring complaints to the local authority and/or on site contractors. Carrying out automatic particulate matter monitoring on the site to ensure concentrations do not exceed thresholds set by the local authority.
	Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.	Reduce	No	Medium effectiveness	Yes	Monitoring complaints to the local authority and/or on site contractors. Carrying out automatic particulate matter monitoring on the site to ensure

Adverse Effects	Mitigation Proposed	Avoid, Reduce or Compensate	Integration With Other Effects	Anticipated Effectiveness	Confirmation of Deliverability	Method of Environmental Monitoring
						concentrations do not exceed thresholds set by the local authority.
	Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable.	Reduce	No	Low effectiveness	Yes	Monitoring complaints to the local authority and/or on site contractors. Carrying out automatic particulate matter monitoring on the site to ensure concentrations do not exceed thresholds set by the local authority.
	Record all inspections of haul routes and any subsequent action in a site log book.	Reduce	No	Medium effectiveness	Yes	Monitoring complaints to the local authority and/or on site contractors. Carrying out automatic particulate matter monitoring on the site to ensure concentrations do not exceed thresholds set by the local authority.
	Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowzers and regularly cleaned.	Reduce	No	Medium effectiveness	Yes	Monitoring complaints to the local authority and/or on site contractors. Carrying out automatic particulate matter monitoring on the site to ensure concentrations do not exceed thresholds set by the local authority.
	Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).	Reduce	No	Low effectiveness	Yes	Monitoring complaints to the local authority and/or on site contractors. Carrying out automatic particulate matter monitoring on the site to ensure concentrations do not exceed thresholds set by the local authority.
	Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits.	Reduce	No	Medium effectiveness	Yes	Monitoring complaints to the local authority and/or on site contractors. Carrying out automatic particulate matter monitoring on the site to ensure concentrations do not exceed thresholds set by the local authority.

Adverse Effects	Mitigation Proposed	Avoid, Reduce or Compensate	Integration With Other Effects	Anticipated Effectiveness	Confirmation of Deliverability	Method of Environmental Monitoring
	Access gates to be located at least 10m from receptors where possible.	Reduce	Yes- minimise impact of noise and transport issues	Medium effectiveness	Yes	Monitoring complaints to the local authority and/or on site contractors. Carrying out automatic particulate matter monitoring on the site to ensure concentrations do not exceed thresholds set by the local authority.
Ground Conditions						
Construction						
Direct contact (people) during works	Implementation of appropriate health, safety and hygiene regime (to include PPE and welfare provisions) and good construction practice informed by the on-going site investigation.	Reduce	N/A – each adverse effect shall be considered individually within a Remediation Strategy	Highly effective	Yes	Verification work shall be undertaken with findings and evidence compiled within a Verification Report suitable for planning.
Dust emissions during construction	Implementation of dust suppression measures (e.g. dampening, wheel washing, site vehicle speed and route control, control of drop height for spoil loading etc. All informed by the ongoing site investigation.	Reduce	N/A – each adverse effect shall be considered individually within a Remediation Strategy	Highly effective	Yes	Verification work shall be undertaken with findings and evidence compiled within a Verification Report suitable for planning.
Leaching and migration to groundwater [secondary Aquifer, River Medlock]	Carry out Foundation Works Risk Assessment informed by the on-going site investigation. Implement measures to minimise infiltration. Avoid stockpiling contaminated soil. Any stockpile covered/placed on impermeable surface. Remove/treat any gross contamination. Re-used soils to meet relevant chemical/ physical properties. Control of groundwater during excavation.	Reduce	N/A – each adverse effect shall be considered individually within a Remediation Strategy	Highly effective	Yes	Verification work shall be undertaken with findings and evidence compiled within a Verification Report suitable for planning.
Surface water run-off/drainage [Ashton Canal]	Implementation of good construction practice informed by the on-going site investigation. Control of surface water run-off/safe disposal to existing drainage system.	Reduce	N/A – each adverse effect shall be considered individually within a Remediation Strategy	Highly effective	Yes	Verification work shall be undertaken with findings and evidence compiled within a Verification Report suitable for planning.

Adverse Effects	Mitigation Proposed	Avoid, Reduce or Compensate	Integration With Other Effects	Anticipated Effectiveness	Confirmation of Deliverability	Method of Environmental Monitoring
Vapour/gas migration to enclosed spaces	Site investigation (currently on-going) prior to any construction to define nature of ground gas regime, design for any gas protection measures to buildings and in-form health and safety for works in confined spaces. Control of entry into any enclosed below ground spaces.	Avoid	N/A – each adverse effect shall be considered individually within a Remediation Strategy	Highly effective	Yes	Verification work shall be undertaken with findings and evidence compiled within a Verification Report suitable for planning
Unexploded Ordnance	Toolbox talks (ordnance awareness briefing), watching brief (to include a competent Explosive Ordnance Disposal Engineer) and health and safety plans as recommended within the BAE Systems detailed UXO assessment.	Reduce	N/A – each adverse effect shall be considered individually within a Remediation Strategy	Moderately effective	Yes	Verification work shall be undertaken with findings and evidence compiled within a Verification Report suitable for planning
Disposal of excavated spoil	Preliminary waste characterisation informed by the on-going site investigation and any earthworks. Lorry movements and routing would be controlled as described in the ES Chapter 12 Traffic and Transport.	Reduce	N/A – each adverse effect shall be considered individually within a Remediation Strategy	Moderately effective	Yes	Verification work shall be undertaken with findings and evidence compiled within a Verification Report suitable for planning
Operation						
Human contact with soils in soft landscaped areas and planters	Importing of soil materials which meet appropriate chemical, physical and biological criteria.	Avoid	Imported soil criteria shall be addressed within the Remediation Strategy	Highly effective		Verification work shall be undertaken with findings and evidence compiled within a Verification Report suitable for planning.
Plants in contact with soils in soft landscaped areas and planters						Verification work shall be undertaken with findings and evidence compiled within a Verification Report suitable for planning.
Human inhalation of ground gas/vapours	Design of ground gas/vapour protection measures. Including during construction, inform health and safety for works in confined spaces and control of entry into any enclosed below ground spaces.	Avoid	N/A – each adverse effect shall be considered individually within a Remediation Strategy	Highly effective		If a long term monitoring programme is required, this shall be specified within the Verification Report.

Adverse Effects	Mitigation Proposed	Avoid, Reduce or Compensate	Integration With Other Effects	Anticipated Effectiveness	Confirmation of Deliverability	Method of Environmental Monitoring
Contamination of Secondary Aquifer, Ashton Canal and River Medlock	Suitable design of foundations and implementation of remediation measures including removal/treatment of any gross contamination.	Reduce	N/A – each adverse effect shall be considered individually within a Remediation Strategy	Highly effective		Verification work shall be undertaken with findings and evidence compiled within a Verification Report suitable for planning.
Aggressive attack on below ground concrete	Design to meet requirements of ground conditions and BRE recommendations.	Avoid	N/A – each adverse effect shall be considered individually within a Remediation Strategy	Highly effective		Verification work shall be undertaken with findings and evidence compiled within a Verification Report suitable for planning
Permeation of water supply pipes	Design to meet requirements of ground conditions and recommendations of United Utilities.	Avoid	N/A – each adverse effect shall be considered individually within a Remediation Strategy	Highly effective		Verification work shall be undertaken with findings and evidence compiled within a Verification Report suitable for planning.
Lighting						
Construction						
	Compound locations would require careful siting to minimise light pollution.	Avoid	None	Highly Effective	Yes	Light measurments
	The lighting installation should be designed following relevant lighting standards and guidance as set in paragraphs 9.8 to 9.12 of the technical appendix 9.1 to provide sensitive and appropriate lighting techniques and luminaire selections.	Reduce	None	Highly Effective	Yes	Light measurments
Operation						
	During operation, the lighting installation will be based on requirements set at relevant standards and suggestions by guidelines and good practice documents. The installation of a lighting control system that will allow the lighting installation to dim depending on daylight availability, will minimise the magnitude of the effect from Moderate Adverse to	Reduce	None	Highly Effective		Light measurments

Adverse Effects	Mitigation Proposed	Avoid, Reduce or Compensate	Integration With Other Effects	Anticipated Effectiveness	Confirmation of Deliverability	Method of Environmental Monitoring
	Negligible for the R3 and R4 receptors. With these control measures in place, no further mitigation is expected to be required.					
Noise and Vibration						
Construction - Examples of mitigation measures that can be used to control construction noise are found in Section 8 of BS 5228-1:2009+A1:2014						
	Selecting quieter plant and equipment.	Reduce	N/A	Moderately effective.	Yes	Noise and vibration monitoring at site boundaries / nearest noise sensitive receivers.
	Turning equipment off when they are not in use.	Avoid	Minimise impact of construction equipment / traffic.	Highly effective.	Yes	Noise and vibration monitoring at site boundaries / nearest noise sensitive receivers.
	Providing enclosures around fixed plant like power generators or using mains power	Reduce	N/A	Moderately effective.	Yes	Noise and vibration monitoring at site boundaries / nearest noise sensitive receivers.
	Ensuring that all plant and equipment is well maintained.	Reduce	Minimise impact of construction equipment / traffic.	Moderately effective.	Yes	Noise and vibration monitoring at site boundaries / nearest noise sensitive receivers.
	Keep internal haul routes well maintained and avoid steep gradients.	Reduce	Minimise impact of construction equipment / traffic.	Moderately effective.	Yes	Noise and vibration monitoring at site boundaries / nearest noise sensitive receivers.
	Use rubber linings in chutes and dumpers to reduce impact noise.	Reduce	N/A	Moderately effective.	Yes	Noise and vibration monitoring at site boundaries / nearest noise sensitive receivers.
	Minimise drop heights of materials.	Reduce	N/A	Highly effective.	Yes	Noise and vibration monitoring at site boundaries / nearest noise sensitive receivers.
	Start plant up sequentially rather than simultaneously.	Reduce	Minimise impact of construction equipment / traffic.	Moderately effective.	Yes	Noise and vibration monitoring at site boundaries / nearest noise sensitive receivers.

Adverse Effects	Mitigation Proposed	Avoid, Reduce or Compensate	Integration With Other Effects	Anticipated Effectiveness	Confirmation of Deliverability	Method of Environmental Monitoring
	Move fixed plant away from identified noise sensitive receptors.	Reduce	Minimise impact of construction equipment / traffic.	Highly effective.	Yes	Noise and vibration monitoring at site boundaries / nearest noise sensitive receivers.
	Modify existing plant with noise attenuation packages such as acoustic enclosures and attenuators.	Reduce	N/A	Moderately effective.	Yes	Noise and vibration monitoring at site boundaries / nearest noise sensitive receivers.
	Avoid using diesel power generators and use local electricity grid wherever possible.	Reduce	Minimise impact of construction equipment / traffic.	Moderately effective.	Yes	Noise and vibration monitoring at site boundaries / nearest noise sensitive receivers.
	For impact driven piling, a non-metallic dolly between the hammer and the driving helmet should be used.	Reduce	N/A	Moderately effective.	Yes	Noise and vibration monitoring at site boundaries / nearest noise sensitive receivers.
	Introducing an acoustic shroud for impact driven piles.	Reduce	N/A	Moderately effective.	Yes	Noise and vibration monitoring at site boundaries / nearest noise sensitive receivers.
	Choose a quieter piling method.	Reduce	N/A	Highly effective.	Yes	Noise and vibration monitoring at site boundaries / nearest noise sensitive receivers.
	Avoiding unnecessary revving of engines.	Reduce	Minimise impact of construction equipment / traffic.	Moderately effective.	Yes	Noise and vibration monitoring at site boundaries / nearest noise sensitive receivers.
Operation - Operational effects negligible and no mitigation required.						
Townscape and Visual Impact						
Construction						
Construction vehicles on key routes	Appropriate delivery routes will be established to limit the duration of vehicles occupying the network. Diverse routes will be managed by the Contractor to distribute vehicle movements across the network. Where possible, deliveries will be scheduled outside of peak traffic flow times to minimise the impact on the surrounding areas.	Avoid	The construction logistics management plan (CLP) will also interact with Traffic and Transport, Noise and Vibration, and Air Quality.	Moderately effective.	Yes	Monitoring measures to be set out in CLP.

Adverse Effects	Mitigation Proposed	Avoid, Reduce or Compensate	Integration With Other Effects	Anticipated Effectiveness	Confirmation of Deliverability	Method of Environmental Monitoring
Loading and unloading of materials	Loading or unloading of plant and materials will not be permitted outside of the campus.	Avoid	The construction logistics management plan will also interact with Traffic and Transport, Noise and Vibration, and Air Quality.	Moderately effective.	Yes	Monitoring measures to be set out in CLP.
Effects of vehicles associated with construction on key routes.	Contractor parking will be managed on campus within the Site compound and the North carpark.	Avoid	The construction logistics management plan will also interact with Traffic and Transport, Noise and Vibration, and Air Quality.	Moderately effective.	Yes	Monitoring measures to be set out in CLP.
Effects of construction vehicles on key routes	To improve the accessibility of the Site and reduce the impact of the construction works on the surrounding areas and infrastructure, the S278 works associated with Highways alterations will be undertaken as 'first task' in the construction process.	Avoid	The construction logistics management plan will also interact with Traffic and Transport, Noise and Vibration, and Air Quality.	Moderately effective.	Yes	Monitoring measures to be set out in CLP.
Effects of construction vehicles on key routes	Where reasonably practical, material will be retained and reused on site.	Avoid	The construction logistics management plan will also interact with Traffic and Transport, Noise and Vibration, and Air Quality.	Moderately effective.	Yes	Monitoring measures to be set out in CLP.
Construction during unsociable hours	Site operating hours will adhere with Manchester City Council's (MCC) 'Environmental Protection Information for Developers. To reduce the impact on the existing transport and public transport infrastructure of operatives attending site, arrival of the workforce on site 30 minutes prior to the permitted operating hours for setting up will be encouraged.	Avoid	The Construction Management Plan (CMP) will be used to implement the mitigation measures. This will also interact with Noise and Vibration and Air Quality.	Moderately effective.	Yes	Monitoring measures to be set out in CMP
Light spillage	Lighting associated with the Site and site establishment will be designed to minimise light spillage to limit the	Reduce	The Construction Management Plan will be used to implement the mitigation measures.	Moderately effective.	Yes	Monitoring measures to be set out in CMP.

Adverse Effects	Mitigation Proposed	Avoid, Reduce or Compensate	Integration With Other Effects	Anticipated Effectiveness	Confirmation of Deliverability	Method of Environmental Monitoring
	impact on adjacent properties and highways.		This will also interact with proposed lighting.			
Construction works	The implementation of good site management, maintenance and housekeeping.	Reduce	The Construction Management Plan will be used to implement the mitigation measures. This will also interact with Ground Conditions, Noise and Vibration and Air Quality.	Moderately effective.	Yes	Monitoring measures to be set out in CMP
Operation - The key principles incorporated into the Proposed Development which form embedded mitigation include.						
	High architectural quality, to deliver a world class arena proposal and key destination.	Reduce	N/A	Highly effective	Yes	Quality Control Management Statement will be in place to monitor architectural quality; this would be secured through a planning condition.
	Utilization of existing ground levels within the Site to facilitate arrival and access. The building sits on a concrete plinth, which resolves the level change across the Site from north to south.	Reduce	Access to the Proposed Development interacts with Traffic and Transport.	Moderately effective.	Yes	N/A
	'Stacked box' aesthetic of building creates an iconic identify and allows for dynamic façade activation, and creates canopies over external pedestrian spaces where pedestrians will be queuing.	Reduce	N/A	Moderately effective.	Yes	Quality Control Management Statement will be in place to monitor architectural quality; this would be secured through a planning condition.
	Strong pedestrian connections to Etihad Stadium using existing Joe Mercer Way and Forge Lane Bridge.	Reduce	Enhanced pedestrian and visual linkages interacts with Traffic and Transport through the promotion of sustainable transport modes.	Highly effective	Yes	N/A
	Unifying approach to materials with create a strong identity and tie the arena into its setting.	Reduce	N/A	Moderately effective.	Yes	Quality Control Management Statement will be in place to monitor architectural quality; this would be secured through a planning condition.

Adverse Effects	Mitigation Proposed	Avoid, Reduce or Compensate	Integration With Other Effects	Anticipated Effectiveness	Confirmation of Deliverability	Method of Environmental Monitoring
	Use of green wall to provide a softer edge and pedestrian friendly environment at ground level.	Reduce	N/A	Highly effective	Yes	Through an agreed landscape management and maintenance strategy, to be secured through planning condition.
	Contemporary approach to materials including black façade, to seamlessly incorporate LED screens which will activate the external building facades during the daytime and at night, and for different functions.	Reduce	The use of LED screens interacts with impact of the lighting form the Proposed Development.	Moderately effective.	Yes	Quality Control Management Statement will be in place to monitor architectural quality; this would be secured through a planning condition. The use of the LED screens shall be monitored and controlled in line with recommendations from MCC Highways and secured via a planning condition.
	Strong lighting concept to create an iconic new destination in keeping with the vision for the Etihad Campus.	Reduce	The proposed lighting scheme interacts with the predicted impact of lighting from the Proposed Development	Moderately effective.	Yes	A detailed lighting scheme shall be agreed with the local authority including details of management and maintenance.
	Use of perforated panel to reflect Manchester's Industrial Heritage.	Reduce	N/A	Moderately effective.	Yes	Quality Control Management Statement will be in place to monitor architectural quality; this would be secured through a planning condition.
	Solid/heavy plinth embeds the arena in its setting, with 'lighter' materials for upper sections.	Reduce	N/A	Moderately effective.	Yes	Quality Control Management Statement will be in place to monitor architectural quality; this would be secured through a planning condition.
	High quality proposals for the public realm, with historical references of the Site through choice of materials.	Reduce	N/A	Highly effective	Yes	Through agreement of the final landscape design to be secured through planning condition.
	Creation of a comprehensive pedestrian and vehicular circulation network around the Site, with active frontage along the Ashton Canal.	Reduce	Enhanced pedestrian and visual linkages interacts with Traffic and Transport through the promotion of sustainable transport modes.	Highly effective	Yes	The development to be built in accordance with the approved plans.
	Creation of a 'green ring' of landscape around the venue to create a pedestrian friendly environment, respond to the setting	Reduce	N/A	Highly effective	Yes	Through agreement of the final landscape together with management and maintenance

Adverse Effects	Mitigation Proposed	Avoid, Reduce or Compensate	Integration With Other Effects	Anticipated Effectiveness	Confirmation of Deliverability	Method of Environmental Monitoring
	opposite Phillip's Park, and the setting adjacent to the Canal.					strategy, to be secured via a planning condition.
	Public realm proposals designed to fit both event and non-event days.	Reduce	N/A	Moderately effective	Yes	Through an agreed landscape management and maintenance strategy to ensure the public realm remains of high quality.
	Preparation of an operational management strategy.	Reduce	An operational management strategy is likely to interact with Traffic and Transport whereby sustainable transport modes will be encouraged.	Moderately effective	Yes	Monitoring measures to be agreed within an operational management strategy to be secured via a planning condition.
Traffic and Transport						
Construction						
	Construction Logistics Plan will help manage all types of vehicles to and from the Site during construction.	Reduce	CLP will also include mitigation measures relevant to Air Quality, TVIA, and Noise + Vibration	Moderately to highly effective	Yes	Various monitoring methods used to monitor CLP topics.
Operation						
	A Travel Plan will be implemented to further encourage the use of sustainable transport.	Reduce	Travel Plan generally limited to traffic and transport matters	Highly effective		Through the Travel Plan, which will be secured via a planning condition to include regular monitoring of performance by the Travel plan co-ordinator.
Water Quality, Drainage and Flood Risk						
Construction						
	The contractor will develop a Construction Environmental Management Plan (CEMP) to cover construction site works. It will include mitigation measures to protect the water environment.	Avoid/ Reduce	No	Highly effective	Yes	Various monitoring methods can be employed to cover the range of topics included in the CEMP.

Adverse Effects	Mitigation Proposed	Avoid, Reduce or Compensate	Integration With Other Effects	Anticipated Effectiveness	Confirmation of Deliverability	Method of Environmental Monitoring
Dust and debris blown from site into the Ashton Canal	Apply dust management procedures which are typically implemented for air quality management issues, such as: Damping down to suppress the creation of dust.	Reduce	No	Moderately effective	Yes	Periodic monitoring of sediment load in the Ashton Canal.
	Implement good site practice, perimeter fences and tight control of materials and waste to minimise the risk of debris entering water bodies.	Avoid	No	Moderately effective	Yes	Periodic monitoring of sediment load in the Ashton Canal.
Increased sediment loads in surface water	Keep gradients of the soil as shallow as possible to prevent large amounts of earth being washed away during periods of heavy rainfall. Areas which are exposed should be reseeded or surfaced as soon as practicable.	Avoid	No	Moderately effective	Yes	Periodic monitoring of sediment load in nearby watercourses.
	Enforce tight control of site boundaries including minimal land clearance and restrictions on the use of machinery adjacent to water bodies. Where possible, do not locate stockpiles within 10 m of water bodies or drainage lines.	Avoid	No	Moderately effective	Yes	Periodic monitoring of sediment load in nearby watercourses.
	Wheel washing facilities should be provided at all entry and exits points. Water from wheel wash facilities must not be discharged into the River Medlock or the on-site surface water sewerage network.	Avoid	No	Moderately effective	Yes	Periodic monitoring of sediment load in nearby watercourses.
	Capture runoff from site in perimeter cut off ditches, settlement lagoons and/or settlement tanks where possible. Any dewatering required from site excavations should be pumped into a settlement tank or lagoon and not discharge direct to a water body or the on-site surface water sewerage network.	Avoid	No	Moderately effective	Yes	Periodic monitoring of sediment load in nearby watercourses.
	Sediment should be removed from water pumped during any extractions required. Sediment should be removed prior to discharges to the surface water network through the use of a baffle tank system or equivalent.	Avoid	No	Moderately effective	Yes	Periodic monitoring of sediment load in nearby watercourses.

Adverse Effects	Mitigation Proposed	Avoid, Reduce or Compensate	Integration With Other Effects	Anticipated Effectiveness	Confirmation of Deliverability	Method of Environmental Monitoring
Accidental release of hydrocarbons and oils into the on-site drainage system	Incorporation of interceptors where appropriate into the Site drainage system at high risk areas, such as parking, unloading and refuelling areas, to remove hydrocarbons and oils from surface water prior to discharge.	Avoid	No	Moderately effective	Yes	Periodic monitoring of nearby watercourses to check for hydrocarbons and oils.
	Other measures including drip trays under equipment such as generators, and wheel washing facilities should also be implemented to minimise the risk of pollutants infiltrating groundwater or the surface water drainage network.	Avoid	No	Moderately effective	Yes	Periodic monitoring of nearby watercourses to check for hydrocarbons and oils.
Accidental release of hazardous materials migrating into the on-site drainage system	Provision of storage facilities and tanks and conduct refuelling of machinery within bunded areas, which should not be located within 10m of water bodies or drainage lines.	Avoid	No	Moderately effective	Yes	Periodic monitoring of nearby watercourses.
	Storage and bunded areas to be constructed of impervious floors and walls with the capacity for the contents of the storage tank and an additional ten per cent safety margin.	Avoid	No	Highly effective	Yes	Periodic monitoring of nearby watercourses.
	As a remedial measure, spill containment equipment such as absorbent materials should be stored on site.	Avoid	No	Moderately effective	Yes	Periodic monitoring of nearby watercourses.
	Mixing of construction materials, such as cement, will be conducted in designated areas located away from water bodies and drainage lines.	Reduce	No	Moderately effective	Yes	Periodic monitoring of nearby watercourses.
Leak or breakage of temporary sewage system	Provision and maintenance of temporary septic tank, cesspit and/or sewerage connection for disposal of sewage from the toilet facilities to reduce the likelihood of crude sewage infiltrating groundwater or migrating towards water bodies.	Reduce	No	Moderately effective	Yes	Periodic monitoring of nearby watercourses.
	Any temporary toilet facilities will be positioned at least 10m away from the banks of the River Medlock.	Reduce	No	Moderately effective	Yes	Periodic monitoring of nearby watercourses.
Increased water demand during the	All relevant contractors should investigate opportunities to minimise	Reduce	No	Moderately effective	Yes	Track how much water is being used during the construction process. Compare this to established benchmarks.

Adverse Effects	Mitigation Proposed	Avoid, Reduce or Compensate	Integration With Other Effects	Anticipated Effectiveness	Confirmation of Deliverability	Method of Environmental Monitoring
construction process	and reduce the use of water, such as: Selection and specification of equipment;					
	Implementation of staff-based initiatives such as turning off taps, plant and equipment when not in use both onsite and within site offices	Reduce	No	Moderately effective	Yes	Track how much water is being used during the construction process. Compare this to established benchmarks.
	Use of recycling water systems such as wheel washes, site toilets handwash; and	Reduce	No	Moderately effective	Yes	Track how much water is being used during the construction process. Compare this to established benchmarks.
	Use of a rainwater harvesting system for use in equipment and vehicle washing.	Reduce	No	Moderately effective	Yes	Track how much water is being used during the construction process. Compare this to established benchmarks.
Dewatering of excavations	Capture runoff from site in perimeter cut off ditches, settlement lagoons and/or settlement tanks where possible. Any dewatering required from site excavations should be pumped into a settlement tank or lagoon and not discharged directly to a water body or the on-site surface water sewerage network. Sediment should be removed from pumped water during any extractions required. Sediment should be removed prior to discharges to the surface water network using a baffle tank system or equivalent.	Avoid	No	Moderately effective	Yes	Periodic monitoring of nearby watercourses.
Flood risk to construction workers and plant users	Construction workers should be made aware of risks associated with excess surface water caused by overland flows and standing water. For example, risks to excavations and damage to plant. To minimise any risk from groundwater flooding during excavation of the Site, cut levels should be limited to at least 0.5m above the groundwater level. Where this is not possible, dewatering and other groundwater	Reduce	No	Moderately effective	Yes	Periodic monitoring of nearby watercourses.

Adverse Effects	Mitigation Proposed	Avoid, Reduce or Compensate	Integration With Other Effects	Anticipated Effectiveness	Confirmation of Deliverability	Method of Environmental Monitoring
	control measures should be employed. Any such groundwater control measures will also require pollution control measures in accordance with EA guidance.					
Operation						
Increased pressure on water services infrastructure (supply)	Early engagement with UU on the potable water needs for the Proposed Development, and any current restrictions and the need for any upgrades.	Reduce	No	Moderately effective	Yes	N/A
	Water efficiency measures that will reduce potable demand and subsequent foul flows including one or more of the following: Low flow fittings: low flush toilets, spray taps and low flow showers, if necessary; Efficient water supply: Leak detection, smart meters and pressure reduction	Reduce	No	Moderately effective	Yes	Track how much water is being consumed during the operation process. Compare this to established benchmarks.
Wind Microclimate						
Construction						
	There are no significant construction effects anticipated, therefore no mitigation is required. However standard construction mitigation measures will be implemented including standard site hoardings to shelter neighbouring areas.	Reduce	Not applicable	Moderately effective	Yes	Not applicable
Operation - Mitigation measures were suggested and implemented into the design in order to resolve the issues observed on the level 01 podium of the Proposed Development, as follows:						

Adverse Effects	Mitigation Proposed	Avoid, Reduce or Compensate	Integration With Other Effects	Anticipated Effectiveness	Confirmation of Deliverability	Method of Environmental Monitoring
	Landscape within the podium along the southern edge.	Reduce	All mitigation measures combined will act to minimise the impact of high-speed winds in the areas concerned	Highly effective	Yes	Implementation of the submitted landscaping scheme, to be monitored by the contractor.
	Landscape at the east side of the podium (some of this has been incorporated as part of the design in the form of a porous fence that surrounds the compound on the east).	Reduce	All mitigation measures combined will act to minimise the impact of high-speed winds in the areas concerned	Highly effective	Yes	Implementation of the submitted landscaping scheme, to be monitored by the contractor.
	Planters located along the southern façade and at the southeast corner of the Proposed Development on the podium level.	Reduce	All mitigation measures combined will act to minimise the impact of high-speed winds in the areas concerned	Highly effective	Yes	Implementation of the submitted landscaping scheme, to be monitored by the contractor.
	Building entrances at the northwest corner of the podium set back into the façade.	Reduce	Not applicable	Highly effective	Yes	Implementation of the approved building design, to be monitored by the contractor.
Climate Change						
Construction						
GHG emissions arising from construction Products and Materials (embodied carbon)	Reduce concrete use by reviewing benefits of switching to a full steel frame superstructure.	Reduce	N/a	Moderately	Conclusion to be reflected in the Stage 4a design specifications	Embodied carbon reduction to be reported as part of the BREEAM Design Stage Assessment for Interim Certification (Mat 01 Life Cycle Assessment credits)
	Maximise recycled content in the steelwork.	Reduce	N/A	Highly effective	Contractor to advise on recycled content achievable through market testing. Structural Engineer to	As above

Adverse Effects	Mitigation Proposed	Avoid, Reduce or Compensate	Integration With Other Effects	Anticipated Effectiveness	Confirmation of Deliverability	Method of Environmental Monitoring
					include in the Structural Steelwork Specification	
	Maximise recycled content in the concrete mixes through cement replacements.	Reduce	N/A	Highly effective	Structural Engineer and Contractor to review technical implications, market availability and any impact on programme. To be included in the Structural Concrete Specification.	As above
	Where practical, maximise recycled content in other key building and fit-out components (e.g. blockwork, internal plasterboard partitions, floor finishes).	Reduce	N/A	Moderately effective	Contractor via the BREEAM Sustainable Procurement Plan	BREEAM Assessment (Credit Mat 03 Responsible Sourcing of Construction Products)
	Where practical, maximise use of recycled aggregates in the civil engineering works (e.g. sub-base, pipe bedding)	Reduce	N/A	Moderately effective	Civil Engineer and Contractor to review technical implications and market availability. To be included in the Civil Engineering Specification	BREEAM Assessment (Credit Wst 01 Use of Recycled and Sustainably Sourced Aggregates)
	Review opportunities to minimise internal finishes such as dry lining, ceilings and decorative floor screeds / covering where not technically required (e.g. for acoustics or fire protection), opting for fair faced finishes instead.	Avoid	N/A	Moderately effective	Architect to review during detailed design development in collaboration with the structural engineer	Embodied carbon reduction to be reported as part of the BREEAM Design Stage Assessment for Interim Certification (Mat 01 Life Cycle Assessment credits)

Adverse Effects	Mitigation Proposed	Avoid, Reduce or Compensate	Integration With Other Effects	Anticipated Effectiveness	Confirmation of Deliverability	Method of Environmental Monitoring
	Review opportunity to use low carbon materials in the FF&E.	Reduce	N/A	Moderately effective	Architect to review during detailed design development	As above
GHG emissions arising from construction transport (Embodied Carbon)	Preference for materials and components that are locally sourced to minimise transportation distances	Reduce	N/A	Moderately effective	Contractor via the BREEAM Sustainable Procurement Plan and Construction Management Plan	BREEAM Assessment (Credit Mat 03 Responsible Sourcing of Construction Products); and Construction Management Plan, to be secured via planning condition.
	Off-site modular construction to consolidate delivery requirements	Reduce	Transport Construction effects	Moderately effective	Contractor to advise on opportunities during design review and development	Embodied carbon reduction to be reported as part of the BREEAM Design Stage Assessment for Interim Certification (Mat 01 Life Cycle Assessment credits)
	Travel plan for site staff	Reduce	Transport Construction effects	Moderately effective	To be included as part of the Construction Management Plan	Construction Management Plan, to be secured via planning condition.
GHG emissions arising from the construction installation processes (embodied carbon)	Off-site construction for energy efficient assembly and minimising site installation processes	Reduce	Air Quality and Noise Construction effects	Moderately effective	Contractor to advise on opportunities during design review and development	Embodied carbon reduction to be reported as part of the BREEAM Design Stage Assessment for Interim Certification (Mat 01 Life Cycle Assessment credits)
	Temporary electrical supply connection to minimise the use of on-site diesel generators	Reduce	Air Quality and Noise Construction effects	Moderately effective	To be included as part of the Construction Management Plan	Construction Management Plan, to be secured via planning condition.
	Site energy monitoring and improvement programme	Reduce	N/A	Moderately effective	Monitored through BREEAM Man 03 and Construction Management Plan	BREEAM (Man 03 Responsible Construction Practices) and Construction Management Plan, to be secured via planning condition.

Adverse Effects	Mitigation Proposed	Avoid, Reduce or Compensate	Integration With Other Effects	Anticipated Effectiveness	Confirmation of Deliverability	Method of Environmental Monitoring
Operation						
GHG emissions arising from operational energy use	Phase out the use of gas for catering (currently in two kitchens only, all of concessions will be electric). As technology and carbon factors are changing at a rapid pace, this will also be reviewed during detailed design and construction and the switch made prior to installation if viable.	Reduce	Air Quality Operational effects	Highly effective	Applicant, in discussion with future catering partners, as emerging non-fossil fuel catering equipment that delivers the same offering becomes viable.	GHG reporting in operation (Etihad Campus Sustainability Framework)
	Phase out gas boilers for hot water and heating in the stair cores. This could include district heating if such a network became available in the locality or integration of solar hot water into a future PV array.	Reduce	Air Quality Operational effects	Highly effective	Applicant, as part of maintenance and replacement programme as emerging new low carbon technology becomes more efficient and viable.	GHG reporting in operation (Etihad Campus Sustainability Framework)
	Align with any future Manchester requirements for carbon offsetting to achieve net zero by 2038	Avoid	N/A	Highly effective	Applicant, in collaboration with Manchester City Council as details of the final Zero Carbon 2038 Framework and Action Plan are published.	GHG reporting in operation (Etihad Campus Sustainability Framework)
	Behaviour change campaign to encourage energy conscious behaviour of building users (staff, visitors, touring community), tying into the 3-year POE	Reduce	N/A	Moderately effective	Applicant, as part of operational management procedures.	GHG reporting in operation (Etihad Campus Sustainability Framework)