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MANCHESTER DIGITAL CAMPUS

Environmental Statement

Volume 2 - Chapter 19: Water Resources and Flood Risk

NOVEMBER 2024

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This document has 61 pages including the cover.

Document history

Document title: Environmental Statement Volume 2, Chapter 19 – Water Resources and Flood Risk

Document reference: MDCX-ATR-XX-XX-RP-Z-000016

Revision	Purpose description	Originated	Checked	Reviewed	Authorised	Date
1.0	Planning submission issue	MH / AN / CE	RS	EG	TC	25/11/2024

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Executive Summary

The Manchester Digital Campus (MDC) project has undergone an assessment to evaluate its potential impacts on water resources and flood risk. This assessment ensures that the development does not harm local water bodies, groundwater, or increase flood risks, preventing issues such as pollution, erosion, or habitat destruction. Additionally, understanding the water environment helps in designing effective mitigation measures such as drainage and water management systems, promoting sustainable water use, and protecting aquatic ecosystems.

The Water Resources chapter evaluates surrounding baseline conditions within the study area, encompassing surface water (including watercourses, relevant statutory designated sites, and the associated Water Framework Directive status), geology and hydrogeology (including superficial geology, made ground, bedrock geology, groundwater bodies, and groundwater abstractions and discharges), and flood risk (including fluvial, surface water, groundwater, reservoir, and other sources of flooding such as canals). The chapter followed a predominantly qualitative assessment based on DMRB LA 113 (Road Drainage and the Water Environment) and DMRB LA 104 (Environmental Assessment and Monitoring) guidance.

The potential impacts of the proposed development include changes to surface water quality, such as direct and indirect pollution leading to habitat degradation and injury to species. Flood risks may change due to alterations in surface water and artificial flood risks. Groundwater impacts include changes in quantity (level and flow), recharge, and quality.

Key issues identified include potential pollution from construction activities, which could degrade water quality and affect local watercourses such as the Rochdale and Ashton Canals, and the River Medlock. Additionally, construction could alter groundwater levels and flow, potentially leading to contamination. Construction activities could also raise flood risks in the area.

There is the potential short-term disruptions to local communities due to construction activities. Environmental resources face risks to surface water and groundwater quality, as well as increased flood risk. Despite these challenges, the project promises long-term benefits. Improved water management systems and sustainable drainage solutions (SuDS) will enhance water quality and reduce flood risks. The project also includes measures to protect local water bodies and ecosystems.

To address these issues, several mitigation measures are in place. During the construction phase, best practices will be implemented to prevent pollution, a robust drainage strategy will manage runoff, and SuDS will control surface water. In the operational phase, long-term water quality monitoring will be conducted, drainage systems will limit runoff to natural levels, and regular maintenance of water management systems will be ensured. Embedded mitigation measures will encompass the creation of an Outline Construction Environmental Management Plan (OCEMP), a Drainage Strategy Report, a temporary drainage plan, and risk assessments for piling and dewatering. Additionally, SuDS will be integrated into the proposed development design wherever feasible.

Overall, the MDC project aims to balance development needs with environmental protection, ensuring that long-term benefits outweigh short-term impacts. There are no significant residual effects on surface water quality, groundwater quantity and quality, and flood risk to the receptors as a result of the proposed development.

19. Water Resources and Flood Risk

19.1. Introduction

19.1.1. This chapter of the Environmental Statement (ES) assesses the likely effects of the Proposed Development with respect to water resources and flood risk. It outlines the assessment methodology, describes the existing baseline conditions, identifies potential impacts and provides an assessment of effects. The chapter also details the mitigation measures necessary to prevent, reduce, or offset any significant adverse effects, and discusses the likely residual effects after these measures have been implemented.

19.1.2. This chapter reports on two different types of cumulative effects: intra-project cumulative effects, which are the combined effects of individual topic impacts on a particular sensitive receptor; and inter-project cumulative effects, which consider the way in which the Proposed Development may give rise to impacts in combination with other developments the study area, termed Reasonably Foreseeable Future Projects (RFFPs). The outlined cumulative effects are then used to inform the overall assessment of cross-topic cumulative effects, which is reported in ES (Volume 2) Chapter 22: Cumulative Effects.

19.1.3. This chapter is supported by figures contained within ES Volume 5, and also by a technical appendix contained within ES Volume 4 Appendix 19, which includes the following:

- ES (Volume 4) Appendix 19.1 – Water Framework Directive Assessment
- ES (Volume 4) Appendix 19.2 – Flood Risk Assessment (FRA)
- ES (Volume 4) Appendix 19.3 – Drainage Strategy
- ES (Volume 5) Figure 19.1 – The MDC and the 1 km radius area of the Site
- ES (Volume 5) Figure 19.2 – The MDC and the 1 km radius area of the Site along with nearby watercourses
- ES (Volume 5) Figure 19.3 – The MDC and the 1 km radius area of the Site along with British Geological Survey Bedrock Geology (625k)
- ES (Volume 5) Figure 19.4 – The MDC and the 1 km radius area of the Site along with British Geological Survey Superficial Geology (625k)

19.2. Competent expert evidence

19.2.1. The various elements of the Water Environment assessment have been carried out as below:

- The surface water quality assessment was reviewed by a Chartered Associate Environmental Scientist (BSc, MSc, CSci, CEnv, CIWEM, CWEM) with 20 years' experience in water quality and environmental assessments, who also undertook the check of the Water chapter.
- The flood risk assessment was originated by a Graduate Environmental Scientist (BSc, GradCIWEM), with 2 years of experience in flood risk.
- The water environment chapter and flood risk assessment were reviewed by a Chartered Scientist (BSc, MRes, CSci, CEnv, C.WEM, MCIWEM) who has over 25 years of knowledge and experience in water environment assessment and has used their knowledge and professional judgement to undertake this assessment.
- The surface water quality assessment was originated by an Assistant Environmental Scientist (BSc, GradCIWEM), with 3 years of experience in surface water quality.
- The groundwater assessment and groundwater WFD compliance assessment was reviewed by a Chartered Hydrogeologist (BSc, PGDip, FGS, CGeol) with over 17 years of knowledge and experience in water resources and the water environment.

19.3. Relevant legislation and guidance

19.3.1. Table 19-1 below summaries the legislation and regulations applicable to Water Environment.

Table 19-1 - Legislation and guidance for the Water Environment.

Legislation / regulation	Summary of requirements
National	
Environment Act 1995[1]	The Act provides for the establishment of a body corporate to be known as the Environment Agency, the key regulator for the water environment.
Environment Act 2021[2]	Following the UK's departure from the EU, this Act was produced to support legislation surrounding water quality, waste and recycling, species decline and improving the natural environment.
Environmental Protection Act 1990[3]	This Act brings in a system of integrated pollution control for the disposal of wastes to land, water, and air.
Flood and Water Management Act 2010[4]	The key areas covered by this Act are: roles and responsibilities for flood and coastal erosion risk management; and, improving reservoir safety.
Highways Act 1980[5]	The Act deals with the management and operation of the road network in England and Wales including the drainage of highways into environmental waters and sewers.
Land Drainage Act 1991[6] Land Drainage Act 1994[7]	The Land Drainage Act 1991 requires watercourses to be maintained in a condition that the free flow of water is not impeded. The 1994 Land Drainage Act amends it in relation to the functions of internal drainage boards and local authorities
Water Act 2003[8] Water Act 2014[9]	These Acts aim to improve water conservation, protect public health and the environment, and improve the service offered to consumers. The Acts relate to water resources, regulation of the water industry and other provisions.
Water Industry Act 1991[10]	This sets out the responsibilities of the Environment Agency in relation to water pollution, resource management, flood defence, fisheries, and in some areas, navigation. The Act regulates discharges to controlled waters, namely rivers, estuaries, coastal waters, lakes and groundwaters
Water Resources Act 1991 (Amendment) (England and Wales) and Regulations 2009[11]	The Act regulates water resources, water quality and pollution, and flood defence. Sets out standards for Controlled Waters
Catchment Flood Management Plans (CFMPs)[12]	CFMPs provide a large scale, strategic planning framework for the integrated management of flood risks to people, property and the environment in a sustainable manner over the next 50 to 100 years.

[1] Environment Act 1995 (legislation.gov.uk)

[2] Environment Act 2021 (legislation.gov.uk)

[3] Environmental Protection Act 1990 (legislation.gov.uk)

[4] Flood and Water Management Act 2010 (legislation.gov.uk)

[5] Highways Act 1980 (legislation.gov.uk)

[6] Land Drainage Act 1991 (legislation.gov.uk)

[7] Land Drainage Act 1994 (legislation.gov.uk)

[8] Water Act 2003 (legislation.gov.uk)

[9] Water Act 2014 (legislation.gov.uk)

[10] Water Industry Act 1991 (legislation.gov.uk)

[11] The Water Resources Act 1991 (Amendment) (England and Wales) Regulations 2009 (legislation.gov.uk)

[12] Catchment flood management plans - GOV.UK (www.gov.uk)

Legislation / regulation	Summary of requirements
The Water Framework (Standards and Classification) Directions (England and Wales) 2015[13]	These Directions set out the environmental standards to be used for the second cycle of river basin plans. They transpose Directive 2013/39/EC on environmental quality standards for priority substances and supersede the 2008 version of the directive.
The Anti-Pollution Works Regulations 1999[14]	Where pollution occurs, or is likely to occur, the Environment Agency can serve a works notice under Section 161A of the Water Resources Act 1991 on any person who has caused or knowingly permitted the pollution (or risk of pollution) to controlled waters, requiring them to carry out anti-pollution/preventative works and operations. The Environment Agency can also recover the costs of any investigation and anti-pollution works carried out. The Anti-Pollution Works Regulations prescribe the content of anti-pollution works notices. They also prescribe the information to be placed on the pollution control registers maintained by the Environment Agency.
Control of Pollution (Oil Storage) (England) Regulations 2001[15]	Regulations controlling the storage of more than 200 litres of oil above ground at an industrial, commercial or institutional site not used in refining or distribution oil. The Regulations apply in England only.
Environmental Damage (Prevention and Remediation) Regulations (England) 2015[16]	The emphasis of these Regulations is on proactively putting in place appropriate pollution prevention measures to reduce risks to the environment.
Environmental Permitting (England and Wales) Regulations 2016[17]	These Regulations provide a consolidated system of environmental permitting in England and Wales and transpose the provisions of 15 European Union (EU) Directives, which impose obligations requiring delivery through permits or which are capable of being delivered through permits. These cover Environment Agency permits for flood risk (on Main River) and certain discharges to watercourses. They also transpose the Groundwater Directive (2006/118/EC) into law in England and Wales.
Flood Risk Regulations 2009[18]	These aim to provide a consistent approach to managing flood risk. The Environment Agency are responsible for managing flood risk from main rivers, the sea and reservoirs. LLFAs are responsible for local sources of flood risk from surface water, groundwater and ordinary watercourses.
Water Environment (Water Framework Directive) (England and Wales) Regulations 2017[19]	The 2017 Regulations place a general duty on the Secretary of State (SoS), the Welsh Ministers, the Environment Agency (EA), and Natural Resources Wales (NRW) to exercise their 'relevant functions' so as to secure compliance with the WFD (Regulation 3). The 2017 Regulations place a general duty on the Secretary of State (SoS), the Welsh Ministers, the Environment Agency and Natural Resources Wales to exercise their 'relevant functions' so as to secure compliance with the WFD (Regulation 3). Functions under the Planning Act 2008 (as amended) (PA2008) are not 'relevant functions' for this purpose.

[13] The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015 (legislation.gov.uk)

[14] The Anti-Pollution Works Regulations 1999 (legislation.gov.uk)

[15] The Control of Pollution (Oil Storage) (England) Regulations 2001 (legislation.gov.uk)

[16] The Environmental Damage (Prevention and Remediation) (England) Regulations 2015 (legislation.gov.uk)

[17] The Environmental Permitting (England and Wales) Regulations 2016 (legislation.gov.uk)

[18] The Flood Risk Regulations 2009 (legislation.gov.uk)

[19] The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 (legislation.gov.uk)

Legislation / regulation	Summary of requirements
	However, the SoS, the Welsh Ministers, Environment Agency, Natural Resources Wales and each public body have a specific duty to have regard to the relevant RBMP, and any supplementary plans made under it, in exercising their functions (Regulation 33); this would include functions under the PA2008.
The Water Resources (Environmental Impact Assessment) (England and Wales) Regulations 2003[20]	These Regulations impose procedural requirements in relation to the consideration of applications or proposals for an abstraction or impounding licence under Chapter II of Part II of the Water Resources Act 1991 and require consent in other cases.
The Conservation of Habitats and Species Regulations 2017[21]	Often referred to as the 'Habitats Regulations', these regulations transpose the EEC Habitats Directive into UK Law. Under these regulations, all competent authorities must consider whether any plan or project will have a 'likely significant effect' on a site designated under the Habitats Directive. If so, they must carry out carry out an 'appropriate assessment'. This is known as Habitats Regulations Appraisal.
The Nitrate Pollution Prevention Regulations 2015[22]	These regulations transpose the EEC Nitrates Directive into English Law. The regulations identify areas as 'nitrate vulnerable zones' if, using available scientific and technical data, they are considered at risk from agricultural nitrate pollution. They apply to about 55% of land in England.
National Flood and Coastal Erosion Risk Management (FCERM) Strategy for England (2020)[23]	This Strategy describes what needs to be done by all risk management authorities involved in flood and coastal erosion risk management for the benefit of people and places.
National Planning Policy Framework (2023)[24]	The National Planning Policy Framework sets out the government's planning policies for England and how these should be applied. The NPPF and associated planning practice guidance include a requirement for need for a sequential assessment/exceptions test to Major and Non-Major development in areas of risk of flooding.
Groundwater (England and Wales) Regulations (2009)[25]	The Groundwater (England and Wales) regulations (2009) is in place to protect groundwater, providing rules for the granting by the Environment Agency of a permit.
Regional	
North West river basin district river basin management plan: updated 2022[26]	The North West river basin district (RBD) river basin management plan describes the challenges that threaten the water environment and how these challenges can be managed.
North West river basin district river basin management plan (2016)[27]	This document sets out the current state of the water environment, the pressures effecting the water environment, environmental objectives for protecting and improving the waters, programme of measures, actions needed to achieve the objectives, progress since the 2009 plan. It also informs decisions on land-use planning because water and land resources are closely linked

[20] The Water Resources (Environmental Impact Assessment) (England and Wales) Regulations 2003 (legislation.gov.uk)

[21] The Conservation of Habitats and Species Regulations 2017 (legislation.gov.uk)

[22] The Nitrate Pollution Prevention Regulations 2015 (legislation.gov.uk)

[23] National Flood and Coastal Erosion Risk Management Strategy for England - GOV.UK (www.gov.uk)

[24] National Planning Policy Framework - GOV.UK (www.gov.uk)

[25] The Groundwater (England and Wales) Regulations 2009 (legislation.gov.uk)

[26] North West river basin district river basin management plan: updated 2022 - GOV.UK (www.gov.uk)

[27] North West river basin district river basin management plan - GOV.UK (www.gov.uk)

Legislation / regulation	Summary of requirements
North West river basin district flood risk management plan (2023)[28]	This plan focuses on the areas that are designated as being at particular risk of flooding, from either rivers and sea or surface water. This plan also sets out the legislative background.
Local	
Local Flood Risk Management Strategy – Manchester City Council[29]	This strategy documents the local flood risk in Manchester, alongside the risk management authorities. Additionally, the Local Flood Risk Management (LFRM) Policies which provide the basis for all local flood risk management actions, are documented within this document. It also sets out the aims and objectives of the local strategy.
Greater Manchester Strategic Flood Risk Management Framework (2019)[30]	The report provides a spatial framework for flood risk management across Greater Manchester. It also recommends key priorities for intervention taking account of previous, existing, and planned interventions.
Manchester City Council Development Plan (Manchester Core Strategy 2012–2027)[31]	The core strategy includes Policy EN 14 which is a flood risk policy. This provides guidelines for the location of developments, design and assessments required in relation to flood risk.
Places for Everyone Joint Development Plan[32]	The plan includes Policy JP-S4: Flood Risk and the Water Environment – which adopts an integrated catchment-based approach to protect the quantity and quality of water bodies with reference to the North West River Basin Management Plan and manage flood risk.
Manchester City, Salford City and Trafford Councils Level 2 Hybrid SFRA (2011)[33]	The Strategic Flood Risk Assessment provides a detailed understanding of flood risk across Manchester, Salford, and Trafford.
Integrated Water Management Plan (2023)[34]	This is a document produced by the Greater Manchester Combined Authority, the EA, and United Utilities. The aim of the Integrated Water Management Plan (IWM) is to deliver progressive improvements in sustainable water management, enhancement of the natural environment and ensure all future developments and critical infrastructure are resilient to flooding and the impact of climate change. This document sets out the ambitions and objectives for achieving this.
Irwell catchment flood management plan[35]	The Irwell catchment flood management plan helps to understand the scale and extent of flooding now and in the future. It also sets out the policies for managing flood risk. This should be used to inform planning and decision making.
Manchester City council preliminary flood risk assessment (2011)[36]	This report collates and reviews all available local flood risk information of past and future flood risk.

19.3.2. Table 19-2 below summaries the Technical Standards and Guidance applicable to the Water Environment.

[28] North West river basin district flood risk management plan - GOV.UK (www.gov.uk)

[29] Local Flood Risk Management Strategy documents | Manchester City Council

[30] JBA Consulting Report Template 2015 (greatermanchester-ca.gov.uk)

[31] Core Strategy 2012-2027 | Core Strategy 2012-2027 | Manchester City Council

[32] Places for Everyone | Places for Everyone | Manchester City Council

[33] Manchester, Salford and Trafford Strategic Flood Risk Assessment | Strategic Flood Risk Assessment | Manchester City Council

[34] Integrated Water Management Plan (greatermanchester-ca.gov.uk)

[35] Irwell_Catchment_Flood_Management_Plan.pdf (publishing.service.gov.uk)

[36] [ARCHIVED CONTENT] (nationalarchives.gov.uk)

Table 19-2 - Technical standard and guidance for Water Environment

Technical standards / guidance	Summary of requirements
Pollution Prevention Guidelines (PPG)[37,38] and Guidance for Pollution Prevention (GPP)[39]	PPG were a series of documents developed by the Environment Agency for England and Wales, the Northern Ireland Environment Agency for Northern Ireland and the Scottish Environmental Protection Agency for Scotland. Each PPG was targeted at a different business or activity. The PPGs were withdrawn from use in 2015, but are still considered good practice as they have, to date, not been replaced with other formal guidance. GPPs provide environmental good practice guidance for the whole of the UK, accepting there may be some exceptions. Relevant PPG and GPP to this development include: PPG 1: Understanding your environmental responsibilities - good environmental practices PPG 3: Use and design of oil separators in surface water drainage systems GPP 4: Treatment and disposal of wastewater where there is no connection to the public foul sewer PPG/GPP 5: Works and maintenance in or near water PPG 23: Maintenance of structures over water
Guidance Pollution Prevention for businesses (GOV.UK)[40]	Guidance for businesses and organisations on prevention of pollution from oil and chemical storage, car washing, construction and other activities. These guidelines are specific to England.
CIRIA C753, 2007. SuDS Manual[41]	CIRIA (Construction Industry Research and Information Association) Guidance encompassing the best practice and framework for planning, design, construction and maintenance of Sustainable Drainage Systems (SuDS). The guidance is designed to aid and enable the effective delivery of SuDS, maximising the benefits from effective water management.
CIRIA C648, 2006. Control of water pollution from linear construction projects[42]	CIRIA (Construction Industry Research and Information Association) guidance encompassing information and best practice for clients through to regulators on how to best manage water pollution from linear construction projects.

[37] Pollution Prevention Guidelines - Works and maintenance in or near water: PPG5 (publishing.service.gov.uk)

[38] Pollution Prevention Guidelines (publishing.service.gov.uk)

[39] Guidance for Pollution Prevention (GPP) documents | NetRegs | Environmental guidance for your business in Northern Ireland & Scotland

[40] Pollution prevention for businesses - GOV.UK (www.gov.uk)

[41] SuDS Manual (ciria.org)

[42] Control of water pollution from linear construction projects (ciria.org)

Technical standards / guidance	Summary of requirements
NRW/NIEA/SEPA, 2017, Guidance for Pollution Prevention: Works and maintenance in or near Water: GPP 5[43]	Guidance developed by NRW (Natural Resources Wales), NIEA (Northern Ireland Environment Agency) and SEPA (Scottish Environment Protection Agency). The guidance is based on best practice and legislation from NRW, NIEA and SEPA. It should be noted it is not endorsed as regulatory guidance by the EA. The guidance is aimed at anyone undertaking works or activities near water and details pollution prevention for near water works including silt pollution, concrete, cement and grout, oils and chemical, bridge maintenance over water, pesticide use, INNS, waste management and incident reporting.

19.4. Assessment methodology

Study area

19.4.1. The study area used to inform the scoping chapter and this ES chapter takes into consideration all features of the water environment within 1 km of the Proposed Development. This is considered to be an appropriate radial distance for any potential impacts to be sufficiently dampened (for example, dilution of pollutants). This study area has been adopted as a minimum for the groundwater assessments as professional judgement indicates any impacts to groundwater flow will also be dissipated within 1 km. It should be noted that groundwater quality is assessed in detail in Chapter 12 (Geology and Soils). The location of the Site in the context of local rivers and canals is shown in Figure 19.1. Methodology

19.4.2. The Design Manual for Roads and Bridges (DMRB) provides a suitable framework to use for assessing the potential impacts of the Proposed Development on the water environment. Therefore, the ES chapter will follow a predominantly qualitative assessment based on DMRB LA 113[44] (Road Drainage and the Water Environment) and DMRB LA 104[45] (Environmental Assessment and Monitoring) guidance. The methodology outlines in the guidance uses the following three steps:

- Estimation of the importance of the receptor (Table 19-3)
- Estimation of the magnitude of impact (Table 19-4)
- Assessment of the significance of effect based on receptor importance and impact magnitude (Table 19-5). Within this assessment anything with a significance of effect classified as moderate, large or very large is considered significant.

19.4.3. No on-site monitoring of water quality or quantity is currently proposed.

[43] GPP 5: Works and maintenance in or near water | NetRegs | Environmental guidance for your business in Northern Ireland & Scotland

[44] https://standardsforhighways.co.uk/search/d6388f5f-2694-4986-ac46-b17b62c21727

[45] https://standardsforhighways.co.uk/search/0f6e0b6a-d08e-4673-8691-cab564d4a60a

Table 19-3 - Criteria for estimating the importance of a water environment receptor[46]

Importance	Typical criteria	Typical examples	
Very high	Nationally significant attribute of high importance	Surface water:	Watercourse having a WFD classification shown in a RBMP and Q95 ≥ 1.0 m^3/s. Site protected/ designated under EC or UK legislation (SAC, SPA, SSSI, Ramsar site, salmonid water)/Species protected by EC legislation LA 108.
		Groundwater:	Principal aquifer providing a regionally important resource and/ or supporting a site protected under EC and UK legislation LA 108. Groundwater locally supports Groundwater Dependent Terrestrial Ecosystem (GWDTE). Source Protection Zone (SPZ) 1.
		Flood risk:	Essential infrastructure or highly vulnerable development.
High	Locally significant attribute of high importance	Surface water:	Watercourse having a WFD classification shown in a RBMP and Q95 < 1.0 m^3/s. Species protected under EC or UK legislation LA 108.
		Groundwater:	Principal aquifer providing locally important resource or supporting a river ecosystem. Groundwater supports a GWDTE. SPZ 2.
		Flood risk:	More vulnerable development.
Medium	Of moderate quality and rarity	Surface water:	Watercourses not having a WFD classification shown in a RBMP and Q95 > 0.001 m^3/s.
		Groundwater:	Aquifer providing water for agricultural or industrial use with limited connection to surface water. SPZ 3.
		Flood risk:	Less vulnerable development.
Low	Lower quality	Surface water:	Watercourses not having a WFD classification shown in a RBMP and Q95 ≤ 0.001 m^3/s.
		Groundwater:	Unproductive strata.
		Flood risk:	Water compatible development.

[46] Table source: Extracted directly from DMRB LA 113 Table 3.70: Estimating the importance of water environment attributes.

Table 19-4 - Criteria for assessing the potential magnitude of impact[47]

Magnitude	Typical criteria	Typical examples	
Major adverse	Results in loss of attribute and/or quality and integrity of the attribute	Surface water:	Loss or extensive change to a fishery/designated nature conservation site Loss of regionally important public water supply. Loss or extensive change to a designated nature conservation site. Reduction in water body WFD classification.
		Groundwater:	Loss of, or extensive change to, an aquifer/groundwater supported habitats Loss of regionally important water supply. Potential high risk of pollution to groundwater Loss of, or extensive change to GWDTE or baseflow contribution to protected surface water bodies. Reduction in water body WFD classification Loss or significant damage to major structures through subsidence or similar effects.
		Flood risk:	Increase in peak flood level (> 100mm). Changes to site resulting in an increase in discharge/runoff of >75% with flood/sewerage exceedance potential Loss of flood storage areas
Moderate adverse	Results in effect on integrity of attribute, or loss of part of attribute	Surface water:	Partial loss or change to a fishery/designated nature conservation site. Loss in the productivity of a fishery Degradation of regionally important public water supply or loss of major commercial/ industrial/ agricultural supplies. Contribution to reduction in water body WFD classification.
		Groundwater:	Partial loss or change to an aquifer/groundwater supported habitats Degradation of regionally important public water supply or loss of significant commercial/ industrial/ agricultural supplies. Potential medium risk of pollution to groundwater

[47] Table source: Extracted directly from DMRB LA 113 Table 3.71: Estimating the magnitude of impact on an attribute.

Magnitude	Typical criteria	Typical examples	
			Partial loss of the integrity of GWDTE. Contribution to reduction in water body WFD classification. Damage to major structures through subsidence or similar effects or loss of minor structures
		Flood risk:	Increase in peak flood level (> 50 mm). Changes to site resulting in an increase in discharge/runoff of >50% with flood/sewerage exceedance potential
Minor adverse	Results in some measurable change in attributes, quality, or vulnerability	Surface water:	Minor effects on water supplies. Potential low risk of some pollution to a surface water body, but insufficient to cause loss in quality, fishery productivity or biodiversity.
		Groundwater:	Potential low risk of some pollution to a groundwater body, but insufficient to cause loss in quality, fishery productivity or biodiversity. Minor effects on an aquifer, GWDTEs, abstractions and structures.
		Flood risk:	Increase in peak flood level (> 10 mm) Changes to site resulting in an increase in discharge/runoff of >25% with flood/sewerage exceedance potential
Negligible	Results in effect on attribute, but of insufficient magnitude to affect the use or integrity	The proposed project is unlikely to affect the integrity of the water environment.	
		Surface water:	No measurable impact to a surface water body.
		Groundwater:	No measurable impact upon an aquifer and very low risk of pollution to groundwater
		Flood risk:	Negligible change to peak flood level (≤ +/- 10 mm).
Minor beneficial	Results in some beneficial effect on attribute or a reduced risk of negative effect occurring	Surface water:	Potential reduction in pollution to a surface water body.
		Groundwater:	Reduction of groundwater hazards to existing structures. Reductions in waterlogging and groundwater flooding Potential reduction in existing pollution risk to groundwater
		Flood risk:	Creation of flood storage and decrease in peak flood level (> 10 mm).
Moderate beneficial	Results in moderate improvement of attribute quality	Surface water:	Moderate improvement to a fishery/designated nature conservation site. Potential increase in the productivity of a fishery. Contribution to improvement in water body WFD classification i.e. Reduced pollution of a receiving water body, but insufficient to change the environmental status/classification, including water quality classification

Magnitude	Typical criteria	Typical examples	
		Groundwater:	Contribution to improvement in water body WFD classification. Improvement in water body Catchment Abstraction Management Strategy (CAMS) (or equivalent) classification. Support to significant improvements in damaged GWDTE.
		Flood risk:	Creation of flood storage and decrease in peak flood level (> 50 mm) Changes to site resulting in a decrease in discharge/runoff >50%
Major beneficial	Results in major improvement of attribute quality	Surface water:	Removal of existing polluting discharge or removing the likelihood of polluting discharges occurring to a watercourse. Significant improvement to a fishery/designated nature conservation site Improvement in water body WFD classification.
		Groundwater:	Removal of existing polluting discharge to an aquifer or removing the likelihood of polluting discharges occurring. Recharge of an aquifer. Improvement in water body WFD classification.
		Flood risk:	Creation of flood storage and decrease in peak flood level (> 100 mm). Changes to site resulting in a decrease in discharge/runoff of >75%
No change		No loss or alteration of characteristics, features, or elements. No observable impact in either direction.	

Table 19-5 - Significance of effect

		Magnitude of Impact				
		Major	**Moderate**	**Minor**	**Negligible**	**No change**
Importance	**Very High**	Very large	Large/very large	Moderate/large	Slight	Neutral
	High	Large/very large	Moderate/large	Slight/moderate	Slight	Neutral
	Medium	Moderate/large	Moderate	Slight	Neutral/slight	Neutral
	Low	Slight/moderate	Slight	Neutral/slight	Neutral/slight	Neutral
	Negligible	Slight	Neutral/slight	Neutral/slight	Neutral	Neutral

Assumptions and limitations

19.4.4. The assumptions applicable to the assessment methodology are outlined, as follows:

- The assessment has been undertaken using baseline data available at the time of writing.
- The data used for this assessment is open-source data, that obtained in the Groundsure report[48], the Drainage Strategy, see ES (Volume 4) Appendix 19.3, Ground Investigation reports from AtkinsRéalis (2023)[54] and e3p (2017)[58], and the Outline Construction & Environmental Management Plan[49].
- The assessment is based on design drawings and Outline Construction & Environmental Management Plan.
- This assessment has relied upon the accuracy and level of detail of the documented data sources.
- It is assumed that best practice design and standard hydrological methodologies form the basis of detailed design.
- There is no information on the hydraulic connectivity of the Rochdale and Ashton Canals with the River Mersey, as such unknown whether water quality and quantity changes in one water body would propagate to the others water bodies.

Consultation

19.4.5. Manchester City Council (MCC) have been consulted for historical drainage records of the Site.

19.4.6. A Scoping Report ES (Volume 4) Appendix 4.1 was submitted to MCC on 30th September 2024 with a formal request for an EIA Scoping Opinion in accordance with Regulation 15 of the EIA Regulations.

19.4.7. A summary of the key points raised in the EIA Scoping Opinion relevant to the Water Resources and Flood Risk chapter are presented in ES (Volume 4) Appendix 4.2, including a response as to where the comments have been addressed within this chapter.

19.5. Baseline conditions

Surface Water

Surface Water Quality

19.5.1. This section outlines the surface water baseline conditions within the study area.

19.5.2. Surface watercourses within the study area generally flow from north east to south west and are located within the North West River Basin District, and the Croal Irwell and Roch Irk Medlock WFD Operational catchments. The study area sits within the North West River Basin Management Plan.

19.5.3. The study area is within Manchester City Centre and includes two canal waterbodies and one river water body (see Figure 19.2). The two canal water bodies are the Rochdale Canal and the Ashton Canal, both classified as WFD waterbodies. The River Medlock itself lies within the study area, this is a WFD waterbody and designated as a Statutory Main River.

[48] Groundsure. 2023. Manchester_RLB

[49] Government Property Agency. MDC - Outline Construction & Environmental Management Plan.

19.5.4. Given the urban nature of the study area, no further surface watercourses were identified as part of this scoping exercise.

19.5.5. Prior to the construction of the Rochdale and Ashton Canals, there was a tributary of the River Medlock – the Shooters Brook, which itself was fed by Newton Brook. Historical maps indicate that the route of the former Shooters Brook was culverted through the Site. However, Shooters Brook is now largely considered a 'lost watercourse', with the upstream section of Newton Brook now diverted several kilometres upstream of the Site. A CCTV survey of the culverted Shooters Brook indicates that there is no structure beneath the Site; instead, it runs in a southernly direction adjacent to the eastern boundary outside of the Site.

19.5.6. A culvert thought to be the former Shooters Brook is present downstream from the Site underneath Store Street with CCTV providing evidence of stopping up of the culvert upstream at the junction of Store Street with Great Ancoats Street.

WFD Status – water quality

19.5.7. The Proposed Development lies between two canals, the Rochdale Canal to the northwest and the Ashton Canal to the southeast. Both canals are designated as WFD Canal waterbodies:

- Rochdale Canal, western section (GB71210517)
- Ashton Canal and Peak Forest Canal, lower section (GB71210219)

19.5.8. The New Islington Marina connects the two canals. Although this is not designated under the WFD, it can be considered in conjunction with the two canals.

19.5.9. The Proposed Development lies within the following WFD river waterbody catchment:

- Medlock (Lumb Brook to Irwell) (GB112069061152)

19.5.10. Two additional WFD river waterbody catchments lie within the periphery of the study area (but do not fall within the Proposed Development):

- Irk (Wince to Irwell) (GB112069061131)
- Irwell / Manchester Ship Canal (Irk to confluence with Upper Mersey) (GB112069061452)

19.5.11. A summary of water quality parameters for the WFD water bodies (2019 Cycle 3 classification) containing the Rochdale Canal, western section and Ashton Canal and Peak Forest Canal, lower section is provided in Table 19-7[50]. Within both the Rochdale Canal western section and the Ashton Canal and Peak Forest Canal, lower section, they both achieve High status for all physico-chemical quality elements, Moderate for supporting elements (surface water) and Good for priority substances. However, both canal waterbodies Fail for the chemical – priority hazardous substances, specifically mercury and its compounds, and polybrominated diphenyl ethers (PBDE).

19.5.12. Table 19-8 provides a summary of the water quality parameters for the WFD river waterbody catchment[50], Medlock (Lumb Brook to Irwell). The Medlock (Lumb Brook to Irwell) has an overall classification of Moderate, a Moderate classification for physico-chemical quality elements and Poor for biological quality elements and phosphate (a physico-chemical quality element).

[50] https://environment.data.gov.uk/catchment-planning

19.5.13. Where WFD status is presented in this report (i.e. for surface water and groundwater), it has been coloured coded consistently with categories set out in the 2015 Directions. The colour coding set out in Table 19-6 has been used.

Table 19-6 - WFD classification colour coding

	Ecological status					Chemical status	
Classification	High	Good	Moderate	Poor	Bad	Fail	Pass

Table 19-7 - WFD Classification - water quality parameters – canal

Water body name	Rochdale Canal, western section	Ashton Canal and Peak Forest Canal, lower section
Water body ID	GB71210517	GB71210219
National Grid Reference (OSNGR)	SD8835507230	SJ9337197048
River Basin District	North West	North West
Management catchment	North West AWB	North West AWB
Operational catchment	Roch Irk Medlock Canals and SWT	Goyt Etherow Tame Canals
A/HMWB	Artificial	Artificial
Classification	2019 Cycle 3	2019 Cycle 3
Overall Water Body	Moderate	Moderate
Ecological	Moderate	Moderate
Physico-chemical quality elements	High	High
▪ Ammonia (Phys-Chem)	High	High
▪ Temperature	High	High
▪ pH	High	High
Supporting elements (Surface Water)	Moderate	Moderate
▪ Mitigation measures assessment	Moderate or less	Moderate or less
Chemical	Fail*	Fail*
Priority hazardous substances	Fail*	Fail*
▪ Benzo(a)pyrene	Good	Good
▪ Dioxins and dioxin-like compounds	Good	Good
▪ Heptachlor and cis-Heptachlor epoxide	Good	Good
▪ Hexabromocyclododecane (HBCDD)	Good	Good
▪ Hexachlorobenzene	Good	Good
▪ Hexachlorobutadiene	Good	Good
▪ Mercury and Its Compounds	Fail	Fail
▪ Perfluorooctane sulphonate (PFOS)	Good	Good

Water body name	Rochdale Canal, western section	Ashton Canal and Peak Forest Canal, lower section
▪ Polybrominated diphenyl ethers (PBDE)	Fail	Fail
Priority substances	Good*	Good*
▪ Fluoranthene	Good	Good
Other Pollutants	Does not require assessment*	Does not require assessment*

* 2022 Does not require assessment

Table 19-8 - WFD Classification - water quality parameters – river

Water body name	Medlock (Lumb Brook to Irwell)
Water body ID	GB112069061152
National Grid Reference (OSNGR)	SD9022900552
River Basin District	North West
Management catchment	Irwell
Operational catchment	Roch Irk Medlock
A/HMWB	Heavily modified
Classification	2022 Cycle 3
Overall Water Body	Moderate
Ecological	Moderate
Biological quality elements	Poor
▪ Fish	Poor
▪ Invertebrates	Moderate
▪ Macrophytes and Phytobenthos Combined	Moderate
▫ Phytobenthos Sub Element	Moderate
Physico-chemical quality elements	Moderate
▪ Ammonia (Phys-Chem)	Good2
▪ Temperature	High3
▪ pH	High
▪ Dissolved Oxygen	High
▪ Phosphate	Poor
Specific Pollutants	High
▪ Iron	High
▪ Permethrin	High
▪ Triclosan	High
Chemical	Does not require assessment[1]
Priority hazardous substances	Does not require assessment[1]
▪ Benzo(a)pyrene	-[3]
▪ Dioxins and dioxin-like compounds	-[3]
▪ Heptachlor and cis-Heptachlor epoxide	-[3]
▪ Hexabromocyclododecane (HBCDD)	-[3]

▪ Hexachlorobenzene	-[3]
▪ Hexachlorobutadiene	-[3]
▪ Mercury and Its Compounds	-[1]
▪ Perfluorooctane sulphonate (PFOS)	-[1]
▪ Polybrominated diphenyl ethers (PBDE)	-[1]
▪ Tributyltin Compounds	-[3]
Priority substances	Does not require assessment[1]
▪ Fluoranthene	-[3]
▪ Cypermethrin (Priority)	-[1]
Other Pollutants	Does not require assessment

[1]- Fail in 2019

[2]- High in 2019

[3] - Good in 2019

[4] - Moderate in 2019

[5] - Poor in 2019

19.5.14. There are no Source Protection Zones (SPZs) within the study area.

19.5.15. The Groundsure report states that there are no surface water abstractions within 1km of the Proposed Development.

19.5.16. The Groundsure report identifies five historical licenced discharges to controlled waters within 500m of the Proposed Development, see Table 19-9. There are no active licenced discharges to control water within 500m of the Proposed Development. Table 19-9

Table 19-9 - Licenced discharges

Location	Address	Details
88m SE	Great Ancoats Street, SSO, Manchester, Greater Manchester	Sewage discharges, final/ treated effluent – water company into Shooters Brook Effective date: 15/09/1993 Revocation date: 15/09/1993
153m SE	Great Ancoats Street, SSO, Manchester, Greater Manchester	Sewage discharges, final/ treated effluent – water company into Shooters Brook Effective date: 15/09/1993 Revocation date: 15/09/1993
284m S	Store Street, Ancoats, Manchester, Greater Manchester	Sewage discharges sewer storm overflow – water company into the River Medlock Effective date: 23/06/1995 Revocation date: 28/11/2022
277m E	SOHO Works Site SWO, Pollard Street, Ancoats, Greater Manchester	Miscellaneous discharges to surface water (Manchester and Ashton Canal) Effective date: 30/09/1985 Revocation date: 01/07/1991
389m SW	Store Street, Ancoats, Manchester, Greater Manchester	Sewage discharges, sewer storm overflow – water company to unknown receiving water Effective date: 01/01/1995 Revocation date: 05/12/2014

Lakes and other surface water features

19.5.17. There are no further lakes or surface water features to those identified above.

Statutory designated sites

19.5.18. There are no Local Nature Reserves (LNRs), National Nature Reserves (NNRs), Ramsar sites, Sites of Special Scientific Interest (SSSIs), Special Areas of Conservation (SACs), Special Protection Areas (SPAs) or Source Protection Zones (SPZs) located within the study area.

19.5.19. The Rochdale Canal (*Rochdale Canal - Stott's Lane to Ducie Street Basin*) adjacent to the Site and the Ashton Canal (*Ashton Canal (West)*) are both designated sites of Biological Importance (SBI)[51].

19.5.20. Within the study area there is the River Irk Nitrate Vulnerable Zone (NVZ).

Hydrogeology

Geology and hydrogeology

19.5.21. A summary of the BGS 1:50 k geology, from the BGS Geoindex[52] within 1 km of the RLB of the Proposed Development within the context of the groundwater environment is provided in Table 19-10. Further detail, particularly regarding Made Ground, soils and local geology can be found in Chapter 12 Ground Conditions.

Superficial geology and Made Ground

19.5.22. Hardstanding currently covers the majority of the Site[54].

19.5.23. Whilst not mapped by the BGS, Made Ground deposits have been proven to overlie the Glacial Till across the Site[54], associated with historical development, including the most recent use as a retail park. The 2023 AtkinsRéalis Ground Investigation[54] found granular Made Ground, to a maximum depth of 3.5 m bgl, across the locations investigated and comprised either fine to coarse gravel of sandstone and concrete, or fine to coarse sand. Cohesive Made Ground was also encountered across these locations and was generally described as slightly sandy slightly gravelly clay.

19.5.24. Cohesive and granular Glacial Till was encountered directly beneath the Made Ground. The cohesive Glacial Till was encountered between 0.3 m bgl and 26.50 m bgl and generally comprised slightly gravelly, slightly sandy, slightly silty Clay[54]. The granular Glacial Till where not directly beneath the Made Ground was encountered as interbedded bands of variable thickness within the cohesive Glacial Till. These bands were encountered at depths ranging between 0.18 m bgl and 29.5 m bgl with a maximum thickness of 7.20 m encountered in BH2a. The granular Glacial Till was generally described as either fine to coarse Gravel or fine to coarse Sand[54].

19.5.25. Based on existing borehole logs[54] only isolated bands of granular material were observed at a shallower depth, between 0.18 to 1.5 m bgl, these are potentially in continuity with the Made Ground. Granular Glacial Till was found between 14 to 18 m bgl in three locations, these granular bands are of variable thicknesses (1 to 4 m) and are not considered to represent a continuous band as they were only encountered in limited borehole locations. A further deeper granular layer within the Glacial Till is

[51] Sites of Biological Importance (SBI / LWS) in Greater Manchester - data.gov.uk

[52] https://www.bgs.ac.uk/map-viewers/geoindex-onshore/

present in the logs directly overlaying the sandstone bedrock, encountered at an approximate depth of 20 to 29.5 m bgl (20 to 29 m AOD) across the Site ranging in thickness between 4 and 10 m.

Bedrock geology

19.5.26. The study area is underlain by a complex bedrock geology. Although the bedrock geology is complex within the study area, over the Proposed Development, the bedrock geology consists of the Chester Formation, consisting of well sorted, fine to coarse red sandstone, see Table 19-10. The Chester Formation was encountered from a depth of between 24.4 to 29.5 m bgl and was proven to a maximum depth of 40.5 m bgl (10 m thickness)[53]. The full thickness of the sandstone unit was not proven (BGS lexicon suggests that this formation can exceed 200 m thick)[54].

Hydrogeology

19.5.27. The Made Ground has no aquifer classification; however, groundwater has been observed within this horizon (granular and cohesive) and it may be potentially connected to adjacent water features, although based on the LIDAR data[55] elevation of both canals (approximately 49 m AOD Rochdale Canal and 47 m AOD the Ashton Canal) and compared to groundwater elevation within the Made Ground 48.58 m AOD in the north-west and 45 m AOD in the south-east, it is unlikely that the Made Ground is providing baseflow to the canals.

19.5.28. The superficial geology type which underlays the Proposed Development is Till, Devensian, which is a Secondary (undifferentiated) Aquifer, see Table 19-10. Secondary undifferentiated aquifer, have minor value compared to Principal and Secondary Aquifers[56].

19.5.29. The Environment Agency has designated the Chester Formation Triassic Sandstones which underly the Site as a principal aquifer. The Environmental Agency (EA) defines Principal aquifer as "*layers of rock or drift deposits that have high intergranular and/ or fracture permeability – (usually provide a high level of water storage). They may support water supply and/or river base flow on a strategic scale. In most cases, principal aquifers are aquifers previously designated as major aquifer*."

19.5.30. The remainder of the study area is underlain by interspersed Carboniferous and Permian Sandstones, Mudstones and Limestones, which are designated as either Principal Aquifers, Secondary Aquifers (predominantly Secondary A although one formation is classified as Secondary B), see Table 19-10 for more details. The Environment Agency (EA) defines Secondary A aquifers as "*permeable layers that can support local water supplies, and may form an important source of base flow to rivers*"[56]. The Environment Agency (EA) defines Secondary B aquifers as "*mainly lower permeability layers that may store and yield limited amounts of groundwater through characteristics like thin cracks (called fissures) and openings or eroded layers*" [56]. The Environment Agency (EA) defines Secondary (undifferentiated) aquifers as "*are aquifers where it is not possible to apply either a Secondary A or B definition because of the variable characteristics of the rock type. These have only a minor value*" [56].

19.5.31. The Groundsure Report[57] identifies that the aquifers underlying the Proposed Development are designated as low groundwater vulnerability.

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[53] ES (Volume 4) Appendix 12.3

[54] AtkinsRéalis. 2023. MSIP-ATK-XX-XX-RP-C-000003 Ground Investigation Report

[55] DEFRA, 2024, Defra Survey Data Download

[56] Environment Agency. 2017. Protect groundwater and prevent groundwater pollution. Available from: https://www.gov.uk/government/publications/protect-groundwater-and-prevent-groundwater-pollution/protect-groundwater-and-prevent-groundwater-pollution

[57] Groundsure Report, 2023, report reference Manchester_RLB.

19.5.32. Within the 2017 e3p[58] ground investigation a shallow groundwater level was identified within the Made Ground and Glacial Till deposits at depths between 0.48 m bgl and 4.20 m bgl. A deeper groundwater level was identified within the Granular Glacial Till overlaying Chester Formation between 20.9 m bgl and 24.4 m bgl. Within the 2023 AtkinsRéalis ground investigation[54] groundwater levels were identified in boreholes monitoring Made Ground and Glacial Till. Groundwater levels ranged between 0.19 m bgl and 4.50 m bgl. Similarly, to the 2017 e3p ground investigation, groundwater was also found in the deeper granular Glacial Till overlaying the Chester Formation ranging between 18.33 and 23.56 m bgl. BH03 and BH8a screened within the granular Glacial Till and Chester Formation contained erroneous results, with unusually elevated groundwater levels that were not replicated elsewhere, as such these were not considered.

19.5.33. Based on the different groundwater elevations recorded between the boreholes measuring the Made Ground and the deeper aquifer of the Chester Formation and overlaying granular Glacial Till, a shallow perched groundwater body is believed to be present within the Made Ground. This perched groundwater is hydraulically separated from the deeper groundwater by the cohesive Glacial Till.

19.5.34. The cohesive Glacial Till overlays the deeper groundwater acts as a confining layer. Groundwater levels on several occasions have been recorded above the top of the of the granular Glacial Till which is thought to be hydraulically connected to the Chesterfield Formation deeper aquifer.

19.5.35. The following hydrogeological regime is considered likely to be present[54]:

- Shallow perched groundwater encountered at the base of the Made Ground and top of the cohesive superficial deposits;
- Observed groundwater levels within the Made Ground and granular superficial deposits, where present, (Glacial Till) indicate that a consistent groundwater body is present. This groundwater body was encountered at the Site between 0.2 and 4.5 m bgl. Granular Glacial Till bands within the cohesive Glacial Till were also encountered in several locations at depth, between 14 to 18 m bgl, however, based on the borehole logs these are very unlikely extend laterally and form a water body. A granular layer is present overlaying the bedrock at 20 to 29.5 m bgl, this is physically separated from the upper granular Glacial Till band by cohesive Glacial Till. Groundwater levels have been observed in this lower granular layer and are likely to be in hydraulic continuity with groundwater in the Chester Formation;
- Based on groundwater levels encountered in boreholes measuring the granular Glacial Till and Chester Formation, groundwater flow within the deeper aquifer is indicated to be towards the south-west, towards the River Irwell; which is consistent with the regional groundwater flow [59] measured towards the south-west.
- Based on groundwater levels measured in the shallower boreholes, groundwater flow within the Made Ground and superficial granular Glacial Till is towards the south-east following the Site topography towards the Ashton Canal, although as stated above there is no connectivity between the shallow groundwater and either canal.
- Based on groundwater levels measured in the deeper boreholes, groundwater flow within the Chester Formation and overlaying granular Glacial Till is towards the south-west following the bedrock slope, top of the bedrock shown in Appendix A of the Atkins GIR[60] towards the River Medlock.
- As stated in the e3p report “Canals in this area are known to contribute to shallow groundwater through leakage”.

[58] ES (Volume 4) Appendix 12.1

[59] British Geological Survey, 2024, Sheet 19: Hydrogeological Map of Clwyd and the Cheshire Basin (1:100,000) – 1989.

[60] Atkins, 2023 Ancoats, Manchester Ground Investigation Report.

Table 19-10 – Proposed Development site summary of geology and hydrogeology[61]

Type	Period	Formation/ Sub-unit	Lithological Description[62]	Environment Agency Aquifer Designation
Made Ground	Quaternary	Made Ground	Cohesive and granular have been found on Site. The granular Made Ground was mostly homogenous in composition and was classified on Site as[63]: Orangish brown, sandy, slightly clayey, sometimes silty very angular to rounded, fine to coarse GRAVEL of sandstone and concrete Yellowish/orangish brown gravelly, slightly clayey, fine to coarse SAND. Cohesive Made Ground was broadly described as soft to stiff grey/black/brown slightly sandy, slightly gravelly clay.	No classification
Superficial Geology	Quaternary	Glacial Till, Devensian	Cohesive Glacial Till with granular layers have been encountered on Site[64]. The cohesive Glacial till was described as a firm to very stiff dark brown slightly gravelly slightly sandy, slightly silty CLAY with occasional cobbles. Gravel and cobbles included mudstone, siltstone, sandstone, limestone, quartz with fragments of coal. The granular Glacial Till was described as either: Medium dense to very dense, orangish/dark brown, sandy slightly silty slightly clayey, very angular to well rounded, fine to coarse GRAVEL. Gravel is of mixed lithologies including sandstone, siltstone, mudstone and limestone; or, Medium dense to very dense, orangish/dark brown, gravelly slightly silty slightly clayey fine to coarse SAND. Gravel is very angular to well rounded, fine to coarse, of mixed lithologies including sandstone, siltstone, mudstone and limestone.	Secondary (undifferentiated)
Bedrock Geology	Triassic	Chester Formation	The formation shows a progressive change in lithology northwards, from a coarse-grained, typically well-cemented proximal facies to a fine-grained, less well-cemented distal facies. Northwards into the Worcester Basin, West Midlands, Staffordshire (Steel and Thompson, 1983), Cheshire and Leicestershire, the formation comprises conglomerates and reddish brown, cross-bedded, pebbly sandstones with subordinate beds of red-brown mudstone. The conglomerates have a reddish brown sandy matrix and consist mainly of pebbles of brown or purple quartzite, with quartz conglomerate and vein quartz. In these areas the formation generally fines upwards, from dominantly conglomerates at the base, to interbedded conglomerates and sandstones, with sandstone and pebbly sandstone predominant in the upper part, and rare mudstones. West of the Pennines they occur in the Wirral-Liverpool area but disappear farther north in Lancashire, where the formation cannot be distinguished.	Principal

[61] https://www.bgs.ac.uk/map-viewers/geoindex-onshore/

[62] https://www.bgs.ac.uk/technologies/the-bgs-lexicon-of-named-rock-units/

[63] AtkinsRéalis. 2023. MSIP-ATK-XX-XX-RP-C-000003 Ground Investigation Report

[64] AtkinsRéalis. 2023. MSIP-ATK-XX-XX-RP-C-000003 Ground Investigation Report

WFD groundwater body

19.5.36. The Proposed Development and the surrounding study area are underlain by the following WFD mitigation groundwater body:

- Manchester and East Cheshire Permo-Triassic Sandstone Aquifers (GB41201G101100)

19.5.37. This WFD groundwater body has a groundwater area of 36,734 ha and a surface area of 367 km^2. Table 19-11 summarises the groundwater body status for 2019. There are no further WFD groundwater bodies within the study area.

19.5.38. The overall classification of the groundwater body is Poor, this is driven by the poor classification for Quantitative (saline intrusion), Chemical (saline intrusion).

Table 19-11 - WFD groundwater classification

Water Body Name	Manchester and East Cheshire Permo-Triassic Sandstone Aquifers
Water Body ID	GB41201G101100
Overall Classification (2019 Cycle 3)	Poor
Objectives	Good (2021)
Quantitative	Poor
▪ Quantitative status element	Poor
▫ Saline intrusion	Poor
▫ Water Balance	Good
▫ GWDTEs test	Good
▫ Dependant surface water body status	Good
Chemical	Poor
▪ Chemical status element	Poor
▫ Drinking water protected area	Good
▫ General chemical test	Good
▫ GWDTEs test	Good
▫ Dependant surface water body status	Good
▫ Saline intrusion	Poor
▪ Supporting elements (Groundwater)	
▫ Prevent and limit objective	Active
▫ Trend assessment	Upward trend
RNAG (2019)	Trend Assessment – Unknown (pending investigation) Quantitative Saline Intrusion -Natural

	Chemical Saline Intrusion – Other pressures
Protected areas	River Weaver (Dane to Frodsham) NVZ River Glaze NVZ Irwell/ Man. Ship Canal (Kersley to Irlam Locks) NVZ River Irk (Moston Brook to River Irwell) NVZ Rochdale Canal (Special Area of Conservation) Manchester and East Cheshire Permo-Triassic Sandstone Aquifers (Drinking Water Protected Area).

Designated sites

19.5.39. There are no Source Protection Zones (SPZs), Drinking Water Protected Areas (DWPAs) or Drinking Water Safeguard Zones (DWSZs) located within the study area.

19.5.40. There are no groundwater-dependent terrestrial ecosystems (GWDTEs) located within the study area.

Groundwater abstractions and discharges

19.5.41. The Groundsure report shows that there are no discharges to groundwater or potable water abstractions within the study area.

19.5.42. The Groundsure report[65] shows that there are no active groundwater abstractions within the study area (1km buffer of the Proposed Development).

Flood Risk

Flood risk from fluvial

19.5.43. Within the immediate proximity of the Proposed Development area, the Environment Agency Flood Map for Planning shows the Proposed Development is located within Flood Zone 1 – low probability of flooding, which represent less than 0.1% (1 in 1000 years) annual probability of flooding from rivers or the sea[66].The Environment Agency Risk of Flooding from Rivers and Sea map shows the Proposed Development does not fall within the flooding from rivers or the sea extent[67].

19.5.44. Within the wider study area of 1 km radius of the Proposed Development, the River Medlock is approximately 0.65 km from the Proposed Development, which has areas of Flood Zone 2 and Flood Zone 3 along its length[66]. The Environment Agency Risk of Flooding from Rivers and Sea map shows that within the 1 km radius of the Proposed Development, there are areas of 'high', 'medium', and 'low' risk of rivers and the sea flood extent which represents – respectively – greater than 3.3%, 3.3–1%, and 1%–0.1% chance of flooding each year[67].

Flood risk from surface water

19.5.45. The Environment Agency Risk of Flooding from Surface Water map shows there are small pockets of 'low' surface water flood risk which represent 0.1%–1% chance of flooding each year[67].

[65] Groundsure Report, 2023, report reference Manchester_RLB

[66] Flood map for planning - GOV.UK (flood-map-for-planning.service.gov.uk)

[67] Learn more about this area's flood risk - Check your long term flood risk - GOV.UK (check-long-term-flood-risk.service.gov.uk)

19.5.46. The Environment Agency Risk of Flooding from Surface Water map shows that within the 1 km radius of the Proposed Development, there are areas of 'high', 'medium', and 'low' risk of surface water flood extent which represents – respectively – greater than 3.3%, 3.3–1%, and 1%–0.1% chance of flooding each year[67].

Flood risk from groundwater

19.5.47. Emergence of groundwater at the surface (and subsequent overland flows) or into subsurface voids as a result of abnormally high groundwater levels is referred to as groundwater flooding. This can have a direct impact on buildings and buried services, as well as an indirect impact by increasing infiltration of groundwater into sewers and soakaways (reducing their capacity to convey surface water runoff).

19.5.48. Groundwater levels collected from on-site boreholes monitoring have been shown that groundwater is recorded at shallow depths between 0.19 and 4.5 m bgl. This indicates that there is a potential risk from groundwater flooding at the Site. Further details on groundwater flooding can be found in the ES (Volume 2) Appendix 19.2 – FRA.

Flood risk from reservoir

19.5.49. The Environment Agency Risk of Flooding from Reservoir map shows the Proposed Development does not fall within the risk of flooding in the unlikely event of a reservoir failure. However, there is risk of flooding along the River Medlock in the unlikely event of a reservoir failure, which is within the 1 km radius of the Proposed Development[67].

Historical Flooding

19.5.50. The Environment Agency Historic Flood map shows the Proposed Development, and the 1 km radius of the Proposed Development has not historically experienced flooding[68].

Other Sources

19.5.51. The Proposed Development is not at risk of flooding from Rochdale and Ashton Canals or the New Islington Marina despite its proximity, or any other artificial sources. This is because canals are controlled waterbodies with regulated flows and are continuously maintained by the Canal & River Trust. In the limited likelihood the Rochdale canal is overtopped, the flood could spread beyond the towpath and into the Site, as there are breaks in the boundary of the fence that separate the canal towpath from the Site. The Proposed Development is partially located within Breach Zone A of Rochdale and Ashton Canals[69].

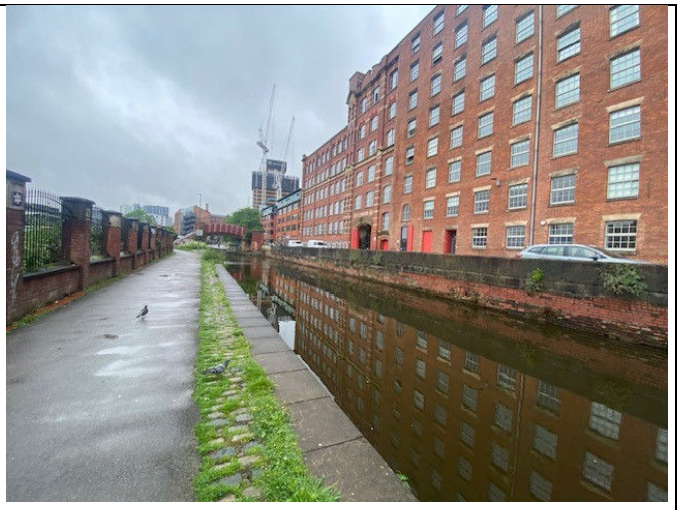
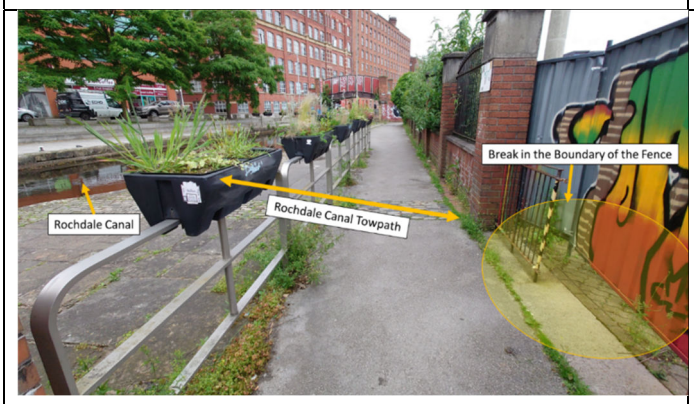
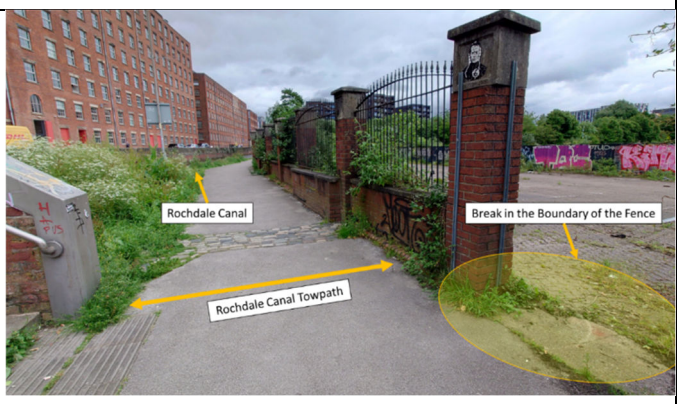
Site Walkover

19.5.52. A Site walkover was undertaken as part of the BNG assessment on the 23rd May 2024 and the flood risk assessment on the 4th June 2024. Photographs from the Site visit are presented in Table 19-12.

[68] Defra Data Services Platform

[69] Manchester Local Flood Risk Management Strategy

Table 19-12 - Photographs from the Site visit

	
The Rochdale Canal (looking south) with the Proposed Development on the left of this image.	The Rochdale Canal (looking south) with the Proposed Development on the left of this image beyond the fence.
	
The Rochdale Canal and towpath separated by fencing from the Site.	The Rochdale Canal and towpath separated by fencing from the Site.

19.6. Receptors

19.6.1. Table 19-13 is a list of all the receptors and the importance given to each receptor for surface water quality, hydrogeology and flood risk. The overall importance is assigned based on the highest importance assigned from the surface water quality, hydrogeology and flood risk.

Table 19-13 - Receptors

Receptor	Importance				Scoped in/ out	Justification
	Surface water quality	Hydrogeology	Flood risk	Overall importance		
River Medlock	High[70]	Not Applicable	Not Applicable	High	IN	Surface water from the Proposed Development will outfall into Shooters Brook culvert, which discharges into the River Medlock downstream of the Proposed Development.
Rochdale Canal,	Low	Not Applicable	Medium	Medium	IN	No mention of the WFD classification within the North West RBMP. The Rochdale Canal is designated SAC within this WFD waterbody, although it is ~5km north east of the Site. Located directly adjacent to the Site.
Ashton Canal	Low	Not Applicable	Medium	Medium	IN	No mention of the WFD classification within the North West RBMP. Located ~150 m south east of the Site.
New Islington Marina	Not Applicable	Not Applicable	Medium	Medium	IN	Although in close proximity there is no pathway due to the road and buildings being in between the Proposed Development and the marina. Located ~90 m north east of the Site.
River Irwell River Irk	Not Applicable	Not Applicable	Not Applicable	Not Applicable	OUT	Although the Irk and the Irwell do have hydraulic connectivity with the canals listed above, this is considered to be sufficiently far enough downstream (more than 2km) of the Proposed Development to eliminate any potential indirect impacts.
Manchester and East Cheshire Permo-Triassic Sandstone Aquifers	Not Applicable	High	Not Applicable	High	IN	The Site is underlain by a principal aquifer and is likely to support the river ecosystem within the River Irwell.
Groundwater in the Made Ground	Not Applicable	Low	Not Applicable	Not Applicable	IN	No classification is given to this unit, based on groundwater levels recorded on Site and compared to canal elevation, it is considered that this unit does not provide flow to the adjacent canals. Although it still contains groundwater.
Groundwater in the cohesive Glacial Till	Not Applicable	Not Applicable	Not Applicable	Not Applicable	OUT	Although the whole unit is considered as a secondary undifferentiated aquifer, it is considered that this unit is unlikely to hold any significant amount of water and potentially considered as unproductive.
Groundwater in the granular Glacial Till overlaying Chester Formation – Secondary undifferentiated aquifer	Not Applicable	High	Not Applicable	High	IN	Although the aquifer is classified as secondary undifferentiated aquifer, this deeper unit is overlaying the Chester Formation and it is likely to hydraulically connected with the principal aquifer, as such it will be considered as one unit.
Groundwater in the Chester Formation – Principal aquifer	Not Applicable	High	Not Applicable	High	IN	The Site is underlain by a principal aquifer and is likely to support the river ecosystem within the River Irwell.
Great Ancoats Street	Not Applicable	Not Applicable	High	High	OUT	Potential surface water runoff from the Site to Great Ancoats Street which is directly adjacent to the Site. However, there will be a drainage strategy to manage this.

[70] https://nrfa.ceh.ac.uk/data/station/meanflow/69020

19.7. Potential impacts

19.7.1. Potential impacts from the Proposed Development to surface water quality, flood risk and groundwater are outlined below. Following this, an assessment has been undertaken to outline the impacts that could result from the construction and operation of the Proposed Development with the embedded mitigation in place.

19.7.2. The DMRB LA 113 standard is clear that embedded mitigation is included in the best practice design approach and this methodology has been retained as part of this assessment. Embedded mitigation covers the project design principles adopted to avoid or prevent adverse environmental effects, whereas essential mitigation is those measures subsequently required to reduce and if possible offset likely significant adverse environmental effects, in support of the reported significance of effects in the environmental assessment. An assessment of the Proposed Development with embedded mitigation is required to be able to identify requirements for essential mitigation.

19.7.3. The potential impacts of the Proposed Development are expected to include the following:

- Surface water quality:
  - Changes to water quality – direct and indirect
  - Pollution (habitat degradation – WQ degradation – injury to species)
- Flood risk:
  - Changes to surface water flood risk
  - Changes to artificial flood risk
- Groundwater:
  - Changes to groundwater quantity (level / flow);
  - Changes in groundwater recharge; and
  - Changes to groundwater quality

Proposed works

19.7.4. The proposed works are listed in the Environmental Statement (Volume 2) Chapter 6. A summary of the activities which may impact the water environment is provided below.

- Dewatering, it is assumed that the flows from dewatering, during construction and operation (if required), will be discharged into the combined sewer. Any dewatering consent is outside of the scope of this assessment and will be dealt with separately.
- Site strip of existing hard and soft landscape.
- Temporary construction compounds, electrical substation, haul roads, lay down areas are to be in place during construction.
- Below ground works such as piling (within the outline structural specification[71] which may vary as design is progressed, the length of piles is proposed between 24.8 and 28.42 m and are likely to be installed within the Chester Formation, piles design is proposed as bored caste in place piles), site excavations (for new lower floor levels - car and cycle parking will be at basement level), coring and removal of obstructions, retaining walls, removal/replacement of utilities including drainage (including rainwater attenuation tanks) and ducts.

[71] AtkinsRéalis 2023, Outline Structural Specification, Manchester Digital Campus Building

- Construction of the building superstructure.
- Landscaping which includes but is not limited to, new trees, raised planter beds, natural stone paving. There will be paving setts and grasscrete paving for vehicle routes into and across the Site. Following the completion of the Site levels, the park area will temporarily consist of made ground with a bare earth surface, seeded with grass. This temporary state will be confirmed at a later date.
- Surface water from the Site is expected to be outfall into the Shooters Brook culvert, which discharges into the River Medlock downstream of the Proposed Development.
- Sustainable Drainage Systems (SuDS) will be implemented to control surface run off into the adjacent canal which is part of the Rochdale Canal Stott's Lane – Ducie Street Basin SBI (Site of Biological Importance).

Potential construction impacts

Surface water quality

- Vehicles accessing compounds, refuelling, oil/ fuel storage tanks and accidental spillage. Risk of release of hydrocarbons and oils, leading to polluted runoff migrating to surface water. Hydrocarbons within surface water can chemically impair biological functions of freshwater fish.
- Storage and use of construction materials/chemicals (e.g. solvents, degreasers) on Site. Risk of accidental releases of contaminants to surface water and infiltration to groundwaters.
- Runoff from construction compounds – stockpiles, drainage, wheel washings and material movements. Construction compound runoff typically contains elevated suspended solids levels. Runoff with high sediment load can have direct adverse effects on adjacent watercourses through increasing turbidity (thus reducing light penetration and reducing plant growth) and by smothering vegetation and bed substrates.
- Run-off rates can increase as a result of compacted soils (e.g. as a result of vehicle movements) or a loss of vegetation. Higher run-off rates can also increase overall soil erosion rates which increases the risk of pollution.
- Changes to the water balance in a catchment (surface or groundwater) have the potential to affect other abstractors. There are 10 potable water abstractions, and 6 groundwater abstractions within the study area, although all these abstractions have a 'historical' status.
- Dewatering, it is assumed that the flows from dewatering, during construction and operation (if required), will be discharged into the combined sewer and therefore will not impact the surface water quality.
- Surface water from the Site is expected to outfall into the Shooters Brook culvert, which discharges into the River Medlock downstream of the Proposed Development potentially impacting the water quality of the downstream water body (River Medlock).

Groundwater

- Changes to groundwater quantity can occur as a result of works extending below the water table such as dewatering or placement of impermeable barriers that might obstruct groundwater flow and result in a rise in groundwater levels. Changes in groundwater quantity might cause alterations to groundwater levels and groundwater flow.
- The deep foundations / earthworks may also introduce a rapid vertical flow pathway into the groundwater body for potentially contaminated runoff. (Mobilisation of contaminants from shallow to deep groundwater (aquifer)).
- Vehicles accessing compounds, refuelling, oil/fuel storage tanks and accidental spillage, including during temporary highways works. Risk of untreated runoff from construction sites discharging through permeable surface geology direct to an aquifer.
- The drainage strategy, see ES (Volume 4) Appendix 19.3, rules out discharge to groundwater therefore, there are considered to be no impacts from discharges to groundwater.

Flood risk

- Increase impermeable surface area due to increase earthworks and compact soils, may increase surface water volume and/or runoff rate; thus, increasing surface water flood risk
- Disturbance of groundwater flow paths where subsurface structures or deep foundations are erected during construction may form a barrier to groundwater flow. This may result in groundwater emergence above surface, thus, increase surface water flood risk.
- Diversion of overland runoff paths on Site, which cause increase flood risk to surrounding water channel.
- Changes to ground elevations altering overland runoff paths on Site, which can cause increase flood risk to surrounding areas

Potential operation impacts

Surface water quality

- Accidental spillage during operation and maintenance. Risk of release of hydrocarbons and other chemicals, leading to polluted runoff migrating to surface water and groundwater. Hydrocarbons and other chemicals within surface water can chemically impair biological functions of freshwater ecology.
- Surface water from the Site is expected to be outfall into the Shooters Brook culvert, which discharges into the River Medlock downstream of the Proposed Development potentially impacting the water quality of the downstream water body (River Medlock).

Groundwater

- Changes to groundwater quantity can occur as a result of works extending below the water table such as dewatering or placement of impermeable barriers that might obstruct groundwater flow and result in a rise in groundwater levels. Changes in groundwater quantity might cause alterations to groundwater levels and groundwater flow paths.
- The deep foundations / earthworks may also introduce a rapid vertical flow pathway into the groundwater body for potentially contaminated runoff. (Mobilisation of contaminants from shallow to deep groundwater (aquifer)).
- The drainage strategy, see ES (Volume 4) Appendix 19.3, rules out discharge to groundwater therefore, there are considered to be no impacts from discharges to groundwater.

Flood risk

- Potential surface water flood risk as a consequence of increased runoff rates and/ or volumes due to high area of impermeable surface or reduced capacity in the drainage network due to increased drainage.
- Disturbance of groundwater flow paths where subsurface structures or deep foundations remain after construction, which may form a barrier to groundwater flow. This may result in groundwater emergence above surface, thus, increase surface water flood risk.
- Permanent alteration and increased runoff into the drainage network via Shooters Brook culvert which discharges into the River Medlock.

19.8. Assessment of effects

Construction phase

Embedded mitigation

19.8.1. The DMRB LA 104 standard is clear that embedded mitigation is included in the best practice design approach. Embedded mitigation covers the project design principles adopted to avoid or prevent adverse environmental effects.

Best Practice

19.8.2. Potential impacts from construction can be mitigated through best practice measures which are associated with good site practice and preparation of robust method statements. Mitigation measures which will be implemented to mitigate any potential impacts to the water environment during construction of the Proposed Development will include adhering to Guidance such as Guidance on Pollution Prevention (GPPs) and CIRIA C715 Environmental good practice. Although now withdrawn by the Environment Agency, their Pollution Prevention Guidelines still detail good practice advice for undertaking works which may have the potential to result in water pollution. In general terms, by following these guidelines, significant impacts to the water environment will be avoided.

19.8.3. The contractor will produce a set of plans to protect surface water from any changes. These include the Soil Handling Management Plan, Pollution Prevention and Control Management Plan and Site Waste Management Plan respectively which will ensure:

- All debris arising from the construction and works will be effectively encapsulated and removed from Site.
- No pollutants will enter drainage, run-off to a watercourse or be allowed to infiltrate to a groundwater body.
- The contractor will ensure that they have a robust Pollution Response Plan in place before works start.
- Any pollution incident will be contained and cleaned up immediately and reported.
- No storage of oils or chemicals will be allowed within 10 m of a watercourse.

Outline Construction Environmental Management Plan (OCEMP) and Construction Environmental Management Plan (CEMP)

19.8.4. The OCEMP details the embedded mitigation relevant to the water environment, which will be in place as part of the Proposed Development. Please see Environmental Statement (Volume 2) Chapter 6.

19.8.5. The final CEMP will include as a minimum:

- An agreed process for managing the volume and quality of discharge of water for construction compounds.
- Detail on the management of surface water drainage. The discharge methodology will be agreed with the EA if discharge consents are required.
- The development of water quality monitoring plans to cover parameters monitored, sample locations frequency and duration of monitoring. This will include who will undertake sampling, any requirements for visual checks, inclusion of additional monitoring points as part of baseline monitoring, sampling/ laboratory analysis accreditation requirements.
- A Pollution Control Plan for managing chemicals and other contaminants. This will contain detail on how oil or chemical storage areas will be bunded and lined in order to contain pollutants in the event of leakage. There will be no storage of materials (or chemicals/fuels) within 8 m of any watercourse.

All machines will use oil trays when parked on site; all fuel storage tanks shall be adequately bunded to prevent pollution of the river. All reasonable requirements specified by the Environment Agency will be in place to prevent fuel, lubricants, or any other fluids or materials entering the watercourse.

- Procedures to deal with accidental leakages or spillages of hydrocarbons and oils, or accidental release of hazardous substances during construction works within the Pollution Control Plan and Emergency Response Plan.

Drainage

19.8.6. Drainage has been considered in the 'Drainage Strategy for Planning' Report, ES (Volume 4) Appendix 19.3, whereby surface water and foul water drainage are considered.

19.8.7. SuDS will be implemented to control surface run off into the adjacent canal which is part of the Rochdale Canal Stott's Lane – Ducie Street Basin SBI[49].

19.8.8. The project will have a temporary drainage plan to cover the duration of the Construction period and until the formal drainage system is operational. It is expected that no discharge will take place without prior consent from the Local Authority (LA)/Local Lead Flood Authority (LLFA).

19.8.9. The Drainage Management Plan will include, as a minimum:

- Design standards - any areas of surface or foul water drainage affected by the works will be identified and each section of affected drainage should be briefly described, and a proposed solution provided.
- Pollution control/interception –
    - Any interceptor solutions will be identified on discipline specific drawings and reviewed during the relevant design stages.
    - Water originating from the Site will be managed appropriately using best practicable methods in accordance with discharge requirements.
    - Refuelling and machine repairs will be undertaken in suitable areas on hardstanding. Any parked machinery will use oil trays. No chemicals / fuels will be stored in proximity to the nearby watercourses.
    - Any chemicals used in the construction process will need to be used in a controlled manner. At this early-stage possible products which are safe to use in vicinity to the borehole abstractions have been identified and proposals on their use will be made during detailed design.
- Outfalls – during construction a surface water management plan will be developed to ensure there will be no discharges to the nearby watercourses. Any known existing drainage and outfalls will be identified and managed to ensure no runoff to the canal.
- SuDS principles should be considered to ensure that the discharge rates and volumes are suitable.
- Earthworks – a review of existing earthworks and drainage provision will be undertaken to assess the required interventions to be developed at subsequent design stages. Areas are to be identified which currently do not have any drainage but is required.
- Access Roads -the development of drainage from the access roads including the modification/re-alignment, connection into or new access road infrastructure will be included. Construction mitigation will include (but not be limited to) measures within the PPGs, e.g. to attenuate and treat polluted runoff.

19.8.10. The Drainage Management Plan will also include details of how increased surface water runoff from new areas of hardstanding (i.e. access roads, visitor centre, car parks etc) will be managed to ensure no increase in flood risk. SuDS will be included in the drainage design where possible. The drainage design will follow the SuDS manual and guidance from the Local Plans/SFRAs will be incorporated. The

Drainage Management Plan will also include details of how the construction compounds will safely manage surface water flows in line with Environment Agency PPG and CIRIA guidance.

Groundwater

19.8.11. Embedded mitigation for the potential impacts to groundwater include the implementation of a piling risk and deep foundation risk assessment as well as a dewatering risk assessment. These are described below:

- A piling risk assessment will consider a full suite of site-specific ground investigation data to ensure the piling methods are appropriate and ensure that any impacts to groundwater are mitigated against.
- A dewatering risk assessment will consider site-specific groundwater levels and the potential impacts from dewatering activities to any sensitive receptors and ensure that any impacts to sensitive receptors are mitigated against.

Flood risk

19.8.12. Embedded mitigation will be adopted as standard practice with construction management being aware of good practice and local sensitivities in relation to flood risk as follows:

- Where subsurface works are required, for structural foundations, buried services etc., localised dewatering may be required,
- The construction programme and schedule of activities for the Proposed Development will consider the duration, time of year, weather forecasting and construction sequencing in relation to flood risk and identify sensitive locations for programming of particular activities. All such considerations shall be formally recorded and incorporated into a Flood Response Plan,
- The placement of haul routes, site compounds, stores of construction material and plant/equipment will be generally located outside of natural flow paths to prevent severance of flow pathways and displacement of flood water.

19.8.13. Note no specific hydraulic modelling of temporary construction conditions has been undertaken: the CEMP will set out measures and procedures for dealing with construction stage flood risk.

Construction effects

Surface water quality

19.8.14. Risks to water quality as a result of construction activities has been identified as having a minor magnitude adverse impact to Rochdale Canal (western section) and Ashton Canal and Peak Forest Canal (lower section) (both Medium Importance). With mitigation in place, the significance of effect has been identified as Slight adverse based on this magnitude and importance.

19.8.15. Risks to water quality as a result of the drainage network that drains into the Shooters Brook culvert, which discharges into the River Medlock downstream of the Proposed Development, has been identified as having a minor magnitude adverse impact to River Medlock (High Importance). With mitigation in place, which includes limiting discharge rate from the Site to the equivalent greenfield runoff rate and implementing SuDS to reduce the surface water runoff pollutants from the Site (as noted in the Drainage Strategy), the significance of effect has been identified as Slight adverse based on this magnitude and importance.

19.8.16. For more detail please see Table 19-14 – Summary of residual effects surface water.

Groundwater

19.8.17. Changes to groundwater quality from piling that may introduce a rapid vertical flow pathway into the groundwater body, for potentially contaminated runoff has been identified as having a minor magnitude of adverse impact to the Groundwater in the Made Ground (cohesive and granular) (Low importance). With mitigation in place, the significance of effect has been identified as Slight adverse.

19.8.18. Changes to groundwater quality to groundwater in the Granular Glacial Till Overlaying Chester Formation and Groundwater in the Manchester and East Cheshire Permo-Triassic Sandstone Aquifers (both High Importance) has been identified as having a minor/moderate magnitude adverse impact. Significance of impact following mitigation is identified as Moderate adverse.

19.8.19. Changes to groundwater quantity from piling and new utilities which are to be laid below the surface may alter the groundwater levels, flow paths and depending on the proposed type of pile it may cause groundwater embankment potentially leading to groundwater flooding to substructures. This impact has been identified as having a minor magnitude of adverse impact to the Groundwater in the Made Ground (cohesive and granular) and the Granular Glacial Till Overlaying Chester Formation and Groundwater in the Manchester and East Cheshire Permo-Triassic Sandstone Aquifers. The significance of effect is **Slight adverse** for groundwater in Made Ground (cohesive and granular). It is unlikely that piling will be of a continuous nature at depth to affect groundwater quantity in the Granular Glacial Till Overlaying Chester Formation and Groundwater in the Manchester and East Cheshire Permo-Triassic Sandstone Aquifers and as such, the significance of effect is Slight adverse.

19.8.20. For more details please see Table 19-15 – Summary of residual effects groundwater.

Flood risk

19.8.21. Risk of surface water ponding due to earthwork and soil compaction, especially where the Proposed Development encroaches on areas of surface water flood risk (Figure 19.2.8, Appendix 19.2 – FRA). This could result in the displacement of surface water and increase flood risk to the Rochdale Canal, which is <0.01 km to the northwest of the Proposed Development. In addition, the construction activities will extend below ground due to the proposed basement carpark. The Rochdale Canal may be in hydraulic conductivity to the groundwater at the Proposed Development due to proximity. Below-ground construction activities may thus increase flood risk to the Rochdale Canal and the Proposed Development. The risk of flood risk due to construction activities has been identified as having a **negligible** magnitude of impact to the Rochdale Canal; with mitigation in place, the significance of the effect has been identified as neutral/slight.

19.8.22. The distance of the Proposed Development to the Ashton Canal (<0.30 km) means construction activities are unlikely to affect the flood risk of the Ashton Canal. However, because the Ashton Canal is connected to New Islington Marina, which is connected to the Rochdale Canal and in proximity to the Proposed Development, the main influence of flood risk to the Ashton Canal due to construction is via the Rochdale Canal. The risk of flood risk due to construction activities has been identified as having a **negligible** magnitude of impact to the Ashton Canal; with mitigation in place, the significance of the effect has been identified as neutral/slight.

19.8.23. Risk of surface water ponding due to earthwork and soil compaction, especially where the Proposed Development encroaches on areas of surface water flood risk (Figure 19.2.8, Appendix 19.2 – FRA). This could result in the displacement of surface water, increasing flood risk to the New Islington Marina, which is <0.03 km northwest of the Proposed Development connected to the Rochdale and Ashton Canal. In addition, the construction activities will extend below ground due to the Proposed Development of an basement carpark. The New Islington Marina may be in hydraulic conductivity to the groundwater of the Proposed Development area due to proximity. The below-ground construction activities may increase the risk of flooding to the New Islington Marina and groundwater flooding at the Proposed

Development. The flood risk due to construction activities has been identified as having a **negligible** magnitude of impact to the Rochdale Canal; with mitigation in place, the significance of the effect has been identified as neutral/slight.

Operation phase

Embedded mitigation

19.8.24. Embedded mitigation for the potential impacts to groundwater include the implementation of a piling risk and deep foundation risk assessment and a dewatering risk assessment. A piling risk assessment will consider a full suite of site-specific ground investigation data to ensure the piling methods are appropriate and ensure that any impacts to groundwater are mitigated against.

19.8.25. SuDS will be incorporated into the Proposed Development design where possible, to both mitigate the pollution risk associated with road runoff and to attenuate flows to greenfield runoff rates. SuDS features may include:

- Filter trenches/ drains are considered suitable to allow water treatment to be provided for the low traffic access roads.
- A proprietary treatment system such as an oil interceptor has been proposed for providing water treatment to the roofs of the proposed buildings and the low traffic access roads.
- Sub-surface storage.

19.8.26. It is noted in the OCEMP that SuDS will be implemented to control surface run off into the adjacent canal which is part of the Rochdale Canal Stott's Lane – Ducie Street Basin SBI[49].

Operation effects

Surface water quality

19.8.27. During operation water quality risks to the Rochdale Canal and the Ashton Canal (both Medium Importance) as a result of the drainage network are expected have a negligible magnitude of impact. This is because the drainage network will drain into the Shooters Brook culvert which discharges into the River Medlock downstream of the Proposed Development. Additionally, SuDS will be implemented to control surface run off into the canal adjacent to the Site (Rochdale Canal). Therefore, it is unlikely that the surface water will reach this receptor. The significance of effect has been identified as Neutral/Slight adverse.

19.8.28. Risks to water quality as a result of the drainage network that drains into Shooters Brook culvert, which discharges into the River Medlock downstream of the Proposed Development have been identified as having a minor magnitude of adverse impact to the River Medlock (High Importance). When embedded mitigation is taken into consideration the impact to the River Medlock is likely to be negligible, as the drainage strategy notes that the maximum permitted discharge rate from the Site should be limited to the equivalent greenfield runoff rate. Additionally, SuDS are built into the Proposed Development which will reduce the pollutants in the surface water from the Proposed Development. The significance of effect has been identified as Slight adverse.

19.8.29. For more details please see Table 19-14 – Summary of residual effects surface water.

Groundwater

19.8.30. During operation deep foundations and piles may represent rapid vertical flow pathways into the groundwater body for potentially contaminated runoff, this impact has been identified as having a

Negligible magnitude of adverse impact (when considering embedded mitigation) to the Groundwater in the Made Ground (cohesive and granular), Low importance. With mitigation in place, the significance of effect has been identified as Slight adverse. Changes to groundwater quality in the Granular Glacial Till Overlaying Chester Formation and Groundwater in the Manchester and East Cheshire Permo-Triassic Sandstone Aquifers (both High Importance) has been identified as Negligible (when considering embedded mitigation). Significance of impact following mitigation is identified as Slight adverse.

19.8.31. Changes to groundwater quantity from piling and new utilities which are to be laid below the surface may alter the groundwater levels, flow paths and depending on the proposed type of pile it may cause groundwater embankment potentially leading to groundwater flooding to substructures. It has been identified as having a Minor magnitude of adverse impact for the Made Ground and Granular Glacial Till Overlaying Chester Formation and Groundwater in the Manchester and East Cheshire Permo-Triassic Sandstone Aquifers. The significance of effect is Slight adverse for groundwater in Made Ground deposits. It is unlikely that piling will be of a continuous nature at depth to affect groundwater quantity in the Granular Glacial Till Overlaying Chester Formation and Groundwater in the Manchester and East Cheshire Permo-Triassic Sandstone Aquifers (both High Importance) and such significance of effect is Slight adverse.

19.8.32. For more details please see Table 19-15 – Summary of residual effects groundwater.

Flood risk

19.8.33. The drainage network will not be draining into Rochdale Canal; instead, into the Shooters Brook culvert, which discharges into the River Medlock downstream of the Proposed Development; hence, there is no increased flood risk to Rochdale Canal during operation. There may be disturbance to groundwater flow paths due to subsurface structures or deep foundations, especially with the proposed basement car park. This may form a barrier to groundwater flow and result in groundwater emergence above ground and, thus flooding on the surface. However, this will be managed by the drainage network. The flood risk during operation has been identified as negligible magnitude of impact to Rochdale Canal and the significance of the effect has been identified as neutral/slight.

19.8.34. The drainage network will not be draining into the Ashton Canal; instead, into the Shooters Brook culvert, which discharges into the River Medlock downstream of the Proposed Development; hence, there is no increased flood risk to the Ashton Canal during operation. There may be a disturbance to groundwater flow paths due to subsurface structures or deep foundations, especially with the proposed basement car park. This may form a barrier to groundwater flow and result in groundwater emergence above ground and thus, flooding on the surface. However, this will be managed by the drainage network. The flood risk due to the operation has been identified as having negligible magnitude of impact to the Ashton Canal, and the significance of the effect has been identified as neutral/slight.

19.8.35. The drainage network will not be draining into New Islington Marina; instead, into the Shooters Brook culvert, which discharges into the River Medlock downstream of the Proposed Development; hence, there is no increased flood risk to New Islington Marina during operation. There may be disturbance to groundwater flow paths due to subsurface structures or deep foundations, especially with the proposed basement car park. This may form a barrier to groundwater flow and result in groundwater emergence above ground and, thus flooding on the surface. However, this will be managed by the drainage network. The flood risk due to the operation has been identified as having a negligible magnitude of impact to New Islington Marina and the significance of the effect has been identified as neutral/slight.

19.8.36. The drainage network will not be draining into Great Ancoats Street, instead, into the Shooters Brook culvert which discharges into the River Medlock downstream of the Proposed Development; hence, there is no increase flood risk to Great Ancoats Street during operation. There may be disturbance to groundwater flow paths due to subsurface structures or deep foundations, especially with the proposed basement car park. This may form a barrier to groundwater flow and result in groundwater emergence

above ground and thus flooding on the surface. However, this will be managed by the drainage network. The risk of flood risk as a result of operation have been identified as negligible to Great Ancoats Street and the significance of effect has been identified as neutral/slight.

19.8.37. For more details please see Table 19-16 – Summary of residual effects flood risk

19.9. Additional mitigation and enhancement measures

19.9.1. At this stage no additional mitigation and enhancement measures are included within this assessment. It should be noted that an aquatic Biodiversity Net Gain Assessment is required, as the Red Line Boundary is within 10m of a watercourse (notably the Rochdale Canal). This assessment will be covered within Chapter 8.

19.10. Residual effects

19.10.1. As there is no requirement for any additional mitigation measures the residual effects will have the same significance of effect as the effects outlined in Section 19.8.

Construction

Surface water quality

19.10.2. It is likely that there will be no significant effects from the construction of the Proposed Developments on surface water quality, for any of the receptors once the mitigation has been put in place.

Groundwater

19.10.3. It is likely that there will be no significant effects from the construction of the Proposed Developments on groundwater within the Made Ground and the deeper granular Glacial Till and the 'Chester Formation receptors once the mitigation has been put in place. It is noted that a separate piling risk assessment may be required to assess the piling effects on the groundwater receptor as included within the embedded mitigation chapter.

Flood risk

19.10.4. It is likely there will be no significant effects from the construction of the Proposed Developments to the flood risk of the receptors once the mitigation has been put in place.

Operation

Surface water quality

19.10.5. It is likely that there will be no significant effects from the operation of the Proposed Developments on surface water quality, for either of the receptors with mitigation in place.

Groundwater

19.10.6. It is likely that there will be no significant effects from the operation of the Proposed Development on groundwater quantity and quality, once the mitigation has been put in place. However, a separate dewatering assessment and piling risk assessment will be carried out if this is deemed necessary, as such impacts from this are considered outside the scope of this report.

Flood risk

19.10.7. It is likely there will be no significant effects from the operation of the Proposed Development to the flood risk of the receptors once the mitigation has been put in place.

19.11. Cumulative effects

19.11.1. This section considers the cumulative effects of the Proposed Development (intra-project cumulative effects) and the Proposed Development interacting with other RFFPs (inter-project cumulative effects) from the perspective of impacts within the scope of the Water Resources and Flood Risk.

Intra-project in-combination cumulative effects assessment (single project impacts) within topic

19.11.2. The focus of intra-project CEA is understanding how receptors may experience a number of different types of impacts from the Proposed Development at the same time. The assessment methodology for this topic is not inherently cumulative and considers impacts on Surface Water Quality, Groundwater and Flood Risk separately.

19.11.3. However, it is not expected that any post-mitigation residual effects on receptors will occur during either construction or operation. Therefore, there are no intra-project cumulative effects within the Water Resources and Flood Risk topic.

Inter-project cumulative assessment

19.11.4. The inter-project cumulative effects assessment ‘within topic’ element for the water environment assessment has been completed with reference to the shortlist list of RFFPs that has been developed for the Proposed Development. The list is based on a review of all developments known to the planning system using the methodology described in Chapter 22: Cumulative Effects.

19.11.5. The RFFP short list has been screened to identify projects that are considered to have a realistic prospect of interacting with the Proposed Development from the perspective of Water Resources and Flood Risk. The sift from the short-list to identify RFFPs that should be scoped into the inter-project CEA took into consideration;

- Construction Timeframes - RFFP likely to be constructed in the same timeframe as the Proposed Development considered
- Distance from the Proposed Development - RFFP within 500m considered
- Scale of the RFFP – all RFFP considered

19.11.6. This process identified potential for inter-project impacts as a result of the Proposed Development in combination with eight RFFPs. These RFFPs are;

- 128191/FO/2020 - Development comprising of five office buildings with flexible ground floor use at land between Ashton Canal and Pollard Street.

- 132574/FO/2021 - Development comprising 4 townhouses at Paradise Wharf.
- 126608/FO/2020 - Development of 66 residential units between Store Street and Ashton Canal.
- 135662/FO/2022 - Development of 154 Bedroom Hotel with ancillary café / bar / restaurant and gym adjacent to Great Ancoats Street and south of Laystall Street.
- 135675/FO/2022 - Development of two apartment buildings comprising 267 dwellings at Tariff Street.
- 137346/FO/2023 - Mixed use development comprising commercial floorspace and 256 residential units adjacent to Poland Street and between Naval Street and Jersey Street.
- 122598/FO/2019 - Mixed use development comprising 94 residential units consisting of townhouses and apartments as well as commercial floorspace at New Islington Marina.
- 128911/FO/2020 - Mixed use development consisting of office space and 89 residential units at Laystall Street.

19.11.7. The section that follows sets out the potential inter-project impacts that may arise and provides a qualitative analysis leading to a conclusion about whether there are likely to be significant cumulative effects that arise.

19.11.8. Available documentation, relating to the water environment (i.e. Flood Risk assessments and drainage strategies) has been reviewed for the RFFPs.

Potential inter-project impacts

Construction

19.11.9. Cumulative inter-project impacts on ground conditions could occur in conjunction with the RFFPs identified as relevant to the Proposed Development.

19.11.10. It is considered that due to their proximity to the Proposed Development, each RFFP has the theoretical potential to contribute to construction additive cumulative impacts on Water Resources and Flooding through:

19.11.11. Construction activities including dewatering, piling, earthworks and other below and above ground activities may affect the surrounding water receptor. As a result of construction, potential surface water impact include increase runoff of pollutants and sediments to nearby watercourses; groundwater impact include polluting the underlying groundwater; and increase of flood risk as a result of increased volume of runoff, displacement of overland flow, and groundwater emergence.

19.11.12. Mitigation measures will be implemented as part of the construction of the Proposed Development as outlined in Section 19.8. The other RFFPs will themselves be subject to mitigation measures including drainage strategies and SuDs, meaning that they will require mitigation and control measures to be adopted during their construction to reduce impacts to water resources and flooding.

19.11.13. Based on the assumptions outlined, the combined impact of these potential cumulative effects is expected to be no greater than the predicted effects on water resources and flooding discussed in this chapter. Consequently, the additive cumulative effects on water resources and flooding are anticipated to be not significant, requiring no additional mitigation.

Operation

19.11.14. Cumulative inter-project effects on water resources could occur in conjunction with the RFFPs identified as relevant to the Proposed Development:

19.11.15. Environmental impacts are likely to be greatest during construction, with minimal impacts likely during operation, however it is considered that due to their proximity to the Proposed Development, each RFFP has the theoretical potential to contribute to operational additive cumulative impacts on water resources during the construction phase through:

19.11.16. Operation activities including maintenance and water discharge to Shooter Brook may affect the surrounding water receptor. As a result of operation, potential surface water impact include increase pollutant to downstream River Medlock as a result of permanent discharge via Shooters Brook; potential groundwater impact include a change in groundwater volume and flow, and an increase in groundwater pollution; and potential increase flood risk due to an increase in surface water runoff and groundwater emergence.

19.11.17. Mitigation measures will be implemented as part of the construction of the Proposed Development as outlined in Section 19.8. The other RFFPs will themselves be subject to mitigation measures including drainage strategies and SuDs, meaning that they will require mitigation and control measures to be adopted during their construction to reduce impacts to Water Resources and Flooding.

19.11.18. Based on the assumptions outlined, the combined impact of these potential cumulative effects is expected to be no greater than the predicted effects on water resources and flooding discussed in this chapter. Consequently, the additive cumulative effects on water resources and flooding are anticipated to be not significant, requiring no additional mitigation.

Mitigation measures

19.11.19. No inter-project impacts are expected. As such, no mitigation is required.

19.12. Summary and conclusions

19.12.1. The baseline assessment identified surface water bodies, groundwater bodies and flood risk within the study area. Within the study area there are two canal waterbodies (Rochdale Canal and the Ashton Canal) and the River Medlock designated as a Statutory Main River. Within the Proposed Development there is presence of shallow granular Made Ground with no aquifer classification however, this unit contains a consistent groundwater body that may provide baseflow to adjacent surface water bodies. The superficial geology, Glacial Till, is classified as a secondary undifferentiated aquifer and divided into cohesive and layered granular units. The bedrock geology underlaying the Proposed Development is the Chester Formation, designated as a Principal Aquifer. The Proposed Development is not at risk of flooding from Rochdale Canal, Ashton Canal, and New Islington Marina despite proximity. In the limited likelihood the Rochdale canal is overtopped, the flood could spread beyond the towpath and into the Site.

19.12.2. The ES chapter followed a predominantly qualitative assessment based on DMRB LA 113[72] (Road Drainage and the Water Environment) and DMRB LA 104[73] (Environmental Assessment and Monitoring) guidance.

19.12.3. Construction and operation of the Proposed Development pose potential risks to the surface water quality (accidental spillage and untreated runoff), groundwater quantity and quality (change to water table due to dewatering and placement of impermeable barriers obstructing groundwater flow, deep foundations / earthworks introducing a vertical flow of contaminated surface runoff) and flood risk (higher

[72] https://standardsforhighways.co.uk/search/d6388f5f-2694-4986-ac46-b17b62c21727

[73] https://standardsforhighways.co.uk/search/0f6e0b6a-d08e-4673-8691-cab564d4a60a

runoff due to increase impermeable surface, groundwater emergence due to subsurface structures or deep foundations, and increased discharge to River Medlock via the drainage network of the Shooters Brook culvert) for the receptors, detailed in Section 19.7.

19.12.4. There has been a variety of embedded mitigation measures which help to reduce the impact of the Proposed Development on the water environment. Moreover, the Assessment of Effects (Section 19.8) identifies further mitigation (in addition to the embedded mitigation) that ensure the Proposed Development does not have a significant impact on the water environment.

19.12.5. This assessment has concluded there are no significant residual effects on the surface water quality, groundwater quantity and quality, and flood risk to the receptors as part of the Proposed Development.

Table 19-14 – Summary of residual effects surface water

Resource / Receptor / affected group	Sensitivity of receptor	Activity or impact	Embedded design mitigation	Effect Magnitude Type Spatial extent Duration Likelihood	Significance of effect (taking into account embedded mitigation)	Additional mitigation	Residual effect
Construction							
Rochdale Canal, western section	Medium	Risk of changes to water quality as a result of construction activities (detailed in Section 19.7).	See embedded mitigation (19.8.1 to 19.8.13)	Adverse Minor Direct Local Temporary Unlikely	Not Significant	When taking into consideration the embedded mitigation detailed above there is no further mitigation required as the impact is negligible.	Not Significant
Ashton Canal and Peak Forest Canal, lower section	Medium	Risk of changes to water quality as a result of construction activities (detailed in Section 19.7)	See embedded mitigation (19.8.1 to 19.8.13)	Adverse Minor Direct Local Temporary Unlikely	Not Significant	When taking into consideration the embedded mitigation detailed above there is no further mitigation required as the impact is negligible.	Not Significant
River Medlock	High	The drainage network drains into the Shooters Brook culvert, which discharges into the River Medlock downstream of the Proposed Development.	See embedded mitigation (19.8.1 to 19.8.13)	Adverse Minor Direct Local	Not Significant	The impact to the WFD river water body is likely to be negligible, as the drainage strategy notes that the maximum permitted discharge rate from the Site should be limited to the equivalent greenfield runoff rate. Additionally, SuDS are built	Not Significant

Resource / Receptor / affected group	Sensitivity of receptor	Activity or impact	Embedded design mitigation	Effect Magnitude Type Spatial extent Duration Likelihood	Significance of effect (taking into account embedded mitigation)	Additional mitigation	Residual effect
				Temporary Unlikely		into the Proposed Development which will reduce the pollutants in the surface water from the Proposed Development site.	
Operation							
Rochdale Canal, western section	Medium	The drainage network will drain into the Shooters Brook culvert which discharges into the River Medlock downstream of the Proposed Development. Additionally, Sustainable Drainage Systems (SuDS) will be implemented to control surface run off into the canal adjacent to the Site (Rochdale Canal). Therefore, it is unlikely that the surface water will reach this receptor.	See embedded mitigation above (19.8.25 and 19.8.26).	Adverse Negligible Direct Local Permanent Unlikely	Not Significant	-	Not Significant
Ashton Canal and Peak	Medium	The drainage network will drain into the Shooters Brook culvert which	See embedded mitigation above	Adverse	Not Significant	-	Not Significant

Resource / Receptor / affected group	Sensitivity of receptor	Activity or impact	Embedded design mitigation	Effect Magnitude Type Spatial extent Duration Likelihood	Significance of effect (taking into account embedded mitigation)	Additional mitigation	Residual effect
Forest Canal, lower section		discharges into the River Medlock downstream of the Proposed Development. Additionally, Sustainable Drainage Systems (SuDS) will be implemented to control surface run off into the canal adjacent to the Site (Rochdale Canal). Therefore, it is unlikely that the surface water will reach this receptor.	(19.8.25 and 19.8.26).	Negligible Direct Local Permanent Unlikely			
River Medlock	High	The drainage network drains into the Shooters Brook culvert, which discharges into the River Medlock downstream of the Proposed Development.	See embedded mitigation above (19.8.25 and 19.8.26).	Adverse Negligible Direct Local Permanent Likely	Not Significant	The impact to the WFD river water body is likely to be negligible, as the drainage strategy notes that the maximum permitted discharge rate from the Site should be limited to the equivalent greenfield runoff rate. Additionally, SuDS are built into the Proposed Development which will reduce the pollutants in the surface water from the Proposed Development site.	Not Significant

Table 19-15 – Summary of residual effects groundwater

Resource / Receptor / affected group	Sensitivity of receptor	Activity or impact	Embedded design mitigation	Effect Magnitude Type Spatial extent Duration Likelihood	Significance of effect (taking into account embedded mitigation)	Additional mitigation	Residual effect
Construction							
Groundwater in the Made Ground (cohesive and granular)	Groundwater Quality						
	Low	Groundwater quality- piling may introduce a rapid vertical flow pathway into the groundwater body, for potentially contaminated runoff. For more details see, Section 19.7.	See embedded mitigation (19.8.1 to 19.8.13)	Adverse Minor Direct Local Temporary Unlikely	Not Significant	See embedded mitigation within Section 19.8	Not Significant
	Groundwater Quantity						
	Low	Changes to the groundwater quantity - the piling and new utilities which are laid below the surface may alter the groundwater levels, flow paths and depending on	See embedded mitigation (19.8.1 to 19.8.13)	Adverse Minor Direct	Not Significant	See embedded mitigation within Section 19.8	Not Significant

		the proposed type of pile it may cause groundwater embankment potentially leading to groundwater flooding to substructures. For more details see, Section 19.7.		Local Temporary Unlikely			
Groundwater in the Granular Glacial Till overlaying Chester Formation and Groundwater in the Manchester and East Cheshire Permo-Triassic Sandstone Aquifers	Groundwater Quality						
	High	Groundwater quality- piling may introduce a rapid vertical flow pathway into the groundwater body, for potentially contaminated runoff. For more details see, Section 19.7.	See embedded mitigation (19.8.1 to 19.8.13)	Adverse Minor/Moderate Direct Local Temporary Unlikely	Moderate adverse	See embedded mitigation within Section 19.8	Moderate adverse
	Groundwater Quantity						
	High	It is unlikely that piling will be of a continuous nature at depth to affect groundwater quantity in this aquifer. For more details see, Section 19.7.	See embedded mitigation (19.8.1 to 19.8.13)	Adverse Minor Direct Local Temporary Unlikely	Not Significant	See embedded mitigation within Section 19.8	Not Significant
Operation							
Made Ground (cohesive and granular),	Groundwater Quality						
	Low	During operation deep foundations and piles may	See embedded	Adverse Negligible	Not Significant	-	Not Significant

		represent rapid vertical flow pathways and introduce contamination into the aquifer.	mitigation above (19.8.24)	Direct			
				Local			
				Permanent			
				Unlikely			
	Groundwater Quantity						
	Low	Deep foundations may form a barrier to groundwater flow, potentially reducing groundwater contributions to adjacent water courses. They may also induce groundwater embankment potentially leading to groundwater flooding to subsurface structures and reduce groundwater contributions to adjacent watercourses.	See embedded mitigation above (19.8.24)	Adverse	Not Significant	-	Not Significant
				Minor			
				Direct			
				Local			
				Permanent			
				Unlikely			
Granular Glacial Till overlaying Chester Formation And Manchester and East Cheshire Permo-Triassic	Groundwater Quality						
	High	During operation deep foundations and piles may create rapid vertical flow pathways and introduce contamination into the aquifer.	See embedded mitigation above (19.8.24)	Adverse	Not Significant	-	Not Significant
				Negligible			
				Direct			
				Local			
				Permanent			
				Unlikely			
	Groundwater Quantity						

- Sandstone Aquifers	High	It is unlikely that piling will be of a continuous nature at depth and have an effect on groundwater quantity in this aquifer.	See embedded mitigation above (19.8.24)	Adverse Negligible Direct Local Permanent Unlikely	Not Significant	-	Not Significant

Table 19-16 – Summary of residual effects flood risk

Resource / Receptor / affected group	Sensitivity of receptor	Activity or impact	Embedded design mitigation	Effect Magnitude Type Spatial extent Duration Likelihood	Significance of effect	Additional mitigation	Residual effect
Construction							
Rochdale Canal, western section	Medium	Risk of surface water ponding due to earthwork and soil compaction, especially where the Proposed Development encroaches on areas of surface water flood risk (Figure 19.2.8, Appendix 19.2 – FRA). This could result in the displacement of surface water and increase flood risk to the Rochdale Canal, which is	See embedded mitigation (19.8.1 to 19.8.13)	Adverse Minor Direct	Not Significant	All earthworks associated with the Proposed Development should be outside the Environment Agency Risk of Flooding from Surface Water map (Figure 19.2.8, Appendix 19.2 – FRA). Any surface water flood risk should be managed by directing overland flow away from infrastructure/assets, then contained/conveyed	Not Significant

		<0.01 km northwest of the Proposed Development. The below-ground construction activities for the proposed basement carpark may increase flood for the Rochdale Canal and Proposed Development, as the Rochdale Canal may be in hydraulic conductivity to the groundwater at the Proposed Development due to proximity.		Local Temporary Unlikely		within the Proposed Development or to the drainage system to ensure no increase in flood risk. Any groundwater emergence due to the construction of the basement car park will be managed at the surface by directing overland flow away from infrastructure/ assets, then contained/ conveyed within the Proposed Development or to the drainage system.	
Ashton Canal and Peak Forest Canal, lower section	Medium	Risk of surface water ponding due to earthwork and soil compaction, especially where the Proposed Development encroaches on areas of surface water flood risk (Figure 19.2.8, Appendix 19.2 – FRA). This could result in the displacement of surface water and increase flood risk to the Ashton Canal, which is <0.03 km southeast of the Proposed Development.	See embedded mitigation (19.8.1 to 19.8.13)	Adverse Minor Direct Local	Not Significant	All earthworks associated with the Proposed Development should be outside the Environment Agency Risk of Flooding from Surface Water map (Figure 19.2.8, Appendix 19.2 – FRA). Any surface water flood risk should be managed by directing overland flow away from infrastructure/assets, then contained/conveyed within the Proposed Development or to the drainage system to ensure no increase in flood risk.	Not Significant

		The below-ground construction activities for the proposed basement carpark may increase flood for the Rochdale Canal and Proposed Development, as the Rochdale Canal may be in hydraulic conductivity to the groundwater at the Proposed Development due to proximity.		Temporary Unlikely		Any groundwater emergence due to the construction of the basement car park will be managed at the surface by directing overland flow away from infrastructure/ assets, then contained/ conveyed within the Proposed Development or to the drainage system.	
New Islington Marina	Medium	Risk of surface water ponding due to earthwork and soil compaction, especially where the Proposed Development encroaches on areas of surface water flood risk (Figure 19.2.8, Appendix 19.2 – FRA). This could result in the displacement of surface water and increase flood risk to the New Islington Marina, which is <0.03 km north of the Proposed Development. The below-ground construction activities for the proposed basement carpark may increase flood for the New Islington Marina and Proposed Development, as the New	See embedded mitigation (19.8.1 to 19.8.13)	Adverse Minor Direct Local Temporary	Not Significant	All earthworks associated with the Proposed Development should be outside the Environment Agency Risk of Flooding from Surface Water map (Figure 19.2.8, Appendix 19.2 – FRA). Any surface water flood risk should be managed by directing overland flow away from infrastructure/assets, then contained/conveyed within the Proposed Development or to the drainage system to ensure no increase in flood risk. Any groundwater emergence due to the construction of the basement car park will be managed at the surface by directing overland flow away from infrastructure/ assets, then contained/ conveyed	Not Significant

		Islington Marina may be in hydraulic conductivity to the groundwater at the Proposed Development due to proximity.		Unlikely		within the Proposed Development or to the drainage system.	
Great Ancoats Street	Very High	Risk of surface water ponding due to earthwork and soil compaction, especially where the Proposed Development encroaches on areas of surface water flood risk (Figure 19.2.8, Appendix 19.2 – FRA). This could result in the displacement of surface water and increase flood risk Great Ancoats Street which is directly adjacent to the Proposed Development. The below-ground construction activities for the proposed basement carpark may increase flood for Great Ancoats Street and Proposed Development, as Great Ancoats Street may be in hydraulic conductivity to the groundwater at the Proposed Development due to proximity.	See embedded mitigation (19.8.1 to 19.8.13)	Adverse Minor Direct Local Permanent Unlikely	Not Significant	All earthworks associated with the Proposed Development should be outside the Environment Agency Risk of Flooding from Surface Water map (Figure 19.2.8, Appendix 19.2 – FRA). Any surface water flood risk should be managed by directing overland flow away from infrastructure/assets, then contained/conveyed within the Proposed Development or to the drainage system.	Not Significant
Operation							

Rochdale Canal, western section	Medium	There may be surface water runoff from the Proposed Development to Rochdale Canal due to increase impermeable surface and diversion of overland runoff paths. There may be disturbance to groundwater flow paths due to subsurface structures or deep foundations, especially with the proposed basement car park. This may form a barrier to groundwater flow and result in groundwater emergence above ground and thus flooding on the surface. However, this will be managed by the drainage network.	See embedded mitigation above (19.8.25 and 19.8.26).	Adverse Minor Direct Local Permanent Unlikely	Not Significant	Employ SuDS to reduce surface water runoff and store the potential increase of surface water runoff to groundwater storage. Careful consideration and design are required to ensure the increased groundwater infiltration by SuDS does not increase groundwater flood risk locally. See embedded mitigation above (19.8.25 and 19.8.26). The drainage network will drain into the Shooters Brook culvert, which discharges into the River Medlock downstream of the Proposed Development. Therefore, it is unlikely there will be an increase in surface water runoff from increased impermeable surfaces.	Not Significant
Ashton Canal and Peak Forest Canal, lower section	Medium	There may be surface water runoff from the Proposed Development to Ashton Canal due to increase impermeable surface and diversion of overland runoff paths.	See embedded mitigation above (19.8.25 and 19.8.26).	Adverse Minor	Not Significant	Employ SuDS to reduce surface water runoff and store the potential increase of surface water runoff to groundwater storage. Careful consideration and design are required to ensure the	Not Significant

		There may be disturbance to groundwater flow paths due to subsurface structures or deep foundations, especially with the proposed basement car park. This may form a barrier to groundwater flow and result in groundwater emergence above ground and thus flooding on the surface. However, this will be managed by the drainage network.		Direct Local Permanent Unlikely		increased groundwater infiltration by SuDS does not increase groundwater flood risk locally. See embedded mitigation above (19.8.25 and 19.8.26). The drainage network will drain into the Shooters Brook culvert, which discharges into the River Medlock downstream of the Proposed Development. Therefore, it is unlikely there will be an increase in surface water runoff from increased impermeable surfaces.	
New Islington Marina	Medium	There may be surface water runoff from the Proposed Development to New Islington Marina due to increase impermeable surface and diversion of overland runoff paths. There may be disturbance to groundwater flow paths due to subsurface structures or deep foundations, especially with the proposed basement car park. This may form a	See embedded mitigation above (19.8.25 and 19.8.26).	Adverse Minor Direct Local	Not Significant	Employ SuDS to reduce surface water runoff and store the potential increase of surface water runoff to groundwater storage. Careful consideration and design are required to ensure the increased groundwater infiltration by SuDS does not increase groundwater flood risk locally. See embedded mitigation above (19.8.25 and 19.8.26). The drainage network will drain into the Shooters Brook	Not Significant

		barrier to groundwater flow and result in groundwater emergence above ground and thus flooding on the surface. However, this will be managed by the drainage network.		Permanent Unlikely		culvert, which discharges into the River Medlock downstream of the Proposed Development. Therefore, it is unlikely there will be an increase surface water runoff from increased impermeable surfaces.	
Great Ancoats Street	Very High	There may be surface water runoff from the Proposed Development to Great Ancoats Street due to increase impermeable surface and diversion of overland runoff paths. There may be disturbance to groundwater flow paths due to subsurface structures or deep foundations, especially with the proposed basement car park. This may form a barrier to groundwater flow and result in groundwater emergence above ground and thus flooding on the surface. However, this will be managed by the drainage network.	See embedded mitigation above (19.8.25 and 19.8.26).	Adverse Minor Direct Local Permanent Unlikely	Not Significant	Employ SuDS to reduce surface water runoff and store the potential increase of surface water runoff to groundwater storage. Careful consideration and design are required to ensure the increased groundwater infiltration by SuDS does not increase groundwater flood risk locally. See embedded mitigation above (19.8.25 and 19.8.26). The drainage network will drain into the Shooters Brook culvert, which discharges into the River Medlock downstream of the Proposed Development. Therefore, it is unlikely there will be an increase surface water runoff from increased impermeable surfaces.	Not Significant

19.13. Glossary and Acronyms

Table 19-17 – Glossary and acronyms

Term	Definition
BGS	British Geological Society
BNG	Biodiversity Net Gain
CAMS	Catchment Abstraction Management Strategy
CCTV	Closed-Circuit Television
CEMP	Construction Environmental Management Plan
CFMP	Catchment Flood Management Plan
CIRIA	Construction Industry Research and Information
CSS	Construction Compounds
DMRB	Design Manual for Roads and Bridges
DWPA	Drinking Water Protected Areas
DWSZ	Drinking Water Safeguard Zones
EA	Environment Agency
EC	European Community
EEC	European Economic Community
EEP	Environmental Emergency Plan
EQS	Environmental Quality Standard
ES	Environment Statement
EU	European Union
FCERM	Flood and Coastal Erosion Management
FRA	Flood Risk Assessment
GPPs	Guidance for Pollution Prevention
GWDTE	Groundwater-Dependent Terrestrial Ecosystems
HBCDD	Hexabromocyclododecane
HMWB	Heavily Modified Water Body
ID	Identification
INNS	Invasive Non-Native Species
IWMP	Integrated Water Management Plan
LA	Local Authority
LFRM	Local Flood Risk Management
LLFA	Local Lead Flood Authority
LNRs	Local Nature Reserves
m AOD	Meters above ordnance datum
NIEA	Northern Ireland Environment Agency
NNRs	National Nature Reserves

NRW	Natural Resources Wales
NVZ	Nitrate Vulnerable Zone
OCEMP	Outline Construction Environmental Management Plan
OSNGR	Ordnance Survey National Grid Reference
PA2008	Planning Act 2008
PBDE	Polybrominated diphenyl ethers
PFOS	Perfluorooctane sulphonate
pH	Potential of hydrogen
PPG	Pollution Prevention Guidelines
Q	Volume rate of flow (i.e. discharge)
RBD	River Basin District
RBMP	River Basin Management Plan
RLB	Red line boundary
SAC	Special Areas of Conservation
SBI	Sites of Biological importance
SEPA	Scottish Environment Protection Agency
SoS	Secretary of State
SPA	Special Protection Area
SPZ	Special Protection Zone
SSSI	Sites of Special Scientific Interest
SuDS	Sustainable Drainage Systems
UK	United Kingdom
WFD	Water Framework Directive
WQ	Water Quality

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