Northumberland Line Project
Ashington Station

Level 2 Flood Risk Assessment

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Quality information

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Distribution List

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N/A	1	Northumberland County Council

Note

The findings from this FRA are based upon an outline design of the site layout plan and boundary which are referenced within this document.

Proposed Finished Floor Levels (FFL), ground and road levels are not yet available for the site. The FRA is based on existing levels and the assumption that ground levels will only be altered locally and by limited amounts. Changes to the site levels could have potential to alter surface water flow routes and mechanisms, and therefore once the final site designs are complete the FRA will be updated accordingly. Any major risks associated with potential ground level changes and which can be identified at this stage are discussed within the FRA.

Please note, where channels were observed to be heavily vegetated, assumptions of the channel alignment have been made. No channel or culvert surveys have been undertaken to inform the FRA.

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Abbreviations

AOD	Above Ordnance Datum
BGS	British Geological Society
BOD	Below Ordnance Datum
EA	Environment Agency
FMfP	Flood Map for Planning
FRA	Flood Risk Assessment
LiDAR	Light Detection and Ranging
LFRMS	Local Flood Risk Management Strategy
LLFA	Lead Local Flood Authority
LPA	Local Planning Authority
NPPF	National Planning Policy Guidance
NCC	Northumberland County Council
NTC	North Tyneside Council
NW	Northumbrian Water
OS	Ordnance Survey
PFRA	Preliminary Flood Risk Assessment
PPG	Planning Practice Guidance
RoFfSW	Risk of Flooding from Surface Water
SuDS	Sustainable Urban Drainage Systems
SFRA	Strategic Flood Risk Assessment
SWMP	Surface Water Management Plan

Glossary

Flood Zone	Environment Agency defined zone of flood risk used for planning
Main River	Main rivers are usually larger rivers and streams. The EA carries out maintenance, improvement or construction work on main rivers to manage flood risk.
Ordinary Watercourse	Ordinary watercourses include every river, stream, ditch, drain, cut, dike/dyke, sluice, sewer (other than a public sewer) and passage through which water flows and which does not form part of a main river.

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1. Introduction

AECOM has been commissioned by Northumberland County Council (NCC) to produce a Level 2 Flood Risk Assessment (FRA) in support of a planning application for a Proposed Development. The Proposed Development comprises a new railway station platform, shelter, car park, cycle storage area, electrical substation, footway, lift and area of landscaping works, located to the west of the existing railway track at Ashington.

The works will support the re-establishment of the Northumberland Line as an operational passenger line which extends from Newcastle to Ashington, approximately 23.5 kilometres (km) in length. To facilitate these works, a total of 6 No. new stations are proposed along the Northumberland Line, which are divided between two administrative areas; North Tyneside Council (NTC) and NCC. This FRA focuses on the new station proposed at Ashington only.

Ashington station is located within Ashington, approximately 22 km north east of Newcastle upon Tyne. The site has a National Grid Reference (NGR) NZ 27266 87589 and the new development has an approximate area of 1.86 hectares (ha). The National Planning Policy Framework 2019 (NPPF)[1] and associated Planning Practice Guidance (PPG)[2] specify that any new development more than 1 ha should be supported by a site-specific FRA.

This FRA is intended to assess the level of flood risk posed to and from the Proposed Development during its operational phase. Appropriate mitigation measures to offset flood risk will be outlined where necessary. The flood risk has been assessed in accordance with the NPPF and the associated PPG. This FRA is based on the best available flood risk information available at the time of writing. Data has been provided by online Environment Agency (EA) resources and other publicly available external sources. An assessment of possible mitigation measures which could be implemented to manage the risk or flooding to and from the construction phase is contained within **Appendix A.** However, the precise measures required will be dependent on final temporary working areas, practices and working methods.

1.1 Description of the Proposed Development

The Proposed Development is located within the administrative area of NCC and is situated at the existing station site in Ashington town centre, Northumberland. NCC acts as the Local Planning Authority (LPA) and the Lead Local Flood Authority (LLFA), responsible for managing local flood risks and ensuring co-operation between the Risk Management Authorities in the area.

The Proposed Development is located east of Kenilworth Road, immediately south of Wansbeck Square. The Proposed Development will involve the installation of a proposed new car park, cycle storage area, electrical substation, footway, lift, station platform, approximately 100 m in length, west of the existing railway track and a small area of landscaping. The site is currently a mix of brownfield and greenfield land, comprising an existing car park in the north east of the site and an area of grass and green scrub, located to the south of the site.

A review of the LiDAR Digital Terrain Model (DTM) of 1 m (metre) grid resolution, derived from the Environment Agency Open Data[3], shows that the Proposed Development is located approximately 34 metres Above Ordnance Datum (mAOD). The topography within the Proposed Development is higher in the north of the site and slopes gently towards the south of the site; as shown in Figure 1-2.

Following a review of the Flood Map for Planning (FMfP) there are no Main Rivers within close proximity of the Proposed Development. The nearest Main River includes the River Wansbeck which is located 1.4 km south of the Proposed Development. The nearest Ordinary Watercourses to the Proposed Development include two tributaries of Blackclose Dean Ordinary Watercourse and are situated within 900 m and 950 m of the Proposed Development. Both watercourses are situated south west of the site and flow in a south westerly direction away from the Proposed Development, before discharging into the River Wansbeck.

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[1] Department for Communities and Local Government (2018) *National Planning Policy Framework*. London.

[2] Department for Communities and Local Government (2018) *Planning Practice Guidance: Flood Risk and Coastal Change*. London.

[3] Environment Agency Open Data https://environment.data.gov.uk/DefraDataDownload/?Mode=survey Accessed 12/11/20.

Figure 1-1 shows the site location with the site boundary highlighted in red and Figure 1-2 shows the topography from downloaded LiDAR.

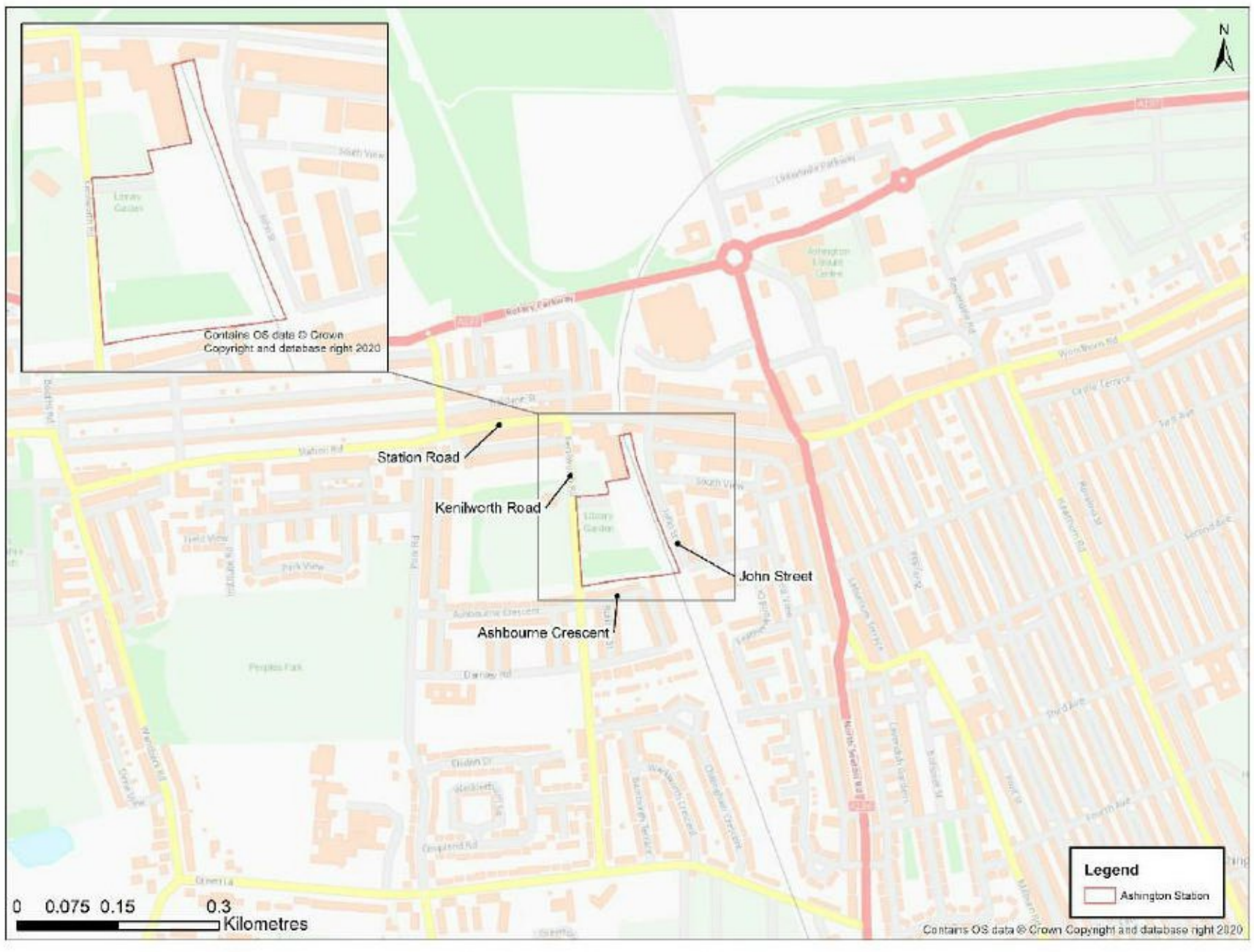

Figure 1-1 – Site Location Plan

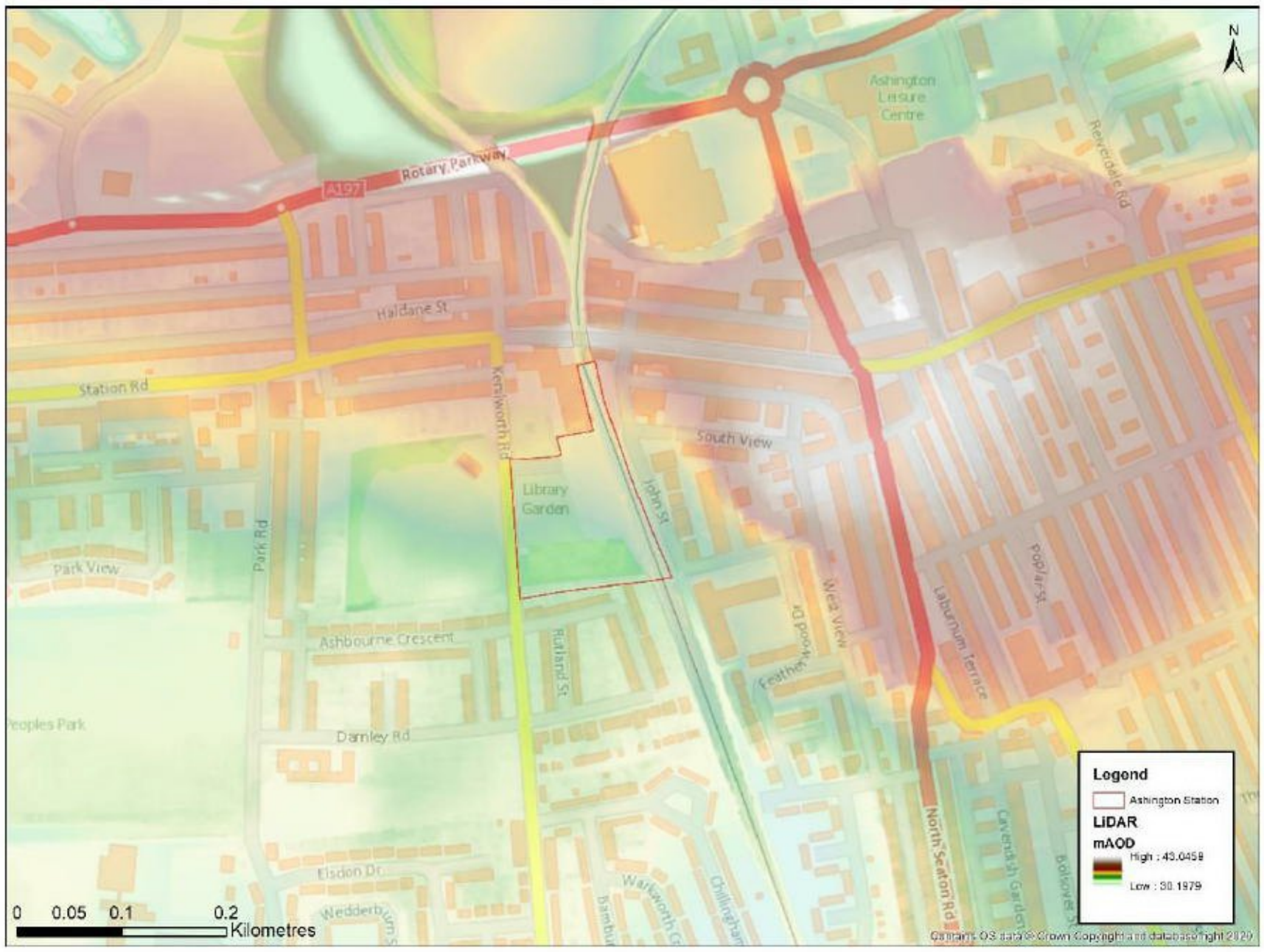

Figure 1-2 – Site Topography

1.2 Description of the Proposed Works

The Proposed Development would involve the construction of the following infrastructure:

- railway platform (~100m in length) and shelter;
- car park with drop off/pick up bays (279 No. spaces);
- lift, with footpath link to the station platform;
- footway to connect to footpath hospital crossing;
- electrical substation;
- cycle storage area; and
- area of landscaping works.

An indicative site layout plan and red line plan, Drawing Ref '60601435-ACM-07-ZZ-DRG-ECV-000002 P02.2 & '60601435-ACM-XX-ZZ-DRG-LEP-000015' are presented in **Appendix B**.

2. Evaluation of Flood Policy

The aim of this section of the report is to introduce the main aspects of the national and local planning policies that are relevant to the Proposed Development in terms of flood risk.

2.1 National Planning Policy

Section 14 of the 2019 updated NPPF[1] and the 2019 Flood Risk and Coastal Change PPG[2] both advise how the planning process can take account of the risks associated with flooding. The main sources of flooding that are used to steer development at the planning stage are Main Rivers and the Sea. The predicted flood risk from these sources are shown on the EAs Fluvial and Coastal Flood Map, also known as the Flood Map for Planning (FMfP) which outlines three main zones of risk. These are as follows:

- **Flood Zone 1 'low probability of flooding' –** This zone comprises land assessed as having a less than 1 in 1,000 chance of river or sea flooding in any year (<0.1% annual exceedance probability).

- **Flood Zone 2 'medium probability of flooding' –** This zone comprises land assessed as having between a 1 in 100 and 1 in 1,000 chance of river flooding (1% - 0.1% AEP) in any year, or between a 1 in 200 and 1 in 1,000 chance of sea flooding in any year (0.5% - 0.1% AEP).

- **Flood Zone 3a 'high probability of flooding'** – This zone comprises land assessed as having a 1 in 100 year or greater chance of river flooding in any year (>1% AEP), or a 1 in 200 year or greater chance of flooding from the sea in any year (0.5% AEP).

- **Flood Zone 3b 'functional floodplain'** – A sub-part of Zone 3, this zone comprises land where water has to flow or be stored in times of a flood. This zone is not usually included within the FMfP and is calculated where necessary during detailed hydraulic modelling.

The NPPF dictates what development is suitable within each Flood Zone based upon the level of vulnerability of the development. This is shown in Table 2-1. The vulnerability classifications suggest the proposed station platform is considered to be 'Essential Infrastructure'.

Table 2-1 - Flood Risk Vulnerability and Flood Zone Compatibility

Flood Risk Vulnerability Classification	Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	✓	Exception Test Required	✓	✓
Zone 3a	Exception Test Required	✓	X	Exception Test Required	✓
Zone 3b	Exception Test Required	✓	X	X	X

In accordance with Table 2-1, the construction of Essential Infrastructure is permitted in Flood Zones 1, 2 and an exception test is required for Flood Zones 3a and 3b. The Proposed Development lies within land classified as being within Flood Zone 1, therefore it is considered that the requirements of the sequential have been met and the exception test is not required. This FRA will be used to consider the flood risk to and from the Proposed Development. As well as fluvial and tidal flooding, it is also necessary to consider flood risk from all other sources, including surface water, groundwater, Ordinary Watercourses, artificial drainage systems and infrastructure failure.

2.2 Regional & Local Planning Policy

The Proposed Development lies within the boundary of NCC, which holds the role of LLFA and LPA. Therefore, NTC has the responsibility for the preparation of local plans and polices to manage flooding in their role as LLFA and LPA. The key policies which will inform the flood risk requirements are outlined in **Section 2.2.**

2.2.1 Northumberland Consolidated Planning Policy Framework

The Northumberland Consolidated Planning Policy Framework (NCPPF)[4] details the planning policy documents that are currently used to determine and guide planning applications in Northumberland. The framework includes a number of planning policy documents put in place by former County Council, District / Borough Councils, before NCC became the LPA in April 2009.

The framework will gradually be replaced by new policies contained within the Northumberland Emerging Local Plan, refer to **Section 2.2.2,** that is currently being prepared by the council.

The NCPPF is divided into Section A and B as follows:

Section A – Schedule of Documents which form the Statutory Development Plan

Section A includes various documents, collectively known as 'Plans and Strategies' which together comprise the 'Statutory Development Plan' and form part of the policy framework for the council. This is further divided into the following:

a) Adopted Statutory Development Plan Documents; and
b) Neighbourhood Plans.

The most relevant adopted statutory development plan to the Proposed Development is the Wansbeck District Local Plan[5] which was produced in 2007. Wansbeck was the former District Council within Northumberland, which included the town of Ashington. Whilst the Policies outlined within the local plan were due to expire in 2010, in accordance with the Secretary of State's Direction in 2010[6], some policies have been extended beyond this date, with the intention of "providing continuity in the development plans system and a stable planning framework locally [...]". *Policy GP22, Flood Risk and Erosion*, has been listed within the States Direction and was therefore extended beyond 2010.

However, whilst initially extended in 2010, in accordance with the Northumberland Consolidated Planning Policy Framework, the Wansbeck Local Plan expired in 2016 and therefore Policy GP22 is no longer considered to be enacted. However, a review of this Policy, GP22 below, indicates that the underlying principles are broadly in alignment with the recommendations of the NPPF and therefore, the development will be in compliance with this policy.

Policy GP22 – Flood Risk and Erosion

'*Developers are required to consider the risk to their development from flooding and erosion and to consider any possible effect of their development on flood risk or erosion elsewhere. Development in areas of flood risk will not be permitted unless a flood risk assessment has been carried out and it can be demonstrated that:*

a) there is no reasonable alternative development option available which would involve no risk or a lower risk of flooding; and

b) the development does not increase the risk of flooding elsewhere; and

c) satisfactory protection measures can be carried out at the expense of the developer and maintained for the lifetime of the development'

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[4] Northumberland Consolidated Planning Policy Framework. https://www.northumberland.gov.uk/NorthumberlandCountyCouncil/media/Planning-and-Building/planning%20policy/Consolidated%20Planning%20Policy%20Framework/Northumberland-Consolidated-Planning-Policy-Framework-v28.pdf Accessed 10/11/20

[5] Wansbeck District Local Plan (2007). https://www.northumberland.gov.uk/NorthumberlandCountyCouncil/media/Planning-and-Building/planning%20policy/Consolidated%20Planning%20Policy%20Framework/Section%20A/Part%201%20-%20Adopted%20Statutory%20DPDs/9.%20Wansbeck/Wansbeck-District-Local-Plan.pdf. Accessed 16/11/20.

[6] https://www.northumberland.gov.uk/NorthumberlandCountyCouncil/media/Planning-and-Building/planning%20policy/Consolidated%20Planning%20Policy%20Framework/Section%20A/Part%201%20-%20Adopted%20Statutory%20DPDs/9.%20Wansbeck/SoS-Direction-Wansbeck-LP.pdf. Accessed 16/11/20.

Neighbourhood Plans have also been produced by NCC which form part of the Statutory Development plan for Northumberland. At the time of writing (November 2020), there are no current Neighbourhood Plans which cover the geographical region of Ashington and therefore do not apply.

Section B – Schedule of Planning Policy Documents which do not form part of the Statutory Development Plan

Section B includes supplementary non-statutory planning documents which have been adopted by predecessor authorities to provide guidance and advice to developers and the LPA when considering and determining planning applications. These have been adopted by NCC in April 2009 and form part of the policy framework for NCC.

A review of the planning documents in Section B were mostly shown to be specific to developments within Ashington Town Centre and include the Wansbeck Design Guide, Supplementary Planning Document[7] and the People and Planning Northumberland Local Development Framework for Ashington Town Centre[8]. Following a review of these documents, there are no additional policies that apply to flood risk or drainage have not been assessed any further.

2.2.2 Northumberland Emerging Local Plan

At the time of writing, November 2020, a local plan for Northumberland is currently being prepared by NCC[9]. A draft outline of the local plan was submitted in January 2019 and is currently undergoing examination, which may therefore be subject to modifications. Once adopted, the emerging local plan will supersede the adopted statutory development plans outlined by the former authorities, including the Wansbeck District Local Plan (2007). The key policies from the Northumberland emerging local plan are as follows:

Policy STP 3 – Principles of Sustainable Development

> *'Development is to be located in areas which are least vulnerable to climatic impacts such as risks from all sources of flooding and rising sea levels.'*

Policy STP 4 – Climate Change Mitigation and Adaption

> *'Development proposals should support adaption to climate change, be resilient to climate change and not make neighbouring areas more susceptible to the negative impacts of climate change. When determining planning applications, consideration will be given to how development proposals through their location take into account [...] the risk of flooding and coastal change, incorporate the use of sustainable drainage systems and control surface water run-off'*

Policy QOP 5– Sustainable Design and Construction

> *'Minimise vulnerability to flooding through the use of materials, green and blue infrastructure and other design features as appropriate'*

Policy WAT 3 – Flooding

1. *'In assessing development proposals, the potential for both on and off-site flood risk from all potential sources will be measured'*
2. *'Development proposals will be required to demonstrate how they will minimise flood risk to people, property and infrastructure from all potential sources by:*
    a. *'Avoiding inappropriate development in areas at risk of flooding [...] applying the Sequential Test and if necessary, the Exceptions test [...]'*
    b. *'Ensuring that the development will be safe over its lifetime, taking account of climate change, will not increase flood risk elsewhere and [...] reduce flood risk overall'*

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[7] Wansbeck Design Guide. https://www.northumberland.gov.uk/NorthumberlandCountyCouncil/media/Planning-and-Building/planning%20policy/Consolidated%20Planning%20Policy%20Framework/Section%20B/Part%201%20-%20Adopted%20LDDs%20(Not%20Statutory)/Wansbeck%20SPD/WDC-Design-Guide-SPD.pdf Accessed: 17/11/20

[8] People and Planning Northumberland Local Development Framework: Ashington Town Centre Supplementary Planning Document (2010) https://www.northumberland.gov.uk/NorthumberlandCountyCouncil/media/Planning-and-Building/planning%20policy/Consolidated%20Planning%20Policy%20Framework/Section%20B/Part%201%20-%20Adopted%20LDDs%20(Not%20Statutory)/Ashington%20SPD/Ashington-Town-Centre-SPD.pdf Accessed: 17/11/20

[9] Northumberland County Council Draft Local Plan https://www.northumberland.gov.uk/NorthumberlandCountyCouncil/media/Planning-and-Building/planning%20policy/Local%20Plan/Northumberland-Local-Plan-Reg-19-Publication-Draft-January-2019-Web-PDF-Version.pdf Accessed 10/11/20

c. *'Assessing the impact of the development proposal on existing sewerage infrastructure and flood risk management infrastructure [...]'*
d. *'Ensuring that development proposals in areas at risk of flooding are made resistant and resilient [...]'*
e. *'Pursuing the full separation of foul and surface water flows [...]'*
f. *'Ensuring that built development proposals [...] separate, minimise and control surface water run-off, with Sustainable Drainage Systems [...]. Surface water should be disposed of in accordance of the following hierarchy for surface water runoff:*
    - *Soakaway system, unless it can be demonstrated that this is not feasible [...].*
    - *To a watercourse [...]To a surface water sewer*
    - *As a last resort [...] to combined sewers*
    - *'Where greenfield sites are to be developed, the surface water run-off rates should not exceed, and where possible should reduce the existing run-off rates.*

g. *'Full consideration should be given to solutions within the wider catchment area, including blue-green infrastructure-based solutions [...].'*

Policy WAT 4 – Sustainable Drainage Systems

'SuDS will be a requirement for any development where it is necessary to manage surface water drainage unless it can be clearly demonstrated that SuDS are not technically, operationally, financially deliverable or viable [...]. SuDS [...] should be devised to take account of predicted future conditions where appropriate efforts should be made to link them into the wider initiative to enhance the green infrastructure. Arrangements must be put in place for the management and maintenance of SuDS over the lifetime of the development.'

2.2.3 North-East Lead Local Flood Authorities Sustainable Drainage Local Standards

The purpose of the North-East LLDA SuDS Local Standards[10] is to provide guidance for the incorporation of SuDS into development to promote consistency and best practice within the NE LLFA area. There are 22 Local Standards outlined within the document, the standards applicable to the Proposed Development include the following:

- *Equivalent Greenfield Run-Off (GFRO) discharge rates should be provided for new development at all sites (Greenfield and Brownfield).*
- *The NNE LLFA will set allowable discharge rates following Local Standards 1-3, unless the permissible discharge rate Northumbrian Water will allow to sewer is below GFRO rates.*
- *The NE LLFA will accept a single Qbar discharge rate from site or rates no more than the 1 in 1 and 1 in 100- year GFRO in accordance with Defra Standards.*
- *Climate change allowances to be applied are 40% on the extreme event modelling (100 year return period)*
- *300mm free board is required in SuDS design*
- *Overland flow modelling for surface water flood routes or other reasons may be required as part of formal submissions.*
- *SuDS design should meet the latest CIRIA SuDS Manual, Sewers for Adoption, British Standards and other best practice guidance.*
- *A site specific maintenance plan will be required to detail how SuDS will be maintained and who will maintain them.*
- *A construction plan is required to show surface run off, any water receptors and an outline of mitigation measures.*
- *The NNE LLFA consider SuDS to be on the surface "green SuDS" that show multifunctional benefit (including quantity control, water quality, biodiversity and amenity) and mimic natural drainage in line with the NPPF and FWMA definitions*
- *The NNE LLFA typically follow Local Authority SuDS Officer Organisation (LASOO) guidance for FRA and Drainage Strategy requirements at Outline and Full planning permission*
- *Infiltration testing is required at all sites before planning approval.*

[10] North-East Lead Local Flood Authorities Sustainable Drainage Local Standards. https://www.northumberland.gov.uk/NorthumberlandCountyCouncil/media/Roads-streets-and-transport/coastal%20erosion%20and%20flooding/SuDS%20%20Planning/NE-LLFA-SuDS-Standards-2020_final-July-2020-1.pdf . Accessed 19/11/20.

- *Source control interception (retaining 5mm rainfall on site) should be applied for the impermeable area of all sites using the CIRIA SuDS manual method.*

2.2.4 Preliminary Flood Risk Assessment (PFRA)

The purpose of a Preliminary Flood Risk Assessment (PFRA) [11] document is to provide a high-level summary of significant flood risk based on available and derivable information describing both the probability and harmful consequences of past and future flooding. The PFRA forms part of the local flood risk management strategies that the LLFA is required to prepare by the Flood and Water Management Act 2010.

As the LLFA, NCC prepared a PFRA in 2011, which collated and evaluated historic and future flooding, identifying significant flood risk areas within NCC administrative area. Two significant historic flood events have been identified in Northumberland, specifically Morpeth, in 1964 and 2008. The main source of flooding on both occasions was flooding from the River Wansbeck Main River.

The location of the Proposed Development has not been identified as an area impacted from a significant historic flood event, however, the PFRA identifies a 25>75% susceptibility to groundwater flooding in Ashington.

The PFRA further shows the Proposed Development is located within Blyth and Wansbeck Catchment Flood Management Boundary. This is further discussed in **Section 2.2.8**.

2.2.5 Strategic Flood Risk Assessment (SFRA)

A SFRA is a required evidence document for the Local Plan which collates information on all known sources of flooding that may affect existing or future development within the area.

A Level 1 Strategic Flood Risk Assessment (SFRA)[12] was completed by Scott Wilson in 2010 on behalf of NCC. The purpose of the Level 1 SFRA enabled the application of the Sequential Test which supports Policy DC19 outlined in the Northumberland Consolidated Planning Policy Framework. The SFRA details the river catchments within Northumberland and noted whilst there is limited recorded hydrological data, it is assumed smaller watercourses may have flashier and shorter response times. In relation to the site location, the SFRA further identified that sewer flooding has not been identified as an issue in Ashington. Whilst the SFRA does identify the River Wansbeck as being a river with historic flooding, the SFRA does not identify Ashington as at risk of flooding within this catchment.

The SFRA identifies the Fontburn Reservoir as a reservoir which falls under the Reservoirs Act. The SFRA states that *'Where development sites or site allocations are located downstream of a reservoir, the residual risk of reservoir breach or overtopping should be considered as part of a site specific FRA'*. As Ashington is located downstream of Fontburn Reservoir, this will be considered within this FRA. The SFRA suggested that development within Ashington should *'should seek to ensure the effective use of SUDS techniques to minimise runoff and therefore reduce pressure on the surface water drainage system.*'

A Level 2 SFRA[13] was completed by URS in 2015 which provides a more detailed assessment of areas previously been identified as potential development locations in the Northumberland Local Plan. The SFRA identifies Potential Development Areas (PDA), including areas within Ashington. Flood risk to the site was not further evaluated in the SFRA given the site would not be subjected to the sequential test under the NPPF as there is a low risk of fluvial and tidal flooding.

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[11] Northumberland Preliminary Flood Risk Assessment https://www.northumberland.gov.uk/NorthumberlandCountyCouncil/media/Roads-streets-and-transport/coastal%20erosion%20and%20flooding/Northumberland-PFRA-Final-Report.pdf Accessed 10/11/20

[12] Level 1 SFRA https://www.northumberlandnationalpark.org.uk/wp-content/uploads/2019/09/Level-1-SFRA-September-2010.pdf Accessed 10/11/20

[13] Level 2 SFRA https://www.northumberland.gov.uk/NorthumberlandCountyCouncil/media/Planning-and-Building/planning%20policy/Studies%20and%20Evidence%20Reports/Flood%20Water%20Studies/2.%20SFRA%20Level%202/Level-2-SFRA-October-2015.pdf Accessed 10/11/20

2.2.6 Local Flood Risk Management Strategy (LFRMS)

The NCC Local Flood Risk Management Strategy (LFRMS)[14] was published in November 2015, which outlines how local flood risk is managed within Northumberland and sets out the roles and responsibility of flood risk management partners. There are five key objectives outlined within the Local Strategy. These are as follows:

1. *Improve knowledge and understanding of flood risk throughout Northumberland*
2. *Promote sustainable development to reduce local flood risk with consideration to the anticipated impact of climate change.*
3. *Actively manage flood risk and drainage infrastructure to reduce likelihood of flooding.*
4. *Encourage communities to become more resilient to flooding by increasing public awareness and understanding their concerns.*
5. *Be better prepared for flood events and post flood recovery.*

2.2.7 Northumberland County Council Flood Action Plan (FAP)

A Flood Action Plan (FAP) [15] was completed by NCC in April 2013, and updated to Version 6.2 in January 2019, as a result of changes to Blyth Local Flood Warning Plans. The Northumbria Local Resilience Forum (LRF) identified two main sources of flooding, fluvial and coastal, which face the local community and as a result a Flood Action Plan was developed to assist the response of the council by detailing information on the alerts and warnings issued by the Environment Agency. There is a total of 53 Flood Warnings that can be applied to Northumberland's rivers and coastline.

The Proposed Development is not located within an EA flood warning area, given the area is at very low risk of fluvial and coastal flooding. The FAP also listed rapid response catchments where flooding is likely to occur without a significant period of warning time. The River Wansbeck has been identified as a rapid response catchment. However, Ashington has not been identified as a community with which the EA are working to develop a local rapid response catchment plan.

2.2.8 Rivers Wansbeck and Blyth Catchment Flood Management Plan (CFMP)

A Catchment Flood Management Plan (CFMP) [16] for the Wansbeck and Blyth was completed by the EA in December 2009. The CFMP outlines the overview of flood risk in the catchment and sets out a preferred plan for sustainable flood risk management over the next 50 to 100 years. The Wansbeck and Blyth Catchment is low-lying, with the main sources of flooding identified as fluvial and tidal flood risk in Morpeth and Blyth respectively. The CFMP also addresses climate change, estimating a 20% increase in peak flows in all watercourses and between a 2.5 mm and 13 mm per year increase in sea levels. It is likely that the most significant impact will be felt in urban areas with the largest increases occurring along the River Wansbeck.

The CFMP is divided into seven sub-areas which have similar physical characteristics, sources of flooding and level of risk. The Proposed Development is located within the 'Wansbeck Font and Lyne' sub area. It is highlighted that there is a risk of flooding along the Rivers Wansbeck, Font and Lyne and the Sleekburn. The sub area adopts 'Policy 6' which is as follows:

Policy 6 – Areas of low to moderate flood risk where we will take action with others to store water or manage run-off in locations that provide overall flood risk reduction or environmental benefits

This policy will tend to be applied where there may be opportunities in some locations to reduce flood risk locally or more widely in a catchment by storing water or managing run-off. The policy has been applied to an area (where the potential to apply the policy exists), but would only be implemented in specific locations within the area, after more detailed appraisal and consultation. The following actions are proposed to implement Policy 6:

- Continue providing and maintaining the current flood defence assets.

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[14] NCC Northumberland Local Flood Risk Management Strategy. https://www.northumberland.gov.uk/NorthumberlandCountyCouncil/media/Roads-streets-and-transport/coastal%20erosion%20and%20flooding/2015-NCC_LFRMS_Final-approved.pdf . Accessed 19/11/20

[15] Northumberland Flood Action Plan https://www.northumberland.gov.uk/NorthumberlandCountyCouncil/media/Fire-and-Rescue/Copy-of-NCC-FAP-Version-6-2.pdf Accessed 12/11/20

[16] Wansbeck and Blyth Catchment Flood Management Plan https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/289180/Rivers_Wansbeck_and_Blyth_Catchment_Flood_Management_Plan.pdf Accessed 12/11/20

- Continue with our current programme of channel maintenance.
- Investigate potential for providing upstream flood storage for Morpeth to reduce the risk of flooding.
- Encourage the take up of our flood warning service.
- Investigate potential for improving the time given from a flood warning before flooding occurs.
- Improve resilience of properties to flooding. Promote sustainable land management to reduce amount and rate of runoff.
- Increase public awareness of the risk of flooding.

3 Climate Change

3.1 Context

The NPPF requires site specific FRAs accompanying planning applications to assess the risk of all sources of flooding to and from the development and to demonstrate how these flood risks will be managed so that the development remains safe throughout its lifetime, taking climate change into account.

The EA published updated climate change guidance in July 2020[17]. The guidance indicates that climate change is likely to increase river flows, sea levels, rainfall intensity, wave height and wind speed.

3.2 Peak River Flow Allowances by River Basin District

The peak river flow allowances show the anticipated changes to peak flow by river basin district. The range of climate change allowances are based on percentiles. A percentile is a measure used in statistics to describe the proportion of possible scenarios that fall below an allowance level. The 50th percentile is the point at which half of the possible scenarios for peak flows fall below it and half fall above it.

- Central allowance is based on the 50th percentile;
- Higher central is based on the 70th percentile;
- Upper end is based on the 90th percentile; and
- High ++ (H ++) is based on the extreme climate change scenario.

The Proposed Development lies within the Northumbria River Basin District. Table 3-1 shows the climate change allowances for the Northumbria Basin District.

Table 3-1 - Peak River Flow Allowances for the Proposed Development

Allowance Category	Total Potential Change Anticipated for '2020s' (2015 to 2039)	Total Potential Change Anticipated for '2050s' (2040 to 2069)	Total Potential Change Anticipated for '2080s' (2070 to 2115)
H ++	20%	35%	65%
Upper End	20%	30%	50%
Higher Central	15%	20%	25%
Central	10%	15%	20%

3.3 Peak River Flow Allowances for the Proposed Development

Whilst the current climate change guidance includes limited guidance for developments in Flood Zone 1, past guidance[18] for developments in Flood Zone 1 state:

[17] Environment Agency (2020) Flood risk assessments: climate change allowances. https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances. Accessed 10/11/20.

[18] Environment Agency (2017) Flood risk assessments: climate change allowances. https://consult.environment-agency.gov.uk/engagement/bostonbarriertwao/results/appendix-9---flood-risk-assessments-climate-change-allowances_20170203.pdf

"In flood zone 1 use the central allowance for essential infrastructure, highly vulnerable, more vulnerable and less vulnerable developments. For water compatible developments use none of the allowances."

The design lifetime of the Proposed Development is 120 years and based upon the EA guidance, the peak river flow climate change allowances for the lifetime of the Proposed Development should be assessed as shown in Table 3-2.

Table 3-2 - Proposed Development Climate Change Assessment Criteria

Proposed Development	
River Basin District	Northumbria
Flood Zone	1
Flood Risk Vulnerability	Essential Infrastructure
Lifetime of Development	120
Climate Change Allowance to be Assessed	20%

3.4 Peak Rainfall Intensity Allowances for the Proposed Development

The predicted increase in the frequency and intensity of storm events could increase the volumes of rainfall to enter the surface water and foul drainage network. Table 3-3 shows the anticipated changes in peak rainfall intensity in small catchments less than 5 km².

Table 3-3 - Peak Rainfall Intensity Allowances for the Proposed Development

Applies across all of England	Total Potential Change Anticipated for '2020s' (2015 to 2039)	Total Potential Change Anticipated for '2050s' (2040 to 2069)	Total Potential Change Anticipated for '2080s' (2070 to 2115)
Upper End	10%	20%	40%
Central	5%	10%	20%

To ensure there is no increase in the rate of runoff discharged from the site, in accordance with guidance provided by the EA and the North East LLFA Sustainable Drainage Local Standards, the proposed drainage strategy will be designed to accommodate the 1 in 100 year + 40% CC event and discharge will be limited to the QBAR (1 in 2 year) runoff rate.

3.5 Impact of Climate Change

Given that the Proposed Development lies within Flood Zone 1 and there are no Main Rivers in close proximity to the site, it is concluded that climate change will not significantly increase the risk of Main River Flooding to and from the site.

The predicted increase in the frequency and intensity of storm events could increase greater volumes of rainfall to enter the surface water and foul drainage network. However, the proposed drainage strategy sets out how the drainage system will be designed to accommodate for the appropriate climate change allowances. Therefore, despite the anticipated increase in rainfall intensity, climate change will unlikely increase the risk of flooding from the surface and foul water drainage network.

4 Assessment of Flood Risk

This section of the report considers the potential risks posed to the Proposed Development from all sources of flooding. Appropriate mitigation measures to offset flood risk have been outlined where necessary.

4.1 Flood Risk from Fluvial Sources

Fluvial flooding occurs when the capacity of a river is exceeded either due to high flows from the catchment draining into the river or a combination of high flows and high tides which causes the river to overflow or overtop the banks.

4.1.1 Flood Risk from Main Rivers

Following a review of aerial and Ordnance Survey (OS) mapping, there are no EA Main Rivers in close proximity to the Proposed Development. The nearest Main River is the River Wansbeck, which is located approximately 1.4 km south of the proposed site and flows in a south easterly direction before discharging into the North Sea.

A review of the EA Flood Map for Planning (FMfP) suggests that the Proposed Development lies outside of the predicted extent of flooding from the River Wansbeck and is located within Flood Zone 1 which is land defined as having a less than 1 in 1,000 greater annual probability of river or sea flooding (>0.1% AEP) in any year; refer to Figure 4-1.

Furthermore, a review of the topography suggests that the Proposed Development is located approximately 30 m above the River Wansbeck and therefore there are likely to be no plausible flow routes between this Main River and the Proposed Development. As the site lies outside of the predicted extent of flooding from Main Rivers, the Proposed Development is considered to be at low risk of flooding from Main Rivers and therefore no mitigation is required.

4.1.2 Flood Risk from Tidal Sources

Tidal flooding occurs during extreme high tide and / or storm surge events which may cause wave overtopping or the unlikely event of a breaching scenario of existing tidal defences. High water levels within tidally influenced estuaries and rivers may also contribute to tidal flooding. As a consequence of climate change, sea level rises and increased storm surges are predicted, increasing the probability of flooding from overtopping or breach on tidal watercourses and at the coast.

The Proposed Development is located approximately 3.8 km west of the North Sea and approximately 30 mAOD and therefore unlikely to be at risk of coastal flooding. Furthermore, whilst the River Wansbeck is a tidally influenced Main River, a review of the EA Flood Map for Planning (FMfP)[19] suggests that the Proposed Development is situated within Flood Zone 1, which is land defined as having less than a 1 in 1000 greater annual probability of river flooding or sea flooding (>0.1%), refer to Figure 4-1. Therefore, the Proposed Development is considered to be at low risk of flooding from the sea and tidal flooding and no mitigation is required.

[19] Environment Agency. Flood Map for Planning. https://flood-map-for-planning.service.gov.uk/.Accessed: 07/11/20.

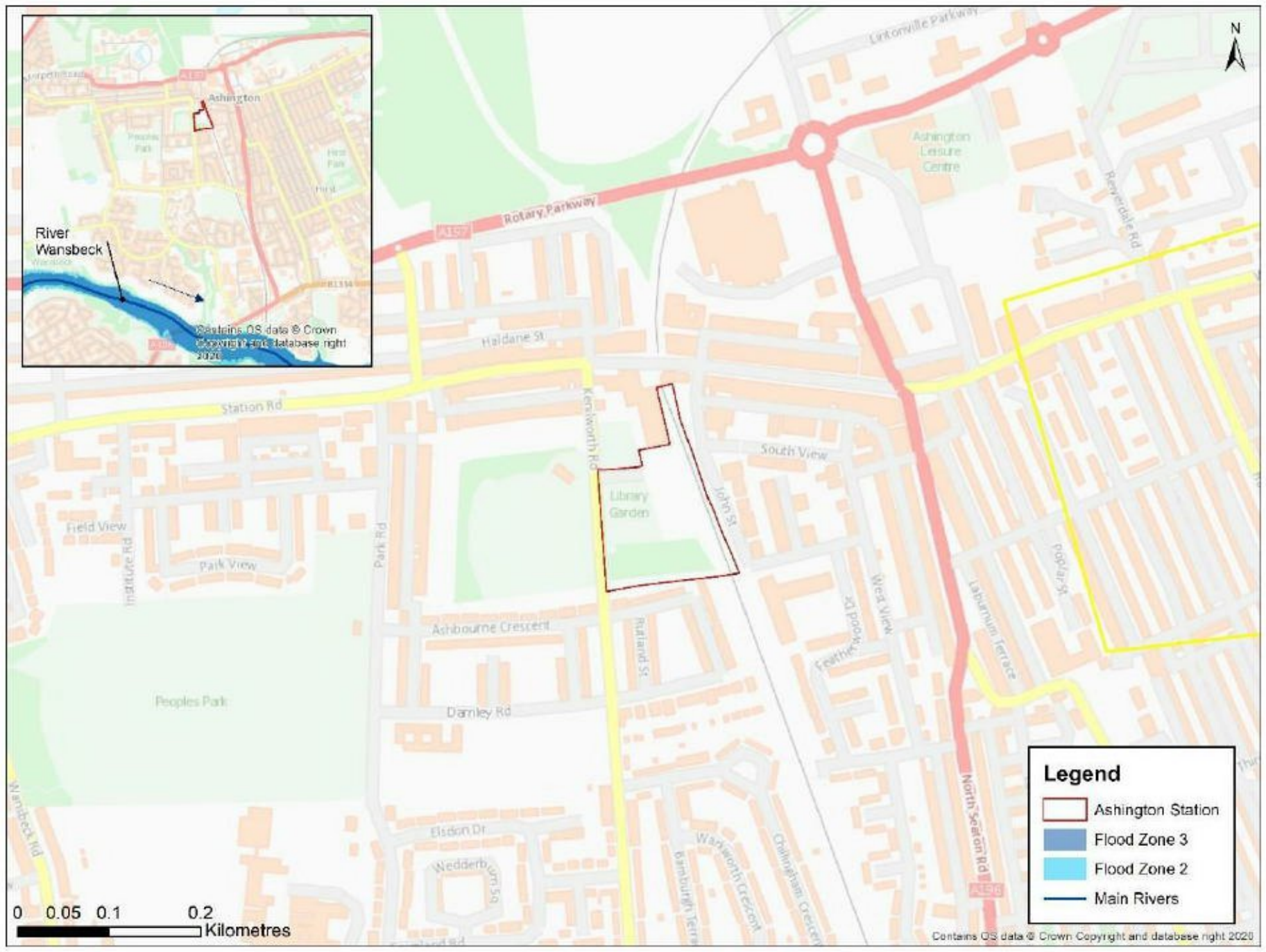

Figure 4-1 – Environment Agency Flood Map for Planning

4.1.3 Flood Risk from Ordinary Watercourses and Land Drainage Systems

Failure of land drainage infrastructure such as drains, channels and outflow pipes are most commonly the result of obstructions, poor maintenance and/ or blockages.

Following a review of Ordinance Survey (OS) mapping and aerial imagery, the nearest two Ordinary Watercourses to the Proposed Development include two tributaries of Blackclose Dean Ordinary Watercourse which are located between 900m and 950 m south of the Proposed Development. Both watercourses flow southwards, away from the proposed site, before discharging into the River Wansbeck.

As the Blackclose Dean watercourse is not a Main River, no mapping showing the predicted extent of flooding is available however, it is possible to use the EA Risk of Flooding from Surface Water (RoFfSW) map as a proxy for Ordinary Watercourse flooding, refer to Figure 4-2. A review of this dataset shows two prominent surface water flow paths originate close the Proposed Development within Peoples Park and Chillingham Crescent, and flow southwards through the built-up residential area, towards Blackclose Dean Ordinary Watercourse in the south. These surface water flows paths could be indicative of the historic channels associated with this watercourse.

The Proposed Development however is situated north of these potential flow routes and a review of LiDAR data indicates that the topography within this area falls moderately southwards towards the low-lying land surrounding Blackclose Dean and River Wansbeck. It is therefore likely that any overland flows and out of bank flooding associated with these features would be channelled in a southerly direction and away from the site. As such there are unlikely to be any plausible flow routes from either the Ordinary Watercourses identified or the potential historic channels, to the site.

The Proposed Development is therefore considered to be at low risk of flooding from Ordinary Watercourses no mitigation is required.

4.2 Flood Risk from Surface Water

Surface water runoff is defined as water flowing over the ground that has not yet entered a drainage channel or similar. An intense period of rainfall which exceeds the infiltration capacity of the ground usually results in surface water runoff, and it can also occur when the capacity of the sewer or drainage network is exceeded. Typically, runoff occurs on sloping land or where the ground surface is relatively impermeable. The ground can be impermeable, either naturally through the soil type or geology, or unnaturally due to development, which places large areas of impervious material over the ground surface (e.g. paving and roads).

As defined by the EA, levels of surface water flood risk can be classified as follows:

- High Risk – the area has an annual chance of flooding of greater than 1 in 30 (3.33% AEP).
- Medium Risk – the area has an annual chance of flooding of between 1 in 100 (1% AEP) and 1 in 30 (3.33% AEP).
- Low Risk – the area has an annual chance of flooding of between 1 in 1000 (0.1% AEP) and 1 in 100 (1% AEP).

A review of available LiDAR data suggests that the topography within the Proposed Development slopes gently southwards, from approximately 35 m AOD in the north to 33 m AOD in the south. Following a review of the LiDAR data, the surface water catchment surrounding the site is considered to be less than 0.5 km^2 and therefore the ability of the catchment to generate large volumes of surface water flow is considered to be limited.

Review of the EA RoFfSW dataset suggests there is no ponding within the Proposed Site up to and including the 1 in 100 year (1% AEP) events. However, a small area of localised ponding is observed adjacent to the south western site boundary, along Kenilworth Road within these events. Ponding on the highway remains relatively shallow, with flood depths reaching up to 300 mm; refer to **Figure 4-2**. Within the 1 in 1000 (0.1% AEP) event, the extent of ponding is increased within this area and consequently, this ponding area encroaches onto the Proposed Site. Within this event ponding still remains relatively shallow with flood depths remaining at 300 mm. However, a review of the site layout plan in **Appendix B** indicates that a new electrical sub-station is proposed at the south-western corner of the site boundary which corresponds to the area predicted to flood during a 1 in 1000 year (0.1% AEP) event onwards. Given an electrical substation will be vulnerable to water egress, it is recommended to raise this infrastructure by a minimum of 300 mm above the existing ground level.

However, the Proposed Development will involve the construction of a drainage system capable of attenuating the Proposed Development up to and including the 1 in 100 year plus 40% climate change event, including attenuating additional storage volumes where surface water runoff is shown to pond on site. As such, any flows which would have ponded within this area are likely to be captured by the proposed drainage network. Therefore, the risk to the Proposed Development is considered to be low and no further mitigation is required.

Figure 4-2 – Risk of Flooding from Surface Water Flood Map

4.3 Flood Risk from Groundwater

Groundwater flooding occurs when the natural level of water stored within the ground rises above local ground level. This can result in deep and long-lasting flooding of low lying or below ground areas such as underpasses and basements. It tends to occur after long periods of sustained high rainfall, and the areas at most risk are often low-lying where the water table is more likely to be at shallow depth. Groundwater flooding is most likely to occur in areas underlain by major aquifers, although it is also associated with more localised floodplain sands and gravels.

British Geological Survey[20] (BGS) information suggests that the geology below the site is located within a Pennine Middle Coal Measures Formation comprising mudstone, siltstone and sandstone, with superficial deposits of Till. Whist Mudstone is typically characterised by low permeability, siltstone, sandstone and till are typically characterised by higher permeability.

According to the EA Aquifer Designation Map[21] the site is underlain by a Secondary A aquifer in the bedrock suggesting there are permeable layers that are capable of supporting water supplies. The site is also underlain by a Secondary (undifferentiated) aquifer in the Superficial Drift suggesting the variable characteristics of rock type make it difficult to determine the permeability of the superficial layers. The presence of these aquifers could be indicative of elevated groundwater levels within the surrounding area. In addition, the BGS Groundwater Vulnerability Map shows the site to be at medium risk from groundwater flooding.

The Proposed Development involves the construction of a new station platform and car park at ground level and a small below ground surface water drainage network, therefore whilst flooding from groundwater could potentially cause a nuisance to site users, the Proposed Development itself is not vulnerable to groundwater ingress.

[20] British Geological Survey (2019) Geology of Britain Viewer. http://mapapps.bgs.ac.uk/geologyofbritain/home.html Accessed: 06/11/20.
[21] Environment Agency Aquifer Designation Map https://magic.defra.gov.uk/MagicMap.aspx Accessed 06/11/20.

Furthermore, a review of the Coal Authority Map[22] indicates that the site is located within the Ellington-Lynemouth mine water block, where water levels are controlled by pumping at Lynemouth Colliery Shaft in Northumberland. According to the government guidance[23], water levels within this area are being lowered to approximately 40 m below Ordnance Datum (mBOD). As such, the ability for groundwater levels within this area to reach the ground surface is considered to be very low. However, as a precautionary measure, to mitigate against groundwater flooding, the below ground drainage network will be designed in such a way as to prevent water ingress and withstand hydrostatic pressure associated with elevated groundwater levels.

4.4 Flood Risk from Sewer and Water Supply Infrastructure

4.4.1 Water Supply Infrastructure

Given potable water mains are pressurised systems, significant flooding could occur in the event of a pipe burst scenario. A review of the Northumbrian Water Drainage Asset Plans **(Appendix C)** shows a number of potable water mains located within close proximity of the Proposed Development, primarily associated with the developments along Ashbourne Crescent, John Street, Kenilworth Road and Station Road. Given the potable water main is a pressurised system, this infrastructure could pose a residual risk in the event of a pipe burst scenario.

Following a review of the topography, in the event of a pipe burst scenario, there are plausible flow routes from this infrastructure towards the Proposed Development. However, Northumbrian Water, as a designated Risk Management Authority have a legislative responsibility to undertake adequate maintenance and inspection regimes, such that the risk of pipe breach is considered low. As such, the risk of flooding from water supply has been considered as a residual risk and no mitigation is required.

4.4.2 Sewer Infrastructure

Sewer and surface water flooding are often interconnected especially in combined sewer systems; insufficient drainage capacity in the sewer network can result in surface water flooding and, by the same rationale, large volumes of surface water can overload the public sewers, causing the sewer network to back up, surcharge and ultimately cause flooding above ground level.

Following a review of the Northumbrian Water Asset Plans there are three combined NWL sewers, adjacent to the southern and western site boundary, all of which are 225 mm internal diameter, associated with the properties along Ashbourne Crescent, Oakland Terrace and Kenilworth Road. In addition, there is a 225 mm combined NW sewer that runs under the existing railway track, in the north of the site boundary and a number of networks which are located east of the Proposed Development. Following a review of the topography, in the event of a sewer surcharge, there are plausible flow routes from this infrastructure towards the Proposed Development.

The two sewer networks located within the south of the site run along Ashbourne Crescent and Oakland Terrace away from the site and connect into a combined sewer network on Darnley Road located approximately 120 m south of the Proposed Development. Both of these sewer networks are located at the top of the respective drainage networks and therefore the ability of these systems to generate large volumes of flow is considered unlikely. In addition, the topography suggests that in the unlikely event of a sewer surcharge, flow would be channelled south and away from the Proposed Development.

The combined sewer network that runs along Kenilworth Road, west of the site, originates as a small 150 mm along a footpath behind Langwell Crescent before turning 90 degrees onto Kenilworth Road. Whilst there is a plausible flow route from Kenilworth Road into the site, the sewer network is located at the top of the drainage network and therefore the ability of this system to generate large volumes of flow is considered unlikely. In addition, in the event of exceedance flows from this infrastructure, Kenilworth Road would likely act as a conduit and would direct flows south by the topography.

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[22] The Coal Authority Interactive Viewer. https://mapapps2.bgs.ac.uk/coalauthority/home.html Accessed 13/11/20.

[23] Guidance: North East England water block factsheets. https://www.gov.uk/government/publications/mine-water-block-factsheets/north-east-england-mine-water-block-factsheets#ellington-lynemouth-mine-water-block-factsheet Accessed 13/11/20.

The sewer network which is located within the northern extent of the site boundary originates in Wansbeck Square, off Station Road, and flows south east under the railway track before connecting into a combined sewer network located to the east of the Proposed Development. Whilst there is a plausible flow route from this infrastructure into the site, the sewer network is located at the top of the drainage network and therefore the ability of this system to generate large volumes of flow is considered unlikely. In addition, in the unlikely event of sewer surcharge, flows would likely be directed south along the railway track or road infrastructure and away from the Proposed Development.

Furthermore, in the event that exceedance flows from this infrastructure did enter the site, these would likely be intercepted by the Proposed Drainage network and as such, would not pose a risk to the site. In addition, as a precautionary measure, to mitigate against flooding from sewer infrastructure, vulnerable infrastructure, including those which contain electrical equipment (such as the electrical substation) or those which could cause a pollution risk if flooded), will be raised above ground level. As such, the risk of flooding from sewerage infrastructure has been considered as a residual risk and no mitigation is required.

4.5 Flood Risk from Canal Systems

Canals do not pose a direct flood risk given they are regulated water bodies with controlled water levels; however, flooding can still occur through a breach or overtopping. Control structures such as weirs or locks could experience a blockage or failure resulting in rising water levels and overtopping. Structural failure could lead to a breach which can potentially be hazardous as they may involve the rapid release of large volumes of water at high velocity.

A review of the Canal and River Network Mapping from the Canal and River Trust indicates there are no canal systems within close proximity to the Proposed Development. As such, the risk of flooding from canal systems is considered to be low and no mitigation is required.

4.6 Flood Risk from Reservoirs

Reservoir failure can be particularly dangerous as it causes the release of large volumes of water at a high velocity, which can result in deep and widespread flooding. However, reservoir inspection and design procedures are very rigorous such that the probability of failure is generally regarded as extremely low.

In accordance with the EA's flood map showing 'Risk of Flooding from Reservoirs', the site is not located within the extent of potential reservoir flooding. The nearest extent of reservoir flooding is from the Fontburn Reservoir which is located approximately 23 km north west of the site, where flows are channelled along the River Font and then the River Wansbeck.

Following a review of OS mapping and aerial imagery, the Proposed Site is located approximately 1.3 km south west of a 16-ha body of water, the Queen Elizabeth II lake. However, a review of the topography suggests that flows from the lake would be channelled by the topography in a north easterly direction and away from the Proposed Development.

Given the site is not located within the extent of potential reservoir flooding, the risk to the site is considered to be low and no mitigation is required.

4.7 Flood Risk from Flood Risk Management Infrastructure

A review of the Environment Agency FMfP suggests there that the closest flood risk management infrastructure includes flood defences on the River Wansbeck, located approximately 7 km south west of the Proposed Development in Morpeth.

However, the maps indicate that the Proposed Development is not within an area considered to benefit from these Environment Agency flood defences. Therefore, the risk from flood risk management infrastructure is considered to be low and no mitigation is required.

4.8 Summary of Flood Risks to the Proposed Development

Flood Risk	Summary of Risk to Development Site (High / Medium / Low)	Notes	Mitigation Required
Fluvial / Tidal - Main Rivers	Low	A review of the EA FMfP suggests that the Proposed Development is located in Flood Zone 1, with no Main Rivers located within close proximity to the Proposed Development. The site is also located approximately 3.8 km from the North Sea and is located outside the extent of flooding from tidally influenced Main Rivers and the sea. Furthermore, a review of the topography suggests that the site is located at a significantly higher elevation than the closest Main River and therefore there is likely to be no plausible flow route between this feature and the Proposed Development. The Proposed Development is therefore not at risk of flooding from fluvial sources, tidal flooding and the sea.	No
Ordinary Watercourse and Land Drainage Systems	Low	Following a review of OS mapping and aerial imagery, the nearest two Ordinary Watercourses to the Proposed Development include two tributaries of Blackclose Dean Ordinary Watercourse and are located between 900 m and 950 m of the Proposed Development. In addition, the RoFfSW dataset shows two prominent surface water flow paths which are located within close proximity to the Proposed Development and could be indicative of historic channels associated with Blackclose Dean Ordinary Watercourse. However, the Proposed Development is situated north of these potential flow routes and a review of the LiDAR data indicates that the topography within this area falls moderately southwards towards Blackclose Dean. As such there are unlikely to be any plausible flow routes from either the Ordinary Watercourses identified or the potential historic channels, to the site.	No
Surface Water	Low	A review of the LiDAR suggests that the topography within the Proposed Development slopes gently southwards. In addition, the LiDAR data shows that the surface water catchment surrounding the site is considered to be less than 0.5 km^2 and therefore the ability of the catchment to generate large volumes of surface water is considered to be limited. Following a review of the RoFfSW dataset, there is a small area of localised ponding located within the south west of the Proposed Development which is considered to be at low risk of flooding. An electrical substation is proposed at this location which will be vulnerable to water egress. It is	Yes

		recommended to raise this infrastructure by a minimum 300 mm above existing ground levels. However, the Proposed Development will involve the construction of a drainage system, capable of accommodating the 1 in 100 year plus 40% climate change event. Therefore, the risk is considered to be low and no further mitigation above that proposed is required.	
Groundwater	Low	A review of the BGS data shows that the Proposed Development is located above a Secondary A aquifer associated with the superficial deposits and a Secondary (undifferentiated) aquifer in the Superficial Drift. The presence of an aquifer beneath the site could be indicative of elevated groundwater levels. The BGS Groundwater Vulnerability Map also shows the site to be at medium risk from groundwater flooding. The Proposed Development involves the construction of a new station platform and car park at ground level and small below ground surface water drainage network. Therefore, whilst flooding from groundwater could potentially cause a nuisance to site users, the development itself is not vulnerable to groundwater ingresses. Furthermore, the Coal Authority Map indicates that this site is within a mine water block area where water levels are lowered by a pumping station to approximately 40 mBOD. Therefore, the ability for groundwater levels to reach the ground surface within this area is considered to be very low. However, as a precautionary measure, the below ground drainage network will be designed in such a way to prevent water ingress and withstand hydrostatic pressure associated with elevated groundwater levels.	No
Water Supply Infrastructure	Residual	A review of the Northumbrian Water Drainage Asset plans shows a number of potable water mains located in close proximity to the Proposed Development. These assets are primarily associated with the developments along Ashbourne Crescent, John Street, Kenilworth Road and Station Road. Following a review of the topography, in the event of a pipe burst scenario, there are plausible flow routes from this infrastructure towards the Proposed Development. However, Northumbrian Water have a legislative responsibility to undertake adequate maintenance and inspection regimes, such that the risk of pipe breach is low. As such, the risk of flooding from water supply has been considered as a residual risk and no mitigation is required.	No
Sewer Infrastructure	Residual	A review of the Northumbrian Water Drainage Asset plans shows a number of combined sewer systems located within close proximity to the Proposed Development. These assets are primarily associated with development along	No

		Ashbourne Crescent, Oakland Terrace, Station Road and Kenilworth Road. Following a review of the topography, in the event of sewer discharge or a pipe burst scenario, there are plausible flow routes from this infrastructure towards the Proposed Development. However, this infrastructure is located at the top of the drainage network and therefore the ability of this system to generate large volumes of flow is considered unlikely. In addition, following a review of the topography, flows from this infrastructure would likely be channelled south and away from the Proposed Development by the topography. Furthermore, in the event that exceedance flows from this infrastructure did enter the site, these would likely be intercepted by the Proposed Drainage network and as such, would not pose a risk to the site. In addition, as a precautionary measure, vulnerable infrastructure, including those which contain electrical equipment (such as the electrical substation) or those which could cause a pollution risk if flooded), will be raised above ground level.	
Canal	Low	There are no canal systems within close proximity of the Proposed Development. As such, the risk of flooding from canals has been considered as low and no mitigation is required.	No
Reservoir	Low	The site is not located in the extent of potential reservoir flooding and there are no reservoirs in close proximity of the Proposed Development. There is a body of water (16 ha) located approximately 1.4 km north east of the Proposed Development. However, following a review of the topography, the flows from the lake would likely be channelled by the topography in a north eastly direction and away from the Proposed Development. As such, the risk of flooding from reservoirs has been considered as low and no mitigation is required.	No
Flood Risk Management Infrastructure	Low	The Proposed Development is not located within an area considered to benefit from EA flood defences. As such, the risk of flooding from flood risk infrastructure failure has been considered as low and no mitigation is required.	No

5 Impacts of the Development on Flood Risk

5.1 Impact on Fluvial Flooding

Given that the Proposed Development is located in Flood Zone 1 and is not situated within close proximity to any Main Rivers or Ordinary Watercourses, the ability of the Proposed Development to increase the risk of fluvial flooding to other areas is considered to be limited. Furthermore, all runoff generated by the Proposed Development will be captured within the proposed drainage system which has been designed to accommodate the 1 in 100 year plus 40% climate change event and will discharge at the QBAR (1 in 2 year) runoff rate into the public sewer network. As such, the ability of the development to increase the risk of fluvial flooding is considered to be low and no further mitigation is therefore proposed.

5.2 Impact on Surface Water

The site is currently used as a car park and therefore the Proposed Development will lead to a small increase in the amount of impermeable surfaces, associated with the creation of a new station platform and slight increase in the size of the car park. As a result, the amount and rate of surface water runoff generated by the Proposed Development could increase, which if left unmitigated, could increase the risk of surface water flooding to surrounding areas.

However, the Proposed Development will include the installation of a drainage network, comprising a series of trapped road gullies and below ground pipe infrastructure, which will capture flows from the proposed car park, platform and cycle storage areas and convey them towards a below ground attenuation tank within the west of the Proposed Development, refer to **Appendix D**. The attenuation tank has been sized to accommodate the 1 in 100 year plus 40% climate change event and will discharge to the Northumbrian Water combined sewer within Kenilworth Road at the QBAR (1 in 2 year) runoff rate.

The impact of the Proposed Development on surface water flood risk to other areas is therefore considered to be low and no further mitigation above that stipulated above is required.

5.3 Impact on Groundwater

The Proposed Development will include a minimal amount of below ground infrastructure associated with the installation of the proposed drainage system. Given the size of this infrastructure relative to the surrounding groundwater catchment, the ability of the Proposed Development to impact sub-surface flow regimes or groundwater storage capabilities is considered to be low. Furthermore, the site lies within an area covered by the Coal Authority Ellington-Lynemouth mine de-watering scheme, whereby groundwater levels are subject to continuous monitoring and artificially lowered to avoid contaminated groundwater entering local watercourses. As such the impact of the Proposed Development is considered to be low and no mitigation is required.

5.4 Impact on Sewers and Water Supply Infrastructure

As discussed, in **Section 5.2** above, the Proposed Development will involve the discharge of surface water runoff into the Northumbrian Water combined public sewer network in Kenilworth Road. However, discharges into this network will be restricted to the QBAR (1 in 2 year) runoff rate. As such, the impact of the Proposed Development on sewer flooding is considered to be low and no further mitigation is required.

5.5 Impact on Flooding from Reservoirs, Canals and Flood Risk Management Infrastructure

As discussed in **Section 4.5 and 4.6**, there are no reservoir or canal systems in close proximity of the Proposed Development. Therefore, the impact of the development on these features is considered to be low and no mitigation is required.

The site does not benefit from flood defences or is located near flood storage areas. The Proposed Development therefore does not include any works that could affect the risk of flooding from the failure of flood management infrastructure to other areas.

5.6 Summary of Flood Risks from the Proposed Development

Flood Risk	Summary of Risk from Development Site (High / Medium / Low)	Notes	Mitigation Required
Fluvial - Main Rivers & Ordinary Watercourse	Low	The Proposed Development is located in Flood Zone 1 and there are no Main Rivers or Ordinary Watercourses in the nearby vicinity. Furthermore, all runoff generated by the Proposed Development will be captured within the proposed drainage system which has been designed to accommodate the 1 in 100 year plus 40% climate change event and will discharge at the QBAR (1 in 2 year) runoff rate into the public sewer network. Therefore, the development will not increase flood risk at Main Rivers or Ordinary Watercourses.	No
Surface Water	Low	The Proposed Development will lead to a small increase in amount of impermeable surfaces which could, if unmitigated, lead to an increase in rate of surface water runoff from the Proposed Development. However, the Proposed Development will involve the construction of a drainage network which will be capable of attenuating and conveying flows to the 1 in 100 year (1% AEP) + 40% CC event and will limit the discharge into the NW combined sewer at QBAR (1 in 2 year) runoff rate. As such the risk from the Proposed Development from surface water runoff is considered to be low and no further mitigation is required.	No
Groundwater	Low	The groundwater catchment surrounding the Proposed Development is relatively large and the volume of proposed elements e.g. below drainage system, are likely to be minimal. The proposed site will therefore have negligible impact on groundwater flow or levels. Furthermore, the site is within an area covered by a coal-mine dewatering scheme where groundwater levels are subject to continuous monitoring and are artificially lowered. As such the impact of the Proposed Development is considered to be low and no mitigation is required.	No
Sewer and Water Supply Infrastructure	Low	The drainage system will involve the discharge of surface water runoff from the site into a combined public sewer network. The discharge will be controlled and restricted to the GBAR (1 in 2 year) runoff rate, As such, the impact of the Proposed Development on sewer flooding is considered to be low and no further mitigation is required.	No

Reservoir	Low	The site is not located near any reservoirs, therefore the impact of the Proposed Development on these features is considered to be limited and no mitigation is required.	No
Canal	Low	There are no canal systems in close proximity to the Proposed Development, therefore the impact of the Proposed Development on these features is considered to be limited and no mitigation is required.	No
Flood Risk Management Infrastructure	Low	The Proposed Development is not located near any flood storage areas or flood defences. The closest flood defence is located in Morpeth, approximately 7 km south west of the site. There would be no works associated with the Proposed Development that could affect the structural integrity of the flood defences.	No

6 Summary and Conclusion

6.1 Summary of Flood Risk

- The Proposed Development comprises of a proposed new car park, cycle storage area, lift, electrical substation, footway, station platform, and a small area of landscaping, to inform the works for the re-opening of the Northumberland Line as a passenger service.

- The Proposed Development is located in Flood Zone 1.

- A review of the NPPF and local planning policies suggests the Proposed Development is considered as 'Essential Infrastructure'. In accordance with Table 3 of the PPG 'Essential Infrastructure' is permitted in Flood Zones 1 and 2.

- The flood risk to the Proposed Development from Main Rivers, Ordinary Watercourses and land drains, surface water, groundwater, canal, reservoirs and flood risk management infrastructure are considered low.

    - As a precautionary measure, given the location of the electrical substation is proposed within an area of predicted surface water flooding during the 1 in 1000 year (0.1% AEP) event onwards, it is recommended to raise the substation by a minimum of 300 mm above the existing ground levels.

- The site lies within an area covered by the Coal Authority Ellington-Lynemouth mine de-watering scheme, whereby groundwater levels are subject to continuous monitoring and artificially lowered to avoid contaminated groundwater entering local watercourses. As such, the ability for groundwater levels to reach the ground surface at the site is considered to be low.

- The flood risk to the Proposed Development from Sewers and Water Main Infrastructure has been considered as residual which accounts for the remaining flood risk after the implementation of mitigation measures.

- The impact of the Proposed Development on flood risk from all sources of flooding i.e. from Main Rivers, Ordinary Watercourses, surface water, groundwater, canals, reservoirs, sewer and water supply infrastructure are considered to be low.

- The Proposed Development will involve construction of a new cark park and station platform which will slightly increase the volume of impermeable surfaces at the site. As such, the Proposed Development will include a surface water drainage system which will be capable of attenuating all runoff from the Proposed Development up to and including the 1 in 100 year plus 40% climate change event. In addition, in accordance with in the North East LLFA Sustainable Drainage Local Standards, the proposed drainage strategy will limit discharge to the QBAR (1 in 2 year) runoff rate. As such, the drainage strategy is compliant with local and national standards.

- As a precautionary measure, the following mitigation will be included. Note, these measures will be accepted as a planning condition and will be incorporated at detailed design.

    - Below ground drainage network will be designed in such a way as to prevent water ingress and withstand hydrostatic pressure associated with elevated groundwater levels.
    - Vulnerable infrastructure, including those which contain electrical equipment or those which could cause a pollution risk if flooded (such as the electrical substation) will be raised above ground level.

6.2 Conclusion

The FRA has demonstrated that it will be possible to manage flood risks to and from the Proposed Development in compliance with the NPFF and accompanying Planning Practice Guidance.

Appendix A – Construction Phase Mitigation

APPENDIX A - CONSTRUCTION PHASE MITIGATION & CONCEPTUAL DRAINAGE STRATEGY

Flood Risk

The FRA assesses flood risk to and from the development for the operational phase. However, temporary construction works will also be undertaken within the site boundary which is not accounted for within the FRA. By their nature these works have potential to impact flood risk for only the short period of time they are in place, but it is important the risks are identified and mitigated to avoid any short-term impact.

A high-level assessment of possible mitigation measures which could be implemented to manage the risk of flooding to and from the development during the construction phase has been provided below. The precise measures required will be dependent on the final temporary working areas, practices and working methods which can be reviewed once these details are known and which will be informed by the suggested measures below.

Please note, the mitigation measures below do not include for any impact on/from Main Rivers, tidal, canals, reservoirs and flood risk management infrastructure as the flood risk from these sources to and from each development are considered to be low.

Table 1 - Construction Phase Mitigation Table

Flood Risk	Risk to/from the Proposed Development	Mitigation	Station to which mitigation is relevant
Fluvial - Ordinary Watercourse and Land Drainage Systems	To the Proposed Development	• Avoid works within 8 m and 16 m of a non-tidal and tidal influenced Ordinary Watercourse, respectively. • Monitoring of local weather conditions on a daily, weekly and monthly basis and planning works accordingly. Avoidance of work near watercourses and / or land drain during periods of heavy rainfall. If required, work should be stopped in poor weather conditions and when there is a risk of flooding. • Development of an emergency evacuation plan covering the Proposed Development (construction) which includes: – details of the evacuation procedures; – emergency access and egress routes and / or; – an elevated safe refuge point: – subscription to the Environment Agency Flood Warning service (if available); and,	Bedlington Blyth Bebside Newsham Seaton Delaval

		– arrangements for removing vulnerable elements (those containing potentially hazardous materials, electrical equipment and electronic and anything capable of becoming entrained in floodwaters, and those which could create a pollution risk if flooded) from the temporary works area. • CAT scans or GPR surveys on site prior to construction to confirm the presence of Ordinary watercourses.	
	From the Proposed Development	• Avoid the overnight storage of equipment and plant and materials overnight outside of the Proposed Development Red Line Boundary. • Avoidance of stockpiling or storing materials and / or equipment within 8 m and 16 m of a non-tidal and tidal influenced Ordinary Watercourse or 10 m of a land drain. • Avoidance of blocking and / or infilling of an Ordinary Watercourse or land drain. • No changes to existing ground levels within 8 m and 16 m of a non-tidal and tidal influenced Ordinary Watercourse as a result of the temporary works. • The contractor will install a drainage system (either temporarily or in accordance with the approved final drainage system) which will be agreed with the local planning authority and Northumbrian Water. The drainage system will be managed in accordance with the conceptual drainage strategy below or the permanent strategy contained within the Drainage Strategy report depending on whether the temporary or permanent drainage system is installed, respectively.	
Surface Water	To the Proposed Development	• Protecting vulnerable elements within areas at risk of surface water flooding. This can include: – raising vulnerable elements over 300 mm (including those which contain electrical and electronic equipment or those which could create a pollution risk if flooded); or – construction of 300 mm bunds around vulnerable infrastructure. • An evacuation procedure should be developed and applied to all construction works where there is a risk of surface water flooding to the Proposed Development site. • Construction works in areas vulnerable to surface water flooding is advised to only take place when low or no rainfall is forecast. • Avoidance of locations within the temporary works areas which are considered to be at risk from surface water flooding; this should include no storage of contractor equipment or stockpiling of materials. The placement of work cabins, on site offices and welfare facilities should also be avoided within these areas.	Ashington Blyth Bebside Newsham Seaton Delaval Northumberland Park
	From the Proposed Development	• No changes to existing ground levels (excluding those proposed as part of the final design) within areas considered to be at risk of surface water flooding. • Materials which could cause a pollution risk if flooded should not be stored within areas at risk of surface water flooding. • Excavated materials (if applicable) should not be stored as bunds in areas identified as vulnerable to surface water flooding.	

Groundwater	To the Proposed Development	• Below ground elements will be designed in such a way to be resistant to fluvial ingress and will be designed to withstand hydrostatic pressure. • The need for any temporary de-watering of the ground prior should be assessed prior to undertaking any below ground works. • Raising vulnerable elements over 300 mm (including those which contain electrical and electronic equipment).	Ashington Bedlington Blyth Bebside Newsham Seaton Delaval Northumberland Park
	From the Proposed Development	• The lateral extent of the groundwater catchment surrounding the Proposed Development is relatively large and the volume of proposed elements are likely to be minimal. In addition, the Proposed Development is located within a coal-mine dewatering scheme where ground levels are continuously monitored and lowered. As such, the risk from the Proposed Development to groundwater flooding is considered to be low and no mitigation is required.	
Sewer and Water Supply Infrastructure	To the Proposed Development	• Raising vulnerable elements over 300 mm (including those which contain electrical and electronic equipment). • Service Searches of existing asset records • CAT scans or GPR surveys on site prior to excavation to confirm the position of sewer and water supply infrastructure prior to construction. • Where necessary and agreed with the relevant utility operator, trial pits to prove the location, depth, size, material & condition of existing sewer and water supply services. • Infrastructure location marking. • Identify isolation valves for clean water mains to minimise the impacts should a water main fail during construction. • The contractor will install a drainage system (either temporarily or in accordance with the approved final drainage system) which will be agreed with the local planning authority and Northumbrian Water. The drainage system will be managed in accordance with the conceptual drainage strategy below.	Ashington Bedlington Blyth Bebside Newsham Seaton Delaval
	From the Proposed Development	• It is assumed that the contractor will take suitable precautions to avoid damaging this infrastructure during the construction process. This should include preventing uncontrolled discharges to drainage systems during construction.	

Drainage

The Drainage Strategy provides an assessment of the runoff, discharge locations and proposed Sustainable Drainage (SuDS) design, which can be viably and practically achieved for the operational phase. However, temporary construction works will also be undertaken within the site boundary which is not accounted for within the Drainage Strategy. Whilst these works may only be present for a limited period of time during the construction phase, they still have the potential to impact upon both flood risk and water quality and so it is important the risks are identified and mitigated to avoid any short-term impact.

The point of discharge for any construction phase works will be assessed and selected in accordance with the general criteria noted in the Drainage Strategies for the stations, which is cognisant of local and national SuDS guidance. The hierarchy for the choice of discharge point for the construction phase drainage is as follows (in order of priority), although the viable provision of suitable mitigation to achieve water quality criteria and quantity limitations will be a consideration also:

- an adequate soakaway or some other adequate infiltration system; or where that is not reasonably practicable or viable for the protection of groundwater,
- a watercourse; or where that is not reasonably practicable,
- a sewer.

The predominant superficial ground conditions over the majority of the site, based on publicly available data and the intrusive ground investigations which have been undertaken to date, is anticipated to be glacial tills/clays which have limited rates of permeability. It is therefore expected that infiltration drainage as a means of disposing of surface water from the construction phases of the works is unviable. However, this will be assessed on a site by site basis, informed by the ground investigation results and site-specific data/information.

Should infiltration drainage be unsuitable then, following the hierarchy of discharge, an outfall to a watercourse will be considered next. The selection of a suitable watercourse will be based on a combination of determining the closest such feature and the topography surrounding the works area. A primary consideration will be to maintain existing flow routes and catchment contributions such that offsite flood risk is not increased. If discharge to a watercourse cannot be practicably achieved, then a connection to Northumbrian Water (NWL) adopted sewers will be considered. In this instance, consultations will be undertaken with both the LLFA and NWL to determine both a suitable receiving system and a maximum discharge rate which is to be achieved by the works drainage. Where necessary, formal agreements will be lodged with NWL to ensure that the requisite legal permissions are granted.

The peak discharge rate from the construction phase drainage system will be based on The North-East Lead Local Flood Authorities Sustainable Drainage Local Standards (SDLS). Broadly, these standards require a single Q_{BAR} discharge rate from site or rates no more than the 1 in 1 and 1 in 100-year greenfield runoff rate in accordance with Defra Standards. An alternative discharge rate may be stipulated by NWL if a connection to their network is required. The greenfield runoff rate will be calculated using either FEH or IOH124 methods for the whole site, minus unaltered greenfield land.

Provision of suitable drainage infrastructure to serve the construction phase will be dependent on the extent of the temporary working areas and working methods which can be reviewed once these details are known. However, they will seek to achieve the following, cognisant of the extent of mitigation to achieve water quality criteria and quantity limitations for the selected point of discharge (as noted earlier):

- Remove pollutants in surface water
- Retain any silts on site and prevent them discharging to watercourses or drains
- Consider and manage erosion
- Maintain the requisite discharge rates
- Prevent accidental spillage reaching the watercourses, drains and sewers.

The following provisions will be considered where necessary, in order to provide suitable mitigation for discharges, in terms of both water quality and discharge rate:

- New drainage ditches, channels and gullies as required to prevent the uncontrolled discharge of surface water runoff
- Provision of silt traps to reduce the flow of suspended solids from site. This may be achieved through a combination of:
  - Filtration of water/runoff through a suitable filter media (straw bales, stone/sand dams etc)
  - Settlement ponds
  - Check dams in swales/ditches
  - Vegetated swales
  - Below ground sump units and tanks
  - Proprietary treatment systems

- Attenuation such that greenfield runoff rates can be maintained. Any settlement ponds, basins and swales can contribute to this volume provision, for all events up to and including the 1 in 100 year event.
- Appropriate flow controls (to be confirmed at detailed design).

In all cases, the proposed design of the drainage systems for the construction phase will be submitted to the relevant Lead Local Flood Authority (North Tyneside Council, or Northumberland County Council) for approval.

Conclusion

Table 1 provides an overview of potential mitigation measures which can be used to offset the flood risk to and from the development during the construction phase. These mitigation measures should be used for indicative purposes only and it is recommended that prior to construction, a detailed assessment of flood risk to and from the temporary works is undertaken, to ensure that all risks are adequately captured and mitigated.

The drainage chapter provides an overview of the mitigation measures which could be used to achieve the pre-requisites of any drainage system for water quality and discharge rate. It also provides an overview of the processes used to select appropriate points of discharge in accordance with Local and National policy.

Appendix B – Site Layout Plans

PROPOSED EXIT FROM CAR PARK

OUTLINE POSITION FOR NEW ELECTRICAL SUB STATION (BY POWERGRID)

KENILWORTH ROAD

ASHBOURNE CRESCENT

PROPOSED ACCESS TO CAR PARK

CAR PARK CONTAINING 279 SPACES

18 PARKING SPACES WITH ELECTRICAL VEHICLE CHARGING POINTS

CARPARK BOUNDARY FENCE

NEW FOOTWAY TO CONNECT TO FOOTPATH HOSPITAL CROSSING

OAKLAND TERRACE

2 MAINTENANCE VEHICLE SPACES

17 DISABLED PARKING SPACES

EXISTING ELECTRICAL SUB STATION TO BE MOVED

WAR MEMORIAL GARDEN AREA UNAFFECTED BY PROPOSALS

PROPOSED TWO-WAY ACCESS TO EXISTING PARKING

PROPOSED TAXI AND PICK UP/DROP OFF BAYS

CYCLE SHELTER

BOTTOM OF EXISTING ACCESS RAMP FROM WANSBECK SQUARE

POTENTIAL REDEVELOPMENT OF WANSBECK SQUARE AND BUILDINGS AT A FUTURE DATE

EXISTING STORE

EXISTING CAR PARK ACCESS STEPS FROM WANSBECK SQUARE

STATION ROAD

COUNCIL ROAD

WANSBECK SQUARE

OVERBRIDGE BWC 5 (STATION ROAD)

< PLATFORM LINE >

DOWN LINE >

< UP LINE

TO NEWCASTLE

RETAINING WALL

PROPOSED PLATFORM

PLATFORM ACCESS/EGRESS

PLATFORM WAITING SHELTER

PLATFORM ACCESS/EGRESS

DOWN LINE >

< UP LINE

RETAINING WALL

RAILWAY SECURITY FENCING BETWEEN CARPARK AREA AND RAILWAY AND TO REAR OF PLATFORM

FOOTPATH FROM LIFT TO STATION AREA

FOOTBRIDGE

NEW LIFT FROM FOOTBRIDGE TO PLATFORM LEVEL

EXISTING STAIRCASE TO FOOTBRIDGE

JOHN STREET

STATION ROAD

EXISTING BUS STOP

DOWN LINE >

< UP LINE

TO ASHINGTON JNC

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION BOX

IT IS ASSUMED THAT WORKS ON THIS DRAWING WILL BE CARRIED OUT BY A COMPETENT CONTRACTOR WORKING, WHERE APPROPRIATE, TO AN APPROPRIATE METHOD STATEMENT

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Notes

GENERAL NOTES

1. CHAINAGE IS IN METRES.
2. CHAINAGE 0m DATUM IS AT 3117 POINTS TOES ON BENTON NORTH JUNCTION OF THE EAST COAST MAINLINE.
3. PROPOSALS SHOWN ARE BASED ON A WORK IN PROGRESS OUTLINE DESIGNS AND ARE THEREFORE SUBJECT TO CHANGE.

KEY

- CARRIAGEWAY
- FOOTWAY
- FOOTPATH & LIFT
- PLATFORM
- VERGE
- LANDSCAPING
- TACTILE PAVING
- FENCING
- SECURE FENCING
- STREET LIGHTING
- BOLLARD
- EXISTING TREES
- SPECIMEN TREES
- SHRUB PLANTING
- HEDGE
- WILDFLOWER MEADOW
- AMENITY GRASS
- REDLINE BOUNDARY

Issue For Land Boundary	RP	DF	DF	14/05/20	P01
WIP GRIP 4 UPDATE				14/05/20	P02.2
Revision Details	By	Chkd	Appd	Checked Date	Suffix

Purpose of Issue: WIP-S0 SUITABILITY

GRIP Stage: GRIP 4

Client: Northumberland County Council

Project Title: NORTHUMBERLAND LINE

Drawing Title: ASHINGTON PLANNING DRAWING GENERAL ARRANGEMENT LEVEL OPTION

Designed	Drawn	Checked	Approved	Date
D.Foy				
Signed	Signed	Signed	Signed	

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Drawing Number: 60601435-ACM-07-ZZ-DRG-ECV-000002 Rev: P02.2

Plot Date: $DATE$ $TIME$
Username: $USER$
Drawing Name: $FILE$

A1: 594 x 841

Key

Red Line Boundary

STATION ROAD

Station Bridge

Shelter

Council Office

Wansbeck Square

PO

Bank

Council Office

FB

SP

Car Park

Mineral Railway

PH

Dairy House

Car Park

P

Ambleside

Entendale

SOUTH VIEW

Longwell Crescent

PCs

Pavilion

Terraces

Library Garden

Car Park

KENILWORTH ROAD

JOHN STREET

Hall

Greenside

Hillside

Cricket Ground

El Sub Sta

Oakland Terrace

Hatchmeadow

OSP

ASHBOURNE CRESCENT

Rutland

Ordnance Survey

50mm

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Revision Details	By	Chkd	Appd	Checked Date	Suffix
First Issue				08/10/20	P01.1

Purpose of Issue: WIP-S0 SUITABILITY

GRIP Stage: GRIP 4

Client: Northumberland County Council

Project Title

NORTHUMBERLAND LINE

Drawing Title

PLANNING RED LINE ASHINGTON

Designed	Drawn	Checked	Approved	Date
E.Floeser	---	---	---	---
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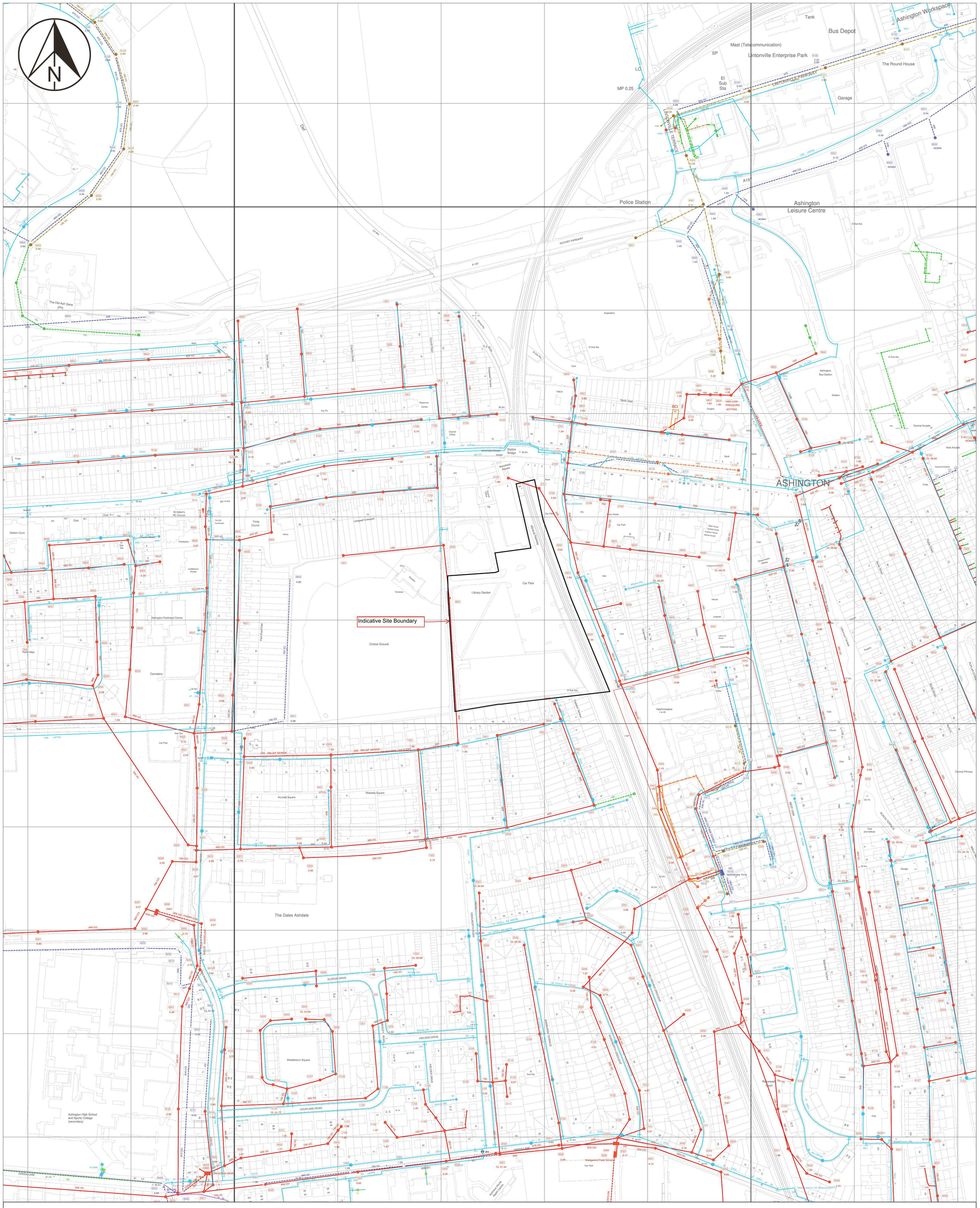
Drawing Number	Rev
60601435-ACM-XX-ZZ-DRG-LEP-000015	P01.1

Plot Date : $DATE$ $TIME$

Username: $USER$
File Name : $FILE$

A3: 297 x 420

Appendix C – Northumbrian Water Drainage Asset Plan



Waste Water - NWL Responsibility		Private/Non NWL		Proposed		Water Network - Network Types			
Combined		Combined		Combined		Distribution		AB Asbestos	
Foul		Foul		Foul		Treated		Abandoned	
Surface		Surface		Surface		Raw		Out of Comm	
Treated Eff		Treated Eff				Fire		Proposed	
Untreated Eff		Trade Eff				Supply			
Overflow		Watercourse				Private			

User : BOWMS

Date : 26/03/2020 10:52:30

Map Sheet : NZ2787NW

Title :

Centre Point : 427247,587617

Paper / Scale : A0@1:1249

10 m

Appendix D - Proposed Drainage Strategy

AECOM Imagine it. Delivered.

Northumberland Line Project

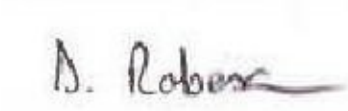
Ashington Station Drainage Strategy

Northumberland County Council

Report Status: FINAL

January 2021

Quality information

Prepared by	Checked by	Verified by	Approved by
			
Dan Hodson Senior Development Infrastructure Engineer	Daniel Roberson Principal Consultant	Steve Dickie Regional Director	Matthew Smedley Associate

Revision History

Revision	Revision date	Details	Authorized	Name	Position
D01	18/12/2020	Draft Issue		Steve Dickie	Regional Director
F01	08/01/2021	Final Issue		Steve Dickie	Regional Director

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Table of Contents

Figures

Tables

1. Introduction

AECOM has been commissioned by Northumberland County Council (NCC) to produce a Drainage Strategy in support of a planning application for a Proposed Development associated with the upgrade of an existing freight railway to accommodate passenger use, referred to as the Northumberland Line. The Proposed Development comprises a new railway station platform and associated car parking and access road, parallel to the existing track alignment at Ashington.

The works will support the re-establishment of the Northumberland Line as an operational passenger line, which extends approximately 23.5 kilometres (km), from Northumberland Park to Ashington. To facilitate these works, a total of 6No. new stations are proposed along the Northumberland Line, which are divided between two administrative areas; North Tyneside Council (NTC) and NCC. This Drainage Strategy focuses on the new station proposed at Ashington only.

This Drainage Strategy assesses the site's current runoff, discharge locations, sets out the principles of the proposed Sustainable Drainage (SuDS) design, inclusive of interception, water quality and maintenance requirements.

2. Site Description

2.1 Existing Site

The proposed development is located east of Kenilworth Road, immediately south of Wansbeck Square in Ashington town centre, Northumberland. It is approximately 23km north-east of Newcastle upon Tyne and has National Grid Reference (NGR) NZ272875, with the nearest Post Code being NE63 0SE.

The site is bounded by Kenilworth Road to the west, the existing railway line to the east, the Wansbeck Square retail area to the north and the residential properties of Ashbourne Crescent to the south.

The parcel of land which will be developed as a station car park is relatively flat, with a gradual fall to the south. Levels range from approximately 35m AOD in the far north of the site, to 34m AOD at the southern boundary.

Currently, the site comprises amenity grassland to the west, a surface level car park to the east and scrubland to the south, previously occupied by a care home.

2.2 Proposed Development

The Proposed Development will involve the construction of the following main infrastructure;

- Access road and footpaths;
- Car parking, including electric vehicle charging infrastructure;
- Railway Platform;
- Landscaping works.

A site layout plan is included in Annex A.

3. Planning Policy

The aim of this section of the report is to introduce the main aspects of the national and local planning policies that are relevant to the Proposed Development in terms of drainage.

3.1 National Policy

National Planning Policy Framework (2019)

With regards to drainage strategy requirements, the National Planning Policy Framework (NPPF) states;

> *163. Development should only be allowed in areas at risk of flooding where, in the light of this assessment (and the sequential and exception tests, as applicable) it can be demonstrated that:*
>
> *c)it incorporates sustainable drainage systems, unless there is clear evidence that this would be inappropriate;*
>
> *165. Major developments should incorporate sustainable drainage systems unless there is clear evidence that this would be inappropriate. The systems used should:*
>
> *a) take account of advice from the lead local flood authority;*
>
> *b) have appropriate proposed minimum operational standards;*
>
> *c) have maintenance arrangements in place to ensure an acceptable standard of operation for the lifetime of the development; and*
>
> *d) where possible, provide multifunctional benefits.*

3.2 Regional and Local Policy

The Northumberland Local Flood Risk Management Strategy (2015)

The Northumberland Local Flood Risk Management Strategy (LFRMS) document set out the initial planning requirements with regards to drainage strategy and use of SUDS in the county, however it should be noted that this predates the specific Local Sustainable Drainage Standards. The LFRMS identified a number of local objectives for managing local flood risk in Northumberland, Objective 2 being to "*Promote sustainable development to reduce local flood risk with consideration to the anticipated impact of climate change*". In order to achieve these objectives are a number of measures, one of which is specific to drainage within Northumberland;

> *Measure 2.2*
>
> *Ensure appropriate and adequate sustainable drainage solutions are included in all new developments.*
>
> - *Continue to promote awareness of flood risk implications and the use of SuDS in planning decision making;*
> - *Approve, adopt and maintain SuDS, in line with statutory requirements and arrangements set out in the local SuDS guidance and where the criteria for adoption is met;*
> - *Work in partnership with Northumbrian Water to understand existing capacity of sewage treatment works and sewerage systems to ensure that new development does not increase surface water flooding as a consequence of capacities being exceeded; and*
>
> *At present we do not have a formal position or guidance on the use of SuDS within Northumberland. However, we strongly encourage their use throughout any new development in Northumberland. We have been pursuing setting the policy for the use of SuDS within the emerging Core Strategy and within Neighbourhood Plans.*
>
> *We will consider adopting and maintaining certain SuDS features on a case-by-case basis. However in all instances the features must be constructed to best practice guidance and we will require an agreed funding mechanism to be in place to ensure the on-going maintenance.*
>
> *On the 6th April 2015 Northumberland County Council, as the Lead Local Flood Authority, became a statutory consultee for major planning applications with surface water implications.*

Major development will be:

- *Residential Development: 10 dwellings or more or residential development with a site area of 0.5 hectares or more where the number of dwellings is not yet known.*
- *Non Residential Development: Provision of a building or buildings where the total floor space to be created is 1000 square metres or more or where the floor area is not yet known, a site area of 1 hectare or more*

Therefore any major development that is submitted will require a Drainage Statement or an extended section within its Flood Risk Assessment looking at the disposal of surface water from the development. Any new major development that is submitted to Northumberland County Council will need to incorporate SuDS within its design and to adhere to National Standards and local guidance.

North-East Lead Local Flood Authorities Sustainable Drainage Local Standards (2020)

The North-East Lead Local Flood Authorities Sustainable Drainage Local Standards (SDLS) were introduced in 2020 in collaboration between the seven LLFA's in the north east region. The 7 North East LLFAs have agreed a total of 22 regional drainage standards to ensure consistency when reviewing planning applications within the north east region.

Of the 22 local standards, the following 12 are relevant and directly applicable to the development;

Local Standard 1 – Equivalent Greenfield Run-Off (GFRO) discharge rates should be provided for new development at all site's (Greenfield and Brownfield).

Local Standard 2 – The NE LLFA accept either FEH or IOH124 methods for calculating GFRO rates.

Local Standard 3 – For calculating GFRO rate the whole site area minus significant areas of public open space should be used.

Local Standard 4 – The NE LLFA will set allowable discharge rates following Local Standards 1-3, unless the permissible discharge rate Northumbrian Water will allow to sewer is below GFRO rates.

Local Standard 6 – The NE LLFA will accept a single Qbar discharge rate from site or rates no more than the 1 in 1 and 1 in 100-year GFRO in accordance with Defra Standards.

Local Standard 8 – Storm events should be checked as a minimum between 15 minutes and 360 minutes.

Local Standard 9 - Climate change allowances to be applied are 40% on the extreme event modelling (100 year return period)

Local Standard 15 – A site specific maintenance plan will be required to detail how SuDS will be maintained and who will maintain them.

Local Standard 17- The NE LLFA consider SuDS to be on the surface "green SuDS" that show multifunctional benefit (including quantity control, water quality, biodiversity and amenity) and mimic natural drainage in line with the NPPF and FWMA definitions

Local Standard 20 - Source control interception (retaining 5mm rainfall on site) should be applied for the impermeable area of all site's using the CIRIA SuDS manual method.

Local Standard 22 - Water quality information should be assessed using criteria in the current CIRIA SuDS manual

4. Discharge Location

The Building Regulations Part H sets out a hierarchy for the choice of discharge point for a rainwater system. In order of priority, the options are given as:

- an adequate soakaway or some other adequate infiltration system; or where that is not reasonably practicable,
- a watercourse; or where that is not reasonably practicable,
- a sewer.

The first option for the point of discharge for a surface water network is via infiltration. Therefore, a review of the Soilscapes website was undertaken to determine the suitability of the underlying ground conditions to support an infiltration drainage system. It indicates that the superficial deposits are '*Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils*'. Appendix C of Northumberland County Council's Strategic Flood Risk Assessment Level 1 provides an overview of SuDS applicability in the region, the area in and around Ashington is marked as '*Attenuation Systems – area above potentially vulnerable aquifer'* and is therefore marked as unsuitable for infiltration.

Furthermore, the British Geological Survey (BGS) hold records for a number of historic borehole records both within, and in very close proximity to, the site. Those borehole logs which are within the site all support the summary given on the Soilscapes website, in that the underlying material, at depths between 3.7m and 4.4m below ground level, is exclusively clay material. Additionally, the initial phases of the ongoing intrusive ground investigation indicate that the site is underlain predominantly by clay. However, the full results of these works will confirm the predominant ground conditions at the site, such that the suitability for infiltration drainage can be determined. Consequently, based on the information currently available which are all consistent in their findings, the potential for infiltration drainage as a means of disposing of surface water from the site, has been discounted.

Following the Building Regulation hierarchy, discharge into the nearest watercourse has been considered next. The closest watercourse with Main River status is the River Wansbeck which is located approximately 1.4km south of the site. The nearest Ordinary Watercourses to the proposed development include two tributaries of Blackclose Dean, and are situated approximately 900m and 950m south west of the Proposed Development. Both watercourses flow in a south westerly direction away from the Proposed Development, before discharging into the River Wansbeck. A direct outfall to either the River Wansbeck or the Blackclose Dene has been discounted since it would require the construction of a new surface water drain beneath a number of adopted highways and third-party land over the majority of its' 1km to 1.4km route, and so is considered to be impracticable.

As infiltration and nearby watercourses are unsuitable for receiving runoff from the Proposed Development, the remaining option, in accordance with the Building Regulations hierarchy, is to discharge to a sewer. The nearest Northumbrian Water Limited (NWL) adopted sewer is a 225mm diameter combined sewer, flowing southwards, immediately adjacent to the site in Kenilworth Road. A Pre-Planning Enquiry had been submitted to NWL who have agreed in principle with the proposal to connect to the adopted combined sewer in Kenilworth Road (refer to Annex F).

5. Surface Water Drainage

5.1 Selection of SuDS

Considering the proposed site layout, which needs to provide a set number of car parking spaces, together with the site's expected ground conditions, the following SuDS techniques were considered and selected or discounted.

Additionally, during a meeting on 29th May 2020, Northumberland County Council's Highways Department and Senior Sustainable Drainage Officer, input to the selection of appropriate SuDS. The minutes of this meeting are included in Annex E.

Table 1. Selection of SuDS techniques

SuDS Type	Utilised on site	Reason why included or discounted
Rainwater Harvesting	X	No habitable buildings are proposed where harvested water could be reused for flushing toilets etc.
Green Roof	X	No significant buildings which could include large areas of roof are included/proposed.
Infiltration Systems	X	Ground conditions are expected to preclude use of infiltration. Refer to minutes of meeting in Annex E.
Proprietary Treatment System	√	Most practicable method of achieving suitable levels of treatment given site constraints.
Filter Strips	X	Discounted due to spatial constraints and NCC Highways preference for conventional road gullies. Refer to minutes of meeting in Annex E.
Filter Drains	X	Discounted due to spatial constraints and NCC Highways preference for conventional road gullies. Refer to minutes of meeting in Annex E.
Swales	X	Discounted due to site spatial constraints.
Bioretention Systems	X	Discounted due to site spatial constraints.
Trees	X	Raised kerbing required around landscaping and lack of infiltration prevents use of tree pits for drainage.
Pervious pavements	X	Pervious pavements not considered as it was discounted NCC Highways. Refer to minutes of meeting in Annex E.
Attenuation Storage Tanks	√	Most viable way of achieving attenuation as permeable paving is discounted by NCC and spatial constraints restrict other SuDS options.
Detention Basin	X	Discounted due to site spatial constraints.
Ponds and Wetlands	X	Due to site space and level constraints ponds and wetland excluded in favour of detention basin

Source: CIRIA SuDS Manual C753

5.2 Greenfield Runoff Rates

The ICP SuDS function in the Micro Drainage software has been used to calculate the Greenfield Runoff (GFRO) rate. This is based on the method given in Chapter 6 of the Interim Code of Practice (ICP) for Sustainable Drainage Systems and uses the recognised Institute of Hydrology (IOH) 124 calculation which establishes rates for sites or catchments of 50ha or greater but adjusted pro-rata by area for specific sites of less than 50ha, as recommended by the CIRIA SuDS Manual, Section 24.3.2 (Flood Estimation for Small Catchments). The Greenfield Runoff calculations are included in Annex B and are summarised in Table 1.

As required by the SDLS Local Standard 3, the area used for the assessment of the GFRO is 1.657ha, which is the whole site area minus significant areas of public open space.

Table 2. GFRO rates for site

Probability	GRFO (l/s/ha)	GRFO for 1.657ha (l/s)
Q_{BAR}	4.3	7.1
Q1 YEAR	3.7	6.1
Q30 YEAR	7.6	12.6
Q100 YEAR	8.9	14.7

5.3 Proposed Surface Water Drainage

Reference should be made to drawing number 60601435/ACM/07/ZZ/DRG/EHW/070006 included in Annex C.

In order to comply with Local Standards 1, 2, 3, 4 and 6, the site has been designed to discharge at a singular Q_{BAR} GFRO rate, this is presented in Table 3 below. The site discharges via a singular vortex flow control device, set to achieve the Q_{BAR} GFRO rate. Local Standard 8 and 9 have been satisfied by modelling using the Micro Drainage software for storm events between 15 and 360 minutes duration with a 40% allowance for climate change applied to the 1 in 100 year storm. The Micro Drainage simulation outputs for the outline drainage design are included in Annex D.

Table 3. GFRO and maximum discharge rate

Probability	GRFO for 1.657ha (l/s)	Maximum discharge rate achieved
Q_{BAR}	7.1	5.2
Q1 YEAR	6.1	4.6
Q30 YEAR	12.6	6.5
Q100 YEAR	14.7	6.6

The proposals allow for a significant betterment in the peak runoff rates for events above the 1 in 1 year event and flow rates for these events, as shown by the 1 in 30 year and 1 in 100 year events in Table 3, are being maintained at the Q_{BAR} rate. The Micro Drainage simulation results in Annex D show the discharge rates being limited to values at, or near to, the Q_{BAR} rate.

Local Standard 8, in addition to specifying the storm events which should be considered, also requires there to be consideration of runoff volume, (in addition to runoff rates) such that it is no greater than the existing GRFO equivalent. As noted in the CIRIA SuDS Manual C753 Chapter 24.10, the difference in runoff volume between the post-development state and the equivalent greenfield (pre-development) state is termed Long Term Storage. It is this volume which should be controlled so that it discharges at very low rates, such that it will have negligible effects on downstream flood risk.

As noted in Section 5, the opportunities for this volume to be discharged via infiltration are severely limited due to the impermeable ground conditions beneath the site. Therefore, the extra volume which would be generated by the development has to be discharged via the drainage network. As noted in the CIRIA SuDS Manual C753:

> "*An alternative approach to managing extra runoff volumes from extreme events…is to release all runoff (above the 1 year event) from the site at a maximum rate of 2l/s/ha or QBAR, whichever is the higher value. This avoids the need to undertake more detailed calculations and modelling*".

The higher Q_{BAR} rate has been chosen for this development based in the permeability of the ground conditions which would produce greater volumes of runoff when compared to more freely draining geology.

Furthermore, it is stated in C753 that:

> *"A discharge limit of 2l/s/ha (or QBAR, which allows for higher discharge rates for specific soil types) has generally been accepted as an appropriate industry standard in the UK".*

Therefore, by providing Long Term Storage, such that peak discharges can be limited to the Q_{BAR} rate for all events up to and including the 1 in 100 year 360 minute rainfall event (with a 40% allowance for climate change), the volumetric requirements required by Local Standard 8 have been satisfied. The scheme will thus be effective in at retaining sufficient water on the site to prevent an increase in flood risk in the receiving catchment.

The overarching drainage strategy is to drain each section of car park to a network of conventional road gullies which are connected to an underground piped drainage network. This overriding strategy is utilised throughout the car park, with the exception of a small area to the north east of the car park which drains to a linear drainage channel which also connects to the same below ground network. Attenuation is provided by a below ground geocellular tank situated to the west of the car park. The volume of attenuation provided ensures that for all events simulated, there is no flooding at surface level within the car park, as illustrated within the hydraulic modelling simulation results including with Appendix D.

Local Standard 17 states that the LLFA would consider SuDS to be on the surface "green SuDS" that show multifunctional benefit (including quantity control, water quality, biodiversity and amenity) and mimic natural drainage in line with the NPPF. As summarised in Section 5.1, the opportunities for the provision of green SuDS at this site is very limited. The requirement to provide a set number of car parking spaces within the developable footprint of the site leaves minimal areas of green open space in which such features like swales, ponds, basins and filter strips could practicably be accommodated.

In such instances, the provision of permeable paving would typically be considered. It simultaneously allows for the treatment of contaminated runoff, provides attenuation and flow control 'at source' and even in instances where the ground conditions do not permit infiltration (as in this case) can still provide interception storage for the first 5mm of rainfall (as required by Local Standard 20). However, as noted in Section 5.1, and recorded in the minutes of the meeting on 29th May 2020 with NCC (Appendix E), the use of permeable paving is to be avoided due to concerns NCC have over the potential for elevated ground water and the long term serviceability in a car park environment. Therefore, the proposed solution of a conventional road gully and pipe network, with attenuation volume provided by geocellular tanks, is considered the most viable option at this site.

All new conventional piped surface water drainage for the development will be designed and installed in accordance with the following British standards and codes of practice and building control documents.

- BS EN 752 – Drain and Sewer Systems Outside Buildings
- Building Regulations Part H – Drainage and waste disposal

5.4 Proposed Foul Drainage

As there are no buildings included in the station design, no foul water drainage is required.

5.5 Source Control Interception

Local Standard 20 requires that source control interception should be applied for the impermeable area of the development such that the first 5mm of rainfall be retained within the site. This can typically be provided through the use of suitable 'green SuDS' methods such as filter strips, swales, bio-retention and basins. However, as noted in Section 5.2, it is not practicable to provide such features at this site due to the severe spatial restrictions of the proposals.

The most viable alternative SuDS solution which could have been deployed to achieve this requirement is the adoption of permeable paving across the vast majority of the car park surface. However, on the basis that NCC had requested such features not be used within the proposals, there are no viable alternative ways that this requirement can be met. Although, it should be noted that the discharges from this development are being received by an NWL adopted combined sewer, as per the existing 'pre-development' scenario. This is not a sensitive receptor from a water quality perspective and the provision of flow control to the Q_{BAR} rate for all events up to and including the 1 in 100 year event inclusive of climate change, addresses the discharge volume requirements in line with CIRIA C753.

5.6 Water Quality

Using the simple index approach to water quality as per Table 26.2 of CIRIA C573 (Figure 1) the site can be considered to have a 'low' pollution hazard level as it would be considered to be non-residential car parking with infrequent traffic change.

TABLE 26.2 Pollution hazard indices for different land use classifications

Land use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydro-carbons
Residential roofs	Very low	0.2	0.2	0.05
Other roofs (typically commercial/ industrial roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach from the roof)	0.05
Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie < 300 traffic movements/day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (eg hospitals, retail), all roads except low traffic roads and trunk roads/motorways[1]	Medium	0.7	0.6	0.7
Sites with heavy pollution (eg haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways[1]	High	0.8[2]	0.8[2]	0.9[2]

Figure 1. Extract from CIRIA C753

Referring to Table 26.3 of CIRIA C573 (Figure 2) the proposed treatment is via the provision of a Class 1 Bypass Separator, which is considered a proprietary treatment system. Therefore, it must demonstrate that it can address each of the contaminant types to acceptable levels for frequent events up to the 1 in 1 year return period event, for inflow concentrations relevant to the contributing drainage area. It should be remembered that the proposed development is discharging to an adopted combined sewer and therefore all flows would be discharged to the water environment via a wastewater treatment works, operated by the sewerage company, which will treat all effluent to agreed and regulated standards.

The provision of a Class 1 bypass separator will ensure that gross amounts of oil and large size suspended solids are removed the water prior to being received by the NWL adopted sewer. The Class 1 designation will ensure that the treated effluent would contain 5mg/l hydrocarbon content up to a pre-determined flow rate. Being a bypass separator, all flows beyond this rate by will be bypassed to the receiving drainage system. The flow rates which the separator will be designed to provide the requisite treatment for, will be defined by the area it required to treat, which in this case is 1.657ha. The specific manufacturer and model of system will be determined at the detailed design stage, however, there are multiple systems available which can be provided 'off the shelf' to satisfy the levels of treatment required at this site.

Consequently, Local Policy 22 is satisfied, as there are systems proposed for this site which provide sufficient mitigation for the pollution hazard level, bearing in mind the sensitivity of the receiving network.

TABLE 26.3 Indicative SuDS mitigation indices for discharges to surface waters

	Mitigation indices[1]		
Type of SuDS component	**TSS**	**Metals**	**Hydrocarbons**
Filter strip	0.4	0.4	0.5
Filter drain	0.4[2]	0.4	0.4
Swale	0.5	0.6	0.6
Bioretention system	0.8	0.8	0.8
Permeable pavement	0.7	0.6	0.7
Detention basin	0.5	0.5	0.6
Pond[4]	0.7[3]	0.7	0.5
Wetland	0.8[3]	0.8	0.8
Proprietary treatment systems[5,6]	These must demonstrate that they can address each of the contaminant types to acceptable levels for frequent events up to approximately the 1 in 1 year return period event, for inflow concentrations relevant to the contributing drainage area		

Figure 2. Extract from CIRIA c753

5.7 Maintenance

The maintenance arrangement that should be implemented initially, following completion of the development, has been set in accordance with the recommendations of the CIRIA SuDS Manual C753. It should be noted that this guide is intended as a starting point and observations from ongoing site inspection records should inform the continuing and long-term maintenance regime. It will be the responsibility of Northumberland County Council, as asset owner/operator of the car park and Network Rail as owner for the platform/station infrastructure, to update and maintain maintenance records and arrangements for their respective drainage assets.

As the proposed drainage network serving the car park will also receive flows from the station platform, which will be owned and operated by Network Rail, these maintenance activities will also help to ensure the serviceability and function of their network.

The maintenance has been arranged into three categories that comprise of;

- Regular maintenance – monthly routine maintenance such as litter collection, grass cutting and checking the side slopes, inlets and outlets where water enters or leaves a SuDS feature
- Occasional maintenance - managing vegetation and removing any silt that builds up in the SuDS features over time
- Remedial work - repairing damage as necessary

Tables 4 and 5 summarise the maintenance requirements for the two primary SuDS features which are being proposed, i.e. swales and attenuation basins respectively.

Table 4. Operation and maintenance requirements for attenuation storage tanks

Maintenance Schedule	Required Action	Typical frequency
Regular maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action	Monthly for 3 months, then annually
Regular maintenance	Remove debris from the catchment surface (where it may cause risks to performance)	Monthly
Regular maintenance	Remove silt from silt traps	Annually, or as required
Remedial actions	Repair inlet/outlet and vent pipes	As required following inspection
Monitoring	Inspect/check all outlets and vents to ensure they are in good condition and operating as designed	Annually
Monitoring	CCTV survey inside for sediment build up and remove if necessary	Every 5 years or as required

Source: CIRIA C753

Table 5. Operation and maintenance requirements for proprietary treatment systems (bypass separator)

Maintenance Schedule	Required Action	Typical frequency
Regular maintenance	Remove litter and debris and inspect for sediment, oil and grease accumulation.	Six monthly
Regular maintenance	Change the filter media (if fitted)	As recommended by the system manufacturer or as required according to site conditions.
Regular maintenance	Remove sediment, oil grease and floatables.	As necessary – this will be indicated by system inspections.
Remedial actions	Replace malfunctioning parts or structures, make good any damaged components.	As required following inspection
Monitoring	Inspect for evidence of poor operation	Six monthly
Monitoring	Inspect filter media (if fitted) and establish appropriate replacement frequencies.	Six monthly or as required.
Monitoring	Inspect sediment accumulation rates and establish appropriate removal frequencies	Monthly during the first six months of operation, then every six months.

Source: CIRIA C753

6. Conclusion

This Drainage Strategy has been developed in accordance with the Building Regulations hierarchy, the National Planning Policy Framework, the North-East Lead Local Flood Authorities Sustainable Drainage Local Standards (SDLS), CIRIA guidelines and guidance from appropriate local planning documents.

National standards, as set out at paragraphs 163 and 165 of the NPPF, have been achieved by following local standards, where these can practicably be achieved, providing initial maintenance schedules and achieving minimum operational standards.

All relevant local policies contained within the SDLS can be considered to be achieved where practicable, and consequently, the LFRMP requirements are satisfied. Local Standards 1, 2, 3, 4 and 6 have been achieved, whereas 17, 20 and 22 have been discussed, with NCC's Senior SuDS Officer, such that a justification is provided as to why they cannot be reasonably or practicable achieved at this site. Local Standards 8, 9 and 15 have been discussed at this outline design stage such that it provides comfort that they could be viably achieved at the detailed design stage. With reference to Local Standard 15, a site specific maintenance plan, based on the schedules and activities discussed in Section 5.7 of this report, will be submitted to NCC for approval in advance of construction on site.

The recommendations and conclusions in this Drainage Strategy provide an approach compliant with NCC, NPPF, SDLS and CIRIA requirements and guidance. Consequently, it is recommended that planning permission could be granted subject to a condition that NCC approve the detailed drainage of the scheme, which will be undertaken in accordance with the methodology and philosophy outlined in this Drainage Strategy.

Annex A - Site Location Plan

PROPOSED EXIT FROM CAR PARK

OUTLINE POSITION FOR NEW ELECTRICAL SUB STATION (BY POWERGRID)

KENILWORTH ROAD

ASHBOURNE CRESCENT

PROPOSED ACCESS TO CAR PARK

CAR PARK CONTAINING 279 SPACES

18 PARKING SPACES WITH ELECTRICAL VEHICLE CHARGING POINTS

CARPARK BOUNDARY FENCE

NEW FOOTWAY TO CONNECT TO FOOTPATH HOSPITAL CROSSING

OAKLAND TERRACE

2 MAINTENANCE VEHICLE SPACES

17 DISABLED PARKING SPACES

EXISTING ELECTRICAL SUB STATION TO BE MOVED

WAR MEMORIAL GARDEN AREA UNAFFECTED BY PROPOSALS

PROPOSED TWO-WAY ACCESS TO EXISTING PARKING

PROPOSED TAXI AND PICK UP/DROP OFF BAYS

CYCLE SHELTER

BOTTOM OF EXISTING ACCESS RAMP FROM WANSBECK SQUARE

POTENTIAL REDEVELOPMENT OF WANSBECK SQUARE AND BUILDINGS AT A FUTURE DATE

EXISTING STORE

EXISTING CAR PARK ACCESS STEPS FROM WANSBECK SQUARE

STATION ROAD

COUNCIL ROAD

WANSBECK SQUARE

OVERBRIDGE BWC 5 (STATION ROAD)

< PLATFORM LINE >

DOWN LINE >

< UP LINE

TO NEWCASTLE

RETAINING WALL

PROPOSED PLATFORM

PLATFORM ACCESS/EGRESS

PLATFORM WAITING SHELTER

PLATFORM ACCESS/EGRESS

DOWN LINE >

< UP LINE

RETAINING WALL

RAILWAY SECURITY FENCING BETWEEN CARPARK AREA AND RAILWAY AND TO REAR OF PLATFORM

FOOTPATH FROM LIFT TO STATION AREA

FOOTBRIDGE

NEW LIFT FROM FOOTBRIDGE TO PLATFORM LEVEL

EXISTING STAIRCASE TO FOOTBRIDGE

JOHN STREET

STATION ROAD

EXISTING BUS STOP

DOWN LINE >

< UP LINE

TO ASHINGTON JNC

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Notes

GENERAL NOTES

1. CHAINAGE IS IN METRES.
2. CHAINAGE 0m DATUM IS AT 3117 POINTS TOES ON BENTON NORTH JUNCTION OF THE EAST COAST MAINLINE.
3. PROPOSALS SHOWN ARE BASED ON A WORK IN PROGRESS OUTLINE DESIGNS AND ARE THEREFORE SUBJECT TO CHANGE.

KEY

- CARRIAGEWAY
- FOOTWAY
- FOOTPATH & LIFT
- PLATFORM
- VERGE
- LANDSCAPING
- TACTILE PAVING
- FENCING
- SECURE FENCING
- STREET LIGHTING
- BOLLARD
- EXISTING TREES
- SPECIMEN TREES
- SHRUB PLANTING
- HEDGE
- WILDFLOWER MEADOW
- AMENITY GRASS
- REDLINE BOUNDARY

Issue For Land Boundary	RP	DF	DF	14/05/20	P01
WIP GRIP 4 UPDATE				14/05/20	P02.2
Revision Details	By	Chkd	Appd	Checked Date	Suffix

Purpose of Issue: WIP-S0 SUITABILITY

GRIP Stage: GRIP 4

Client: Northumberland County Council

Project Title: NORTHUMBERLAND LINE

Drawing Title: ASHINGTON PLANNING DRAWING GENERAL ARRANGEMENT LEVEL OPTION

Designed	Drawn	Checked	Approved	Date
D.Foy				
Signed	Signed	Signed	Signed	

Suitability	AECOM Internal Project No.	Engineering Manager
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Drawing Number: 60601435-ACM-07-ZZ-DRG-ECV-000002 Rev: P02.2

Plot Date: $DATE$ $TIME$
Username: $USER$
Drawing Name: $FILE$

A1: 594 x 841

Key

Red Line Boundary

STATION ROAD

Station Bridge

Shelter

Council Office

Wansbeck Square

PO

Bank

Council Office

FB

SP

Car Park

Mineral Railway

PH

Dairy House

Car Park

P

Ambleside

Entendale

SOUTH VIEW

Longwell Crescent

PCs

Pavilion

Terraces

Library Garden

Car Park

KENILWORTH ROAD

JOHN STREET

Hall

Greenside

Hillside

Cricket Ground

El Sub Sta

Oakland Terrace

Hatchmeadow

OSP

ASHBOURNE CRESCENT

Rutland

Ordnance Survey

50mm

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Revision Details	By	Chkd	Appd	Checked Date	Suffix
First Issue				08/10/20	P01.1

Purpose of Issue: WIP-S0 SUITABILITY

GRIP Stage: GRIP 4

Client: Northumberland County Council

Project Title

NORTHUMBERLAND LINE

Drawing Title

PLANNING RED LINE ASHINGTON

Designed	Drawn	Checked	Approved	Date
E.Floeser	---	---	---	---
Signed	Signed	Signed	Signed	

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60601435-ACM-XX-ZZ-DRG-LEP-000015	P01.1

Plot Date : $DATE$ $TIME$

Username: $USER$
File Name : $FILE$

A3: 297 x 420

Annex B - Greenfield Runoff Rates

ICP SUDS Mean Annual Flood

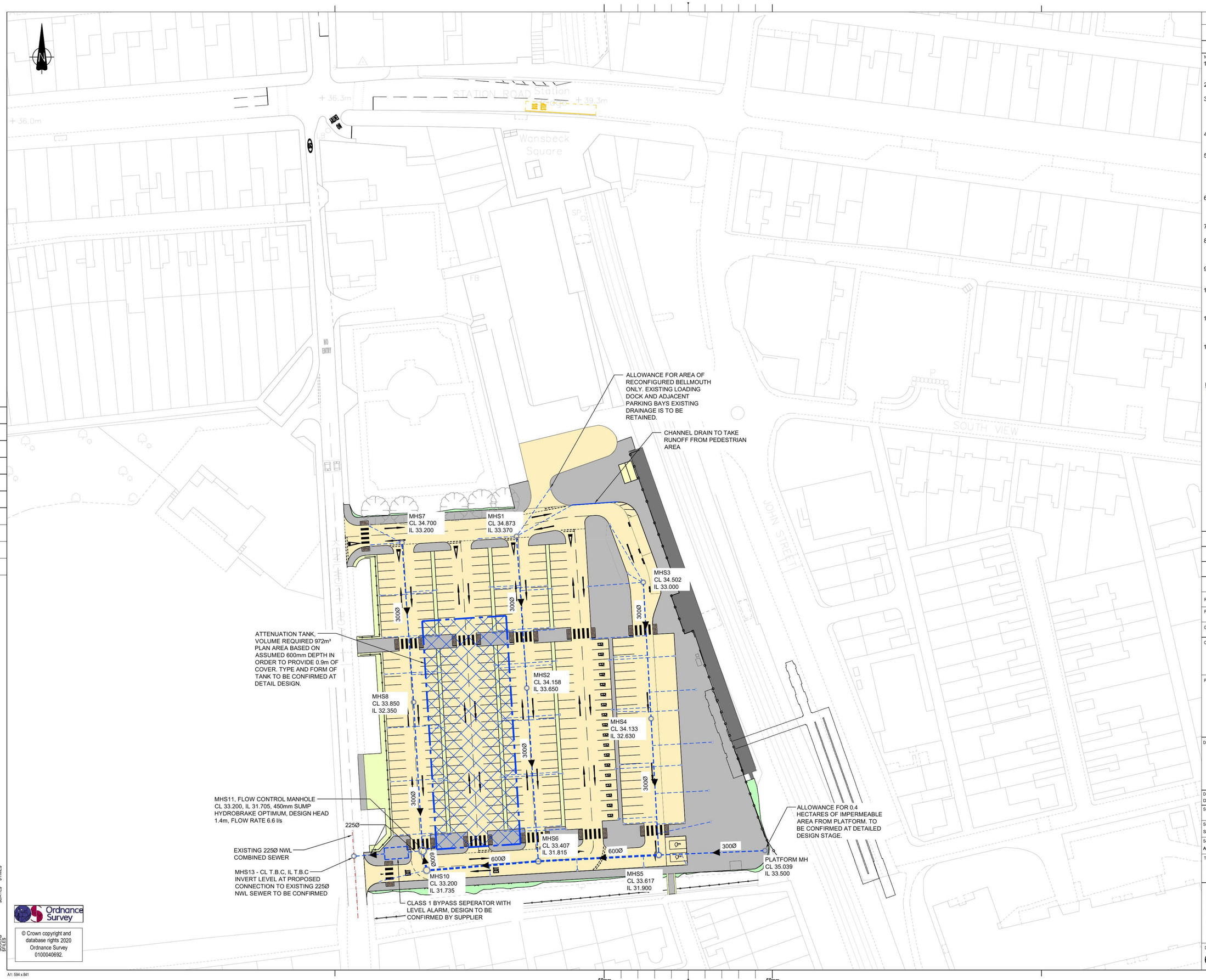
Input

Return Period (years)	100	Soil	0.450
Area (ha)	1.000	Urban	0.000
SAAR (mm)	687	Region Number	Region 3

Results l/s

QBAR Rural	4.3
QBAR Urban	4.3
Q100 years	8.9
Q1 year	3.7
Q30 years	7.6
Q100 years	8.9

Annex C - Drainage Strategy Drawing


SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION BOX
IT IS ASSUMED THAT WORKS ON THIS DRAWING WILL BE CARRIED OUT BY A COMPETENT CONTRACTOR WORKING, WHERE APPROPRIATE, TO AN APPROPRIATE METHOD STATEMENT
THIS DRAWING IS TO BE USED ONLY FOR THE PURPOSE OF ISSUE THAT IT WAS ISSUED FOR AND IS SUBJECT TO AMENDMENT
Notes
1. DO NOT SCALE THIS DRAWING ON PRINT OR ELECTRONICALLY. WORK FROM FIGURED DIMENSIONS ONLY.
2. ALL DIMENSIONS SHOWN ARE IN METRES UNLESS OTHERWISE NOTED.
3. ALL WORK SHALL BE IN ACCORDANCE WITH THE RELEVANT SPECIFICATIONS ISSUED BY AECOM, BRITISH STANDARD CODES OF PRACTICE, STATUTORY REQUIREMENTS AND THE CONTRACT DOCUMENTS.
4. ALL WORKS CARRIED OUT ON THE HIGHWAY MUST BE IN ACCORDANCE WITH CL 117 OF THE SPECIFICATION FOR HIGHWAY WORKS (SHW).
5. PRIOR TO COMMENCEMENT OF WORKS, THE CONTRACTOR IS RESPONSIBLE FOR LOCATING AND PROTECTING ALL EXISTING SERVICES. THE CONTRACTOR IS RESPONSIBLE FOR PROTECTING ALL PIPEWORK AT ALL STAGES OF CONSTRUCTION.
6. ALL EXISTING SERVICES SHALL BE LOCATED BY THE CONTRACTOR. LOCATIONS AND DEPTHS SHALL BE CLEARLY IDENTIFIED PRIOR TO COMMENCING DRAINAGE WORKS.
7. ALL PIPE RUNS SHALL BE LAID IN STRAIGHT LINES WITH LEVEL SOFFITS UNLESS NOTED OTHERWISE.
8. THIS DESIGN IS AN OUTLINE DESIGN INTENDED FOR PLANNING USE ONLY. NOT TO BE USED FOR CONSTRUCTION OR TENDER AND IS STRICTLY SUBJECT TO DETAILED DESIGN AND AGREEMENT.
9. FOR DETAILS OF DESIGN PHILOSOPHY, REFER TO CORRESPONDING AECOM SURFACE WATER DRAINAGE STRATEGY REPORT.
10. DESIGN SUBJECT TO AGREEMENT BY THE RELEVANT AUTHORITY TO THE PROPOSED OFFSITE CONNECTION LOCATION AND DISCHARGE RATE, ALL OF WHICH IS TO BE AGREED.
11. DESIGN SUBJECT TO THE RESULTS OF AN INTRUSIVE GROUND INVESTIGATION TOGETHER WITH THE RESULTS OF ANY GROUNDWATER MONITORING RESULTS.
12. DESIGN OF ATTENUATION TANK SUBJECT TO SYSTEM CHOSEN AND THE INSTALLATION DESIGN AND ADVICE OF THE MANUFACTURER. SUITABLE ACCESS FOR MAINTENANCE AND INSPECTION TO BE PROVIDED.
LEGEND
SURFACE WATER SEWER
SURFACE WATER MANHOLE
FLOW DIRECTION
ROAD GULLY
STATION ROAD
Station
Wansbeck Square
KIRKHAM HOUSE
JOHN STREET
SOUTH VIEW
ALMES IN
NO ENTRY
+ 36.3m
+ 36.0m
+ 39.3m
ALLOWANCE FOR AREA OF RECONFIGURED BELLMOUTH ONLY. EXISTING LOADING DOCK AND ADJACENT PARKING BAYS EXISTING DRAINAGE IS TO BE RETAINED.
CHANNEL DRAIN TO TAKE RUNOFF FROM PEDESTRIAN AREA
MHS7 CL 34.700 IL 33.200
MHS1 CL 34.873 IL 33.370
MHS3 CL 34.502 IL 33.000
ATTENUATION TANK, VOLUME REQUIRED 972m³ PLAN AREA BASED ON ASSUMED 600mm DEPTH IN ORDER TO PROVIDE 0.9m OF COVER. TYPE AND FORM OF TANK TO BE CONFIRMED AT DETAIL DESIGN.
MHS2 CL 34.158 IL 33.650
MHS8 CL 33.850 IL 32.350
MHS4 CL 34.133 IL 32.630
MHS11, FLOW CONTROL MANHOLE CL 33.200, IL 31.705, 450mm SUMP HYDROBRAKE OPTIMUM, DESIGN HEAD 1.4m, FLOW RATE 6.6 l/s
ALLOWANCE FOR 0.4 HECTARES OF IMPERMEABLE AREA FROM PLATFORM. TO BE CONFIRMED AT DETAILED DESIGN STAGE.
225Ø
EXISTING 225Ø NWL COMBINED SEWER
MHS13 - CL T.B.C, IL T.B.C INVERT LEVEL AT PROPOSED CONNECTION TO EXISTING 225Ø NWL SEWER TO BE CONFIRMED
MHS6 CL 33.407 IL 31.815
MHS10 CL 33.200 IL 31.735
MHS5 CL 33.617 IL 31.900
PLATFORM MH CL 35.039 IL 33.500
CLASS 1 BYPASS SEPERATOR WITH LEVEL ALARM, DESIGN TO BE CONFIRMED BY SUPPLIER
300Ø
600Ø
Ordnance Survey
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For Stage 1 RSA | CH | DB | JOB | 07/08/20 | P01
Revision Details | By | Chkd | Appd | Checked Date | Suffix
Purpose of Issue: SUITABLE FOR INFORMATION
GRIP Stage: GRIP 4
Client: Northumberland County Council
Project Title: NORTHUMBERLAND LINE
Drawing Title: ASHINGTON CAR PARK HIGHWAYS DRAINAGE LAYOUT
Designed D.Roberson | Drawn C.Hodson | Checked D.Barker | Approved J.O'Brien | Date 11/11/20
Signed | Signed | Signed | Signed
Suitability S2 | AECOM Internal Project No. 60601435 | Engineering Manager Alasdair Bathie
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Annex D - Hydraulic Calculation Outputs

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	1	PIMP (%)	100
M5-60 (mm)	18.000	Add Flow / Climate Change (%)	0
Ratio R	0.336	Minimum Backdrop Height (m)	1.000
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	3.000
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for Storm

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	46.828	0.720	65.0	0.128	5.00	0.0	0.600	o	300	Pipe/Conduit	
1.001	51.635	0.535	96.5	0.160	0.00	0.0	0.600	o	300	Pipe/Conduit	
2.000	40.619	0.370	109.8	0.045	5.00	0.0	0.600	o	300	Pipe/Conduit	
2.001	40.619	0.520	78.1	0.154	0.00	0.0	0.600	o	300	Pipe/Conduit	
3.000	31.588	1.300	24.3	0.400	10.00	0.0	0.600	o	300	Pipe/Conduit	
2.002	35.910	0.085	422.5	0.219	0.00	0.0	0.600	o	600	Pipe/Conduit	
1.002	33.947	0.080	424.3	0.195	0.00	0.0	0.600	o	600	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	43.78	5.40	33.370	0.128	0.0	0.0	0.0	1.95	138.0	15.2
1.001	42.02	5.94	32.650	0.288	0.0	0.0	0.0	1.60	113.1	32.8
2.000	43.60	5.45	33.000	0.045	0.0	0.0	0.0	1.50	106.0	5.3
2.001	42.36	5.83	32.630	0.199	0.0	0.0	0.0	1.78	125.9	22.8
3.000	32.38	10.16	33.500	0.400	0.0	0.0	0.0	3.20	226.4	35.1
2.002	31.55	10.67	31.900	0.817	0.0	0.0	0.0	1.18	333.2	69.8
1.002	30.82	11.15	31.815	1.300	0.0	0.0	0.0	1.18	332.4	108.5

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.003	5.201	0.030	173.4	0.024	0.00	0.0	0.600	o	600	Pipe/Conduit	
4.000	48.857	0.850	57.5	0.045	5.00	0.0	0.600	o	300	Pipe/Conduit	
4.001	44.076	0.345	127.8	0.144	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.004	10.253	0.020	512.7	0.144	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.005	10.251	0.020	512.6	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.006	100.964	0.450	224.4	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.003	30.75	11.20	31.735	1.324	0.0	0.0	0.0	1.85	522.1	110.2
4.000	43.81	5.39	33.200	0.045	0.0	0.0	0.0	2.08	146.9	5.3
4.001	42.08	5.92	32.350	0.189	0.0	0.0	0.0	1.39	98.2	21.5
1.004	30.31	11.50	31.705	1.657	0.0	0.0	0.0	0.57	22.7«	136.0
1.005	29.89	11.80	31.625	1.657	0.0	0.0	0.0	0.57	22.7«	136.0
1.006	27.51	13.74	31.605	1.657	0.0	0.0	0.0	0.87	34.5«	136.0

Midpoint
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Checked by Daniel Roberson

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Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
1	34.842	1.472	Open Manhole	1200	1.000	33.370	300				
2	34.158	1.508	Open Manhole	1200	1.001	32.650	300	1.000	32.650	300	
3	34.502	1.502	Open Manhole	1200	2.000	33.000	300				
4	34.133	1.503	Open Manhole	1200	2.001	32.630	300	2.000	32.630	300	
PLAT	35.039	1.539	Open Manhole	1200	3.000	33.500	300				
5	33.617	1.717	Open Manhole	1500	2.002	31.900	600	2.001	32.110	300	
								3.000	32.200	300	
6	33.407	1.592	Open Manhole	1500	1.002	31.815	600	1.001	32.115	300	
								2.002	31.815	600	
10	33.200	1.465	Open Manhole	1500	1.003	31.735	600	1.002	31.735	600	
7	34.667	1.467	Open Manhole	1200	4.000	33.200	300				
8	33.850	1.500	Open Manhole	1200	4.001	32.350	300	4.000	32.350	300	
11FC	33.200	1.495	Open Manhole	1500	1.004	31.705	225	1.003	31.705	600	
								4.001	32.005	300	375
INTERCEPTOR	33.143	1.518	Open Manhole	1200	1.005	31.625	225	1.004	31.685	225	60
13	33.200	1.595	Open Manhole	1200	1.006	31.605	225	1.005	31.605	225	
ExNWL_2402	32.400	1.245	Open Manhole	1200		OUTFALL		1.006	31.155	225	

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	o	300	1	34.842	33.370	1.172	Open Manhole	1200
1.001	o	300	2	34.158	32.650	1.208	Open Manhole	1200
2.000	o	300	3	34.502	33.000	1.202	Open Manhole	1200
2.001	o	300	4	34.133	32.630	1.203	Open Manhole	1200
3.000	o	300	PLAT	35.039	33.500	1.239	Open Manhole	1200
2.002	o	600	5	33.617	31.900	1.117	Open Manhole	1500
1.002	o	600	6	33.407	31.815	0.992	Open Manhole	1500
1.003	o	600	10	33.200	31.735	0.865	Open Manhole	1500
4.000	o	300	7	34.667	33.200	1.167	Open Manhole	1200
4.001	o	300	8	33.850	32.350	1.200	Open Manhole	1200
1.004	o	225	11FC	33.200	31.705	1.270	Open Manhole	1500
1.005	o	225	INTERCEPTOR	33.143	31.625	1.293	Open Manhole	1200
1.006	o	225	13	33.200	31.605	1.370	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	46.828	65.0	2	34.158	32.650	1.208	Open Manhole	1200
1.001	51.635	96.5	6	33.407	32.115	0.992	Open Manhole	1500
2.000	40.619	109.8	4	34.133	32.630	1.203	Open Manhole	1200
2.001	40.619	78.1	5	33.617	32.110	1.207	Open Manhole	1500
3.000	31.588	24.3	5	33.617	32.200	1.117	Open Manhole	1500
2.002	35.910	422.5	6	33.407	31.815	0.992	Open Manhole	1500
1.002	33.947	424.3	10	33.200	31.735	0.865	Open Manhole	1500
1.003	5.201	173.4	11FC	33.200	31.705	0.895	Open Manhole	1500
4.000	48.857	57.5	8	33.850	32.350	1.200	Open Manhole	1200
4.001	44.076	127.8	11FC	33.200	32.005	0.895	Open Manhole	1500
1.004	10.253	512.7	INTERCEPTOR	33.143	31.685	1.233	Open Manhole	1200
1.005	10.251	512.6	13	33.200	31.605	1.370	Open Manhole	1200
1.006	100.964	224.4	ExNWL_2402	32.400	31.155	1.020	Open Manhole	1200

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.006	ExNWL_2402	32.400	31.155	31.225	1200	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	1.000	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	1	Cv (Summer)	1.000
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Storm Duration (mins)	30
Ratio R	0.336		

Online Controls for Storm

Hydro-Brake® Optimum Manhole: 11FC, DS/PN: 1.004, Volume (m³): 6.7

Unit Reference	MD-SHE-0114-6600-1400-6600
Design Head (m)	1.400
Design Flow (l/s)	6.6
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	114
Invert Level (m)	31.705
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.400	6.6	Kick-Flo®	0.868	5.3
Flush-Flo™	0.417	6.6	Mean Flow over Head Range	-	5.8

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	4.0	1.200	6.1	3.000	9.4	7.000	14.1
0.200	6.0	1.400	6.6	3.500	10.2	7.500	14.6
0.300	6.5	1.600	7.0	4.000	10.8	8.000	15.1
0.400	6.6	1.800	7.4	4.500	11.4	8.500	15.5
0.500	6.6	2.000	7.8	5.000	12.0	9.000	15.9
0.600	6.4	2.200	8.2	5.500	12.6	9.500	16.3
0.800	5.8	2.400	8.5	6.000	13.1		
1.000	5.6	2.600	8.8	6.500	13.6		

Storage Structures for Storm

Tank or Pond Manhole: 11FC, DS/PN: 1.004

Invert Level (m) 31.705

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	1620.0	0.600	1620.0	0.601	0.0

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Checked by Daniel Roberson

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.331
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	16.900	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	ON
DVD Status	OFF
Inertia Status	OFF

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360
Return Period(s) (years)	1, 2, 30, 100
Climate Change (%)	0, 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
1.000	1	15 Winter	1	+0%				
1.001	2	15 Winter	1	+0%			100/15 Summer	
2.000	3	15 Winter	1	+0%				
2.001	4	15 Winter	1	+0%			100/15 Summer	
3.000	PLAT	15 Winter	1	+0%				
2.002	5	15 Winter	1	+0%			100/15 Summer	
1.002	6	15 Winter	1	+0%			100/15 Summer	
1.003	10	15 Winter	1	+0%			100/15 Summer	
4.000	7	15 Winter	1	+0%				
4.001	8	15 Winter	1	+0%			100/360 Winter	
1.004	11FC	360 Winter	1	+0%			30/120 Summer	
1.005	INTERCEPTOR	360 Winter	1	+0%				
1.006	13	360 Winter	1	+0%				

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	33.436	-0.234	0.000	0.11		13.8	OK	
1.001	2	32.756	-0.194	0.000	0.27		28.9	OK	
2.000	3	33.043	-0.257	0.000	0.05		4.8	OK	
2.001	4	32.711	-0.219	0.000	0.16		19.1	OK	
3.000	PLAT	33.576	-0.224	0.000	0.15		30.1	OK	
2.002	5	32.146	-0.354	0.000	0.24		66.8	OK	
1.002	6	32.094	-0.321	0.000	0.39		107.4	OK	
1.003	10	32.004	-0.331	0.000	0.42		109.5	OK	
4.000	7	33.237	-0.263	0.000	0.03		4.8	OK	
4.001	8	32.441	-0.209	0.000	0.20		18.4	OK	
1.004	11FC	31.844	-0.086	0.000	0.32		4.6	OK	
1.005	INTERCEPTOR	31.711	-0.139	0.000	0.32		4.6	OK	
1.006	13	31.660	-0.170	0.000	0.14		4.6	OK	

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Checked by Daniel Roberson

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2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.331
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	16.900	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	ON
DVD Status	OFF
Inertia Status	OFF

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360
Return Period(s) (years)	1, 2, 30, 100
Climate Change (%)	0, 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
1.000	1	15 Winter	2	+0%				
1.001	2	15 Winter	2	+0%		100/15 Summer		
2.000	3	15 Winter	2	+0%				
2.001	4	15 Winter	2	+0%		100/15 Summer		
3.000	PLAT	15 Winter	2	+0%				
2.002	5	15 Winter	2	+0%		100/15 Summer		
1.002	6	15 Winter	2	+0%		100/15 Summer		
1.003	10	15 Winter	2	+0%		100/15 Summer		
4.000	7	15 Winter	2	+0%				
4.001	8	15 Winter	2	+0%		100/360 Winter		
1.004	11FC	360 Winter	2	+0%		30/120 Summer		
1.005	INTERCEPTOR	360 Winter	2	+0%				
1.006	13	360 Winter	2	+0%				

2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	33.445	-0.225	0.000	0.14		17.9	OK	
1.001	2	32.773	-0.177	0.000	0.35		37.4	OK	
2.000	3	33.050	-0.250	0.000	0.06		6.3	OK	
2.001	4	32.724	-0.206	0.000	0.21		24.7	OK	
3.000	PLAT	33.588	-0.212	0.000	0.19		39.0	OK	
2.002	5	32.189	-0.311	0.000	0.31		86.4	OK	
1.002	6	32.139	-0.276	0.000	0.50		139.0	OK	
1.003	10	32.049	-0.286	0.000	0.54		141.7	OK	
4.000	7	33.241	-0.259	0.000	0.05		6.2	OK	
4.001	8	32.454	-0.196	0.000	0.26		23.8	OK	
1.004	11FC	31.877	-0.053	0.000	0.35		5.2	OK	
1.005	INTERCEPTOR	31.717	-0.133	0.000	0.35		5.2	OK	
1.006	13	31.663	-0.167	0.000	0.15		5.2	OK	

Midpoint
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Basingstoke, RG21 7PP

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Checked by Daniel Roberson

Innovyze

Network 2018.1

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.331
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	16.900	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	ON
DVD Status	OFF
Inertia Status	OFF

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360
Return Period(s) (years)	1, 2, 30, 100
Climate Change (%)	0, 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
1.000	1	15 Winter	30	+0%				
1.001	2	15 Winter	30	+0%			100/15 Summer	
2.000	3	15 Winter	30	+0%				
2.001	4	15 Winter	30	+0%			100/15 Summer	
3.000	PLAT	15 Winter	30	+0%				
2.002	5	15 Winter	30	+0%			100/15 Summer	
1.002	6	15 Winter	30	+0%			100/15 Summer	
1.003	10	15 Winter	30	+0%			100/15 Summer	
4.000	7	15 Winter	30	+0%				
4.001	8	15 Winter	30	+0%			100/360 Winter	
1.004	11FC	360 Winter	30	+0%			30/120 Summer	
1.005	INTERCEPTOR	360 Winter	30	+0%				
1.006	13	360 Winter	30	+0%				

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name		Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000		1	33.475	-0.195	0.000	0.26		33.7	OK	
1.001		2	32.845	-0.105	0.000	0.72		76.7	OK	
2.000		3	33.070	-0.230	0.000	0.12		11.8	OK	
2.001		4	32.776	-0.154	0.000	0.47		54.9	OK	
3.000		PLAT	33.623	-0.177	0.000	0.36		73.5	OK	
2.002		5	32.429	-0.071	0.000	0.62		172.6	OK	
1.002		6	32.394	-0.021	0.000	0.98		271.9	OK	
1.003		10	32.300	-0.035	0.000	1.00		262.8	OK	
4.000		7	33.260	-0.240	0.000	0.09		11.8	OK	
4.001		8	32.514	-0.136	0.000	0.57		52.3	OK	
1.004		11FC	32.032	0.102	0.000	0.44		6.5	SURCHARGED	
1.005	INTERCEPTOR		31.730	-0.120	0.000	0.44		6.5	OK	
1.006		13	31.671	-0.159	0.000	0.19		6.5	OK	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.331
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	16.900	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	ON
DVD Status	OFF
Inertia Status	OFF

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360
Return Period(s) (years)	1, 2, 30, 100
Climate Change (%)	0, 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
1.000	1	15 Winter	100	+40%				
1.001	2	15 Winter	100	+40%		100/15 Summer		
2.000	3	15 Winter	100	+40%				
2.001	4	360 Winter	100	+40%		100/15 Summer		
3.000	PLAT	30 Winter	100	+40%				
2.002	5	360 Winter	100	+40%		100/15 Summer		
1.002	6	360 Winter	100	+40%		100/15 Summer		
1.003	10	360 Winter	100	+40%		100/15 Summer		
4.000	7	15 Winter	100	+40%				
4.001	8	360 Winter	100	+40%		100/360 Winter		
1.004	11FC	360 Winter	100	+40%		30/120 Summer		
1.005	INTERCEPTOR	180 Winter	100	+40%				
1.006	13	360 Summer	100	+40%				

Midpoint
Alencon Link
Basingstoke, RG21 7PP

Northumberland Line
Ashington Station
Surface Water Rev1

Date 07/12/2020
File ASHINGTONSW REV1.MDX

Designed by Dan Hodson
Checked by Daniel Roberson

Innovyze

Network 2018.1

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name		Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000		1	33.589	-0.081	0.000	0.47		60.6	OK	
1.001		2	33.455	0.505	0.000	1.11		118.8	SURCHARGED	
2.000		3	33.143	-0.157	0.000	0.21		21.1	OK	
2.001		4	33.117	0.187	0.000	0.14		15.9	SURCHARGED	
3.000		PLAT	33.675	-0.125	0.000	0.64		132.4	OK	
2.002		5	33.117	0.617	0.000	0.23		65.3	SURCHARGED	
1.002		6	33.116	0.701	0.000	0.37		103.0	FLOOD RISK	
1.003		10	33.114	0.779	0.000	0.39		103.5	FLOOD RISK	
4.000		7	33.279	-0.221	0.000	0.15		21.2	OK	
4.001		8	33.114	0.464	0.000	0.17		15.2	SURCHARGED	
1.004		11FC	33.114	1.184	0.000	0.45		6.6	FLOOD RISK	
1.005	INTERCEPTOR		31.731	-0.119	0.000	0.45		6.6	OK	
1.006		13	31.672	-0.158	0.000	0.19		6.6	OK	

Annex E - Minutes of meeting with NCC 29th May 2020

Minutes

Meeting name
Northumberland Line Stations - Surface water drainage and SuDS

Meeting date
29th May 2020

Location
N/A (MS Teams)

AECOM project number
60628487

Subject
Discussion of which SuDS options can be adopted for the stations and car parks.

Time
10:00

Project name
Northumberland Line

Prepared by
D. Roberson

Attendees
Daniel Roberson (DR)
Principal Consultant – AECOM

Dan Hodson (DH)
Senior Engineer – AECOM

Steve Dickie (SD)
Regional Director – AECOM

James O'Brien (JO)
Principal Consultant – AECOM

James Hitching (JH)
Senior Sustainable Drainage Officer – NCC

Gary Mills (GM)
Principal Engineer (Roads) - NCC

Circulation list
Daniel Roberson
Dan Hodson
Steve Dickie
James O'Brien
James Hitching
Gary Mills

Apologies
None

Ref	Item	Action
01	Introduction to the purpose of the call – primarily to confirm which SuDS and Drainage options Northumberland County Council (NCC) would be willing to adopt and maintain at the Northumberland Line Stations, which would also being suitable from a planning approval point of view. DR noted the conflict in preferences currently advised by NCC in that GM would appear to prefer conventional drainage with 'end of pipe' SuDS whereas JH had later advised of greens SuDS including rain gardens and swales.	**N/A**
02	JH clarified that he had discussed the provision of SuDS with GM and understood the concerns each other had with regards to the adoption of certain features within the station car parks. JH stated that he would want to see a range of SuDS features employed at each site.	**N/A**
03	JH advised that the use of permeable paving is not the preferred solution, due to potential issues of elevated groundwater and mine workings. GM also noted that he has concerns about the long terms serviceability of permeable paving in car parking environments. Use of permeable paving therefore to be avoided at all stations.	**DR, DH**
04	GM asked who would be responsible for (or owner/operator of) the car parks upon completion of the scheme. JO stated that the ownership responsibilities were currently unconfirmed, however it is being assumed that this will be NCC, until clarified/confirmed otherwise.	**N/A**
05	DR noted that the use of green SuDS at constrained sites like Ashington and Bedlington Station would be impracticable, and the non-adoption of permeable paving would make obtaining the desired level of treatment difficult. JH stated that each site would be reviewed on a case by case basis, but the use of proprietary systems in lieu of greens SuDS would be acceptable for planning so long as this is fully justified in the FRA and Drainage Strategy which is submitted for planning approval.	**DR, DH**
06	DR asked whether NCC had any specific policy/ requirement of surface water treatment where discharge is to a less sensitive receptor (i.e. NWL combined sewer). JH to discuss with NWL and advise accordingly. JH advised, in line with current policy, that the surface water drainage scheme should allow surface water to be sperate to combined/foul flows.	**JH**
07	With NCC confirming acceptance to the use of most other types of green and grey SuDS systems, JH noting that they consider this a 'flagship' scheme, some specific design considerations were highlighted by JH and GM. These primarily included the provision of features which limit the overrun of vehicles into the SuDS areas, like raised rubber strips	**DR,DH**

Ref	Item	Action
	in adjoining parking bays, such that flush finishing of paving edges would permit runoff to discharge direct to swales and filter strips. JH also noted that his preference would be for vegetated swales, potentially underlain by a filter drain, in lieu of conventional gullies for serving areas of the car park.	
08	SD noted that there has been recent experience of NWL preferring not to have discharge regimes which aim for low peak flows over a long duration, a process often promoted by the adoption of SuDS. JH to discuss the issue of discharge regimes with NWL for those sites which are aiming to connect with existing sewers (Ashington and Bedlington).	**JH**
09	DR noted that JH had requested in his recent correspondence that further improvements be made to Meggies Burn if Newsham station is to discharge to it, and requested further clarity on what NCC were expecting to see, bearing in mind that AECOMs current scope is strictly for the drainage strategy of the station. JH stated that there are currently flooding issues on Meggies Burn and that the potential of discharging the surface water from Newsham Station is an issue which he needs to discuss with the NCC planning department. It may involve contributions via a Section 106 agreement. JH to advise, JO to report back to wider design team.	**JH, JO**

Annex F - NWL Correspondence

Northumbrian Water
Developer Services
Leat House
Pattinson Road
Washington
NE38 8LB

Ext: 36603
Direct Line: 0191 419 6603
Email: developmentenquiries@nwl.co.uk
Our Ref: 040650180937
Your Ref:

Friday, 27 November 2020

Dan Hodson
AECOM
One Trinity Gardens
Newcastle Upon Tyne
NE1 2HF

Dear Dan

Re: Pre-Planning Enquiry – Kenilworth Road, Ashington

Further to the Point of Connection Application for the above site, received 10th November 2020, we are now able to provide the following response.

We have based our response on the information in your application and accompanying correspondence. Therefore, should any of the information now be different, then you must ensure that you inform us of any changes as further Network Modelling may be required and our response may also change, leading to this response being invalid.

Northumbrian Water assesses the impact of the proposed development on our assets and assesses the capacity within our network's to accommodate and treat the anticipated flows arising from the development. We do not therefore offer comment on aspects of planning applications that are outside of our area of control.

Enclosed in this response is a scaled plan showing the **approximate** position of the water and sewerage networks within the vicinity of this site.

We have changed the way contractors and developers can access our assets.

Historically only our own staff and framework contractors could access our sewerage network. As of 1st January 2018, we are allowing third party contractors to access our sewer network on a site by site basis, subject to certain conditions.

Further information (including how to apply) is available from our web site - https://www.nwl.co.uk/services/developers/developer-sewerage-services/

Also enclosed is our extract showing locations within the approximate vicinity of this site that have, from our records, experienced flooding. This has been provided to demonstrate the known flood risks within the vicinity which have been considered as part of our assessment on this enquiry.

We have also carried out a review of your application and can confirm the following:

Sewerage and Sewage Treatment

Northumbrian Water would ask that you please separate the foul and surface water flows in accordance with Part H of the Building Regulations prior to the final connection to the public sewer.

All new connections to the public sewerage system must first be approved through the Section 106 of the Water Industry Act 1991 process prior to construction.

Should you decide to proceed with this development, a fully completed Sewer Connection application form will be required. These are available to download from the following link:

https://www.nwl.co.uk/services/developers/developer-sewerage-services/new-sewer-connections-s106/

- Surface Water Discharge

No surface water flow from the proposed development will be allowed to connect into the existing public sewerage system unless it is proven that the alternative options which are listed within Part H of the Building Regulations 2003 are not available:

Rainwater from a system provided pursuant to sub-paragraphs (1) or (2) shall discharge to one of the following, listed in order of priority –

(a) an adequate soakaway or some other adequate infiltration system; or, where that is not reasonably practicable,

(b) a watercourse; or, where that is not reasonably practicable,

(c) a sewer.

If the more sustainable options prove to be unfeasible, a restricted surface water flow of 6.6 l/sec would be permitted to discharge into the 225 mm diameter combined public sewer within Kenilworth Road to the west of the site at or between Manholes 2601 and 2402. Any excess in flows must be attenuated on site.

Written approval for all individual connections (direct or indirect) to the public sewerage system should be obtained through the Section 106 process, following completion of the detailed drainage design and before the commencement of any drainage works on site.

- Sewage Treatment Capacity

The Sewage Treatment Works to which this development finally discharges to is able to accept the additional flows.

Please note that this response is valid for 1 year only and you should resubmit your proposals should this period lapse prior to your development beginning.

Should you require any further assistance or information, then please do not hesitate to contact me at developmentenquiries@nwl.co.uk or alternatively on 0191 419 6603, please quote our reference number above in any future correspondence.

Yours sincerely,

Laura Clegg
Team Leader
Developer Services (Asset Protection)