BECKWITH
& HANLON

June 2026

Flood Risk Assessment and Drainage Strategy

26-019-001 Residential Development, Phase 2, Dalzell Street, Moor Row
Prepared for Nigel Kay Homes Ltd

beckwithandhanlon.com

Revision	Description	By	Checked	Date
P1	Initial Issue	JM	MH	30/06/26

CONTENTS

Executive Summary

Description

Beckwith and Hanlon Consulting Engineers Limited were commissioned by Nigel Kay Homes Ltd in February 2026 to undertake a Flood Risk Assessment (FRA) and Drainage Strategy for a proposed up to 45-unit (second phase) residential development, on land adjacent to Dalzell Street, Moor Row, Whitehaven.

This report will be provided as supporting documentation as part of a planning application.

Site Parameters

Total Area: 2.9Ha

Greenfield: ✓

Brownfield: **X**

Mixed Green and Brownfield: **X**

Existing Runoff Location: Greenfield (into River Keekle)

Ground Conditions: Predominantly glacial till over bedrock

Ground Contamination: Low

Ground Infiltration Potential: Low

Flood Risk Assessment

Site is located predominantly within Flood Zone 1

Pluvial: Low (Mitigated through proposed development drainage network and SuDS)

Groundwater: Low

Other sources: N/A

Sequential Test: N/A

Drainage Strategy

The surface water drainage for the scheme has been designed to discharge into the existing drainage ditch to the north of the site at a restricted discharge rate of no more than Qbar 32.3 l/s. Discharge will be made via a new outfall.

The design can accommodate up to a 1 in 100-year critical storm event (plus 50% climate change and 10% urban creep) for up to the 1440-minute storm duration with on-site attenuation provided. Attenuation for all storm events is provided by an online attenuation basin, an offline attenuation tank and permeable paving.

The foul water drainage serving the development is proposed to discharge into the existing 375mm diameter United Utilities combined water public sewer network to the southeast of the site, as approved by United Utilities.

Conclusions

The proposed development will have a low to very low risk of flooding from rivers and sea, surface water, reservoirs and sewers and will discharge at a controlled, restricted rate as advised by the Lead Local Flood Authority.

This Flood Risk Assessment has confirmed that the proposed development is appropriate and sustainable in the terms as set out in NPPF.

1.0 Introduction

Beckwith and Hanlon Consulting Engineers Limited were commissioned by Nigel Kay Homes Ltd in February 2026 to undertake a Flood Risk Assessment (FRA) and Drainage Strategy for a proposed up to 45-unit (second phase) residential development, on land adjacent to Dalzell Street, Moor Row, Whitehaven.

This report will be provided as supporting documentation as part of a planning application.

The objective of this FRA is to identify flooding or surface water management issues relating to the development site and identify suitable flood mitigation measures, if required. The assessment will be based upon existing available information and will aim to identify if the site is affected by current or future flooding and whether the development will increase flood risk elsewhere.

The objectives of this report are as follows:

- Identify existing site drainage characteristics.
- Describe and assess the proposed development.
- Assess the flood risk in accordance with the Department for Levelling Up, Housing and Communities (DLUHC) Technical Guidance and the National Planning Policy Framework (NPPF February 2025).
- Consider existing information provided through discussions with the Environment Agency (EA), the Lead Local Flood Authority (LLFA) and Water Authority to identify any mitigation measures required.

2.0 Existing Site Information

Site Location

The proposed development site is located on land adjacent to Dalzell Street, moor Row, Whitehaven. The subject site has an approximate developable area of 2.9Ha and is centred on National Grid Reference NY 00590 14723.

Refer to the Site Location Plan in **Appendix A**.

Site Description

The site is a roughly rectangular shaped parcel of land which is currently agricultural land, and the boundaries of the site are formed as follows:

Northern boundary – The north of the site is bounded by agricultural land and attenuation basin currently serving phase 1 of the residential development to the south.

Eastern boundary – The eastern boundary of the site is bounded by mainly woodland and the River Keekle.

Western boundary – The western boundary is formed by an open agricultural field, with Dalzell Street forming the most westerly boundary.

Southern boundary – The south of the site is formed by Phase 1 of the Nigel Kay Homes Ltd residential development, currently under construction.

A review of the existing site levels has been carried out, and this indicates that levels fall from south to north, falling further away to the east, down to the Rive Keekle. Levels fall from circa 75mAOD to 66mAOD south to north.

An existing topographical survey of the site has been carried out and is included within **Appendix B**.

The existing topographical survey can be used to determine proposed site levels whilst taking into consideration the flood risk associated with the scheme and the proposals.

Existing Ground Conditions

The geology of the site has been ascertained by making reference to the 1:50,000 British Geological Survey (BGS) website;

The BGS website states that the bedrock comprises of "*Brockram-Breccia. These sedimentary rocks are fluvial in origin. They are detrital, ranging from coarse- to fine-grained and form beds and lenses of deposits reflecting the channels, floodplains and levees of a river or estuary (if in a coastal setting).*"

The superficial deposits recorded at the site compromise of "*Till, Devensian - Diamicton*" which is described as: "*These sedimentary deposits are glacigenic in origin. They are detrital, created by the action of ice and meltwater, they can form a wide range of deposits and geomorphologies associated with glacial and inter-glacial periods during the Quaternary.*"

The Governments online flood map for planning, included within **Appendix E**, indicate the site to be predominantly within a Flood Zone 1 Area, with a small amount of Flood Zone 2/3, to the northern boundary which is outside the proposed developable area. The flood map also indicates a similar small area of surface water flooding within the same area which emanates from a small track on the northern most boundary, following a review of the topographical survey.

The Governments on-line flood risk maps confirm that flooding from rivers, the sea, groundwater and/or reservoirs is unlikely.

Online EA groundwater vulnerability mapping indicates that the site is located within an area of medium-low groundwater vulnerability. Medium areas are defined as *'Areas that offer some groundwater protection. Intermediate between high and low vulnerability'*. Low areas are defined as '*areas that provide the greatest protection to groundwater from pollution. They are likely to be characterised by low-leaching soils and/or the presence of low-permeability superficial deposits*.'

EA aquifer designation mapping indicates that the underlying solid strata to be classified as Secondary aquifer (Sedimentary superficial bedrock) and Principal aquifer (Sedimentary bedrock).

Furthermore, a Preliminary Ground Investigation (undertaken by GEO Environmental Engineering – Ref: GEO2022-5470 dated 11.08.2022) reported that the soil infiltration testing demonstrated that there was not enough infiltration value to support soakaways and that an alternative solution should be sought.

Based on the above factors, it is considered that surface water discharge via infiltration systems will not be feasible for the proposed scheme.

Existing Sewer Infrastructure

United Utilities (UU) sewer record plans have been obtained for the site and are included in **Appendix C**. The plan indicates that there is a series of combined water, surface water and foul water sewers adjacent to the southern boundary of the Phase 1 development (located in the residential development serving Pearson Close and Montreal Place).

A Pre-Planning Enquiry has been submitted to UU for the Phase 2 works and their response is included in **Appendix C**. UU confirmed that the proposed foul sewer network may discharge from site at an unrestricted rate into the 375mm diameter combined sewer located in the residential development serving Pearson Close and Montreal Place, to the south of the site.

Hydrology

The nearest named watercourse is the River Keekle, approx. 50m to the east of the site.

3.0 Proposed Development

The proposed scheme is for the development of up to 45-unit residential development on land adjacent to Dalzell Street, Moor Row, Whitehaven.

A proposed site plan has been included in **Appendix D**.

4.0 Flood Risk Assessment

National Planning Policy Framework

The National Planning Policy Framework (NPPF) aims to avoid inappropriate development in areas at risk of flooding, directing development away from high-risk areas and avoiding increasing or reducing the risk of flooding elsewhere. This FRA has been undertaken with regards to the NPPF and with reference to the Planning Practice Guidance (PPG) in relation to ensuring that flood risk is taken into consideration to avoid inappropriate development in areas at risk of flooding.

National Standard 3: Management of Extreme Rainfall and Flooding

The Environment Agency (EA) provide appropriate information on the extent of flood risk via their 'Flood Map for Planning (Rivers and Sea)' available online via the UK Government website. The flood maps for planning indicate the extent of the extreme flooding from surface water, rivers or sea and reservoirs that would occur without the presence of flood defences. The flood zones are defined and outlined as below:

Table 1: Flood Zone Definition

Flood Zone	Definition
Flood Zone 1 (Low Probability)	Less than 1 in 1,000 annual probability of river or sea flooding (<0.1%) (Area shown clear on Flood Maps – all land outside of Zones 2 and 3)
Flood Zone 2 (Medium Probability)	Between a 1 in 100 and 1 in 1,000 annual probability of river flooding (1%-0.1%) **or** between 1 in 200 and 1 in 1,000 annual probability of sea flooding (0.5%-0.1%) in any year (Area shown light blue on Flood Maps)
Flood Zone 3a (High Probability)	1 in 100 or greater annual probability of river flooding (>1%) **or** a 1 in 200 or greater annual probability of flooding from the seas (>0.5%) in any year (Area shown dark blue on Flood Maps)
Flood Zone 3b (Functional Flood Plain)	Land where water must flow or be stored during times of flooding. Strategic Flood Risk Assessments prepared by local planning authorities should identify these areas. (Area also shown dark blue on Flood Maps)

*Flood Map areas do not take flood defences into consideration. Flood Risk increase due to climate change is not considered.

Review of the UK Government data confirms that the site is located within a **Flood Zone 1** (Low Probability) area and is at no risk of flooding from rivers or sea, or from reservoirs. Sequential testing is not required to be carried out for developments within Flood Zone 1 areas and as such it should not be necessary to consider sequential testing for this scheme.

Pluvial flood maps indicate a small amount of Flood Zone 2/3, to the northern boundary which is outside the proposed developable area. The flood map also indicates a similar small area of surface water flooding within the same area which emanates from a small track on the northern most boundary.

The existing onsite surfacing water flooding will be mitigated through the proposed development, as the site is being developed with both soft landscaping and positively drained hard standing areas. The inclusion of a controlled, restricted discharge rate and attenuation to accommodate onsite flows, will further mitigate the existing risk of surface water flooding. It is therefore considered that this flood risk is omitted through the proposed development and associated infrastructure.

The UK Government 'Extent of Flooding' maps are included in **Appendix E.**

The plans attached within the Appendices represent the best available current information on the extent of flood risk. It should be noted however that these maps are indicative only and are to be used as a basis of consultation and not as the sole basis for decisions on where planning policies apply.

Flood Risk Vulnerability Classification

Table 2: Flood Risk Vulnerability Classification

Essential Infrastructure • Essential transport infrastructure (including mass evacuation routes) which must cross the area at risk. • Essential utility infrastructure which must be in a flood risk area for operational reasons, including electricity generating power stations and grid and primary substations; and water treatment works that need to remain operational in times of flood. • Wind turbines.
Highly vulnerable • Police stations, ambulance stations, fire stations, command centers; telecommunications installations required to be operational during flooding • Emergency dispersal points. • Basement dwellings. • Caravans, mobile homes and park homes intended for permanent residential use. • Installations requiring hazardous substances consent. (Where there is a demonstrable need to locate such installations for bulk storage of materials with port or other similar facilities, or such

installations with energy infrastructure or carbon capture and storage installations, that require coastal or water-side locations, or need to be located in other high flood risk areas, in these instances the facilities should be classified as “essential infrastructure”).
More vulnerable • Hospitals. • Residential institutions such as residential care homes, children’s homes, social services homes, prisons and hostels. • Buildings used for dwelling houses, student halls of residence, drinking establishments, nightclubs and hotels. • Non–residential uses for health services, nurseries and educational establishments. • Landfill and sites used for waste management facilities for hazardous waste. • Sites used for holiday or short-let caravans and camping, subject to a specific warning and evacuation plan
Less Vulnerable • Police, ambulance and fire stations which are not required to be operational during flooding. • Buildings used for shops; financial, professional and other services; restaurants, cafes and hot food takeaways; offices; general industry, storage and distribution; non-residential institutions not included in the ‘more vulnerable’ class; and assembly and leisure. • Land and buildings used for agriculture and forestry. • Waste treatment (except landfill* and hazardous waste facilities). • Minerals working and processing (except for sand and gravel working). • Water treatment works which do not need to remain operational during times of flood. • Sewage treatment works, if adequate measures to control pollution and manage sewage during flooding events are in place.
Water-compatible Development • Flood control infrastructure. • Water transmission infrastructure and pumping stations. • Sewage transmission infrastructure and pumping stations. • Sand and gravel working. • Docks, marinas and wharves. • Navigation facilities. • Ministry of Defence installations. • Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location. • Water-based recreation (excluding sleeping accommodation). • Lifeguard and coastguard stations. • Amenity open space, nature conservation and biodiversity, outdoor sports and recreation and essential facilities such as changing rooms. • Essential ancillary sleeping or residential accommodation for staff required by uses in this category, subject to a specific warning and evacuation plan.

The Flood Risk Vulnerability Classification for this development site is “More Vulnerable – Buildings used for dwelling houses, student halls of residence, drinking establishments, nightclubs and hotels”. It can be seen from Table 3 below that developments of this nature should be located within Flood Zones 1 and 2 with an Exception Test required for development in a Flood Zone 3a

area. It should be noted that the site falls within a **Flood Zone 1 – Low Probability** classified area and as such it should not be necessary to consider a Sequential Test.

Table 3: Flood Risk Vulnerability and Flood Zone 'Compatibility'

Flood Risk Vulnerability Classification (See Table 2)	Essential Infrastructure	Water Compatibility	Highly Vulnerable	More Vulnerable	Less Vulnerable
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	✓	Exception Test Required	✓	✓
Zone 3a	Exception Test Required	✓	x	Exception Test Required	✓
Zone 3b functional flood plain	Exception Test Required	✓	x	x	x

Key: ✓ - Development is appropriate

x – Development should not be permitted

Sources of Potential Flooding

Other Sources of Flood Risk:

The table below identifies the potential sources of flood risk to the development.

Flood Source	Potential Risk				Description
	High	Medium	Low	None	
Fluvial			✓		River Keekle adjacent to site however Flood Risk maps confirm proposed development in FZ1
Tidal				✓	No tidal influence nearby
Canals				✓	No canals nearby
Groundwater			✓		No ground water issues identified
Reservoirs				✓	No reservoirs nearby
Sewers			✓		UU existing infrastructure plans show no risk from existing sewers
Pluvial			✓		Design process will minimize risk
Development Drainage			✓		Design process will minimize risk

Information from the Environment Agency and the Water Authority to support the risks classification in the above table are included in **Appendix E.**

Existing Structures Affecting Flooding

There are no known existing structures on site that may affect flooding of the site.

Sequential Test

As the proposed development is predominantly within a Flood Zone 1 – Low Probability a sequential test is not necessary.

Flood Risk Mitigation Measures

As the site is situated predominantly within Flood Zone 1 – Low Probability, there is no requirement for any mitigating measures relating to flooding from Rivers and the Sea, Reservoirs or Groundwater.

Any onsite surfacing water flooding will be mitigated through the proposed development, as the site is being developed with both soft landscaping and positively drained hard standing areas. The inclusion of a controlled, restricted discharge rate and attenuation to accommodate onsite flows, will further mitigate the existing risk of surface water flooding. It is therefore considered that this flood risk is omitted through the proposed development and associated infrastructure.

5.0 Surface Water Drainage

National Standard 1: Runoff Destinations

Infrastructure protocol states that a designer should consider the following in order of preference before finalising a surface water design statement for the development.

• Collected for not-potable use, or where this is not reasonably practicable,

• Discharge via infiltration, or where this is not reasonably practicable,

• Discharge to an above ground surface water body, or where this is not reasonably practicable,

• Discharge to a surface water sewer, or another pipes surface water drainage system, or where this is not reasonably practicable,

• Discharge to a public sewer network.

Method 1 – Collected for non-potable use.

Due to the limited opportunity to re-use collected surface water for residential properties, and a permanent, direct discharge location is also required to minimise the risk of flooding, it is considered that collection for non-potable use, shall not apply to the scheme.

Method 2 – Discharge via infiltration.

The Preliminary Ground Investigation (undertaken by GEO Environmental Engineering – Ref: GEO2022-5470 dated 11.08.2022) reported that the soil infiltration testing demonstrated that there was not enough infiltration value to support soakaways and that an alternative solution should be sought.

Based on the above factors, it is considered that surface water discharge via infiltration systems will not be feasible for the proposed scheme.

Method 3 – Discharge to an above ground surface water body.

The nearest named watercourse is the River Keekle approx. 50m to the south of the site. Mapping also indicates the presence of issues and an unnamed watercourse / drainage ditch just to the north of the site boundary in the adjacent field area which has an existing piped or culverted outfall to the River Keekle.

Therefore, based on the above it is considered that Method 3 is the most suitable option for surface water discharge.

Method 4 – Discharge to a public surface water sewer.

As the surface water is proposed to discharge directly to the drainage ditch to the north and ultimately a local water course (River Keekle), this method has not been considered.

Method 5 – Discharge to a public sewer network.

As the surface water is proposed to discharge directly to the drainage ditch to the north and ultimately a local water course (River Keekle), this method has not been considered.

Proposed Drainage

It is proposed to provide a surface water drainage network serving the proposed development roof and driveway areas. Surface water associated with proposed landscaped areas, from open space and private gardens, will infiltrate through surface layers of topsoil, be intercepted by planting and be subject to natural evaporation. On this basis, these landscaped contributing areas will not enter the proposed surface water network and therefore have been excluded from calculations.

An initial greenfield runoff calculation has been undertaken for the development using the HR Wallingford greenfield runoff calculation, based on up-to-date FEH data, and is included within **Appendix F**. Based upon the total developable site area of 2.984 ha for the development, a QBar rate of 32.3 l/s has been determined.

This rate requires confirmation from Cumberland Council LLFA.

Exceedance flows generated by the development due to the applied discharge restriction are required to be attenuated and managed on site. The drainage network is required to be designed to meet the following requirements:

• No surcharge for a 1 in 2-year return period event

• No flooding for a 1 in 30-year return period event

• No flooding of buildings or third-party land for a 1 in 100-year return period event with a 50% allowance for climate change and 10% urban creep for up to the 1440-minute storm duration.

A drainage strategy has been produced associated with surface and foul water drainage to serve the proposed development and is included **Appendix G**.

The surface water drainage network has been designed to discharge into an existing drainage ditch to the north of the site. Discharge at a restricted discharge rate of 32.3/s, will be made via a new outfall. This rate has been achieved with 2no. Hydrobrakes with 244mm and 143mm diameter orifices.

The discharge rate from site is to be agreed with Cumberland Council LLFA.

National Standard 2: Management of everyday rainfall

The CIRIA SuDS Manual states that interception can be delivered on site using one or a combination of processes:

- Rainwater Harvesting
- Infiltration
- Evapotranspiration using temporary shallow ponding or storage within the soil or upper aggregate layers

The use of rainwater harvesting or infiltration to ground is not proposed for this scheme. Therefore, evapotranspiration of surface water flows will be encouraged across the development where possible.

Permeable paving to all shared and private drives shall be included, to which proposed roof areas will also discharge directly into. Inclusion of permeable paving offers at source treatment for surface water, however, also reduces the rate at which flows enter the system whilst also offering short term attenuation. This approach promotes evapotranspiration of surface water flows and as outlined within the CIRIA SuDS Manual, is assumed to comply with interception requirements.

The proposed development also includes an online attenuation basin, in which the site surface water drainage flows directly through. Although infiltration to ground directly is assumed unfeasible for surface water discharge, there will be a nominal element of natural infiltration through the basin. As noted within the CIRIA SuDS Manual, with a shallow sloping, unlined base it is considered that areas of the site directed through the basin, of up to 5 times the base area, comply with interception.

Surface water associated with proposed landscaped areas, from open space and private gardens, will infiltrate through surface layers of topsoil, be intercepted by planting and be subject to natural evaporation.

It is therefore considered that the first 5mm of rainfall for the majority of rainfall events will be contained within the proposed development site where feasible due to site constraints.

National Standard 3: Management of Extreme Rainfall and Flooding

The design can accommodate surface water flow for storm events up to a 1 in 100-year critical storm event plus 50% climate change and 10% urban creep with on-site attenuation provided. Attenuation for all storm events is provided via an online attenuation basin, an offline attenuation tank and permeable paving. Detailed Causeway FLOW simulation calculations are included within **Appendix H**. The proposed surface water drainage system will be private.

Discharge from site has been restricted to the calculated QBar rate for the scheme, based on the total developable area of 2.984ha. Using the FEH statistical (2025) method, the QBar rate for the developable area has been determined at 32.3l/s. A copy of these calculations is included within **Appendix F**.

Based on an assumed impermeable area percentage of 60% of the overall developable area of the site a total attenuation volume of approx. 925m³ has been calculated to be required for the development via the FLOW simulation calculations. This attenuation is proposed to be provided via an online attenuation basin to the north of the site and an offline attenuation tank in the centre. The basin is formed with 1 in 3 side slopes, with the approach embankments to the basin generally 1 in 3. The basin is at a depth of 1.5m with a base sloping gently from the west side towards the outfall. However, the maximum water depth of the basin, for up to the 1 in 100-year critical storm event plus 50% climate change and 10% urban creep, is 0.869m. This allows for >300mm freeboard within the basin extents. The basin provides 498m³ of attenuation. Access to the basin can be taken directly from the adjacent roads/drives to the west and south, with access points generally at a 1 in 3 gradient from the highway. A 1m wide flat strip to the perimeter of the basin is provided to ease maintenance operations. The attenuation basin will be maintained by a Private Management Company and carried out in accordance with the CIRIA C753 SuDS manual.

The attenuation tank will provide attenuation for the remaining required volume of storage to the figure of 427m³. The attenuation basin will be maintained by Private Management Company and carried out in accordance with the CIRIA C753 SuDS manual.

National Standard 4: Water Quality

To ensure the water quality entering the surface water network does not have a detrimental impact to the environment, permeable paving will be included for all shared and private drives. Trapped road gullies with sumps will be provided to drain runoff from the highway areas. Furthermore, surface water runoff from all the development hardstanding area is proposed to flow through the online basin prior to discharge into the ditch.

The Simple Index Approach, as per Table 26.2 in the CIRIA SuDS Manual, summarises the land use and pollutants appropriate to this development as below:

Land Use	Pollution hazard level	TSS	Metals	Hydrocarbons
Residential roofs	Very Low	0.2	0.2	0.05
Individual property driveways and low traffic roads	Low	0.5	0.4	0.4

The indicative SuDS Mitigation indices, as per Table 26.3 in the CIRIA SuDS Manual, summarises the mitigation indices appropriate to this development as below:

Type of SuDS	TSS	Metals	Hydrocarbons
Permeable pavement	0.7	0.6	0.7
Attenuation basin	0.5	0.5	0.5

Based on the above, it is considered that all driveway areas offer sufficient water treatment prior to discharge from site. All the private hardstanding areas will also pass through the online attenuation basin, providing secondary treatment to flows prior to discharge from site.

Of the roads on site, all are treated through directly flowing through the attenuation basin. For the more extreme flood events, where surface water flows back up the system, there is further opportunity for surface water to be treated, and subject to evapotranspiration, until the storm passes.

Where possible the basin inlet headwalls have been located as far away from the outlet headwall as possible to provide the maximum distance, and therefore flow path length, within the basin. This

will reduce the rate at which flows pass through the basin, encouraging infiltration to ground at a nominal rate and evapotranspiration.

Surface water pipework will be designed in accordance with Building Regulations Part H and DCG "the Code" to ensure suitable access for maintenance and operation as required.

National Standards 5 & 6: Amenity and Biodiversity

The sustainable drainage system design actively supports biodiversity by incorporating a network of native shrub and woodland species, alongside marginal and wetland wildflower species. The layout of these features ensures ecological connectivity across the site, while the creation of varied microhabitats will attract a diverse range of species, including pollinators, amphibians, and birds. Habitat diversity is further enhanced as the seasonal water level variation will mimic natural wetland dynamics. In accordance with UKHab classification, the system will also contribute to the site's Biodiversity Net Gain which will form a specific planning condition. This will include a Habitat Management and Monitoring Plan (HMMP) which will ensure long-term ecological value. Therefore, the design and management of the site's drainage system align with Standard 6's goal of maximising biodiversity benefits.

In addition to the ecological function, the sustainable drainage basin will enhance the visual amenity of the development and contribute to the landscape character. The use of native species planting and integration into the wider landscape strategy will create a naturalistic appearance that complements the surrounding environment and supports residents' wellbeing. Species selection and planting will be tailored to site-specific conditions and follow established guidance, to ensure suitability for the site.

National Standards 7: Design of drainage for construction, operation, maintenance, decommissioning and structural integrity.

Surface water pipework will be designed in accordance with Building Regulations Part H and DCG "the Code" to ensure suitable access for maintenance and operation as required.

A SuDS Maintenance & Management Schedule shall be provided which addresses the operation and maintenance requirements for each of the drainage and SuDS features included within the proposed scheme. This also outlines the responsibilities of maintenance for each element along with confirmation of who responsibilities are attributed to.

A construction phase surface water management plan should also be provided, to ensure that surface water is managed appropriately (including silt management), during the construction of the proposed development.

6.0 Foul Water Drainage

A Pre-Planning Enquiry has been submitted to UU for Phase 2, and their response is included in **Appendix C**. UU confirmed that the proposed foul sewer network may discharge from site at an unrestricted rate into the 375mm diameter combined sewer located in the residential development serving Pearson Close and Montreal Place, to the south of the site.

The Phase 2 foul sewer works will connect (via a foul water pump and rising main) to an existing 'as-constructed' foul sewer, serving the Phase 1 works, in the south-eastern corner of the overall development.

The above proposals are reflected within the drainage strategy included in **Appendix G**.

Foul water pipework will be designed in accordance with Building Regulations Part H ensuring suitable access for maintenance and operation as required.

7.0 Conclusions

Beckwith and Hanlon Consulting Engineers Limited were commissioned by Nigel Kay Homes Ltd in February 2026 to undertake a Flood Risk Assessment (FRA) and Drainage Strategy for a proposed up to 45-unit (second phase) residential development, on land adjacent to Dalzell Street, Moor Row, Whitehaven.

This report will be provided as supporting documentation as part of a planning application.

Initial review of the UK Government data indicate that the site is located predominantly within a **Flood Zone 1** (Low Probability) area and is at no risk of flooding from rivers, sea or from reservoirs.

Pluvial flood maps indicate a small amount of Flood Zone 2/3, to the northern boundary which is outside the proposed developable area. The flood map also indicates a similar small area of surface water flooding within the same area which emanates from a small track on the northern most boundary,

Existing onsite surfacing water flooding will be mitigated through the proposed development, as the site is being developed with both soft landscaping and positively drained hard standing areas. The inclusion of a controlled, restricted discharge rate and attenuation to accommodate onsite flows, will further mitigate the existing risk of surface water flooding. It is therefore considered that this flood risk is omitted through the proposed development and associated infrastructure.

Sequential testing is not required to be carried out for developments within Flood Zone 1 areas and as such it should not be necessary to consider sequential testing for this scheme.

The assessment associated with appropriate surface water management has followed the order of hierarchy based on the following:

Method 1 – Collected for non-potable use

Method 2 – Discharge via infiltration

Method 3 – Discharge to an above ground surface water body

Method 4 – Discharge to a public surface water sewer

Method 5 – Discharge to a public sewer network

Furthermore, the assessment concluded that the most appropriate method for proposed surface water management associated with the residential development was **Method 3**, discharge to an above ground surface water body.

The surface water drainage for the scheme has been designed to discharge into the existing drainage ditch to the north of the site at a restricted discharge rate of no more than Qbar 32.3 l/s Discharge will be made via a new outfall.

The design can accommodate up to a 1 in 100-year critical storm event (plus 50% climate change and 10% urban creep) for up to the 1440-minute storm duration with on-site attenuation provided. Attenuation for all storm events is provided by an online attenuation basin, an offline attenuation tank and permeable paving.

To ensure the water quality entering the surface water network does not have a detrimental impact to the environment, permeable paving is to be included in all shared and private drives. All flows will also pass through the online attenuation basin which will provide further treatment.

The foul sewer network will discharge from site at an unrestricted rate into the 375mm diameter combined sewer located in the residential development serving Pearson Close and Montreal Place, to the south of the site. This will be via a foul water pump and rising main to an existing 'as-constructed' foul sewer, serving the Phase 1 works.

The proposed development will have a low to very low risk of flooding from rivers, sea, reservoirs, and sewers, with surface water flooding mitigation provided through the proposed development drainage scheme. Flows will discharge at a controlled, restricted rate as advised by the Local Authority.

This Flood Risk Assessment has confirmed that the proposed development is appropriate and sustainable in the terms as set out in NPPF.

8.0 Report Conditions

The report is based on the information that has been acquired and/or made available to Beckwith and Hanlon Consulting Engineers Limited via the various searches and consultations undertaken as part of the Flood Risk Assessment. In some cases, anecdotal information has been relied upon, where documented evidence has been lacking.

The conclusions drawn in the above report are considered correct although any subsequent additional information may allow refinement of the conclusions.

All work carried out in preparing this report has utilised and is based upon Beckwith and Hanlon Consulting Engineers Limited current professional knowledge and understanding of current UK standards and codes, technology and legislation. Changes in this legislation and guidance may occur at any time in the future and cause any conclusions to become inappropriate or incorrect.

This report has been prepared using information contained in maps and documents prepared by others. Beckwith and Hanlon Consulting Engineers Limited can accept no responsibility for the accuracy of such information.

APPENDIX A

SITE LOCATION PLAN

SITE LOCATION
E 300626
N 514750

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PROJECT

DALZELL STREET
MOOR ROW
PHASE 2

DRAWING TITLE

SITE LOCATION PLAN

Beckwith & Hanlon Consulting Engineers Limited
F22 Willow Court, Marquis Court,
Team Valley Trading Estate,
Gateshead, NE11 0RU
Tel: +44 (0) 191 429 5820

SCALE	BY	CHECKED	DATE
1:20,000	JH	JM	JUNE '26

DRAWING NO.
26-019-910

STATUS	REV	P1
PRELIMINARY	SIZE	A3

APPENDIX B

EXISTING TOPOGRAPHICAL SURVEY

0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100
Scale Bar — metres

Note: Parts of site overgrown at time of survey, some detail may not be shown.

514850
514800
514750
514700
514650
514600
514550
514500
300300
300350
300400
300450
300500
300550
300600
300650
300700
300750
300800
300850

Revision Notes:

N

Survey Note:
Survey on planar grid, referenced to OSGB36 at the following point:
300511.90mE
514609.64mN
Contours @ 0.5m intervals.

Survey Key:

Wall		Cover	
Kerb		Man Hole	
		Fire Hydrant	
	WS	Water Supply	
	LP	Lamp Post	
Fence	EP	Electricity Pole	
Vegetation Line	TP	Telegraph Pole	
		Anchor Point	
Tree		Bench Mark	
		Bore Hole	
Bush	AV	Air Valve	
Gate	FP	Fire Point	
	SV	Stop Valve	
Drop Kerb	CATV	Cable TV	
	TBGH	Top of Bottom Gate Hanging	
O/H Telecomms			
O/H Power			

SPATIAL DATA LIMITED
3 Boundary Bank, Kendal, Cumbria, LA9 5RR
Telephone: +44(0)1539 734400
E-mail: info@SpatialDataLtd.com
URL: www.SpatialDataLtd.com

Client: Glen Beattie

Project: Land on Dalzell Street, Moor Row

Site Survey: August 2022

Scale: 1:500 @ A0

Crew: AC,SM,SN Chk: HT Ref: NJC

APPENDIX C

UU SEWER RECORD PLANS

UU CORRESPONDENCE

WASTEWATER PRE-DEVELOPMENT ENQUIRY

United Utilities Grasmere House, 2nd Floor
Lingley Mere Business Park
Great Sankey
Warrington
WA5 3LP

15.06.2026

Dear **Julie,**

Pre-Development Enquiry for **Land off Dalzell Street, Egremont, CA24 3LH** UU Reference Number: **09576801**

We have assessed your application based on the information provided. This pre-development advice on your drainage strategy will be valid for 12 months. Your strategy will need review by other authorities as part of the planning process. We advise conducting necessary site investigations to confirm viability of your proposals.

Modelled Flood Risk

I can confirm that we do not have modelled flood risk within the vicinity of the proposed development.

Please note that our modelling data is indicative, and only representative of the 1:100year storm event.

Please see **comment 2** of the attached guidance sheet

Asset Protection

We have reviewed our records and can confirm that there does not appear to be any charted public sewers located within the boundary of the proposed development.

Please see **comment 3** of the attached guidance sheet and **Working Near Our Pipelines Guidance document**

Foul Water

Foul flow from this site will be allowed to drain into the public combined sewer system.

Our preferred point of discharge would be to the 375mm diameter public combined sewer located South of your proposed development at an unrestricted rate. We would have no objection to an indirect connection to this asset.

Manhole reference NY00147501, **Grid reference** 300767, 514531

WASTEWATER PRE-DEVELOPMENT ENQUIRY

Please see the images at the end of this letter for clarification

Surface Water

Follow the National Planning Policy Guidance drainage hierarchy and Provide evidence for discounting higher options before considering public sewer discharge. Consult the Lead Local Flood Authority regarding surface water concerns.

Please see comment **4** within the guidance sheet

Infiltration

Please see comment **4** within the guidance sheet

Waterbody

If an evidence-based assessment has been carried out and confirms that infiltration is not feasible, we recommend that you contact the Lead Local Flood Authority and/or Environment Agency to discuss a point of discharge to the watercourse located to the North of the proposed site.

We would encourage you to engage with any third-party landowner and riparian owner to agree access and discharge rights to the water body if this is not in your ownership.

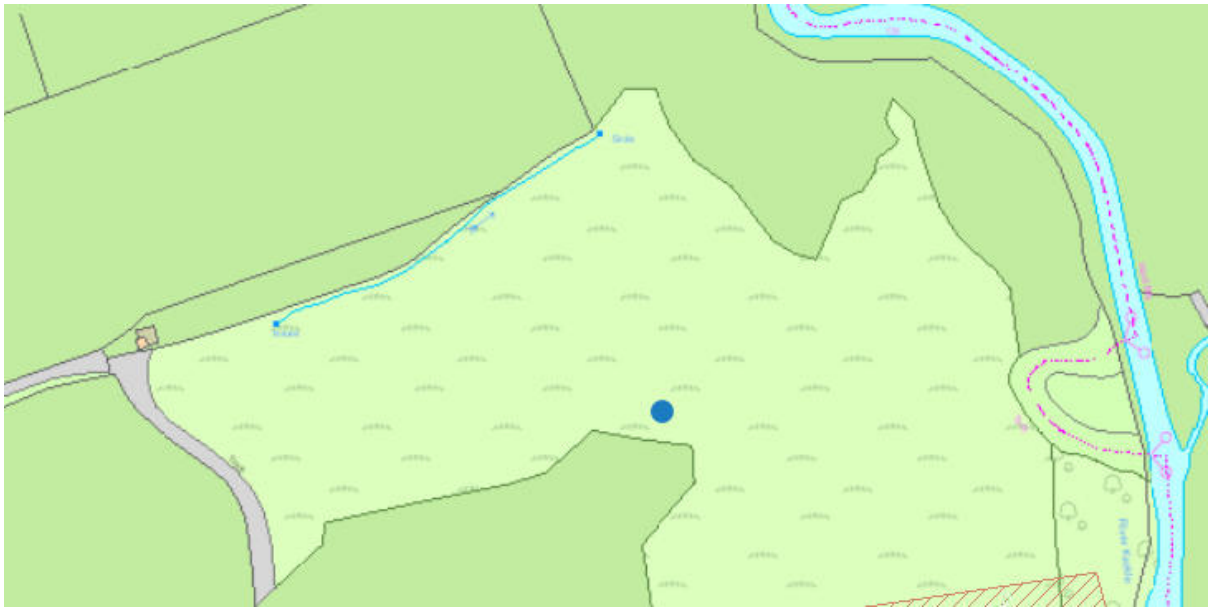
Public Sewer

We would not consider a connection to the public sewer for surface water disposal at this time, higher options in the drainage hierarchy will need to be investigated and sufficiently discounted prior to discussions.

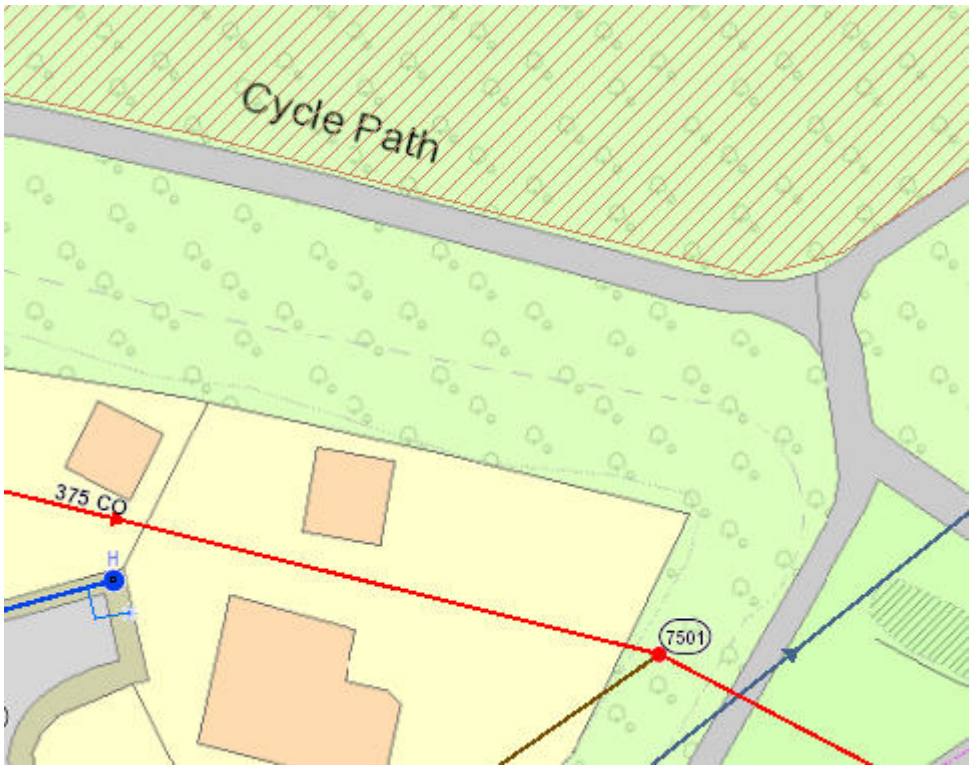
WASTEWATER PRE-DEVELOPMENT ENQUIRY

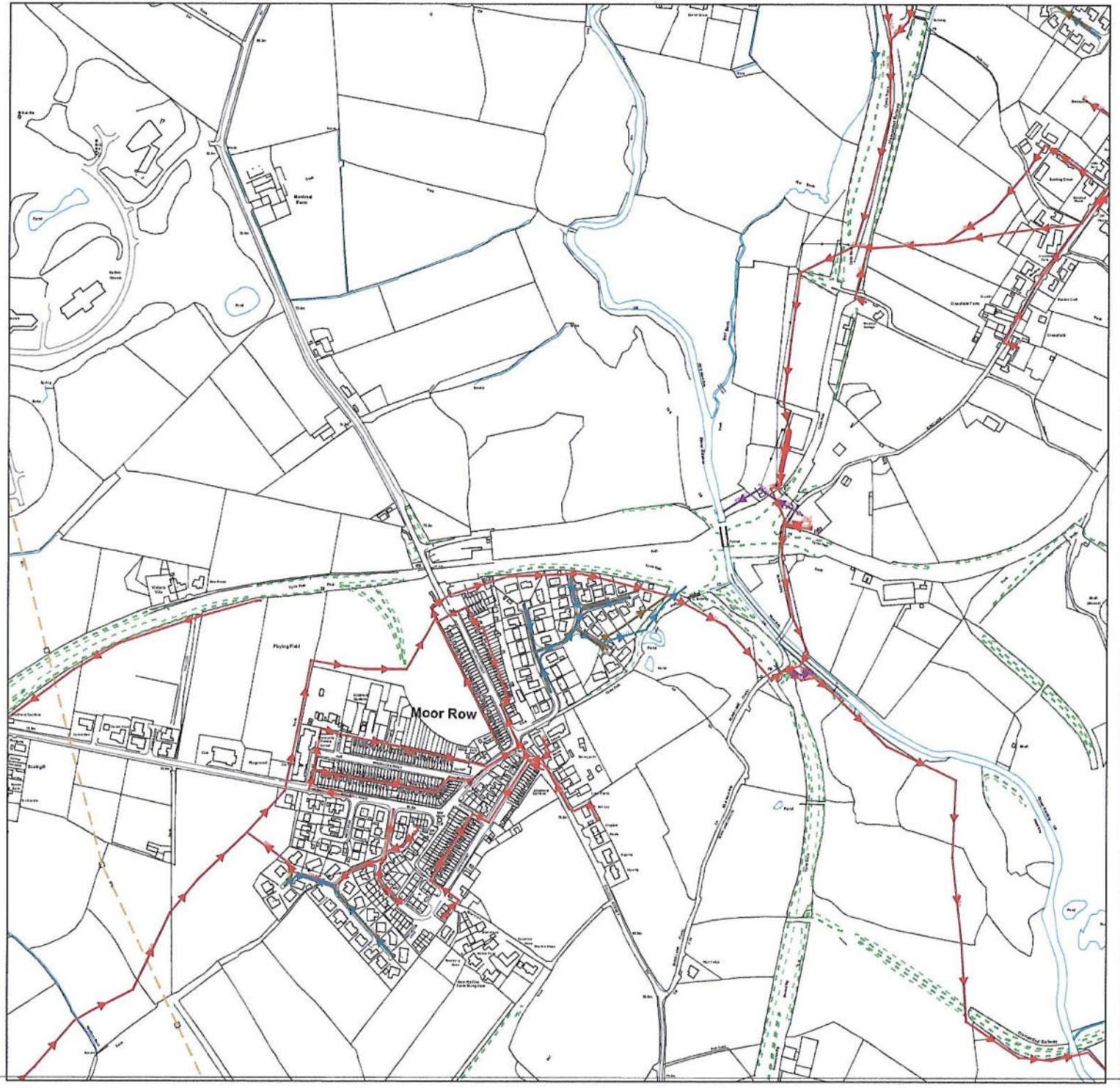
United Utilities
Water for the North West

Development Image



Foul Connection Point





Extract from Map of Public Sewers

The position of underground apparatus shown on this plan is approximate only and is given in accordance with the best information currently available.

The actual positions may be different from those shown on the plan and private pipes, sewers or drains may not be recorded.

United Utilities will not accept any liability for any damage caused by the actual positions being different from those shown.

LEGEND

				Water Course
				Overflow Pipe
				Sludge Main
				Highway Drain
Combined	Surface Water	Foul	Abandoned	
				Public Sewer
				Private Sewer
				Section 104
				Rising Main

Montreal
Moor Row
CA24 3LE

Printed By : Property Searches Date: 27/04/2016

DO NOT SCALE

Approximate Scale: 1:5000

United Utilities
helping life flow smoothly

APPENDIX D

PROPOSED SITE LAYOUT

No.	Date	Revision	Initial

ALPHA DESIGN

Architectural Services
Member of the Chartered Institute of
Architectural Technologists

Tel: 01900 829199 email: gb@adcumbria.co.uk

Project

RESIDENTIAL DEVELOPMENT,
DALZELL STREET,
MOOR ROW

Client

NIGEL KAY HOMES LTD.

Drawing

PHASE 2 -
INDICATIVE SITE PLAN

Scale 1:1000 @ A1 (L) Drawn GB

Checked Date MAY 2026

Drawing No.

26/01/1093 - 02

APPENDIX E

ENVIRONMENT AGENCY FLOOD INFORMATION

Flood map for planning

Your reference	Location (easting/northing)	Created
Phase 2 Moor Row	**300619/514742**	**29 June 2026 12:51**

Your selected location is in flood zone 3, an area with a high probability of flooding.

This means:

- you must complete a flood risk assessment for development in this area
- you should follow the Environment Agency's standing advice for carrying out a flood risk assessment (see https://www.gov.uk/guidance/flood-risk-assessment-standing-advice)

Notes

The flood map for planning shows river and sea flooding data only. It doesn't include other sources of flooding. It is for use in development planning and flood risk assessments.

This information relates to the selected location and is not specific to any property within it. The map is updated regularly and is correct at the time of printing.

Environment Agency

Flood map for planning

Your reference
Phase 2 Moor Row

Location (easting/northing)
300619/514742

Scale
1:2,500

Created
29 Jun 2026 12:51

- Selected area
- Flood zone 3
- Flood zone 2
- Flood zone 1
- Flood defence
- Main river
- Water storage area

0 20 40 60 m

Show

Datasets

Surface water

Hide

- Flood zones 2 and 3
- Surface water
- None

Climate change

Present day

Show

Annual likelihood of flooding

1 in 30

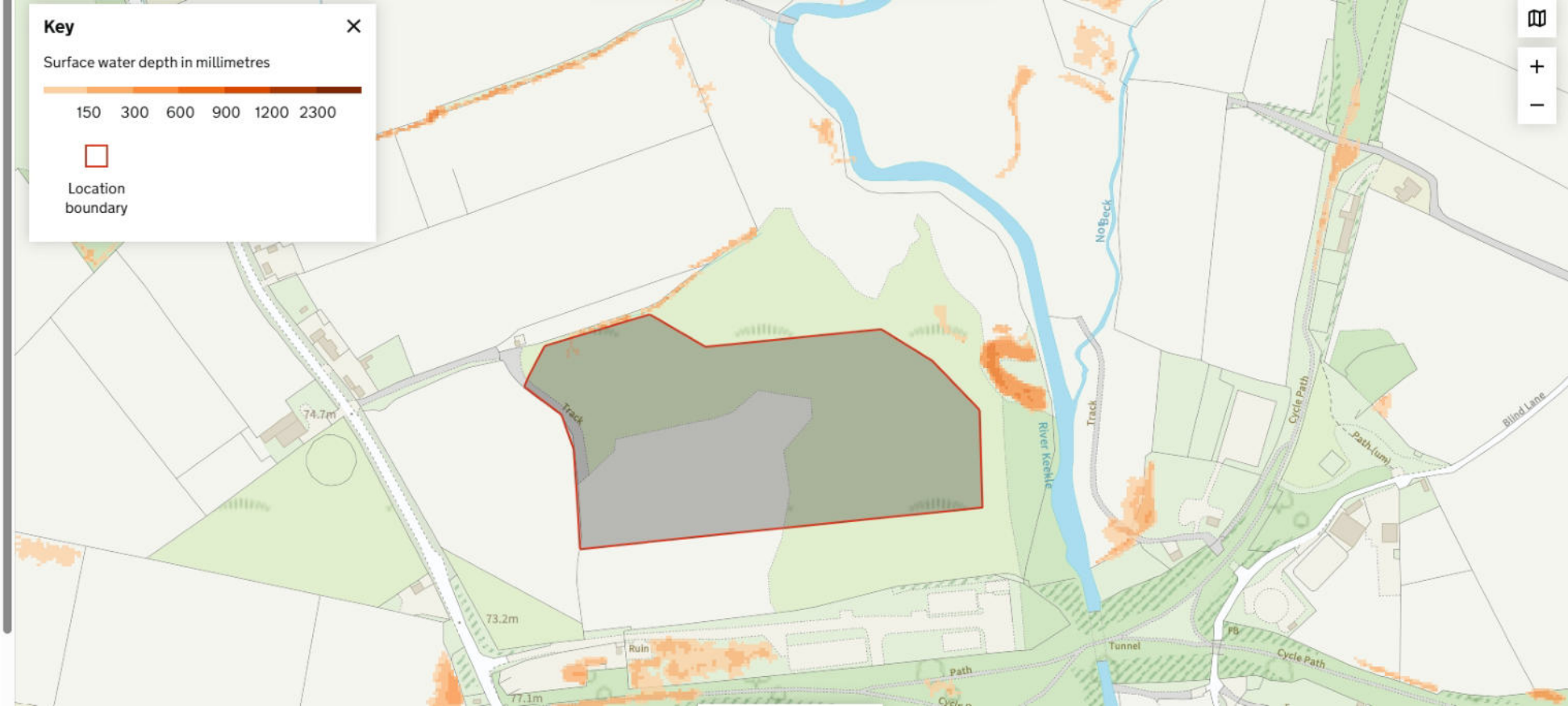
Hide

- 1 in 30
- 1 in 100
- 1 in 1000

Depth in millimetres

All depths

Show



Show

Datasets

Surface water

Hide

- ○ Flood zones 2 and 3
- ◉ Surface water
- ○ None

Climate change

Present day

Show

Annual likelihood of flooding

1 in 100

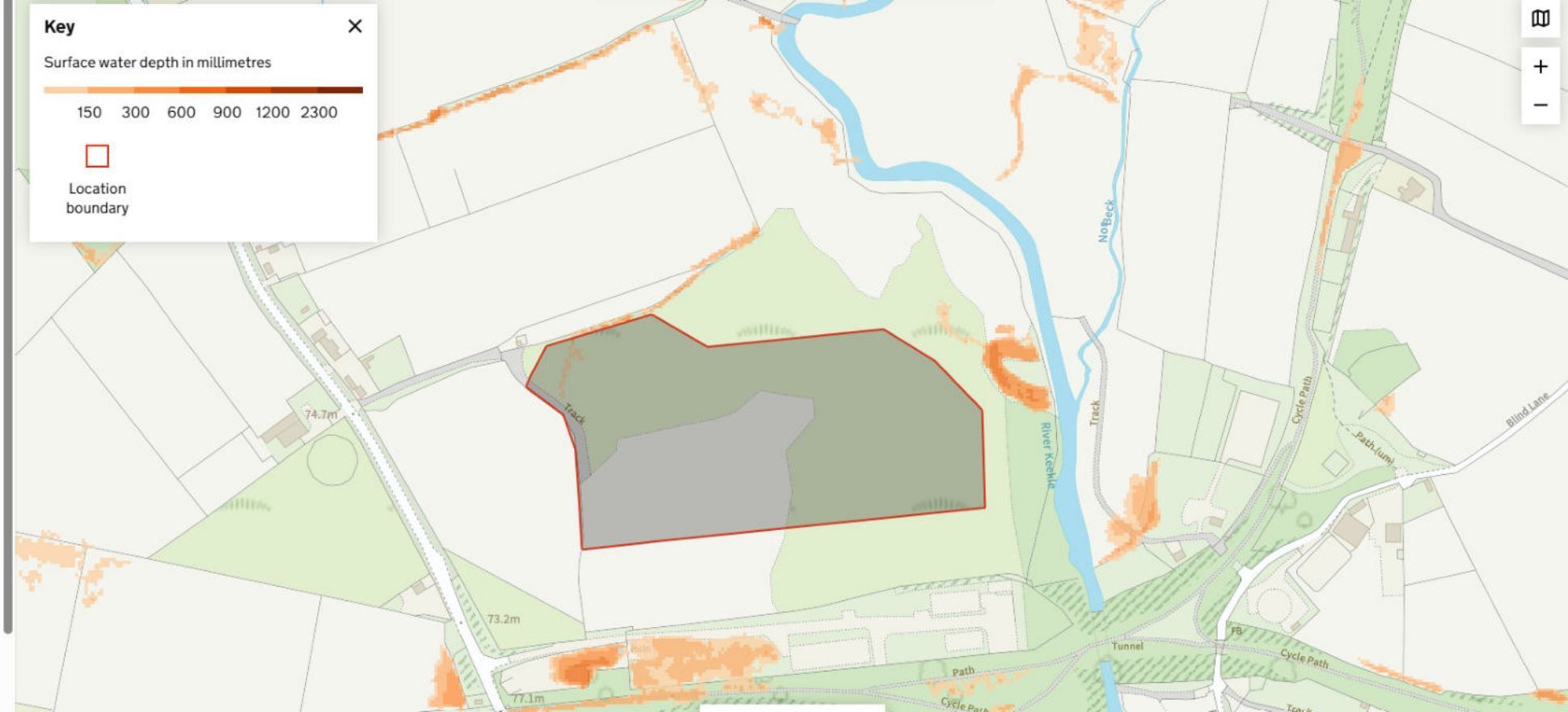
Hide

- ○ 1 in 30
- ◉ 1 in 100
- ○ 1 in 1000

Depth in millimetres

All depths

Show



Show

Datasets

Surface water

Hide

- Flood zones 2 and 3
- Surface water
- None

Climate change

Present day

Show

Annual likelihood of flooding

1 in 1000

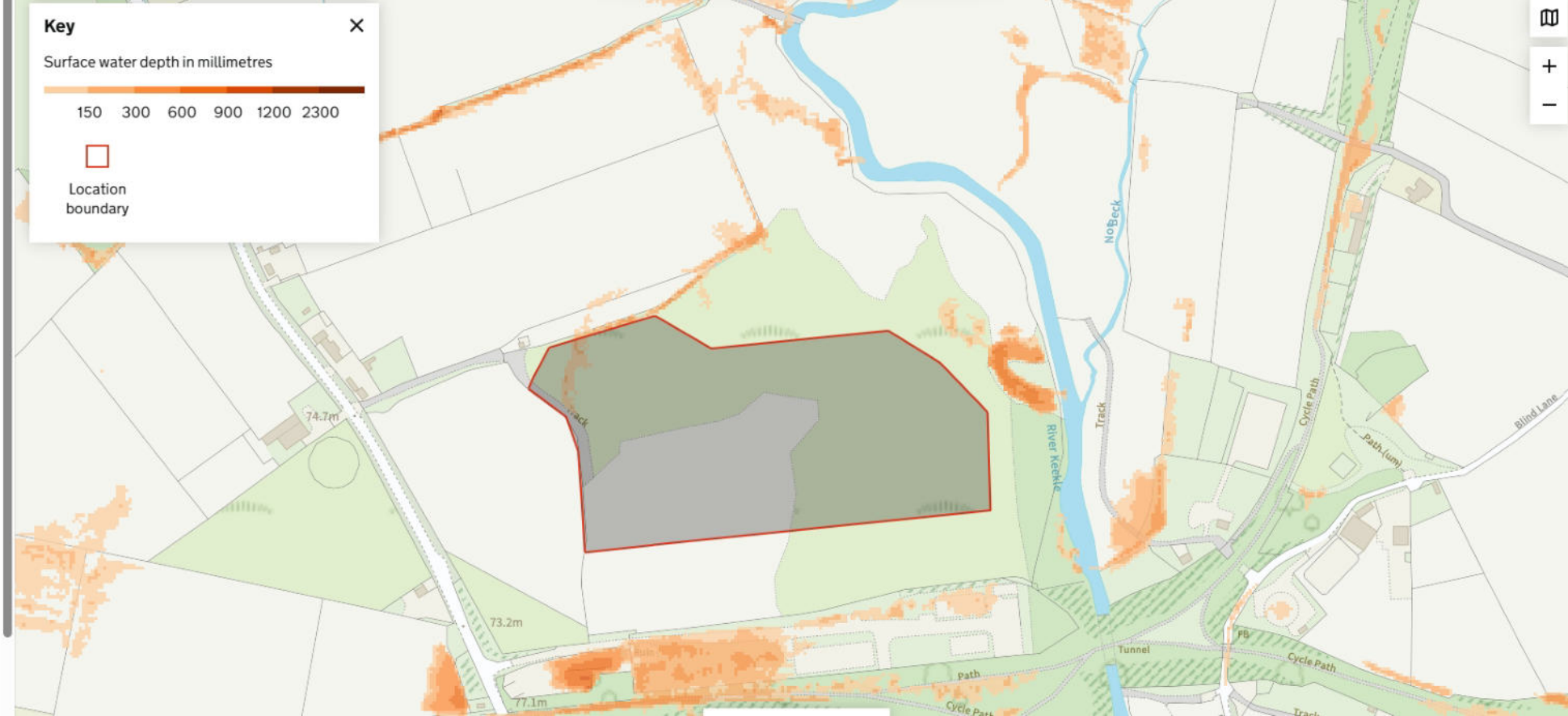
Hide

- 1 in 30
- 1 in 100
- 1 in 1000

Depth in millimetres

All depths

Show



APPENDIX F

HR WALLINGFORD GREENFIELD RUN-OFF CALCULATIONS

Greenfield runoff rate estimation tool

www.uksuds.com | Greenfield runoff rate estimation tool (https://www.uksuds.com/)

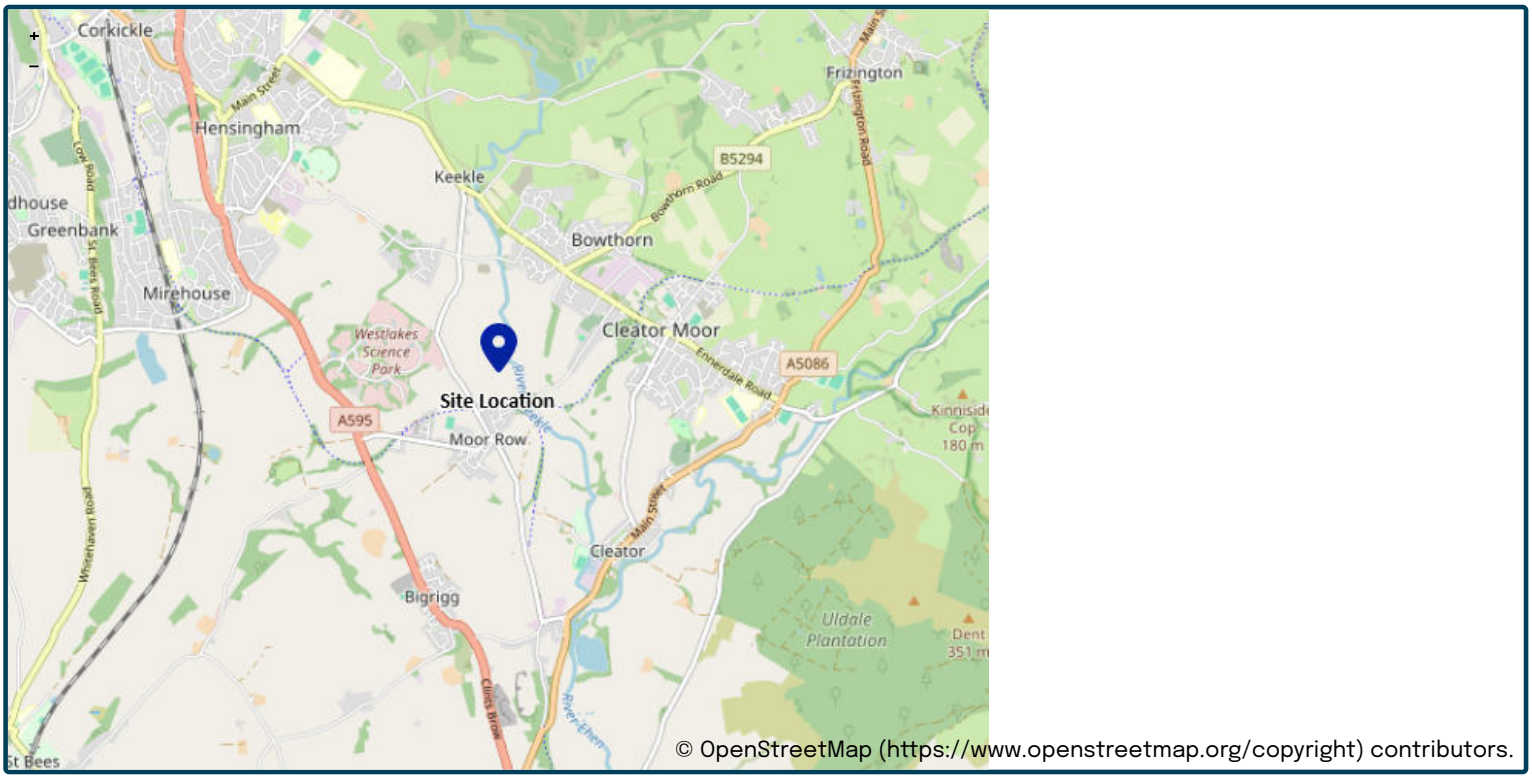
This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance “Rainfall runoff management for developments”, SC030219 (2013), the SuDS Manual C753 (CIRIA, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Project details

Date	09/06/2026
Calculated by	Beckwith & Hanlon
Reference	26-019
Model version	2.2.3

Location

Site name	Dalzell Street Phase 2
Site location	Moor Row



Site easting (British National Grid)	300633
Site northing (British National Grid)	514669

Site details

Total site area (ha)	2.984 ha

Greenfield runoff

Method

Method	FEH statistical (2025)

FEH statistical (2025)

	My value		Map value
SAAR9120 (mm)	1262 mm		
BFIHOST19scaled	0.426		
QMed-QBar conversion	1.075		1.075
QMed (l/s)	30.8 l/s		
QBar (FEH statistical 2025) (l/s)	33.1 l/s		

Growth curve factors

	My value		Map value
Hydrological region	10		10
1 year growth factor	0.87		
2 year growth factor	0.93		
10 year growth factor	1.38		
30 year growth factor	1.7		
100 year growth factor	2.08		
200 year growth factor	2.37		

Results

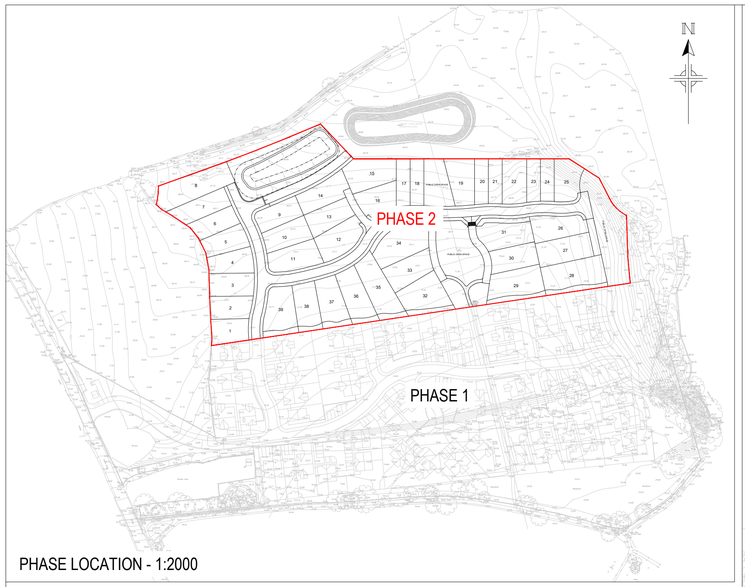
Method	FEH statistical (2025)
Flow rate 1 year (l/s)	28.8 l/s
Flow rate 2 year (l/s)	30.8 l/s
Flow rate 10 years (l/s)	45.7 l/s
Flow rate 30 years (l/s)	56.4 l/s
Flow rate 100 years (l/s)	69.0 l/s
Flow rate 200 years (l/s)	78.6 l/s

Please note runoff estimation is subject to significant uncertainty. Results are therefore normally reported to only 1 decimal place. Where 2 decimal places are provided, this does not indicate accuracy to this level, it has been adopted to prevent 'zero' figures from being reported. Outputs less than 0.01 l/s are reported as 0.01 l/s.

Disclaimer

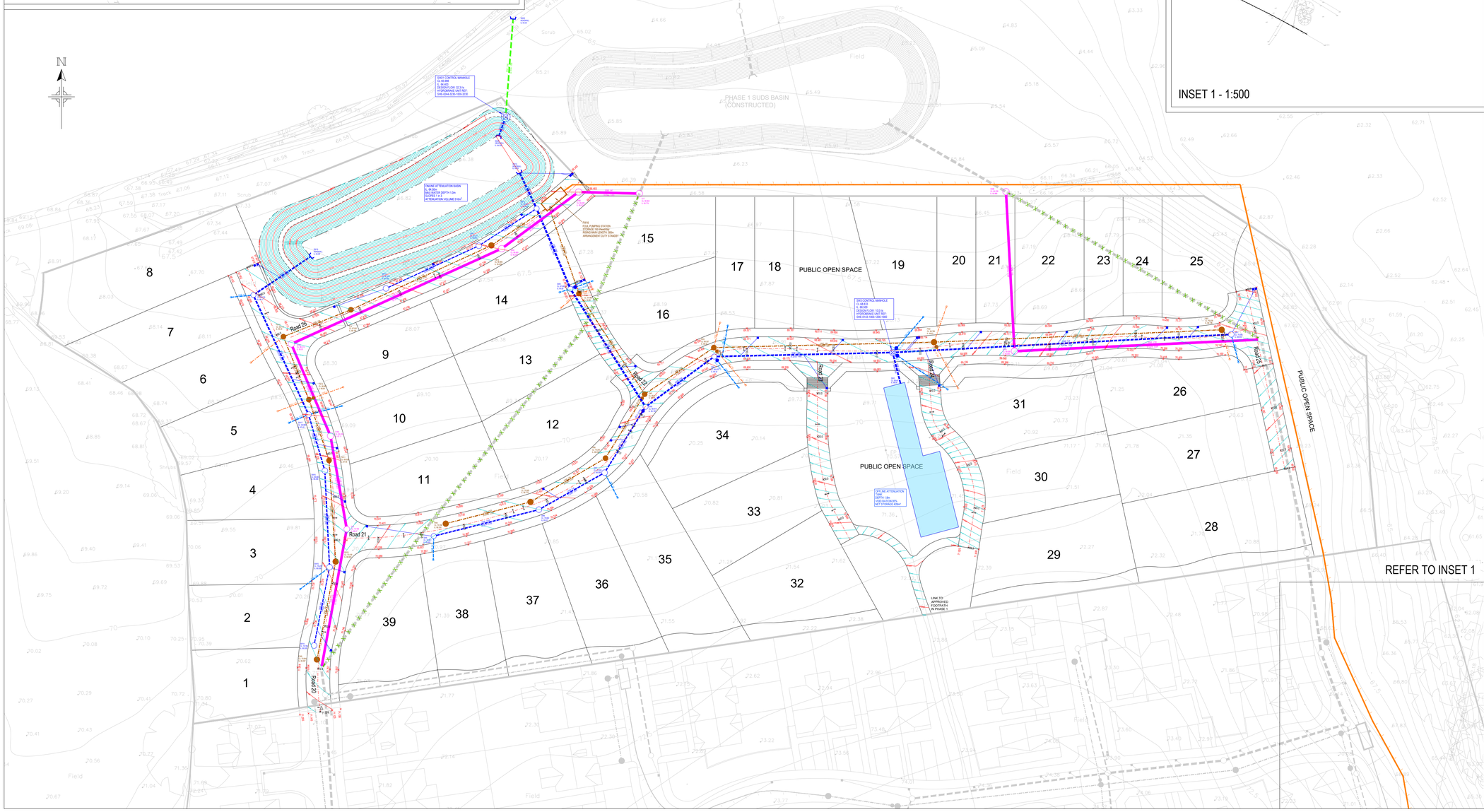
APPENDIX G

DRAINAGE STRATEGY



PHASE LOCATION - 1:2000

INSET 1 - 1:500



NOTE

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DO NOT SCALE OFF THIS DRAWING.

DO NOT TAKE DIGITAL DIMENSIONS OFF THIS DRAWING.

GENERAL

THIS DRAWING IS BASED ON THE FOLLOWING:

- TOPOGRAPHIC SURVEY PROVIDED BY SPATIAL DATA LTD. - AUGUST 2022.
- PROPOSED SITE PLAN PROVIDED BY ALPHA DESIGN, PHASE 2 INDICATIVE PLAN 26/01/1093-02.

DALZELL STREET, MOOR ROW, PHASE 2

THIS IS A PRELIMINARY DRAINAGE AND LEVELS STRATEGY ONLY. THE PROPOSALS INCLUDED ARE SUBJECT TO RECEIPT OF DETAILED EXISTING UTILITY PLANS, CUMBERLAND COUNCIL LLFA APPROVAL, SECTION 106 TECHNICAL APPROVAL FROM UNITED UTILITIES AND DETAILED DESIGN.

COMBINED WATER

THERE IS AN ADOPTED 375 Ø COMBINED WATER SEWER RUNNING TO THE SOUTH OF THE SITE.

FOUL WATER

FOUL WATER FLOWS ARE PROPOSED TO DISCHARGE WITHOUT RESTRICTION INTO THE EXISTING ADOPTED 375 Ø COMBINED SEWER TO THE SOUTH OF THE SITE AS APPROVED BY UNITED UTILITIES RESPONSE TO A PRE-DEVELOPMENT ENQUIRY DATED 15/06/26.

SURFACE WATER

SURFACE WATER FLOWS ARE PROPOSED TO DISCHARGE AT NO GREATER THAN 32.3l/s (QBAR) IN TO THE EXISTING SURFACE WATERCOURSE TO THE NORTH OF THE SITE SUBJECT TO CUMBERLAND COUNCIL LLFA APPROVAL.

SURFACE WATER DRAINAGE STRATEGY

CAUSEWAY FLOW MODELING HAS DEMONSTRATED THAT THE FLOW RATES FROM THE DEVELOPMENT AREA FOR A 1440 MINUTE STORM DURATION ARE AS FOLLOWS,

1 IN 2 YEAR:	21.9 l/s
*1 IN 30 YEAR:	32.3 l/s
#1 IN 100 YEAR:	32.3 l/s

* INCLUDING 45% CLIMATE CHANGE
\# INCLUDING 50% CLIMATE CHANGE

THESE RATES ARE DERIVED FROM THE CAUSEWAY FLOW SOFTWARE MODEL USING FEH RAINFALL AND INCLUDE A 10% ALLOWANCE FOR URBAN CREEP. SUMMER & WINTER VOLUMETRIC RUN-OFF COEFFICIENTS HAVE BEEN SET AT 1.0 & 1.0 RESPECTIVELY AS STANDARD.

SURFACE WATER ATTENUATION

SURFACE WATER ATTENUATION FOR UP TO AND INCLUDING THE 1 IN 100 YEAR STORM EVENT (+50% CLIMATE CHANGE AND 10% URBAN CREEP) IS PROVIDED VIA AN ONLINE ATTENUATION BASIN AND AN OFFLINE ATTENUATION TANK AS INDICATED WITHIN THE PROPOSED STRATEGY DRAWING.

PERMEABLE PAVING

PERMEABLE PAVING IS TO BE INSTALLED IN ALL PRIVATE DRIVES.

DRAINAGE MAINTENANCE

ALL DRAINAGE INDICATED WILL BE MAINTAINED BY AN APPOINTED MANAGEMENT COMPANY.

KEY

- EXISTING 375Ø UNITED UTILITIES COMBINED SEWER
- PROPOSED SURFACE WATER SEWER
- PROPOSED SURFACE WATER DIVERSION
- ABANDONED SURFACE WATER SEWER
- PROPOSED TRAPPED GULLY
- PROPOSED FILTER DRAIN
- PROPOSED FOUL WATER SEWER
- PROPOSED FOUL RISING MAIN
- PRIVATE SURFACE WATER LATERAL
- PRIVATE FOUL WATER LATERAL
- PROPOSED ROAD CONTOURS
- SITE BOUNDARY

REV	AMENDMENT	BY	CKD	DATE
P2	FOUL RISING MAIN ADDED.	JH	JM	29/06/26
P1	FIRST ISSUE	JH	JM	26/06/26

CLIENT

NIGEL KAY HOMES LTD

PROJECT

DALZELL STREET
MOOR ROW
PHASE 2

DRAWING TITLE

PRELIMINARY DRAINAGE AND LEVELS STRATEGY

Beckwith & Hanlon Consulting Engineers Limited
F22 Willow Court, Marquis Court,
Team Valley Trading Estate,
Gateshead, NE11 0RU
Tel: +44 (0) 191 429 5820

SCALE	BY	CHECKED	DATE
1:500	JH	JM	JUNE '26

DRAWING NO.
26-019-901

STATUS	REV	P2
PRELIMINARY	SIZE	A1

APPENDIX H

DRAINAGE CALCULATIONS

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	240.00
Return Period (years)	1	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	1.000
Ratio-R	0.300	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	x

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)	Invert Level (m)
SW1	0.172	5.00	70.055	1350	300747.087	514768.054	1.448	68.607
SW3	0.319	5.00	68.833	1500	300668.880	514763.876	2.333	66.500
SW4	0.157	5.00	69.432	1200	300627.670	514762.937	3.112	66.320
SW5	0.070	5.00	70.801	1200	300562.867	514721.465	1.450	69.351
SW6	0.020	5.00	70.602	1350	300587.159	514727.585	1.502	69.100
SW7	0.104	5.00	70.339	1350	300602.334	514736.114	1.750	68.589
SW8	0.034	5.00	69.919	1200	300611.801	514751.333	3.764	66.155
SW9	0.133	5.00	67.882	1200	300594.452	514778.568	3.282	64.600
SW10	0.039	5.00	67.554	1350	300551.843	514778.664	1.350	66.204
SW11	0.018	5.00	67.011	1350	300573.278	514788.531	1.350	65.661
SW12	0.013	5.00	66.645	1200	300586.633	514797.120	2.100	64.545
SW13			65.998	1350	300582.743	514805.318	1.478	64.520
SW14	0.029	5.00	70.783	1350	300535.223	514696.206	1.478	69.305
SW15	0.059	5.00	70.476	1350	300538.804	514714.290	1.618	68.858
SW16	0.012	5.00	69.683	1350	300537.718	514736.571	1.350	68.333
SW17	0.237	5.00	68.998	1350	300533.967	514749.528	1.598	67.400
SW18	0.015	5.00	68.019	1200	300521.204	514777.142	1.849	66.170
SW19			65.998	1350	300534.420	514786.039	1.108	64.890
SW20			65.998	1350	300577.946	514813.917	1.498	64.500
SW21			65.998	2100	300579.471	514818.267	1.598	64.400
SW22			64.609	1350	300581.196	514840.902	0.409	64.200
SW2		5.00	69.450	1200	300670.696	514756.703	2.900	66.550

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	SW1	SW3	78.318	0.600	68.607	66.500	2.107	37.2	300	5.50	45.5
1.001	SW3	SW4	41.221	0.600	66.500	66.320	0.180	229.0	300	6.17	43.4
1.002	SW4	SW8	19.659	0.600	66.320	66.230	0.090	218.4	300	6.48	42.5
3.000	SW5	SW6	25.051	0.600	69.351	69.100	0.251	99.8	225	5.32	46.2
3.001	SW6	SW7	17.408	0.600	69.100	68.589	0.511	34.1	225	5.45	45.7
3.002	SW7	SW8	17.923	0.600	68.589	67.450	1.139	15.7	225	5.54	45.4
1.003	SW8	SW9	32.291	0.600	66.155	64.600	1.555	20.8	375	6.61	42.1
1.004	SW9	SW12	20.133	0.600	64.600	64.545	0.055	366.1	375	6.97	41.1

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	2.587	182.8	21.3	1.148	2.033	0.172	0.0	68	1.742
1.001	1.035	73.1	57.7	2.033	2.812	0.491	0.0	202	1.143
1.002	1.060	74.9	74.6	2.812	3.389	0.648	0.0	246	1.201
3.000	1.308	52.0	8.7	1.225	1.277	0.070	0.0	62	0.976
3.001	2.249	89.4	11.1	1.277	1.525	0.089	0.0	53	1.542
3.002	3.315	131.8	23.9	1.525	2.244	0.194	0.0	65	2.534
1.003	3.991	440.8	100.0	3.389	2.907	0.876	0.0	120	3.249
1.004	0.941	103.9	112.5	2.907	1.725	1.008	0.0	375	0.953

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
4.000	SW10	SW11	23.597	0.600	66.204	65.661	0.543	43.5	150	5.26	46.4
4.001	SW11	SW12	15.878	0.600	65.661	65.394	0.267	59.5	150	5.46	45.7
1.005	SW12	SW13	9.074	0.600	64.545	64.520	0.025	363.0	375	7.13	40.7
1.006	SW13	SW20	9.846	0.030	64.520	64.500	0.020	492.3	500	7.39	40.1
5.000	SW14	SW15	18.434	0.600	69.305	68.858	0.447	41.2	150	5.20	46.6
5.001	SW15	SW16	22.308	0.600	68.858	68.333	0.525	42.5	225	5.38	46.0
5.002	SW16	SW17	13.489	0.600	68.333	67.475	0.858	15.7	225	5.45	45.7
5.003	SW17	SW18	30.421	0.600	67.400	66.170	1.230	24.7	300	5.61	45.2
5.004	SW18	SW19	15.931	0.600	66.170	64.890	1.280	12.4	300	5.67	45.0
5.005	SW19	SW20	51.689	0.030	64.890	64.500	0.390	132.5	500	6.37	42.8
1.007	SW20	SW21	4.609	0.030	64.500	64.450	0.050	92.2	300	7.51	39.8
1.008	SW21	SW22	22.701	0.030	64.400	64.200	0.200	113.5	300	8.19	38.2
2.000	SW2	SW3	7.399	0.600	66.550	66.500	0.050	148.0	300	5.10	47.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
4.000	1.530	27.0	5.0	1.200	1.200	0.039	0.0	44	1.173
4.001	1.306	23.1	7.1	1.200	1.101	0.057	0.0	57	1.153
1.005	0.945	104.4	119.1	1.725	1.103	1.079	0.0	375	0.957
1.006	0.632	632.3	117.2	0.978	0.998	1.079	0.0	236	0.411
5.000	1.571	27.8	3.6	1.328	1.468	0.029	0.0	37	1.091
5.001	2.012	80.0	11.0	1.393	1.125	0.088	0.0	56	1.417
5.002	3.316	131.9	12.4	1.125	1.298	0.100	0.0	46	2.097
5.003	3.174	224.3	41.3	1.298	1.549	0.337	0.0	86	2.436
5.004	4.479	316.6	42.9	1.549	0.808	0.352	0.0	74	3.163
5.005	1.219	1218.6	40.8	0.608	0.998	0.352	0.0	102	0.500
1.007	0.617	43.6	154.2	1.198	1.248	1.431	0.0	300	0.626
1.008	0.556	39.3	148.1	1.298	0.109	1.431	0.0	300	0.564
2.000	1.290	91.2	0.0	2.600	2.033	0.000	0.0	0	0.000

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	78.318	37.2	300	Circular	70.055	68.607	1.148	68.833	66.500	2.033
1.001	41.221	229.0	300	Circular	68.833	66.500	2.033	69.432	66.320	2.812
1.002	19.659	218.4	300	Circular	69.432	66.320	2.812	69.919	66.230	3.389
3.000	25.051	99.8	225	Circular	70.801	69.351	1.225	70.602	69.100	1.277
3.001	17.408	34.1	225	Circular	70.602	69.100	1.277	70.339	68.589	1.525
3.002	17.923	15.7	225	Circular	70.339	68.589	1.525	69.919	67.450	2.244
1.003	32.291	20.8	375	Circular	69.919	66.155	3.389	67.882	64.600	2.907
1.004	20.133	366.1	375	Circular	67.882	64.600	2.907	66.645	64.545	1.725
4.000	23.597	43.5	150	Circular	67.554	66.204	1.200	67.011	65.661	1.200
4.001	15.878	59.5	150	Circular	67.011	65.661	1.200	66.645	65.394	1.101
1.005	9.074	363.0	375	Circular	66.645	64.545	1.725	65.998	64.520	1.103

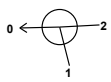
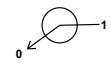
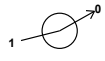
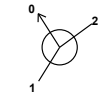
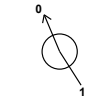
Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	SW1	1350	Manhole	Adoptable	SW3	1500	Manhole	Adoptable
1.001	SW3	1500	Manhole	Adoptable	SW4	1200	Manhole	Adoptable
1.002	SW4	1200	Manhole	Adoptable	SW8	1200	Manhole	Adoptable
3.000	SW5	1200	Manhole	Adoptable	SW6	1350	Manhole	Adoptable
3.001	SW6	1350	Manhole	Adoptable	SW7	1350	Manhole	Adoptable
3.002	SW7	1350	Manhole	Adoptable	SW8	1200	Manhole	Adoptable
1.003	SW8	1200	Manhole	Adoptable	SW9	1200	Manhole	Adoptable
1.004	SW9	1200	Manhole	Adoptable	SW12	1200	Manhole	Adoptable
4.000	SW10	1350	Manhole	Adoptable	SW11	1350	Manhole	Adoptable
4.001	SW11	1350	Manhole	Adoptable	SW12	1200	Manhole	Adoptable
1.005	SW12	1200	Manhole	Adoptable	SW13	1350	Manhole	Adoptable

Pipeline Schedule

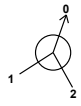
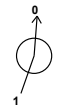
Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.006	9.846	492.3	500	1:3 Swale	65.998	64.520	0.978	65.998	64.500	0.998
5.000	18.434	41.2	150	Circular	70.783	69.305	1.328	70.476	68.858	1.468
5.001	22.308	42.5	225	Circular	70.476	68.858	1.393	69.683	68.333	1.125
5.002	13.489	15.7	225	Circular	69.683	68.333	1.125	68.998	67.475	1.298
5.003	30.421	24.7	300	Circular	68.998	67.400	1.298	68.019	66.170	1.549
5.004	15.931	12.4	300	Circular	68.019	66.170	1.549	65.998	64.890	0.808
5.005	51.689	132.5	500	1:3 Swale	65.998	64.890	0.608	65.998	64.500	0.998
1.007	4.609	92.2	300	Circular	65.998	64.500	1.198	65.998	64.450	1.248
1.008	22.701	113.5	300	Circular	65.998	64.400	1.298	64.609	64.200	0.109
2.000	7.399	148.0	300	Circular	69.450	66.550	2.600	68.833	66.500	2.033

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.006	SW13	1350	Manhole	Adoptable	SW20	1350	Manhole	Adoptable
5.000	SW14	1350	Manhole	Adoptable	SW15	1350	Manhole	Adoptable
5.001	SW15	1350	Manhole	Adoptable	SW16	1350	Manhole	Adoptable
5.002	SW16	1350	Manhole	Adoptable	SW17	1350	Manhole	Adoptable
5.003	SW17	1350	Manhole	Adoptable	SW18	1200	Manhole	Adoptable
5.004	SW18	1200	Manhole	Adoptable	SW19	1350	Manhole	Adoptable
5.005	SW19	1350	Manhole	Adoptable	SW20	1350	Manhole	Adoptable
1.007	SW20	1350	Manhole	Adoptable	SW21	2100	Manhole	Adoptable
1.008	SW21	2100	Manhole	Adoptable	SW22	1350	Manhole	Adoptable
2.000	SW2	1200	Manhole	Adoptable	SW3	1500	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
SW1	300747.087	514768.054	70.055	1.448	1350		0	1.000	68.607	300
SW3	300668.880	514763.876	68.833	2.333	1500		1	2.000	66.500	300
							2	1.000	66.500	300
							0	1.001	66.500	300
SW4	300627.670	514762.937	69.432	3.112	1200		1	1.001	66.320	300
							0	1.002	66.320	300
SW5	300562.867	514721.465	70.801	1.450	1200		0	3.000	69.351	225
SW6	300587.159	514727.585	70.602	1.502	1350		1	3.000	69.100	225
							0	3.001	69.100	225
SW7	300602.334	514736.114	70.339	1.750	1350		1	3.001	68.589	225
							0	3.002	68.589	225
SW8	300611.801	514751.333	69.919	3.764	1200		1	3.002	67.450	225
							2	1.002	66.230	300
							0	1.003	66.155	375
SW9	300594.452	514778.568	67.882	3.282	1200		1	1.003	64.600	375
							0	1.004	64.600	375

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
SW10	300551.843	514778.664	67.554	1.350	1350		0	4.000	66.204	150
SW11	300573.278	514788.531	67.011	1.350	1350		1	4.000	65.661	150
							0	4.001	65.661	150
SW12	300586.633	514797.120	66.645	2.100	1200		1	4.001	65.394	150
							2	1.004	64.545	375
							0	1.005	64.545	375
SW13	300582.743	514805.318	65.998	1.478	1350		1	1.005	64.520	375
							0	1.006	64.520	500
SW14	300535.223	514696.206	70.783	1.478	1350		0	5.000	69.305	150
SW15	300538.804	514714.290	70.476	1.618	1350		1	5.000	68.858	150
							0	5.001	68.858	225
SW16	300537.718	514736.571	69.683	1.350	1350		1	5.001	68.333	225
							0	5.002	68.333	225
SW17	300533.967	514749.528	68.998	1.598	1350		1	5.002	67.475	225
							0	5.003	67.400	300
SW18	300521.204	514777.142	68.019	1.849	1200		1	5.003	66.170	300
							0	5.004	66.170	300
SW19	300534.420	514786.039	65.998	1.108	1350		1	5.004	64.890	300
							0	5.005	64.890	500
SW20	300577.946	514813.917	65.998	1.498	1350		1	5.005	64.500	500
							2	1.006	64.500	500
							0	1.007	64.500	300
SW21	300579.471	514818.267	65.998	1.598	2100		1	1.007	64.450	300
							0	1.008	64.400	300
SW22	300581.196	514840.902	64.609	0.409	1350		1	1.008	64.200	300
SW2	300670.696	514756.703	69.450	2.900	1200		0	2.000	66.550	300

Simulation Settings

Rainfall Methodology	FEH-22	Analysis Speed	Normal	Starting Level (m)	
Rainfall Events	Singular	Skip Steady State	x	Check Discharge Rate(s)	x
Summer CV	1.000	Drain Down Time (mins)	1440	Check Discharge Volume	x
Winter CV	1.000	Additional Storage (m³/ha)	0.0		

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)	Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0	100	50	10	0
30	45	10	0				

Node SW21 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	64.400	Product Number	CTL-SHE-0244-3230-1000-3230
Design Depth (m)	1.000	Min Outlet Diameter (m)	0.300
Design Flow (l/s)	32.3	Min Node Diameter (mm)	1800

Node SW3 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	66.500	Product Number	CTL-SHE-0143-1000-1200-1000
Design Depth (m)	1.200	Min Outlet Diameter (m)	0.225
Design Flow (l/s)	10.0	Min Node Diameter (mm)	1500

Node SW20 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	64.500
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	192

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	8.6	0.0	0.500	609.9	0.0	1.000	811.0	0.0	1.500	1026.3	0.0
0.100	459.1	0.0	0.600	649.0	0.0	1.100	852.9	0.0	1.500	1028.7	0.0
0.200	496.0	0.0	0.700	688.7	0.0	1.200	895.4	0.0			
0.300	533.4	0.0	0.800	728.9	0.0	1.300	938.5	0.0			
0.400	571.4	0.0	0.900	769.7	0.0	1.400	982.1	0.0			

Node SW2 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	66.550
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	192

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	250.0	250.0	1.800	250.0	350.9	1.801	0.0	350.9

Results for 2 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	SW1	10	68.683	0.076	26.3	0.1084	0.0000	OK
15 minute summer	SW3	10	67.291	0.791	74.5	1.3973	0.0000	SURCHARGED
15 minute summer	SW4	10	66.466	0.146	33.0	0.1657	0.0000	OK
15 minute summer	SW5	10	69.423	0.072	10.7	0.0815	0.0000	OK
15 minute summer	SW6	10	69.159	0.059	13.6	0.0841	0.0000	OK
15 minute summer	SW7	10	68.664	0.075	29.4	0.1079	0.0000	OK
15 minute summer	SW8	10	66.253	0.098	66.9	0.1103	0.0000	OK
15 minute summer	SW9	11	64.878	0.278	87.0	0.3142	0.0000	OK
15 minute summer	SW10	10	66.252	0.048	6.0	0.0684	0.0000	OK
15 minute summer	SW11	11	65.727	0.066	8.7	0.0944	0.0000	OK
15 minute summer	SW12	11	64.794	0.249	96.9	0.2815	0.0000	OK
360 minute summer	SW13	232	64.783	0.263	33.8	0.3759	0.0000	OK
15 minute summer	SW14	10	69.345	0.040	4.4	0.0575	0.0000	OK
15 minute summer	SW15	10	68.924	0.066	13.4	0.0939	0.0000	OK
15 minute summer	SW16	10	68.386	0.053	15.1	0.0763	0.0000	OK
15 minute summer	SW17	10	67.504	0.104	51.2	0.1487	0.0000	OK
15 minute summer	SW18	10	66.252	0.082	53.2	0.0932	0.0000	OK
15 minute summer	SW19	10	65.019	0.129	52.9	0.1843	0.0000	OK
360 minute summer	SW20	232	64.782	0.282	49.0	113.7137	0.0000	OK
360 minute summer	SW21	232	64.768	0.368	22.1	1.2737	0.0000	SURCHARGED
360 minute summer	SW22	232	64.313	0.113	22.1	0.0000	0.0000	OK
360 minute summer	SW2	224	66.751	0.201	14.1	48.0447	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	SW1	1.000	SW3	25.9	0.511	0.142	3.3033	
15 minute summer	SW3	1.001	SW4	9.9	0.582	0.135	0.9638	
15 minute summer	SW4	1.002	SW8	32.6	0.999	0.435	0.6421	
15 minute summer	SW5	3.000	SW6	10.6	1.106	0.203	0.2402	
15 minute summer	SW6	3.001	SW7	13.4	1.361	0.150	0.1731	
15 minute summer	SW7	3.002	SW8	29.2	2.593	0.221	0.2017	
15 minute summer	SW8	1.003	SW9	66.7	1.226	0.151	1.7793	
15 minute summer	SW9	1.004	SW12	86.4	1.049	0.832	1.6630	
15 minute summer	SW10	4.000	SW11	5.9	0.977	0.220	0.1449	
15 minute summer	SW11	4.001	SW12	8.6	1.184	0.372	0.1152	
15 minute summer	SW12	1.005	SW13	96.8	1.485	0.928	0.6030	
360 minute summer	SW13	1.006	SW20	33.1	0.182	0.052	3.5398	
15 minute summer	SW14	5.000	SW15	4.4	0.785	0.157	0.1031	
15 minute summer	SW15	5.001	SW16	13.3	1.591	0.166	0.1872	
15 minute summer	SW16	5.002	SW17	15.0	2.152	0.113	0.0939	
15 minute summer	SW17	5.003	SW18	51.0	2.738	0.227	0.5680	
15 minute summer	SW18	5.004	SW19	52.9	2.395	0.167	0.3551	
15 minute summer	SW19	5.005	SW20	55.1	0.569	0.045	5.2628	
360 minute summer	SW20	1.007	SW21	22.1	0.314	0.506	0.3208	
360 minute summer	SW21	1.008	SW22	22.1	0.635	0.561	0.7901	367.2
360 minute summer	SW2	2.000	SW3	-14.1	-0.354	-0.154	0.4191	

Results for 30 year +45% CC +10% A Critical Storm Duration. Lowest mass balance: 99.59%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	SW1	10	68.819	0.212	108.0	0.3040	0.0000	OK
15 minute summer	SW3	9	68.151	1.651	309.9	2.9169	0.0000	SURCHARGED
15 minute summer	SW4	11	66.954	0.634	106.3	0.7174	0.0000	SURCHARGED
15 minute summer	SW5	10	69.520	0.169	43.8	0.1907	0.0000	OK
15 minute summer	SW6	10	69.234	0.134	55.7	0.1921	0.0000	OK
15 minute summer	SW7	10	68.788	0.199	120.8	0.2853	0.0000	OK
15 minute summer	SW8	11	66.747	0.592	242.0	0.6694	0.0000	SURCHARGED
15 minute summer	SW9	11	66.159	1.559	318.0	1.7634	0.0000	SURCHARGED
15 minute summer	SW10	11	66.573	0.369	24.8	0.5277	0.0000	SURCHARGED
15 minute summer	SW11	11	66.141	0.480	32.8	0.6876	0.0000	SURCHARGED
15 minute summer	SW12	11	65.436	0.891	354.5	1.0072	0.0000	SURCHARGED
360 minute summer	SW13	256	65.215	0.695	92.6	0.9945	0.0000	SURCHARGED
15 minute summer	SW14	10	69.392	0.087	18.0	0.1251	0.0000	OK
15 minute summer	SW15	10	69.010	0.152	55.1	0.2182	0.0000	OK
15 minute summer	SW16	10	68.441	0.108	62.0	0.1546	0.0000	OK
15 minute summer	SW17	10	67.674	0.274	210.6	0.3914	0.0000	OK
15 minute summer	SW18	10	66.374	0.204	218.0	0.2310	0.0000	OK
360 minute summer	SW19	256	65.215	0.325	50.1	0.4651	0.0000	OK
360 minute summer	SW20	256	65.215	0.715	132.3	378.1347	0.0000	SURCHARGED
360 minute summer	SW21	256	65.181	0.781	32.7	2.7058	0.0000	SURCHARGED
60 minute winter	SW22	116	64.338	0.138	32.3	0.0000	0.0000	OK
360 minute summer	SW2	280	67.533	0.983	58.5	234.6807	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	SW1	1.000	SW3	110.0	1.662	0.601	4.8465	
15 minute summer	SW3	1.001	SW4	19.3	0.717	0.264	2.9028	
15 minute summer	SW4	1.002	SW8	101.3	1.438	1.352	1.3844	
15 minute summer	SW5	3.000	SW6	43.4	1.527	0.834	0.7092	
15 minute summer	SW6	3.001	SW7	55.3	1.784	0.618	0.5389	
15 minute summer	SW7	3.002	SW8	119.6	3.475	0.907	0.6159	
15 minute summer	SW8	1.003	SW9	238.4	2.161	0.541	3.5616	
15 minute summer	SW9	1.004	SW12	314.7	2.854	3.029	2.2206	
15 minute summer	SW10	4.000	SW11	22.0	1.271	0.814	0.4154	
15 minute summer	SW11	4.001	SW12	31.8	1.808	1.378	0.2767	
15 minute summer	SW12	1.005	SW13	351.9	3.193	3.372	1.0008	
360 minute summer	SW13	1.006	SW20	90.0	0.290	0.142	18.1568	
15 minute summer	SW14	5.000	SW15	17.9	1.183	0.643	0.2605	
15 minute summer	SW15	5.001	SW16	54.7	2.299	0.684	0.5296	
15 minute summer	SW16	5.002	SW17	61.8	2.603	0.469	0.3773	
15 minute summer	SW17	5.003	SW18	208.8	3.520	0.931	1.8021	
15 minute summer	SW18	5.004	SW19	217.0	3.912	0.685	0.8923	
360 minute summer	SW19	5.005	SW20	42.2	0.265	0.035	61.2720	
360 minute summer	SW20	1.007	SW21	32.7	0.464	0.749	0.3246	
360 minute summer	SW21	1.008	SW22	32.3	0.701	0.821	1.0319	1135.5
360 minute summer	SW2	2.000	SW3	-58.5	-0.831	-0.642	0.5210	

Results for 100 year +50% CC +10% A Critical Storm Duration. Lowest mass balance: 99.38%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	SW1	11	69.799	1.192	140.6	1.7060	0.0000	FLOOD RISK
15 minute summer	SW3	11	68.495	1.995	398.0	3.5257	0.0000	SURCHARGED
15 minute summer	SW4	11	68.117	1.797	130.8	2.0320	0.0000	SURCHARGED
15 minute summer	SW5	11	70.072	0.721	57.0	0.8157	0.0000	SURCHARGED
15 minute summer	SW6	11	69.774	0.674	67.1	0.9647	0.0000	SURCHARGED
15 minute summer	SW7	11	69.446	0.857	144.2	1.2265	0.0000	SURCHARGED
15 minute summer	SW8	11	67.759	1.604	294.8	1.8136	0.0000	SURCHARGED
15 minute summer	SW9	11	66.869	2.269	396.2	2.5668	0.0000	SURCHARGED
15 minute summer	SW10	12	67.241	1.037	32.2	1.4844	0.0000	SURCHARGED
15 minute summer	SW11	12	66.636	0.975	40.0	1.3953	0.0000	SURCHARGED
30 minute summer	SW12	19	65.764	1.219	424.9	1.3791	0.0000	SURCHARGED
360 minute summer	SW13	312	65.396	0.876	113.8	1.2529	0.0000	SURCHARGED
15 minute summer	SW14	12	69.520	0.215	23.4	0.3072	0.0000	SURCHARGED
15 minute summer	SW15	11	69.258	0.400	71.5	0.5718	0.0000	SURCHARGED
15 minute summer	SW16	11	68.845	0.512	75.5	0.7322	0.0000	SURCHARGED
15 minute summer	SW17	11	68.491	1.091	261.0	1.5609	0.0000	SURCHARGED
15 minute summer	SW18	11	66.427	0.257	268.5	0.2906	0.0000	OK
360 minute summer	SW19	312	65.396	0.506	63.5	0.7234	0.0000	SURCHARGED
360 minute summer	SW20	312	65.396	0.896	162.7	510.3815	0.0000	SURCHARGED
360 minute summer	SW21	312	65.368	0.968	32.8	3.3544	0.0000	SURCHARGED
60 minute winter	SW22	228	64.338	0.138	32.3	0.0000	0.0000	OK
240 minute winter	SW2	232	67.873	1.323	66.8	315.6779	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	SW1	1.000	SW3	137.8	1.957	0.753	5.5151	
15 minute summer	SW3	1.001	SW4	28.5	0.717	0.390	2.9028	
15 minute summer	SW4	1.002	SW8	127.9	1.816	1.707	1.3844	
15 minute summer	SW5	3.000	SW6	51.8	1.498	0.996	0.9963	
15 minute summer	SW6	3.001	SW7	67.8	1.722	0.758	0.6923	
15 minute summer	SW7	3.002	SW8	143.5	3.609	1.089	0.7128	
15 minute summer	SW8	1.003	SW9	292.7	2.654	0.664	3.5616	
15 minute summer	SW9	1.004	SW12	394.5	3.577	3.796	2.2206	
15 minute summer	SW10	4.000	SW11	26.1	1.485	0.967	0.4154	
15 minute summer	SW11	4.001	SW12	38.5	2.185	1.666	0.2795	
30 minute summer	SW12	1.005	SW13	424.4	3.848	4.066	1.0008	
360 minute summer	SW13	1.006	SW20	110.3	0.317	0.174	27.5277	
15 minute summer	SW14	5.000	SW15	22.9	1.350	0.824	0.3245	
15 minute summer	SW15	5.001	SW16	66.4	2.246	0.830	0.8872	
15 minute summer	SW16	5.002	SW17	79.5	2.604	0.603	0.5365	
15 minute summer	SW17	5.003	SW18	257.0	3.670	1.146	2.0482	
15 minute summer	SW18	5.004	SW19	268.5	4.192	0.848	1.0204	
360 minute summer	SW19	5.005	SW20	52.5	0.287	0.043	100.1080	
360 minute summer	SW20	1.007	SW21	32.8	0.466	0.752	0.3246	
360 minute summer	SW21	1.008	SW22	32.3	0.701	0.821	1.0319	1440.4
240 minute winter	SW2	2.000	SW3	-66.8	-0.949	-0.733	0.5210	

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