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**DRAINAGE STRATEGY REPORT
FOR
PROPOSED COMMERCIAL UNITS AT
SITE 1 SNECKYEAT INDUSTRIAL ESTATE, WHITEHAVEN**



**FOR
NORTHERN TRUST CO. LTD**

Project : 2022.262
Date : Aug 23
Engineer : I.Schofield

Report Control

Report Title	Drainage Strategy Report			
Project Number	2020.221			
Revision	Issue	Date	Prepared	Approved
01	Issue 1	18/08/23	I. Schofield	G. Schofield

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1.0 Brief

Graham Schofield Associates Ltd have been appointed by Northern Trust Co. Ltd to undertake a Drainage Strategy in support of a planning application to construct 5 new commercial/light industrial units on existing undeveloped plots on Sneckyeat Industrial Estate, Whitehaven.

1.1 Limitations

The opinions expressed within this review are based upon sourced documentation available. Graham Schofield Associates Ltd have not undertaken any or quantitative assessments or special investigations other than monitoring the required excavation of the trial holes required for the percolation tests.

The report is based upon current guidance and may therefore require revision to incorporate any future changes in guidance or legislation.

2.0 Existing Site Description and Location

2.1 Site Location

The site is located at National Grid Reference 299025 (E), 516185 (N) and is currently a vacant plot used informally for parking it is a mixture of topsoil and wild growth. The site is loosely rectangular in shape and has an area of 0.329 Ha. Figure 1 below shows the site boundary within the local context.



Figure 1: Site Location Plan

The site is bounded by Sneckyeat Road (access road which leads onto the spine road Sneckyeat Road) to the north, the mews court for Units 8a, b and c to the west a stone surfaced car park to the east and West Cumberland Hospital to the south.

2.2 Notable Features

A topographical survey of the site was undertaken by JLP Surveying Consultants Ltd. in February 2023 and provides level data at metres above Ordnance Survey datum (mAD0). An inspection of the data indicates the ground levels fall fairly steeply from north east to south west, with a range in levels across site of 96.792m AOD at the south western boundary of the development and a maximum of 99.500m AOD at the north eastern boundary. The topographical survey referenced above is included within Appendix A of this report.

3.0 Development Proposals

The proposal for the development is to construct two blocks of commercial/light industrial units. Block 1 will consist of 2 no. units at 206sqm and 2 no. further units at 101sqm, to provide 4no. units in total. Block 2 is provided over the same footprint as Block 1 but will consist of 1no. unit only at 620sqm. The two blocks are to be located along the East and West boundaries of the site with the central 'corridor' provided for car parking, service yard and access/egress circulation. A copy of the development proposals are provided in Appendix B for information.

4.0 Surface Water Management

This drainage strategy report aims to examine the current site and its context in terms of any existing drainage regimes. Based on this information and paying due regard to any Environmental / Topographical constraints associated with the site, examination of available options for the satisfactory disposal of foul and surface water flows will be investigated. From these investigations a preferred Surface Water Management Plan is to be developed for later detailed design development.

The basis of this strategy will be to identify a robust and workable drainage solution that can be delivered for the site that is fully compliant with current Planning Policy, Building Regulations, and design guidance. The site is in Flood Zone 1, the site is less than 1 ha and does not appear to have critical drainage problems as notified by the Environment Agency or identified in the Copeland Borough Council Strategic Flood Risk Assessment.

5.0 Existing Site Drainage Arrangements & Flood Risk

5.1 Existing Site Drainage

From the asset search information and CCTV drainage investigation it was determined that there is a 225Ø private surface water sewer located along the top of the embankment between Sneckyeat Industrial Estate and West Cumberland Hospital. This SW drain appears to service the lower sections of Sneckyeat Industrial Estate and it is believed that this sewer discharges to a culvert located to the east of Hensingham. The following referenced information can be found in the

Appendices: United Utilities Sewer Records in Appendix C and Drain Alert Drainage Investigation in Appendix D

Existing Flood Risk

The Environment Agency Flood Map for Planning has been reviewed to initially assess the level of flood risk for the area - see Figure 2 below. The flood map shows areas that are a risk of flooding in a 1% (1 in 100 year) fluvial or a 0.5% (1 in 200 year) tidal and a 0.1% (1 in 1000 year) Annual Exceedance Probability (AEP).

This information indicates that the site lies within an area defined as Flood Zone 1 "Low Probability" envelope, which is assessed as having a less than 0.1% annual probability of rivers or sea flooding in any year by reference to National Planning Policy Framework (NPPF). The flood risk mapping indicates that the site is not within an area identified as being at risk. The Flood Map does not provide information on the depth of flooding associated with flood zones.

Flood map showing the flood zone your site is in

The map shows the flood risk to your site and the surrounding area.

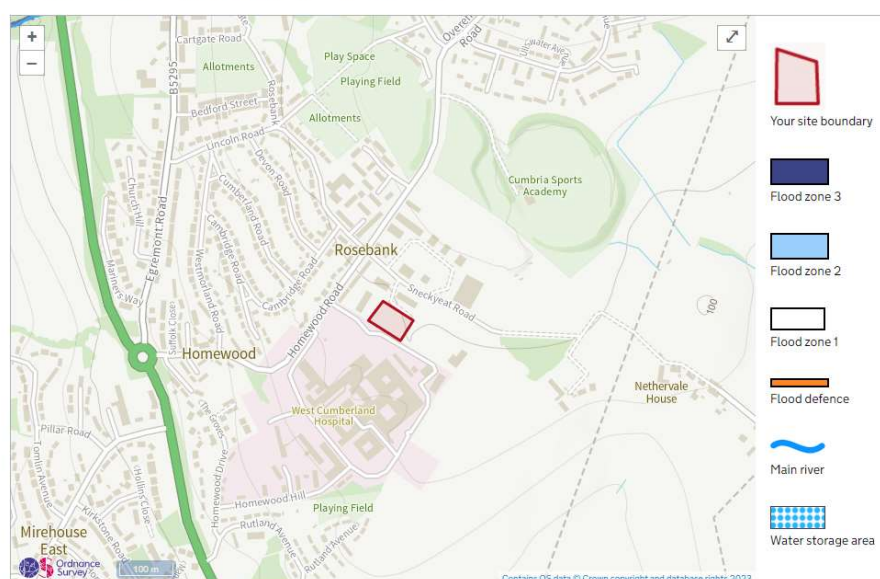


Figure 2: Environment Agency Flood Mapping for Planning

The Environment Agency also predicts the depth of flooding associated with each probability scenario. Figure 3 below indicates extent of depth associated with the High Probability risk. A high probability means that each year, the area has a chance of flooding greater than 1 in 30 (3.3%). In this scenario, the predicted water depth for the site is not at high risk of flooding.

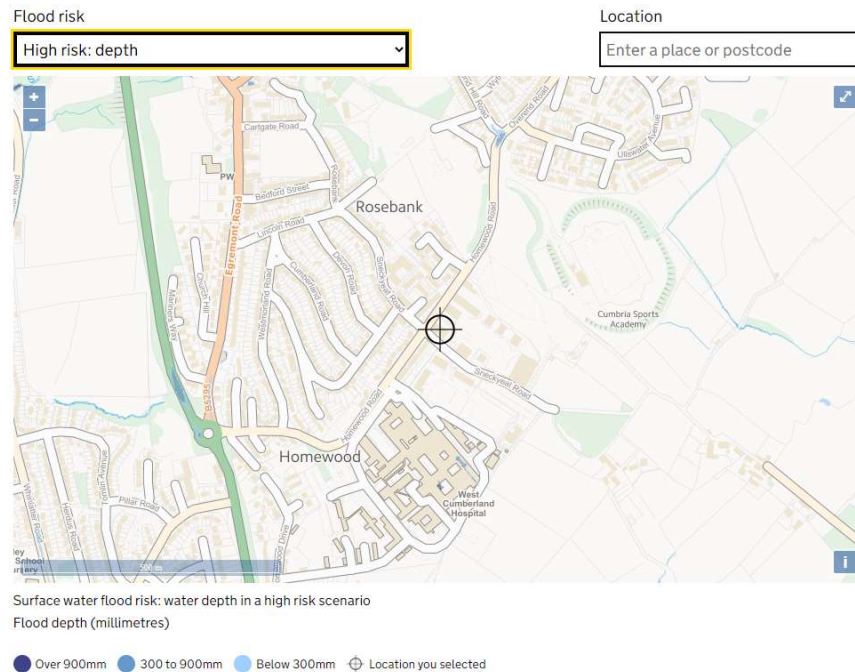


Figure 3: Environment Agency Surface Water Flooding – High Risk: Depth Extract

Surface Water Flooding has also been considered for the Low Probability event, Figure 4 below. In this respect, a Low Probability indicates flooding occurring because of rainfall will have an annual probability of occurring between 0.1% (1 in 1000 years) and 1% (1 in 100 years). The predicted water depth for the site is not at high risk of flooding.

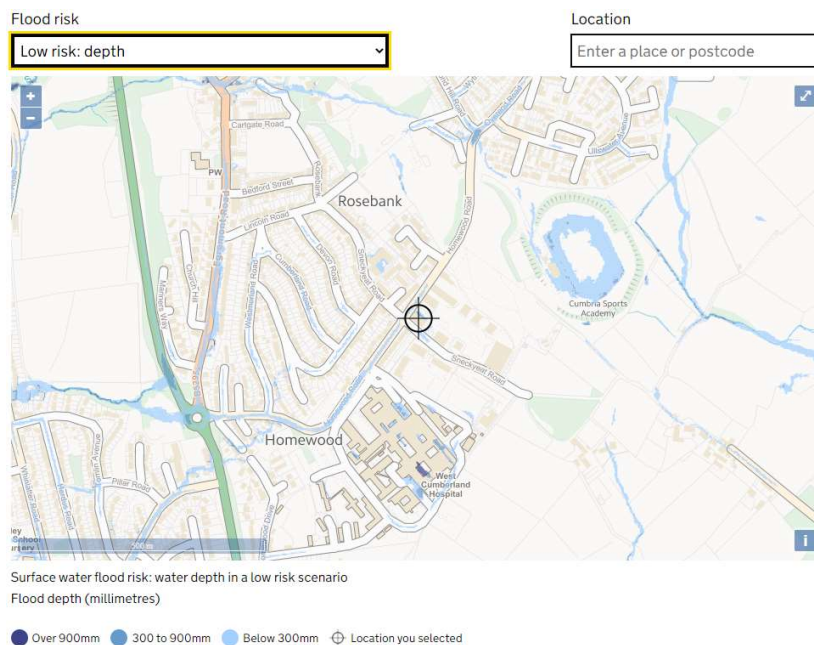


Figure 4: Environment Agency Surface Water Flooding –Low Risk: Depth Extract

6.0 Proposed Site Drainage Arrangements

The current site area is 0.33Ha which is currently a vacant plot on the industrial estate comprising grass and topsoil over made ground. The proposals include two blocks of single storey commercial units, Block 1 is 43.3m long by 15.3m wide located along the

western boundary of the site. Block 2 is of a similar footprint size and located along the eastern boundary of the site. The remaining central 'corridor' is provided for car parking, service yard and access/egress circulation. The development proposals for the site will result in an increase of the impermeable area of 0.33Ha and therefore an increase in the peak surface water runoff rates and volume from the site. The development proposals and their associated drainage implications are reviewed below.

6.1 Foul Water

United Utilities (UU) currently utilise the guidance provided by Sewers for Adoption (6th Edition) which indicates that for gravity sewers serving industrial developments the domestic flow design is 0.6 litres/second per hectare of developable land, which equates to a domestic flow design of 0.198l/s. It is understood that the development will be 'normal industry' usage, thus the trade effluent figure of 0.5 litres/second per hectare has been employed, hence the trade effluent output would be 0.165 litres/second, giving a total design flow of 0.363l/s.

From the drainage investigation survey there is a foul sewer runs along the top of the embankment between Sneckyeat Industrial Estate and West Cumberland Hospital which runs from east to west. It is intended to form a new connection onto this drain within the central part of the site.

6.2 Surface Water

Following the drainage hierarchy as presented in Paragraph 80 of the National Planning Policy Guidance the options for surface water management/discharge must be considered in the following order:

1. Infiltration (percolation) through the soil/sub strata
2. To a Surface Water Body (pond, ditch, stream, river)
3. To a Surface Water Sewer or a Highway Drain
4. Combined Water Sewer

A review of the British Geological Survey's viewers for Bedrock and Superficial Deposits revealed the substrata consisted of clay deposits overlying sandstone (refer to Figures 5 & 6 for details). The infiltration rates associated with the soils are not considered sufficient for the practical use of infiltration devices such as soakaways or permeable surfaces. BRE Digest 365 and Section 13.4 of CIRIA 753 require that the time taken for infiltration devices to empty to 50% should be within 24 hours. This requirement is unlikely to be achieved in these soils. Furthermore, Table 25.1 of CIRIA 753 indicates that soils with this level of infiltration capacity are classified as very poor infiltration media. A trial hole investigation was undertaken on site which confirmed the presence of the clay under a varying depth of Made Ground ranging from 400mm to 1000mm in depth.

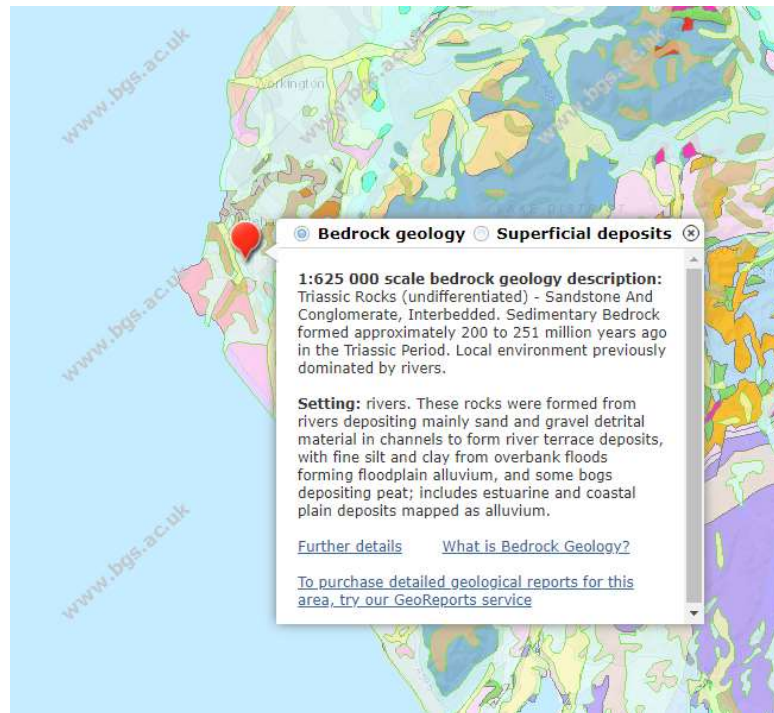


Figure 5: British Geological Survey Viewer - Bedrock Geology

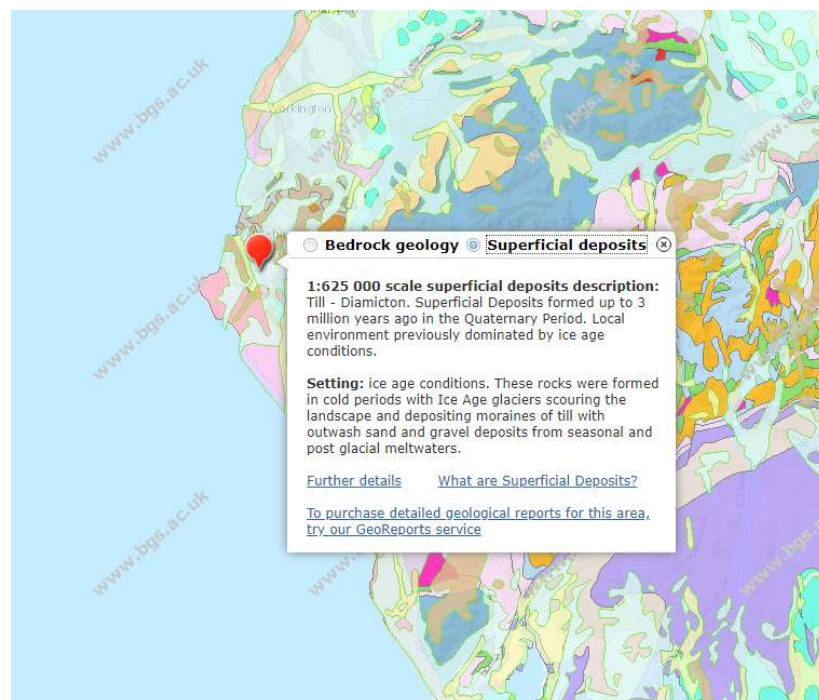


Figure 6: British Geological Survey Viewer – Superficial Deposits

Ordnance Survey mapping for the area indicates the nearest watercourse is the unnamed tributary of the River Keekle which serves as field drainage approximately 500m east of the development site.

From drainage investigation work, the site is surrounded by surface water drains which run from north to south and discharge to a private surface water sewer which runs eastward along the embankment between the Industrial Estate and West

Cumberland Hospital, it is intended to form a surface water connection onto this sewer via a new manhole within the central section of the site.

The site has been a vacant plot since Sneckyeat Industrial Estate was developed in the mid-1990s they are considered to be Greenfield it is intended to restrict the pass forward flows rates to Greenfield Runoff. The HR Wallingford Greenfield runoff rate estimation was used to undertake the calculation using IH-124 methodology which gave a Qbar of 2.95l/s. Therefore onward flow rates will be restricted to 3l/s. A copy HR Wallingford Greenfield runoff rate estimation tool report is provided in Appendix E.

It is proposed to construct a geocellular attenuation tank under the car park/service yard to accommodate the volume of surface water which will be required to be stored over and above the restricted flow. A model of the proposed surface water drainage was created and simulated storm events for 1 in 2 year, 1 in 30 year, 1 in 100 year + climate change allowance. The Climate Change Allowance was derived from “*Flood Risk assessments: climate changes allowances*” gov.uk website “*Table 2: peak rainfall intensity allowance in small catchments (less than 5km²) or urban drainage catchments (based on a 1961 to 1990 baseline)*” The structural design cases for wind loading use a design life of 50 years, this will be utilised for the drainage design life, this would put the development in the “*Total potential change anticipated for the ‘2080s’ (2070 to 2115)*” The guidance states that “*Design your drainage system to make sure there is no increase in the rate of runoff discharged from the site for the upper end allowance.*” Hence 40% allowance is used. The results and a proposed drainage layout are provided in Appendix E.

6.3 **Flood Risk**

The development proposals are not currently located within areas identified by the Environment Agency as being at risk of flooding for planning purposes. Based on being able to satisfactorily manage the surface water flows from the site by means of attenuation and controlled discharge into the network it is considered that the development proposals do not affect upon the current flood risk areas or increase flood risk off

7.0 Summary

A review of the relevant guidance documents and various types of data collected at the site has enabled a full assessment of the flood risks to be quantified. The site is located within the Flood Zone 1 therefore all uses of land are appropriate in this zone.

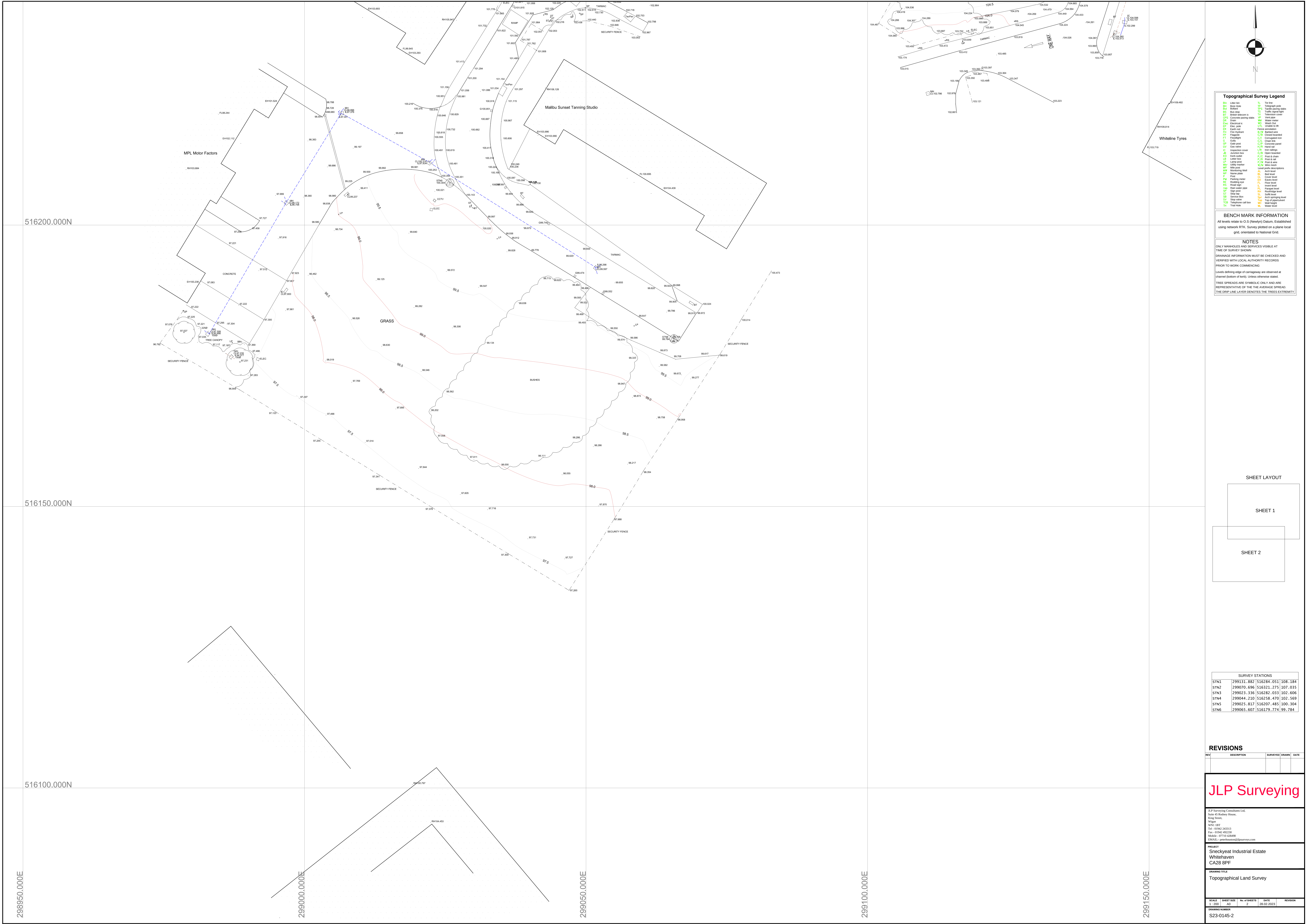
This assessment has investigated the possibility of groundwater flooding and flooding from other sources at the site. It is considered that there will be low risk of groundwater flooding across the site and low risk of flooding from other sources.

It is proposed that a new foul drains from the development site is to be connected into the existing private foul drainage within the estate, using a 1:80 minimum gradient for self-cleansing for pipes of 150mm.

The proposed method of managing the surface water runoff is by means of an attenuated discharge from a mixture of oversized pipes and geocellular attenuation structures, before releasing into the existing surface water drainage network at a proposed controlled rate 3l/s. Pipes are to be laid at a minimum 1:150 minimum gradient for self-cleansing for pipes of 150mm diameter.

Development of the site is not considered to represent an increased flood risk to the site or the wider area. The permeable area of the site will likely decrease, however, with effective storage measures to accommodate the 100yr + 40% climate change events it will be possible to manage efficiently the surface water runoff from the proposed development.

Appendix A: - Topographical Survey

[illegible]

BENCH MARK INFORMATION

All levels relate to O.S (Newlyn) Datum, Established using network RTK. Survey plotted on a plane local grid, orientated to National Grid.

NOTES

ONLY MANHOLES AND SERVICES VISIBLE AT TIME OF SURVEY SHOWN

DRAINAGE INFORMATION MUST BE CHECKED AND VERIFIED WITH LOCAL AUTHORITY RECORDS PRIOR TO WORK COMMENCING

Levels defining edge of carriageway are observed at channel (bottom of kerb). Unless otherwise stated.

TREE SPREADS ARE SYMBOLIC ONLY AND ARE REPRESENTATIVE OF THE AVERAGE SPREAD.

THE DRIP LINE LAYER DENOTES THE TREES EXTREMITY

SHEET LAYOUT

SHEET 1

SHEET 2

SURVEY STATIONS			
STN1	299131.882	516284.051	108.18
STN2	299070.696	516321.275	107.03
STN3	299023.336	516282.033	102.60
STN4	299044.210	516258.470	102.56
STN5	299025.817	516207.485	100.30
STN6	299065.607	516179.774	99.784

REVISIONS

REV	DESCRIPTION	SURVEYED	DRAWN	D

JLP Surveying

JLP Surveying Consultants Ltd,
Suite 45 Rodney House,
King Street,
Wigan
WN1 1BT
Tel - 01942 243313
Fax - 01942 492230
Mobile - 07710 428458
EMAIL: peterhazzen@jlpurvey.com

PROJECT
Sneckyeat Industrial Estate
Whitehaven
CA28 8PF

DRAWING TITLE

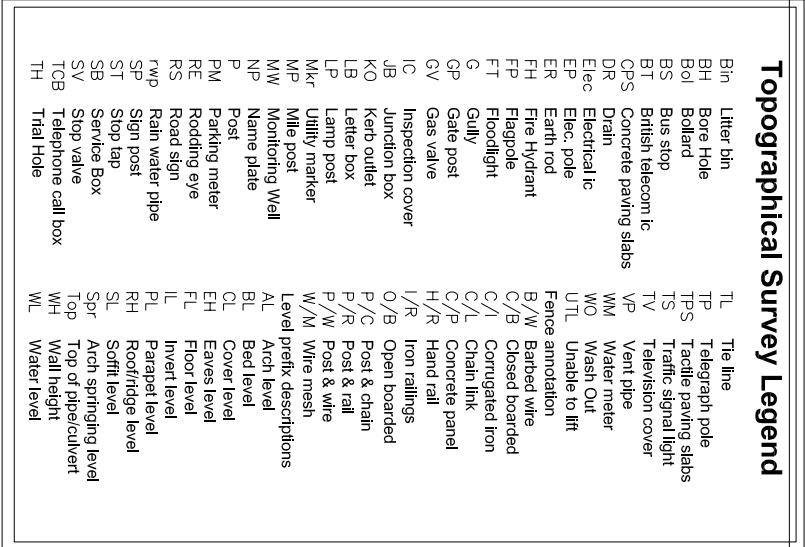
Topographical Land Survey

SCALE 1:200	SHEET SIZE A0	No. of SHEETS 2	DATE 28.02.2023	REVISION
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DRAWING NUMBER
S23-0145-2

Appendix B: - Development Proposals

Ref	Element/Activity	Impact	Priority	Risk Owner	Risk Level	Information about residual	Contractor design element
1	Design of the building structure, including foundations, walls, floors, and roof.	Structural integrity, safety, and durability.	High	Structural Engineer	High	Information about residual	Contractor design element
2	Design of the building services, including heating, ventilation, and air conditioning (HVAC), lighting, and electrical systems.	Comfort, health, and energy efficiency.	Medium	Mechanical/Electrical Engineer	Medium	Information about residual	Contractor design element
3	Design of the building facade, including windows, doors, and exterior walls.	Aesthetics, energy efficiency, and weather resistance.	Medium	Architect	Medium	Information about residual	Contractor design element
4	Design of the building interior spaces, including rooms, corridors, and common areas.	Functionality, safety, and user experience.	Medium	Interior Designer	Medium	Information about residual	Contractor design element
5	Design of the building foundation and structural elements.	Structural integrity and safety.	High	Structural Engineer	High	Information about residual	Contractor design element
6	Design of the building facade and exterior walls.	Aesthetics and weather resistance.	Medium	Architect	Medium	Information about residual	Contractor design element
7	Design of the building interior spaces and common areas.	Functionality and user experience.	Medium	Interior Designer	Medium	Information about residual	Contractor design element
8	Design of the building services, including heating, ventilation, and air conditioning (HVAC), lighting, and electrical systems.	Comfort, health, and energy efficiency.	Medium	Mechanical/Electrical Engineer	Medium	Information about residual	Contractor design element
9	Design of the building facade and exterior walls.	Aesthetics and weather resistance.	Medium	Architect	Medium	Information about residual	Contractor design element
10	Design of the building interior spaces and common areas.	Functionality and user experience.	Medium	Interior Designer	Medium	Information about residual	Contractor design element
11	Design of the building foundation and structural elements.	Structural integrity and safety.	High	Structural Engineer	High	Information about residual	Contractor design element
12	Design of the building facade and exterior walls.	Aesthetics and weather resistance.	Medium	Architect	Medium	Information about residual	Contractor design element
13	Design of the building interior spaces and common areas.	Functionality and user experience.	Medium	Interior Designer	Medium	Information about residual	Contractor design element
14	Design of the building services, including heating, ventilation, and air conditioning (HVAC), lighting, and electrical systems.	Comfort, health, and energy efficiency.	Medium	Mechanical/Electrical Engineer	Medium	Information about residual	Contractor design element
15	Design of the building facade and exterior walls.	Aesthetics and weather resistance.	Medium	Architect	Medium	Information about residual	Contractor design element
16	Design of the building interior spaces and common areas.	Functionality and user experience.	Medium	Interior Designer	Medium	Information about residual	Contractor design element
17	Design of the building foundation and structural elements.	Structural integrity and safety.	High	Structural Engineer	High	Information about residual	Contractor design element
18	Design of the building facade and exterior walls.	Aesthetics and weather resistance.	Medium	Architect	Medium	Information about residual	Contractor design element
19	Design of the building interior spaces and common areas.	Functionality and user experience.	Medium	Interior Designer	Medium	Information about residual	Contractor design element
20	Design of the building services, including heating, ventilation, and air conditioning (HVAC), lighting, and electrical systems.	Comfort, health, and energy efficiency.	Medium	Mechanical/Electrical Engineer	Medium	Information about residual	Contractor design element



SCALE: DATE: BY: CHECKED:

SCALE: DATE: BY: CHECKED:

All insulation to be GRC/RC free with zero odour degradation / resistance.

All Cladding details to comply with Kingspan Enhanced details.

MATERIAL/COLOUR KEY

- Steel framework - Metal Grey
- Roof cladding - Kingspan K5100PRV Insulated Roof Panel (LPCB Approved) or equal - Colour Glosswing Grey
- Gutters, Fascias & Verges - Colour Anthracite Grey
- Rainwater pipes - Colour Anthracite Grey
- Wall cladding - Kingspan K5100PRV Insulated Wall Panel (LPCB Approved) or equal - Colour Anthracite Grey at high level and Metal Grey at low level.
- Flashings - Colour to match wall cladding Anthracite Grey / Metal Grey
- Brickwork - Red Bricks (Forrester County Multi Drageford - TBA) and down turn 2x below DPC.
- Load bearing - Colour Anthracite Grey
- Personnel doors - Colour Anthracite Grey
- Escape doors - Colour Anthracite Grey
- Blanking/lockable panels - Colour TBA
- Window frames - Colour Anthracite Grey
- Glazing tint - Colour TBA

Hatched areas denote contrasting colours

CRITICAL DOOR DIMENSIONS

- Internal Doors Minimum effective clear width 800mm
- Escape doors Minimum effective clear width 900mm
- Fire Exit Doors Minimum effective clear width 800mm

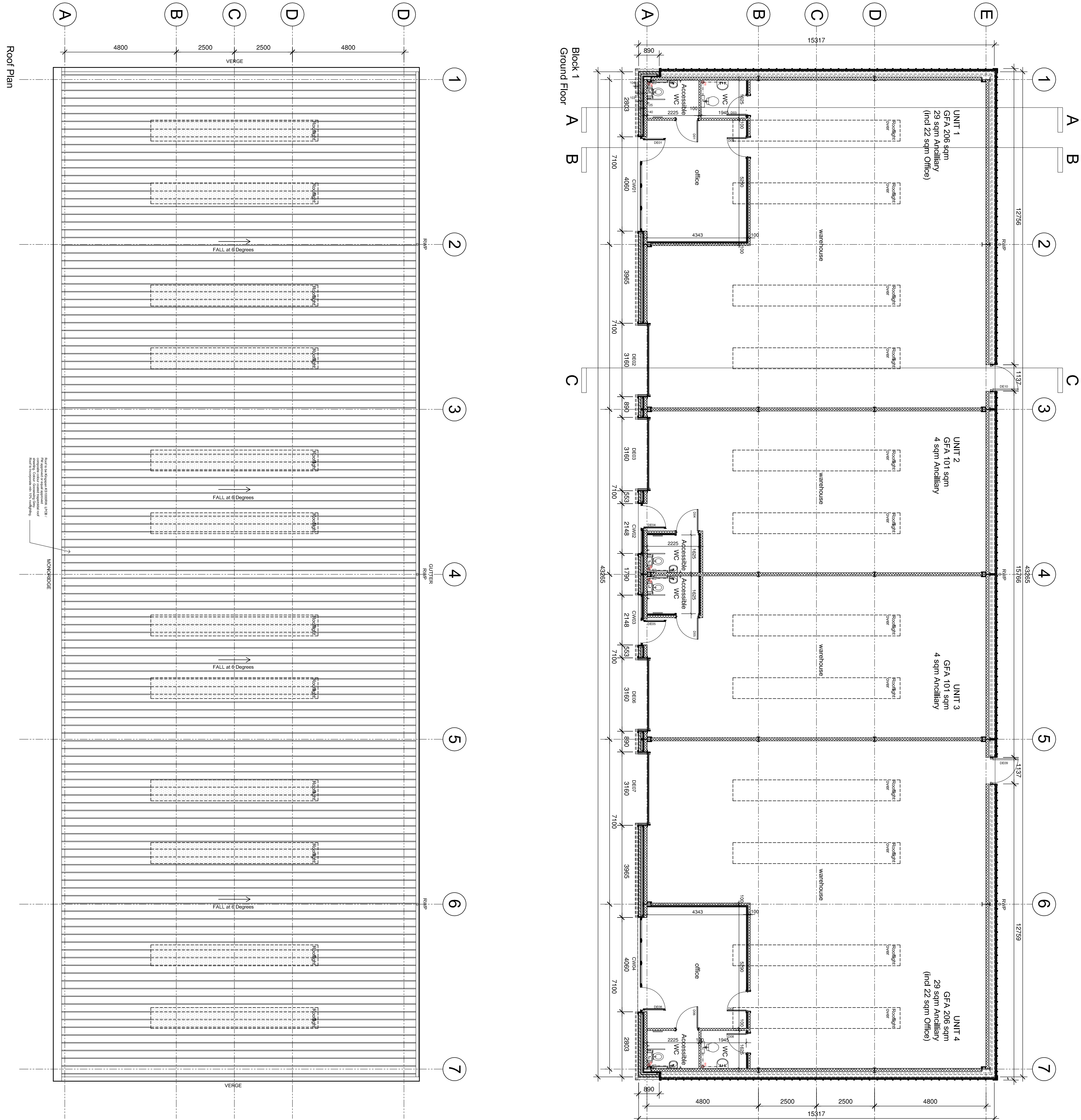
All vision panels to have minimum zones of visibility between 500mm to 800mm and 1150mm to 1500mm.

U VALUES

- Roof 0.18W/m²K
- Wall 0.28W/m²K
- Floor (below heated Offices and WCs only) No U Value
- Floor (below unheated Warehouse Space only) 1.8W/m²K
- Windows 2.28W/m²K
- Rooflights 1.55W/m²K
- High-usage entrance Doors 1.30W/m²K
- Vehicle Access Doors 1.30W/m²K

NOTE - Notwithstanding the above stated U Values, these are a minimum required by the Building Standards and actual values required may be better than this.

Actual values are to be as required by BREEM Cycles.



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CLIENT:

Northern Trust

PROJECT:

Sneekycot Industrial Estate
Whitenoven

DRAWING NUMBER:

22123-PA-A-BI-ZZ-DR-A-3000-A

DRAWING TITLE:

Block 1
GA Plan & Elevations

STATUS:

PLANNING

SCALE DATE BY: CHECKED:
1:100@A1 27.04.2023 PP PP

PADDOCK
JOHNSON

Studio 2, The Lyceum,
Bent Street, Port Sunlight,
Merseyside, CH12 4LJ
0151 643 9234
www.paddockjohnson.com
Paddock Johnson Partnership
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Notes: This Drawing is the copyright of Paddock Johnson Partnership Limited and may not be copied without their written consent.

Dimensions are given in millimetres unless otherwise stated. Dimensions are given to the centre of lines unless otherwise stated. Dimensions are given to the face of lines unless otherwise stated.

Due to inaccuracies of scanning, scanned images should not be scaled.

REV DATE DESCRIPTION

A 03.08.23 Various amendments to avoid clash with HV Cables.

BY: SD

All insulation to be GFC/HCF-C, free with zero
Ozone Depletion Potential.
All Cladding details to comply with Kingspan
Enhanced details

MATERIAL/COLOUR KEY

- Steel panework - Main Grey
- Roof cladding - Kingspan KSI000RW Insulated Roof Panel
- UPVC Approved or equal - Colour Greenaway Grey
- UPVC Approved or equal - Colour Greenaway Grey
- Roofwater gapes - Colour Anthracite Grey
- Wall cladding - Kingspan KSI000RW Insulated Wall Panel (UPVC Approved) or equal - Colour Anthracite Grey at high level and Main Grey at low level.
- Paintings - Colour -to match wall cladding Anthracite Grey / Brickwork - Red Paintings (Foreman County Multi Degraded - TBA) and taken down to min 2c below DPC.
- Korlar - Natural -TBA
- Loading doors - Colour Anthracite Grey
- Escalator doors - Colour Anthracite Grey
- Banking/lookalike panels - Colour TBA
- Window - Extruded Aluminium window sections - Colour Anthracite Grey
- Glazing unit - Colour TBA

Hatched areas denote contrasting colors

CRITICAL DOOR DIMENSIONS

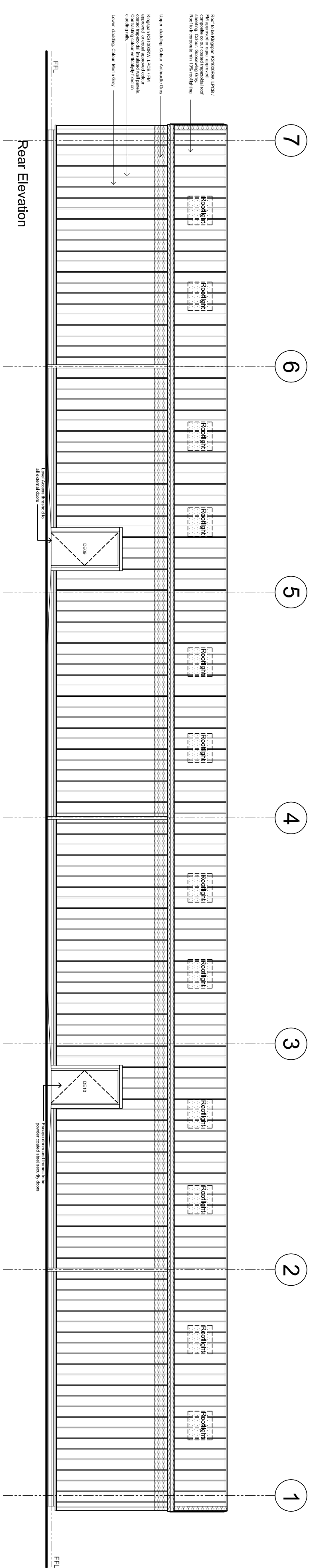
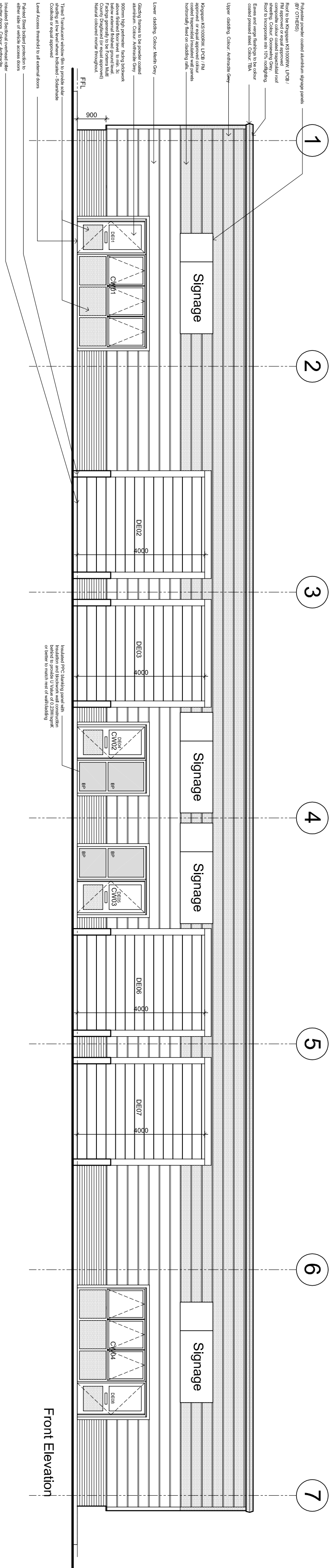
Internal Doors Minimum effective clear with 800mm
Entrance Doors Minimum effective clear with 900mm
Fire Exit Doors Minimum effective clear with 850mm
All doors capable to have minimum zones of visibility between 500mm to 900mm and 1150mm to 1500mm.

U VALUES

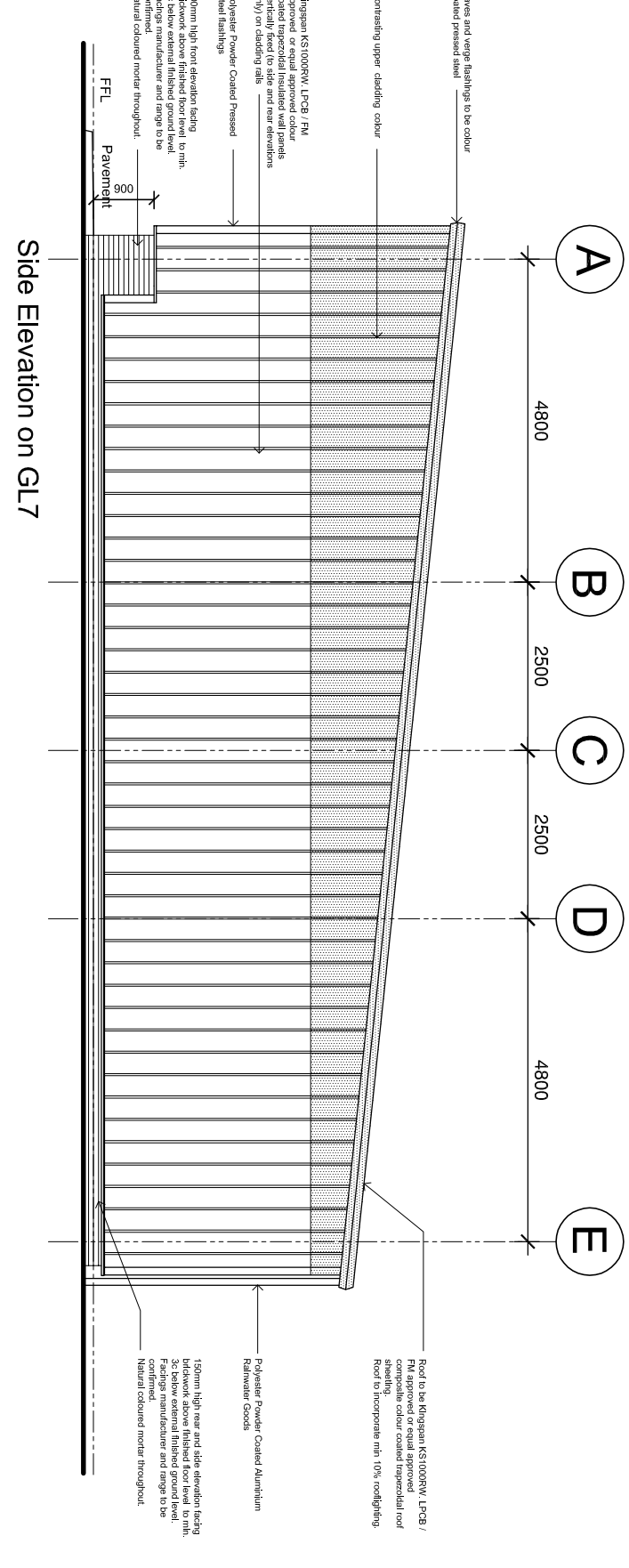
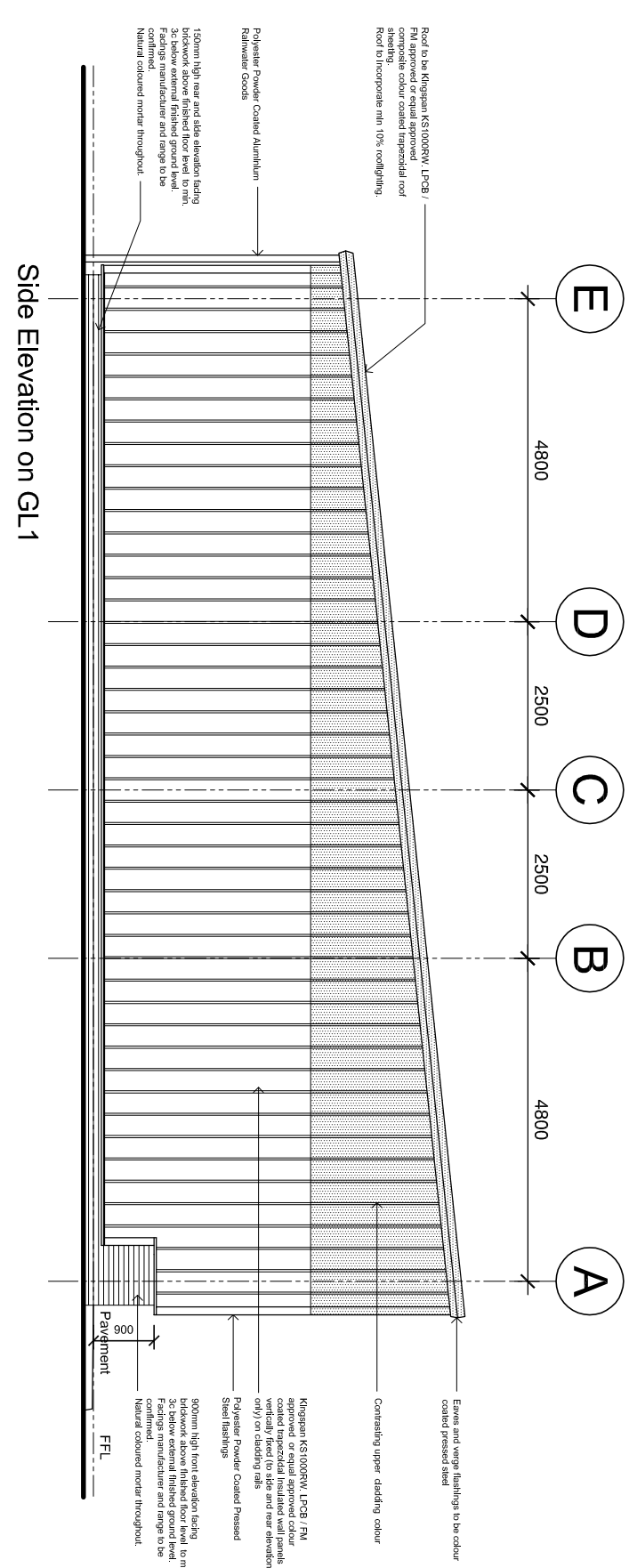
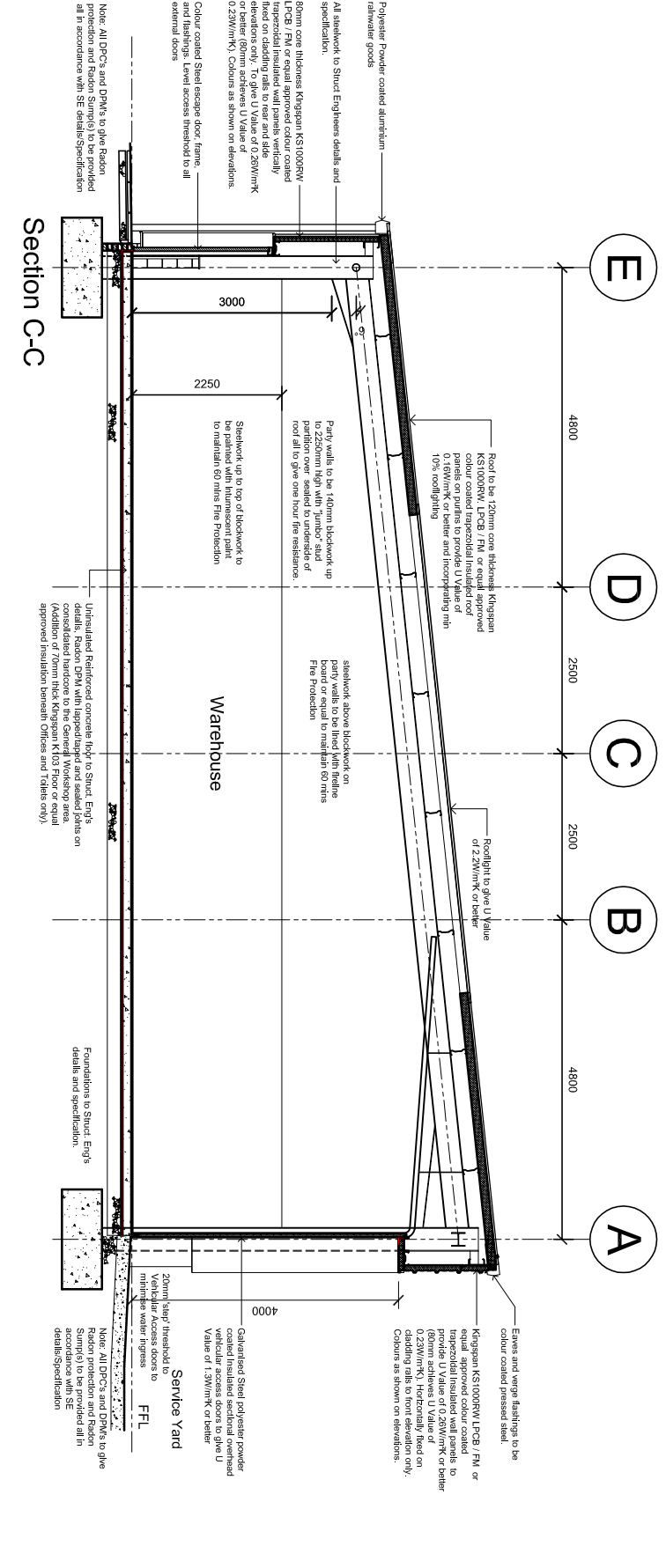
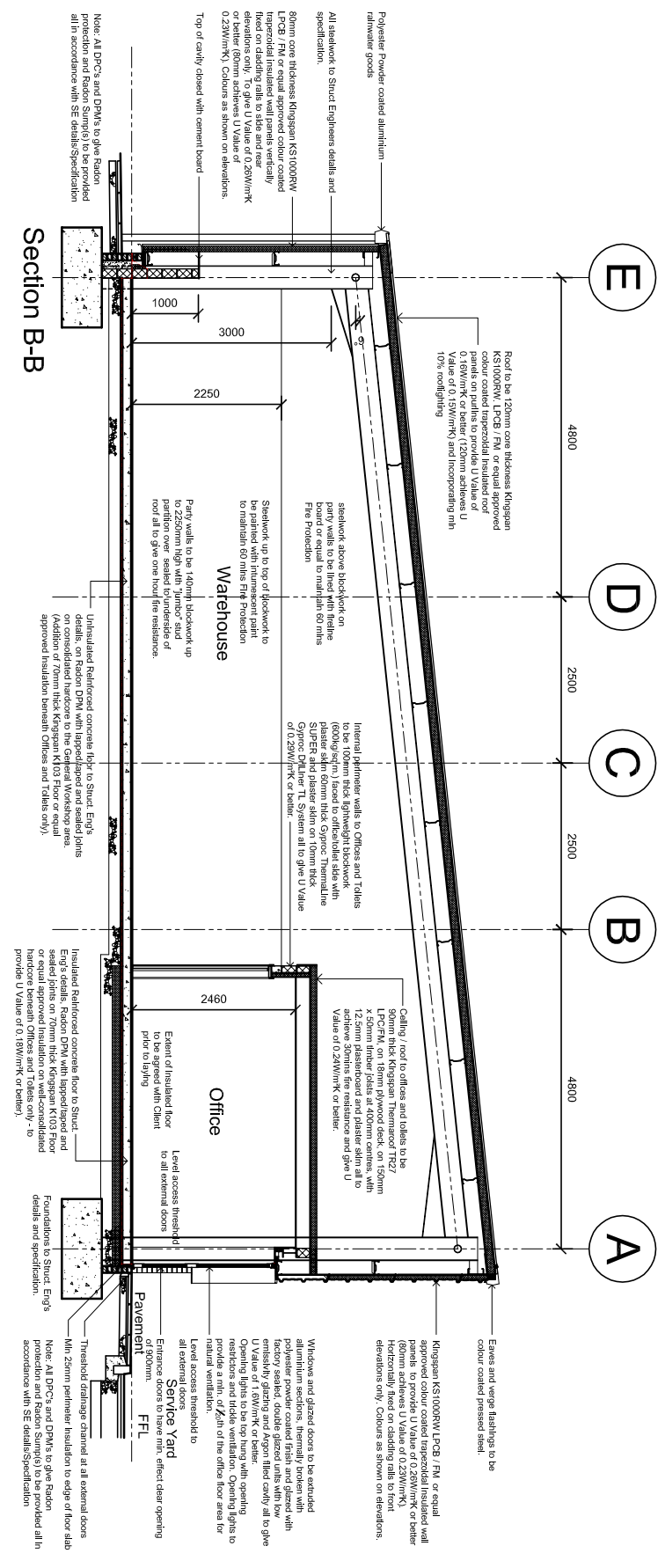
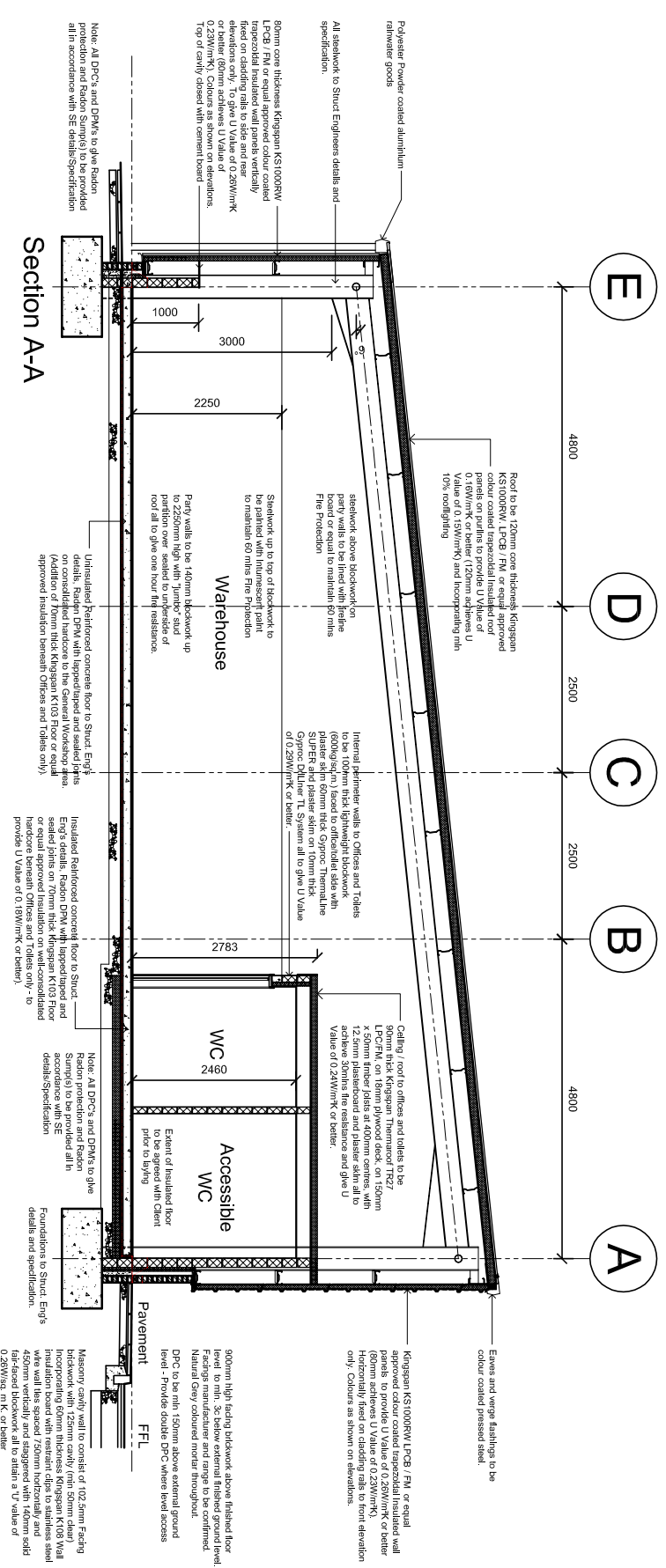
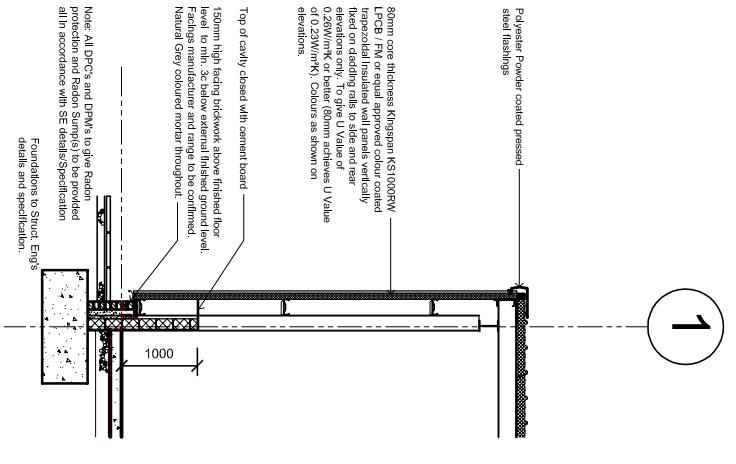
Roof 0.18W/m²K
Walls 0.18W/m²K
Floors (below heated offices and WCs only) 0.18W/m²K
Woods No U Value
Personnel Doors 1.6W/m²K
High-usage entrance Doors 3.0W/m²K
Vehicle Access Doors 1.3W/m²K

NOTE - Notwithstanding the above stated U Values, these are a minimum required by the Building Standards and actual values required may be better than this.

Actual values are to be required by SBEM Calc.



Typical Cable Section



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CLIENT: Northern Trust

PROJECT: Steekveet Industrial Estate
Whitehaven

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DRAWING TITLE: Block 1
GA Elevations & Sections

STATUS: PLANNING

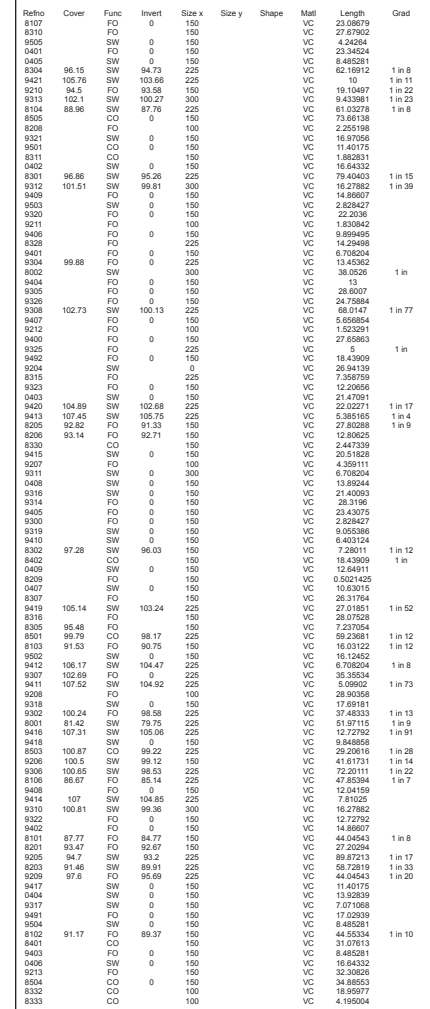
SCALE: 1:100@A1

DATE: 28.04.23	BY: PP	CHECKED: PP
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PADDOCK
JOHNSON

Studio 2, The Lyceum,
Bent Street, Port Sunlight,
Merseyside, CH2 4LJ
051 664 5524
www.paddockjohnson.com
Paddock Johnson Partnership
Limited, Registered in England
0190 100660149

Appendix C: - United Utilities Asset Records



All point assets follow the standard colour convention:

red - combined	blue - surface water
brown - foul	purple - overflow

- Manhole
- Head of System
- Extent of Survey
- Roding Eye
- Inlet
- Discharge Point
- Vortex
- Penstock
- Washout Chamber
- Valve
- Air Valve
- Non Return Valve
- Soakaway
- Gully
- Cascade
- Flow Meter
- Hatch Box
- Oil Interceptor
- Summit
- Drop Shaft
- Office Plate
- Side Entry Manhole
- Outfall
- Screen Chamber
- Inspection Chamber
- Bifurcation Chamber
- Lamp Hole
- T-Junction / Saddle
- Catchpit
- Valve Chamber
- Vent Column
- Vortex Chamber
- Penstock Chamber
- Network Storage
- Sewer Overflow
- We Treatment Works
- We Pumping Station
- Septic Tank
- Control Kiosk
- ▽ Change of Characteristic

MANHOLE FUNCTION

- | | |
|----|---------------|
| FO | Foul |
| SW | Surface Water |
| CO | Combined |
| OV | Overflow |

SEWER SHAPE

- | | | | |
|----|-------------|----|-------------|
| CI | Circular | TR | Trapezoidal |
| EG | Egg | AR | Arch |
| OV | Oval | BA | Barrel |
| FT | Flat Top | HO | HorseShoe |
| RE | Rectangular | UN | Unspecified |
| SQ | Square | | |

SEWER MATERIAL

- | | |
|-----|---------------------------|
| AC | Asbestos Cement |
| BR | Brick |
| PE | Polyethylene |
| RP | Reinforced Plastic Matrix |
| CO | Concrete |
| CSB | Concrete Segment Bolted |
| CSU | Concrete Segment Unbolted |
| CC | Concrete Box Culverted |
| PSC | Plastic / Steel Composite |
| GRC | Glass Reinforced Plastic |
| DI | Ductile Iron |
| PVC | Polyvinyl Chloride |
| CI | Cast Iron |
| SI | Spun Iron |
| ST | Steel |
| VC | Vitrified Clay |
| PP | Polypropylene |
| PF | Pitch Fibre |
| MAC | Masonry, Coursed |
| MAR | Masonry, Random |
| U | Unspecified |

Address or Site Reference:

10B SNECKYEAT ROAD INDUSTRIAL ESTATE,
WHITEHAVEN,
CA28 8PF

Scale: 1:1250 **Date:** 14/09/2020

Sheet: 1 of 1

Printed by: Property Searches

SEWER RECORDS



The position of the underground apparatus shown on this plan is approximate only and is given in accordance with the best information currently available. United Utilities Water will not accept liability for any loss or damage caused by the actual position being different from those shown.

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Appendix D: - Drain Alert Drainage Investigation Report



Cripplegate Lane, Hoghton, Preston. PR5 0RR
Tel: 01254 851500 Fax: 01254854004 service@drain-alert.co.uk

Northern Trust
Lynton House
Ackhurst Park
Foxhole Road
Chorley
PR7 1NY

12/11/2020

Dear Graham,

Reference: - JN30596, Sneakyeat Industrial

May we thank you for your valued custom. As requested, we have conducted a CCTV inspection at the above premises. We have emailed a link to you to access the Wincan VX video clips and documents via the cloud.

We trust that the report is to your satisfaction; however, should you have any queries then please do not hesitate to contact me.

Yours sincerely,

Mr S W Ormisher, B.A.(Hons.),
Technical Services Consultant

Service areas: Preston • Bolton • Wigan • Salford • Tameside • Rochdale • Cheshire • Fylde • Burnley
Company Reg. No. 029502950360 • Reg. No. 448 2116 57





Plan of the drainage system, not to scale

Enclosed

Conclusion

As requested, a CCTV survey and investigation of drainage system serving two site areas on Sneakyeat Industrial park was carried out as instructed. Upon arrival visible inspection found numerous manholes to be in light road and footpath areas.

The survey was conducted upstream and downstream from manholes identified and marked on plan accordingly. Evidence from the survey found two systems to be present, foul and surface water, these systems were seen to be of 150/225 & 300mm clay construction throughout serving numerous gullies and other external drainage lines.

The general condition of lines surveyed was found to be reasonable and in expected working order throughout, although a few faults were found in certain areas which will require further work to be carried out to prevent problems occurring and deterioration in the future.

Faults Found:

Section 4 MHSW3-MHSW4

Silt debris seen at 17.40mtrs, causing restriction in flow through the drainage line, not allowing the CCTV to be carried out successfully.

We trust that the above is acceptable; however, should you require any further information, please do not hesitate to contact me.

Yours sincerely,

Mr S W Ormisher,
Technical Services Consultant

Disclaimer - Please note that any dimensions, levels and drainage layout drawings that are provided by Drain Alert, should be checked before being relied upon. All updated drawings are not to scale. It is the responsibility of the client to verify all information given with regards to the drainage prior to commencing any design or work site.

Project

Project Name: 30596 Sneakyeat Industrial Park

Project Description: Converted project from v8 project

Project Date: 04/11/2020

Table of Contents

Project Name	Project Number	Project Date
30596 Sneakyeat Industrial Park		04/11/2020

Project Information	P-1
Section: 1; MHSW1 > MHSW2 (MHSW1X)	1
Section: 2; MHSW5 > Main Line (MHSW5X)	2
Section: 3; MHSW4 > MHSW5 (MHSW4X)	3
Section: 4; MHSW3 > MHSW4 (MHSW3X)	4

Project Information

Project Name	Project Number	Project Date
30596 Sneakeat Industrial Park		04/11/2020

Client

Company: Northern Trust
Contact: Oliver Clark
Street: Sneakeat Road
Town or City: Whitehaven
County: Cumbria

Site

Company: Sneakeat Industrial Park
Contact: Graham Schofield
Street: Sneakeat Road
Town or City: Whitehaven
County: Cumbria

Contractor

Company: Drain-Alert
Contact: Mr Stephen Ormisher
Department: Director
Street: Cripplegate Lane
Town or City: Hoghton, Preston
County: Lancashire
Phone: 01254 851500
Fax: 01254 854004
Mobile: 07973 436145
Email: service@drain-alert.co.uk

Section Inspection - 04/11/2020 - MH SW1X

Section 1	Inspection 1	Date 04/11/20	Time 11:29	Client`s Job Ref 30586	Weather Dry	Pre Cleaned No	PLR MH SW1X
Operator L Hilton		Vehicle PK65 HFB		Camera P494 Tractor	Preset Length Not Specified	Legal Status Not Specified	Alternative ID Not Specified

Town or Village:	Site Area 2	Inspection Direction:	Downstream	Upstream Node:	MH SW1
Road:	Sneakyeat Road	Inspected Length:	25.50 m	Upstream Pipe Depth:	
Location:	Footpath or verge	Total Length:	25.50 m	Downstream Node:	MH SW2
Surface Type:	Unknown	Joint Length:	0.00 m	Downstream Pipe Depth:	
Use:	Surface water	Pipe Shape:	Circular		
Type of Pipe:		Dia/Height:	300 mm		
Flow Control:		Pipe Material:	Vitrified clay		
Year Constructed:	Not Specified	Lining:	No Lining		
Inspection Purpose:	Sample survey to determine asset condition	Lining Material:	No Lining		

Recommendations: None specified

The diagram shows a vertical shaft with a scale bar on the left. The scale bar is labeled 'Scale: 1:220' and 'Position [m]'. The shaft is represented by a vertical line with a blue arrow pointing downwards. The top of the shaft is labeled 'MH SW1' and 'Depth: m'. The bottom of the shaft is labeled 'MH SW2' and 'Depth: m'. A table on the right lists observations from the survey.

Code	Observation	MPEG	Photo	Grade
ST	Start of survey	00:00:31		
FH	Finish survey: MH SW2 Underneath Car	00:03:45		

Construction Features					Miscellaneous Features				
Structural Defects					Service & Operational Observations				
STR No. Def	STR Peak	STR Mean	STR Total	STR Grade	SER No. Def	SER Peak	SER Mean	SER Total	SER Grade
0	0.0	0.0	0.0	1.0	0	0.0	0.0	0.0	1.0

Section 2	Inspection 1	Date 04/11/20	Time 13:55	Client's Job Ref 30586	Weather Dry	Pre Cleaned No	PLR MH SW5X
Operator L Hilton		Vehicle PK65 HFB		Camera P494 Tractor	Preset Length Not Specified	Legal Status Not Specified	Alternative ID Not Specified

Town or Village:	Site Area 1	Inspection Direction:	Downstream	Upstream Node:	MH SW5
Road:	Sneakeyeat Road	Inspected Length:	39.20 m	Upstream Pipe Depth:	
Location:	Footpath or verge	Total Length:	39.20 m	Downstream Node:	MAIN LINE
Surface Type:	Unknown	Joint Length:	0.00 m	Downstream Pipe Depth:	
Use:	Surface water		Pipe Shape:	Circular	
Type of Pipe:			Dia/Height:	225 mm	
Flow Control:			Pipe Material:	Vitrified clay	
Year Constructed:	Not Specified		Lining:	No Lining	
Inspection Purpose:	Sample survey to determine asset condition		Lining Material:	No Lining	
Comments:					
Recommendations:	None specified				

Diagram of Manhole Section

Scale: 1:338

Position [m]

Code

Observation

MPEG

Photo

Grade

Depth: m

MH SW5

0.00

ST

Start of survey

00:00:14

39.20

FH

Finish survey: Buried Manhole

00:04:44

Main Line

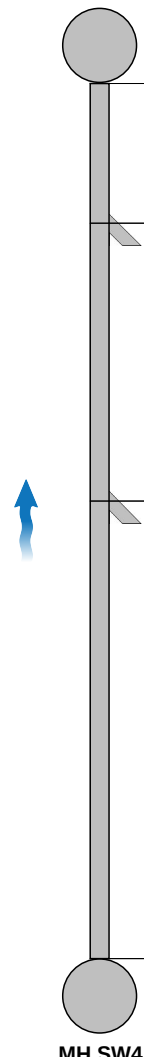
Depth: m

Construction Features					Miscellaneous Features				
Structural Defects					Service & Operational Observations				
STR No. Def	STR Peak	STR Mean	STR Total	STR Grade	SER No. Def	SER Peak	SER Mean	SER Total	SER Grade
0	0.0	0.0	0.0	1.0	0	0.0	0.0	0.0	1.0

Section Inspection - 04/11/2020 - MH SW4X

Section 3	Inspection 1	Date 04/11/20	Time 14:49	Client's Job Ref 30586	Weather Dry	Pre Cleaned No	PLR MH SW4X
Operator L Hilton		Vehicle PK65 HFB		Camera P494 Tractor	Preset Length Not Specified	Legal Status Not Specified	Alternative ID Not Specified

Town or Village:	Site Area 1	Inspection Direction:	Upstream	Upstream Node:	MH SW4
Road:	Sneakyeat Road	Inspected Length:	26.20 m	Upstream Pipe Depth:	
Location:	Footpath or verge	Total Length:	26.20 m	Downstream Node:	MH SW5
Surface Type:	Unknown	Joint Length:	0.00 m	Downstream Pipe Depth:	
Use:	Surface water	Pipe Shape:	Circular		
Type of Pipe:		Dia/Height:	225 mm		
Flow Control:		Pipe Material:	Vitrified clay		
Year Constructed:	Not Specified	Lining:	No Lining		
Inspection Purpose:	Sample survey to determine asset condition	Lining Material:	No Lining		
Comments:					
Recommendations:	None specified				

Scale: 1:226	Position [m]	Code	Observation	MPEG	Photo	Grade
Depth: m MH SW5						
	0.00	ST	Start of survey	00:00:14		
	4.20	JN	Junction, at 9 o'clock, 150mm diameter: Road Gully	00:00:46		
	12.50	JN	Junction, at 9 o'clock, 150mm diameter: Road Gully	00:01:25		
	26.20	FH	Finish survey: MH SW4	00:02:33		
MH SW4 Depth: m						

Construction Features

Structural Defects

Miscellaneous Features

Service & Operational Observations

STR No. Def	STR Peak	STR Mean	STR Total	STR Grade	SER No. Def	SER Peak	SER Mean	SER Total	SER Grade
0	0.0	0.0	0.0	1.0	0	0.0	0.0	0.0	1.0

Section Inspection - 04/11/2020 - MH SW3X

Section 4	Inspection 1	Date 04/11/20	Time 14:55	Client's Job Ref 30586	Weather Dry	Pre Cleaned No	PLR MH SW3X
Operator L Hilton		Vehicle PK65 HFB		Camera P494 Tractor	Preset Length Not Specified	Legal Status Not Specified	Alternative ID Not Specified

Town or Village:	Site Area 1	Inspection Direction:	Upstream	Upstream Node:	MH SW3
Road:	Sneakyeat Road	Inspected Length:	17.40 m	Upstream Pipe Depth:	
Location:	Footpath or verge	Total Length:	17.40 m	Downstream Node:	MH SW4
Surface Type:	Unknown	Joint Length:	0.00 m	Downstream Pipe Depth:	
Use:	Surface water	Pipe Shape:	Circular		
Type of Pipe:		Dia/Height:	225 mm		
Flow Control:		Pipe Material:	Vitrified clay		
Year Constructed:	Not Specified	Lining:	No Lining		
Inspection Purpose:	Sample survey to determine asset condition	Lining Material:	No Lining		
Comments:					
Recommendations:	None specified				

Scale:	1:150	Position [m]	Code	Observation	MPEG	Photo	Grade
Depth: m MH SW4 0.00 ST Start of survey 00:00:14							
17.40 DES Debris silt, 95% cross-sectional area loss 00:01:51 _24ffb3c-a7e4-4ada-b457-11e 5							
17.40 FH Finish survey: Limit of CCTV Due to Silt 00:01:57							
MH SW3 Depth: m							

Construction Features

Structural Defects

Miscellaneous Features

Service & Operational Observations

STR No. Def	STR Peak	STR Mean	STR Total	STR Grade	SER No. Def	SER Peak	SER Mean	SER Total	SER Grade
0	0.0	0.0	0.0	1.0	1	10.0	0.6	10.0	5.0

Section Pictures - 04/11/2020 - MH SW3X

Section	Inspection Direction	PLR	Client's Job Ref	Contractor's Job Ref
4	Upstream	MH SW3X	30586	



_24fffb3c-a7e4-4ada-b457-11e457c9573c.jpg, 00:01:51, 17.40
m

Debris silt, 95% cross-sectional area loss



Manhole Record Card

Number	MHSW1	Date Of Survey	04/11/2020
Status	PR	Function	S
		Type	

Cover Details:

Square Recta ☐ Double Triang ☐ Single Triangl ☐ Circular ☐ Multiple ☐ Hinged ☐ Lockable ☐

CoverLevel Cover Load Class

Cover	600 X 400	Chamber	0 X 0	EvidenceOfSurcharge	☐
Shaft	0 X 0	ShaftDepth	0	ToxicAtmosphere	☐
Brick	☒	Precast Concrete	☐	PVC	☐
Reducing Slab	☐	Taper	☐	Side Entry	☐
		Segments	☐	No.RegCourses	
		No.Land	0	Step Irons	☒
				Ladder	☐

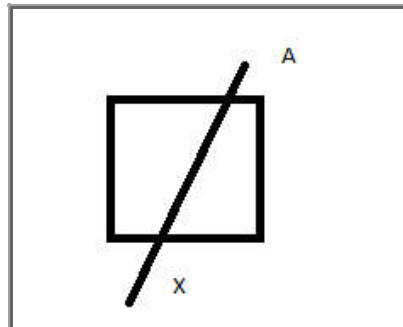
PlanPhoto



LocationPhoto



PlanofManhol



Chamber Conditions:

Cover	OK	Shaft	OK
Irons/Ladder	OK	Chamber	OK
Benching/Channel	OK		

Pipe	Invert L	DepthFr	UpstreamRe	Downstream	Pipe Sh	SizeHeight	SizeWidth	Pipe Material	Lining Material
A	-2.150	2.15	MHSW		C		300	CON	
X	-2.170	2.17		MHSW2	C		300	CON	

Disclaimer - Any dimensions and levels provided on this form should be checked before being relied upon. It is the responsibility of the customer to verify all information given with regards to the drainage prior to designing or commencing any work on site.



Manhole Record Card

Number	MHSW3	Date Of Survey	04/11/2020
Status	PR	Function	S
		Type	M

Cover Details:

Square Recta ☒ Double Triang ☐ Single Triangl ☐ Circular ☐ Multiple ☐ Hinged ☐ Lockable ☐

CoverLevel Cover Load Class

Cover	600 X 600	Chamber	0 X 0	EvidenceOfSurcharge	☐
Shaft	0 X 0	ShaftDepth	0	ToxicAtmosphere	☐
Brick	☒	Precast Concrete	☐	PVC	☐
Reducing Slab	☐	Taper	☐	Side Entry	☐
		No.Land	0	Step Irons	☒
				Ladder	☐

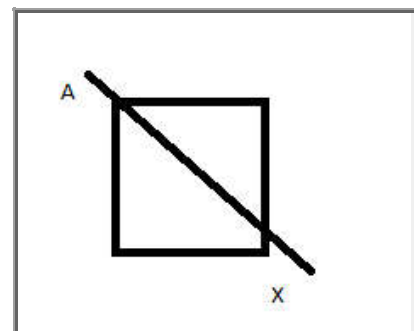
PlanPhoto



LocationPhoto



PlanofManhol



Chamber Conditions:

Cover	OK	Shaft	OK
Irons/Ladder	OK	Chamber	OK
Benching/Channel	OK		

Pipe	Invert L	Depth	Fr	Upstream	Re	Downstream	Pipe Sh	Size	Height	Size	Width	Pipe Material	Lining Material
A	-1.710	1.71	MHSW2				C			300		CON	
X	-1.720	1.72				MH	C			300		CON	

Disclaimer - Any dimensions and levels provided on this form should be checked before being relied upon. It is the responsibility of the customer to verify all information given with regards to the drainage prior to designing or commencing any work on site.



Manhole Record Card

Number	MHSW1	Date Of Survey	04/11/2020
Status	PR	Function	S
		Type	M

Cover Details:

Square Recta ☒ Double Triang ☐ Single Triangl ☐ Circular ☐ Multiple ☐ Hinged ☐ Lockable ☐

CoverLevel Cover Load Class

Cover	600 X 600	Chamber	0 X 0	EvidenceOfSurcharge	☐
Shaft	0 X 0	ShaftDepth	0	ToxicAtmosphere	☐
Brick	☐	Precast Concrete	☒	PVC	☐
Reducing Slab	☐	Taper	☐	Side Entry	☐
		No.Land	0	Step Irons	☒
				Ladder	☐

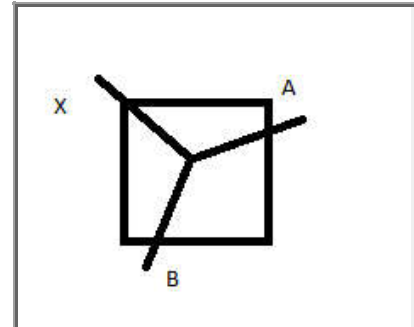
PlanPhoto



LocationPhoto



PlanofManhol



Chamber Conditions:

Cover	OK	Shaft	OK
Irons/Ladder	OK	Chamber	OK
Benching/Channel	OK		

Pipe	Invert L	DepthFr	UpstreamRe	Downstream	Pipe Sh	SizeHeight	SizeWidth	Pipe Material	Lining Material
A	-1.250	1.25	ACO		C		150	VC	
B	-1.250	1.25	GULLY		C		150	VC	
X	-1.290	1.29		MHSW2	C		150	VC	

Disclaimer - Any dimensions and levels provided on this form should be checked before being relied upon. It is the responsibility of the customer to verify all information given with regards to the drainage prior to designing or commencing any work on site.



Manhole Record Card

Number	MHSW5	Date Of Survey	04/11/2020
Status	PR	Function	S
		Type	M

Cover Details:

Square Recta ☒ Double Triang ☐ Single Triangl ☐ Circular ☐ Multiple ☐ Hinged ☐ Lockable ☐

CoverLevel Cover Load Class

Cover	600 X 600	Chamber	0 X 0	EvidenceOfSurcharge	☐
Shaft	0 X 0	ShaftDepth	0	ToxicAtmosphere	☐
Brick	☐	Precast Concrete	☐	PVC	☐
Reducing Slab	☐	Taper	☐	Side Entry	☐
		No.Land	0	Step Irons	☒
		Segments	☐	No.RegCourses	
		Ladder	☐		

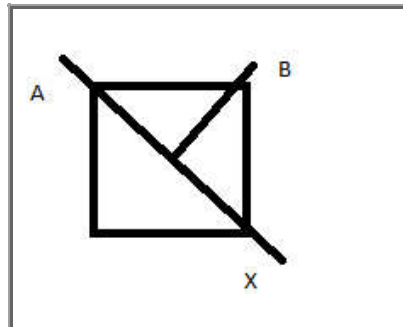
PlanPhoto



LocationPhoto



PlanofManhol



Chamber Conditions:

Cover	OK	Shaft	OK
Irons/Ladder	OK	Chamber	OK
Benching/Channel	OK		

Pipe	Invert L	DepthFr	UpstreamRe	Downstream	Pipe Sh	SizeHeight	SizeWidth	Pipe Material	Lining Material
A	-1.820	1.82	MH		C		150	VC	
B	-1.870	1.87	MHSW4		C		225	VC	
X	-1.900	1.90		BMH	C		225	VC	

Disclaimer - Any dimensions and levels provided on this form should be checked before being relied upon. It is the responsibility of the customer to verify all information given with regards to the drainage prior to designing or commencing any work on site.



Manhole Record Card

Number	MHFW1	Date Of Survey	04/11/2020
Status	PR	Function	F
		Type	M

Cover Details:

Square Recta ☒ Double Triang ☐ Single Triangl ☐ Circular ☐ Multiple ☐ Hinged ☐ Lockable ☐

CoverLevel Cover Load Class

Cover	600 X 600	Chamber	0 X 0	EvidenceOfSurcharge	☐
Shaft	0 X 0	ShaftDepth	0	ToxicAtmosphere	☐
Brick	☐	Precast Concrete	☒	PVC	☐
Reducing Slab	☐	Taper	☐	Side Entry	☐
		No.Land	0	Step Irons	☒
		Segments	☐	No.RegCourses	
				Ladder	☐

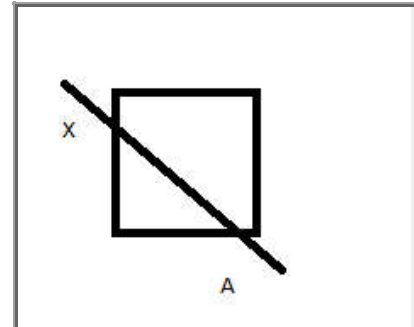
PlanPhoto



LocationPhoto



PlanofManhol



Chamber Conditions:

Cover	OK	Shaft	OK
Irons/Ladder	OK	Chamber	OK
Benching/Channel	OK		

Pipe	Invert L	DepthFr	UpstreamRe	Downstream	Pipe Sh	SizeHeight	SizeWidth	Pipe Material	Lining Material
A	-2.870	2.87			C		225	VC	
X	-2.900	2.90		MH	C		225	VC	

Disclaimer - Any dimensions and levels provided on this form should be checked before being relied upon. It is the responsibility of the customer to verify all information given with regards to the drainage prior to designing or commencing any work on site.



Manhole Record Card

Number	MHSW4	Date Of Survey	04/11/2020
Status	PR	Function	S
		Type	M

Cover Details:

Square Recta ☒ Double Triang ☐ Single Triangl ☐ Circular ☐ Multiple ☐ Hinged ☐ Lockable ☐

CoverLevel Cover Load Class

Cover	600 X 600	Chamber	0 X 0	EvidenceOfSurcharge	☐
Shaft	0 X 0	ShaftDepth	0	ToxicAtmosphere	☐
Brick	☐	Precast Concrete	☒	PVC	☐
Reducing Slab	☐	Taper	☐	Side Entry	☐
		No.Land	0	Step Irons	☒
				Ladder	☐

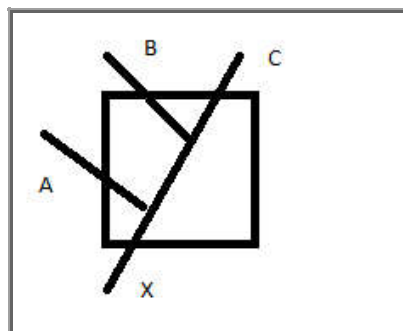
PlanPhoto



LocationPhoto



PlanofManhol



Chamber Conditions:

Cover	OK	Shaft	OK
Irons/Ladder	OK	Chamber	OK
Benching/Channel	OK		

Pipe	Invert L	DepthFr	UpstreamRe	Downstream	Pipe Sh	SizeHeight	SizeWidth	Pipe Material	Lining Material
A	-1.350	1.35			C		100	VC	
B	-1.340	1.34			C		150	VC	
C	-1.490	1.49	MHSW3		C		225	VC	
X	-1.510	1.51		MHSW5	C		225	VC	

Disclaimer - Any dimensions and levels provided on this form should be checked before being relied upon. It is the responsibility of the customer to verify all information given with regards to the drainage prior to designing or commencing any work on site.



Manhole Record Card

Number	MHSW2	Date Of Survey	04/11/2020
Status	PR	Function	S
		Type	M

Cover Details:

Square Recta ☒ Double Triang ☐ Single Triangl ☐ Circular ☐ Multiple ☐ Hinged ☐ Lockable ☐

CoverLevel Cover Load Class

Cover	600 X 600	Chamber	0 X 0	EvidenceOfSurcharge	☐
Shaft	0 X 0	ShaftDepth	0	ToxicAtmosphere	☐
Brick	☐	Precast Concrete	☒	PVC	☐
Reducing Slab	☐	Taper	☐	Side Entry	☐
		No.Land	0	Step Irons	☒
		Segments	☐	No.RegCourses	
				Ladder	☐

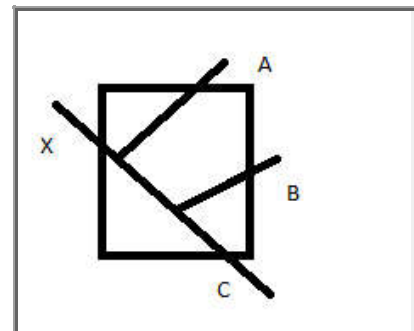
PlanPhoto



LocationPhoto



PlanofManhol



Chamber Conditions:

Cover	OK	Shaft	OK
Irons/Ladder	OK	Chamber	OK
Benching/Channel	OK		

Pipe	Invert L	DepthFr	UpstreamRe	Downstream	Pipe Sh	SizeHeight	SizeWidth	Pipe Material	Lining Material
A	-2.450	2.45	MH		C		150	VC	
B	-2.450	2.45			C		150	VC	
C	-2.480	2.48	MHSW1		C		150	VC	
X	-2.520	2.52		MHSW3	C		150	VC	

Disclaimer - Any dimensions and levels provided on this form should be checked before being relied upon. It is the responsibility of the customer to verify all information given with regards to the drainage prior to designing or commencing any work on site.

Appendix E: - Trial Hole Investigation Logs



El Sub St

RESIDUAL RISKS

REV.	DESCRIPTION	DRAWN	APPROVED	DATE

STATUS	PLANNING
--------	----------

GRAHAM SCHOFIELD ASSOCIATES
Consulting Civil and Structural Engineers
72 Balcarres Road,
Leyland
PR25 3ED
tel: (01772) 459383 fax: (01772) 459384
email: reception@gsa72.co.uk

GSA

client
NORTHERN TRUST

project
PROPOSED INDUSTRIAL UNITS
SNECKYEAT INDUSTRIAL ESTATE
WHITEHAVEN

title
SITE I
TRIAL HOLE LOCATIONS

drawn OC	checked G5	drawing number 2022.262.C010
date 06.01.21	date 06.01.21	
scale 1:250	A2	

TRIAL PIT LOG

LOCATION ID:	PROJECT No:	2020.22 I			
TPO I SITE I	PROJECT TITLE	SNECKYEAT INDUSTRIAL ESTATE, WHITEHAVEN			
	CLIENT	NORTHERN TRUST			
	PLANT		START & END DATE	04. I I .20	
GROUND LEVEL (m AOD)					

STRATA					SAMPLES			IN-SITU TESTS		
GROUND WATER STRIKE	BACKFILL	LEVEL (m AOD)	DESCRIPTION	LEGEND DEPTH (m BGL)	TYPE	FROM (m)	TO (m)	TYPE	DEPTH (m)	RESULT
			Grass over general fill material comprising LIMESTONE bricks/concrete and general builders waste (Hardcore) mixed with Soft to Firm dark orangish brown mottled bluish grey slightly sandy slightly gravelly CLAY. Sand is fine and medium.	0.15						
			Thin layer Soft to Firm dark orangish brown mottled bluish grey slightly sandy slightly gravelly CLAY. Sand is fine and medium.	0.70						
			Hole Terminated at 1.20m BGL	1.20						

REMARKS

Reason for Termination:
Target depth reached.

Groundwater Notes:
No groundwater encountered.

Other Remarks:

GRAHAM SCHOFIELD ASSOCIATES
Consulting Civil and Structural Engineers
 Suite 3 Balfour Court
 Off Hough Lane
 Leyland
 PR25 2TF
 tel: (01772) 459383
 email: reception@gsa72.co.uk

GSA

TRIAL PIT LOG

LOCATION ID:	PROJECT No:	2020.22 I			
TPO2 SITE I	PROJECT TITLE	SNECKYEAT INDUSTRIAL ESTATE, WHITEHAVEN			
	CLIENT	NORTHERN TRUST			
	PLANT		START & END DATE	04. I I .20	
GROUND LEVEL (m AOD)					

STRATA						SAMPLES			IN-SITU TESTS		
GROUND WATER STRIKE	BACKFILL	LEVEL (m AOD)	DESCRIPTION	LEGEND	DEPTH (m BGL)	TYPE	FROM (m)	TO (m)	TYPE	DEPTH (m)	RESULT
			Grass over soft dark brown sandy slightly CLAY with abundant rootlets. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse. (Topsoil)		0.10						
			General Fill material comprising LIMESTONE bricks/concrete and general builders waste (Hardcore) mixed with Soft to Firm dark orangish brown mottled bluish grey slightly sandy slightly gravelly CLAY. Sand is fine and medium.		1.10						
			Thin layer Soft to Firm dark orangish brown mottled bluish grey slightly sandy slightly gravelly CLAY. Sand is fine and medium.		1.30						
			Hole Terminated at 1.30m BGL								

REMARKS

Reason for Termination:
Target depth reached.

Groundwater Notes:
No groundwater encountered.

Other Remarks:

GRAHAM SCHOFIELD ASSOCIATES
Consulting Civil and Structural Engineers
 Suite 3 Balfour Court
 Off Hough Lane
 Leyland
 PR25 2TF
 tel: (01772) 459383
 email: reception@gsa72.co.uk

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Appendix F: - HR Wallingford Greenfield Runoff Rate Estimation for Sites

Calculated by:

Site name:

Site location:

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.

Site Details

Latitude:

Longitude:

Reference:

Date:

Runoff estimation approach**Site characteristics**

Total site area (ha):

Methodology

Q_{BAR} estimation method:

SPR estimation method:

Soil characteristics

	Default	Edited
SOIL type:	4	4
HOST class:	N/A	N/A
SPR/SPRHOST:	0.47	0.47

Hydrological characteristics

	Default	Edited
SAAR (mm):	1188	1188
Hydrological region:	10	10
Growth curve factor 1 year:	0.87	0.87
Growth curve factor 30 years:	1.7	1.7
Growth curve factor 100 years:	2.08	2.08
Growth curve factor 200 years:	2.37	2.37

Notes**(1) Is $Q_{BAR} < 2.0$ l/s/ha?**

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is $SPR/SPRHOST \leq 0.3$?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited
Q_{BAR} (l/s):	2.95	2.95
1 in 1 year (l/s):	2.57	2.57
1 in 30 years (l/s):	5.01	5.01
1 in 100 years (l/s):	6.13	6.13
1 in 200 years (l/s):	6.99	6.99

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.

Appendix G: - Proposed Drainage Strategy and Calculations



drawn AG	checked IS	drawing number 2022-262-C005
date AUG 23	date AUG 23	
scale 1:200	AI	

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XP Solutions	Network 2020.1	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Block 2 SW

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	2	PIMP (%)	100
M5-60 (mm)	16.000	Add Flow / Climate Change (%)	0
Ratio R	0.260	Minimum Backdrop Height (m)	0.600
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
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)	250

Designed with Level Soffits

Network Design Table for Block 2 SW

« - 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
S21.000	66.019	0.440	150.0	0.045	5.00	0.0	0.600	o	150	Pipe/Conduit	
S21.001	17.126	0.114	150.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S21.002	14.062	0.094	150.0	0.030	0.00	0.0	0.600	o	150	Pipe/Conduit	
S22.000	52.401	0.513	102.1	0.160	5.00	0.0	0.600	o	225	Pipe/Conduit	
S21.003	6.921	0.047	147.3	0.000	0.00	0.0	0.600	o	150	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)
S21.000	41.14	6.35	97.660	0.045	0.0	0.0	0.0	0.82	14.5	5.0
S21.001	40.26	6.69	97.220	0.045	0.0	0.0	0.0	0.82	14.5	5.0
S21.002	39.58	6.98	97.106	0.075	0.0	0.0	0.0	0.82	14.5	8.0
S22.000	42.96	5.68	97.525	0.160	0.0	0.0	0.0	1.29	51.4	18.6
S21.003	39.26	7.12	97.012	0.235	0.0	0.0	0.0	0.83	14.6«	25.0

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Manhole Schedules for Block 2 SW

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
S2RE1	98.350	0.690	Open Manhole	250	S21.000	97.660	150				
S22	98.350	1.130	Open Manhole	600	S21.001	97.220	150	S21.000	97.220	150	
S23	98.350	1.244	Open Manhole	600	S21.002	97.106	150	S21.001	97.106	150	
S25	98.725	1.200	Open Manhole	600	S22.000	97.525	225				
S26	98.850	1.838	Open Manhole	1200	S21.003	97.012	150	S21.002	97.012	150	
								S22.000	97.012	225	
S2SW4	98.400	1.435	Open Manhole	1200		OUTFALL		S21.003	96.965	150	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S2RE1	299047.289	516136.933	299047.289	516136.933	Required	
S22	298990.652	516170.855	298990.652	516170.855	Required	
S23	298999.361	516185.600	298999.361	516185.600	Required	
S25	299051.345	516170.633	299051.345	516170.633	Required	
S26	299006.489	516197.721	299006.489	516197.721	Required	
S2SW4	299000.565	516201.299			No Entry	

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PIPELINE SCHEDULES for Block 2 SW

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)
S21.000	o	150	S2RE1	98.350	97.660	0.540	Open Manhole	250
S21.001	o	150	S22	98.350	97.220	0.980	Open Manhole	600
S21.002	o	150	S23	98.350	97.106	1.094	Open Manhole	600
S22.000	o	225	S25	98.725	97.525	0.975	Open Manhole	600
S21.003	o	150	S26	98.850	97.012	1.688	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)
S21.000	66.019	150.0	S22	98.350	97.220	0.980	Open Manhole	600
S21.001	17.126	150.0	S23	98.350	97.106	1.094	Open Manhole	600
S21.002	14.062	150.0	S26	98.850	97.012	1.688	Open Manhole	1200
S22.000	52.401	102.1	S26	98.850	97.012	1.613	Open Manhole	1200
S21.003	6.921	147.3	S2SW4	98.400	96.965	1.285	Open Manhole	1200

Free Flowing Outfall Details for Block 2 SW

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S21.003	S2SW4	98.400	96.965	96.965	1200	0

Simulation Criteria for Block 2 SW

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	0.000
Hot Start (mins)	0	Inlet Coefficient	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 Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	2	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	16.000	Storm Duration (mins)	30
Ratio R	0.260		

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Online Controls for Block 2 SW

Hydro-Brake® Optimum Manhole: S26, DS/PN: S21.003, Volume (m³): 4.4

Unit Reference	MD-SHE-0079-3000-1250-3000
Design Head (m)	1.250
Design Flow (l/s)	3.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	79
Invert Level (m)	97.012
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.250	3.0	Kick-Flo®	0.702	2.3
Flush-Flo™	0.344	2.9	Mean Flow over Head Range	-	2.6

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)	Depth (m)	Flow (l/s)
0.100	2.2	0.800	2.4	2.000	3.7	4.000	5.1	7.000	6.7
0.200	2.7	1.000	2.7	2.200	3.9	4.500	5.4	7.500	6.9
0.300	2.9	1.200	2.9	2.400	4.1	5.000	5.7	8.000	7.1
0.400	2.9	1.400	3.2	2.600	4.2	5.500	6.0	8.500	7.3
0.500	2.8	1.600	3.4	3.000	4.5	6.000	6.2	9.000	7.5
0.600	2.6	1.800	3.5	3.500	4.8	6.500	6.5	9.500	7.7

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Storage Structures for Block 2 SW

Cellular Storage Manhole: S26, DS/PN: S21.003

Invert Level (m) 97.012 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	180.0	0.0	1.800	0.0	0.0	3.600	0.0	0.0
0.200	180.0	0.0	2.000	0.0	0.0	3.800	0.0	0.0
0.400	180.0	0.0	2.200	0.0	0.0	4.000	0.0	0.0
0.500	180.0	0.0	2.400	0.0	0.0	4.200	0.0	0.0
0.600	180.0	0.0	2.600	0.0	0.0	4.400	0.0	0.0
0.700	180.0	0.0	2.800	0.0	0.0	4.600	0.0	0.0
0.800	180.0	0.0	3.000	0.0	0.0	4.800	0.0	0.0
0.801	0.0	0.0	3.200	0.0	0.0	5.000	0.0	0.0
1.600	0.0	0.0	3.400	0.0	0.0			

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

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 0.000
 Hot Start Level (mm) 0 Inlet Coefficient 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 Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 16.000 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.259 Cv (Winter) 0.840

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

 Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960,
 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
 Return Period(s) (years) 1, 2, 30, 100
 Climate Change (%) 0, 0, 0, 40

									Water	Surcharged
	US/MH		Return	Climate	First (X)	First (Y)	First (Z)	Overflow	Level	Depth
PN	Name	Storm	Period	Change	Surcharge	Flood	Overflow	Act.	(m)	(m)
S21.000	S2RE1	15 Winter	1	+0%	100/15 Summer				97.717	-0.093
S21.001	S22	15 Winter	1	+0%	100/15 Summer				97.276	-0.094
S21.002	S23	15 Winter	1	+0%	30/15 Summer				97.179	-0.077
S22.000	S25	15 Winter	1	+0%	100/15 Summer				97.612	-0.138
S21.003	S26	360 Winter	1	+0%	2/240 Winter				97.131	-0.031

		Flooded		Half Drain		Pipe		
PN	US/MH Name	Volume (m³)	Flow / Cap. (l/s)	Time (mins)	Flow (l/s)	Status	Level Exceeded	
S21.000	S2RE1	0.000	0.28		4.0	OK		
S21.001	S22	0.000	0.30		4.0	OK		
S21.002	S23	0.000	0.47		6.3	OK		
S22.000	S25	0.000	0.31		15.2	OK		
S21.003	S26	0.000	0.19	149	2.4	OK		

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

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 0.000
 Hot Start Level (mm) 0 Inlet Coefficient 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 Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 16.000 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.259 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960,
 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
 Return Period(s) (years) 1, 2, 30, 100
 Climate Change (%) 0, 0, 0, 40

								Water		Surcharged	
PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Level (m)	Depth (m)	
S21.000	S2RE1	15 Winter	2	+0%	100/15 Summer				97.726	-0.084	
S21.001	S22	15 Winter	2	+0%	100/15 Summer				97.285	-0.085	
S21.002	S23	15 Winter	2	+0%	30/15 Summer				97.191	-0.064	
S22.000	S25	15 Winter	2	+0%	100/15 Summer				97.625	-0.125	
S21.003	S26	240 Winter	2	+0%	2/240 Winter				97.162	0.000	

		Flooded		Half Drain		Pipe			Level
PN	US/MH Name	Volume (m³)	Flow / Cap.	Overflow (l/s)	Time (mins)	Flow (l/s)	Status	Exceeded	
S21.000	S2RE1	0.000	0.37			5.2	OK		
S21.001	S22	0.000	0.38			5.1	OK		
S21.002	S23	0.000	0.61			8.1	OK		
S22.000	S25	0.000	0.40			19.5	OK		
S21.003	S26	0.000	0.21		136	2.6	SURCHARGED		

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

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 0.000
 Hot Start Level (mm) 0 Inlet Coefficient 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 Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 16.000 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.259 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960,
 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
 Return Period(s) (years) 1, 2, 30, 100
 Climate Change (%) 0, 0, 0, 40

									Water	Surcharged
PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Level (m)	Depth (m)
S21.000	S2RE1	15 Winter	30	+0%	100/15 Summer				97.757	-0.053
S21.001	S22	360 Winter	30	+0%	100/15 Summer				97.336	-0.034
S21.002	S23	360 Winter	30	+0%	30/15 Summer				97.333	0.077
S22.000	S25	15 Winter	30	+0%	100/15 Summer				97.672	-0.078
S21.003	S26	360 Winter	30	+0%	2/240 Winter				97.329	0.167

Flooded				Half Drain Pipe			Level	
PN	US/MH Name	Volume (m³)	Flow / Cap. (l/s)	Time (mins)	Flow (l/s)	Status	Exceeded	
S21.000	S2RE1	0.000	0.68		9.7	OK		
S21.001	S22	0.000	0.15		2.1	OK		
S21.002	S23	0.000	0.25		3.4	SURCHARGED		
S22.000	S25	0.000	0.73		36.2	OK		
S21.003	S26	0.000	0.23	230	2.9	SURCHARGED		

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

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 0.000
 Hot Start Level (mm) 0 Inlet Coefficient 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 Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 16.000 Cv (Summer) 0.750
 Region England and Wales Ratio R 0.259 Cv (Winter) 0.840

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

 Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960,
 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
 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.	Water	Surcharged
									Level (m)	Depth (m)
S21.000	S2RE1	15 Winter	100	+40%	100/15 Summer				98.281	0.471
S21.001	S22	480 Winter	100	+40%	100/15 Summer				97.732	0.362
S21.002	S23	480 Winter	100	+40%	30/15 Summer				97.730	0.474
S22.000	S25	15 Winter	100	+40%	100/15 Summer				98.163	0.413
S21.003	S26	480 Winter	100	+40%	2/240 Winter				97.727	0.565

PN	US/MH Name	Flooded		Half Drain		Pipe	Level Exceeded
		Volume (m³)	Flow / Cap.	Overflow (l/s)	Time (mins)	Flow (l/s)	
S21.000	S2RE1	0.000	1.18			16.8	FLOOD RISK
S21.001	S22	0.000	0.21			2.9	SURCHARGED
S21.002	S23	0.000	0.37			4.9	SURCHARGED
S22.000	S25	0.000	1.31			64.6	SURCHARGED
S21.003	S26	0.000	0.23		416	2.9	SURCHARGED

Technical Specification

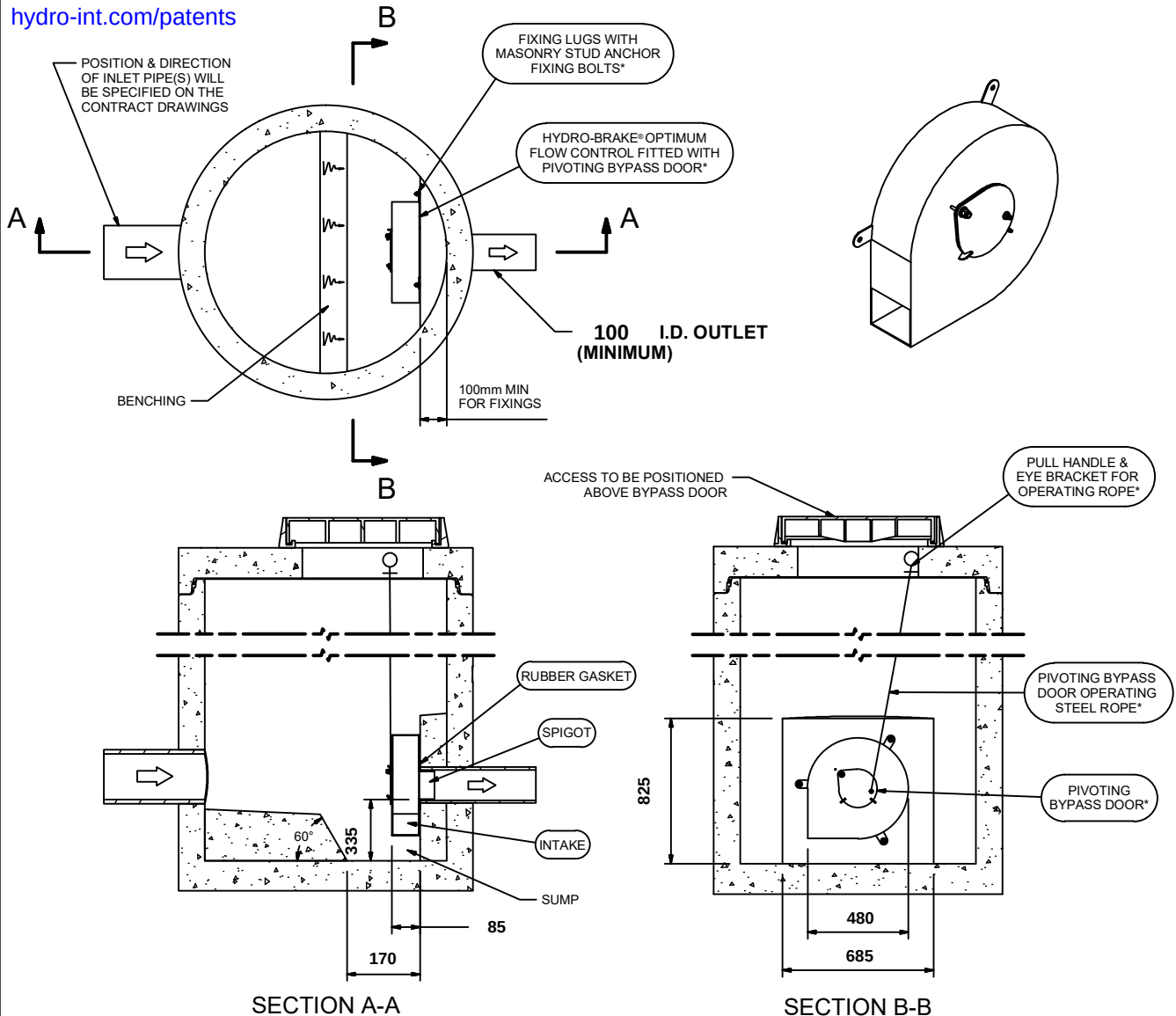
Control Point	Head (m)	Flow (l/s)
Primary Design	1.250	3.000
Flush-Flo™	0.344	2.863
Kick-Flo®	0.702	2.304
Mean Flow		2.558

Hydro-Brake® Optimum Flow Control including:

- 3 mm grade 304L stainless steel
- Integral stainless steel pivoting by-pass door allowing clear line of sight through to outlet, c/w stainless steel operating rope
- Beed blasted finish to maximise corrosion resistance
- Stainless steel fixings
- Rubber gasket to seal outlet



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IMPORTANT: ○ LIMIT OF HYDRO INTERNATIONAL SUPPLY
 THE DEVICE WILL BE HANDED TO SUIT SITE CONDITIONS
 FOR SITE SPECIFIC DETAILS AND MINIMUM CHAMBER SIZE REFER TO HYDRO INTERNATIONAL
 ALL CIVIL AND INSTALLATION WORK BY OTHERS
 * WHERE SUPPLIED
 HYDRO-BRAKE® FLOW CONTROL & HYDRO-BRAKE® OPTIMUM FLOW CONTROL ARE REGISTERED TRADEMARKS FOR FLOW
 CONTROLS DESIGNED AND MANUFACTURED EXCLUSIVELY BY HYDRO INTERNATIONAL

THIS DESIGN LAYOUT IS FOR ILLUSTRATIVE PURPOSES ONLY. NOT TO SCALE.

DESIGN ADVICE



The head/flow characteristics of this SHE-0079-3000-1250-3000 Hydro-Brake® Optimum Flow Control are unique. Dynamic hydraulic modelling evaluates the full head/flow characteristic curve.
The use of any other flow control will invalidate any design based on this data and could constitute a flood risk.

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DATE	1/7/2021 4:05 PM
SITE	Sneckyeat Industrial Estate
DESIGNER	Oliver Clark
REF	2020.221

SHE-0079-3000-1250-3000
 Hydro-Brake® Optimum

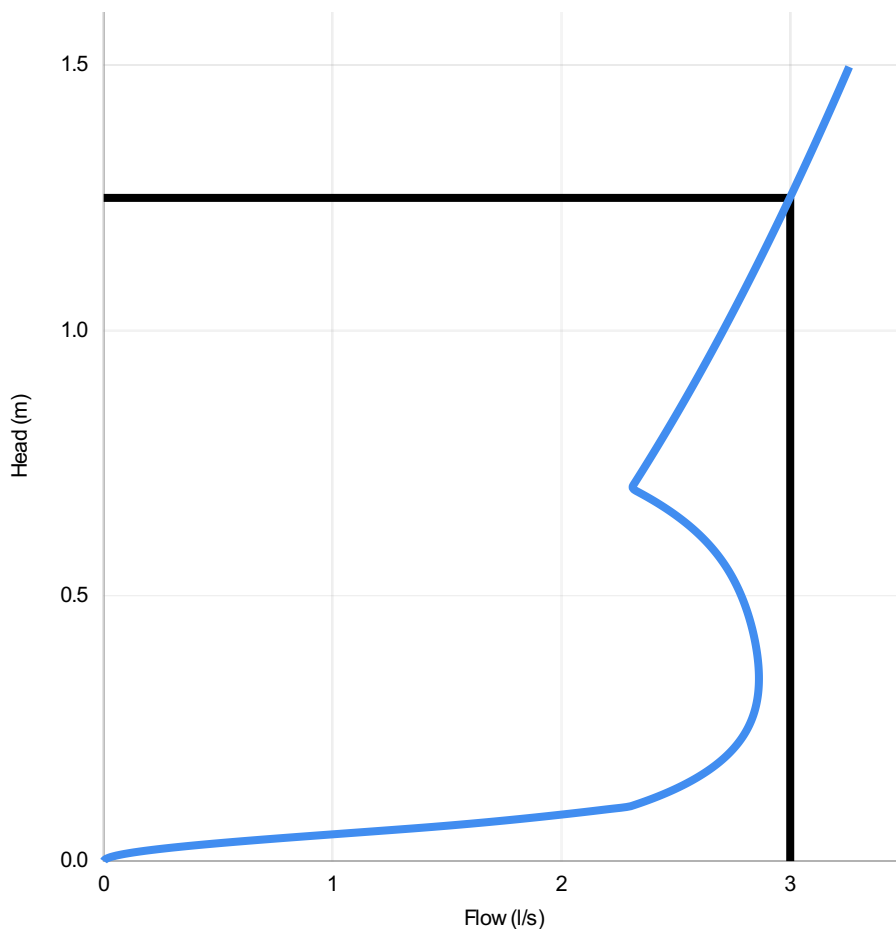
Technical Specification

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Head (m)	Flow (l/s)
0.000	0.000
0.043	0.770
0.086	1.970
0.129	2.463
0.172	2.647
0.216	2.759
0.259	2.824
0.302	2.855
0.345	2.863
0.388	2.856
0.431	2.838
0.474	2.809
0.517	2.768
0.560	2.711
0.603	2.630
0.647	2.517
0.690	2.361
0.733	2.350
0.776	2.411
0.819	2.471
0.862	2.530
0.905	2.587
0.948	2.642
0.991	2.696
1.034	2.749
1.078	2.801
1.121	2.852
1.164	2.902
1.207	2.950
1.250	2.998

DESIGN ADVICE



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Hydro
International

DATE	07/01/2021 16:05
Site	Sneckyeat Industrial Estate
DESIGNER	Oliver Clark
Ref	2020.221

SHE-0079-3000-1250-3000
Hydro-Brake Optimum®