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DRAINAGE STRATEGY REPORT

FOR

PROPOSED COMMERCIAL UNITS

AT SNECKYEAT INDUSTRIAL ESTATE, WHITEHAVEN

FOR

NORTHERN TRUST CO. LTD

Project	:	2020.221
Date	:	Dec. 2020
Engineer	:	O. Clark
Issue 02	:	11 Jan. 2021
Issue 03	:	5 May 2021

Report Control

Report Title	Drainage Strategy Report			
Project Number	2020.221			
Revision	Issue	Date	Prepared	Approved
01	Issue 1	08/10/2020	O. Clark	G. Schofield
02	Issue 2	11/01/2021	O. Clark	G. Schofield
03	Issue 3	10/05/2021	O. Clark	G. Schofield

CONTENTS

1.0 Brief

Graham Scofield Associates Ltd have been appointed by Northern Trust Co. Ltd to undertake a Drainage Strategy in support of a planning application to construct 9 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

Block 1 is located at National Grid Reference 299099 (E), 516278 (N) and is currently a vacant plot used informally for parking it is a mixture of topsoil and wild growth. Block 2 is located at National Grid Reference 299025 (E), 516185 (N) and is also currently a vacant plot used informally for parking it is a mixture of topsoil and wild growth. The sites are rectangular in shape, Block 1 is some 0.345 Ha and Block 2 is 0.329 Ha in area the locations of the sites are indicated below in Figure 1, Yellow for Block 1, Orange for Block 2.

Figure 1: Site Location Plan

Block 1 is bounded by Sneckyeat Road (crescent shaped distributor road) to the north, east and west, to the south is Units 9 A and B and Unit 7. Block 2 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

At the time this report has been written a topographical survey of the area was not available however examination of the Environment Agency LiDAR Data which is available to download from https://data.gov.uk/dataset/f0db0249-f17b-4036-9e65-309148c97ce4/national-lidar-programme for the area provides level data at metres above Ordnance Survey datum (mAOD). The Environment Agency LiDAR data referenced above is represented as a contoured drawing and is included in Appendix A.

An inspection of the data indicates the ground levels fall fairly steeply from north east to south west, culminating a minimum site level for Block 1 of 105.0m AOD at the south western boundary of the development and a maximum of 108.0m AOD at the north eastern boundary. Block 2 to the south also falls steeply from north east to south west has a minimum level of 97.5 at the south western boundary and a maximum level of 100.0m AOD at the entrance to the plot in the north western corner.

3.0 Development Proposals

The proposal for the development of the two vacant plots is to construct a two blocks of commercial/light industrial units, Block 1 will consist of two rows of two each unit has an area of 204m^2 in the centre of the plot with car park/service yards to the west and east respectively with access and egress from the private circulation road. Block 2 will comprise a row of units located at the southern end of the plot comprising: four units of 206m^2 and one of 103m^2 at the western end of the row. To the north of the units is the car park/service yard with access/egress from the private access road at the north western corner of the plot. 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 public surface water sewer located in Sneckyeat Road the head of which is at the junction with Homewood Road and runs north west. There is a 150Ø public surf ace water sewer located in the front gardens of Homewood Road on the north west side which runs south west from the junction with Sneckyeat Road. There is a 225Ø public foul water sewer the head of which is located in Sneckyeat Road at the junction with Homewood Road it then turns south west through the open ground to the east of the electricity substation on Sneckyeat Road before running south and running through the rear gardens of Homewood Road. It is assumed that the north western third of Sneckyeat Industrial Estate units are served by a network of private foul and surface water sewers which ultimately discharge into the public sewer network at the junction of Sneckyeat Road and Homewood Road. The north eastern and southern thirds of Sneckyeat Industrial Estate are served by separate surface water sewers which run east, one under Sneckyeat Road and Galemire, the second along the top of the embankment between Sneckyeat Industrial Estate and West Cumberland Hospital. It is believed that these sewers discharge 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.

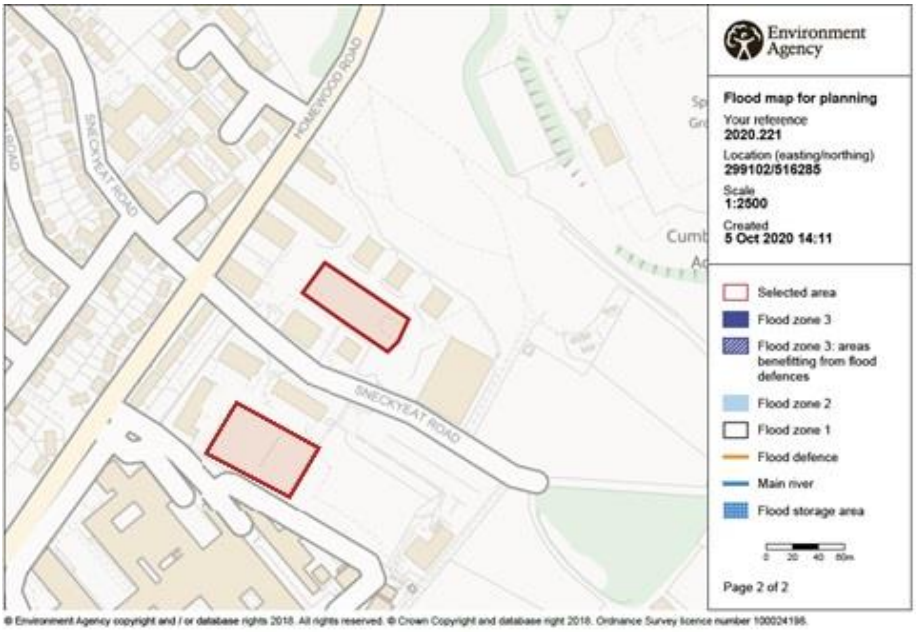

Figure 2: Environment Agency Flood Mapping for Planning

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.

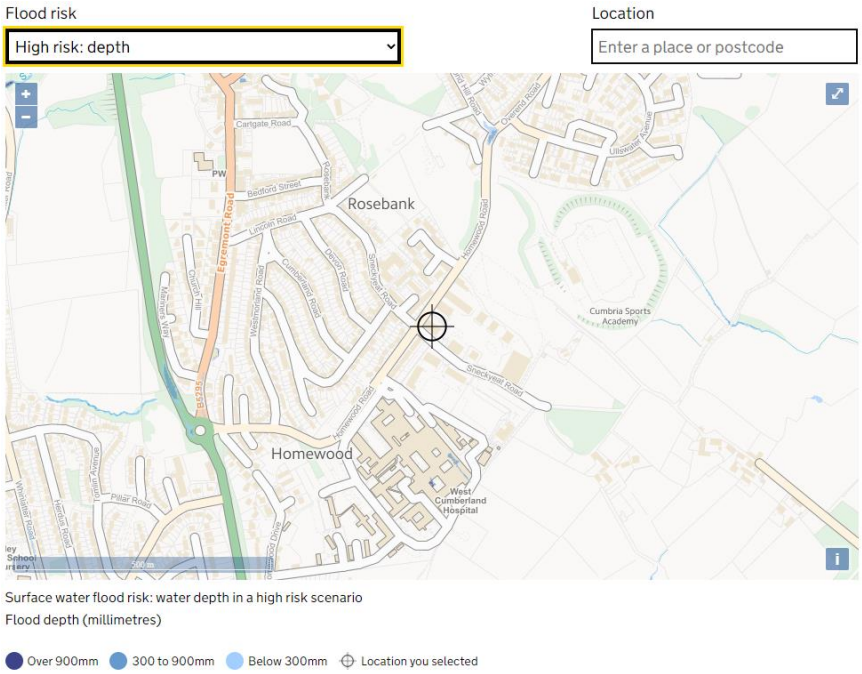

Figure 3: Environment Agency Surface Water Flooding – High Risk: Depth Extract

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.

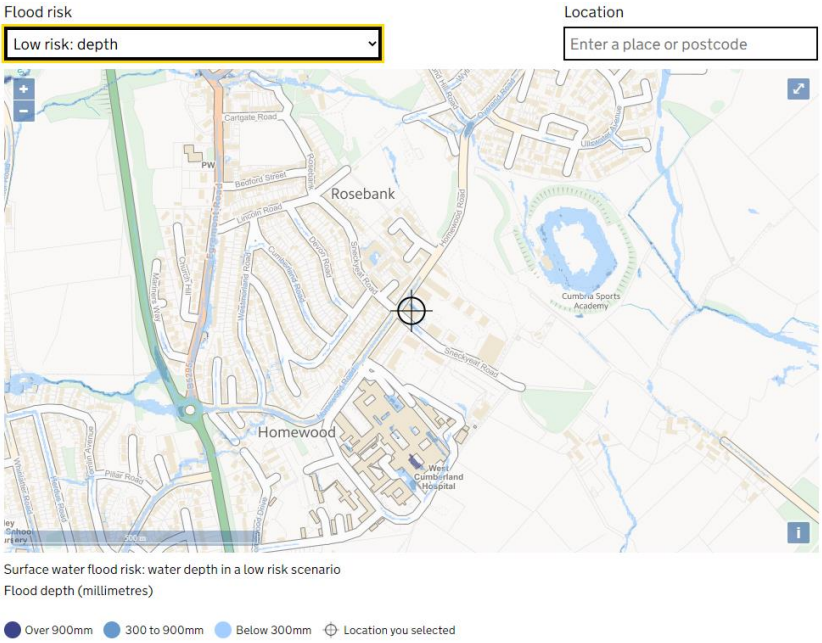

Figure 4: Environment Agency Surface Water Flooding –Low Risk: Depth Extract

6.0 Proposed Site Drainage Arrangements

The current site area is 0.70Ha split 0.37Ha for Block 1 and 0.33Ha for Block 2 which are currently vacant plots on the industrial estate comprising grass and topsoil over made ground. The proposals include two blocks of single storey commercial units, Block 1 is 30m long by 30m wide located centrally within the northern plot with combined car parking/service yard 30m wide by 30m long either side of the units to the east and west. Block 2 is some 15.16m wide by 65.6m long located to the south of the plot with a 70m long by 30m wide combined service yard/car parking located to the north of the units. The development proposals for the site will result in an increase of the impermeable area of 0.70Ha 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 0.42l/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 0.35 litres/second, giving a total design flow of 0.8l/s, 0.4l/s for Block 1 and 0.4l/s for Block 2.

From a visual inspection of the site, it appears there is a private foul sewer within Sneckyeat Road (the perimeter road to the west of the plot) serving the units of the northern western section of the site, it is intended to form a new connection for the western units of Block 1 to this existing private foul sewer. From the drainage investigation survey there appears to be a foul drain in the eastern side verge/footpath of the perimeter road which runs south to Sneckyeat Road, it is intended to form a

new connection to this drain for the eastern units. 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 for Block 2 into an existing manhole adjacent to 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

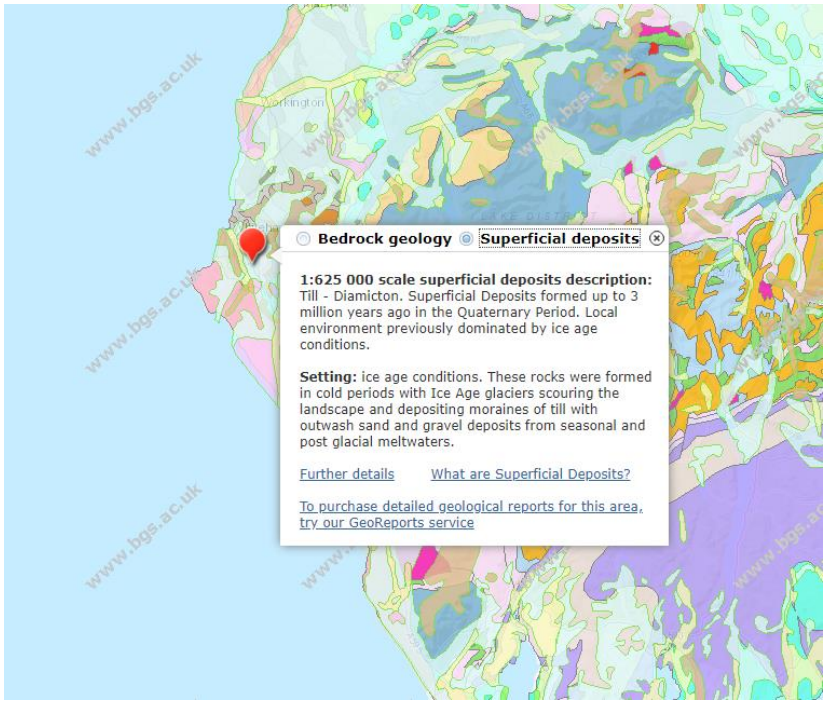

Figure 6: British Geological Survey Viewer – Superficial Deposits

Ordinance 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 observations of Block 1 site it appears there are private surface water sewers within Sneckyeat Road (the perimeter road that surrounds the plot) serving the units of the north western section of the site, it is intended to form a new connection for the west units of Block 1.

From drainage investigation work there is a surface water sewer which runs in the eastern verge/footpath of the eastern side of Sneckyeat Road (perimeter road surrounding Block 1 site) which runs into Sneckyeat Road and then Galemire it is intended to form a new connection for the eastern units of Block 1 to this surface water sewer. Block 2 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, int is intended to form a new surface water connection to an existing manhole to the north west of the site.

As both sites have been vacant plots 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 for Block 1 of 3.31/s and 2.95l/s for Block 2. As Block 1 will be split into 2 separate networks draining approximately equal areas it is intended to restrict each side to 1.6l/s, Block 2 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 oversize some of the main drainage pipes and construct a geocellular attenuation tank under the car park/service yard of each Block 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 for each block was created and simulated storm events for 1in 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 5km^2) 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 sites be connected to be connected to 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 of 3.3 l/s for Block 1 and 3l/s for Block 2. 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: - LiDAR Contours Plan

RESIDUAL RISKS

REV	DESCRIPTION	DRAWN	APPROVED	DATE

STATUS

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GSA

client

NORTHERN TRUST

project

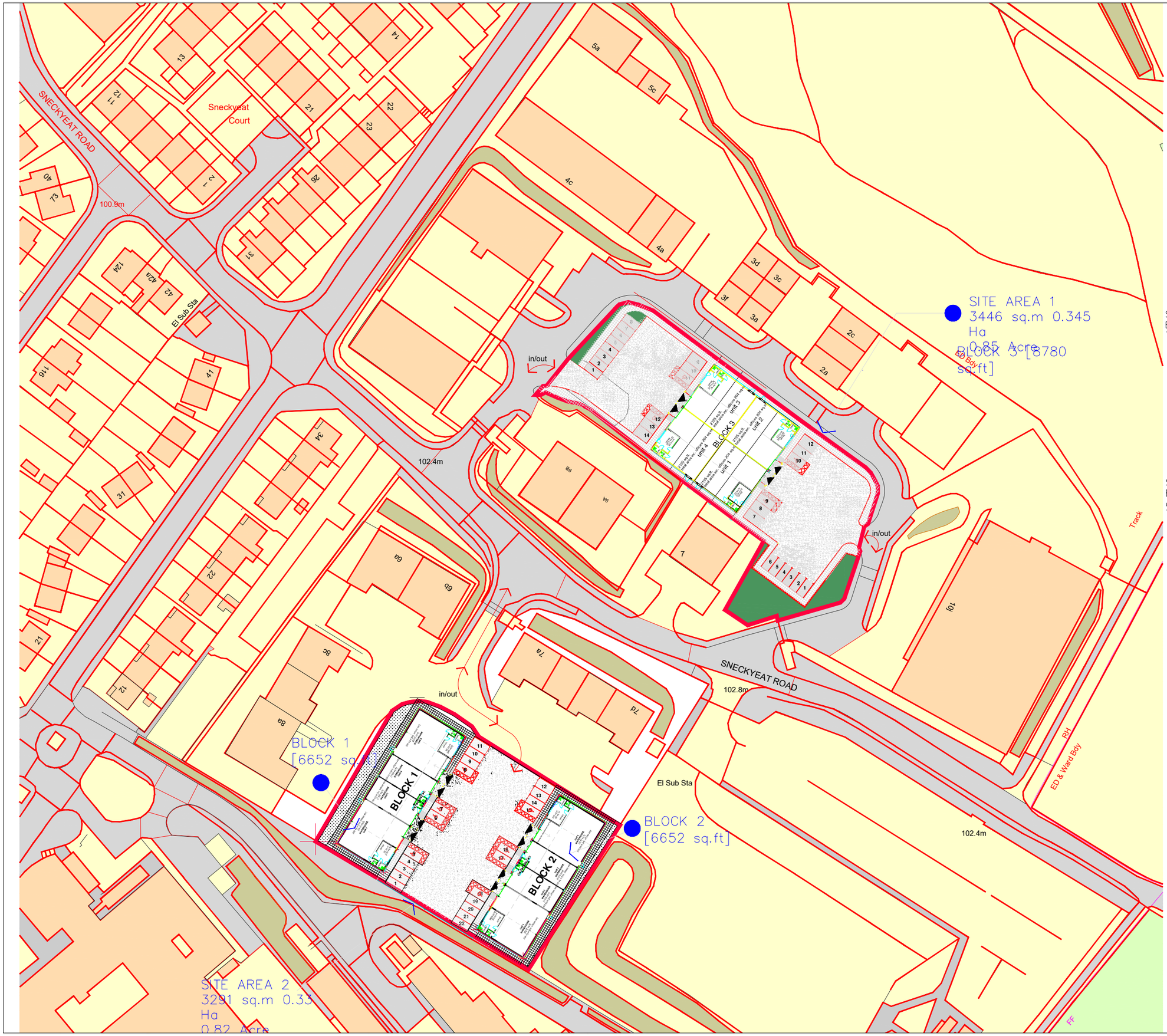
PROPOSED INDUSTRIAL UNITS
SNECKYEAT INDUSTRIAL ESTATE
WHITEHAVEN

title

LiDAR CONTOURS PLAN

drawn OC	checked GS	drawing number	
date 28.01.20	date 28.01.20	2020.221.C001	
scale 1:500	A1		

Appendix B: - Development Proposals



NORTH

Site Area 1 [0.85 Acre].
Block 3 achieves 8780 sq.ft
TOTAL PROVISION

Site Area 2 [0.82 Acre].
Block 1 and Block 2 together achieve 13,304 sq.ft.
TOTAL PROVISION

All site dimensions shall be verified by the contractor on site prior to work commencing

Do not scale from this drawing
Only work to written dimensions

Notes

MATERIAL KEY

- Air Entrained Concrete Finish to apron to Loading Doors
- 600 x 600mm Concrete Paving Flags, shading indicates tactile paving
- Tactile paving and dropped kerb
- Gravel infill
- Grassed areas
- Bollards to Loading Doors
- Assumed site boundary [to be checked against title deeds]

SCHEDULE OF ACCOMMODATION
BLOCK 3 [comprising 4 Units]

Unit	total sq.m	total sq.ft	cars	m2/ per car
1	204	2195	6	34
2	204	2195	6	34
3	204	2195	7	30
4	204	2195	7	30
total	816	8780	26	

SCHEDULE OF ACCOMMODATION
BLOCK 2 [comprising Units]

Unit	total sq.m	total sq.ft	cars	m2/ per car
1	206	2217	4	50
2	103	1109	2	50
3	103	1109	2	50
4	206	2217	3	68
total	618	6652	11	

SCHEDULE OF ACCOMMODATION
BLOCK 1 [comprising Units]

Unit	total sq.m	total sq.ft	cars	m2/ per car
1	206	2217	4	50
2	103	1109	2	50
3	103	1109	2	50
4	206	2217	3	68
total	618	6652	11	

Rev.	Date	Details	Drawn	Checked
E	23.3.21	client changes added	de	de
D	10.2.21	New proposal/for client approval	de	de
C	13.2.20	client update red line now continuous grid lines removed	de	de
B	19.2.20	CLIENT APPROVED/ PLANNING SUBMISSION	de	de
A	13.2.20	client update	de	de

Issued for: PLANNING APPLICATION

NORTHERN TRUST
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Email: info@northerntrust.co.uk

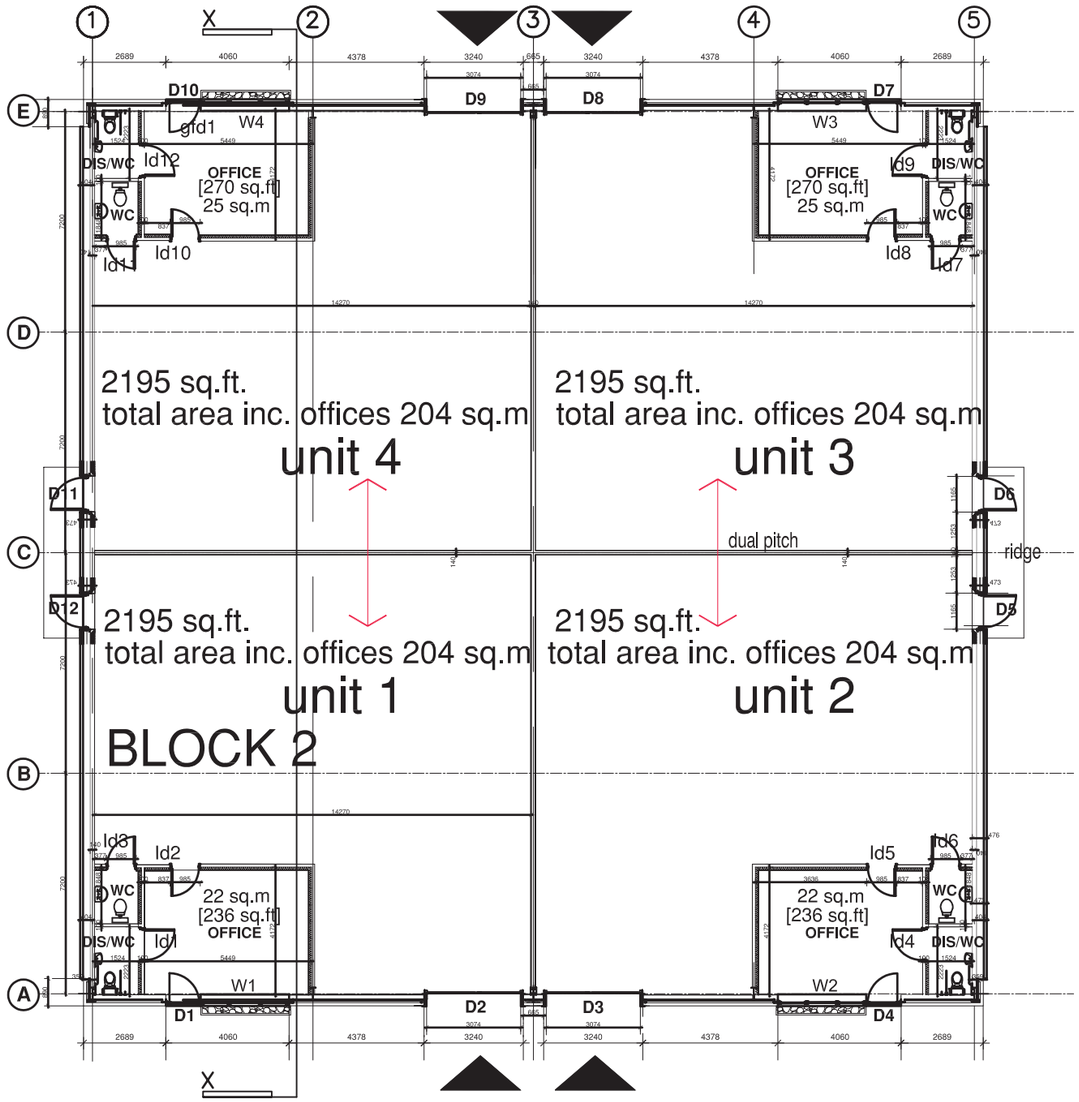
Client

Project: Sneckyeat Industrial Estate, Whitehaven,

Drawing: Proposed Site Plan

Drawn By	DE	Date	31.1.20
Checked By	DE	Date	31.1.20
Scale	1/500	@A1	
	1/1000	@A3	

Drawing No. WJ-149-0002 Rev. E



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Only work to written dimensions

Notes

MATERIAL/COLOUR KEY

- Steel paintwork - Merlin Grey
- Roof cladding - Kingspan KS1000RW Insulated Roof Panel (LPCB Approved) or equal - Colour Goosewing Grey
- Gutters, Fascias & Verges - Colour Goosewing Grey
- Rainwater pipes - Colour to match cladding
- Kingspan KS1000RW Insulated Wall Panel (LPCB Approved) or equal - Colour Goosewing Grey / Merlin Grey. Flashings to match panel colour.
- Brickwork - Rustic Red
- Loading doors - Merlin Grey
- Personnel doors - Merlin Grey
- Escape doors - Merlin Grey
- Windows - Extruded Aluminium window sections - Colour Merlin Grey.
- Glazing tint - Colour Grey

Hatched areas denote contrasting colours, actual locations of vertical panels / rear doors may vary slightly to suit setting-out of panels.

CRITICAL DOOR DIMENSIONS

Internal Doors -Minimum effective clear width 800mm
Entrance Doors -Minimum effective clear width 900mm for one leaf
Fire Exit Doors -Minimum effective clear width 850mm

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

NOTES
Cavity barriers to be provided as indicated, maximum 20m centres and on line of each unit sub-division.

Expansion joints to be provided to brickwork/blockwork as indicated on the Structural Engineers drawings.

Wall ties to be provided as detailed on the Structural Engineers drawings.

SCHEDULE OF ACCOMMODATION BLOCK 2

Unit	total sq.m	total sq.ft	cars	m2/ per car
unit 1	204	2195	7	25
unit 2	204	2195	7	25
unit 3	204	2195	6	30
unit 4	204	2195	6	30

REQUIRED U VALUES

'Warm Roof' Construction-0.18 W/sq.m.K

External Wall Construction-0.27 W/sq.m.K

Ground Floor Construction-0.22 W/sq.m.K [Only applies where spaces above are heated ie. wc's and offices].

Ground Floor Construction-No U Value requirement where spaces above are unheated ie. warehouse.

Windows,Rooflights-1.8W/sq.m.K

Personnel Doors-1.8W/sq.m.K

Vehicle Access and Similar Large Doors-1.5W/sq.m.K

Rev.	Date	Details	Drawn	Checked
B	19.2.20	CLIENT APPROVED/ PLANNING SUBMISSION	de	de
A	13.2.20	CLIENT UPDATE	de	de

Issued for:
PLANNING SUBMISSION

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NORTHERN TRUST
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Tel 01257 238 555 Fax 01257 238 556
Email:info@northerntrust.co.uk

Client

Project
Sneackyeat Industrial Estate,
Whitehaven,

Drawing
Proposed plans,
Block 2

Drawn By DE	Date 29.1.20	Drawing No. WJ-149-0004	Rev. B
Checked By DE	Date 29.1.20		
Scale 1/100	@A1		

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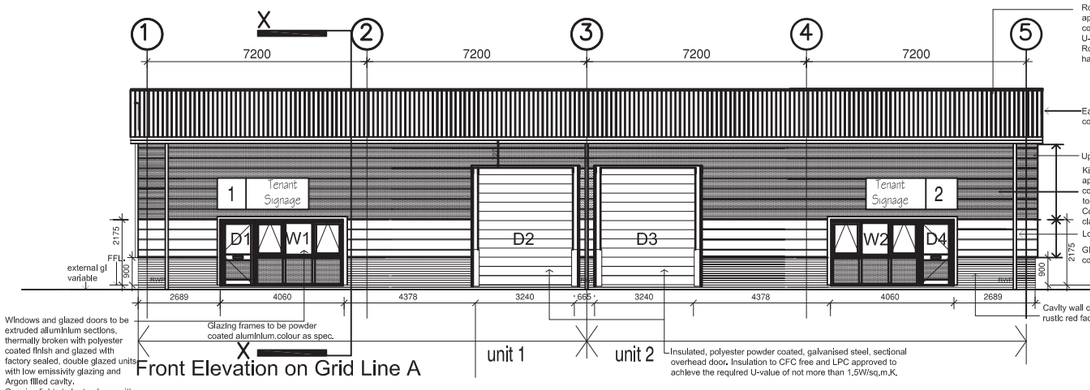
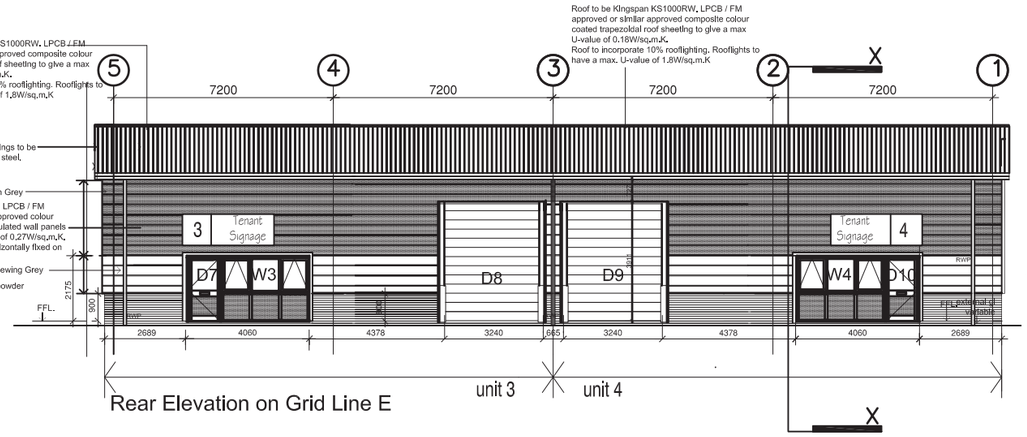
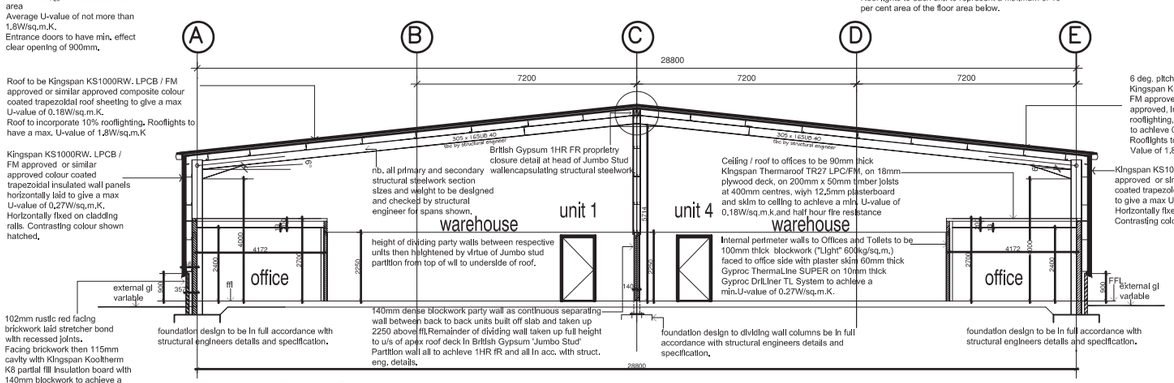


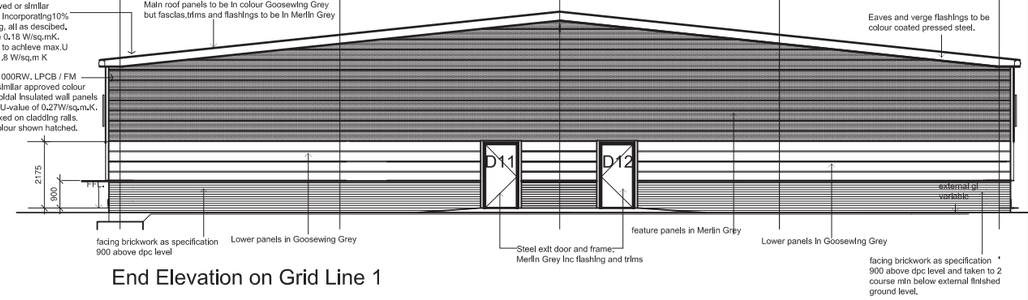
Front Elevation on Grid Line A



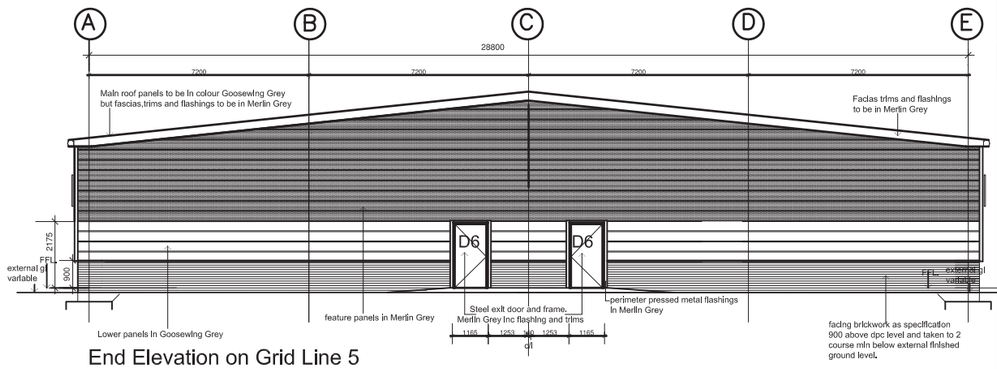
Rear Elevation on Grid Line E



Typical Cross Section on X-X



End Elevation on Grid Line 1



End Elevation on Grid Line 5

All site dimensions shall be verified by the contractor on site prior to work commencing.

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Ground Floor Construction-[No U Value requirement where space above is unheated ie warehouse]

Windows,Rooflights-1.8W/sq.m.K

Personnel Doors-1.8W/sq.m.K

Vehicle Access and Similar Large Doors-1.5W/sq.m.K

Rev.	Date	Details	Drawn	Checked
B	18.2.20	CLIENT APPROVED/ PLANNING SUBMISSION	de	de
A	13.2.20	CLIENT UPDATE	de	de

Issued for:
PLANNING SUBMISSION

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Tel 01257 238 555 Fax 01257 238 556
Email:info@northerntrust.co.uk

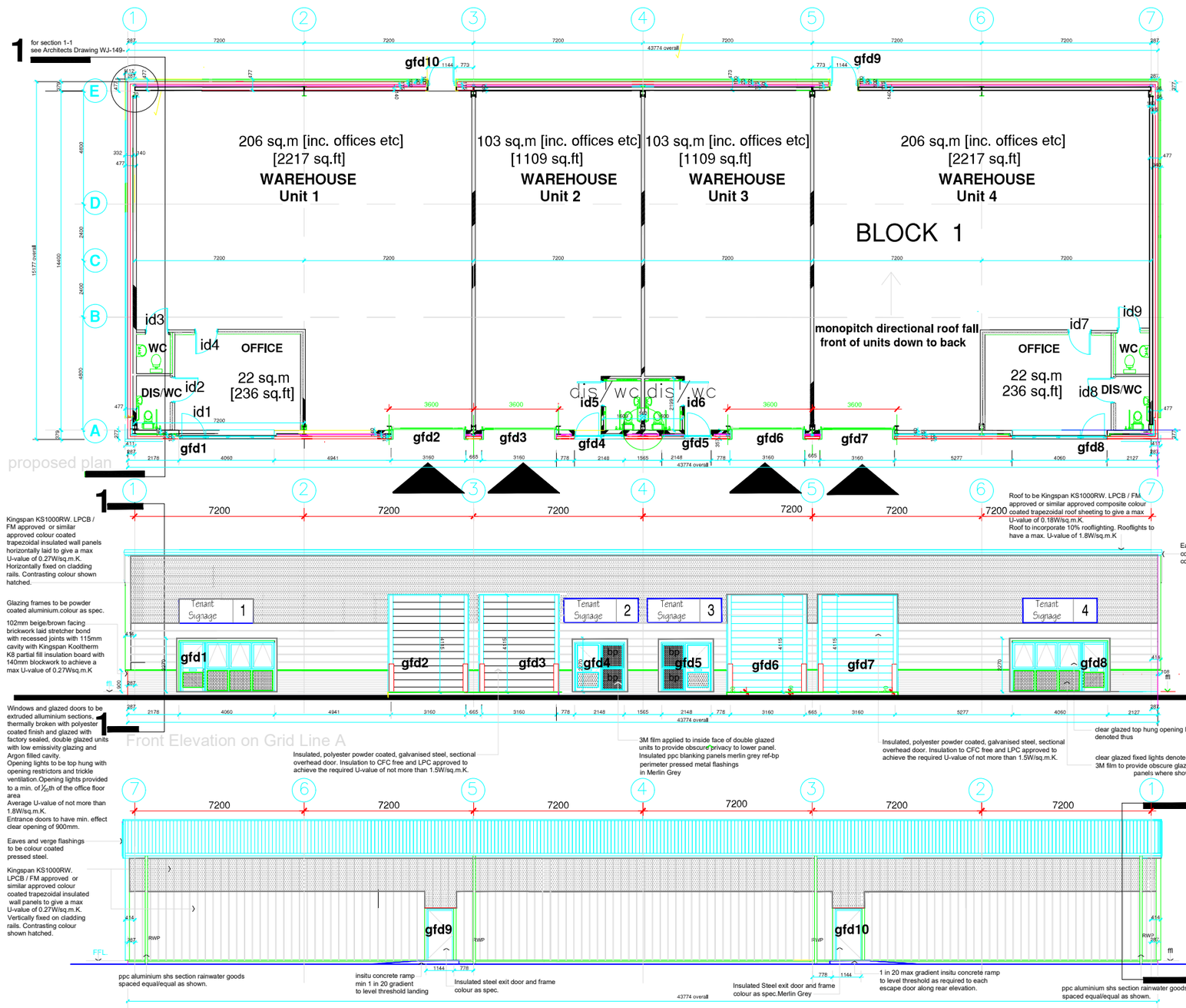
Client

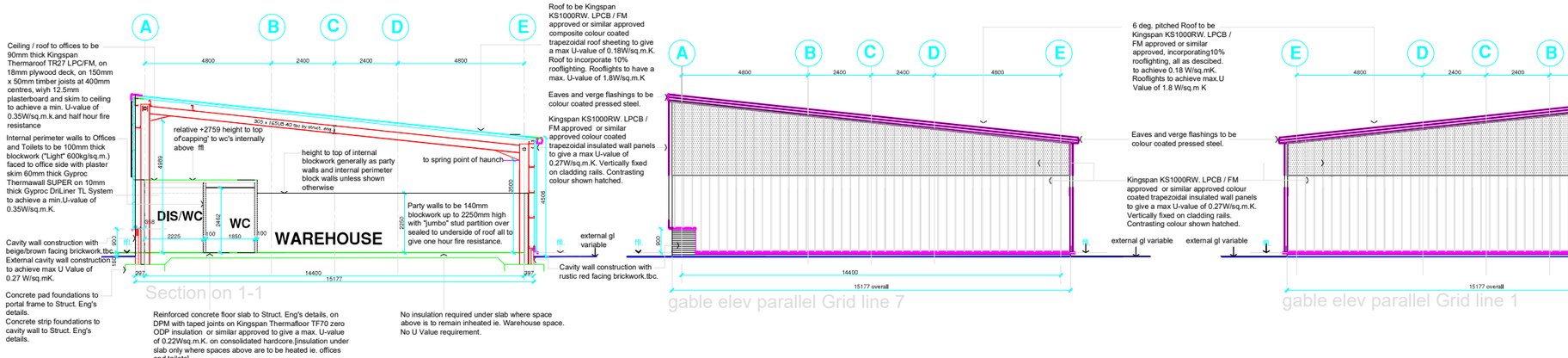
Project
Sneackyeat Industrial Estate, Whitehaven,

Drawing
Proposed Elevations Block 2 [units 1-4 inc]

Drawn By	DE	Date	27.1.20.	Drawing No.	Rev.
Checked By	DE	Date	27.1.20	WJ-149-0003..	B
Scale	1/100	@A1			

electronic path to this drawing WJ-149





All site dimensions shall be verified by the contractor on site prior to work commencing

Do not scale from this drawing
Only work to written dimensions

Notes

MATERIAL/COLOUR KEY

- Steel paintwork - Merlin Grey
- Roof cladding - Kingspan KS1000RW Insulated Roof Panel (LPCB Approved) or equal - Colour Goosewing Grey
- Gutters, Fascias & Verges - Colour Goosewing Grey
- Rainwater pipes - Colour to match cladding
- Kingspan KS1000RW Insulated Wall Panel (LPCB Approved) or equal - Colour Goosewing Grey / Merlin Grey. Flashings to match panel colour.
- Brickwork - Beige/Brown tbc [to be confirmed]
- Loading doors - Merlin Grey
- Personnel doors - Merlin Grey
- Escape doors - Merlin Grey
- Windows - Extruded Aluminium window sections - Colour Merlin Grey.
- Glazing tint - Colour Grey

Hatched areas denote contrasting colours, actual locations of vertical panels / rear doors may vary slightly to suit setting-out of panels.

CRITICAL DOOR DIMENSIONS

Internal Doors -Minimum effective clear width 800mm
Entrance Doors -Minimum effective clear width 900mm for one leaf
Fire Exit Doors -Minimum effective clear width 850mm

All vision panels to have minimum zones of visability betweem 500mm to 800mm and 1150mm to 1500mm.

NOTES

Cavity barriers to be provided as indicated, maximum 20m centres and on line of each unit sub-division.

Expansion joints to be provided to brickwork/blockwork as indicated on the Structural Engineers drawings.

Wall ties to be provided as detailed on the Structural Engineers drawings.

REQUIRED U VALUES

'Warm Roof' Construction-0.18 W/sq.m.K max.

External Wall Construction-0.27 W/sq.m.K max.

Ground Floor Construction-0.22 W/sq.m.K [Only applies where space above is heated ie. wc's and offices].

Ground Floor Construction-No U Value Requirement Only applies where space above is unheated ie to warehouse.

Windows,Rooflights-1.8W/sq.m.K max.

Personnel Doors-1.8W/sq.m.K max.

Vehicle Access and Similar Large Doors-1.5W/sq.m.K max.

Rev.	Date	Details	Drawn	Checked
D	22.3.21	Revised as per client req.	de	de
C	24.2.21	Block 1 drawing only	de	de
B	19.2.20	CLIENT APPROVED/ PLANNING SUBMISSION	de	de
A	13.2.20	CLIENT UPDATE	de	de

Issued for: PLANNING APPLICATION

NORTHERN TRUST
INVESTMENT / DEVELOPMENT / REGENERATION
NORTHERN TRUST
LYNTON HOUSE, ACKHURST PARK, CHORLEY PR7 1NY.
Tel: 01257 238 555 Fax: 01257 238 556
Email:info@northerntrust.co.uk

Client

Project: Sneckyeat Industrial Estate, Whitehaven,

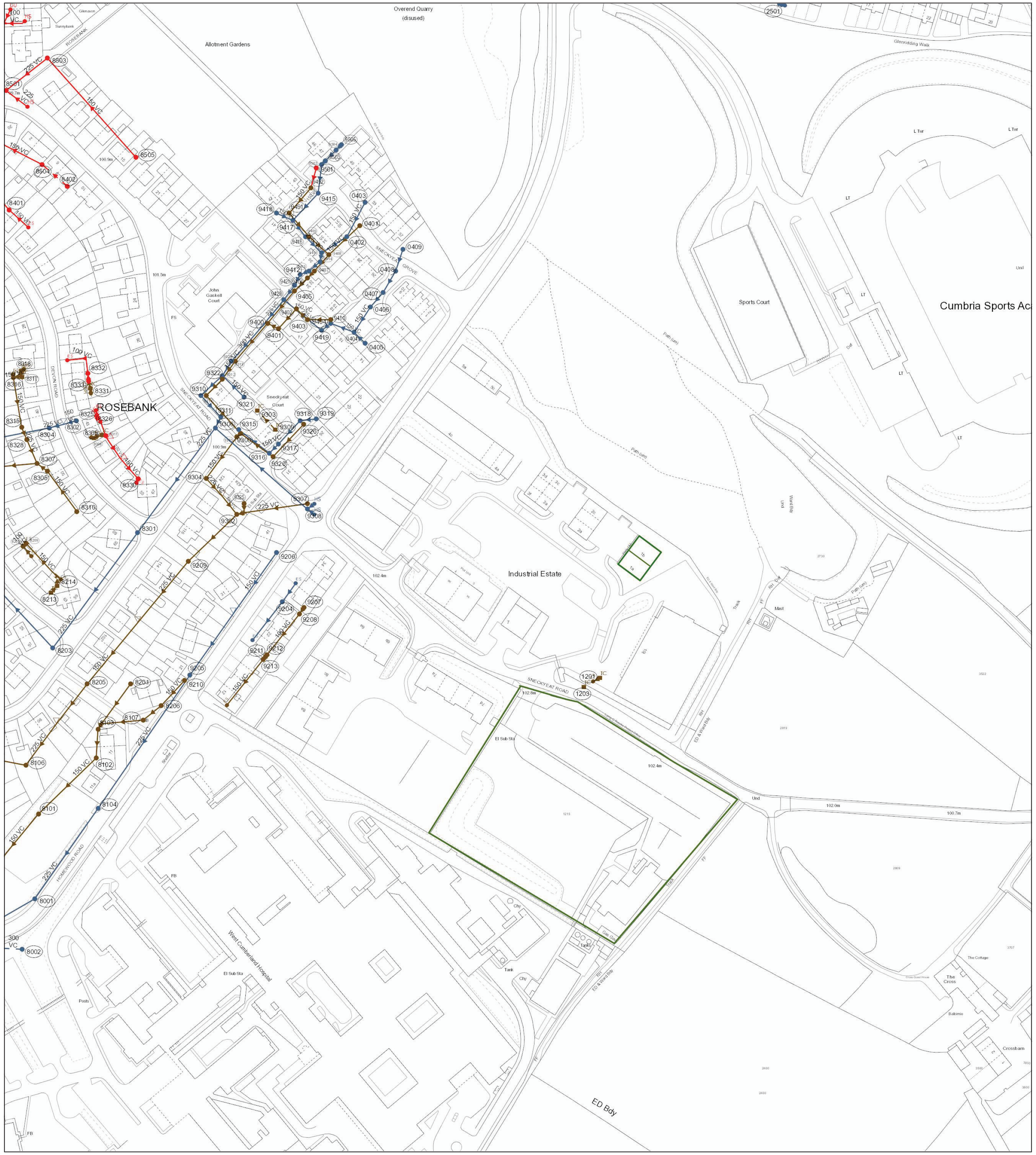
Drawing: Proposed plans,elevs,sect Block 1

Drawn By	DE	Date	9.7.18
Checked By	DE	Date	9.7.18
Scale	1/100	@A1	

Drawing No. WJ-149-0005 Rev. D

electronic path to this drawing-WJ- 149

Appendix C: - United Utilities Asset 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.

Refno	Cover	Func	Invert	Size x	Size y	Shape	Matl	Length	Grad
8107		FO	0	150			VC	23.08679	
8310		FO		150			VC	27.67902	
9505		SW	0	150			VC	4.24264	
0401		FO	0	150			VC	23.34524	
0405		SW	0	150			VC	8.485281	
8304	96.15	SW	94.73	225			VC	62.16912	1 in 8
9421	105.76	SW	103.66	225			VC	10	1 in 11
9210	94.5	FO	93.58	150			VC	19.10497	1 in 22
9313	102.1	SW	100.27	300			VC	9.433981	1 in 23
8104	88.96	SW	87.76	225			VC	61.03278	1 in 8
8505		CO	0	150			VC	73.66138	
8208		FO		100			VC	2.255198	
9321		SW	0	150			VC	16.97056	
9501		CO	0	150			VC	11.40175	
8311		CO		150			VC	1.882831	
0402		SW	0	150			VC	16.64332	
8301	96.86	SW	95.26	225			VC	79.40403	1 in 15
9312	101.51	SW	99.81	300			VC	16.27882	1 in 39
9409		FO	0	150			VC	14.86607	
9503		SW	0	150			VC	2.828427	
9320		FO	0	150			VC	22.2036	
9211		FO		100			VC	1.830842	
9406		FO	0	150			VC	9.899495	
8328		FO		225			VC	14.29498	
9401		FO	0	150			VC	6.708204	
9304	99.88	FO	0	225			VC	13.45362	
8002		SW		300			VC	38.0526	1 in
9404		FO	0	150			VC	13	
9305		FO	0	150			VC	28.6007	
9326		FO	0	150			VC	24.75884	
9308	102.73	SW	100.13	225			VC	68.0147	1 in 77
9407		FO	0	150			VC	5.656854	
9212		FO		100			VC	1.523291	
9400		FO	0	150			VC	27.65863	
9325		FO		225			VC	5	1 in
9492		FO	0	150			VC	18.43909	
9204		SW		0			VC	26.94139	
8315		FO		225			VC	7.358759	
9323		FO	0	150			VC	12.20656	
0403		SW	0	150			VC	21.47091	
9420	104.89	SW	102.68	225			VC	22.02271	1 in 17
9413	107.45	SW	105.75	225			VC	5.385165	1 in 4
8205	92.82	FO	91.33	150			VC	27.80288	1 in 9
8206	93.14	FO	92.71	150			VC	12.80625	
8330		CO		150			VC	2.447339	
9415		SW	0	150			VC	20.51828	
9207		FO		100			VC	4.359111	
9311		SW	0	300			VC	6.708204	
0408		SW	0	150			VC	13.89244	
9316		SW	0	150			VC	21.40093	
9314		FO	0	150			VC	28.3196	
9405		FO	0	150			VC	23.43075	
9300		FO	0	150			VC	2.828427	
9319		SW	0	150			VC	9.055386	
9410		SW	0	150			VC	6.403124	
8302	97.28	SW	96.03	150			VC	7.28011	1 in 12
8402		CO		150			VC	18.43909	1 in
0409		SW	0	150			VC	12.64911	
8209		FO		150			VC	0.5021425	
0407		SW	0	150			VC	10.63015	
8307		FO		150			VC	26.31764	
9419	105.14	SW	103.24	225			VC	27.01851	1 in 52
8316		FO		150			VC	28.07528	
8305	95.48	FO		150			VC	7.237054	
8501	99.79	CO	98.17	225			VC	59.23681	1 in 12
8103	91.53	FO	90.75	150			VC	16.03122	1 in 12
9502		SW	0	150			VC	16.12452	
9412	106.17	SW	104.47	225			VC	6.708204	1 in 8
9307	102.69	FO	0	225			VC	35.35534	
9411	107.52	SW	104.92	225			VC	5.09902	1 in 73
9208		FO		100			VC	28.90358	
9318		SW	0	150			VC	17.69181	
9302	100.24	FO	98.58	225			VC	37.48333	1 in 13
8001	81.42	SW	79.75	225			VC	51.97115	1 in 9
9416	107.31	SW	105.06	225			VC	12.72792	1 in 91
9418		SW	0	150			VC	9.848858	
8503	100.87	CO	99.22	225			VC	29.20616	1 in 28
9206	100.5	SW	99.12	150			VC	41.61731	1 in 14
9306	100.65	SW	98.53	225			VC	72.20111	1 in 22
8106	86.67	FO	85.14	225			VC	47.85394	1 in 7
9408		FO	0	150			VC	12.04159	
9414	107	SW	104.85	225			VC	7.81025	
9310	100.81	SW	99.36	300			VC	16.27882	
9322		FO	0	150			VC	12.72792	
9402		FO	0	150			VC	14.86607	
8101	87.77	FO	84.77	150			VC	44.04543	1 in 8
8201	93.47	FO	92.67	150			VC	27.20294	
9205	94.7	SW	93.2	225			VC	89.87213	1 in 17
8203	91.46	SW	89.91	225			VC	58.72819	1 in 33
9209	97.6	FO	95.69	225			VC	44.04543	1 in 20
9417		SW	0	150			VC	11.40175	
0404		SW	0	150			VC	13.92839	
9317		SW	0	150			VC	7.071068	
9491		FO	0	150			VC	17.02939	
9504		SW	0	150			VC	8.485281	
8102	91.17	FO	89.37	150			VC	44.55334	1 in 10
8401		CO		150			VC	31.07613	
9403		FO	0	150			VC	8.485281	
0406		SW	0	150			VC	16.64332	
9213		FO		150			VC	32.30826	
8504		CO	0	150			VC	34.88553	
8332		CO		100			VC	18.95977	
8333		CO		100			VC	4.195004	

Refno	Cover	Func	Invert	Size x	Size y	Shape	Matl	Length	Grad

LEGEND

Abandoned | Foul | Surface Water | Combined

- Public Sewer
- Private Sewer
- Section 104
- Rising Main
- Sludge Main
- Overflow
- Water Course
- Highway Drain

All point assets follow the standard colour convention:
red - combined blue - surface water
brown - foul purple - overflow

- Manhole
- Head of System
- Extent of Survey
- Rodding 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
- Orifice 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 Tank
- Sewer Overflow
- Ww Treatment Works
- Ww Pumping Station
- Septic Tank
- Control Kiosk
- Change of Characteristic

MANHOLE FUNCTION

FO Foul
SW Surface Water
CO Combined
OV Overflow

SEWER SHAPE

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

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

United Utilities
helping life flow smoothly

Appendix D: - Drain Alert Drainage Investigation Report

DRAIN ALERT®
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

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 form 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,

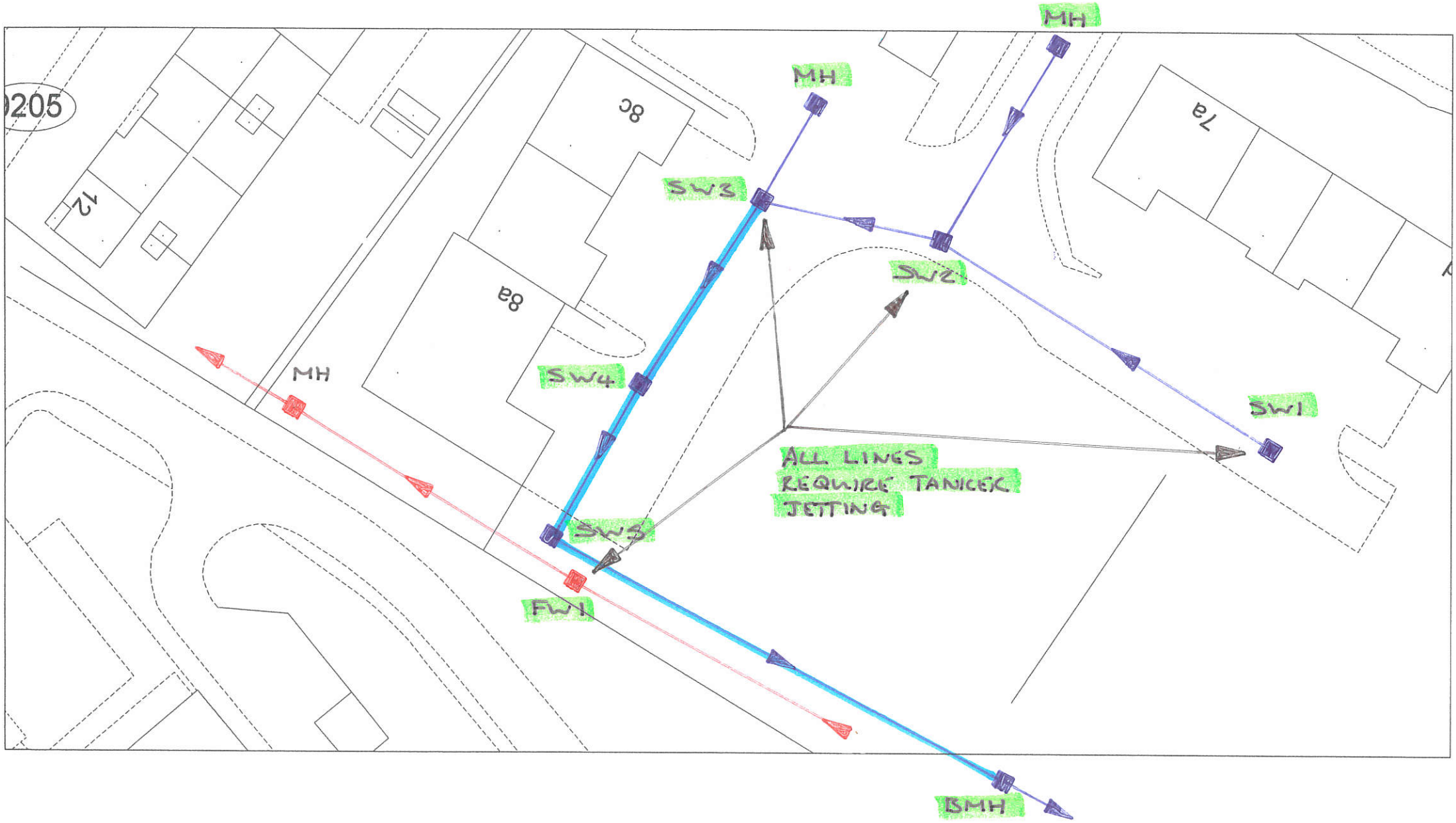
Mr S W Ormisher,
Technical Services Consultant

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.

30596

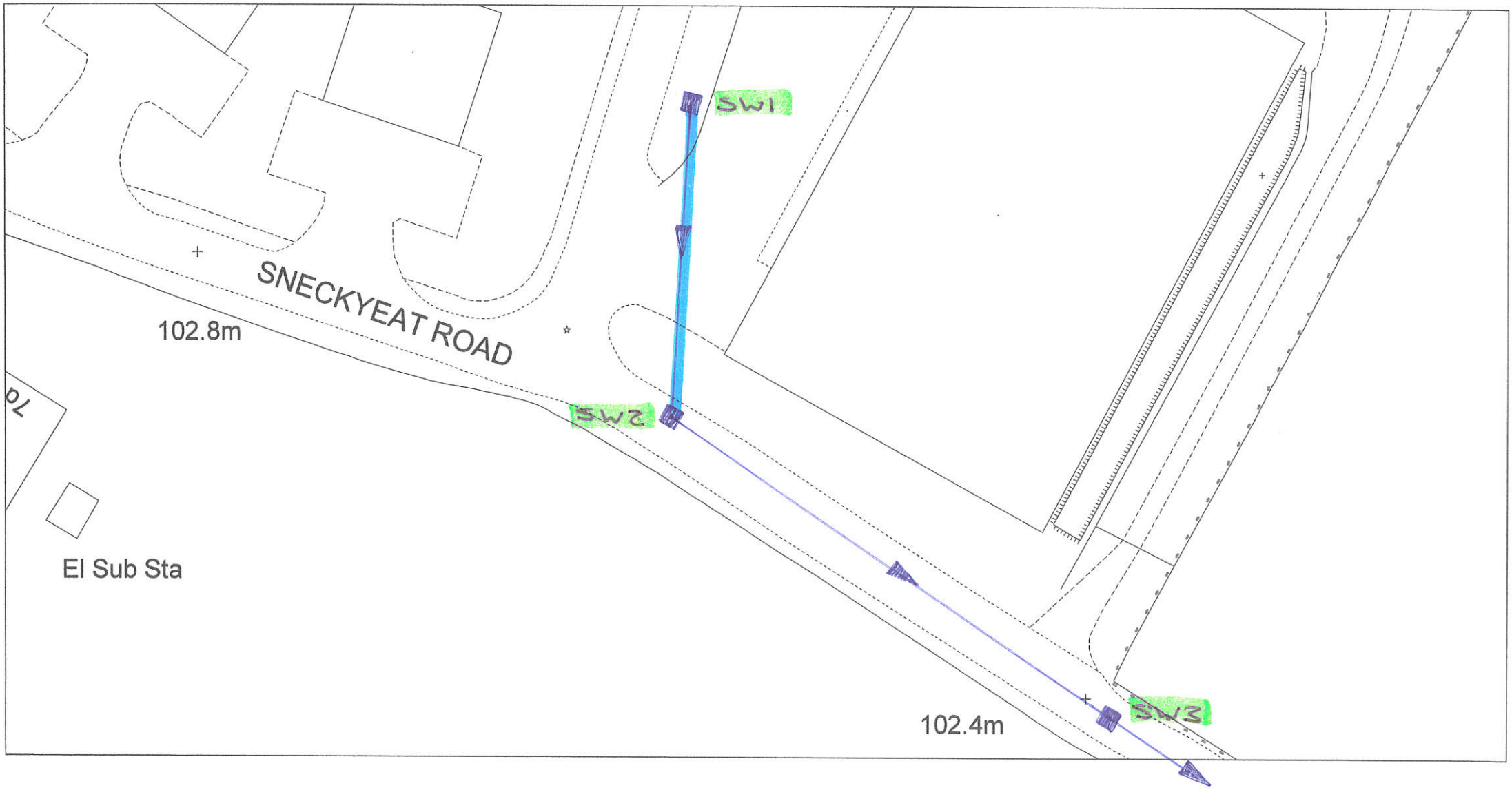
- SW LINES SURVEYED

- MH REF's / INFO

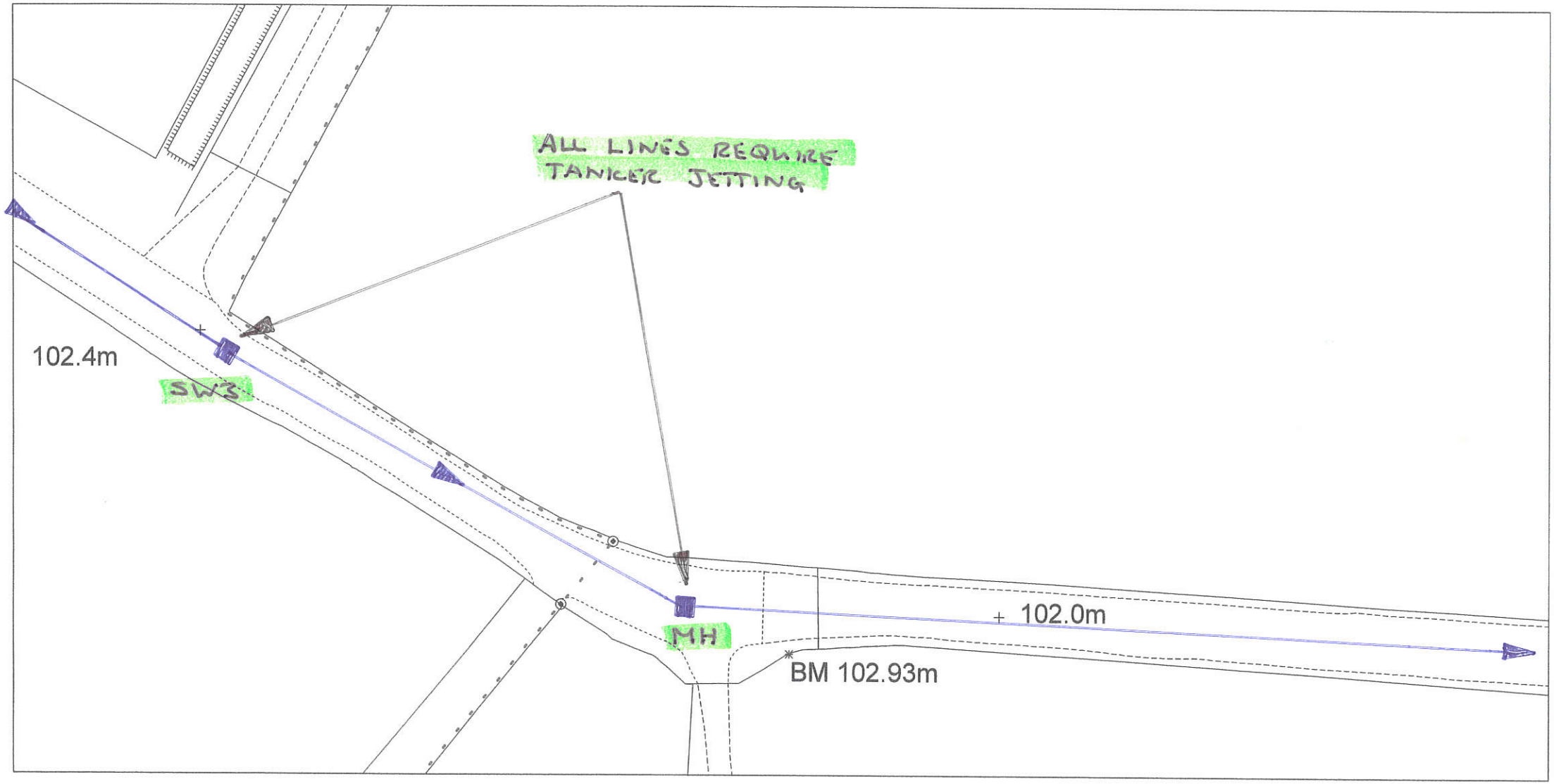


30596

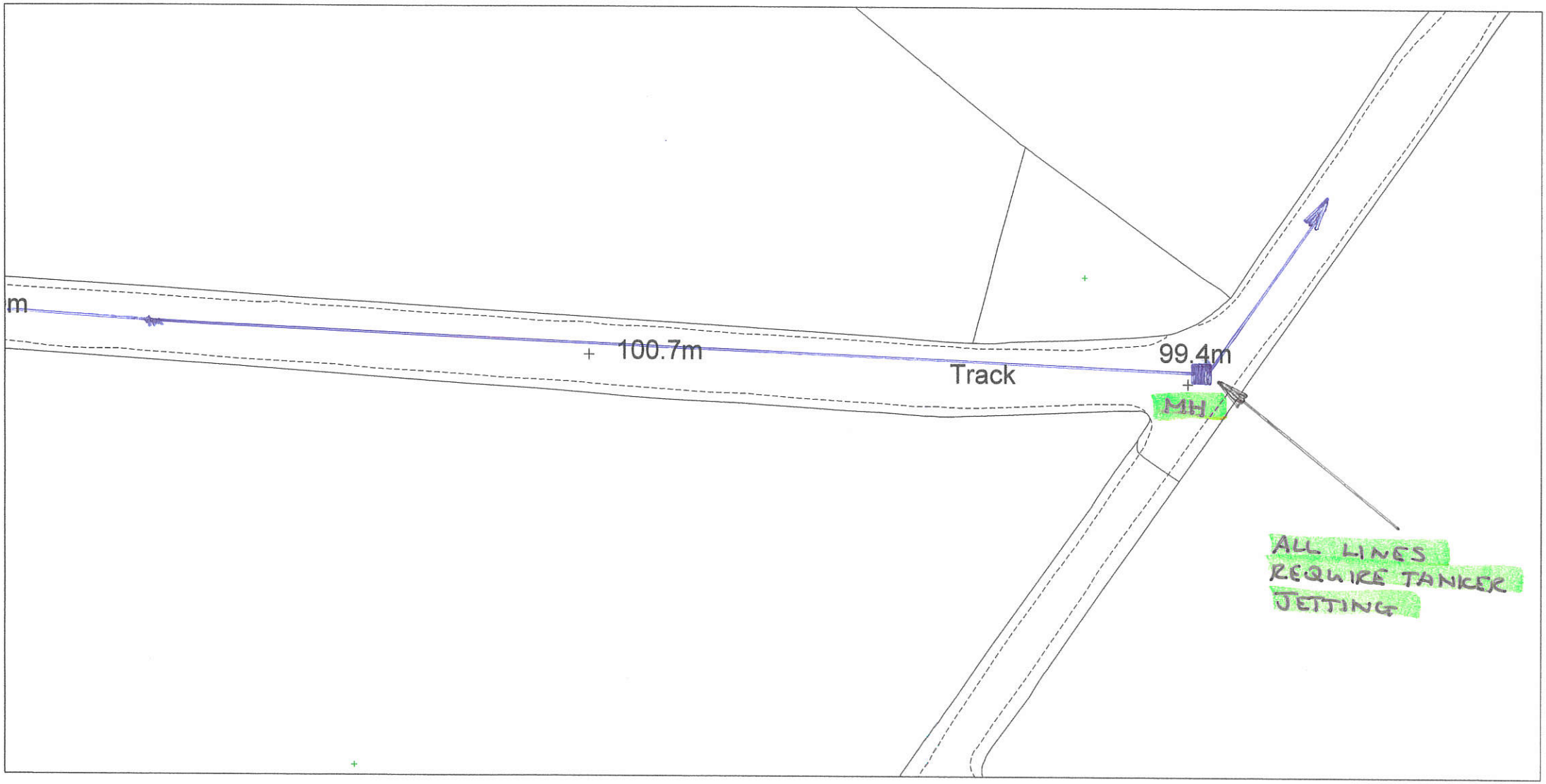
- SW LINES SURVEYED
- MH REF's / INFO



30546


ALL LINES REQUIRE TANKER JETTING
102.4m
SW3
MH
102.0m
BM 102.93m

30596



Drain-Alert
Cripplegate Lane, Hoghton,Preston
Tel. 01254 851500
service@drain-alert.co.uk

Project

Project Name:	30596 Sneakyeat Industrial Park
Project Description:	Converted project from v8 project
Project Date:	04/11/2020

Drain-Alert
Cripplegate Lane, Hoghton,Preston
Tel. 01254 851500
service@drain-alert.co.uk

Table of Contents

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

Drain-Alert
Cripplegate Lane, Hoghton,Preston
Tel. 01254 851500
service@drain-alert.co.uk

Project Information

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

Client

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

Site

Company: Sneakyeat Industrial Park
Contact: Graham Schofield
Street: Sneakyeat 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

Drain-Alert
Cripplegate Lane, Hoghton,Preston
Tel. 01254 851500
service@drain-alert.co.uk

Section Inspection - 04/11/2020 - MH SW1X

Section	Inspection	Date	Time	Client`s Job Ref	Weather	Pre Cleaned	PLR
1	1	04/11/20	11:29	30586	Dry	No	MH SW1X

Operator	Vehicle	Camera	Preset Length	Legal Status	Alternative ID
L Hilton	PK65 HFB	P494 Tractor	Not Specified	Not Specified	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

Comments:
Recommendations: None specified

Scale: 1:220	Position [m]	Code	Observation	MPEG	Photo	Grade
Depth: m MH SW1						
	0.00	ST	Start of survey	00:00:31		
	25.50	FH	Finish survey: MH SW2 Underneath Car	00:03:45		
MH SW2 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

Drain-Alert
Cripplegate Lane, Hoghton,Preston
Tel. 01254 851500
service@drain-alert.co.uk

Section Inspection - 04/11/2020 - MH SW5X

Section	Inspection	Date	Time	Client`s Job Ref	Weather	Pre Cleaned	PLR
2	1	04/11/20	13:55	30586	Dry	No	MH SW5X

Operator	Vehicle	Camera	Preset Length	Legal Status	Alternative ID
L Hilton	PK65 HFB	P494 Tractor	Not Specified	Not Specified	Not Specified

Town or Village:	Site Area 1	**Inspection Direction:**	Downstream	**Upstream Node:**	MH SW5
Road:	Sneakyeat 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

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

Drain-Alert
Cripplegate Lane, Hoghton,Preston
Tel. 01254 851500
service@drain-alert.co.uk

Section Inspection - 04/11/2020 - MH SW4X

Section	Inspection	Date	Time	Client`s Job Ref	Weather	Pre Cleaned	PLR
3	1	04/11/20	14:49	30586	Dry	No	MH SW4X

Operator	Vehicle	Camera	Preset Length	Legal Status	Alternative ID
L Hilton	PK65 HFB	P494 Tractor	Not Specified	Not Specified	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					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

Drain-Alert
Cripplegate Lane, Hoghton,Preston
Tel. 01254 851500
service@drain-alert.co.uk

Section Inspection - 04/11/2020 - MH SW3X

Section	Inspection	Date	Time	Client`s Job Ref	Weather	Pre Cleaned	PLR
4	1	04/11/20	14:55	30586	Dry	No	MH SW3X

Operator	Vehicle	Camera	Preset Length	Legal Status	Alternative ID
L Hilton	PK65 HFB	P494 Tractor	Not Specified	Not Specified	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	_24fffb3c-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					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	1	10.0	0.6	10.0	5.0

Drain-Alert
Cripplegate Lane, Hoghton,Preston
Tel. 01254 851500
service@drain-alert.co.uk

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 ☐

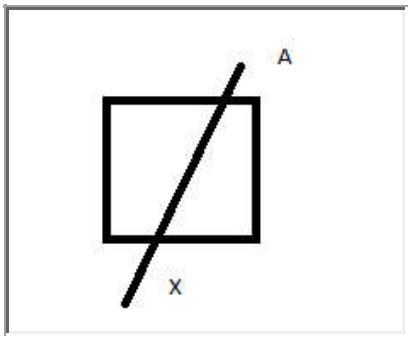
CoverLevel	0.00	Cover Load Class	M

Cover	600 X 400	Chamber	0 X 0	EvidenceOfSurcharge	☐
Shaft	0 X 0	ShaftDepth	0	ToxicAtmosphere	☐
Brick	☑	Precast Concrete ☐	PVC ☐	Segments ☐	No.RegCourses
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	UpstreamRef	Downstream	Pipe Sha	SizeHeight	SizeWidth	Pipe Material	Lining Material
A	-2.150	2.15	MHSW		C		300	CON	
X	-2.170	2.17		MHSW2	C		300	CON	

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	0.00	Cover Load Class	H

Cover	600 X 600	Chamber	0 X 0	EvidenceOfSurcharge	☐
Shaft	0 X 0	ShaftDepth	0	ToxicAtmosphere	☐

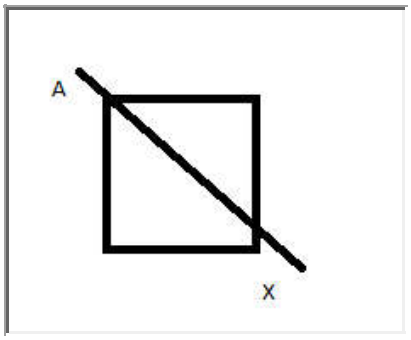
Brick ☑ Precast Concrete ☐ PVC ☐ Segments ☐ No.RegCourses

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	UpstreamRef	Downstream	Pipe Sha	SizeHeight	SizeWidth	Pipe Material	Lining Material
A	-1.710	1.71	MHSW2		C		300	CON	
X	-1.720	1.72		MH	C		300	CON	

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 0.00 Cover Load Class H

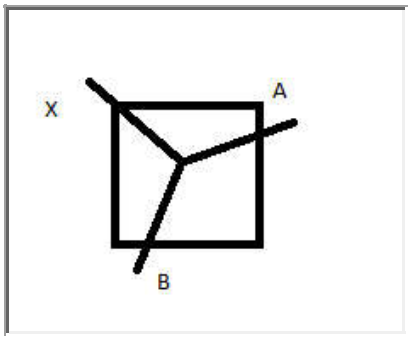
Cover	600 X 600	Chamber	0 X 0	EvidenceOfSurcharge	☐		
Shaft	0 X 0	ShaftDepth	0	ToxicAtmosphere	☐		
Brick	☐	Precast Concrete	☑	PVC	☐	Segments	☐
Reducing Slab	☐	Taper	☐	Side Entry	☐	No.Land	0

No.RegCourses Step Irons ☑ Ladder ☐

PlanPhoto

LocationPhoto

PlanofManhol



Chamber Conditions:

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

Pipe	Invert L	DepthFr	UpstreamRef	Downstream	Pipe Sha	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	

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	0.00	Cover Load Class	H

Cover	600 X 600	Chamber	0 X 0	EvidenceOfSurcharge	☐
Shaft	0 X 0	ShaftDepth	0	ToxicAtmosphere	☐

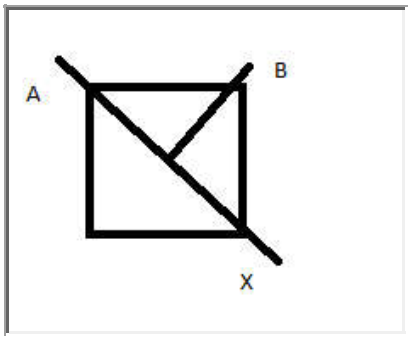
Brick ☐ Precast Concrete ☐ PVC ☐ Segments ☐ No.RegCourses

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	UpstreamRef	Downstream	Pipe Sha	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	

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 0.00 Cover Load Class H

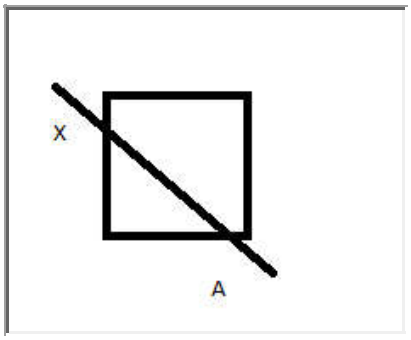
Cover	600 X 600	Chamber	0 X 0	EvidenceOfSurcharge	☐		
Shaft	0 X 0	ShaftDepth	0	ToxicAtmosphere	☐		
Brick	☐	Precast Concrete	☑	PVC	☐	Segments	☐
Reducing Slab	☐	Taper	☐	Side Entry	☐	No.Land	0

No.RegCourses Step Irons ☑ Ladder ☐

PlanPhoto

LocationPhoto

PlanofManhol



Chamber Conditions:

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

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

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 ☐

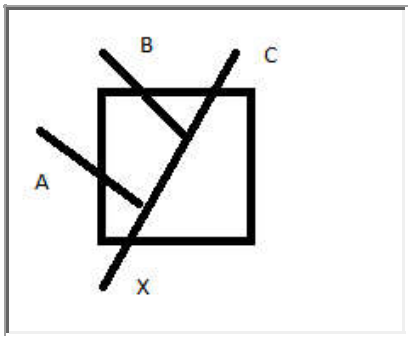
CoverLevel 0.00 Cover Load Class H

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

PlanPhoto

LocationPhoto

PlanofManhol



Chamber Conditions:

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

Pipe	Invert L	DepthFr	UpstreamRef	Downstream	Pipe Sha	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	

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	0.00	Cover Load Class	H

Cover	600 X 600	Chamber	0 X 0	EvidenceOfSurcharge	☐
Shaft	0 X 0	ShaftDepth	0	ToxicAtmosphere	☐

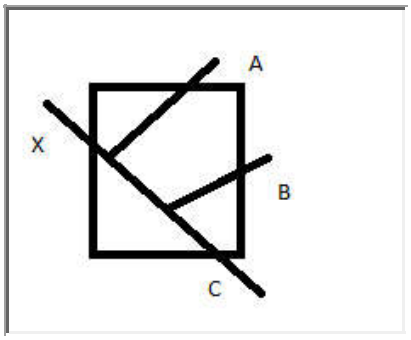
Brick ☐ Precast Concrete ☑ PVC ☐ Segments ☐ No.RegCourses

Reducing Slab ☐ Taper ☐ Side Entry ☐ No.Land 0 Step Irons ☑ Ladder ☐

PlanPhoto

LocationPhoto

PlanofManhol

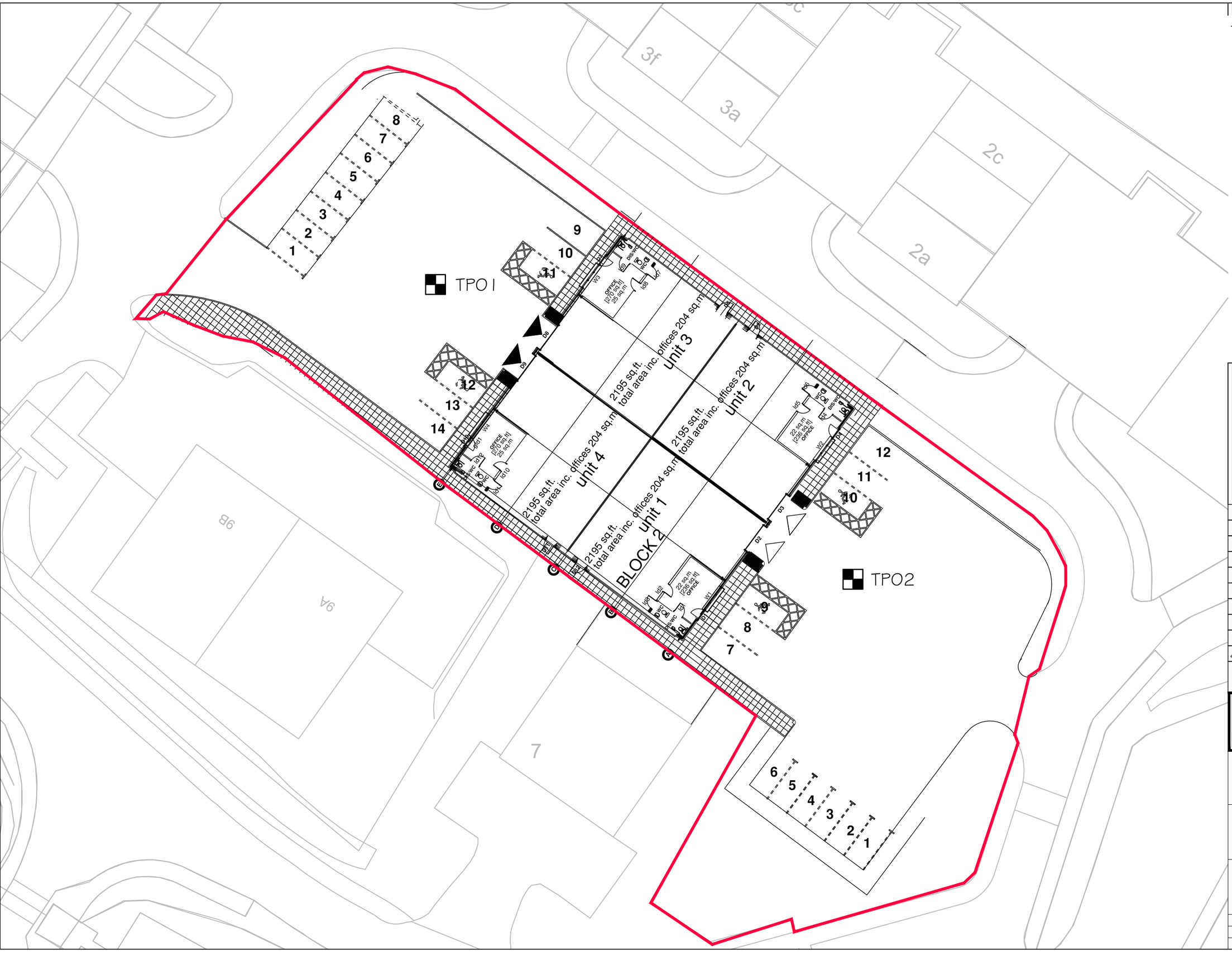


Chamber Conditions:

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

Pipe	Invert L	DepthFr	UpstreamRef	Downstream	Pipe Sha	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	

Appendix E: - Trial Hole Investigation Logs



LEGEND

TPO I TRIAL PIT LOCATIONS

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

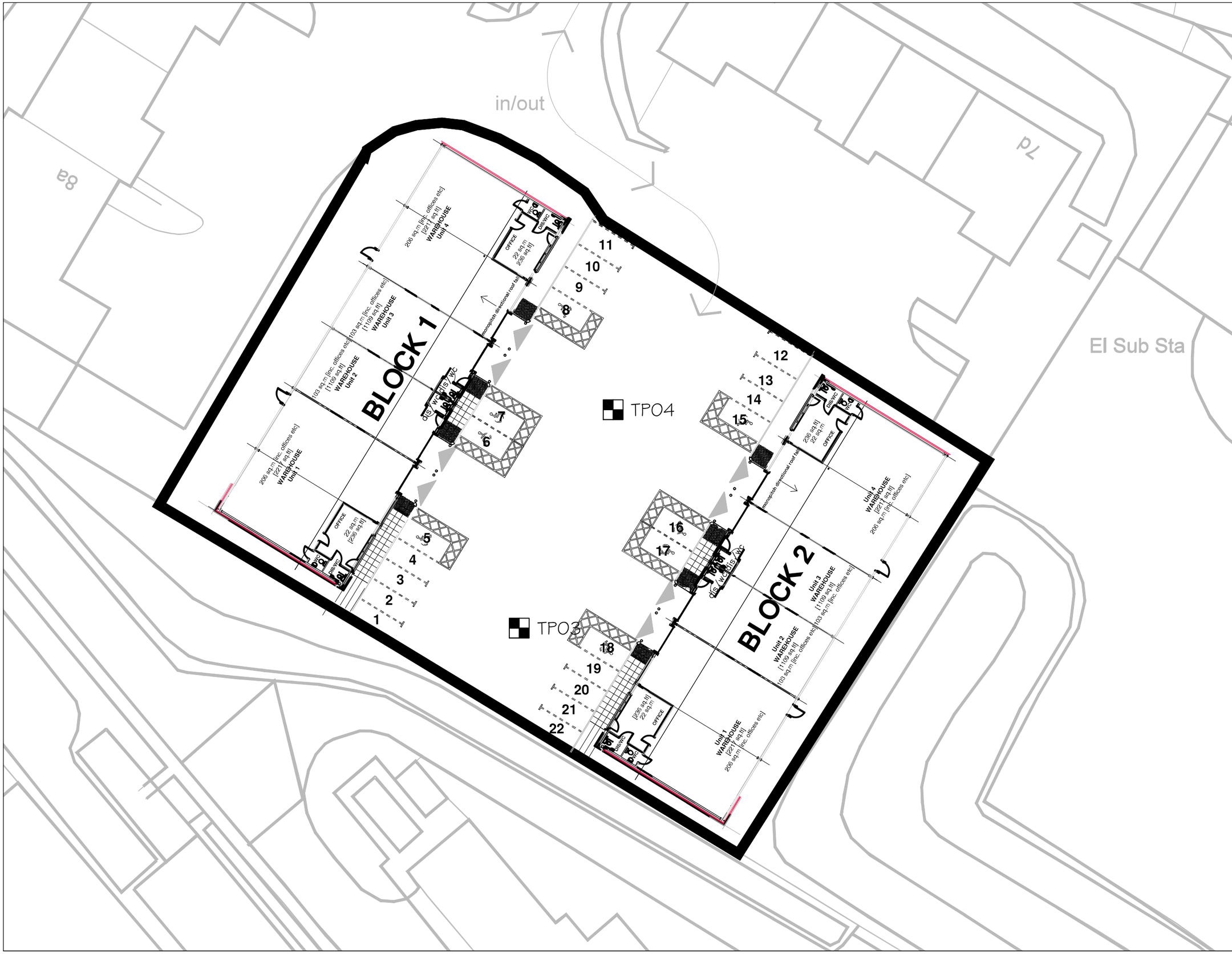
GSA

client
NORTHERN TRUST

project
PROPOSED INDUSTRIAL UNITS
SNECKYEAT INDUSTRIAL ESTATE
WHITEHAVEN

title
BLOCK 1
TRIAL HOLE LOCATIONS

drawn OC	checked GS	drawing number	
date 06.01.21	date 06.01.21	2020.221.C007	
scale 1:250	A2		



LEGEND

TP01 TRIAL PIT LOCATIONS

RESIDUAL RISKS

rev	DESCRIPTION	DRAWN	APPROVED	DATE
A	BLOCK ORIENTATION AMENDED	SNG	GS	26.05.21

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
BLOCK 2
TRIAL HOLE LOCATIONS

drawn OC	checked GS	drawing number	
date 06.01.21	date 06.01.21	2020.221.C007	A
scale 1:250	A2		

TRIAL PIT LOG

LOCATION ID:	PROJECT No:	2020.221		
TP01	PROJECT TITLE	SNECKYEAT INDUSTRIAL ESTATE, WHITEHAVEN		
	CLIENT	NORTHERN TRUST		
	PLANT		START & END DATE	04.11.20
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)		0.20						
			General Fill material comprising bricks/concrete and general builders waste (Hardcore)		0.60						
					0.80						
			Thin layer Soft to Firm dark orangish brown mottled bluish grey slightly sandy slightly gravelly CLAY. Sand is fine and medium.		0.90						
			Graded Limestone MOT Material		1.20						
			Thin layer Soft to Firm dark orangish brown mottled bluish grey slightly sandy slightly gravelly CLAY. Sand is fine and medium.								
			Hole Terminated at 1.20m BGL								

REMARKS

Reason for Terminaton:
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:	2020.221			
TP02	PROJECT TITLE	SNECKYEAT INDUSTRIAL ESTATE, WHITEHAVEN			
	CLIENT	NORTHERN TRUST			
	PLANT		START & END DATE	04.11.20	
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)		0.15						
			General Fill material comprising LIMESTONE bricks/concrete and general builders waste (Hardcore)		0.60						
			Thin layer Soft to Firm dark orangish brown mottled bluish grey slightly sandy slightly gravelly CLAY. Sand is fine and medium.		1.20						
			Hole Terminated at 1.20m BGL								

REMARKS

Reason for Terminaton:
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:	2020.221		
TP03	PROJECT TITLE	SNECKYEAT INDUSTRIAL ESTATE, WHITEHAVEN		
	CLIENT	NORTHERN TRUST		
	PLANT		START & END DATE	04.11.20
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 Terminaton:
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:	2020.221			
TP04	PROJECT TITLE	SNECKYEAT INDUSTRIAL ESTATE, WHITEHAVEN			
	CLIENT	NORTHERN TRUST			
	PLANT		START & END DATE	04.11.20	
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 Terminaton:
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

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

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Oliver Clark
Site name:	Block 1
Site location:	Sneckyeat Industrial Estate, Whitehaven

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:	54.53182° N
Longitude:	3.5608° W
Reference:	3779967155
Date:	Oct 01 2020 16:27

Runoff estimation approach

IH124

Site characteristics

Total site area (ha): 0.369

Methodology

Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

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 ≤ 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):	3.31	3.31
1 in 1 year (l/s):	2.88	2.88
1 in 30 years (l/s):	5.62	5.62
1 in 100 year (l/s):	6.88	6.88
1 in 200 years (l/s):	7.84	7.84

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Oliver Clark
Site name:	Block 2
Site location:	Sneckyeat Industrial Estate, Whitehaven

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:	54.53084° N
Longitude:	3.56179° W
Reference:	1375022432
Date:	Oct 02 2020 16:38

Runoff estimation approach

IH124

Site characteristics

Total site area (ha): 0.329

Methodology

Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

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.

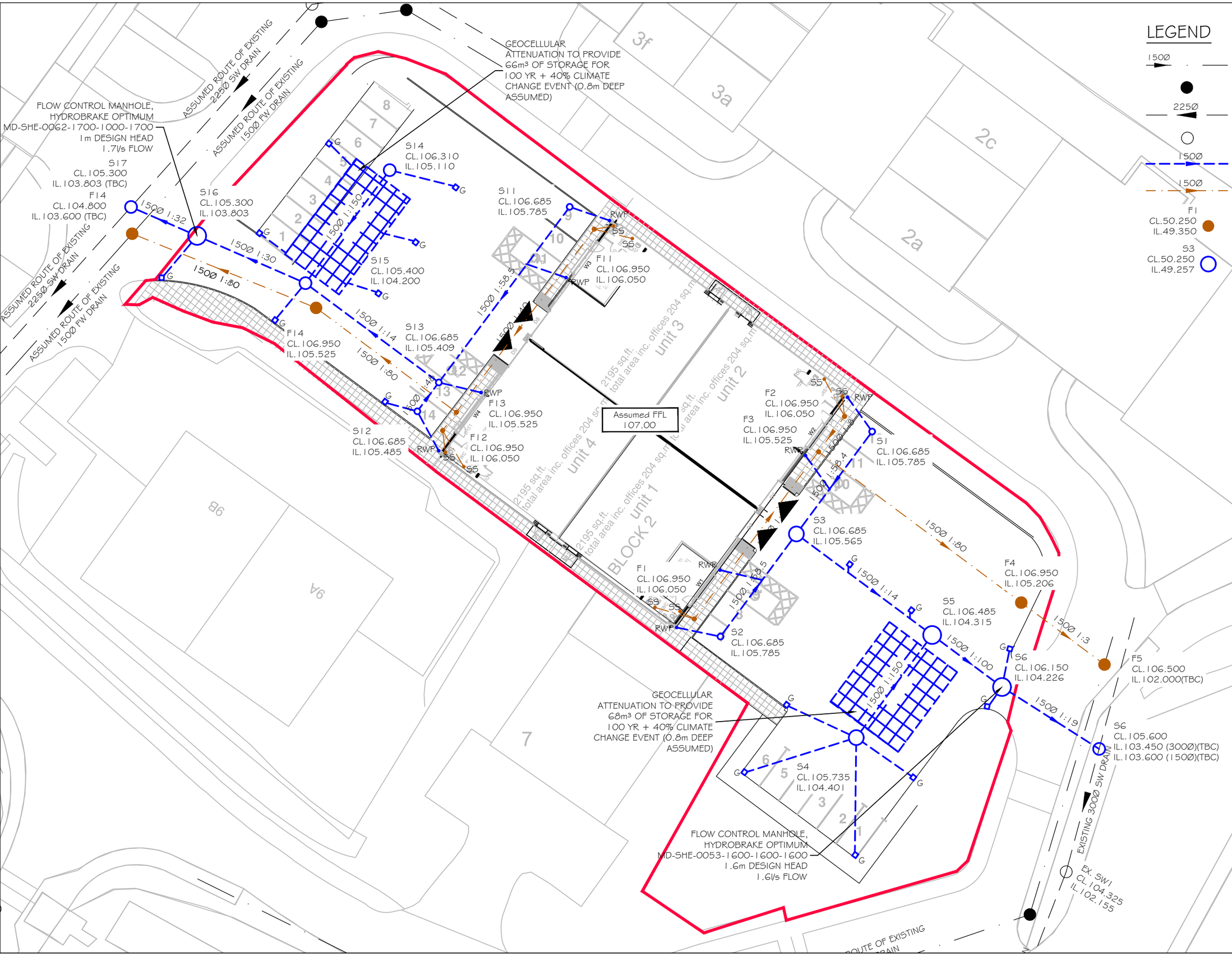
(3) Is SPR/SPRHOST ≤ 0.3?

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 year (l/s):	6.13	6.13
1 in 200 years (l/s):	6.99	6.99

Appendix G: - Proposed Drainage Strategy and Calculations



LEGEND

- 150Ø — EXISTING PRIVATE FOUL DRAIN
- EXISTING PRIVATE FOUL MANHOLE
- 225Ø — EXISTING PRIVATE SURFACE WATER DRAIN
- EXISTING PRIVATE SURFACE WATER MANHOLE
- 150Ø — PROPOSED PRIVATE SURFACE WATER DRAIN
- 150Ø — PROPOSED PRIVATE FOUL WATER DRAIN
- F1 CL.50.250 IL.49.350 — PROPOSED PRIVATE FOUL WATER DRAIN
- S3 CL.50.250 IL.49.257 — PROPOSED PRIVATE SURFACE WATER MANHOLE

RESIDUAL RISKS

REV.	DESCRIPTION	DRAWN	APPROVED	DATE
A	EXISTING SURFACE WATER AND FOUL SEWERS AT THE PERIMETER OF THE SITE REVISED TO SUIT FINDINGS OF DRAINAGE SURVEY	OC	GS	06.01.21

STATUS

PLANNING

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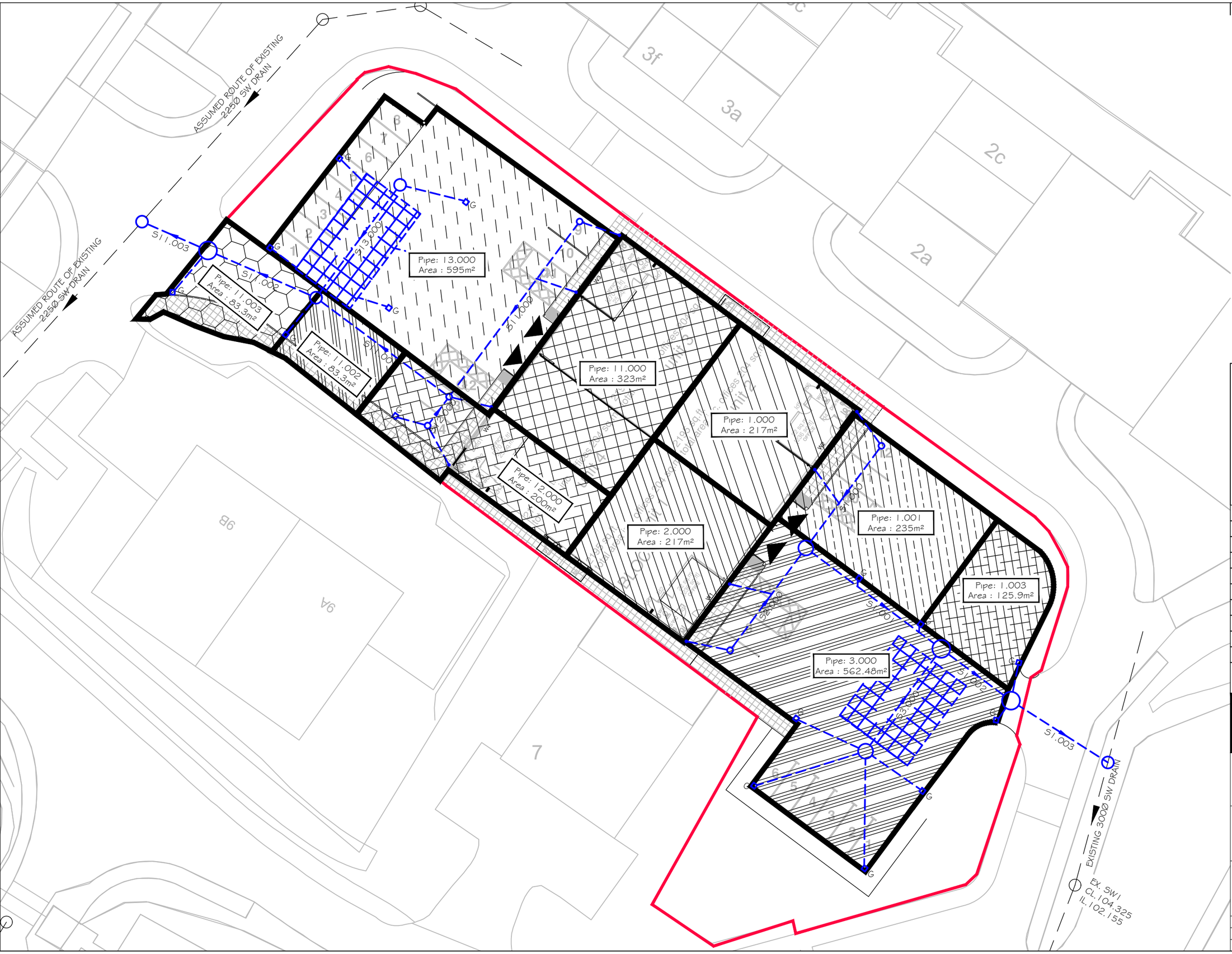
GSA

client
NORTHERN TRUST

project
PROPOSED INDUSTRIAL UNITS
SNECKYEAT INDUSTRIAL ESTATE
WHITEHAVEN

title
BLOCK 1
PROPOSED DRINAGE STRATEGY

drawn OC	checked GS	drawing number	
date 10.09.20	date 10.09.20	2020.221.C003	A
scale 1:250	A2		



RESIDUAL RISKS

REV	DESCRIPTION	DRAWN	APPROVED	DATE
A	BLOCK 1 EAST SURFACE WATER CONNECTION REVISED	OC	GS	No.01.21

STATUS

PLANNING

GRAHAM SCHOFIELD ASSOCIATES
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NORTHERN TRUST

project
PROPOSED INDUSTRIAL UNITS
SNECKYEAT INDUSTRIAL ESTATE
WHITEHAVEN

title
BLOCK 1
PROPOSED CONTRIBUTING AREAS

drawn OC	checked GS	drawing number	
date 30.09.20	date 30.09.20	2020.221.C002	A
scale 1:250	A2		

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Block 1 - West 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	0.258	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)	500

Designed with Level Soffits

Network Design Table for Block 1 - West SW

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
S11.000	22.000	0.376	58.5	0.033	5.00	0.0	0.600	o	150	Pipe/Conduit	
S12.000	3.630	0.076	47.8	0.020	5.00	0.0	0.600	o	150	Pipe/Conduit	
S11.001	16.769	1.209	13.9	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S13.000	14.216	0.095	150.0	0.060	5.00	0.0	0.600	o	150	Pipe/Conduit	
S11.002	11.920	0.397	30.0	0.009	0.00	0.0	0.600	o	150	Pipe/Conduit	
S11.003	8.836	0.275	32.1	0.012	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)
S11.000	43.97	5.28	105.785	0.033	0.0	0.0	0.0	1.32	23.3	3.9
S12.000	44.71	5.04	105.485	0.020	0.0	0.0	0.0	1.46	25.8	2.4
S11.001	43.66	5.38	105.409	0.053	0.0	0.0	0.0	2.72	48.1	6.3
S13.000	43.93	5.29	104.295	0.060	0.0	0.0	0.0	0.82	14.5	7.1
S11.002	43.34	5.49	104.200	0.122	0.0	0.0	0.0	1.84	32.6	14.3
S11.003	43.09	5.57	103.803	0.134	0.0	0.0	0.0	1.78	31.5	15.6

Manhole Schedules for Block 1 - West SW

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
S11	106.685	0.900	Open Manhole	600	S11.000	105.785	150				
S12	106.685	1.200	Open Manhole	600	S12.000	105.485	150				
S13	106.685	1.276	Open Manhole	600	S11.001	105.409	150	S11.000	105.409	150	
								S12.000	105.409	150	
S14	106.310	2.015	Open Manhole	1200	S13.000	104.295	150				
S15	105.400	1.200	Open Manhole	1800	S11.002	104.200	150	S11.001	104.200	150	
								S13.000	104.200	150	
S16	105.300	1.497	Open Manhole	1800	S11.003	103.803	150	S11.002	103.803	150	
S17	104.700	1.172	Open Manhole	1200		OUTFALL		S11.003	103.528	150	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S11	299094.686	516302.580	299094.686	516302.580	Required	
S12	299079.318	516281.962	299079.318	516281.962	Required	
S13	299081.490	516284.876	299081.490	516284.876	Required	
S14	299076.533	516306.284	299076.533	516306.284	Required	
S15	299068.047	516294.879	299068.047	516294.879	Required	
S16	299057.113	516299.655	299057.113	516299.655	Required	
S17	299049.015	516303.190			No Entry	

PIPELINE SCHEDULES for Block 1 - West 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)
S11.000	o	150	S11	106.685	105.785	0.750	Open Manhole	600
S12.000	o	150	S12	106.685	105.485	1.050	Open Manhole	600
S11.001	o	150	S13	106.685	105.409	1.126	Open Manhole	600
S13.000	o	150	S14	106.310	104.295	1.865	Open Manhole	1200
S11.002	o	150	S15	105.400	104.200	1.050	Open Manhole	1800
S11.003	o	150	S16	105.300	103.803	1.347	Open Manhole	1800

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)
S11.000	22.000	58.5	S13	106.685	105.409	1.126	Open Manhole	600
S12.000	3.630	47.8	S13	106.685	105.409	1.126	Open Manhole	600
S11.001	16.769	13.9	S15	105.400	104.200	1.050	Open Manhole	1800
S13.000	14.216	150.0	S15	105.400	104.200	1.050	Open Manhole	1800
S11.002	11.920	30.0	S16	105.300	103.803	1.347	Open Manhole	1800
S11.003	8.836	32.1	S17	104.700	103.528	1.022	Open Manhole	1200

Free Flowing Outfall Details for Block 1 - West SW

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S11.003	S17	104.700	103.528	103.162	1200	0

Simulation Criteria for Block 1 - West 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 Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs 0 Number of 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		

Online Controls for Block 1 - West SW

Hydro-Brake® Optimum Manhole: S16, DS/PN: S11.003, Volume (m³): 4.0

Unit Reference	MD-SHE-0062-1700-1000-1700
Design Head (m)	1.000
Design Flow (l/s)	1.7
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	62
Invert Level (m)	103.803
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	1.7	Kick-Flo®	0.549	1.3
Flush-Flo™	0.270	1.6	Mean Flow over Head Range	-	1.4

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	1.4	0.800	1.5	2.000	2.3	4.000	3.2	7.000	4.2
0.200	1.6	1.000	1.7	2.200	2.4	4.500	3.4	7.500	4.3
0.300	1.6	1.200	1.8	2.400	2.5	5.000	3.6	8.000	4.4
0.400	1.5	1.400	2.0	2.600	2.6	5.500	3.7	8.500	4.6
0.500	1.4	1.600	2.1	3.000	2.8	6.000	3.9	9.000	4.7
0.600	1.3	1.800	2.2	3.500	3.0	6.500	4.0	9.500	4.8

Storage Structures for Block 1 - West SW

Cellular Storage Manhole: S15, DS/PN: S11.002

Invert Level (m) 104.200 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	82.0	0.0	1.800	0.0	0.0	3.600	0.0	0.0
0.200	82.0	0.0	2.000	0.0	0.0	3.800	0.0	0.0
0.400	82.0	0.0	2.200	0.0	0.0	4.000	0.0	0.0
0.600	82.0	0.0	2.400	0.0	0.0	4.200	0.0	0.0
0.800	82.0	0.0	2.600	0.0	0.0	4.400	0.0	0.0
0.801	0.0	0.0	2.800	0.0	0.0	4.600	0.0	0.0
1.200	0.0	0.0	3.000	0.0	0.0	4.800	0.0	0.0
1.400	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			

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Block 1 - West 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 Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs 0 Number of 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
Region	England and Wales	Ratio R	0.259
Cv (Summer)	0.750		
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 Level (m)	Surcharged Depth (m)
S11.000	S11	15 Winter	1	+0%					105.823	-0.112
S12.000	S12	15 Winter	1	+0%					105.518	-0.117
S11.001	S13	15 Winter	1	+0%					105.443	-0.116
S13.000	S14	15 Winter	1	+0%	30/15 Winter				104.365	-0.080
S11.002	S15	120 Winter	1	+0%	30/30 Summer				104.285	-0.065
S11.003	S16	120 Winter	1	+0%	1/15 Summer				104.280	0.327

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S11.000	S11	0.000	0.14			3.2	OK	
S12.000	S12	0.000	0.11			1.9	OK	
S11.001	S13	0.000	0.11			5.0	OK	
S13.000	S14	0.000	0.43			5.7	OK	
S11.002	S15	0.000	0.11		61	3.3	OK	
S11.003	S16	0.000	0.06			1.5	SURCHARGED	

2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Block 1 - West 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 Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs 0 Number of 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
Region	England and Wales	Ratio R	0.259
Cv (Summer)	0.750		
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 Level (m)	Surcharged Depth (m)
S11.000	S11	15 Winter	2	+0%					105.829	-0.106
S12.000	S12	15 Winter	2	+0%					105.523	-0.112
S11.001	S13	15 Winter	2	+0%					105.447	-0.112
S13.000	S14	15 Winter	2	+0%	30/15 Winter				104.376	-0.069
S11.002	S15	180 Winter	2	+0%	30/30 Summer				104.325	-0.025
S11.003	S16	180 Winter	2	+0%	1/15 Summer				104.320	0.367

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S11.000	S11	0.000	0.19			4.1	OK	
S12.000	S12	0.000	0.14			2.5	OK	
S11.001	S13	0.000	0.15			6.5	OK	
S13.000	S14	0.000	0.55			7.4	OK	
S11.002	S15	0.000	0.10		91	2.8	OK	
S11.003	S16	0.000	0.06			1.5	SURCHARGED	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Block 1 - West 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 Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs 0 Number of 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
Region	England and Wales	Ratio R	0.259
Cv (Summer)	0.750		
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 Level (m)	Surcharged Depth (m)
S11.000	S11	15 Winter	30	+0%					105.846	-0.089
S12.000	S12	15 Winter	30	+0%					105.538	-0.097
S11.001	S13	15 Winter	30	+0%					105.463	-0.096
S13.000	S14	240 Winter	30	+0%	30/15 Winter				104.530	0.085
S11.002	S15	240 Winter	30	+0%	30/30 Summer				104.527	0.177
S11.003	S16	240 Winter	30	+0%	1/15 Summer				104.523	0.570

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S11.000	S11	0.000	0.35			7.6	OK	
S12.000	S12	0.000	0.27			4.6	OK	
S11.001	S13	0.000	0.27			12.1	OK	
S13.000	S14	0.000	0.27			3.5	SURCHARGED	
S11.002	S15	0.000	0.09		204	2.5	SURCHARGED	
S11.003	S16	0.000	0.06			1.5	SURCHARGED	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Block 1 - West 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 Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs 0 Number of 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
Region	England and Wales	Ratio R	0.259
Cv (Summer)	0.750		
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 Level (m)	Surcharged Depth (m)
S11.000	S11	15 Winter	100	+40%					105.871	-0.064
S12.000	S12	15 Winter	100	+40%					105.559	-0.076
S11.001	S13	15 Winter	100	+40%					105.484	-0.075
S13.000	S14	360 Winter	100	+40%	30/15 Winter				104.958	0.513
S11.002	S15	360 Winter	100	+40%	30/30 Summer				104.955	0.605
S11.003	S16	360 Winter	100	+40%	1/15 Summer				104.949	0.996

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S11.000	S11	0.000	0.62			13.6	OK	
S12.000	S12	0.000	0.48			8.3	OK	
S11.001	S13	0.000	0.49			21.7	OK	
S13.000	S14	0.000	0.37			4.9	SURCHARGED	
S11.002	S15	0.000	0.06		340	1.9	SURCHARGED	
S11.003	S16	0.000	0.07			1.8	SURCHARGED	

Technical Specification

Control Point	Head (m)	Flow (l/s)
Primary Design	1.600	1.600
Flush-Flo™	0.234	1.130
Kick-Flo®	0.475	0.928
Mean Flow		1.202

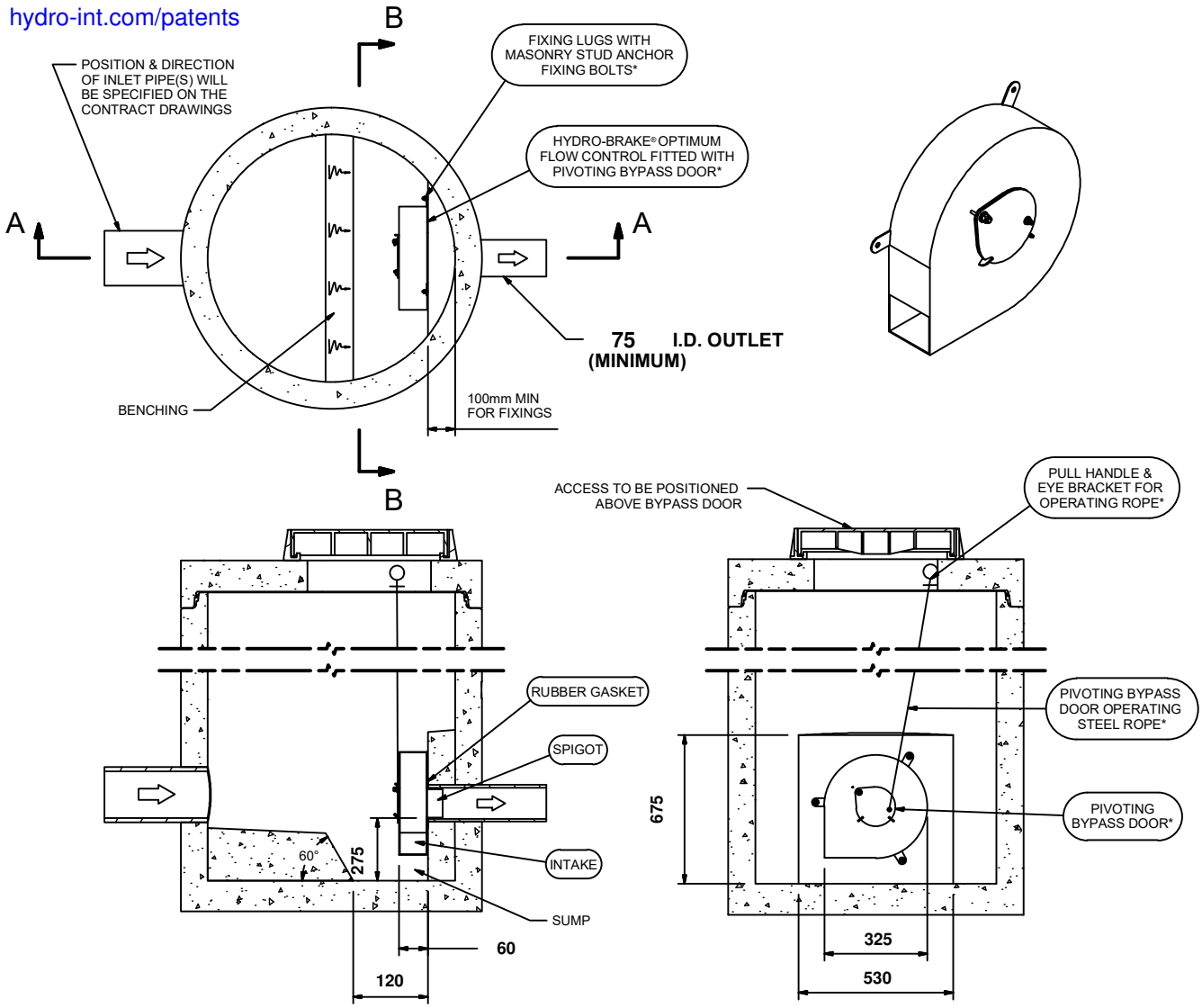
Hydro-Brake® Optimum Flow Control including:

- 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

BBA APPROVAL INSPECTION TESTING CERTIFICATION CERTIFICATE 08/4596

WRc Approved PT/329/0412

hydro-int.com/patents



SECTION A-A

SECTION B-B

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-0053-1600-1600-1600 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.

Hydro International®

DATE	10/7/2020 2:26 PM
SITE	Sneckyeat Industrial Estate
DESIGNER	Oliver Clark
REF	2020.221

SHE-0053-1600-1600-1600
Hydro-Brake® Optimum

oliver@gsa72.co.uk

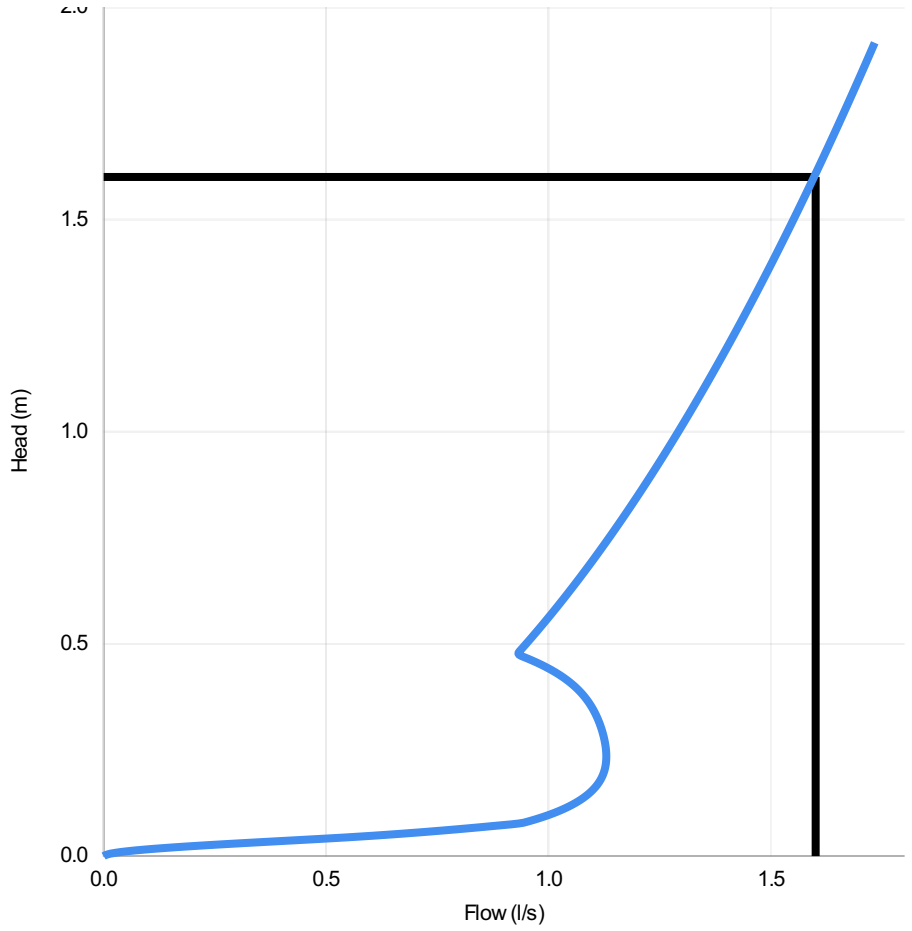
Technical Specification

Control Point	Head (m)	Flow (l/s)
Primary Design	1.600	1.600
Flush-Flo	0.234	1.130
Kick-Flo®	0.475	0.928
Mean Flow		1.202

BBA APPROVAL INSPECTION TESTING CERTIFICATION
CERTIFICATE No 08/4596

WRc APPROVED
PT/329/0412

hydro-int.com/patents



Head (m)	Flow (l/s)
0.000	0.000
0.055	0.700
0.110	1.032
0.166	1.107
0.221	1.129
0.276	1.125
0.331	1.107
0.386	1.072
0.441	1.001
0.497	0.946
0.552	0.991
0.607	1.034
0.662	1.075
0.717	1.113
0.772	1.151
0.828	1.187
0.883	1.221
0.938	1.255
0.993	1.287
1.048	1.319
1.103	1.350
1.159	1.380
1.214	1.409
1.269	1.437
1.324	1.465
1.379	1.493
1.434	1.519
1.490	1.545
1.545	1.571
1.600	1.596

DESIGN ADVICE

The head/flow characteristics of this SHE-0053-1600-1600-1600 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.**

Hydro International®

DATE	07/10/2020 14:26
Site	Sneckyeat Industrial Estate
DESIGNER	Oliver Clark
Ref	2020.221

SHE-0053-1600-1600-1600

Hydro-Brake Optimum®

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Block 1 - East 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 1 - East SW

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
S1.000	12.845	0.220	58.4	0.020	5.00	0.0	0.600	o	150	Pipe/Conduit	
S2.000	12.871	0.220	58.5	0.021	5.00	0.0	0.600	o	150	Pipe/Conduit	
S1.001	17.069	1.250	13.7	0.021	0.00	0.0	0.600	o	150	Pipe/Conduit	
S3.000	12.871	0.086	150.0	0.056	5.00	0.0	0.600	o	150	Pipe/Conduit	
S1.002	8.781	0.164	53.5	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.003	11.613	0.551	21.1	0.013	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)
S1.000	44.50	5.16	105.785	0.020	0.0	0.0	0.0	1.32	23.3	2.4
S2.000	44.50	5.16	105.785	0.021	0.0	0.0	0.0	1.32	23.3	2.5
S1.001	44.18	5.27	105.565	0.062	0.0	0.0	0.0	2.74	48.4	7.4
S3.000	44.19	5.26	104.401	0.056	0.0	0.0	0.0	0.82	14.5	6.7
S1.002	43.85	5.37	104.315	0.118	0.0	0.0	0.0	1.38	24.4	14.0
S1.003	43.59	5.46	104.151	0.131	0.0	0.0	0.0	2.20	38.9	15.5

Manhole Schedules for Block 1 - East SW

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
S1	106.685	0.900	Open Manhole	600	S1.000	105.785	150				
S2	106.685	0.900	Open Manhole	600	S2.000	105.785	150				
S3	106.685	1.120	Open Manhole	1200	S1.001	105.565	150	S1.000	105.565	150	
								S2.000	105.565	150	
S4	105.735	1.334	Open Manhole	1200	S3.000	104.401	150				
S5	106.485	2.170	Open Manhole	1200	S1.002	104.315	150	S1.001	104.315	150	
								S3.000	104.315	150	
S6	106.150	1.999	Open Manhole	1800	S1.003	104.151	150	S1.002	104.151	150	
S7	105.600	2.000	Open Manhole	1200		OUTFALL		S1.003	103.600	150	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S1	299125.193	516279.923	299125.193	516279.923	Required	
S2	299109.897	516259.252	299109.897	516259.252	Required	
S3	299117.553	516269.598	299117.553	516269.598	Required	
S4	299123.591	516249.063	299123.591	516249.063	Required	
S5	299131.247	516259.409	299131.247	516259.409	Required	
S6	299138.292	516254.167	299138.292	516254.167	Required	
S7	299148.085	516247.925			No Entry	

PIPELINE SCHEDULES for Block 1 - East 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)
S1.000	o	150	S1	106.685	105.785	0.750	Open Manhole	600
S2.000	o	150	S2	106.685	105.785	0.750	Open Manhole	600
S1.001	o	150	S3	106.685	105.565	0.970	Open Manhole	1200
S3.000	o	150	S4	105.735	104.401	1.184	Open Manhole	1200
S1.002	o	150	S5	106.485	104.315	2.020	Open Manhole	1200
S1.003	o	150	S6	106.150	104.151	1.849	Open Manhole	1800

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)
S1.000	12.845	58.4	S3	106.685	105.565	0.970	Open Manhole	1200
S2.000	12.871	58.5	S3	106.685	105.565	0.970	Open Manhole	1200
S1.001	17.069	13.7	S5	106.485	104.315	2.020	Open Manhole	1200
S3.000	12.871	150.0	S5	106.485	104.315	2.020	Open Manhole	1200
S1.002	8.781	53.5	S6	106.150	104.151	1.849	Open Manhole	1800
S1.003	11.613	21.1	S7	105.600	103.600	1.850	Open Manhole	1200

Free Flowing Outfall Details for Block 1 - East SW

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.003	S7	105.600	103.600	103.600	1200	0

Simulation Criteria for Block 1 - East 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 Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs 0 Number of 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		

Online Controls for Block 1 - East SW

Hydro-Brake® Optimum Manhole: S6, DS/PN: S1.003, Volume (m³): 5.2

Unit Reference	MD-SHE-0053-1600-1600-1600
Design Head (m)	1.600
Design Flow (l/s)	1.6
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	53
Invert Level (m)	104.151
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.600	1.6	Kick-Flo®	0.475	0.9
Flush-Flo™	0.234	1.1	Mean Flow over Head Range	-	1.2

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	1.0	0.800	1.2	2.000	1.8	4.000	2.4	7.000	3.2
0.200	1.1	1.000	1.3	2.200	1.8	4.500	2.6	7.500	3.3
0.300	1.1	1.200	1.4	2.400	1.9	5.000	2.7	8.000	3.4
0.400	1.1	1.400	1.5	2.600	2.0	5.500	2.8	8.500	3.5
0.500	0.9	1.600	1.6	3.000	2.1	6.000	2.9	9.000	3.5
0.600	1.0	1.800	1.7	3.500	2.3	6.500	3.0	9.500	3.6

Storage Structures for Block 1 - East SW

Cellular Storage Manhole: S4, DS/PN: S3.000

Invert Level (m) 104.535 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	85.0	0.0	1.800	0.0	0.0	3.600	0.0	0.0
0.200	85.0	0.0	2.000	0.0	0.0	3.800	0.0	0.0
0.400	85.0	0.0	2.200	0.0	0.0	4.000	0.0	0.0
0.600	85.0	0.0	2.400	0.0	0.0	4.200	0.0	0.0
0.800	85.0	0.0	2.600	0.0	0.0	4.400	0.0	0.0
0.801	0.0	0.0	2.800	0.0	0.0	4.600	0.0	0.0
1.200	0.0	0.0	3.000	0.0	0.0	4.800	0.0	0.0
1.400	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			

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Block 1 - East 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 Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs 0 Number of 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
Region	England and Wales	Ratio R	0.259
Cv (Summer)	0.750		
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 Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
S1.000	S1	15 Winter	1	+0%					105.815	-0.120	0.000
S2.000	S2	15 Winter	1	+0%					105.816	-0.119	0.000
S1.001	S3	15 Winter	1	+0%					105.600	-0.115	0.000
S3.000	S4	180 Winter	1	+0%	1/15 Summer				104.615	0.064	0.000
S1.002	S5	180 Winter	1	+0%	1/15 Summer				104.614	0.149	0.000
S1.003	S6	180 Winter	1	+0%	1/15 Summer				104.611	0.310	0.000

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	0.09			1.9	OK	
S2.000	S2	0.10			2.0	OK	
S1.001	S3	0.12			5.6	OK	
S3.000	S4	0.08		89	1.0	SURCHARGED	
S1.002	S5	0.08			1.6	SURCHARGED	
S1.003	S6	0.03			1.1	SURCHARGED	

2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Block 1 - East 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 Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs 0 Number of 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 Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
S1.000	S1	15 Winter	2	+0%					105.819	-0.116	0.000
S2.000	S2	15 Winter	2	+0%					105.820	-0.115	0.000
S1.001	S3	15 Winter	2	+0%					105.606	-0.109	0.000
S3.000	S4	240 Winter	2	+0%	1/15 Summer				104.660	0.109	0.000
S1.002	S5	240 Winter	2	+0%	1/15 Summer				104.658	0.193	0.000
S1.003	S6	240 Winter	2	+0%	1/15 Summer				104.655	0.354	0.000

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	0.12			2.5	OK	
S2.000	S2	0.12			2.6	OK	
S1.001	S3	0.16			7.3	OK	
S3.000	S4	0.08		135	1.0	SURCHARGED	
S1.002	S5	0.07			1.6	SURCHARGED	
S1.003	S6	0.03			1.1	SURCHARGED	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Block 1 - East 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 Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs 0 Number of 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
Region	England and Wales	Ratio R	0.259
Cv (Summer)	0.750		
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 Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
S1.000	S1	15 Winter	30	+0%					105.833	-0.102	0.000
S2.000	S2	15 Winter	30	+0%					105.834	-0.101	0.000
S1.001	S3	15 Winter	30	+0%					105.624	-0.091	0.000
S3.000	S4	240 Winter	30	+0%	1/15 Summer				104.874	0.323	0.000
S1.002	S5	240 Winter	30	+0%	1/15 Summer				104.872	0.407	0.000
S1.003	S6	240 Winter	30	+0%	1/15 Summer				104.869	0.568	0.000

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	0.22			4.6	OK	
S2.000	S2	0.23			4.9	OK	
S1.001	S3	0.32			14.6	OK	
S3.000	S4	0.08		242	1.1	SURCHARGED	
S1.002	S5	0.07			1.4	SURCHARGED	
S1.003	S6	0.03			1.1	SURCHARGED	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Block 1 - East 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 Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs 0 Number of 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 Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
S1.000	S1	15 Winter	100	+40%					105.850	-0.085	0.000
S2.000	S2	15 Winter	100	+40%					105.852	-0.083	0.000
S1.001	S3	15 Winter	100	+40%					105.648	-0.067	0.000
S3.000	S4	480 Winter	100	+40%	1/15 Summer				105.330	0.779	0.000
S1.002	S5	480 Winter	100	+40%	1/15 Summer				105.328	0.863	0.000
S1.003	S6	480 Winter	100	+40%	1/15 Summer				105.324	1.023	0.000

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	0.39			8.3	OK	
S2.000	S2	0.41			8.7	OK	
S1.001	S3	0.58			26.2	OK	
S3.000	S4	0.10		470	1.3	SURCHARGED	
S1.002	S5	0.06			1.3	SURCHARGED	
S1.003	S6	0.04			1.4	SURCHARGED	

Technical Specification

Control Point	Head (m)	Flow (l/s)
Primary Design	1.000	1.700
Flush-Flo™	0.270	1.591
Kick-Flo®	0.549	1.295
Mean Flow		1.433

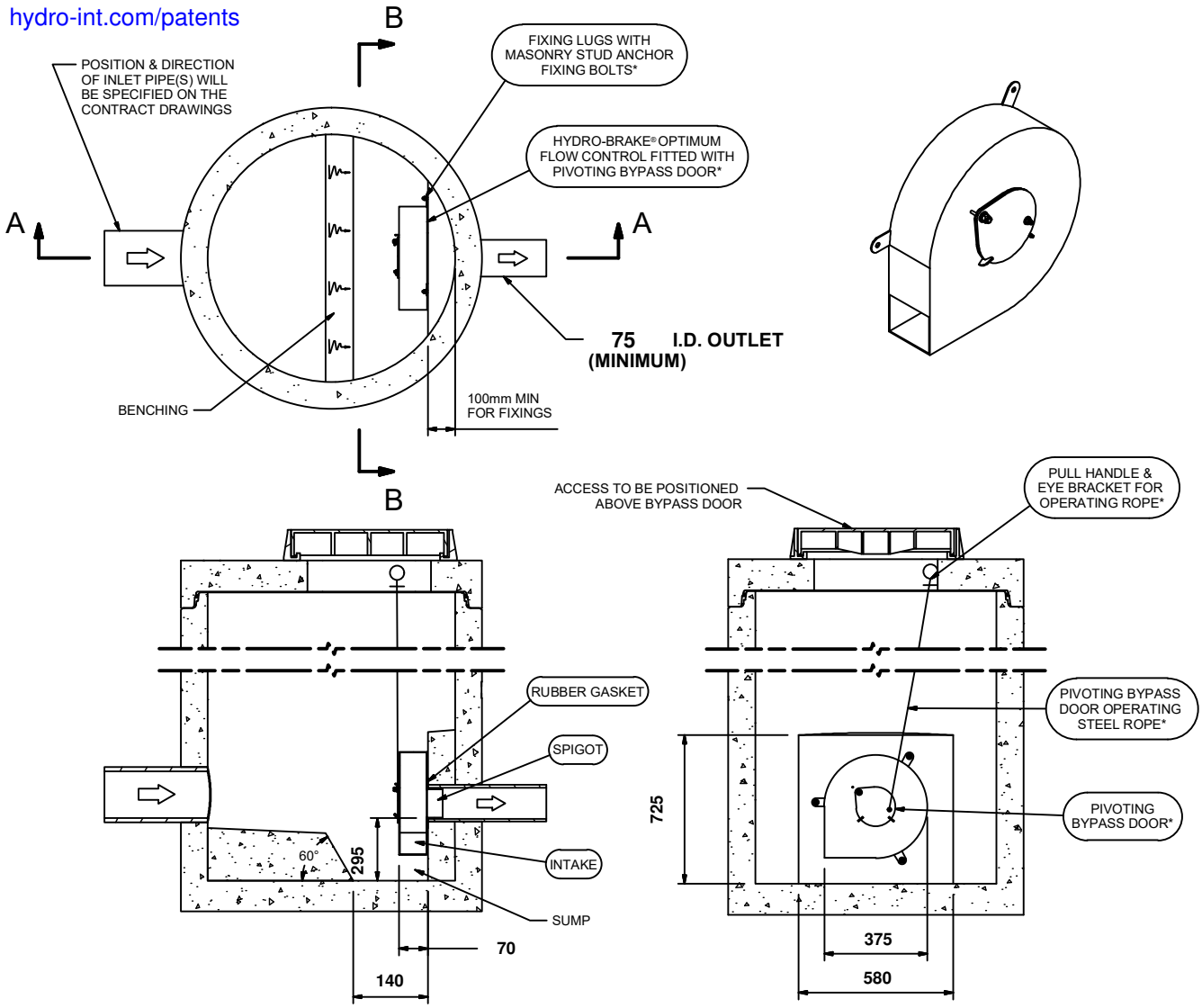
Hydro-Brake® Optimum Flow Control including:

- 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

BBA APPROVAL INSPECTION TESTING CERTIFICATION CERTIFICATE 08/4596

WRc Approved PT/329/0412

hydro-int.com/patents



SECTION A-A

SECTION B-B

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-0062-1700-1000-1700 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.

Hydro International®

DATE	10/7/2020 2:25 PM
SITE	Sneckyeat Industrial Estate
DESIGNER	Oliver Clark
REF	2020.221

SHE-0062-1700-1000-1700
Hydro-Brake® Optimum

oliver@gsa72.co.uk

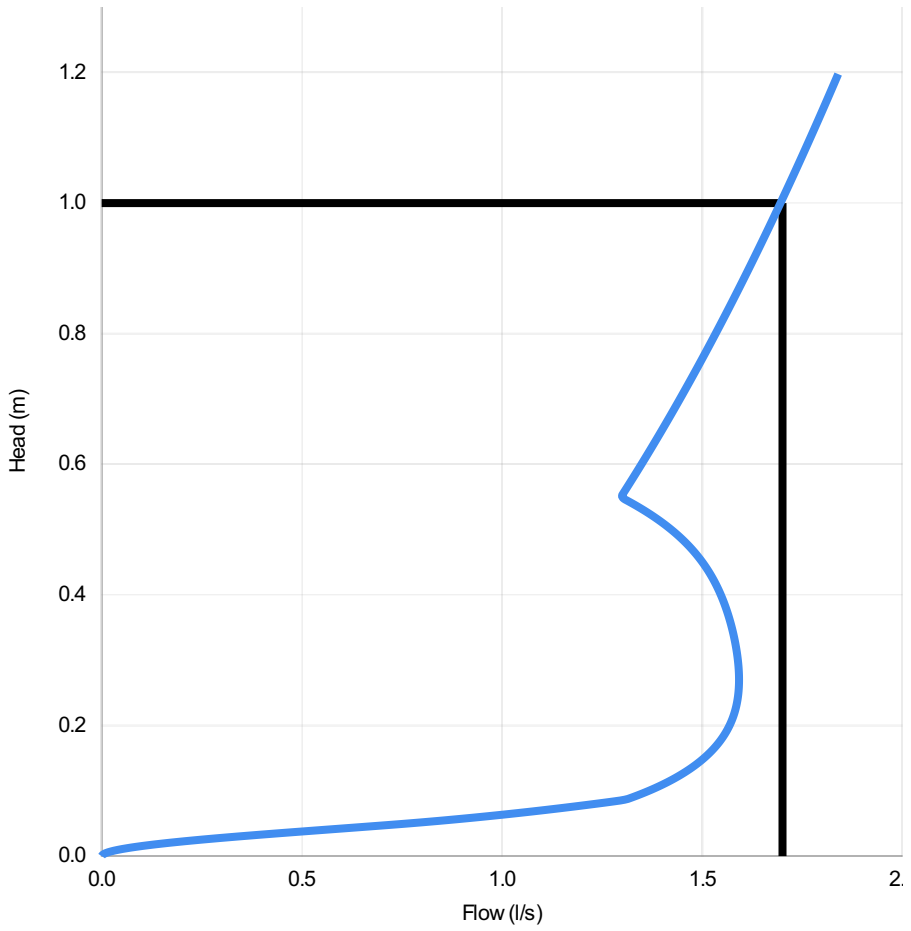
Technical Specification

Control Point	Head (m)	Flow (l/s)
Primary Design	1.000	1.700
Flush-Flo	0.270	1.591
Kick-Flo®	0.549	1.295
Mean Flow		1.433

BBA APPROVAL INSPECTION TESTING CERTIFICATION
CERTIFICATE No 08/4596

WRc APPROVED
PT/329/0412

hydro-int.com/patents



Head (m)	Flow (l/s)
0.000	0.000
0.034	0.431
0.069	1.084
0.103	1.379
0.138	1.479
0.172	1.539
0.207	1.573
0.241	1.588
0.276	1.591
0.310	1.586
0.345	1.575
0.379	1.559
0.414	1.536
0.448	1.502
0.483	1.454
0.517	1.385
0.552	1.299
0.586	1.334
0.621	1.368
0.655	1.402
0.690	1.434
0.724	1.466
0.759	1.497
0.793	1.527
0.828	1.556
0.862	1.585
0.897	1.613
0.931	1.641
0.966	1.668
1.000	1.695

DESIGN ADVICE

The head/flow characteristics of this SHE-0062-1700-1000-1700 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.**

Hydro International®

DATE	07/10/2020 14:25
Site	Sneckyeat Industrial Estate
DESIGNER	Oliver Clark
Ref	2020.221

SHE-0062-1700-1000-1700

Hydro-Brake Optimum®

EXISTING 150Ø SW DRAIN
EX. SW3
EX. SW2
CL.100.400
IL.97.880
EXISTING 225Ø SW DRAIN
EX. SW4
CL.98.400
IL.96.890
EXISTING 225Ø SW DRAIN
EX. SW5
CL.97.650
IL.95.750
EXISTING 150Ø SW DRAIN
EX. SW1
CL.99.780
IL.98.490
EXISTING 150Ø SW DRAIN
EXISTING 150Ø SW DRAIN
In/out
8c
7a
7d
SNE
102.
El Sub Sta
BLOCK 1
BLOCK 2
WAREHOUSE Unit 1
WAREHOUSE Unit 2
WAREHOUSE Unit 3
WAREHOUSE Unit 4
OFFICE
WC
Area : 1418m²
Area :677m²
Area : 677m²
1
2
3
4
5
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G

RESIDUAL RISKS

REV.	DESCRIPTION	DRAWN	APPROVED	DATE
B	BLOCK ORIENTATION AMENDED	SWG	GS	16.09.21
A	BLOCK 1 EAST SURFACE WATER CONNECTION REVISED	OC	GS	16.01.21

STATUS
PLANNING

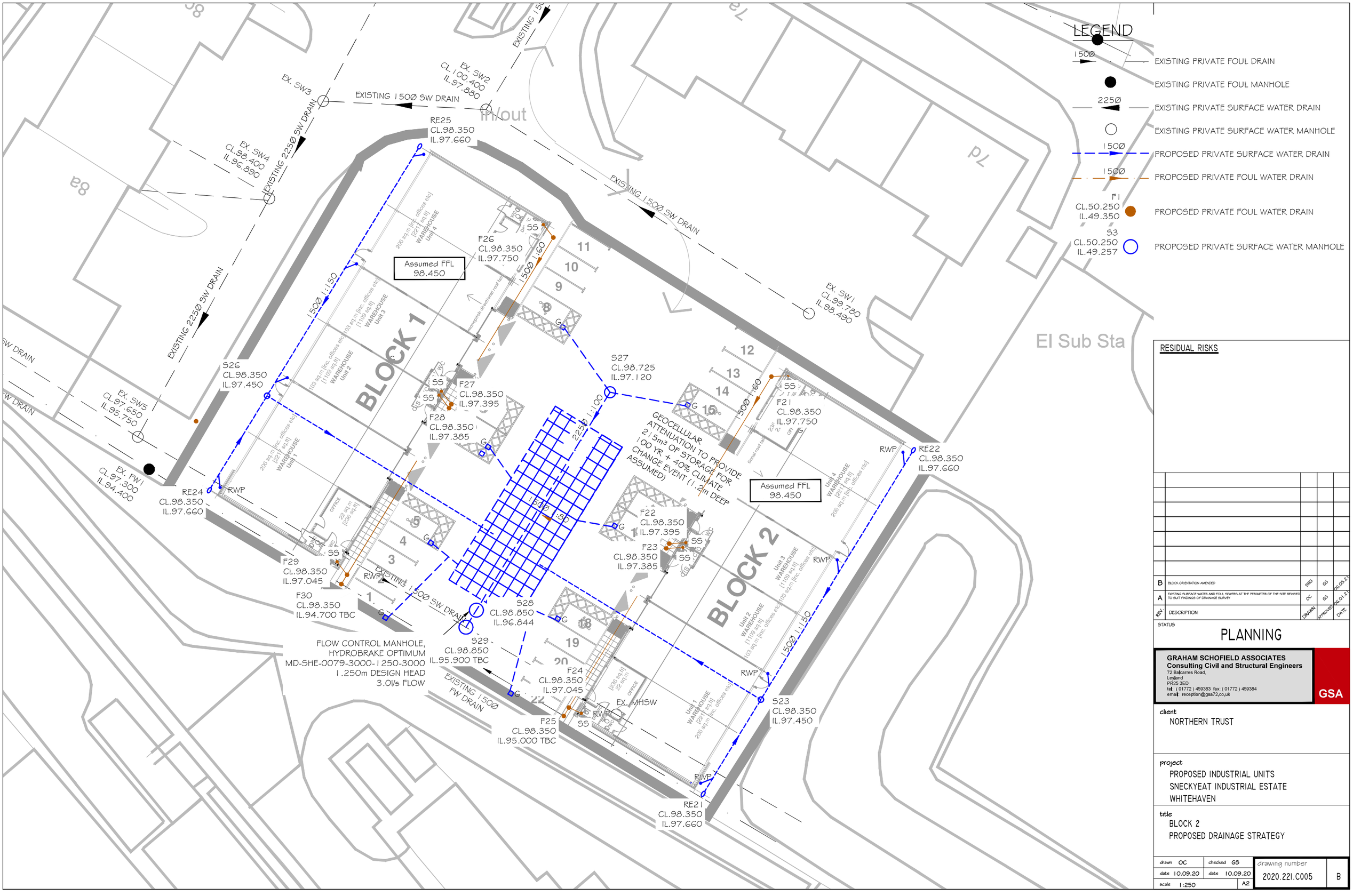
GRAHAM SCHOFIELD ASSOCIATES
Consulting Civil and Structural Engineers
72 Balcarres Road,
Leyland
PR25 3ED
tel: (01772) 459383 fax: (01772) 459384
email: reception@gsa72.co.uk
GSA

client
NORTHERN TRUST

project
PROPOSED INDUSTRIAL UNITS
SNECKYEAT INDUSTRIAL ESTATE
WHITEHAVEN

title
BLOCK 2
PROPOSED CONTRIBUTING AREAS

drawn	OC	checked	GS	drawing number	
date	30.09.20	date	30.09.20	2020.221.C004	B
scale		A2			



LEGEND

- 150Ø — EXISTING PRIVATE FOUL DRAIN
- EXISTING PRIVATE FOUL MANHOLE
- 225Ø — EXISTING PRIVATE SURFACE WATER DRAIN
- EXISTING PRIVATE SURFACE WATER MANHOLE
- 150Ø — PROPOSED PRIVATE SURFACE WATER DRAIN
- 150Ø — PROPOSED PRIVATE FOUL WATER DRAIN
- F1 CL.50.250 IL.49.350 — PROPOSED PRIVATE FOUL WATER DRAIN
- S3 CL.50.250 IL.49.257 — PROPOSED PRIVATE SURFACE WATER MANHOLE

RESIDUAL RISKS

REV.	DESCRIPTION	DRAWN	APPROVED	DATE
B	BLOCK ORIENTATION AMENDED	SNG	GS	26.09.21
A	EXISTING SURFACE WATER AND FOUL SEWERS AT THE PERIMETER OF THE SITE REVISED TO SUIT FINDINGS OF DRAINAGE SURVEY	OC	GS	26.01.21

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
BLOCK 2
PROPOSED DRAINAGE STRATEGY

drawn OC	checked GS	drawing number	
date 10.09.20	date 10.09.20	2020.221.C005	B
scale 1:250	A2		

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

Manhole Schedules for Block 2 SW

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
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	

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 Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs 0 Number of 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		

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

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 (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
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			

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 Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs 0 Number of 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
Region	England and Wales	Ratio R	0.259
Cv (Summer)	0.750		
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 Level (m)	Surcharged Depth (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

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe 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	

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 Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs 0 Number of 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
Region	England and Wales	Ratio R	0.259
Cv (Summer)	0.750		
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 Level (m)	Surcharged 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

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level 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	

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 Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs 0 Number of 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
Region	England and Wales	Ratio R	0.259
Cv (Summer)	0.750		
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 Level (m)	Surcharged 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

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level 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	

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 Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs 0 Number of 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
Region	England and Wales	Ratio R	0.259
Cv (Summer)	0.750		
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 Level (m)	Surcharged 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 Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
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

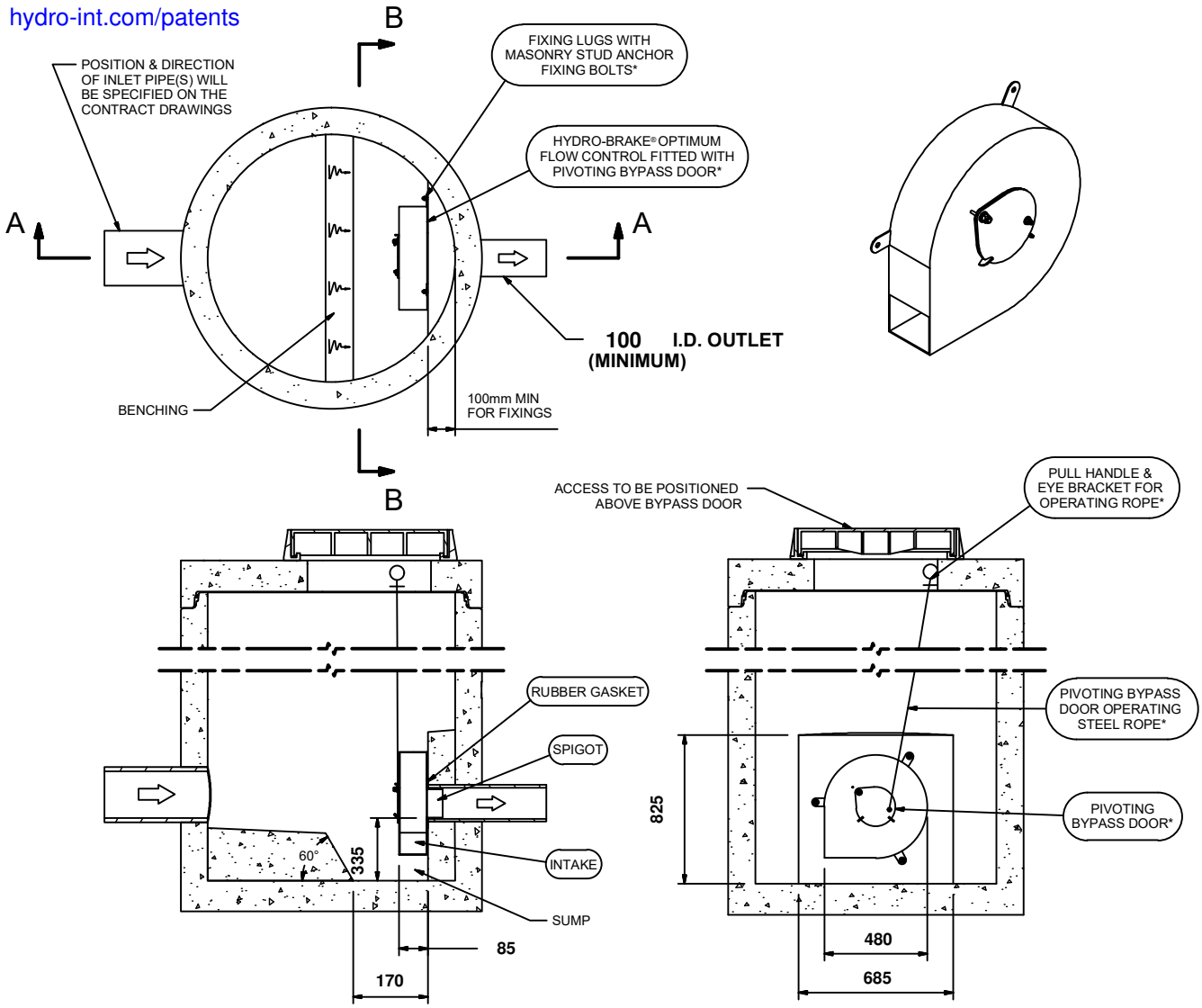
Hydro-Brake® Optimum Flow Control including:

- 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

BBA APPROVAL INSPECTION TESTING CERTIFICATION CERTIFICATE 08/4596

WRc Approved PT/329/0412

hydro-int.com/patents



SECTION A-A

SECTION B-B

IMPORTANT: (oval) 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.

Hydro International®

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

oliver@gsa72.co.uk

Technical Specification

Control Point	Head (m)	Flow (l/s)
Primary Design	1.250	3.000
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BBA APPROVAL INSPECTION TESTING CERTIFICATION
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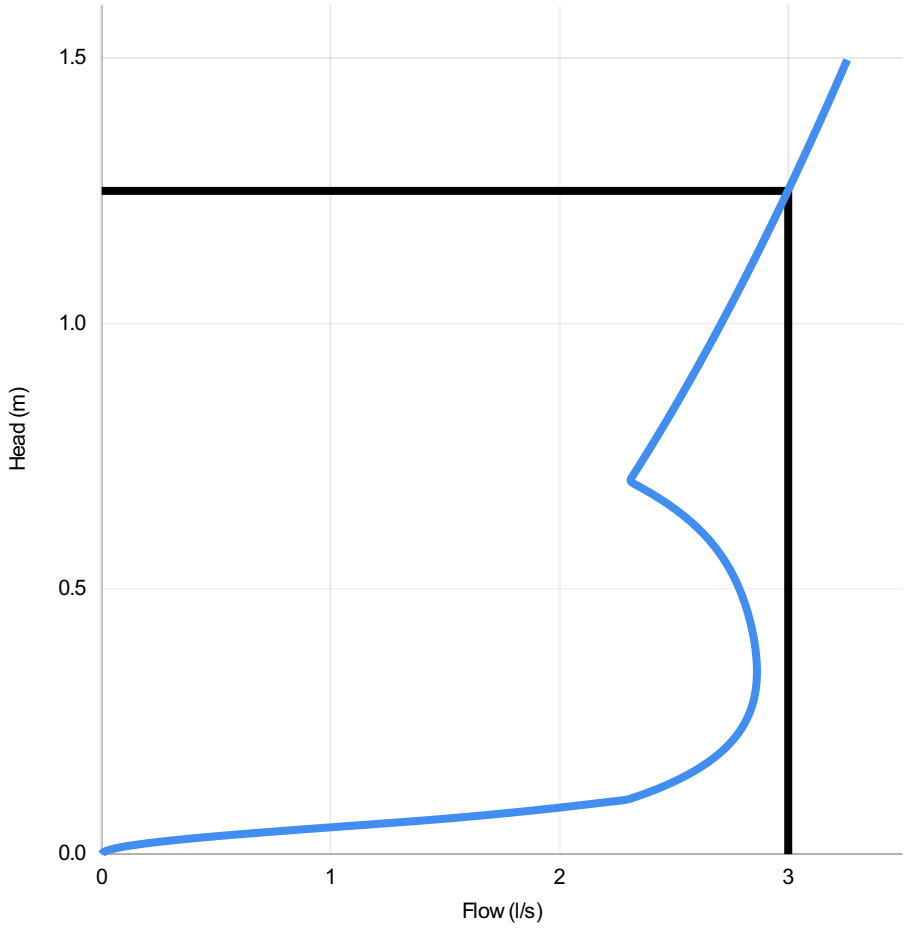

Head (m)	Flow (l/s)
0.000	0.000
0.043	0.770
0.086	1.970
0.129	2.463
0.172	2.647
0.216	2.759
0.259	2.824
0.302	2.855
0.345	2.863
0.388	2.856
0.431	2.838
0.474	2.809
0.517	2.768
0.560	2.711
0.603	2.630
0.647	2.517
0.690	2.361
0.733	2.350
0.776	2.411
0.819	2.471
0.862	2.530
0.905	2.587
0.948	2.642
0.991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

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.**

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®