

Report on Drainage Strategy to Accompany Planning Application

by

Barratt Manchester

Revision	Date	Prepared By	Revision Notes
-	04.09.19	CD	

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1. Introduction

The following document has been prepared to assist the designer's preparation and the readers understanding of the drainage theory and calculations in one reference document.

2. Site Details

Development Name	Chipping Lane Phase 1
Site Address	Land off Chipping Lane, Longridge, Preston, PR3 2NA
Longitude, Latitude (or OS Grid Ref)	360026; 438013
Site Description	3 No. open grassed fields separated by mature hedgerows and sporadic trees. Currently used by livestock for grazing.
Site Area (Ha)	5.35Ha (+ 1.36Ha of Phase 2)
Existing Permeable Area (Ha)	5.35Ha (+ 1.36Ha of Phase 2)
Existing Impermeable Area (Ha)	0Ha
Developable Area	6.03Ha
Is the Site Steeply Sloping (Y/N), If "Yes" Typical Gradient.	Yes 1:46

Table 1

3. Existing Site Run-off Rates

Refer to the site specific FRA produced by Betts Hydro dated March 2016

Return Period	Existing Discharge Rate
Qbar Total Site Area (l/s)	50.05 l/s
1 in 1 Year (l/s)	43.42 l/s
1 in 30 Year (l/s)	84.42 l/s
1 in 100 Year (l/s)	103.72 l/s

Table 2

Where compliance to 100 year volumetric criterion is not provided, the limiting discharge for any return period up to the 100 year 6 hour event, shall be not greater than Qbar or 2L/s/Ha, whichever is greater.

4. Soakaway Testing

A site specific site investigation was carried out by soiltechnics dated February 2016. A copy of the site investigation is presented in Appendix C.

Ground conditions are typically 0.3m of Topsoil overlaying cohesive Devensian Till to beyond depths of 4.7m. The Till is comprised of initially 1-1.5m of low to high strength clay, below which the shear strength increases. Varying amounts of silt, sand and gravel were also found.

2No soakaway tests were carried out as part of the site investigation. It was considered that the Devensian Till is impermeable and therefore indicate that infiltration drainage is NOT a feasible option.

5. Design Parameters

Engineering Layout Drg No	459/ED/02
Proposed Impermeable Areas Drg No	459/ED/04
Lowest FFL	105.175
Maximum TWL for Design (Lowest FFL – 0.6m)	104.575
M5-60	18.800
Ratio R	0.280
MADD Factor	2.000
Climate Change Allowance	30%
Discharge location minimum level	102.04
Surcharge Outfall Level	102.56
Point of Connection	Watercourse
Point of Connection Approved By UU (Y/N)	Yes

Table 3

6. Summary of Drainage Design

The drainage has been designed in accordance with the site specific FRA produced by Betts Hydro dated July 2016.

The drainage has also been designed to comply with DEFRA's Non-statutory technical standards for sustainable drainage systems dated March 2015. Compliance to such is demonstrated within Section 9.

Surface water is to drain to the adjacent watercourse named Higgin Brook. Discharge rates have been limited to existing greenfield run off rates/Qbar.

Attenuation storage is provided in the form of oversized pipes under highways and public open spaces. Attenuation storage in the highways is sized to provide attenuation for all flows up to and including 1 in 30 year storm event.

For storm events exceeding 1 in 30 year events, long term storage is provided in above ground storage areas to ensure no flooding to properties occurs for all storm events up to and including 1 in 100 year 6 hour storm event plus a 30% allowance for climate change.

Microdrainage simulations are available in Appendix D

Return Period	Existing Discharge Rate	Proposed Discharge Rate
Qbar Total Site Area (l/s)	50.05 l/s	50.05 l/s
1 in 1 Year (l/s)	43.42 l/s	50.05 l/s
1 in 30 Year (l/s)	84.42 l/s	50.05 l/s
1 in 100 Year (l/s)	103.72 l/s	50.05 l/s

Table 4

7. Design for Exceedance

All surface water drainage models have been modelled for storm events greater than the 1 in 100 Year event to determine the impact of flooding. The Flood locations are shown on the attached Flood Routing and over land flow drawing. Any exceedance flooding has been demonstrated to be managed within the site where reasonably practicable.

This demonstrates that properties are unlikely to flood during extreme flood events.

8. Maintenance

The surface water network, including all pipes up to and including the outfall headwalls, is to be put forward for adoption by United Utilities under a S104 agreement. Those sewers are to be maintained under UUs maintenance regime.

All areas of public open space will be transferred to the management company for adoption and maintenance. This includes the overflow pond and any drainage (not adopted by UU), and land drains within the open space. The management and maintenance will be funded by the purchasers/owners of the development by way of an annual fee levied on the owner. In order to ensure the long term operation of the overflow pond, the maintenance contract will stipulate regular maintenance of the SUDS network.

A draft inspection & maintenance schedule for elements of the SUDS infrastructure is shown in Table 5.

Drainage Element	Maintenance Requirement	Frequency
Catchpits	Inspect. Remove excess silt & debris, Clear Blockage	Inspected every 3 months. Silt & debris removed as necessary.
Surface Water Culvert	Inspect for signs of blockage. CCTV inspection where required. Remove excess silt & debris, clear blockage. Repair if necessary.	Annually. Blockages, silt and debris removed as necessary , and any repairs carried out as necessary.
Ditches/Swales	Inspect. Remove excess vegetation. Clear blockages, silt & debris.	Inspected every 1 Month. Blockages, silt & debris removed as necessary.

Table 5

Refer to the Site Landscape Maintenance Schedule for further details on the site wide schedule.

9. Compliance with DEFRA's Non-statutory Technical Standards for Sustainable Drainage Systems dated March 2015

Flood risk outside the development

Criteria	Designers Comments
S1 Where the drainage system discharges to a surface water body that can accommodate uncontrolled surface water discharges without any impact on flood risk from that surface water body (e.g. the sea or a large estuary) the peak flow control standards (S2 and S3 below) and volume control technical standards (S4 and S6 below) need not apply.	The surface water discharges to existing watercourse/sewer, therefore this criteria does not apply.

Peak flow control

Criteria	Designers Comments
S2 For greenfield developments, the peak runoff rate from the development to any highway drain, sewer or surface water body for the 1 in 1 year rainfall event and the 1 in 100 year rainfall event should never exceed the peak greenfield runoff rate for the same event.	All proposed discharge rates are less than or equal to Qbar. Therefore this criteria is deemed to comply.
S3 For developments which were previously developed, the peak runoff rate from the development to any drain, sewer or surface water body for the 1 in 1 year rainfall event and the 1 in 100 year rainfall event must be as close as reasonably practicable to the greenfield runoff rate from the development for the same rainfall event, but should never exceed the rate of discharge from the development prior to redevelopment for that event.	The site is greenfield therefore not applicable. Therefore, this criteria is deemed to comply.

Volume control

Criteria	Designers Comments
S4 Where reasonably practicable, for greenfield development, the runoff volume from the development to any highway drain, sewer or surface water body in the 1 in 100 year, 6 hour rainfall event should never exceed the greenfield runoff volume for the same event.	As the infiltration test results do not allow infiltration drainage, it is not possible to reduce the run-off volume to the greenfield volume, therefore Criteria S6 will apply.
S5 Where reasonably practicable, for developments which have been previously developed, the runoff volume from the development to any highway drain, sewer or surface water body in the 1 in 100 year, 6 hour rainfall event must be constrained to a value as close as is reasonably practicable to the greenfield runoff volume for the same event, but should never exceed the runoff volume from the development site prior to redevelopment for that event.	The site is Greenfield therefore not applicable.
S6 Where it is not reasonably practicable to constrain the volume of runoff to any drain, sewer or surface water body in accordance with S4 or S5 above, the runoff volume must be discharged at a rate that does not adversely affect flood risk.	As the infiltration test results do not allow infiltration drainage, it is not possible to reduce the run-off volume to the greenfield volume, therefore the discharge rate has been reduced to a maximum of Qbar for all rainfall events up to and including 1 in 100 year 6 hour event.

Flood risk within the development

Criteria	Designers Comments
S7 The drainage system must be designed so that, unless an area is designated to hold and/or convey water as part of the design, flooding does not occur on any part of the site for a 1 in 30 year rainfall event.	The drainage system has been designed to ensure no flooding occurs for any part of the site for a 1 in 30 year event. Micro drainage simulation for a 1 in 30 year event are attached in Appendix D
S8 The drainage system must be designed so that, unless an area is designated to hold and/or convey water as part of the design, flooding does not occur during a 1 in 100 year rainfall event in any part of: a building (including a basement); or in any utility plant susceptible to water (e.g. pumping station or electricity substation) within the development.	<p>The drainage system has been designed to ensure no flooding to properties occurs for any part of the site for a 1 in 100 year 6 Hour event. For flows in excess of the 1 in 30 year event, flows are allowed to overflow into Long Term Storage areas located in public open spaces.</p> <p>Some minor flooding to highways is accepted for the 1 in 100 year 6 hour event. Flooding is only permitted where it can be demonstrated that minor flooded is contained wholly within the adopted highway and will not flood properties. The location and flood extent are shown on the Flood Routing and Overland Flow drawing.</p> <p>Micro drainage simulation for a 1 in 100 year event are attached in Appendix D</p>
S9 The design of the site must ensure that, so far as is reasonably practicable, flows resulting from rainfall in excess of a 1 in 100 year rainfall event are managed	All surface water drainage models have been modelled for storm events greater than the 1 in 100 Year event to determine the impact of flooding. The Flood locations are shown on the attached Flood Routing and over land flow drawing. Any exceedance flooding has been demonstrated to be managed within the site where reasonably practicable.

Structural integrity

Criteria	Designers Comments
S10 Components must be designed to ensure structural integrity of the drainage system and any adjacent structures or infrastructure under anticipated loading conditions over the design life of the development taking into account the requirement for reasonable levels of maintenance.	All Sewers are to be covered under a S104 agreement with United Utilities for future adoption. All sewers to be built to UU adoptable standards. A 12 month maintenance period is standard with all S104 sewers
S11 The materials, including products, components, fittings or naturally occurring materials, which are specified by the designer must be of a suitable nature and quality for their intended use.	<p>All main sewers to be constructed to adoptable standards.</p> <p>All SUDS to be constructed in accordance with the Typical details as provided.</p>

Designing for maintenance considerations

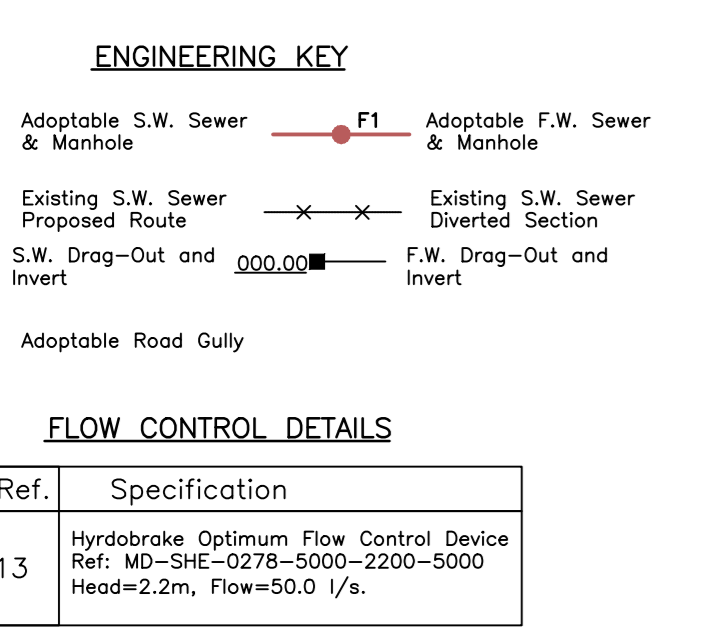
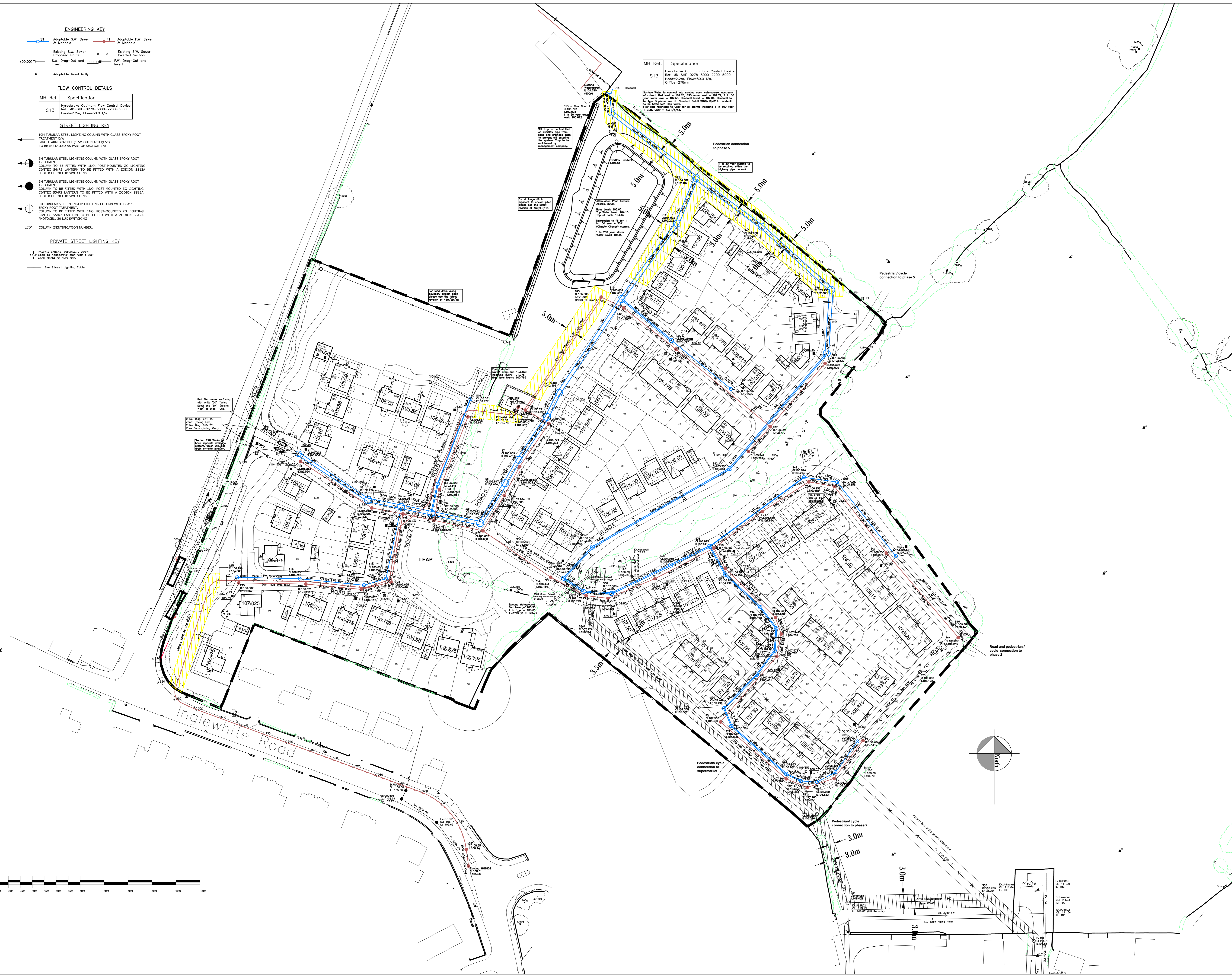
Criteria	Designers Comments
S12 Pumping should only be used to facilitate drainage for those parts of the site where it is not reasonably practicable to drain water by gravity.	Surface Water Pump Stations are not proposed on this development. A Foul ONLY Pump Stations is provided only where it is not possible to drain foul by gravity.

Construction

Criteria	Designers Comments
S13 The mode of construction of any communication with an existing sewer or drainage system must be such that the making of the communication would not be prejudicial to the structural integrity and functionality of the sewerage or drainage system.	All Sewers are to be covered under a S104 agreement with United Utilities for future adoption. All sewers to be built to UU adoptable standards. Connection to the ordinary watercourse will require LLFA land drainage consent. Details of the works have been submitted to the LLFA and subsequently approved. No works to within 8m of an ordinary watercourse will be permitted without LLFA approval.
S14 Damage to the drainage system resulting from associated construction activities must be minimised and must be rectified before the drainage system is considered to be completed.	All Sewers are to be covered under a S104 agreement with United Utilities for future adoption. All sewers to be built to UU adoptable standards. A 12 month maintenance period is standard with all S104 sewers. Connection to the ordinary watercourse will require LLFA land drainage consent. Details of the works have been submitted to the LLFA and subsequently approved. No works to within 8m of an ordinary watercourse will be permitted without LLFA consent.

Drawings
Topographical Survey

Drawings
Engineering Layout



MH Ref. Specification

MH Ref.	Specification
S13	Hydrobrake Optimum Flow Control Device Ref: HD-SHE-0278-5000-2200-5000 Head=2.2m, Flow=50.0 l/s. Orifice=2.275m

- WARNING TO HOUSE-PURCHASERS**
Property Misdescription Act 1990
- Buyers are warned that this is a working drawing and is not intended to be treated as descriptive material describing in relation to any particular property or development, any of the specified matters prescribed by any Order made under the above Act. The completion of this drawing may be subject to change at any time and alterations and variations can occur during the progress of the works without revision of the drawing. Consequently the layout, form, content and dimensions of the finished construction may differ materially from those shown. Nor do the contents of this drawing constitute a contract, part of any contract or warranty.
- GENERAL NOTES**
- All adoptable drainage works have been designed and are to be constructed in accordance with 'Sewers for Adoption, 6th Edition', and 'Urban Utilities Guidelines for Sewer for Adoption 6th Edition'. Where specification conflicts, the guidelines shall prevail.
 - United Utilities Standard details to be used are:
SNE/19/02/04 Manhole Type 1
SNE/19/02/04 Manhole Type 2 and Invert Access Detail
SNE/19/02/04 Show Marking Detail for Street Drains (Type 4)
SNE/19/02/04 Show Marking Detail for Street Drains (Type 4)
K005 and K006
SNE/19/02/04 Pipe Control Manhole Detail
SNE/19/02/04 External Bumping Detail
SNE/19/02/04 Pipe Bumping Detail
SNE/19/02/04 Variable Manhole - Guidance Notes
SNE/19/02/04 Inverted Type 1 and Typical Invert Detail
SNE/19/02/04 Typical Invert Detail Type 1 & Type 2
 - All pipe work shall be Extra Strength (Class) to BS 205 and BS 65 (SW pipes only).
 - All proposed concrete pipework shall be Class 125 in accordance with BS511 Part 1, BS EN 1916 and bear the BS Mark.
 - All concrete manholes and manhole covers and covers to be manufactured to BS EN 1917 and BS 5911 Part 3.
 6. All pipe work shall be installed in Class 5 granular surround unless otherwise stated.
 - All concrete manholes and manhole covers and covers to be manufactured to BS EN 1917 and BS 5911 Part 3.
 8. All pipe work shall be installed in Class 5 granular surround unless otherwise stated.
 9. All pipe work shall be installed in Class 5 granular surround unless otherwise stated.
 10. All proposed connections to the sewer shall be 150mm unless stated otherwise.
 11. All private house drainage shall be 100mm and all drop-out connections shall be 150mm at a minimum gradient of 1:80 unless otherwise stated and in accordance with BS EN 1916 Part 1 of the Building Regulations.
 12. Sewall from private surfaces shall not discharge across the highway. Gullies or channels shall be provided as appropriate to prevent this.
 13. Street crossings shall be provided at the inner tangent points of all junctions.
 14. Pipes shall be protected from concentrated loading by construction traffic during the construction period when installed cover to the pipe may not be available to support traffic.
 15. All pipe work shall be installed in Class 5 granular surround unless otherwise stated.
 16. Groundwater to ensure that pipe drainage be within the curbside of the plot they serve where possible and inspection covers kept within handrails where possible.
 17. Contractor to provide United Utilities with sufficient notice prior to commencement of Sewer works on their inspection telephone number: 0161 855 900.
 18. Contractor to obtain all necessary Highway opening notices from the relevant Local Authority, obtain approval to work on United Utilities Coverage Systems, obtain approval to method statement from the Environment Agency for any work affecting watercourses.
 19. All manholes adopted by SBC to have a minimum 150mm 150mm 150mm concrete surround to full depth.

STREET LIGHTING NOTES

1. Street lighting shall be factory supplied and include a compliance test certificate. Lighting Special Details are specified in sheets N12, N14 and N15. If required, maximum cable size with leader pillars shall be 'Street' conductor size.
2. The 'N' series for Lighting Special Details shall be used in conjunction with this drawing.
3. All new lighting columns shall be American Signage Systems water specifications and in accordance with N12. A numbering schedule shall be obtained for all new columns from Lancashire County Council (01772 53702) upon completion. Street lighting shall be installed in accordance with the following notes:
4. The regional electric company is Electricity North West. Use an Independent Connection Provider can be used when the IIC meter for supply point connections, transformers and connections.
5. All supply cables to new or existing lighting columns shall be enclosed in 50/100mm internal diameter orange, medium density polyethylene (MDPE) duct, unless otherwise stated.
6. All street lighting equipment shall be set at the specified adjustable footcandle on verge. Lighting columns shall be set at the back of the footway with the road facing across the road.

REV	DESCRIPTION	DATE	DRAWN
30	FFL for Plots 71-124 revised; Drop outs revised and notes added	12.07.19	CD
29	FFL for Plots 71-85 revised	19.06.19	CD
28	FFL for Plots 88-92 revised	04.04.19	CD
27	REVISION IN LINE WITH WITH REPLAN LAYOUT 7, ROAD	21.11.18	CD
2	STREET LIGHTING BOLLARD ADDED TO PLOT 3.	29.10.18	FB
Y	STREET LIGHT LCG4 AMENDED TO LCG5.	24.05.18	FB
X	CRICKET PITCH DRAINAGE DITCH REVISED	23.05.18	CD
W	LEVELS REVISED FOR ROADS 1 & 6; FFLS REVISED FOR PLOTS 30-36; 92-97; 78-80 & 88-93; S39 MOVED; SW DIVERSION CONNECTION REVISED	24.04.18	CD
V	STREET LIGHTING AMENDED TO SIT WITHIN ADAPTABLE HIGHWAY	21.02.18	FB
U	DRAINAGE DITCH ALONG SOUTHERN BOUNDARY OF CRICKET PITCH REVISED TO LAND DRAIN	05.02.18	CD
T	DRAINAGE DITCH AROUND CRICKET PITCH DESIGNED; POND REVISED TO SUIT.	31.01.18	CD
S	PRIVATE STREET LIGHTING BOLLARDS ADDED.	12.01.18	FB
R	DRAINAGE TO PLOTS 37-46 REVISED	05.01.18	CD
Q	TURNING HEADS FOR ROADS 3-5 REVISED	29.11.17	CD
P	FFL'S PLOTS 24-28 REVISED	13.11.17	CD
N	ROAD 1 CULVERT DETAILS ADDED; TURNING HEADS REVISED IN LINE WITH VEHICLE TRACKING REQUIREMENTS	25.10.17	CD
M	FFL'S REVISED TO SUIT NEW EXTERNAL LEVELS PLANS	19.09.17	CD
L	1 IN 200 YEAR WATER LEVEL NOTE ADDED TO POND; RISING MAIN SIZE REVISED, AND REDUCED DOWN TO ONE	08.02.17	CD
K	POND WATER LEVEL AND TOP BANK LEVEL REDUCED; RISING MAIN ROUTE AND SIZE REVISED; F44 INVERT LEVEL REVISED	10.01.17	FB
J	FFL'S UPDATED TO SUIT EXTERNAL LEVELS; PRIVATE DRAINAGE ALSO UPDATED; F43-F19 PIPE REVISED TO OVAL; OTHER AMENDMENTS IN LINE WITH LU COMMENTS	07.12.16	CD
I	FFL'S UPDATED TO SUIT EXTERNAL LEVELS; PRIVATE DRAINAGE ADDED.	24.10.16	FB
H	FFL'S UPDATED TO SUIT EXTERNAL LEVELS; SECOND RISING MAIN & DIAMETERS ADDED; INCOMING INVERT REVISED.	20.10.16	FB
G	FFL'S REVISED; NAME PLATES, TACTILE CROSSINGS AND STREET LIGHTS ADDED; F40 REMOVED; F39-F42 REVISED; DIVERSION ROUTE REVISED	07.10.16	FB/CD
F	FFL'S REVISED TO SUIT EXTERNAL LEVELS; SCHEDULES; FOLL ONLINE STORAGE ADDED; DIVERSION LEVELS ADDED	11.08.16	CD
E	FULL DRAINAGE DESIGN DUE TO OUTFALL CHANGES & POND PUT IN	06.04.16	CD
D	FULL DRAINAGE DESIGN DUE TO FLOW RATE CHANGES & POND REMOVED	23.03.16	CD

BARRATT HOMES
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Tel: 0161 872 0161
Fax: 0161 855 2828

Job: Chipping Lane Longridge
Title: Engineering Layout

Design By: CD	Date: Feb 2016	Drawing Number: 459/ED/02	Rev: 30
CAD By: CD	Scale: 1:500 @ A0		

Drawings

Surface Water Drainage Area Plan

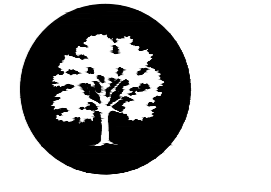


- WARNING TO HOUSE-PURCHASERS**
Property Misdescriptions Act 1991
- Buyers are warned that this is a working drawing and is not intended to be treated as definitive material descriptions in relation to any particular property or development. The contents of this drawing may be subject to change at any time and alterations and variations can occur during the progress of the works without provision of the drawing. Consequently the layout, form, content and dimensions of the finished construction may differ materially from those shown. Nor do the contents of this drawing constitute a contract, part of any contract or warranty.
- ENGINEERING NOTES**
- All applicable drainage works have been designed and are to be constructed in accordance with Towns for Adoption, the Code of Practice for Sewer for Adoption and BS EN 12454-2. Where specification conflicts, UK guidelines shall take precedence.
 - United Utilities Standard details to be used are:
 SWS/01/0000 Typical Outfall Details D, E and F
 SWS/01/0001 Typical Details C & H
 SWS/01/0002 Detail C and safety grille to manhole access shaft
 SWS/01/0003 Standard Detail No 4 (Type 1 Manhole)
 SWS/01/0004 Standard Detail No 5 (Type 2 Manhole)
 SWS/01/0005 Standard Detail No 6 (Manhole Access)
 SWS/01/0006 Standard Details 7, 8, 9 and 10
 SWS/01/0007 Lockers, Safety Chains and Handrails
 SWS/01/0008 Typical Details A, B, and C
 SWS/01/0009 General and Internal Roadways and Connection Details
 SWS/01/0010 Manhole and French Drain Details
 SWS/01/0011 Pipe Treatment Details
 SWS/01/0012 Typical Details 1 and 2 - Segmental Shafts
 SWS/01/0013 Pipe Treatment Details
 SWS/01/0014 Manhole Access Details
 SWS/01/0015 Shallow Large Diameter Sewer
 - All clay pipe work shall be Extra Strength Clayware to BS 206 and BS 67 (SR pipes only).
 - All general concrete pipework shall be to Class 120 in accordance with BS911 Part 1, BS EN 1916 and bear the BS kilnmark.
 - All applicable drainage to be bedded in Class 5 granular surround unless otherwise stated.
 - All concrete manholes and coverways rings, concrete cover slabs and Gullies to be manufactured to BS EN 1917 and BS 1510/Part 3.
 - Using Manholes to Drainage Datum. Contractor to ensure that this drawing is read in conjunction with the site specific Topographical Survey provided by Barratt Manchester and the Benchmark information provided.
 - This drawing is to be read in accordance with all other relevant drawings.
 - The contractor shall be responsible for ensuring that any existing street levels indicated on the drawings are correct before work commences.
 - All proposed connections to the sewer shall be 150mm unless stated otherwise.
 - All private house drainage shall be 150mm and all drop-out connections shall be 150mm at a minimum gradient of 1:80 unless otherwise stated and laid in accordance with Part H of the Building Regulations.
 - Rooftop from private surfaces shall not discharge across the highway. Gullies or channels shall be provided as appropriate to prevent this.
 - Tree coverings shall be provided at the near target points of all junctions.
 - Pipes shall be protected from concentrated loading by construction traffic during the construction period when insufficient cover to the pipe may make them vulnerable to damage.
 - Soils CBR tests of the road formation level are to be carried out to determine the depth of pavement construction required. This is to be approved by the adopting authority prior to construction of the road pavements.
 - Groundwater to ensure that pipe drainage is within the surface of the plot they serve where possible and inspection covers kept within roadways where possible.
 - Contractor to provide United Utilities with sufficient notice prior to commencement of sewer works on their inspection telephone number: Tel 0845 602 0406.
 - Contractor to obtain all necessary highway crossing notices from the relevant Local Authority, obtain approval to work on United Utilities Covering System, obtain approval to install pavement from the Government Agency for any works affecting a watercourse.
 - All methods adopted by MMC to have a minimum 150mm S4 concrete surround to full depth.

ENGINEERING KEY

1.000 = 0.168 Ha	5.000 = 0.033 Ha
1.001 = 0.034 Ha	5.001 = 0.068 Ha
1.002 = 0.039 Ha	5.002 = 0 Ha
1.003 = 0.030 Ha	5.003 = 0 Ha
1.004 = 0.049 Ha	5.004 = 0.097 Ha
1.005 = 0 Ha	5.005 = 0.022 Ha
1.006 = 0 Ha	5.006 = 0.021 Ha
1.007 = 0.057 Ha	5.007 = 0.033 Ha
1.008 = 0.046 Ha	5.008 = 0 Ha
1.009 = 0.022 Ha	5.009 = 0.087 Ha
1.010 = 0.068 Ha	5.010 = 0 Ha
1.011 = 0 Ha	5.011 = 0.016 Ha
1.012 = 0 Ha	5.012 = 0.050 Ha
3.000 = 0.051 Ha	5.013 = 0.011 Ha
3.001 = 0.016 Ha	5.014 = 0.043 Ha
3.002 = 0.060 Ha	5.015 = 0.099 Ha
3.003 = 0.115 Ha	5.016 = 0.011 Ha
3.000 = 0.075 Ha	5.017 = 0.015 Ha
3.001 = 0.009 Ha	5.018 = 0.060 Ha
4.000 = 0.044 Ha	5.019 = 0.119 Ha
4.001 = 0.084 Ha	5.020 = 0.035 Ha
	5.021 = 0 Ha
	5.022 = 0.076 Ha
	6.000 = 0.052 Ha
	6.001 = 0.090 Ha
	6.002 = 0.036 Ha
	6.003 = 0.282 Ha
	7.000 = 0.034 Ha

B	REVISED IN LINE WITH ENGINEERING LAYOUT REV C	18.07.16	CD
A	FULL DRAINAGE DESIGN DUE TO FLOW RATE CHANGES & POND REMOVED	24.03.16	CD
REV	DESCRIPTION	DATE	DRAWN



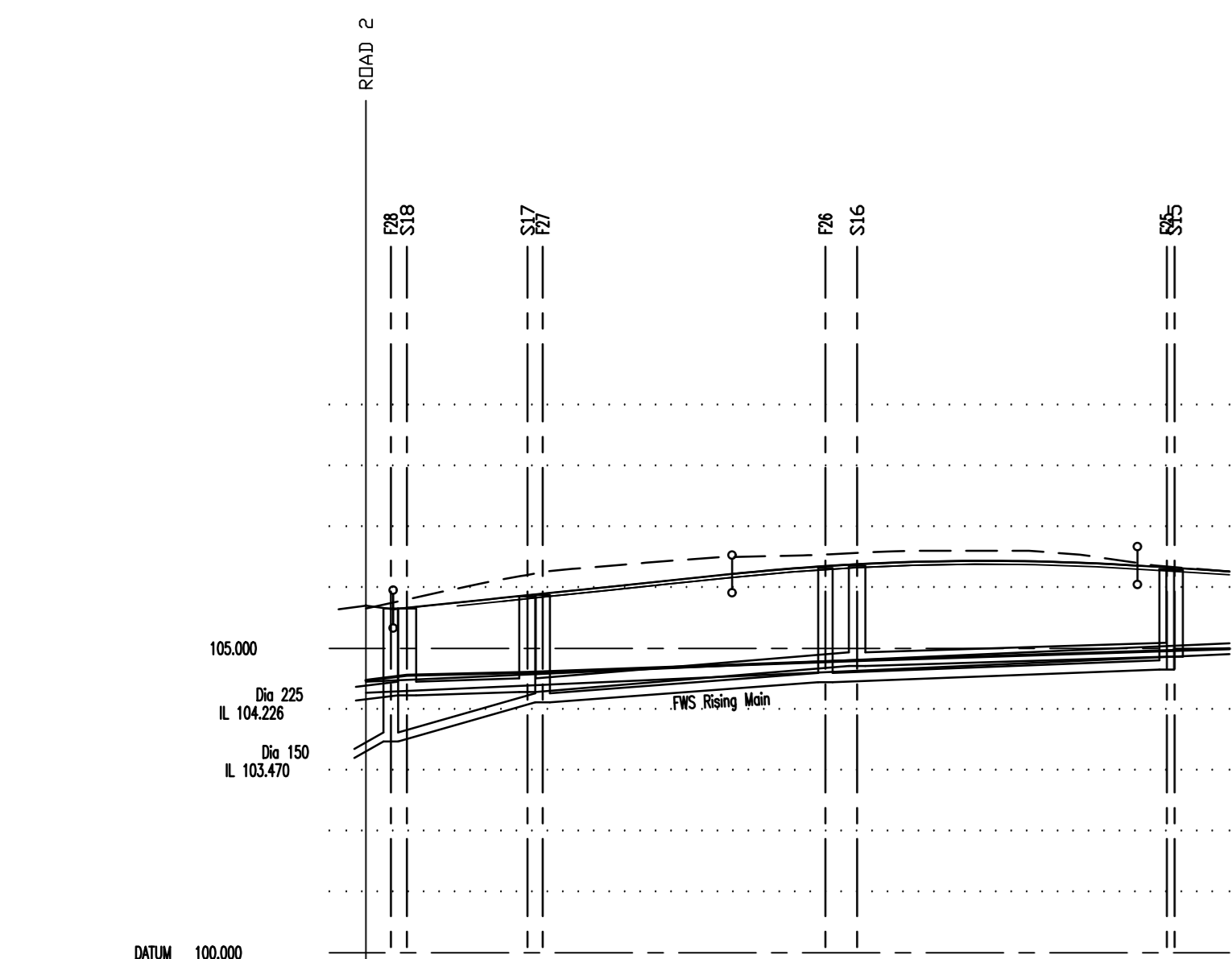
BARRATT HOMES

MANCHESTER
Barratt Homes Manchester
(A division of BDM Trading Ltd)
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Manchester
M16 9HQ
Tel: 0161 872 0161
Fax: 0161 855 2828

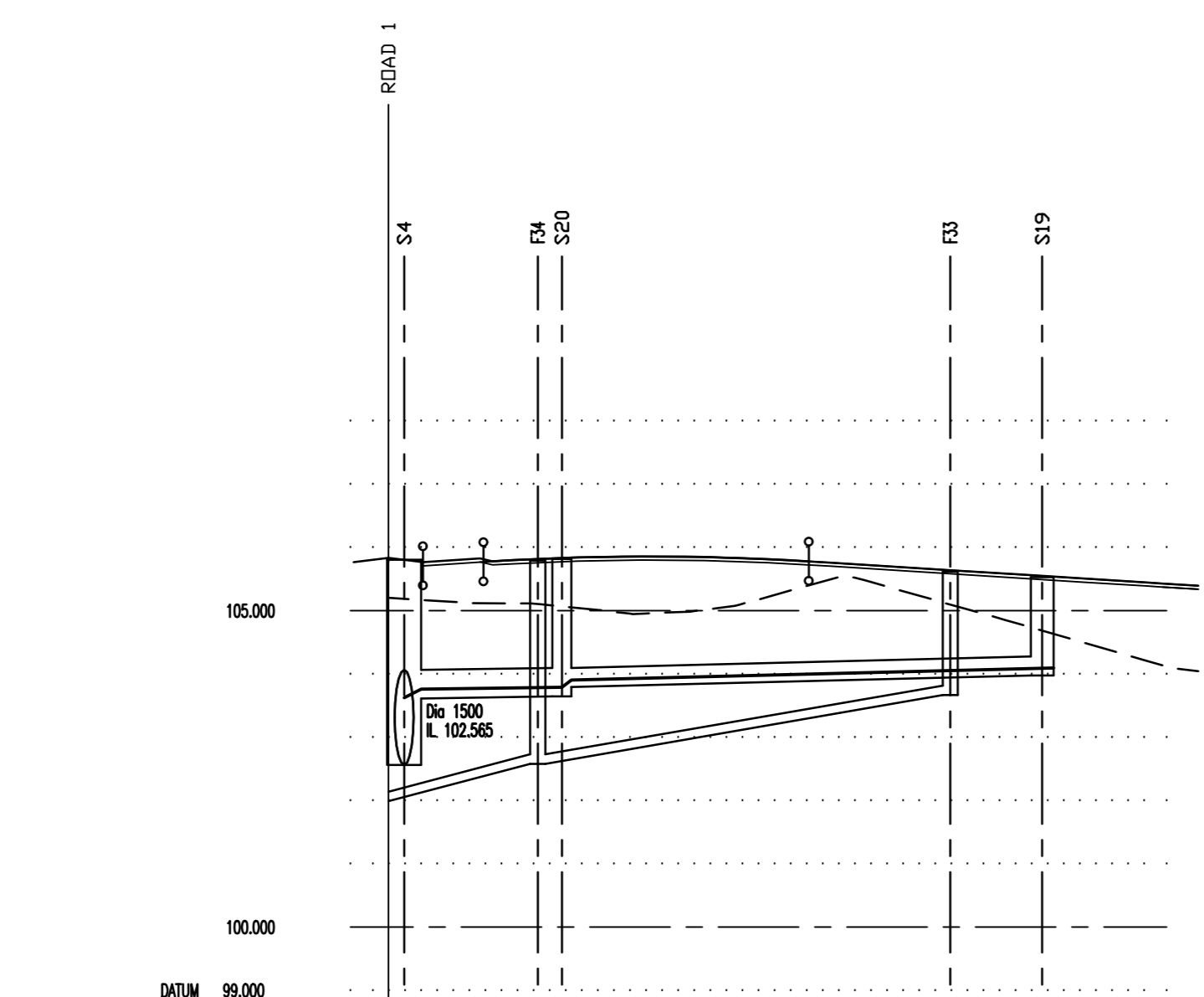
Job	Chipping Lane Longridge		
Task	Surface Water Drainage Area Plan		
Design By	Date	Drawing Number	Rev
CD	Feb 2016	459/ED/04	B
CAD By	Scale		
CD	1:500 @ A0		

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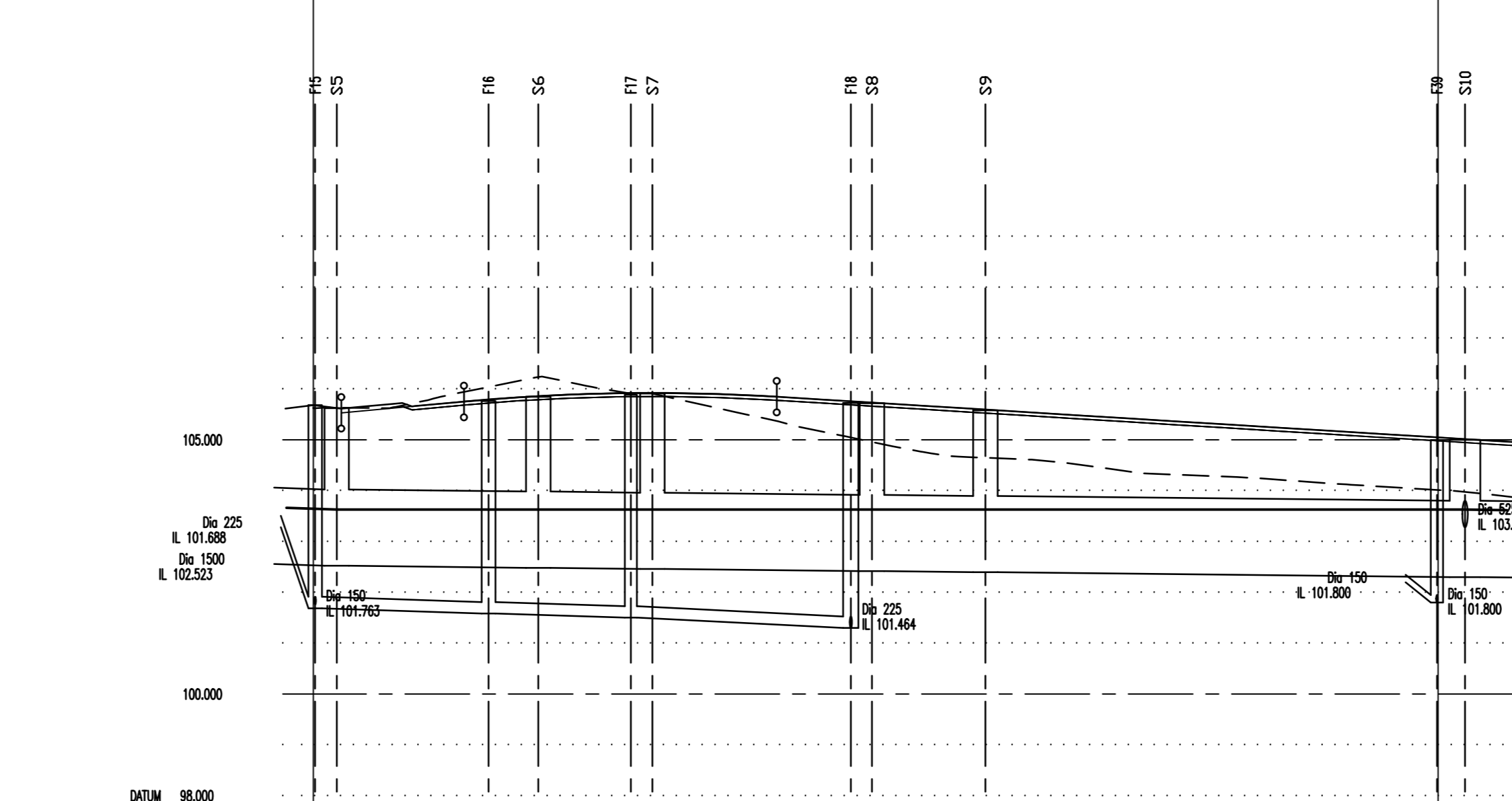
Drawings
Longsections



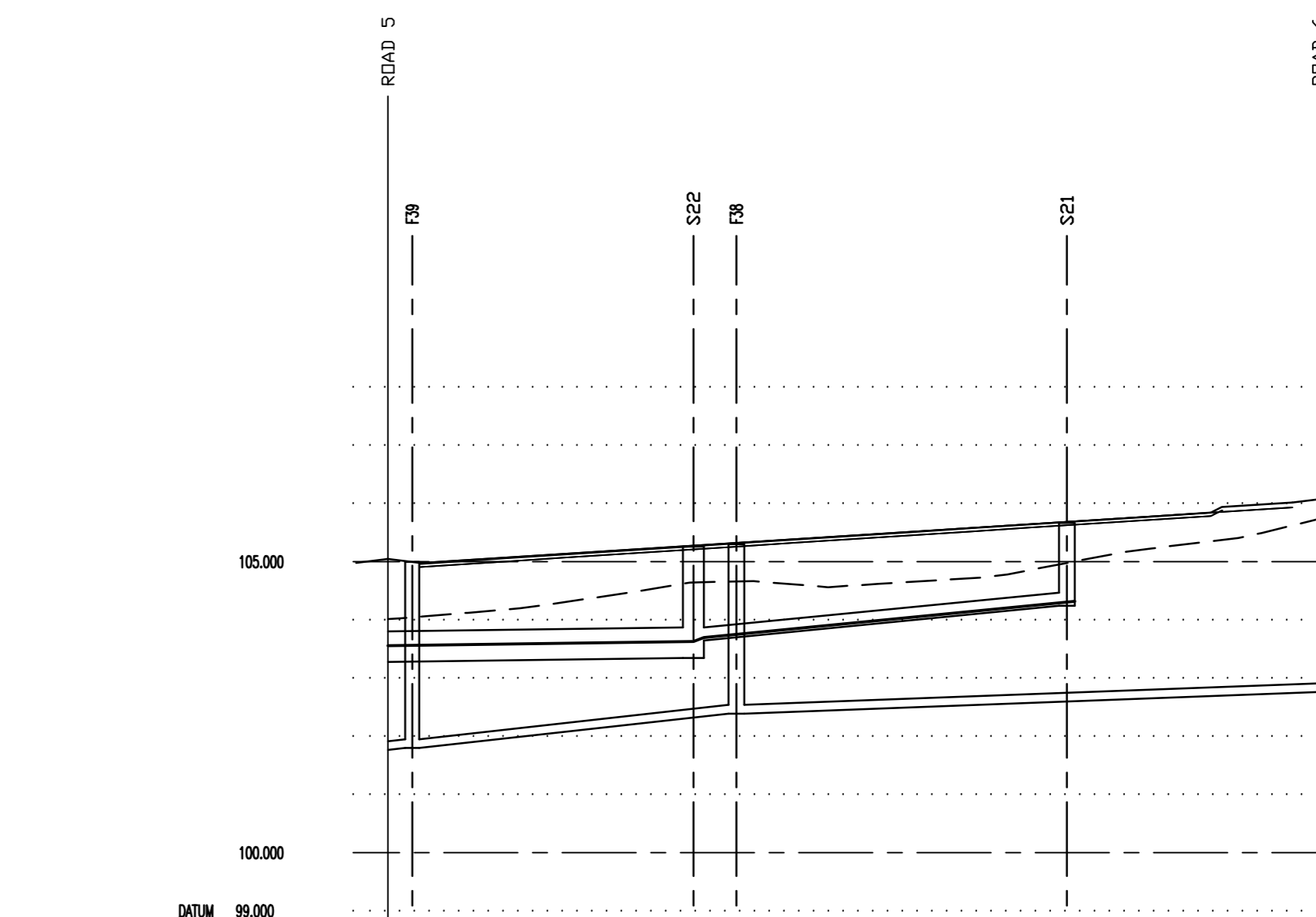
CHANCE	EXISTING GROUND LEVEL	ALIGNMENT LEVEL	VERTICAL ALIGNMENT	HORIZONTAL ALIGNMENT	LEFT HAND CHANNEL	RIGHT HAND CHANNEL	STORMWATER COVER LEVEL	STORMWATER INVERT	STORMWATER DETAILS	STORMWATER LENGTH	STORMWATER DIMENSION	FOULWATER COVER LEVEL	FOULWATER INVERT	FOULWATER DETAILS	FOULWATER LENGTH	FOULWATER DIMENSION
0.000	105.64	105.41			105.06	105.06	105.05	104.25	Pipe 2.002 Dia 225 Circular CLW 1 in 170	8.581	CLASS 5 BED AND SURROUND	105.05	105.07	Pipe 3.002 Dia 150 Circular CLW 1 in 20	12.877	CLASS 5 BED AND SURROUND
0.000	105.64	105.41	C = 2.03%	R = 32.000	105.06	105.06	105.05	104.25	Pipe 2.001 Dia 225 Circular CLW 1 in 51	26.997	CLASS 5 BED AND SURROUND	105.05	105.07	Pipe 3.001 Dia 150 Circular CLW 1 in 20	21.223	CLASS 5 BED AND SURROUND
0.000	105.64	105.41	L = 33.265 K = -10.0	R = 28.000	105.06	105.06	105.05	104.25	Pipe 2.000 Dia 225 Circular CLW 1 in 170	26.678	CLASS 5 BED AND SURROUND	105.05	105.07	Pipe 3.000 Dia 150 Circular CLW 1 in 20	28.025	CLASS 5 BED AND SURROUND
0.000	105.64	105.41	E = -1.250%	R = 28.000	105.06	105.06	105.05	104.25				105.05	105.07			
0.000	105.64	105.41	F = -0.800%		105.06	105.06	105.05	104.25				105.05	105.07			



CHANCE	EXISTING GROUND LEVEL	ALIGNMENT LEVEL	VERTICAL ALIGNMENT	HORIZONTAL ALIGNMENT	LEFT HAND CHANNEL	RIGHT HAND CHANNEL	STORMWATER COVER LEVEL	STORMWATER INVERT	STORMWATER DETAILS	STORMWATER LENGTH	STORMWATER DIMENSION	FOULWATER COVER LEVEL	FOULWATER INVERT	FOULWATER DETAILS	FOULWATER LENGTH	FOULWATER DIMENSION
0.000	105.38	105.30			105.14	105.14	105.09	104.67	Pipe 3.001 Dia 300 Circular CLW 1 in 40	12.524	CLASS 5 BED AND SURROUND	105.09	105.11	Pipe 5.001 Dia 125 Circular CLW 1 in 20	11.165	CLASS 5 BED AND SURROUND
0.000	105.38	105.30	C = 0.33%	R = 20.000	105.14	105.14	105.09	104.67	Pipe 3.000 Dia 300 Circular CLW 1 in 40	37.825	CLASS 5 BED AND SURROUND	105.09	105.11	Pipe 5.000 Dia 125 Circular CLW 1 in 20	32.509	CLASS 5 BED AND SURROUND
0.000	105.38	105.30	L = 25.726 K = -10.0	R = 20.000	105.14	105.14	105.09	104.67				105.09	105.11			
0.000	105.38	105.30	C = -1.250%	R = 20.000	105.14	105.14	105.09	104.67				105.09	105.11			
0.000	105.38	105.30	F = -0.800%		105.14	105.14	105.09	104.67				105.09	105.11			



CHANCE	EXISTING GROUND LEVEL	ALIGNMENT LEVEL	VERTICAL ALIGNMENT	HORIZONTAL ALIGNMENT	LEFT HAND CHANNEL	RIGHT HAND CHANNEL	STORMWATER COVER LEVEL	STORMWATER INVERT	STORMWATER DETAILS	STORMWATER LENGTH	STORMWATER DIMENSION	FOULWATER COVER LEVEL	FOULWATER INVERT	FOULWATER DETAILS	FOULWATER LENGTH	FOULWATER DIMENSION
0.000	105.67	105.53			105.38	105.38	105.52	105.03	Pipe 1.004 Dia 150 Circular CLW 1 in 100	18.697	CLASS 5 BED AND SURROUND	105.52	105.54	Pipe 1.014 Dia 125 Circular CLW 1 in 100	17.155	CLASS 5 BED AND SURROUND
0.000	105.67	105.53	C = 1.846%	R = 15.000	105.38	105.38	105.52	105.03	Pipe 1.005 Dia 150 Circular CLW 1 in 40	11.261	CLASS 5 BED AND SURROUND	105.52	105.54	Pipe 1.015 Dia 125 Circular CLW 1 in 100	13.743	CLASS 5 BED AND SURROUND
0.000	105.67	105.53	L = 30.753 K = -10.0	R = 15.000	105.38	105.38	105.52	105.03	Pipe 1.006 Dia 150 Circular CLW 1 in 49	21.474	CLASS 5 BED AND SURROUND	105.52	105.54	Pipe 1.016 Dia 125 Circular CLW 1 in 100	21.770	CLASS 5 BED AND SURROUND
0.000	105.67	105.53	C = -1.326%	R = 15.000	105.38	105.38	105.52	105.03	Pipe 1.007 Dia 150 Circular CLW 1 in 511	11.233	CLASS 5 BED AND SURROUND	105.52	105.54			
0.000	105.67	105.53	F = -0.813%		105.38	105.38	105.52	105.03	Pipe 1.008 Dia 150 Circular CLW 1 in 500	47.046	CLASS 5 BED AND SURROUND	105.52	105.54			



CHANCE	EXISTING GROUND LEVEL	ALIGNMENT LEVEL	VERTICAL ALIGNMENT	HORIZONTAL ALIGNMENT	LEFT HAND CHANNEL	RIGHT HAND CHANNEL	STORMWATER COVER LEVEL	STORMWATER INVERT	STORMWATER DETAILS	STORMWATER LENGTH	STORMWATER DIMENSION	FOULWATER COVER LEVEL	FOULWATER INVERT	FOULWATER DETAILS	FOULWATER LENGTH	FOULWATER DIMENSION
0.000	104.64	104.61			104.83	104.83	104.65	104.25	Pipe 4.001 Dia 300 Circular CLW 1 in 398	27.069	CLASS 5 BED AND SURROUND	104.65	104.67	Pipe 6.003 Dia 150 Circular CLW 1 in 42	10.422	CLASS 5 BED AND SURROUND
0.000	104.64	104.61	C = 0.227%	R = 15.000	104.83	104.83	104.65	104.25	Pipe 4.000 Dia 300 Circular CLW 1 in 54	22.096	CLASS 5 BED AND SURROUND	104.65	104.67	Pipe 6.002 Dia 150 Circular CLW 1 in 47	27.728	CLASS 5 BED AND SURROUND
0.000	104.64	104.61			104.83	104.83	104.65	104.25				104.65	104.67	Pipe 6.001 Dia 150 Circular CLW 1 in 138	51.037	CLASS 5 BED AND SURROUND

- WARNING TO HOUSE-PURCHASERS**
Property Descriptions Act 1991
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- ENGINEERING LEGEND NOTES**
- All adoptable drainage works have been designed and are to be constructed in accordance with 'Notes for Adoption, the Rules and Tables' published by the Institution of Civil Engineers, when specification conflict, the latter shall take precedence.
 - Unless otherwise stated, all works shall be in accordance with the following:
 - Standard Details A, E and F
 - Standard Detail G & H
 - Standard Detail No 4 (Type 1 Work)
 - Standard Detail No 5 (Type 2 Work)
 - Standard Detail No 6 (Manhole Access)
 - Standard Detail No 7 (Type 1 Work)
 - Standard Detail No 8 (Type 2 Work)
 - Standard Detail No 9 (Type 3 Work)
 - Standard Detail No 10 (Type 4 Work)
 - Standard Detail No 11 (Type 5 Work)
 - Standard Detail No 12 (Type 6 Work)
 - Standard Detail No 13 (Type 7 Work)
 - Standard Detail No 14 (Type 8 Work)
 - Standard Detail No 15 (Type 9 Work)
 - Standard Detail No 16 (Type 10 Work)
 - Standard Detail No 17 (Type 11 Work)
 - Standard Detail No 18 (Type 12 Work)
 - Standard Detail No 19 (Type 13 Work)
 - Standard Detail No 20 (Type 14 Work)
 - Standard Detail No 21 (Type 15 Work)
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 - Standard Detail No 24 (Type 18 Work)
 - Standard Detail No 25 (Type 19 Work)
 - Standard Detail No 26 (Type 20 Work)
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 - Standard Detail No 31 (Type 25 Work)
 - Standard Detail No 32 (Type 26 Work)
 - Standard Detail No 33 (Type 27 Work)
 - Standard Detail No 34 (Type 28 Work)
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 - Standard Detail No 94 (Type 88 Work)
 - Standard Detail No 95 (Type 89 Work)
 - Standard Detail No 96 (Type 90 Work)
 - Standard Detail No 97 (Type 91 Work)
 - Standard Detail No 98 (Type 92 Work)
 - Standard Detail No 99 (Type 93 Work)
 - Standard Detail No 100 (Type 94 Work)
 - All clay pipe work shall be Extra Strength Durocrete to BS 205 and BS 45 (DN pipes only).
 - All proposed concrete pavements shall be to Class 105 in accordance with BS 5911 Part 1, BS EN 12184-2 and BS EN 12184-3.
 - All adoptable drainage to be bedded in Class 5 granular material unless otherwise stated.
 - All concrete manholes and soakways (wgs, concrete cover slabs and curbs) to be manufactured to BS EN 1917 and BS 5911 Part 1.
 - Rising Mains to be Black Polyethylene Pipes complying to BS EN 12242-2. Polyethylene fittings, including loose joints, and electro-fusion fittings shall comply with BS EN 12242-2.
 - All levels relate to Ordnance Datum. Contractor to ensure that the drawing is read in conjunction with the site specific Topographical Survey provided by Barratt Manchester and the Benchmark information provided.
 - This drawing is to be read in accordance with all other relevant drawings.
 - The contractor shall be responsible for ensuring that any existing invert levels indicated on the drawings are correct before work commences.
 - All proposed connections to the sewer shall be 150mm unless stated otherwise.
 - All private house drainage shall be 100mm and all drop-out connections shall be 150mm at a minimum gradient of 1:100 unless otherwise stated and in accordance with Part 4 of the Building Regulations.
 - Ruoff from private surfaces shall not discharge across the highway, culvert or channels that be provided or otherwise to prevent this.
 - Prom crossings shall be provided at the lower target points of all junctions.
 - Pipes shall be protected from concentrated loading by construction traffic during the construction period when installed close to the pipe may make them vulnerable to damage.
 - Under no circumstances shall the road formation level be used to determine the depth of the road pavement.
 - Contractor to ensure that all drainage is within the curbside of the plot if same where possible and inspection covers kept within kerbside where possible.
 - Contractor to provide United Utilities with sufficient notice prior to commencement of Sewer works on their inspection telephone number: 08 000 922 0468.
 - Contractor to obtain all necessary Highway opening notices from the relevant Local Authority, obtain approval to work on United Utilities' sewerage system, obtain approval to install material from the Environment Agency for any works affecting a watercourse.

SCALES
HERE: 1/200
OVER: 1/100

REV	DESCRIPTION	DATE	DRAWN
G	Roads 4 & 5 extended	28.11.17	CD
F	Roads 3 & 4 extended	30.10.17	CD
E	Second rising main removed	08.02.17	CD
D	Rising Main route revised: removed from Road 5, replaced by Street 2, added to Road 5. Gradients of FW revised in Road 5.	16.11.16	CD
C	Second rising main removed from Road 5.	08.10.16	CD
B	FW revised in Road 5 to 30 year storm.	15.08.16	CD
A	F40 removed, added to Road 5 section. Material added to 1500 dia. pipes.	15.08.16	CD

BARRATT HOMES
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Barratt Homes Manchester
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4 Brindley Road
City Park
Manchester
M16 9HQ
Tel: 0161 872 0161
Fax: 0161 855 2828

Job: Chipping Lane Longridge

Title: Engineering Longsections
Sheet 2
Roads 3-5 & 7

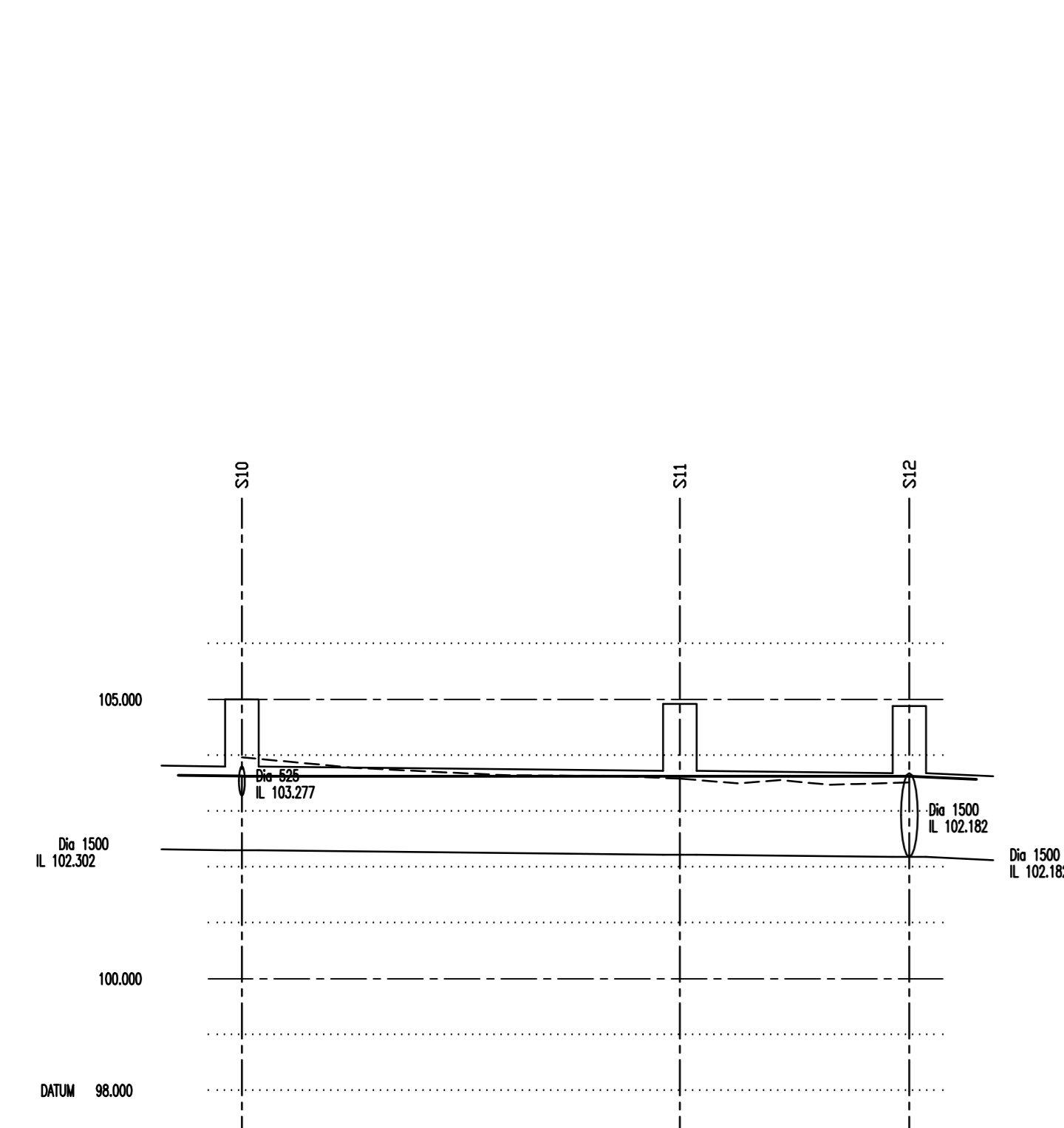
Drawn By: CD	Date: 10.08.16	Drawing Number: 459/ED/11	Rev: G
CAD By: CD	Scale: 1:500H, 1:100V		

WARNING TO HOUSE-PURCHASERS
 Property Descriptions Act 1991

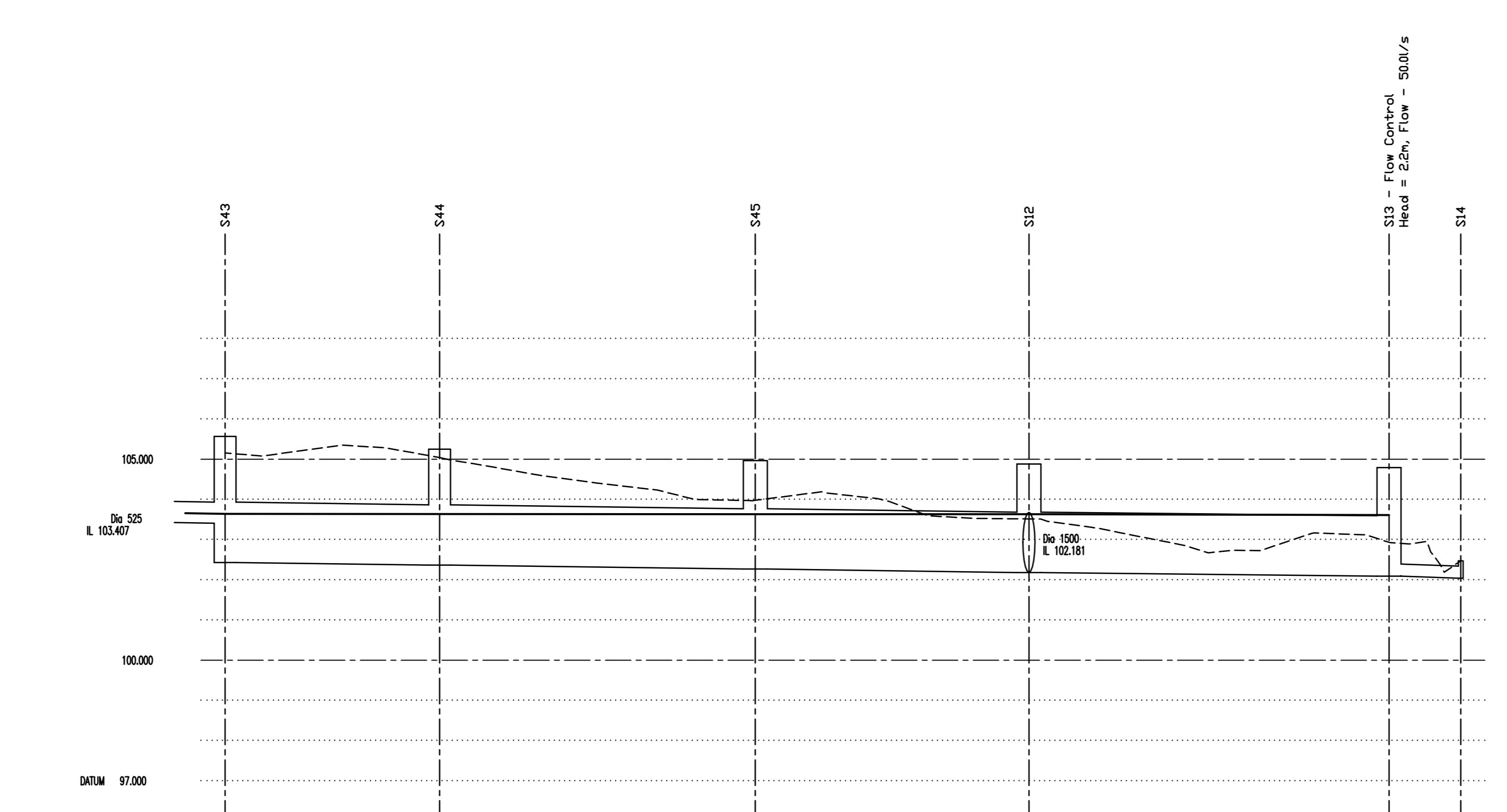
Buyers are warned that this is a working drawing and is not intended to be treated as descriptive material describing, in relation to any particular property or development, any of the specified matters prescribed by any Order made under the above Act. The contents of this drawing may be subject to change at any time and alterations and variations can occur during the progress of the work without revision of the drawing. Consequently the layout, form, content and dimensions of the finished construction may differ materially from those shown. Nor do the contents of this drawing constitute a contract, part of any contract or warranty.

- ENGINEERING LAYOUT NOTES**
- All adaptable drainage works have been designed and are to be constructed in accordance with 'Codes for Adoption, 6th Edition, and United Utilities' Guidelines for Sewer for adoption 6th Edition. Where specification conflicts, UU guidelines shall take precedence.
 - United Utilities Standard details to be used are:
 - SNU(0)/0008 Typical Outfall Details 0, E and F
 - SNU(0)/0010 Typical Details 0 to 4
 - Outlet Gully and sully grille to materials access shaft
 - SNU(0)/0018 Standard Detail No 4 (Type 1 Manhole)
 - Standard Detail No 3 (Type 2 Manhole)
 - Standard Detail No 6 (Manhole Access)
 - SNU(0)/0022 Standard Details 7, 8, 9 and 10
 - Ladders, Safety Covers and Handrails
 - SNU(0)/0028 Typical Details A, B, and C
 - External and Internal Blockings and Connection Details
 - SNU(0)/0046 Manhole and Inlet Pipe Details
 - MEL, MHL, MSL and PSE
 - SNU(0)/0059 Manhole Details and Block Invert Renovation
 - MHL, MSL, MSL and SS1
 - SNU(0)/0088 Typical Details 1 and 2 - Segregated Shafts
 - SNU(0)/0104 Pipe Connection Details
 - All city pipe work shall be Extra Strength Clayware to BS 200 and BS 45 (SR pipe only).
 - All general concrete pipework shall be to Class 120 in accordance with BS5911 Part 1, BS EN 1916 and meet the BS Minimum.
 - All adaptable drainage to be bedded in Class 5 granular surround unless otherwise stated.
 - All concrete manholes and soakways steps, concrete cover slabs and Cms to be manufactured to BS EN 1917 and BS 5811 Part 3.
 - Rising Mains to be Black Polyethylene Pipes complying to BS EN 12244-2. Polyethylene fittings, including fusion joints, and electro-fusion fittings shall comply with BS EN 12244-2.
 - All levels shall be Ordnance Datum. Contractor to ensure that this drawing is read in conjunction with the site specific Topographical Survey provided by Barratt Manchester and the Benchmark information provided.
 - This drawing is to be read in accordance with all other relevant drawings.
 - The contractor shall be responsible for ensuring that any existing invert levels indicated on the drawings are correct before work commences.
 - All proposed connections to the sewer shall be 150mm unless stated otherwise.
 - All private house drainage shall be 100mm and all drainage connections shall be 150mm of a minimum gradient of 1:80 unless otherwise stated and laid in accordance with Part H of the Building Regulations.
 - Runoff from private surfaces shall not discharge across the highway. Gullies or channels shall be provided as appropriate to prevent this.
 - From crossings shall be provided at the inner tangent points of all junctions.
 - Pipes shall be protected from concentrated loading by construction traffic during the construction period where installation cover to the pipe may make them vulnerable to damage.
 - Initial OBE levels of the road formation level are to be carried out to determine the depth of pavement construction required. This is to be approved by the adopting authority prior to construction of the road pavement.
 - Contractor to ensure that pit drainage be within the curbside of the pit they serve where possible and inspection covers kept within handrails where possible.
 - Contractor to provide United Utilities 1850mm with sufficient notice prior to commencement of sewer works on their inspection line/line number. See SWS 002 0002.
 - Contractor to obtain all necessary Highway opening notices from the relevant Local Authority, obtain approval to work on United Utilities Sewerage System, obtain approval to method statement from the Government Agency for any works affecting a watercourse.

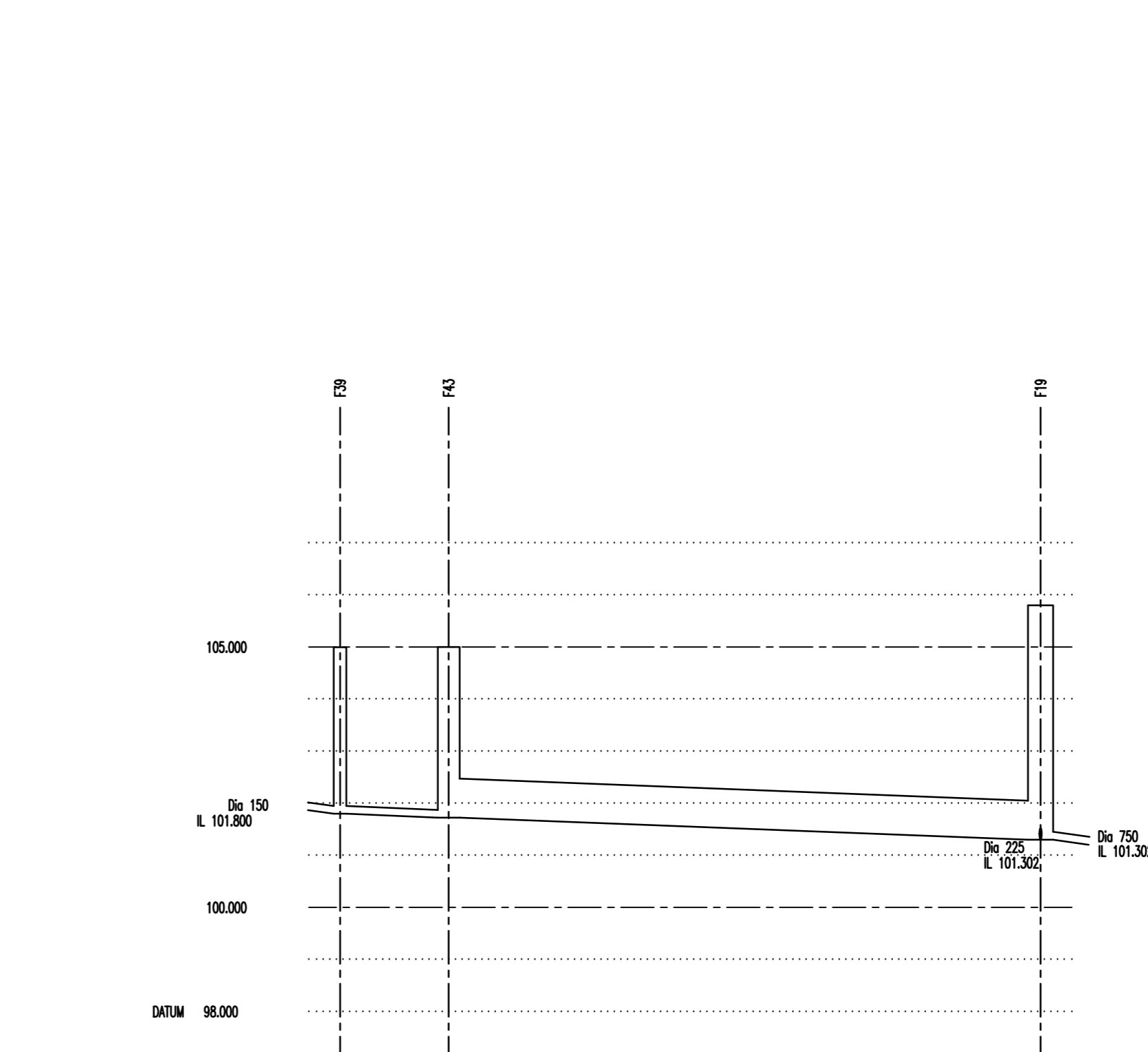
SCALES
 HORIZ: 1/200
 VERT: 1/100



GROUND LEVEL	102.182	102.177	102.170	102.166	102.157	102.153
STORMWATER COVER LEVEL	102.182			102.182	102.182	102.182
STORMWATER INVERT	102.232			102.222	102.222	102.191
STORMWATER DETAILS	Pipe 1.000 Dia 1500 Circular 1 in 491		Pipe 1.010 Dia 1500 Circular 1 in 501			
STORMWATER LENGTHS	39.189		29.544			
STORMWATER EMBEDEMMENT	CLASS 5 BED AND SURROUND					
FOULWATER COVER LEVEL						
FOULWATER INVERT						
FOULWATER DETAILS						
FOULWATER LENGTHS						



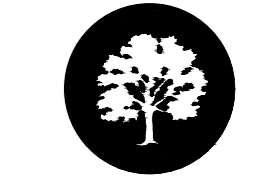
GROUND LEVEL	102.181	102.177	102.170	102.166	102.157	102.153	102.148	102.144	102.140	102.136	102.132	102.128	102.124	102.120	102.116	102.112	102.108	102.104	102.100	
STORMWATER COVER LEVEL	102.181			102.181	102.181	102.181	102.181	102.181	102.181	102.181	102.181	102.181	102.181	102.181	102.181	102.181	102.181	102.181	102.181	102.181
STORMWATER INVERT	102.421			102.395	102.385	102.381	102.377	102.373	102.369	102.365	102.361	102.357	102.353	102.349	102.345	102.341	102.337	102.333	102.329	102.325
STORMWATER DETAILS	Pipe 5.030 Dia 1500 Circular 1 in 400		Pipe 5.011 Dia 1500 Circular 1 in 400				Pipe 5.022 Dia 1500 Circular 1 in 400				Pipe 1.011 Dia 1500 Circular 1 in 500				Pipe 1.012 Dia 1500 Circular 1 in 500					
STORMWATER LENGTHS	26.670		38.257				34.015				44.787				8.914					
STORMWATER EMBEDEMMENT	CLASS 5 BED AND SURROUND																			
FOULWATER COVER LEVEL																				
FOULWATER INVERT																				
FOULWATER DETAILS																				
FOULWATER LENGTHS																				



GROUND LEVEL	102.132	102.127	102.120	102.116	102.112	102.108	102.104	102.100
STORMWATER COVER LEVEL								
STORMWATER INVERT								
STORMWATER DETAILS								
STORMWATER LENGTHS								
FOULWATER COVER LEVEL	102.132	102.130	102.128	102.126	102.124	102.122	102.120	102.118
FOULWATER INVERT	102.300	102.273	102.253	102.233	102.213	102.193	102.173	102.153
FOULWATER DETAILS	Pipe 4.015 Dia 800 Circular 1 in 150		Pipe 4.004 Dia 800 Circular 1 in 150					
FOULWATER LENGTHS	10.422		56.807					

EXISTING GROUND LEVEL	102.182	102.177	102.170	102.166	102.157	102.153
ALIGNMENT LEVEL						
STORMWATER INVERT	102.232			102.222	102.222	102.191
FOULWATER INVERT	102.300			102.273	102.253	102.153
CULVERT INVERT	102.300			102.273	102.253	102.153
CULVERT DETAILS	Dia 800 Circular 1 in 154					
CULVERT LENGTHS	19.968					
CULVERT EMBEDEMMENT	CONCRETE SURROUND					

REV	DESCRIPTION	DATE	DRAWN
D	Road 1 Culvert Revised	24.04.18	CD
C	Road 1 Culvert Added	16.10.17	CD
B	F45 to F19 revised	21.11.16	CD
A	F39 to F19 revised; Top water levels for 1 in 30 for storms added	06.10.16	CD



BARRATT HOMES
MANCHESTER

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 City Park
 Manchester
 M16 9HQ
 Tel: 0161 872 0161
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Job	Chipping Lane Longridge		
Title	Engineering Longsections Sheet 4 Open Space		
Design By	Date	Drawing Number	Rev
CD	10.08.16	459/ED/13	D
CAD By	Scale		
CD	1:500H; 1:100V		

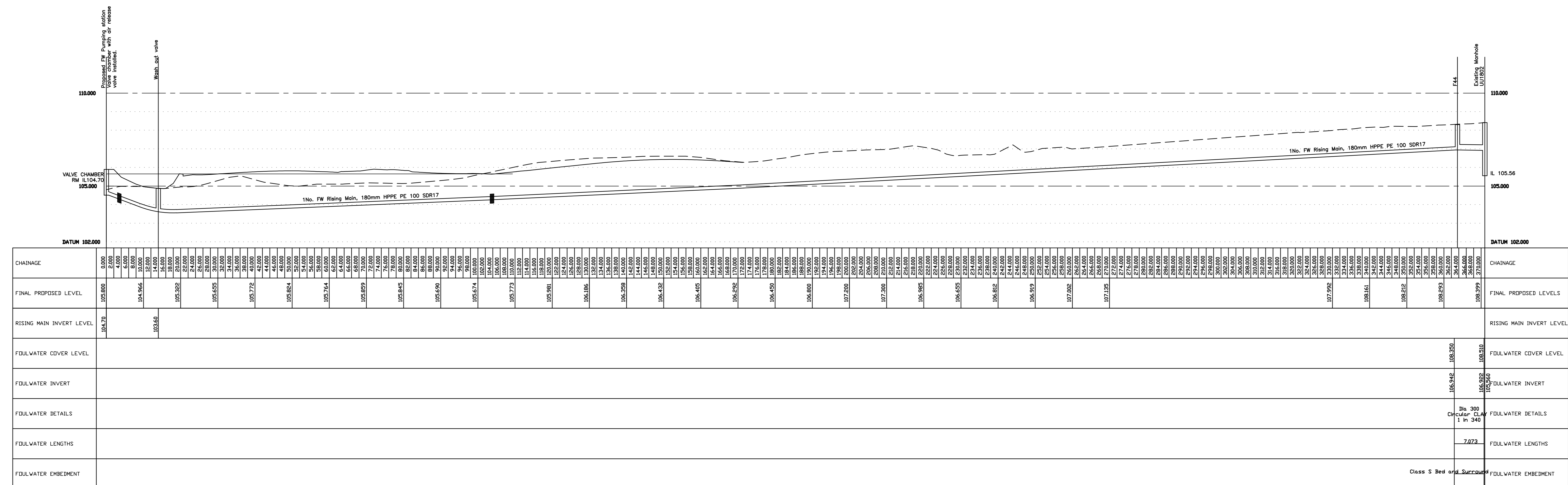
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ENGINEERING LEGEND NOTES

- All adoptable drainage works have been designed and are to be constructed in accordance with 'Sewers for Adoption, 8th Edition, and United Utilities 'Guidance for Sewer for Adoption 8th Edition', where specification conflict, U's guidelines shall take precedence.
- United Utilities Standard details to be used are:
 S190/00/0048 Typical Outfall Details D, E and F
 S190/00/0070 Typical Details G & H
 S190/00/0071 Gully Gullies and entry gulle to materials access shaft
 S190/01/0018 Standard Detail No 4 (Type 1 Manhole)
 Standard Detail No 5 (Type 2 Manhole)
 Standard Detail No 6 (Manhole Access)
 S190/01/0020 Standard Details 7, 8, 9 and 10
 Ladders, Safety Chains and Handrails
 S190/01/0028 Typical Details A, B, C and E
 General and Internal Backings and Connection Details
 S190/01/0048 Manhole and French Drain Details
 MHC, MFC and PSC
 S190/01/0028 Manhole Details and Block Invert Restoration
 MHC, MFC and PSC
 S190/01/0048 Typical Details J and J - Segmented Shafts
 S190/02/0019 Pipe Embedment Details
- All clay pipe work shall be Extra Strength Duroc to BS 205 and BS 45 (SW pipe only).
- All precast concrete pipework shall be to Class 100 in accordance with BS911 Part 1, BS EN 1916 and per the BS Marking.
- All adoptable drainage to be bedded in Class 5 granular material unless otherwise stated.
- All Concrete manholes and soakways rings, concrete cover slabs and Cus to be manufactured to BS EN 1917 and BS 5911 Part 1.
- Rising Mains to be Black Polyethylene Pipes complying to BS EN 12242-2. Polyethylene fittings, including Lapse Joints and electro-fusion fittings shall comply with BS EN 12242-2.
- All levels relate to Ordnance Datum. Contractor to ensure that the drawing is read in conjunction with the site specific Topographical Survey provided by Barratt Manchester and the Benchmark information provided.
- This drawing is to be read in accordance with all other relevant drawings.
- The contractor shall be responsible for ensuring that any existing invert levels indicated on the drawings are correct before work commences.
- All proposed connections to the sewer shall be 150A unless stated otherwise.
- All private house drainage shall be 100A and all drop-out connections shall be 150A at a minimum gradient of 1:100 unless otherwise stated and set in accordance with Part 4 of the Building Regulations.
- Ruoff from private surfaces shall not discharge across the highway. Gullies or channels shall be provided as appropriate to prevent this.
- Prom crossings shall be provided at the lower tangent points of all junctions.
- Pipes shall be protected from concentrated loading by construction traffic during the construction period when installed closer to the pipe may make them vulnerable to damage.
- Under OB levels of the road formation level are to be carried out to determine the depth of proposed construction required. This is to be approved by the adopting authority prior to construction of the road pavement.
- Contractor to ensure that pit drainage be within the curbside of the pit they serve where possible and inspection covers kept with kerbside where possible.
- Contractor to provide United Utilities with sufficient notice prior to commencement of Sewer works on their Inspector telephone number. 0161 845 9426.
- Contractor to obtain all necessary Highway opening notices from the relevant Local Authority, obtain approval to work on United Utilities Energy System, obtain approval in written statement from the Environment Agency for any works affecting a watercourse.

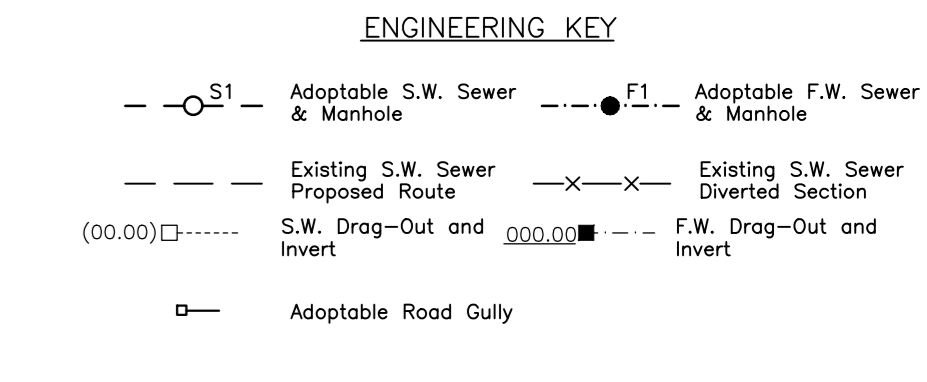
SCALES
HERE: 1/500
VERT: 1/100



Drawings
Flood Route Plan



- WARNING TO HOUSE-PURCHASERS**
Property Misdescriptions Act 1991
- Buyers are warned that this is a working drawing and is not intended to be treated as descriptive material. It is subject to any particular property or development, any of the specified matters prescribed by any Order made under the above Act. The contents of this drawing may be subject to change at any time and alterations and variations can occur during the progress of the works without revision of the drawing. Consequently the layout, form, content and dimensions of the finished construction may differ materially from those shown. No do the contents of this drawing constitute a contract, part of any contract or warranty.
- GENERAL NOTES**
- All adoptable drainage works have been designed and are to be constructed in accordance with 'Sewers for Adoption, 4th Edition', and United Utilities 'Guidance for Sewer for Adoption 4th Edition'. Where specification conflicts, UK guidance shall prevail.
 - United Utilities Standard details to be used are:
 - SNG/19/02/04 Manhole Type 1
 - SNG/19/02/04 Manhole Type 2 and Invert Access Detail
 - SNG/19/02/04 Shallow Manhole Detail for Small Diameter Pipes (Type 4)
 - SNG/19/02/04 Shallow Surface Water Manhole Detail - Standard Invert (less than 2.0m) - For Pipe Sizes 450mm and Above
 - SNG/19/02/04 Fine Control Manhole Detail
 - SNG/19/02/04 External Backstop Detail
 - SNG/19/02/04 Pipe Bedding Detail
 - SNG/19/02/04 Variable Manhole - Guidance Notes
 - SNG/19/02/04 Headwall Type 1 and Typical Outlet Gully Detail
 - SNG/19/02/04 Typical Outlet Details Type 1 & Type 2
 - All day pipe work shall be Extra Strength Clayware to BS 200 and BS 65 (SM pipes only).
 - All precast concrete pipework shall be Class 120 in accordance with BS591 Part 1, BS EN 1916 and bear the BS mark.
 - All concrete manholes and soakways rings, concrete cover slabs and Cais to be manufactured to BS EN 1917 and BS 591 Part 3.
 - All adoptable drainage to be installed in Class 3 granular surround unless otherwise stated.
 - Rising Mains to be Block Polyethylene Pipes complying to BS EN 12244-2. Polyethylene fittings, including fusion joints, and electro-fusion fittings shall comply with BS EN 12244-2.
 - All levels refer to Ordnance Datum. Contractor to ensure that the drawing is read in conjunction with the site specific Topographic Survey provided by Barratt Homes and the Benchmark information provided.
 - This drawing is to be read in accordance with all other relevant drawings.
 - The contractor shall be responsible for ensuring that any existing level levels indicated on the drawings are correct before work commences.
 - All proposed connections to the sewer shall be 150mm unless stated otherwise.
 - All private house drainage shall be 100mm and all drop-out connections shall be 150mm at a minimum gradient of 1:80 unless otherwise stated and set in accordance with Part 9 of the Building Regulations.
 - Runoff from paved surfaces shall not discharge across the highway. Gullies or channels shall be provided as appropriate to prevent this.
 - Open crossings shall be provided at the inner tangent points of all junctions.
 - Pipes shall be protected from concentrated loading by construction traffic during the construction period when surfacing cover to the pipe may not be then available for storage.
 - Walls 200mm thick of the road formation level are to be carried out to determine the depth of pavement construction required. This is to be reported by the existing authority prior to construction of the road pavements.
 - Groundwater to ensure that pit drainage be within the curbside of the pit they serve where possible and inspection covers kept within handkerchiefs where possible.
 - Contractor to provide United Utilities with sufficient notice prior to commencement of Sewer works on their respective telephone number: 0161 852 8000.
 - Contractor to obtain all necessary Highway opening notices from the relevant Local Authority, obtain approval to work on United Utilities Sewerage Schemes, obtain approval to method statement from the Environment Agency for any work affecting a watercourse.
 - All materials adopted by MDC to have a minimum 150mm 15M concrete surround to full depth.



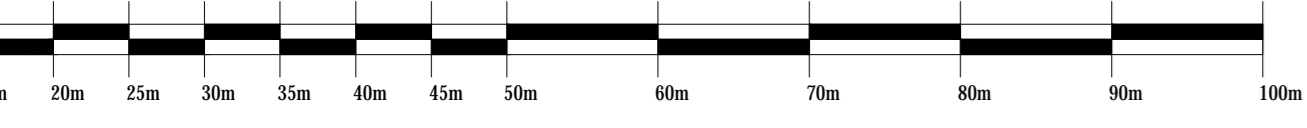
FLOW CONTROL DETAILS

MH Ref.	Specification
S13	Hydrobolske Optimum Flow Control Device Ref: MD-SHE-0278-5000-2000-5000 Head=2.0m, Flow=50.0 l/s

A	Updated to Planning Layout PLO2 Revision 12	04.09.19	CD
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Job Chipping Lane Longridge			
Title Flood Route Plan			
Design By CD	Date 14.11.16	Drawing Number 459/ED/34	Rev A
CAD By CD	Scale 1:500 @ A0		



Drawings
Plot Drainage

WARNING TO HOUSE-PURCHASERS
Property Misdescription Act 1993

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REV	DESCRIPTION	DATE	DRAWN
H	Plot drainage amended for plots 71-75	12.07.19	CD
G	Plot drainage amended for plots 71-75	19.06.19	CD
F	Plot drainage amended for plots 33-124	16.11.18	FB
E	Yard gullies added to the private drive	11.09.18	LB
D	Foul private drainage for Plots 37-46 revised	05.01.18	CD
C	FFLs and cover levels revised to match new levels plans; private drive drainage added	19.09.17	CD
B	Private drainage amended for plots 10-12, 24-25, 47-49 & 110-111 to coincide with latest planning layout	27.07.17	FB
A	Private drainage amended to suit latest FFLs. CLs & ILS updated	07.12.16	FB



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Job	Chippings Lane Longridge		
Title	Plot Drainage Sheet Sheet 1 of 3		
Design By	Issue	Drawing Number	Rev
FB	20.10.16	459/ED/30	H
CAD By	Scale		
FB	1:200		

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REV	DESCRIPTION	DATE	DRAWN
F	Plot drainage amended for plots 99-104	12.07.19	CD
E	Plot drainage amended for plots 33-124	16.11.18	FB
D	Foul private drainage for Plots 37-46 revised	05.01.18	CD
C	FFLs and cover levels revised to match new levels plans; private drive drainage added	19.09.17	CD
B	Private drainage amended for plots 10-12, 24-25, 47-49 & 110-111 to coincide with latest planning layout	27.07.17	FB
A	Private drainage amended to suit latest FFLs. CLs & ILS updated	07.12.16	FB



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Job Chippings Lane Longridge			
Title Plot Drainage Sheet Sheet 2 of 3			
Design By FB	Date 20.10.16	Drawing Number 459/ED/31	Rev F
CAD By FB	Scale 1:200		

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REV	DESCRIPTION	DATE	DRAWN
H	Plot drainage revised for Plots 71-124	12.07.19	CD
G	Plot drainage revised for Plots 71-85	19.06.19	CD
F	FFL for Plots 88-92 revised and drainage revised to suit	04.04.19	CD
E	Plot drainage amended for plots 33-124	16.11.18	FB
D	FFLs and cover levels revised to match new levels plans; private drive drainage added; Plots 90-91 added	19.09.17	CD
C	Private drainage amended for plots 10-12, 24-25, 47-49 & 110-111 to coincide with latest planning layout	27.07.17	FB
B	Private drainage amended to suit latest FFLs. CLs & ILS updated	07.12.16	FB
A	Private drainage updated for plots 110-117	25.10.16	FB

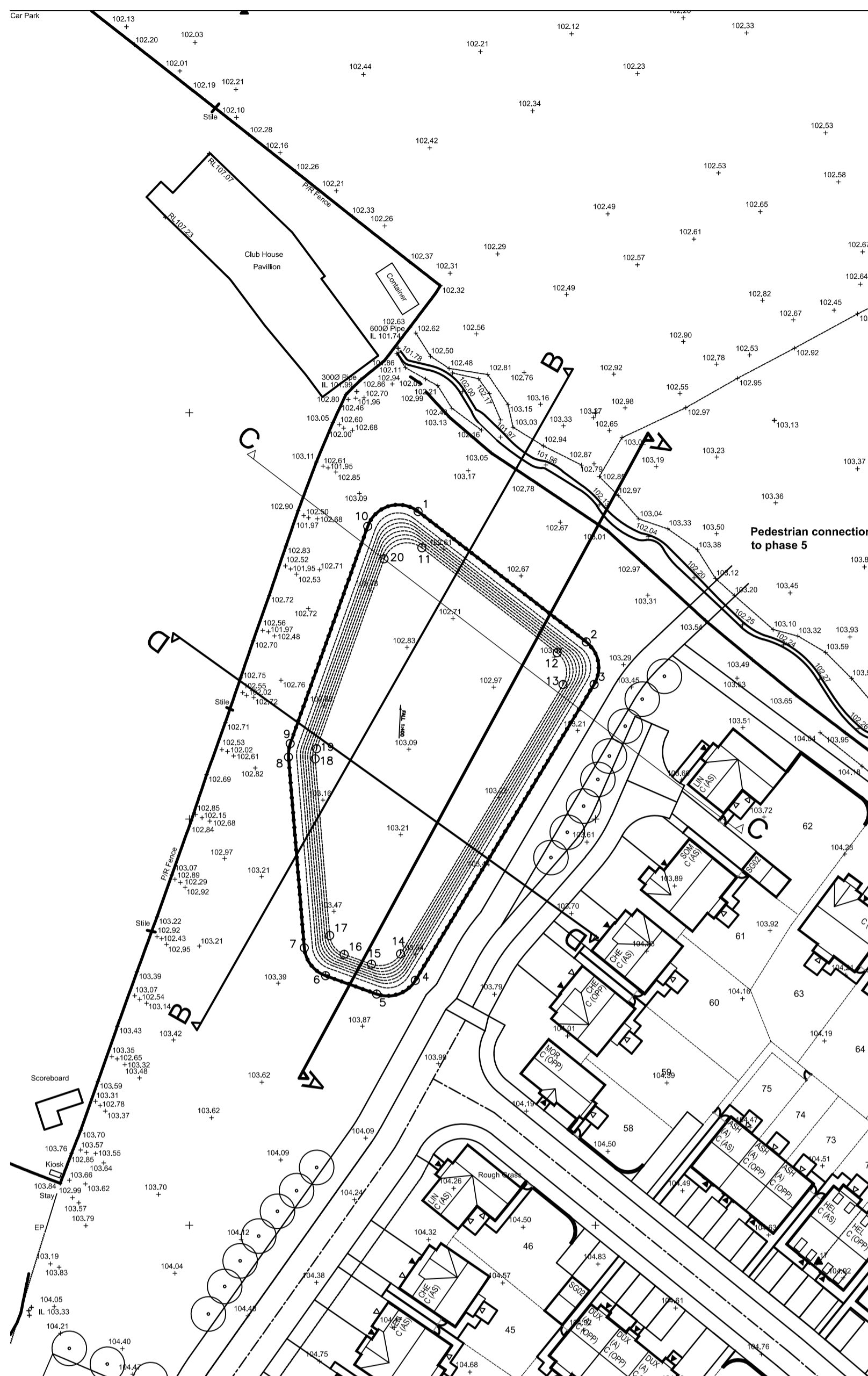
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Job: Chippings Lane Longridge

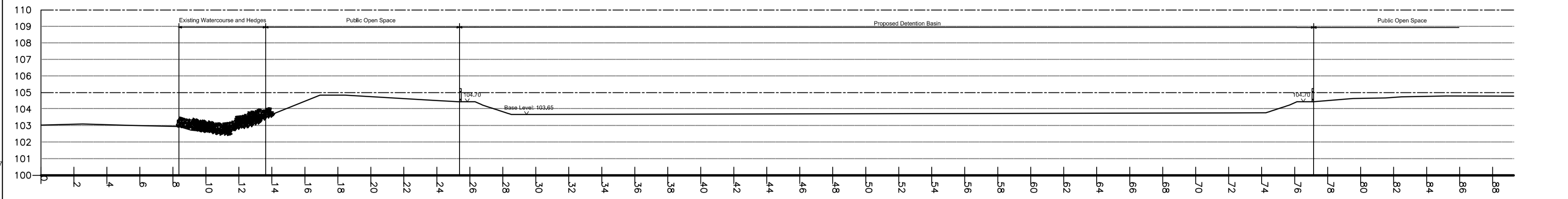
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Design By: FB	Date: 20.10.16	Drawing Number: 459/ED/32	Rev: H
CAD By: FB	Scale: 1:200		

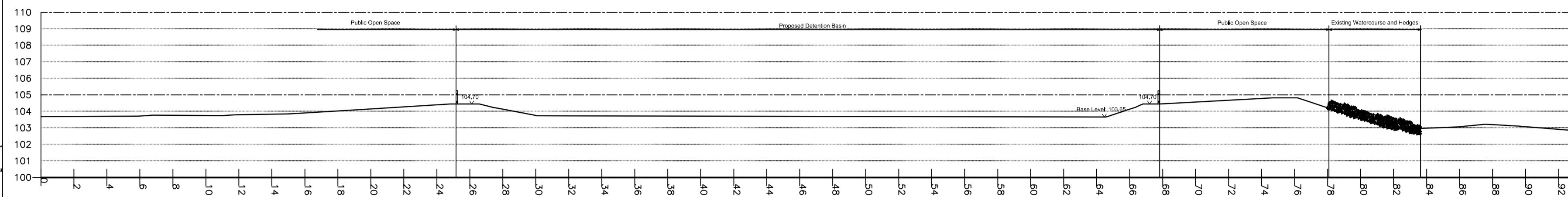
Drawings
Overflow Pond Details



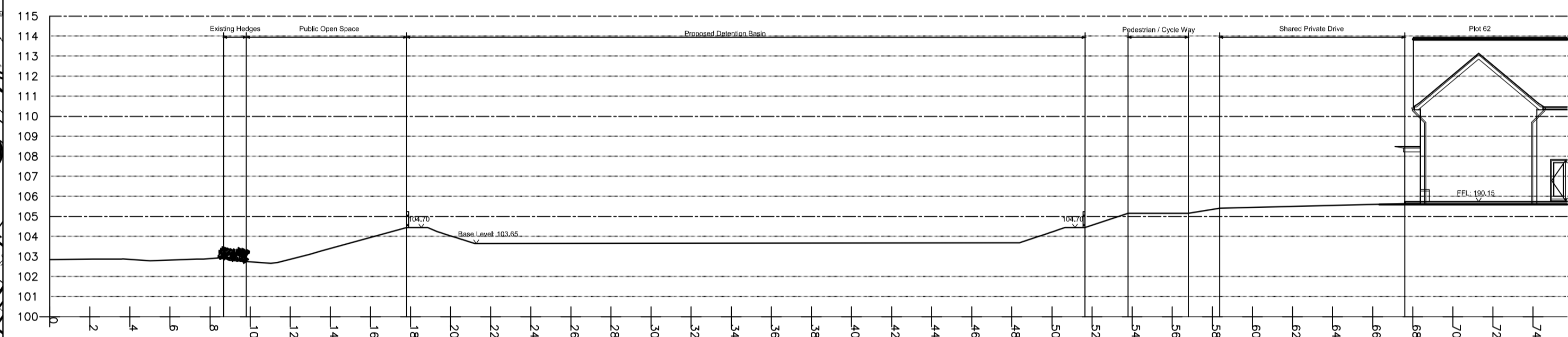
Plan View of Pond (Scale 1:500)



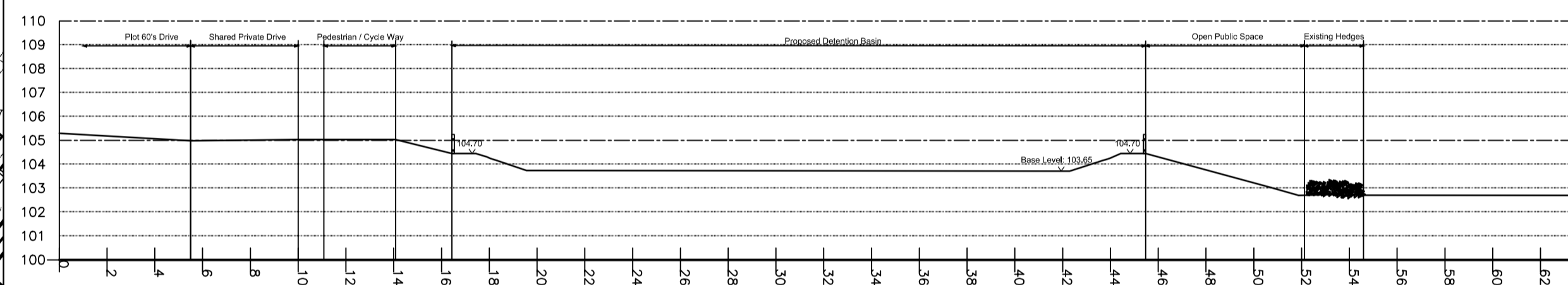
Section A-A



Section B-B

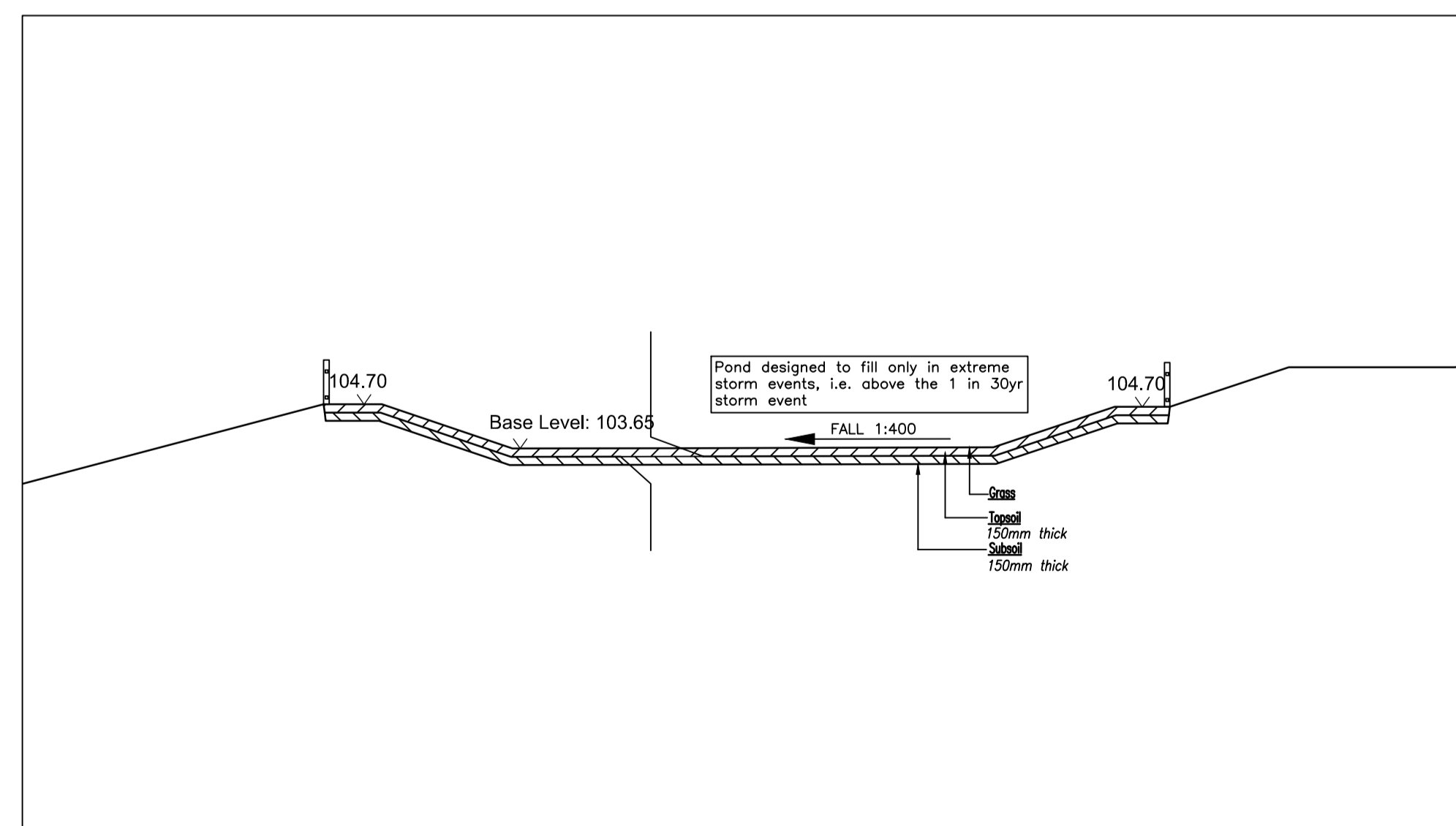


Section C-C

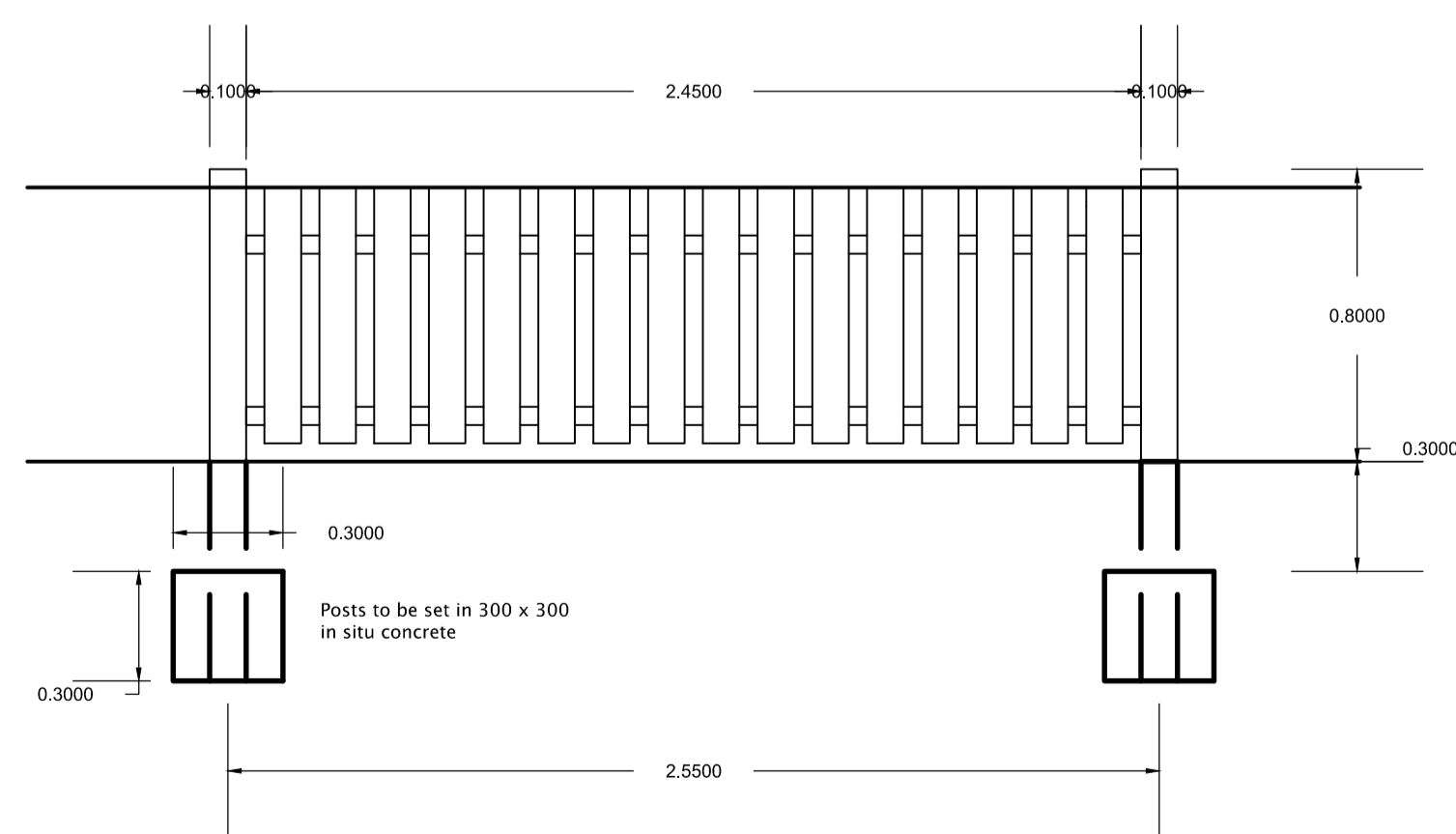


Section D-D

Cross Sections through Pond (Scale 1:200)



Typical Arrangement through Pond (Scale 1:100)



Picket Fence Detail for Pond Perimeter (Scale 1:20)

WARNING TO HOUSE-PURCHASERS

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REV	DESCRIPTION	DATE	DRAWN
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HOMES**

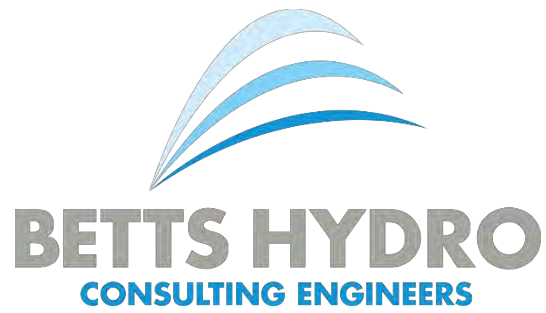
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Job Chipping Lane Longridge			
Title Overflow Pond Details			
Design By CD	Date 11.01.17	Drawing Number 459/ED/35	Rev -
C.A.D By CD	Scale As Shown @ A1		

Appendix A

Flood Risk Assessment



Chipping Lane, Longridge

**FLOOD RISK ASSESSMENT
& SUSTAINABLE DRAINAGE ASSESSMENT**



For

Barratt Homes
BDW Trading Limited
Barratt House, Cartwright Way,
Forest Business Park, Bardon Hill,
Coalville,
Leicestershire,
LE67 1UF




March 2016

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**Chipping Lane, Longridge
 FLOOD RISK ASSESSMENT
 & SUSTAINABLE DRAINAGE ASSESSMENT**


Document Tracking Sheet

Document Reference: HYD068
Revision: 2.1
Date of Issue: 3rd March 2016
Report Status: Final

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Revision History:

Rev:	Date:	Status:	Prepared by:	Checked by:	Issued by:
1.0	09/02/2016	Draft	HJ/CP	RDN/RMF	HJ
1.1	22/02/2016	Draft	HJ/CP	RDN/RMF	HJ
2.0	03/03/2016	Final	HJ/CP	RDN/RMF	HJ
2.1	03/03/2016	Final	HJ/CP	RDN/RMF	HJ



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EXECUTIVE SUMMARY

This Flood Risk Assessment (FRA) & Sustainable Drainage Assessment has been prepared for a proposed **residential development** and associated infrastructure located at **Chipping Lane, Longridge**. The site is located within **Flood Zone 1** according to the Environment Agency's (EA's) online flood maps. The National Planning Policy Framework (NPPF) requires a FRA for sites greater than 1 ha. The proposals are 'residential' in nature, classified as 'more vulnerable' in Table 2 within the Technical Guidance to the NPPF. This type of development is appropriate in Flood Zone 1.

This FRA has identified the site to be at **low risk** from all sources of flooding including; fluvial, tidal, pluvial, groundwater, sewer related and flooding from artificial sources. The development is accessible during times of extreme flooding as the site is within Flood Zone 1.

The development proposal was granted outline planning application (N^o 3/2014/0764) on the 29th October 2015. This FRA has built upon the FRA submitted with the application completed by RSK (March 2015, Ref: 880500-R1). The previous FRA proposed that run-off rates will be restricted to QBar. In this report, **QBar** is calculated as **8.3 l/s/ha**. See Appendix C for Hydrological Calculations. Any discrepancy between this QBar and the previous figure is due to refined FEH catchment characteristics being utilised within the ICP SuDS method.

The existing site is classed as greenfield. Surface water runoff from the existing site flows overland in a north-westerly direction before outfalling to a land drainage ditch/ordinary watercourse situated along the northern border. This ditch flows west before outfalling via a 600mm dia pipe to contribute to the Higgin Brook catchment.

The ground investigation report carried out by Soiltechnics (Feb 2016, Ref: STN3505NM-G01) indicates that infiltration is **not viable** at this site.

Surface water will outfall via the existing pathways (i.e. to the on-site ordinary watercourse) at a maximum rate of QBar (l/s). The restriction of runoff rates on increased impermeable areas will create storm water storage volumes. These will be retained on-site for events up to and including the 1 in 100 year event plus an allowance for climate change. Sustainable Drainage Systems (SuDS) could be incorporated into the planning layout which will assist in the reduction of surface water runoff from areas of hardstanding.

The nearest public foul sewers are located within Inglewhite Road to the south-east of the site. The conveyance route of foul flows will be determined during detailed design. A pumped solution will likely be required and early liaisons with UU regarding adoptable pump design are recommended.

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Specialist Software

-  Flood Estimation Handbook FEH CD-ROM (v.3.0) – Determination of Catchment Descriptors and depths of rainfall.
-  MicroDrainage WinDES (v.14.1) – Calculation of Greenfield run-off rates IH124/ICP-SUDS, Greenfield run-off volumes, rates of rainfall and stormwater storage estimates.

Abbreviations & Acronyms

AEP	Annual Exceedance Probability	mAOD	Metres Above Ordnance Datum
BGL	Below Ground Level	NGR	National Grid Reference
BGS	British Geological Survey	NPPF	National Planning Policy Framework
CC	Climate Change	NSRI	National Soil Resources Institute
EA	Environment Agency	OS	Ordnance Survey
FEH	Flood Estimation Handbook	PFRA	Preliminary Flood Risk Assessment
FRA	Flood Risk Assessment	PPS	Planning Policy Statement
FZ	Flood Zone	QSE	Quick Storage Estimate
Ha	Hectare	QBAR	Mean Annual Flood
IDB	Internal Drainage Board	SFRA	Strategic Flood Risk Assessment
LLFA	Lead Local Flood Authority	SuDS	Sustainable Drainage Systems
LPA	Local Planning Authority	UU	United Utilities

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1.0 INTRODUCTION

- 1.1.1 The impact of flooding on the natural and built environment are material planning considerations. The NPPF sets out the Government's objectives for the planning system, how planning should facilitate and promote sustainable patterns of development, avoiding flood risk and accommodating the impacts of climate change. Government policy with respect to development in flood risk areas is contained within the NPPF and the supporting Technical Guidance.
- 1.1.2 The NPPF requires a FRA for sites greater than 1 ha. The proposals are 'residential' in nature, classified as 'more vulnerable' in Table 2 within the Technical Guidance to the NPPF. This type of development is appropriate in Flood Zone 1.
- 1.1.3 The development proposal was granted outline planning application (N^o 3/2014/0764) on the 29th October 2015. This FRA has built upon the FRA submitted with the application completed by RSK (March 2015, Ref: 880500-R1).
- 1.1.4 The NPPF advises that the LPA should consult with the EA for advice on flood issues at a strategic level and in relation to planning applications.

2.0 EXISTING SITE LOCATION

2.1 Location

- 2.1.1 The site is located on land off Chipping Lane, Longridge, PR3 2NA. The OS NGR is 360073E, 437980N.
- 2.1.2 The site is surrounded by greenfield land to the north, east and west and by residential areas to the south. Chipping Lane forms the western site boundary.

2.2 Existing and Historical Land Use

- 2.2.1 The site is currently classed as greenfield. No other land uses have been identified as part of this report.

2.3 Topography

- 2.3.1 The site slopes in a north-westerly direction with levels ranging from around 121m AOD near the eastern border to 102m AOD in the north-west.

3.0 DEVELOPMENT PROPOSALS

3.1 Nature of the development

3.1.1 The nature of the development is residential and comprises of residential units associated infrastructure. A copy of the development layout for Phase I is included in Appendix A.

4.0 SOURCES OF FLOOD RISK

4.1 Fluvial Flood Risk

4.1.1 The flood risk of the site has been assessed using EA online Flood Maps.






-  Flood Zone 1 – Low Risk (<0.1%)
-  Flood Zone 2 – Medium Risk (1% – 0.1% fluvial, 0.5% – 0.1% tidal)
-  Flood Zone 3 – High Risk (>1% fluvial, >0.5% tidal)

Figure 1: EA Flood Map for Planning (Rivers and Sea).

4.1.2 Figure 1 shows that the site is within Flood Zone 1, which would indicate a **low risk** from fluvial flooding.

4.2 Tidal Flooding

4.2.1 As there is no coastline or tidal river near to the site, tidal flood risk is deemed **low**.

4.3 Pluvial Flood Risk

- 4.3.1 Pluvial (surface water) flooding occurs when rainwater is unable to drain away through the normal drainage systems or soak into the ground, but lies on or flows over the ground instead.
- 4.3.2 Pluvial flood risk as indicated by the EA map (Figure 2) shows that the site is predominantly at **very low** to **low** risk.

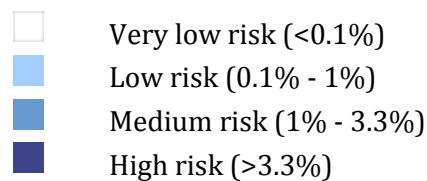


Figure 2: The EA's Indicative Surface Water Flood Risk Map.

- 4.3.3 There are some areas of low to medium risk that appear to follow the direction of overland flow. There is a singular area of medium to high risk located centrally to the site that is indicative of a topographic low point.
- 4.3.4 The development proposals, although increasing the impermeable area of the site, will provide a betterment on the pre-existing scenario in that any exceedance flows for storm events up to and including the 100 year event plus 30% climate change, will be attenuated on-site prior to a restricted outfall.
- 4.3.5 Finished floor levels will be raised at least 150mm above the external levels and external areas of hardstanding will comply with building regulations and divert water away from the proposed dwellings. This will further mitigate pluvial flood risk.
- 4.3.6 Therefore the pluvial flood risk to the development is overall considered to be **low**.

4.4 Sewer Related Flood Risk

- 4.4.1 Rainwater is sometimes drained into combined sewers. Foul water flooding can occur in areas prone to overland flow when the sewer is overwhelmed by heavy rainfall and will continue until the water drains away. It can also occur when the sewer becomes blocked or is of inadequate capacity, this could lead to there being a high risk of internal property flooding with contaminated water.
- 4.4.2 United Utilities records indicate that there is a 375mm diameter surface water pipe from the eastern site boundary which cuts through the site before outfalling to Higgin Brook near the centre of the site. A 3m easement will apply from this SWS in accordance with UU guidelines.
- 4.4.3 New sewers will be designed and constructed in accordance with Sewers for Adoption and put up for adoption by United Utilities as part of the detailed design (stc).
- 4.4.4 Flood Risk from sewer related sources is considered to be **low**. See Appendix B for UU sewer records.

4.5 Groundwater Flood Risk

- 4.5.1 In general terms groundwater flooding can occur from three main sources: - raised water tables, seepage and percolation and groundwater recovery or rebound.
- ☞ If groundwater levels are naturally close to the surface then this can present a flood risk during times of intense rainfall.
 - ☞ Seepage and percolation occur where embankments above ground level hold water. In these cases water travels through the embankment material and emerges on the opposite side of the embankment.
 - ☞ Groundwater recovery/rebound occurs where the water table has been artificially depressed by abstraction. When the abstraction stops the water table makes a recovery to its original level. There is the potential for groundwater flooding in low lying areas where groundwater levels have been depressed below their pre-pumping conditions, where these were at or close to ground level.
- 4.5.2 The online BGS maps show that the underlying geology consists of the Bowland Shale Formation, whilst the Soilscales online Map indicates that the soil has impeded drainage. The presence of surface water flood lines in the direction of overland flow in Figure 2 is also indicative of the presence of poorly permeable underlying clay soils.
- 4.5.3 Groundwater flood risk is therefore considered to be **'low'**, this will be further mitigated by the increase in Finished Floor Levels by at least 150mm above existing external levels.

4.6 Artificial Sources of Flood Risk

4.6.1 The site is partially at risk of flooding from the 'Dilworth Upper' reservoir, yet the risk designation is yet 'to be determined' according to the EA online maps and information. Reservoir flooding is extremely rare, therefore the flood risk from artificial sources is deemed **low**.

4.7 Flood Risk Mitigation Measures & Residual Risks

4.7.1 Finished Floor Levels will be a minimum of 150mm above the external levels (following any re-grade). External levels within proximity will fall away from proposed dwellings in accordance with building regulations.

4.7.2 Surface water run-off rates will be restricted through the use of vortex flow control devices. The increased volume of run-off for storms greater than the 30 year event can be mitigated through the use of SuDS (evapotranspiration/bio-retention/rainwater re-use).

4.7.3 The development is considered accessible during the extreme storm events as the site is within Flood Zone 1.

5.0 SURFACE WATER MANAGEMENT

5.1 Pre-Development Surface Water Run-off

5.1.1 The previous FRA completed by RSK (March 2015, Ref: 880500-R1) proposed that run-off rates will be restricted to QBar. In this report, QBar is calculated as 8.3 l/s/ha. See Appendix C for Hydrological Calculations. Any discrepancy between this QBar and the previous figure is due to refined FEH catchment characteristics being utilised within the ICP SuDS method.

5.1.2 The pre-development (greenfield) runoff rates are shown in Table 1. The ICP SuDS method was utilised using FEH catchment characteristics.

Storm Event	Greenfield Rate (l/s/ha)
Q1 year	7.2
QBar	8.3
Q30 years	14.0
Q100 years	17.2

Table 1: Greenfield Run-off Rates (ICP SuDS)

5.2 Post-Development Surface Water Run-off

5.2.1 The impermeable area will increase as a result of the development and increased run-off rates will be restricted to QBar (l/s/ha) thereby providing **significant betterment** to the downstream catchment for all storm events greater than the average annual event.

- 5.2.2 Rates will be restricted through the use of a vortex flow control device. Increased run-off volumes for storms greater than the 30 year event can be reduced through the use of SuDS (evapotranspiration/bio-retention/rainwater reuse).
- 5.2.3 Storm-water storage volumes will be attenuated on-site prior to outfall. Table 2 indicates the estimated volumes of storm-water storage that will be required if flows are restricted to variable discharge rates.
- 5.2.4 The impermeable area is estimated to be 60% of the total site area. This is a conservative estimation that considers gardens, permeable driveways and landscaped areas.

Storm Event	Storage Estimate (m ³ /ha)
Q1 year	32 - 73
QBar (~ 2.3 years)	45 - 96
Q30 years	141 - 249
Q100 years + cc	327 - 507

Table 2: Quick Storage Estimates

- 5.2.5 Hydrological Calculations are included within Appendix C. The above figures are estimates only and will be recalculated during detailed design.

5.3 Sustainable Drainage Systems (SuDS)

- 5.3.1 In accordance with the NPPF, SuDS should be used wherever possible to manage surface water and reduce the impact on downstream watercourses and sewers.
- 5.3.2 SuDS have the ability to address four core objectives; water quantity, water quality, amenity and biodiversity. With the appropriate system specified, all four core objectives can be satisfied. Where possible, peak surface water discharge rates to watercourses and sewers should be reduced.
- 5.3.3 Preference should always be given to practical SuDS over conventional pipe systems. Opportunities should be taken to provide soft landscaping on site to minimise surface water run-off, improve bio-diversity and increase visual enhancement.
- 5.3.4 The ground investigation report carried out by Soiltechnics (Feb 2016, Ref: STN3505NM-G01) indicates that infiltration is **not viable** at this site.
- 5.3.5 There is potential to utilise SuDS on this site, with large areas of POS provided within the layout at the lowest points of the site. Due to the level gradient of the site, shallow SuDS would be preferable to systems such as deep ponds or detention basins. Suitable SuDS would include the use of swales and bio-retention areas.

- 5.3.7 It is important that SuDS is seen as a multi-use commodity, and that areas that benefit from SuDS, and the additional environmental and aesthetic enhancement they can bring if designed properly, are open to the public.

5.4 Methods of Surface Water Management

- 5.4.1 There are three methods that have been reviewed for the management and discharge of surface water detailed below; these may be applied individually or collectively to form a complete strategy. They should be applied in the order of priority listed below.
- 5.4.2 **Discharge via Infiltration** - The ground investigation report carried out by Soiltechnics (Feb 2016, Ref: STN3505NM-G01) indicates that infiltration is **not viable** at this site.
- 5.4.3 **Discharge to Watercourse** – There are several on-site watercourses which the site currently drains to. These are designated ‘ordinary watercourses’ and ordinary watercourse consent should be applied for with Lancashire County Council prior to any on-site works. As the watercourses are not designated as ‘Main River’, a 3-5m easement is considered appropriate.
- 5.4.4 **Discharge to Public Sewer** – Surface water will not outfall to a public sewer.

5.5 Climate Change

- 5.5.1 The UK climate is changing significantly will vary greatly by region with more short duration and high intensity rainfall events as well as more periods of long duration rainfall.
- 5.5.2 The NPPF Technical Guidance states that the recommended national precautionary sensitivity ranges for increase of peak rainfall intensity is 30% until 2115. The impact of climate change means there is likely to be a long term increase in average sea levels.
- 5.5.3 An increase in flood water levels means that flooding events will occur more frequently and have a greater impact. Any increase flood risk to the site from climate change is likely to be related to the increase in rainfall intensity and duration.
- 5.5.4 An additional 30% to accommodate climate change will be incorporated into the design of the stormwater storage attenuation.

5.6 Foul Water Management

- 5.6.1 The nearest public foul sewers are located within Inglewhite Road to the south-east of the site. The conveyance route of foul flows will be determined during detailed design. A pumped solution will likely be required and early liaisons with UU regarding adoptable pump design are recommended. Sewers will be designed and constructed in accordance with Sewers for Adoption.

6.0 SUMMARY

6.1 Conclusion and Recommendations

- 6.1.1 This report has been prepared for a development proposal of residential dwellings and associated infrastructure. The site lies within Flood Zone 1. The residential proposals are classified as 'more vulnerable'. This type of development is considered to be appropriate in accordance with the NPPF.
- 6.1.2 The report has indicated that the site is at **low** risk of flooding from fluvial, tidal, sewer related and artificial sources. There is some medium indicative risk of pluvial flooding which will be reduced and mitigated by the implementation of the development proposal. Flood risk to the surrounding area as a result of the development will be significantly reduced due to the restriction of proposed run-off rates to mimic the existing rate for the average annual event (QBar).
- 6.1.3 Attenuation will be provided on-site for storm events up to and including the 1 in 100 year event + 30% climate change.
- 6.1.4 Any residual or unforeseen flood risk to the proposed development will be further mitigated by raising finished floor levels to at least 150mm above external levels. External levels will fall away from dwellings in accordance with Building Regulations.
- 6.1.5 Applications for sewer adoption will be discussed and submitted during detailed design.

BIBLIOGRAPHY & REFERENCES

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CIRIA 609: Sustainable drainage systems. Hydraulic, structural and water quality advice (2004).
CIRIA 624: Development and flood risk – guidance for the construction industry (2004).
CIRIA 635: Designing for Exceedance in urban drainage: Good practice (2006).
CIRIA 644: Building Greener (2007).
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Planning Policy Statement 25: Development and Flood Risk (2006).
Sewers for Adoption 7th Edition, WRc (2012).
Technical Guidance to the National Planning Policy Framework, CLG (2012).

Web-based References

- Bingmaps – www.bing.com/Maps
British Geological Survey – www.bgs.ac.uk/opengeoscience/home.html
CIRIA – www.ciria.org
Cranfield University – www.landis.org.uk/soilscapes
Environment Agency – www.environment-agency.gov.uk
Flood Forum – www.floodforum.org.uk
Google Maps – www.maps.google.co.uk
Streetmap – www.streetmap.co.uk

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Appendix A: Site Plans

Identifier	Descriptor
Betts Associates Ltd	Location Plan
Barratt Homes	Proposed Planning Layout (Phase I)
Betts Associates Ltd	Indicative Drainage Strategy

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LOCATION PLAN



OS X (Eastings) 360073

OS Y (Northings) 437980

Nearest Post Code PR3 2NA

Lat (WGS84) N53:50:12 (53.836529)

Long (WGS84) W2:36:30 (-2.608205)

Lat,Long 53.836529,-2.608205

Nat Grid SD600379 / SD6007337980

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