Appendix D

UNITED UTILITIES SEWER RECORDS

Public

How to contact us:

United Utilities Water Limited
Property Searches
Haweswater House
Lingley Mere Business Park
Great Sankey
Warrington
WA5 3LP

Telephone: 0370 7510101

E-mail: propertysearches@uuplc.co.uk

Your Ref: Omega 8
Our Ref: UUPS-ORD-135906
Date: 13/11/2019

WSP

3 white rose office park
millshaw park lane,
leeds,
ls11 0dl

FAO:

Dear Sirs

Location: Omega Business park

I acknowledge with thanks your request dated 13/11/2019 for information on the location of our services.

Please find enclosed plans showing the approximate position of United Utilities' apparatus known to be in the vicinity of this site.

The enclosed plans are being provided to you subject to the United Utilities terms and conditions for both the wastewater and water distribution plans which are shown attached.

If you are planning works anywhere in the North West, please read United Utilities' access statement before you start work to check how it will affect our network. http://www.unitedutilities.com/work-near-asset.aspx .

I trust the above meets with your requirements and look forward to hearing from you should you need anything further.

If you have any queries regarding this matter please contact us .

Yours Faithfully,

[redacted]

Karen McCormack
Property Searches Manager

United Utilities Water Limited
Registered In England & Wales No. 2366678
Registered Office Haweswater House, Lingley Mere Business Park,
Lingley Green Avenue, Great Sankey, Warrington, WA5 3LP

TERMS AND CONDITIONS - WASTEWATER AND WATER DISTRIBUTION PLANS

These provisions apply to the public sewerage, water distribution and telemetry systems (including sewers which are the subject of an agreement under Section 104 of the Water Industry Act 1991 and mains installed in accordance with the agreement for the self construction of water mains) (UUWL apparatus) of United Utilities Water Limited "(UUWL)".

TERMS AND CONDITIONS:

- This Map and any information supplied with it is issued subject to the provisions contained below, to the exclusion of all others and no party relies upon any representation, warranty, collateral contract or other assurance of any person (whether party to this agreement or not) that is not set out in this agreement or the documents referred to in it.
- This Map and any information supplied with it is provided for general guidance only and no representation, undertaking or warranty as to its accuracy, completeness or being up to date is given or implied.
- In particular, the position and depth of any UUWL apparatus shown on the Map are approximate only. UUWL strongly recommends that a comprehensive survey is undertaken in addition to reviewing this Map to determine and ensure the precise location of any UUWL apparatus. The exact location, positions and depths should be obtained by excavation trial holes.
- The location and position of private drains, private sewers and service pipes to properties are not normally shown on this Map but their presence must be anticipated and accounted for and you are strongly advised to carry out your own further enquiries and investigations in order to locate the same.
- The position and depth of UUWL apparatus is subject to change and therefore this Map is issued subject to any removal or change in location of the same. The onus is entirely upon you to confirm whether any changes to the Map have been made subsequent to issue and prior to any works being carried out.
- This Map and any information shown on it or provided with it must not be relied upon in the event of any development, construction or other works (including but not limited to any excavations) in the vicinity of UUWL apparatus or for the purpose of determining the suitability of a point of connection to the sewerage or other distribution systems.
- No person or legal entity, including any company shall be relieved from any liability howsoever and whensoever arising for any damage caused to UUWL apparatus by reason of the actual position and/or depths of UUWL apparatus being different from those shown on the Map and any information supplied with it.
- If any provision contained herein is or becomes legally invalid or unenforceable, it will be taken to be severed from the remaining provisions which shall be unaffected and continue in full force and affect.
- This agreement shall be governed by English law and all parties submit to the exclusive jurisdiction of the English courts, save that nothing will prevent UUWL from bringing proceedings in any other competent jurisdiction, whether concurrently or otherwise.

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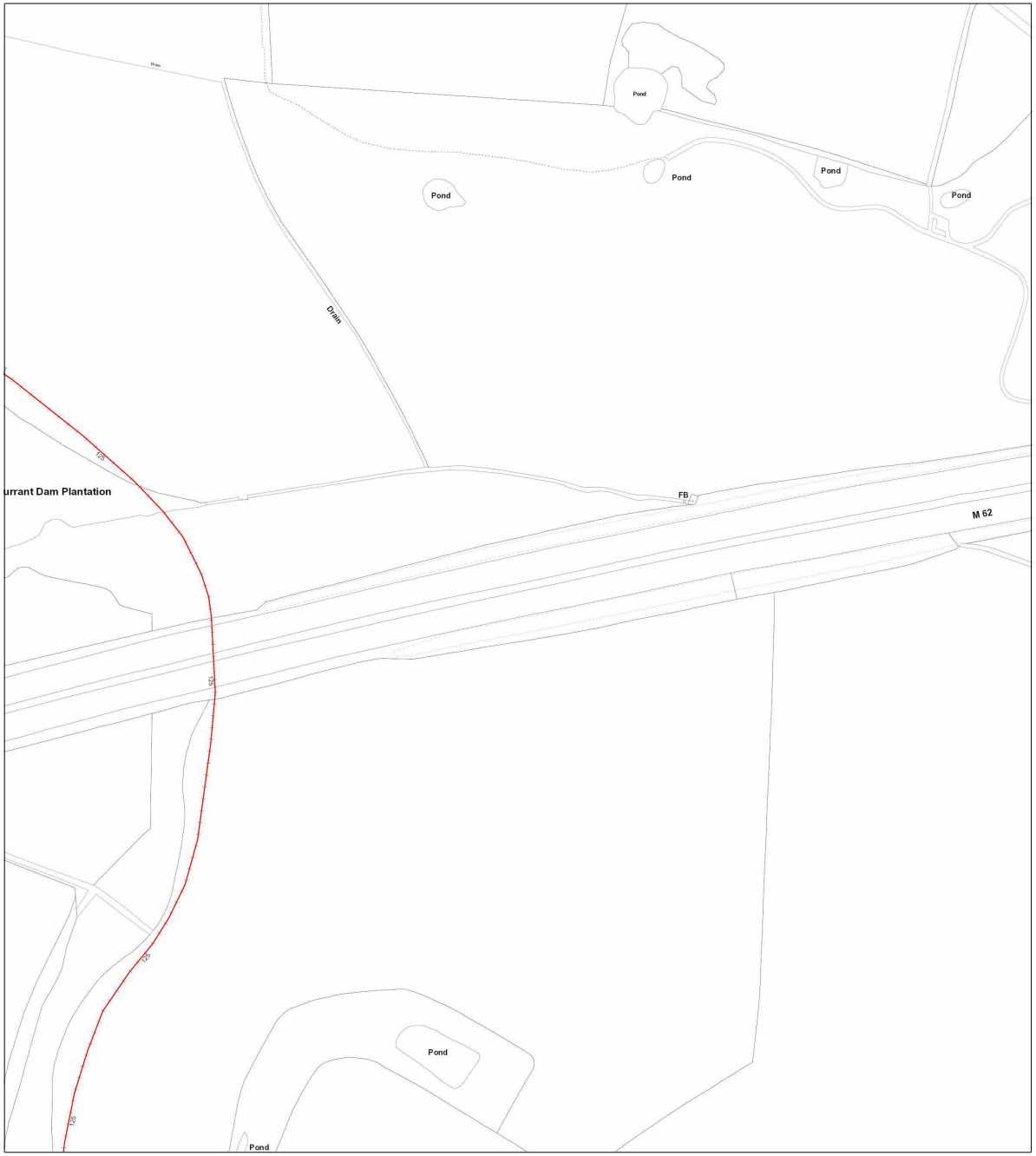

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Refno	Cover	Func	Invert	Size x	Size y	Shape	Matl	Length	Grad

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

SEWER MATERIAL

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

Address or Site Reference:

Omega Business park,

OS sheet Number: SJ5390NE
Scale: 1:1250 **Date:** 13/11/2019
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SEWER RECORDS

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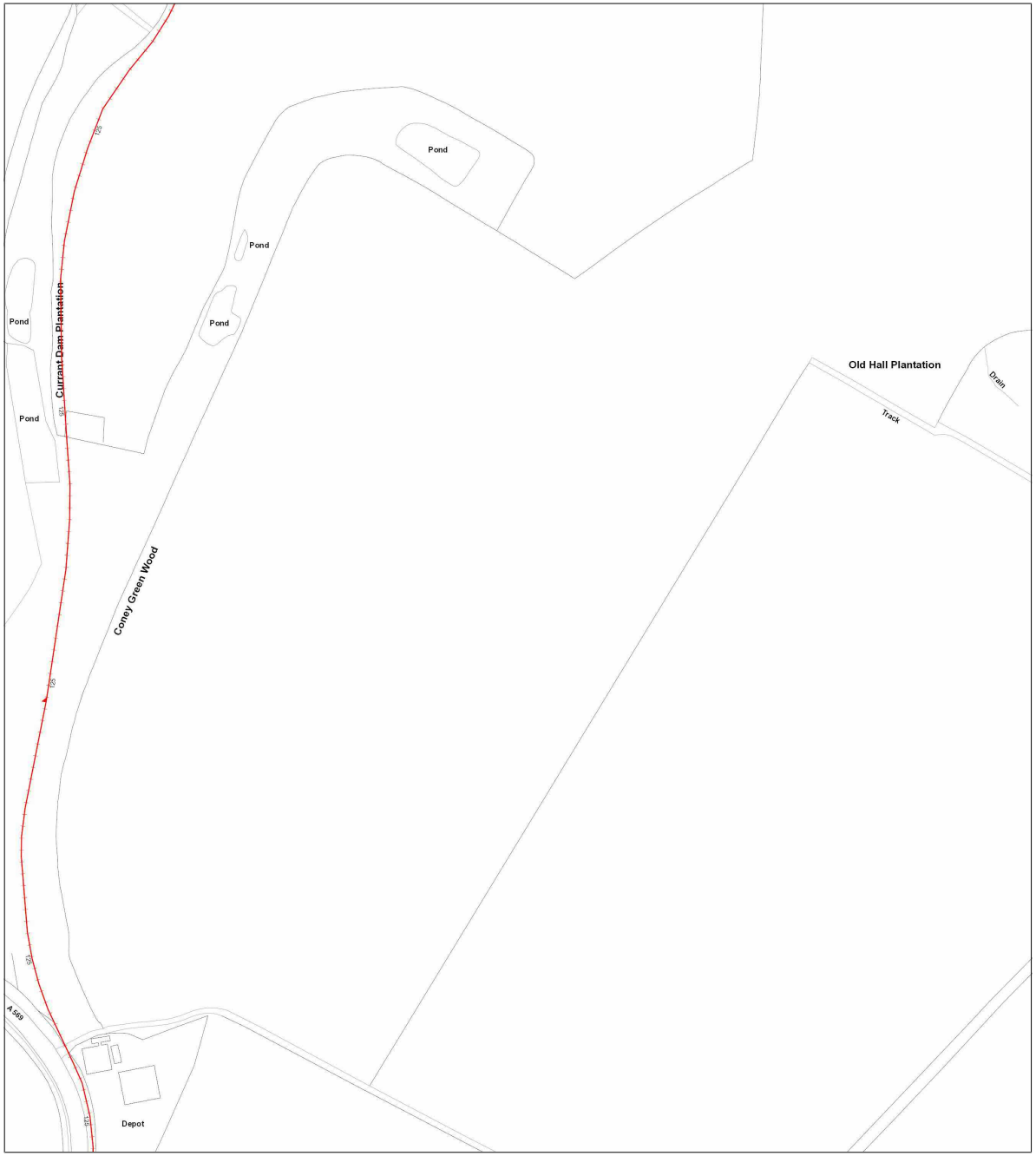

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Refno	Cover	Func	Invert	Size x	Size y	Shape	Matl	Length	Grad

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:
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brown - foul, purple - overflow

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- Inlet
- Discharge Point
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- Non Return Valve
- Soakaway
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- 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	TR	Trapezoidal
EG	Egg	AR	Arch
OV	Oval	BA	Barrel
FT	Flat Top	HO	HorseShoe
RE	Rectangular	UN	Unspecified
SQ	Square		

SEWER MATERIAL

AC	Asbestos Cement
BR	Brick
PE	Polyethylene
RP	Reinforced Plastic Matrix
CO	Concrete
CSB	Concrete Segment Bolted
CSU	Concrete Segment Unbolted
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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:

Omega Business park,

OS sheet Number: SJ5390SE
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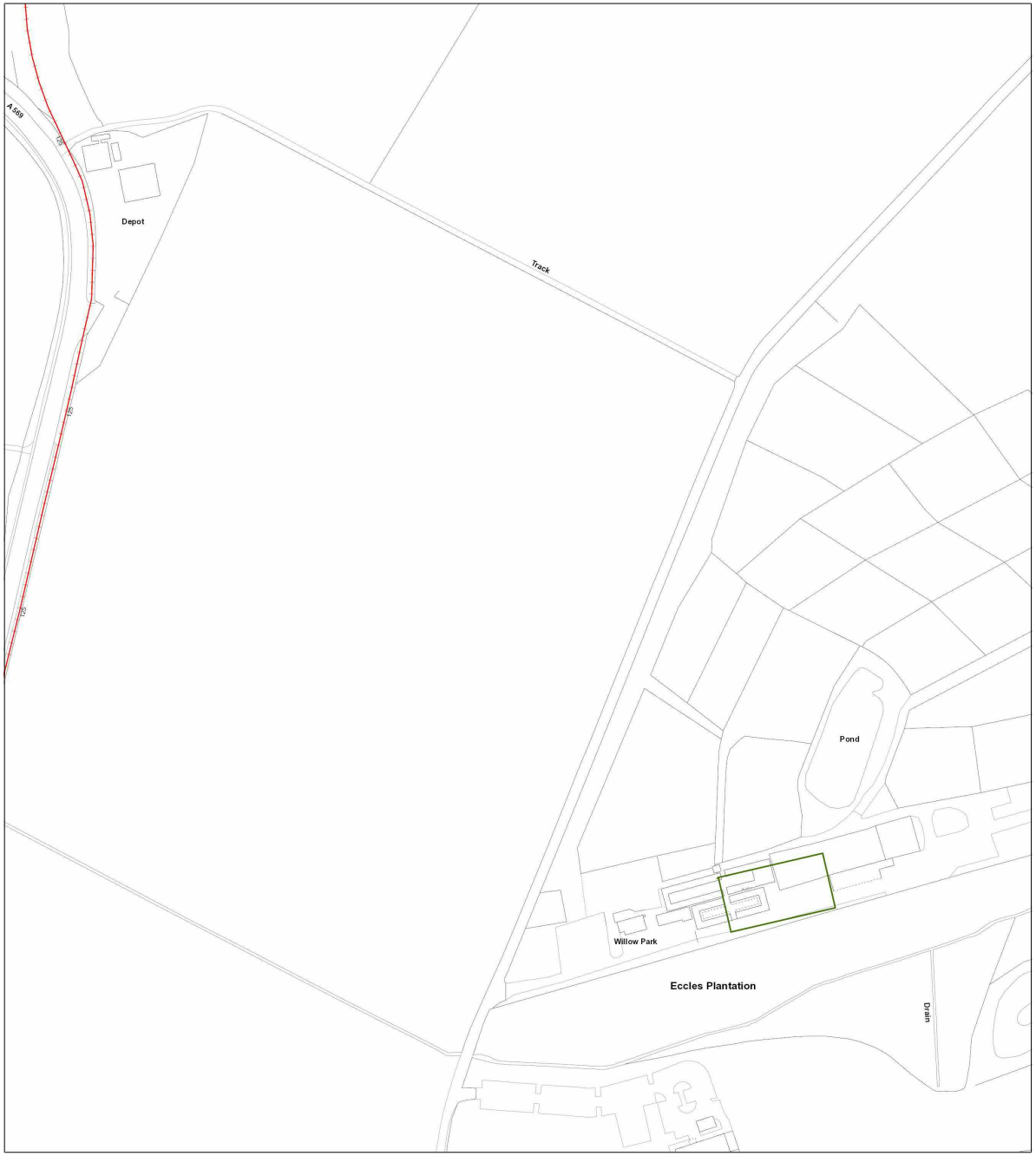

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Refno	Cover	Func	Invert	Size x	Size y	Shape	Matl	Length	Grad

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
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- Non Return Valve
- Soakaway
- Gully
- Cascade
- Flow Meter
- Hatch Box
- Oil Interceptor
- Summit
- Drop Shaft
- Orifice Plate
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- 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	TR	Trapezoidal
EG	Egg	AR	Arch
OV	Oval	BA	Barrel
FT	Flat Top	HO	HorseShoe
RE	Rectangular	UN	Unspecified
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SEWER MATERIAL

AC	Asbestos Cement
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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:

Omega Business park,

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LEGEND

Abandoned | Foul | Surface Water | Combined

- Public Sewer
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MANHOLE FUNCTION

FO	Foul
SW	Surface Water
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OV	Overflow

SEWER SHAPE

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VC	Vitrified Clay
PP	Polypropylene
PF	Pitch Fibre
MAC	Masonry, Coursed
MAR	Masonry, Random
U	Unspecified

Address or Site Reference:

Omega Business park,

OS sheet Number: SJ5490SW
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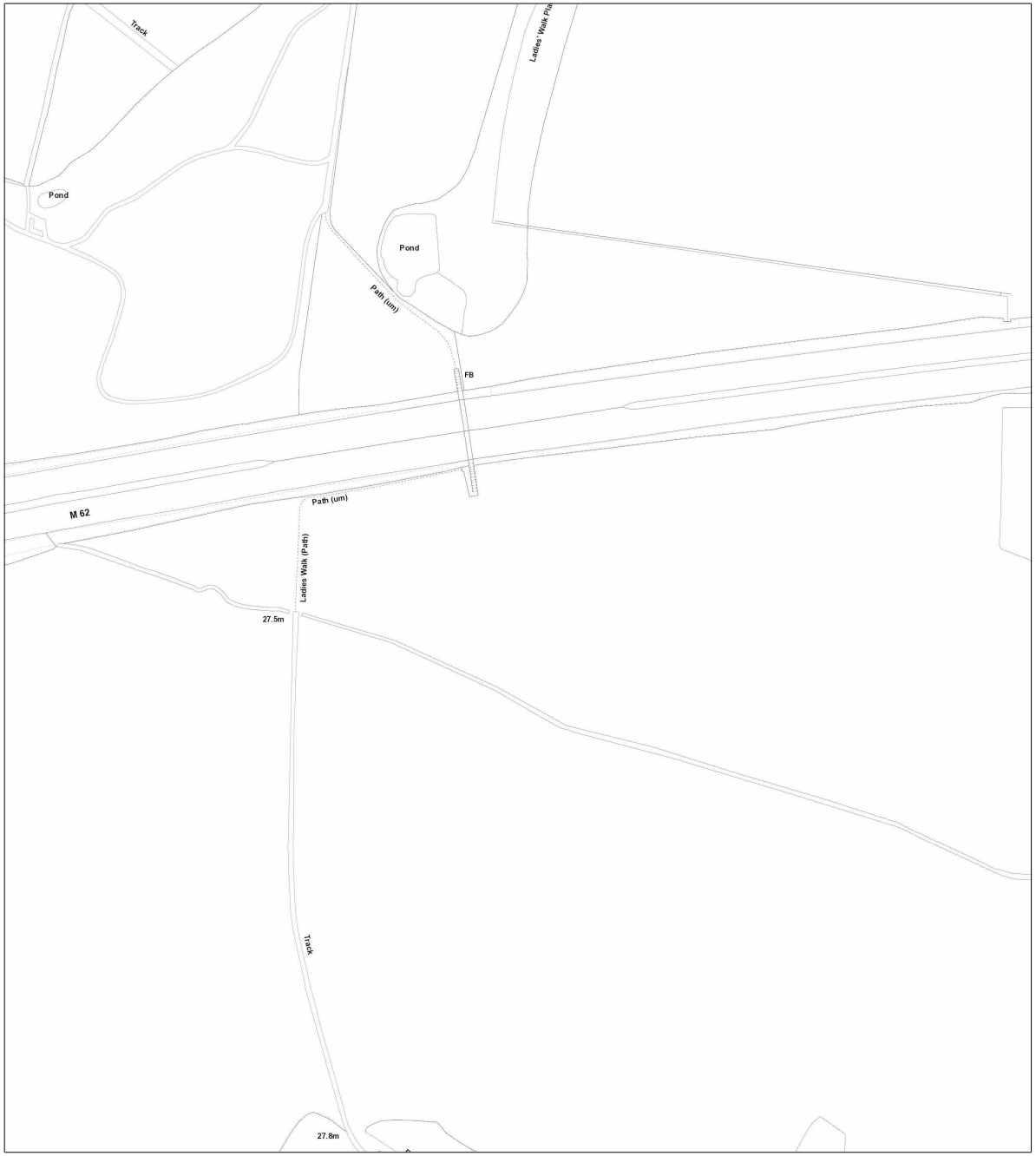

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Refno	Cover	Func	Invert	Size x	Size y	Shape	Matl	Length	Grad

LEGEND

Abandoned | Foul | Surface Water | Combined

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

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- Non Return Valve
- Soakaway
- Gully
- Cascade
- Flow Meter
- Hatch Box
- Oil Interceptor
- Summit
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- Inspection Chamber
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- Lamp Hole
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- Valve Chamber
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- 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	TR	Trapezoidal
EG	Egg	AR	Arch
OV	Oval	BA	Barrel
FT	Flat Top	HO	HorseShoe
RE	Rectangular	UN	Unspecified
SQ	Square		

SEWER MATERIAL

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ST	Steel
VC	Vitrified Clay
PP	Polypropylene
PF	Pitch Fibre
MAC	Masonry, Coursed
MAR	Masonry, Random
U	Unspecified

Address or Site Reference:

Omega Business park,

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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:
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- Extent of Survey
- Rodding Eye
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- Discharge Point
- Vortex
- Penstock
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- Hatch Box
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- Summit
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- Vent Column
- Vortex Chamber
- Penstock Chamber
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- Sewer Overflow
- Ww Treatment Works
- Ww Pumping Station
- Septic Tank
- Control Kiosk
- Change of Characteristic

MANHOLE FUNCTION

FO	Foul
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OV	Overflow

SEWER SHAPE

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MAR	Masonry, Random
U	Unspecified

Address or Site Reference:

Omega Business park,

OS sheet Number: SJ5489NW

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Nodes: 0

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SEWER RECORDS

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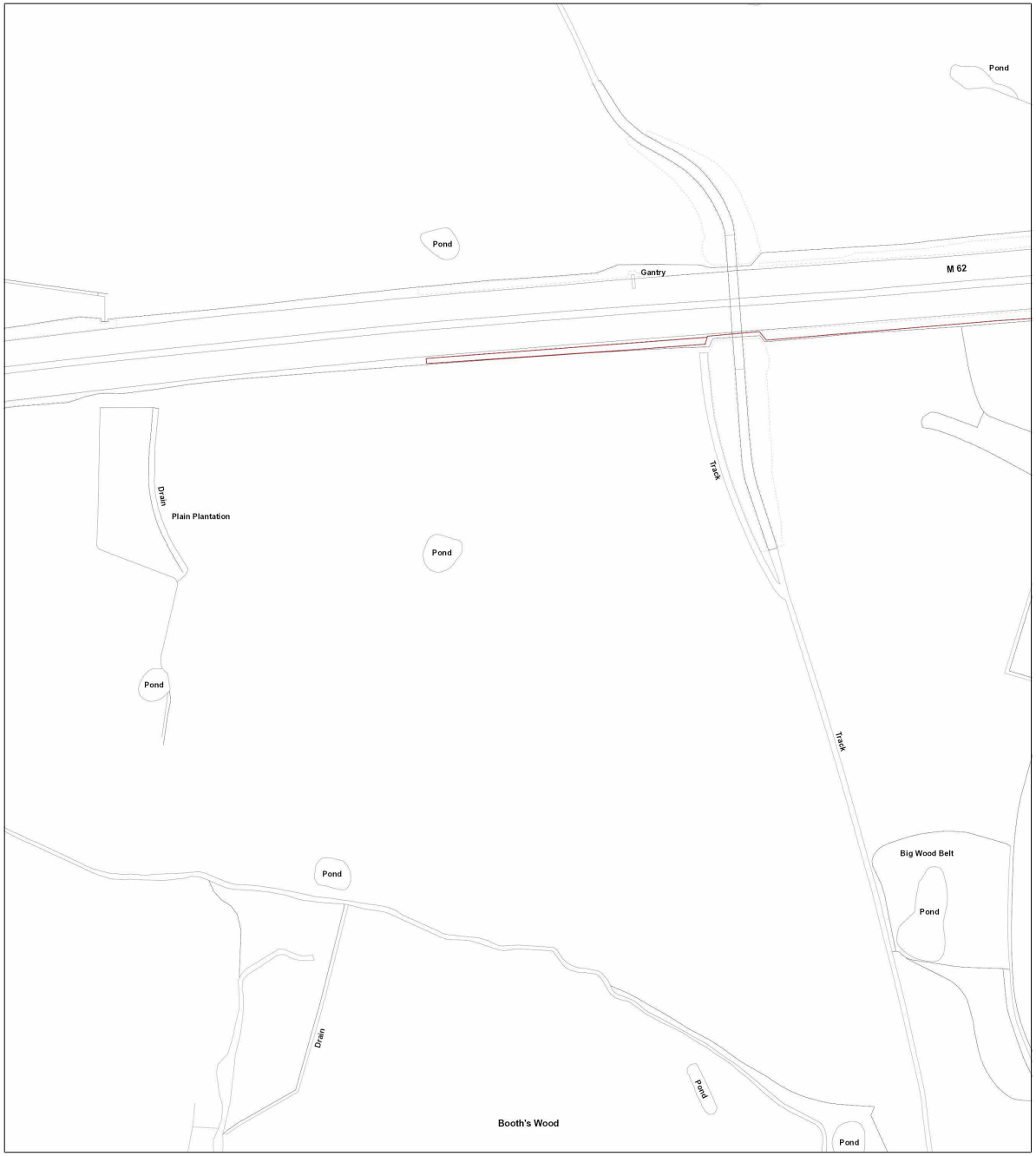

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LEGEND

Abandoned | Foul | Surface Water | Combined

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

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- Control Kiosk
- Change of Characteristic

MANHOLE FUNCTION

FO	Foul
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OV	Overflow

SEWER SHAPE

CI	Circular	TR	Trapezoidal
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SEWER MATERIAL

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ST	Steel
VC	Vitrified Clay
PP	Polypropylene
PF	Pitch Fibre
MAC	Masonry, Coursed
MAR	Masonry, Random
U	Unspecified

Address or Site Reference:

Omega Business park,

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SEWER RECORDS

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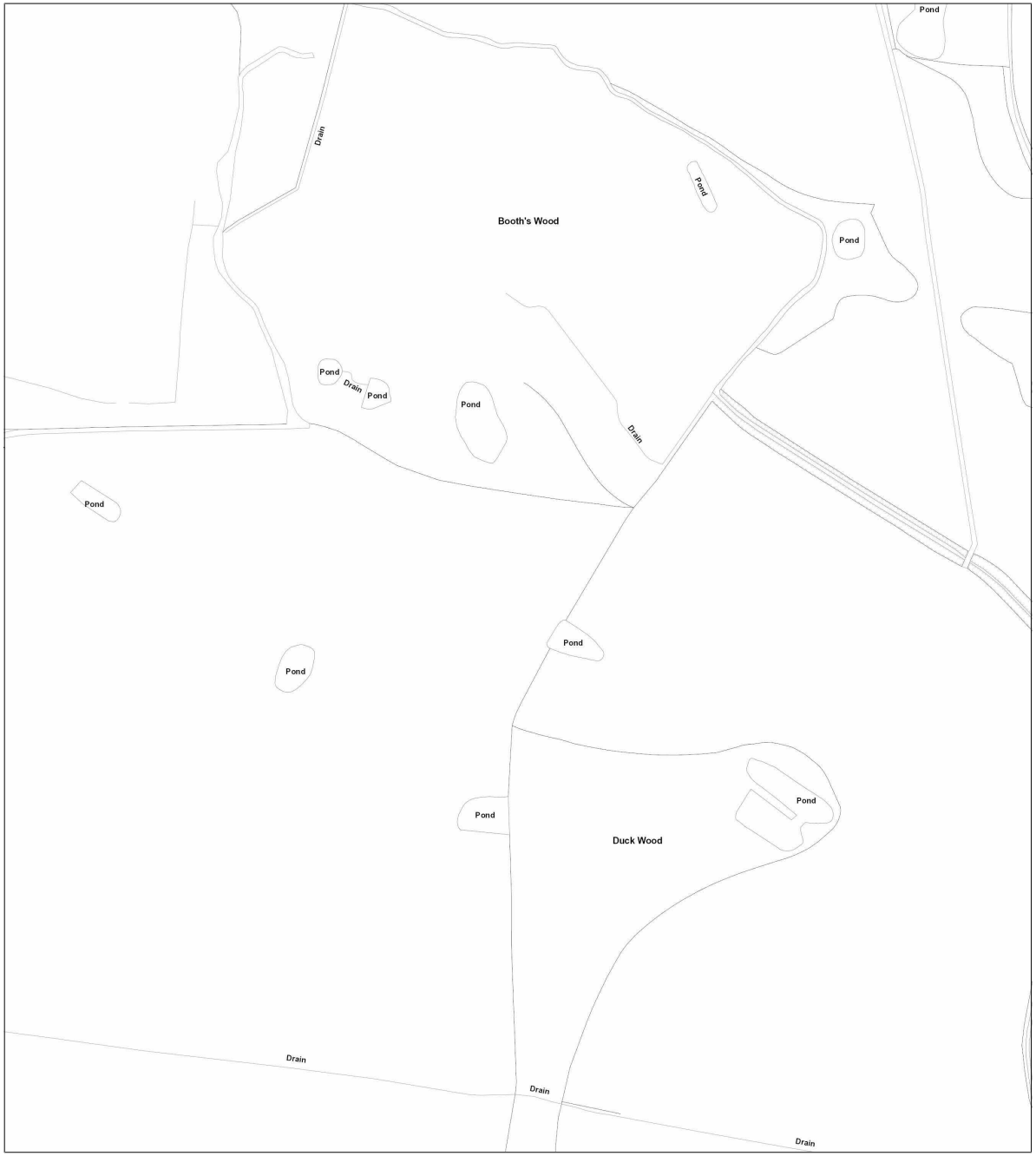

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LEGEND

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

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

SEWER MATERIAL

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

Address or Site Reference:

Omega Business park,

OS sheet Number: SJ5490SE
Scale: 1:1250 **Date:** 13/11/2019
Nodes: 0
Sheet: 8 of 15

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SEWER RECORDS

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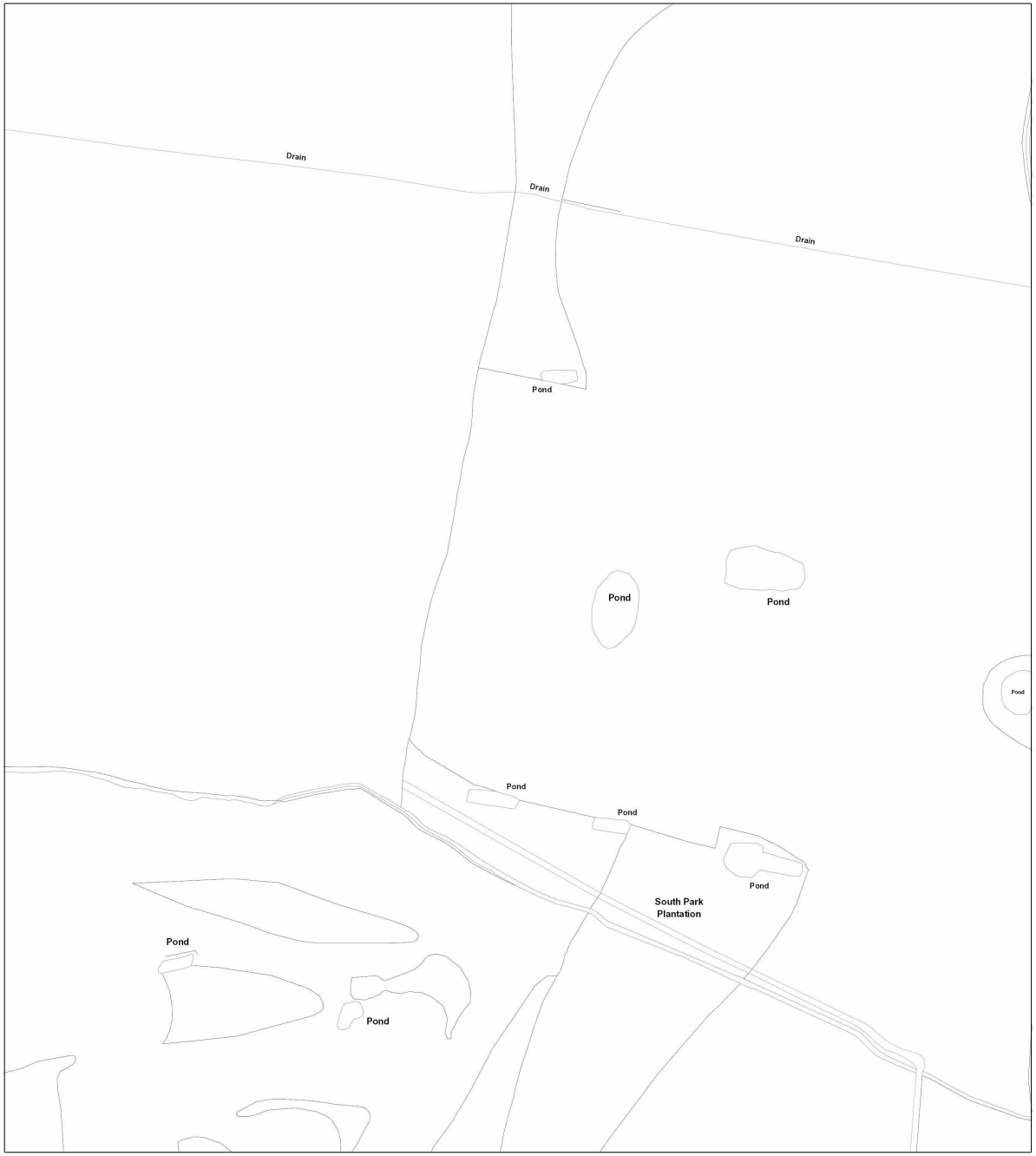

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Refno	Cover	Func	Invert	Size x	Size y	Shape	Matl	Length	Grad

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

SEWER MATERIAL

AC	Asbestos Cement
BR	Brick
PE	Polyethylene
RP	Reinforced Plastic Matrix
CO	Concrete
CSB	Concrete Segment Bolted
CSU	Concrete Segment Unbolted
CC	Concrete Box Culverted
PSC	Plastic / Steel Composite
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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:

Omega Business park,

OS sheet Number: SJ5489NE
Scale: 1:1250 **Date:** 13/11/2019
Nodes: 0
Sheet: 9 of 15

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SEWER RECORDS

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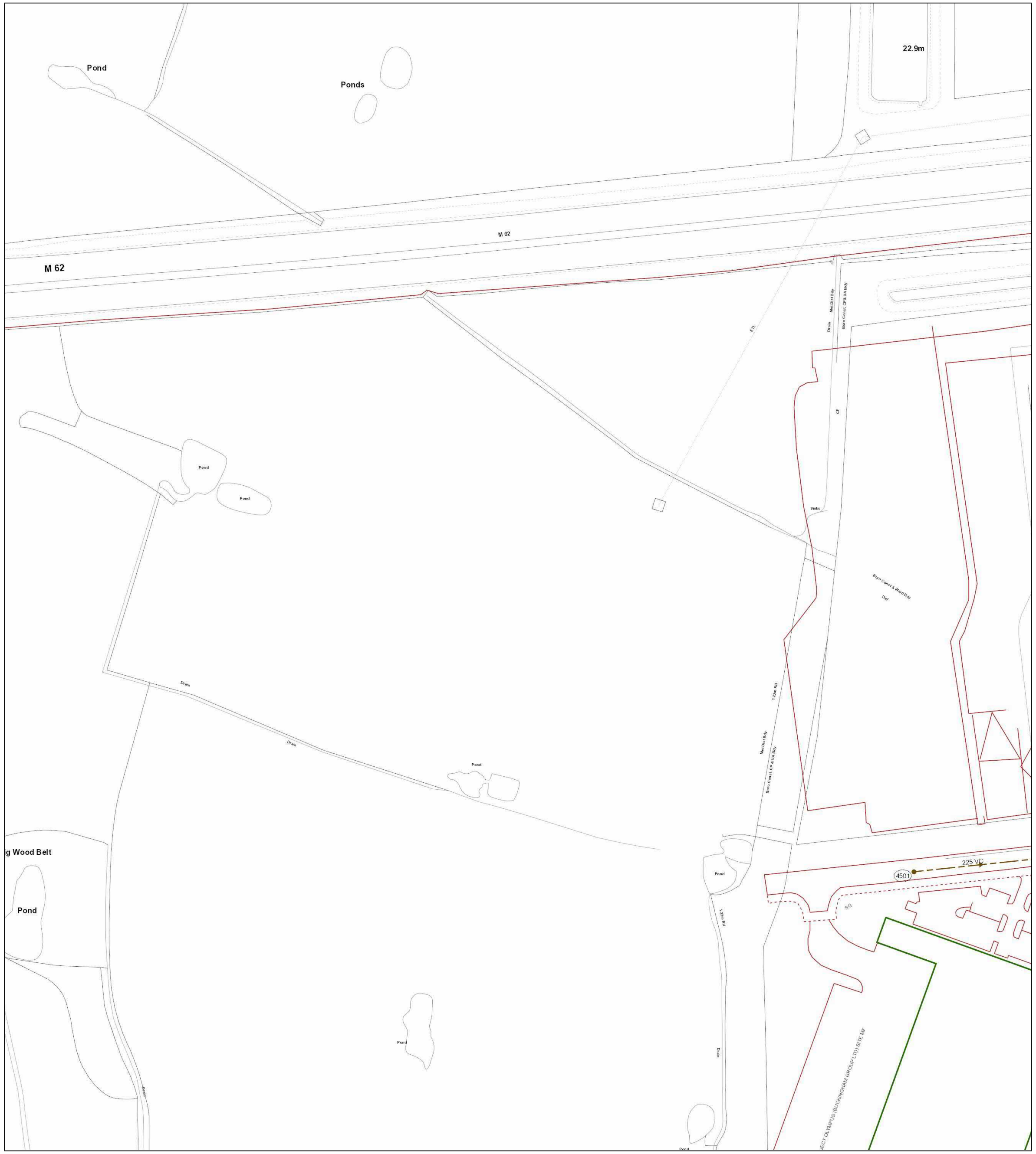

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Refno	Cover	Func	Invert	Size x	Size y	Shape	Matl	Length	Grad
4501	21.52	FO	19.32	225			VC	75.25677	1 in 151
4501	21.52	FO	19.32	225			VC	75.25677	1 in 151

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

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- Head of System
- Extent of Survey
- Rodding Eye
- Inlet
- Discharge Point
- Vortex
- Penstock
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- 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:

Omega Business park,

OS sheet Number: SJ5590NW
Scale: 1:1250 **Date:** 13/11/2019
Nodes: 2
Sheet: 10 of 15

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SEWER RECORDS

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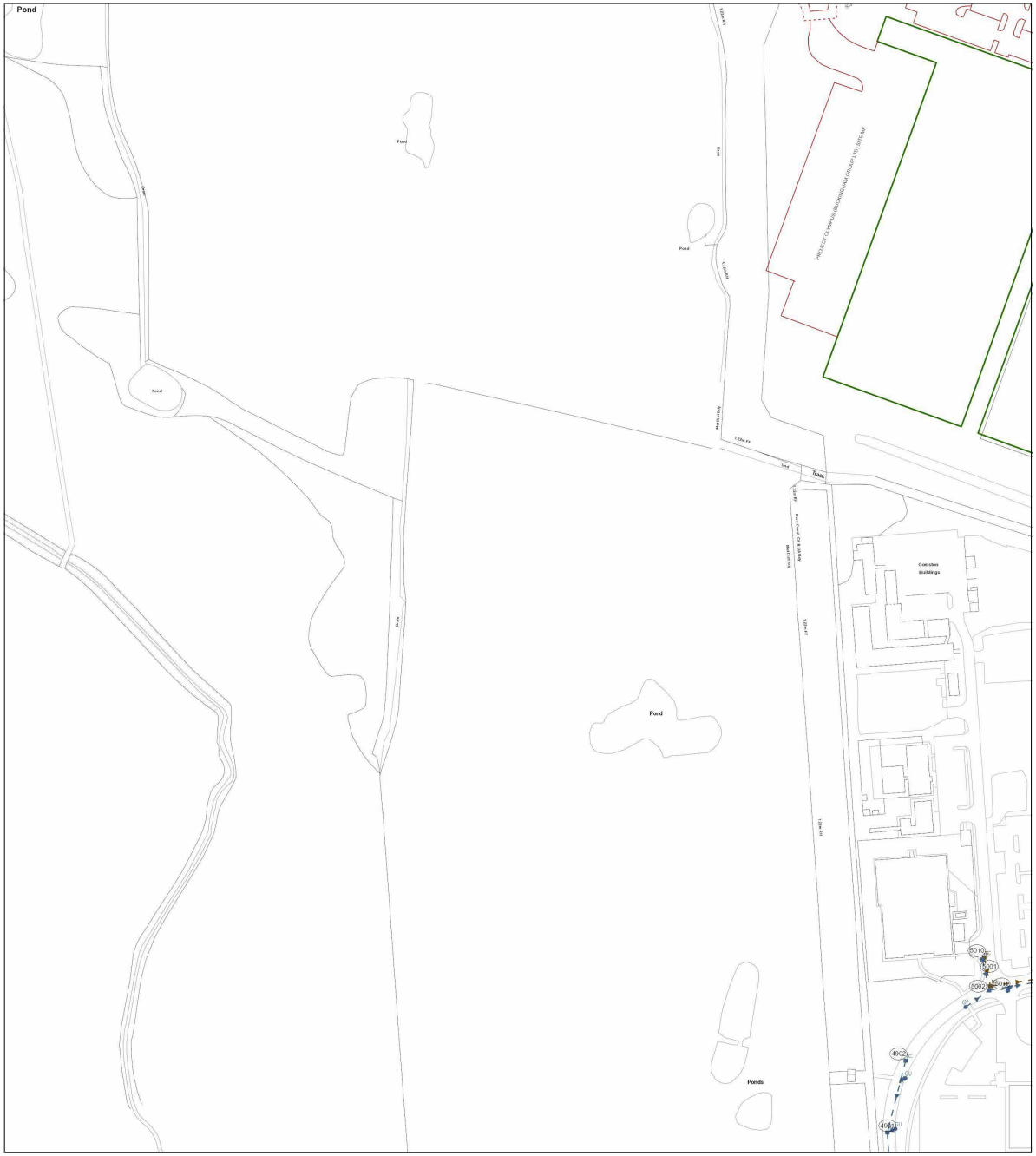

Refno	Cover	Func	Invert	Size x	Size y	Shape	Matl	Length	Grad	Refno	Cover	Func	Invert	Size x	Size y	Shape	Matl	Length	Grad

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

SEWER MATERIAL

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

Address or Site Reference:

Omega Business park,

OS sheet Number: SJ5590SW

Scale: 1:1250 **Date:** 13/11/2019

Nodes: 0

Sheet: 11 of 15

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SEWER RECORDS

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Refno	Cover	Func	Invert	Size x	Size y	Shape	Matl	Length	Grad
4401	17.01	SW	15.51	150			PVC	26.954 35	1 in 50
4401	17.01	SW	15.51	150			PVC	26.954 35	1 in 50
4402	16.74	SW	14.65	525			CO	25.611 74	1 in 285
4402	16.74	SW	14.65	525			CO	25.611 74	1 in 285
4402	16.74	SW	14.6	600			CO	26.538 02	1 in 295
4402	16.74	SW	14.6	600			CO	26.538 02	1 in 295
4403	16.98	FO	14.24	150			PVC	60.922 49	1 in 80
4403	16.98	FO	14.24	150			PVC	60.922 49	1 in 80

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

SEWER MATERIAL

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

Address or Site Reference:

Omega Business park,

OS sheet Number: SJ5589NW
Scale: 1:1250 **Date:** 13/11/2019
Nodes: 8
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SEWER RECORDS

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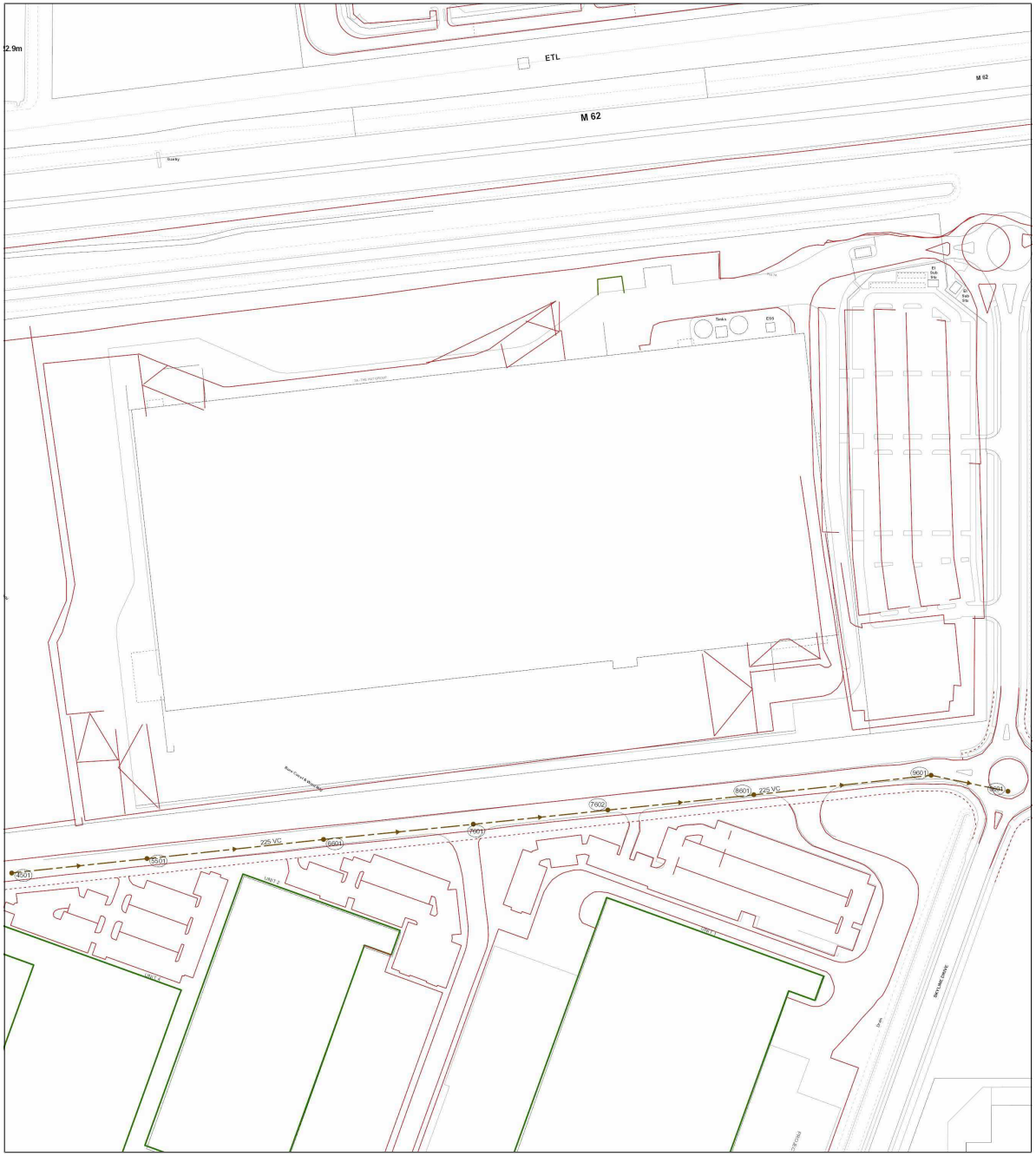

Refno	Cover	Func	Invert	Size x	Size y	Shape	Mat	Length	Grad
7602	21.32	FO	17.09	225			VC	81.203985	1 in 148
8601	21.33	FO	18.16	225			VC	83.41533	1 in 149
7601	21.62	FO	17.6	225			VC	75.011115	1 in 147
9601	20.64	FO	16.54	225			VC	98.90434	1 in 148
4501	21.52	FO	19.32	225			VC	75.25677	1 in 151
4501	21.52	FO	19.32	225			VC	75.25677	1 in 151
5501	21.97	FO	18.82	225			VC	98.38638	1 in 149
9601	20.5	FO	15.97	225			VC	43.40433	1 in 150

Refno	Cover	Func	Invert	Size x	Size y	Shape	Mat	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:
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- Rodding Eye
- Inlet
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- Vortex
- Penstock
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- Non Return Valve
- Soakaway
- Gully
- Cascade
- Flow Meter
- Hatch Box
- Oil Interceptor
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- Orifice Plate
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- Bifurcation Chamber
- Lamp Hole
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- 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	TR	Trapezoidal
EG	Egg	AR	Arch
OV	Oval	BA	Barrel
FT	Flat Top	HO	HorseShoe
RE	Rectangular	UN	Unspecified
SQ	Square		

SEWER MATERIAL

AC	Asbestos Cement
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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:

Omega Business park,

OS sheet Number: SJ5590NE

Scale: 1:1250 **Date:** 13/11/2019

Nodes: 8

Sheet: 13 of 15

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SEWER RECORDS

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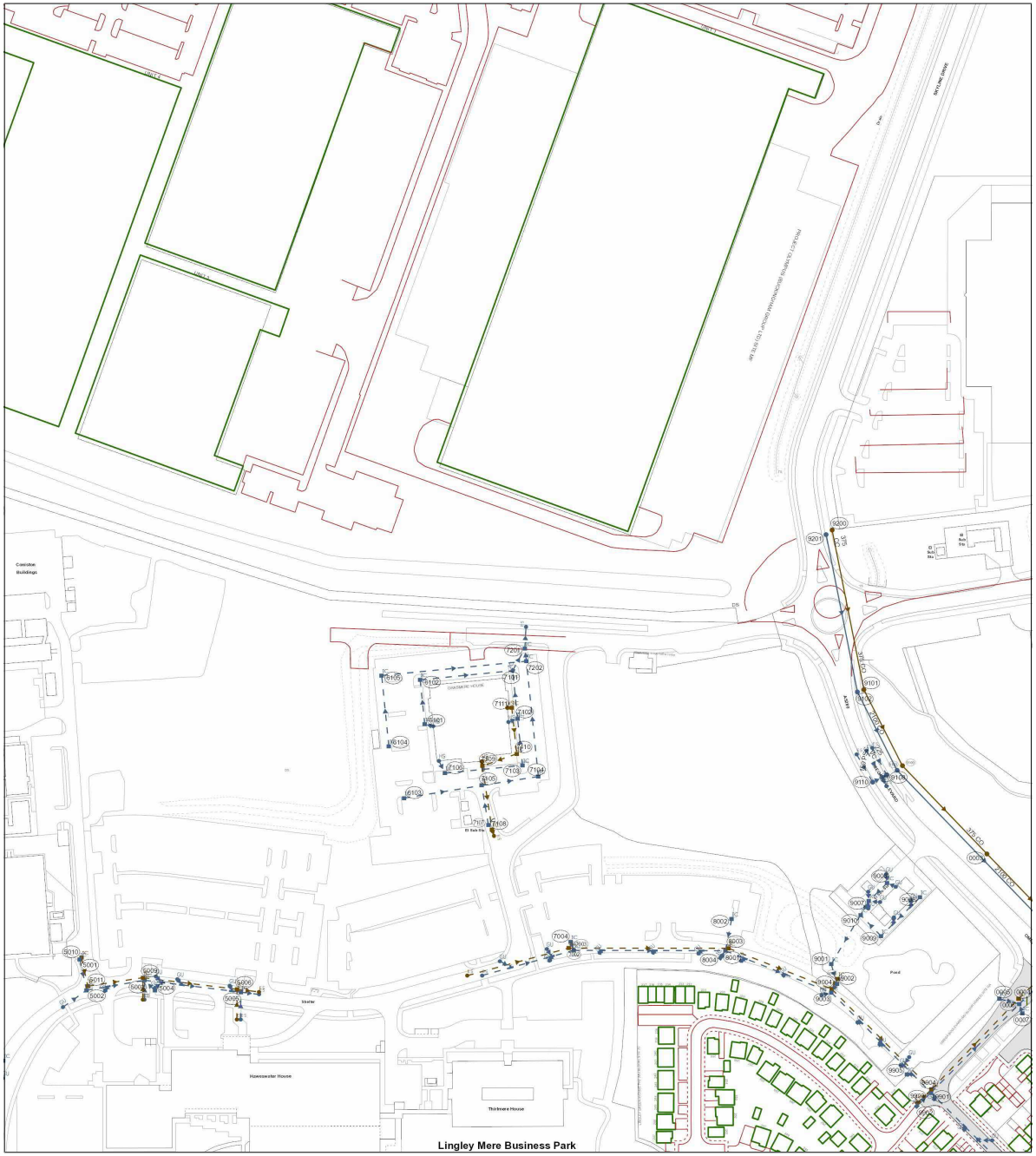

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9100		SW		225			VC	5.3232.92	
9200	20.5	FO	13.58	375			CO	90.2567	
9110		SW		150			PSC	5.7438.54	
9201	20.4	SW	14.33	2100			CO	89.934.81	
9102	19.65	SW	14.19	2100			CO	48.616.95	
9101	19.5	FO	13.26	375			CO	47.074.28	
9100	18.5	FO	13.09	375			CO	67.677.38	
9108		SW		150			PSC	2.9813.22	
0003	18.45	FO	12.91	375			CO	70.081.95	1 in 779
9103	19.5	SW	14.11	2100			CO	140.32.29	1 in 246

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

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- Hatch Box
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- Summit
- Drop Shaft
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- 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	TR	Trapezoidal
EG	Egg	AR	Arch
OV	Oval	BA	Barrel
FT	Flat Top	HO	HorseShoe
RE	Rectangular	UN	Unspecified
SQ	Square		

SEWER MATERIAL

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BR	Brick
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ST	Steel
VC	Vitrified Clay
PP	Polypropylene
PF	Pitch Fibre
MAC	Masonry, Coursed
MAR	Masonry, Random
U	Unspecified

Address or Site Reference:

Omega Business park,

OS sheet Number: SJ5590SE
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SEWER RECORDS

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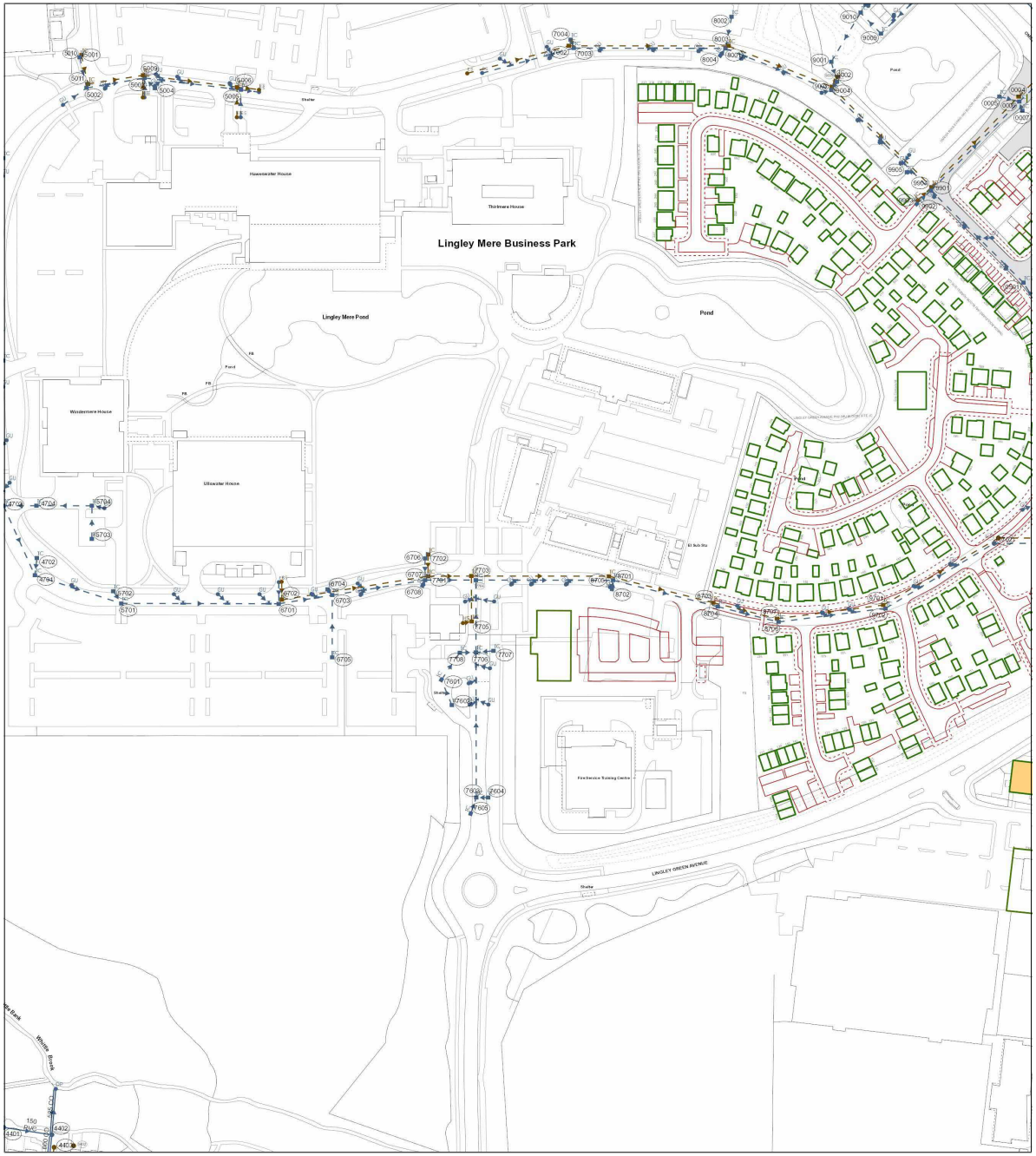

Refno	Cover	Func	Invert	Size x	Size y	Shape	Matl	Length	Grad
4401	17.01	SW	15.51	150			PVC	26.954 35	1 in 50
4401	17.01	SW	15.51	150			PVC	26.954 35	1 in 50
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4402	16.74	SW	14.65	525			CO	25.611 74	1 in 285
4402	16.74	SW	14.6	600			CO	26.538 02	1 in 295
4402	16.74	SW	14.6	600			CO	26.538 02	1 in 295
4403	16.98	FO	14.24	150			PVC	60.922 49	1 in 80
4403	16.98	FO	14.24	150			PVC	60.922 49	1 in 80
0702		SW		0			UN	45.563 84	
0701		FO		0			UN	79.354 03	
9103	19.5	SW	14.11	2100			CO	140.32 29	1 in 246

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

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- Head of System
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- 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	TR	Trapezoidal
EG	Egg	AR	Arch
OV	Oval	BA	Barrel
FT	Flat Top	HO	HorseShoe
RE	Rectangular	UN	Unspecified
SQ	Square		

SEWER MATERIAL

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RP	Reinforced Plastic Matrix
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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:

Omega Business park,

OS sheet Number: SJ5589NE

Scale: 1:1250 **Date:** 13/11/2019

Nodes: 11

Sheet: 15 of 15

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SEWER RECORDS

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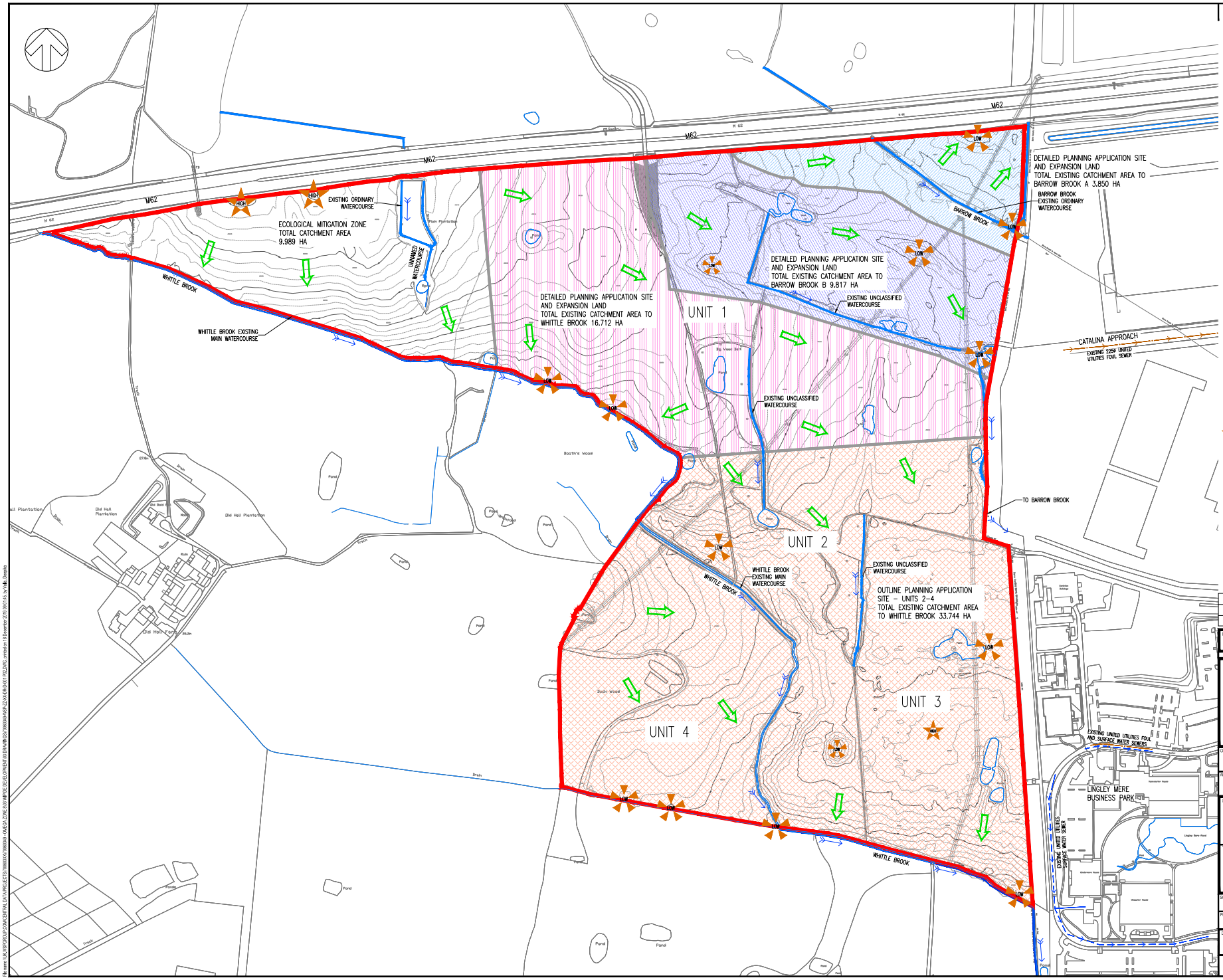
Appendix E

CATCHMENT AREA PLAN

Public



DO NOT SCALE

NOTES

1. ALL DIMENSIONS ARE SHOWN IN MILLIMETRES AND ALL LEVELS ARE SHOWN IN METRES UNLESS NOTED OTHERWISE.
2. THIS DRAWING IS IN THE DEVELOPMENT STAGE AND IS SUBJECT TO CHANGE.
3. THIS DRAWING IS BASED ON THE FOLLOWING INFORMATION:
   - TOPOGRAPHICAL SURVEY REF 52187_01 BY MALCOLM HUGHES SURVEYORS DATED MARCH 2019.
   - SITE MASTERPLAN REF 4150–CA–00–00–DR–A–05100_ZONE 8 MASTERPLAN–SK3 BY CHETWOODS DATED OCTOBER 2019.
   - UNITED UTILITIES SEWER RECORDS DATED NOVEMBER 2019.

KEY

- SITE BOUNDARY
- EXISTING UNITED UTILITIES SURFACE WATER SEWER (APPROXIMATE LOCATION)
- EXISTING UNITED UTILITIES FOUL WATER SEWER (APPROXIMATE LOCATION)
- OUTLINE PLANNING APPLICATION SITE UNITS 2–4 CATCHMENT AREA TO WHITTLE BROOK 33.744 HA
- DETAILED PLANNING APPLICATION SITE UNIT 1 & EXPANSION LAND CATCHMENT AREA TO WHITTLE BROOK 16.712 HA
- DETAILED PLANNING APPLICATION SITE UNIT 1 & EXPANSION LAND CATCHMENT AREA TO BARROW BROOK 9.817 HA
- DETAILED PLANNING APPLICATION SITE UNIT 1 & EXPANSION LAND CATCHMENT AREA TO BARROW BROOK 3.850 HA
- ECOLOGICAL MITIGATION ZONE CATCHMENT AREA TO WHITTLE BROOK 9.989 HA
- DIRECTION OF FALL (FROM TOPOGRAPHICAL SURVEY)
- SITE HIGH POINT / LOW POINT (FROM TOPOGRAPHICAL SURVEY)

REV	DATE	BY	DESCRIPTION	CHK	APP
P02	16/12/2019	DV	GENERAL UPDATE	LC	CLI
P01	06/12/2019	DV	FIRST ISSUE	MWW	MWW

DRAWING STATUS: S2 - FOR INFORMATION

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wsp.com

CLIENT: OMEGA ST. HELENS

ARCHITECT:

SITE/PROJECT: OMEGA ZONE 8, ST. HELENS

TITLE: EXISTING DRAINAGE CATCHMENT AREA PLAN

SCALE @ A1:	CHECKED:	APPROVED:
1:2500	VD	MWW

PROJECT NO:	DESIGNED:	DRAWN:	DATE:
70060349	DV	DV	December 19

DRAWING No.: 70060349-WSP-ZZ-XX-DR-D-001 P02 REV: P02

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File name: UK.WSPGROUP.COM\CENTRAL DATA\PROJECTS\70060349\70060349 - OMEGA ZONE 8\03 WIP\DE DEVELOPMENT\01 DRAWING\70060349-WSP-ZZ-XX-DR-D-001 P02.DWG, printed on 19 December 2019 09:11:45, by VD, Deepto

Appendix F

MICRODRAINAGE CALCULATION RESULTS

Public

Appendix F.1

GREENFIELD RUNOFF CALCULATIONS

Public

IH 124 Mean Annual Flood

Input

Return Period (years)	1	SAAR (mm)	851	Urban	0.000
Area (ha)	74.112	Soil	0.470	Region Number	Region 10

Results	l/s
QBAR Rural	430.6
QBAR Urban	430.6
Q1 year	374.6
Q1 year	374.6
Q2 years	401.1
Q5 years	512.4
Q10 years	594.3
Q20 years	677.0
Q25 years	706.2
Q30 years	730.1
Q50 years	796.6
Q100 years	895.7
Q200 years	1016.3
Q250 years	1055.0
Q1000 years	1309.1

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Greenfield Runoff Volume

FEH Data

Return Period (years)	100
Storm Duration (mins)	360
FEH Rainfall Version	1999
Site Location	Omega 8
C (1km)	-0.024
D1 (1km)	0.316
D2 (1km)	0.325
D3 (1km)	0.317
E (1km)	0.294
F (1km)	2.469
Areal Reduction Factor	1.00
Area (ha)	74.112
SAAR (mm)	851
CWI	45.000
SPR Host	41.130
URBEXT (1990)	0.0000

Results

Percentage Runoff (%)	25.53
Greenfield Runoff Volume (m³)	12491.668

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Appendix F.2

OUTLINE PLANNING APPLICATION SITE STORAGE CALCULATIONS

Public

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	97.338	0.338	33.3	2196.0	OK
30 min Summer	97.446	0.446	40.0	2899.5	OK
60 min Summer	97.560	0.560	40.7	3639.1	OK
120 min Summer	97.673	0.673	42.8	4377.4	OK
180 min Summer	97.735	0.735	44.7	4774.5	OK
240 min Summer	97.773	0.773	45.9	5021.3	OK
360 min Summer	97.819	0.819	47.2	5326.6	OK
480 min Summer	97.847	0.847	48.0	5504.4	OK
600 min Summer	97.862	0.862	48.5	5603.6	OK
720 min Summer	97.869	0.869	48.7	5651.4	OK
960 min Summer	97.873	0.873	48.8	5674.0	OK
1440 min Summer	97.871	0.871	48.7	5664.6	OK
2160 min Summer	97.856	0.856	48.3	5561.3	OK
2880 min Summer	97.830	0.830	47.6	5397.1	OK
4320 min Summer	97.771	0.771	45.8	5009.2	OK
5760 min Summer	97.710	0.710	44.0	4614.4	OK
7200 min Summer	97.653	0.653	42.2	4242.8	OK
8640 min Summer	97.599	0.599	40.7	3895.9	OK
10080 min Summer	97.546	0.546	40.7	3546.5	OK
15 min Winter	97.378	0.378	36.5	2460.0	OK
30 min Winter	97.500	0.500	40.7	3251.0	OK
60 min Winter	97.628	0.628	41.4	4084.3	OK
120 min Winter	97.756	0.756	45.4	4914.6	OK
180 min Winter	97.825	0.825	47.4	5365.2	OK
240 min Winter	97.869	0.869	48.6	5647.8	OK
360 min Winter	97.924	0.924	50.2	6003.1	OK
480 min Winter	97.956	0.956	51.0	6216.4	OK
600 min Winter	97.976	0.976	51.6	6343.3	OK
720 min Winter	97.987	0.987	51.8	6414.8	OK
960 min Winter	97.993	0.993	52.0	6455.0	OK

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	131.495	0.0	1521.0	27
30 min Summer	87.293	0.0	2067.8	41
60 min Summer	55.250	0.0	3291.5	70
120 min Summer	33.773	0.0	4023.7	130
180 min Summer	24.968	0.0	4447.2	188
240 min Summer	20.019	0.0	4735.1	248
360 min Summer	14.622	0.0	5139.8	366
480 min Summer	11.697	0.0	5425.7	484
600 min Summer	9.830	0.0	5634.9	602
720 min Summer	8.524	0.0	5790.9	720
960 min Summer	6.801	0.0	5987.9	844
1440 min Summer	4.939	0.0	6058.0	1088
2160 min Summer	3.580	0.0	8332.3	1488
2880 min Summer	2.846	0.0	8747.8	1904
4320 min Summer	2.056	0.0	9158.5	2724
5760 min Summer	1.631	0.0	10476.0	3520
7200 min Summer	1.362	0.0	10904.5	4320
8640 min Summer	1.175	0.0	11230.5	5104
10080 min Summer	1.037	0.0	11443.0	5848
15 min Winter	131.495	0.0	1725.6	26
30 min Winter	87.293	0.0	2321.5	41
60 min Winter	55.250	0.0	3692.8	70
120 min Winter	33.773	0.0	4501.4	128
180 min Winter	24.968	0.0	4965.3	186
240 min Winter	20.019	0.0	5278.0	242
360 min Winter	14.622	0.0	5711.5	358
480 min Winter	11.697	0.0	6010.7	474
600 min Winter	9.830	0.0	6222.6	586
720 min Winter	8.524	0.0	6373.2	698
960 min Winter	6.801	0.0	6542.0	912

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Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
1440 min Winter	97.982	0.982	51.7	6380.2	OK
2160 min Winter	97.953	0.953	51.0	6197.4	OK
2880 min Winter	97.912	0.912	49.8	5930.2	OK
4320 min Winter	97.820	0.820	47.3	5331.5	OK
5760 min Winter	97.731	0.731	44.6	4749.0	OK
7200 min Winter	97.648	0.648	42.0	4213.8	OK
8640 min Winter	97.570	0.570	40.7	3704.9	OK
10080 min Winter	97.493	0.493	40.7	3203.0	OK

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
1440 min Winter	4.939	0.0	6519.1	1144
2160 min Winter	3.580	0.0	9324.8	1604
2880 min Winter	2.846	0.0	9778.6	2052
4320 min Winter	2.056	0.0	10173.9	2940
5760 min Winter	1.631	0.0	11738.9	3760
7200 min Winter	1.362	0.0	12222.7	4608
8640 min Winter	1.175	0.0	12595.9	5368
10080 min Winter	1.037	0.0	12850.7	6048

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.500	Shortest Storm (mins)	15
Ratio R	0.376	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 9.011

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	3.011	4	8	3.000	8	12	3.000

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Model Details

Storage is Online Cover Level (m) 100.000

Tank or Pond Structure

Invert Level (m) 97.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	6500.0	1.000	6500.0

Crown Vortex Valve® Outflow Control

Design Head (m) 1.000 Vortex Valve® Type R2 SW Only Invert Level (m) 97.000
Design Flow (l/s) 52.3 Diameter (mm) 281

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	6.9	1.200	57.2	3.000	90.4	7.000	138.1
0.200	18.2	1.400	61.8	3.500	97.6	7.500	142.9
0.300	29.6	1.600	66.0	4.000	104.4	8.000	147.6
0.400	37.9	1.800	70.0	4.500	110.7	8.500	152.2
0.500	40.7	2.000	73.8	5.000	116.7	9.000	156.6
0.600	40.4	2.200	77.4	5.500	122.4	9.500	160.9
0.800	46.7	2.400	80.9	6.000	127.8		
1.000	52.2	2.600	84.2	6.500	133.1		

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Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	97.338	0.338	24.2	1520.6	OK
30 min Summer	97.447	0.447	25.8	2010.1	OK
60 min Summer	97.561	0.561	27.1	2523.8	OK
120 min Summer	97.674	0.674	29.7	3033.1	OK
180 min Summer	97.735	0.735	31.0	3307.2	OK
240 min Summer	97.773	0.773	31.8	3477.0	OK
360 min Summer	97.819	0.819	32.8	3686.5	OK
480 min Summer	97.846	0.846	33.3	3807.7	OK
600 min Summer	97.861	0.861	33.6	3874.4	OK
720 min Summer	97.868	0.868	33.7	3905.7	OK
960 min Summer	97.871	0.871	33.8	3917.7	OK
1440 min Summer	97.868	0.868	33.7	3905.0	OK
2160 min Summer	97.850	0.850	33.4	3825.9	OK
2880 min Summer	97.824	0.824	32.8	3706.7	OK
4320 min Summer	97.763	0.763	31.6	3431.8	OK
5760 min Summer	97.702	0.702	30.3	3157.1	OK
7200 min Summer	97.645	0.645	29.1	2902.9	OK
8640 min Summer	97.594	0.594	27.9	2672.0	OK
10080 min Summer	97.548	0.548	26.8	2464.8	OK
15 min Winter	97.379	0.379	25.5	1704.1	OK
30 min Winter	97.501	0.501	25.8	2254.8	OK
60 min Winter	97.629	0.629	28.7	2830.8	OK
120 min Winter	97.757	0.757	31.5	3405.3	OK
180 min Winter	97.826	0.826	32.9	3716.8	OK
240 min Winter	97.869	0.869	33.7	3911.9	OK
360 min Winter	97.924	0.924	34.8	4156.4	OK
480 min Winter	97.956	0.956	35.4	4302.6	OK
600 min Winter	97.975	0.975	35.7	4389.0	OK
720 min Winter	97.986	0.986	35.9	4437.1	OK
960 min Winter	97.992	0.992	36.0	4462.4	OK

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	131.495	0.0	1117.7	26
30 min Summer	87.293	0.0	1495.3	41
60 min Summer	55.250	0.0	2329.9	70
120 min Summer	33.773	0.0	2841.5	130
180 min Summer	24.968	0.0	3136.7	188
240 min Summer	20.019	0.0	3336.9	248
360 min Summer	14.622	0.0	3617.1	366
480 min Summer	11.697	0.0	3813.0	484
600 min Summer	9.830	0.0	3954.2	602
720 min Summer	8.524	0.0	4057.0	720
960 min Summer	6.801	0.0	4178.4	846
1440 min Summer	4.939	0.0	4185.6	1090
2160 min Summer	3.580	0.0	5822.7	1492
2880 min Summer	2.846	0.0	6117.4	1904
4320 min Summer	2.056	0.0	6402.5	2724
5760 min Summer	1.631	0.0	7280.8	3520
7200 min Summer	1.362	0.0	7583.2	4320
8640 min Summer	1.175	0.0	7817.5	5104
10080 min Summer	1.037	0.0	7977.5	5856
15 min Winter	131.495	0.0	1261.6	26
30 min Winter	87.293	0.0	1659.7	41
60 min Winter	55.250	0.0	2610.3	70
120 min Winter	33.773	0.0	3174.1	128
180 min Winter	24.968	0.0	3496.4	184
240 min Winter	20.019	0.0	3712.4	242
360 min Winter	14.622	0.0	4009.4	358
480 min Winter	11.697	0.0	4210.5	474
600 min Winter	9.830	0.0	4348.8	586
720 min Winter	8.524	0.0	4442.7	698
960 min Winter	6.801	0.0	4534.6	912

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Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
1440 min Winter	97.979	0.979	35.8	4405.8	OK
2160 min Winter	97.950	0.950	35.3	4273.9	OK
2880 min Winter	97.908	0.908	34.5	4085.2	OK
4320 min Winter	97.815	0.815	32.7	3668.3	OK
5760 min Winter	97.726	0.726	30.8	3267.5	OK
7200 min Winter	97.646	0.646	29.1	2906.3	OK
8640 min Winter	97.574	0.574	27.4	2583.7	OK
10080 min Winter	97.509	0.509	25.8	2291.1	OK

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
1440 min Winter	4.939	0.0	4481.9	1144
2160 min Winter	3.580	0.0	6513.7	1604
2880 min Winter	2.846	0.0	6834.2	2052
4320 min Winter	2.056	0.0	7103.9	2940
5760 min Winter	1.631	0.0	8156.9	3760
7200 min Winter	1.362	0.0	8497.5	4608
8640 min Winter	1.175	0.0	8764.4	5368
10080 min Winter	1.037	0.0	8953.8	6160

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.500	Shortest Storm (mins)	15
Ratio R	0.376	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 6.247

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	2.247	4	8	2.000	8	12	2.000

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Model Details

Storage is Online Cover Level (m) 100.000

Tank or Pond Structure

Invert Level (m) 97.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	4500.0	1.000	4500.0

Crown Vortex Valve® Outflow Control

Design Head (m) 1.000 Vortex Valve® Type R2 SW Only Invert Level (m) 97.000
Design Flow (l/s) 36.2 Diameter (mm) 234

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	5.7	1.200	39.6	3.000	62.7	7.000	95.8
0.200	14.6	1.400	42.8	3.500	67.7	7.500	99.1
0.300	22.3	1.600	45.8	4.000	72.4	8.000	102.4
0.400	25.8	1.800	48.6	4.500	76.8	8.500	105.5
0.500	25.6	2.000	51.2	5.000	80.9	9.000	108.6
0.600	28.0	2.200	53.7	5.500	84.9	9.500	111.6
0.800	32.4	2.400	56.1	6.000	88.7		
1.000	36.2	2.600	58.4	6.500	92.3		

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Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	97.331	0.331	24.5	1555.5	O K
30 min Summer	97.437	0.437	26.6	2055.7	O K
60 min Summer	97.549	0.549	27.5	2582.4	O K
120 min Summer	97.661	0.661	30.2	3104.7	O K
180 min Summer	97.721	0.721	31.5	3386.5	O K
240 min Summer	97.758	0.758	32.3	3561.6	O K
360 min Summer	97.804	0.804	33.3	3778.1	O K
480 min Summer	97.831	0.831	33.8	3904.2	O K
600 min Summer	97.846	0.846	34.1	3974.5	O K
720 min Summer	97.853	0.853	34.3	4008.6	O K
960 min Summer	97.856	0.856	34.3	4022.5	O K
1440 min Summer	97.853	0.853	34.3	4011.3	O K
2160 min Summer	97.837	0.837	34.0	3933.2	O K
2880 min Summer	97.811	0.811	33.4	3813.5	O K
4320 min Summer	97.752	0.752	32.2	3535.2	O K
5760 min Summer	97.693	0.693	30.9	3255.3	O K
7200 min Summer	97.637	0.637	29.6	2995.7	O K
8640 min Summer	97.587	0.587	28.5	2759.1	O K
10080 min Summer	97.542	0.542	27.3	2545.8	O K
15 min Winter	97.371	0.371	26.0	1742.9	O K
30 min Winter	97.491	0.491	26.6	2306.3	O K
60 min Winter	97.616	0.616	29.1	2896.6	O K
120 min Winter	97.742	0.742	32.0	3486.3	O K
180 min Winter	97.810	0.810	33.4	3806.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	131.495	0.0	1129.6	30
30 min Summer	87.293	0.0	1515.9	45
60 min Summer	55.250	0.0	2374.2	74
120 min Summer	33.773	0.0	2896.0	132
180 min Summer	24.968	0.0	3197.0	192
240 min Summer	20.019	0.0	3400.9	250
360 min Summer	14.622	0.0	3686.0	368
480 min Summer	11.697	0.0	3885.2	486
600 min Summer	9.830	0.0	4028.7	604
720 min Summer	8.524	0.0	4133.0	722
960 min Summer	6.801	0.0	4256.0	856
1440 min Summer	4.939	0.0	4263.2	1094
2160 min Summer	3.580	0.0	5950.8	1492
2880 min Summer	2.846	0.0	6249.5	1908
4320 min Summer	2.056	0.0	6534.0	2728
5760 min Summer	1.631	0.0	7452.7	3520
7200 min Summer	1.362	0.0	7761.3	4328
8640 min Summer	1.175	0.0	7999.5	5104
10080 min Summer	1.037	0.0	8160.2	5856
15 min Winter	131.495	0.0	1276.2	30
30 min Winter	87.293	0.0	1685.1	44
60 min Winter	55.250	0.0	2660.3	74
120 min Winter	33.773	0.0	3235.3	130
180 min Winter	24.968	0.0	3563.6	188

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Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
240 min Winter	97.853	0.853	34.3	4007.3	OK
360 min Winter	97.906	0.906	35.3	4259.9	OK
480 min Winter	97.939	0.939	36.0	4411.7	OK
600 min Winter	97.958	0.958	36.3	4501.9	OK
720 min Winter	97.969	0.969	36.5	4552.8	OK
960 min Winter	97.975	0.975	36.7	4581.2	OK
1440 min Winter	97.963	0.963	36.4	4525.0	OK
2160 min Winter	97.935	0.935	35.9	4393.4	OK
2880 min Winter	97.894	0.894	35.1	4203.0	OK
4320 min Winter	97.804	0.804	33.3	3779.5	OK
5760 min Winter	97.717	0.717	31.4	3370.2	OK
7200 min Winter	97.638	0.638	29.7	3000.4	OK
8640 min Winter	97.568	0.568	28.0	2668.0	OK
10080 min Winter	97.503	0.503	26.6	2363.3	OK

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
240 min Winter	20.019	0.0	3783.7	246
360 min Winter	14.622	0.0	4085.9	360
480 min Winter	11.697	0.0	4290.3	476
600 min Winter	9.830	0.0	4430.9	590
720 min Winter	8.524	0.0	4526.4	700
960 min Winter	6.801	0.0	4619.9	916
1440 min Winter	4.939	0.0	4564.5	1150
2160 min Winter	3.580	0.0	6656.8	1608
2880 min Winter	2.846	0.0	6981.5	2056
4320 min Winter	2.056	0.0	7248.5	2944
5760 min Winter	1.631	0.0	8349.7	3800
7200 min Winter	1.362	0.0	8697.4	4608
8640 min Winter	1.175	0.0	8968.9	5376
10080 min Winter	1.037	0.0	9159.8	6160

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.500	Shortest Storm (mins)	15
Ratio R	0.376	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 6.398

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	1.600	4	8	1.600	8	12	1.600	12	16	1.598

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Model Details

Storage is Online Cover Level (m) 100.000

Tank or Pond Structure

Invert Level (m) 97.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	4700.0	1.000	4700.0

Crown Vortex Valve® Outflow Control

Design Head (m) 1.000 Vortex Valve® Type R2 SW Only Invert Level (m) 97.000
Design Flow (l/s) 37.1 Diameter (mm) 237

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	5.8	1.200	40.7	3.000	64.3	7.000	98.2
0.200	14.8	1.400	43.9	3.500	69.5	7.500	101.7
0.300	22.7	1.600	47.0	4.000	74.3	8.000	105.0
0.400	26.5	1.800	49.8	4.500	78.8	8.500	108.2
0.500	26.3	2.000	52.5	5.000	83.0	9.000	111.4
0.600	28.8	2.200	55.1	5.500	87.1	9.500	114.4
0.800	33.2	2.400	57.5	6.000	90.9		
1.000	37.1	2.600	59.9	6.500	94.7		

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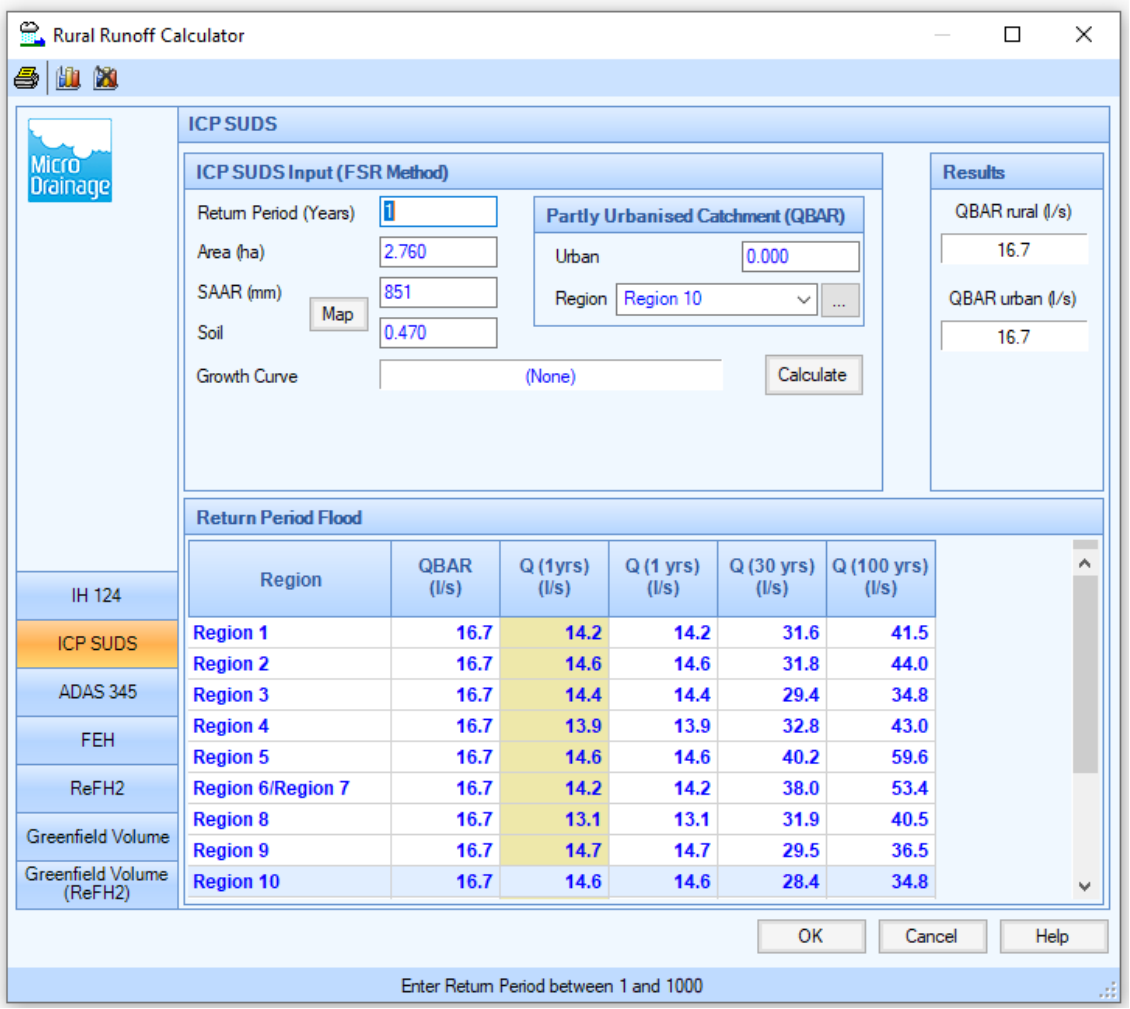
Appendix F.3

DETAILED PLANNING APPLICATION SITE HYDRAULIC CALCULATIONS

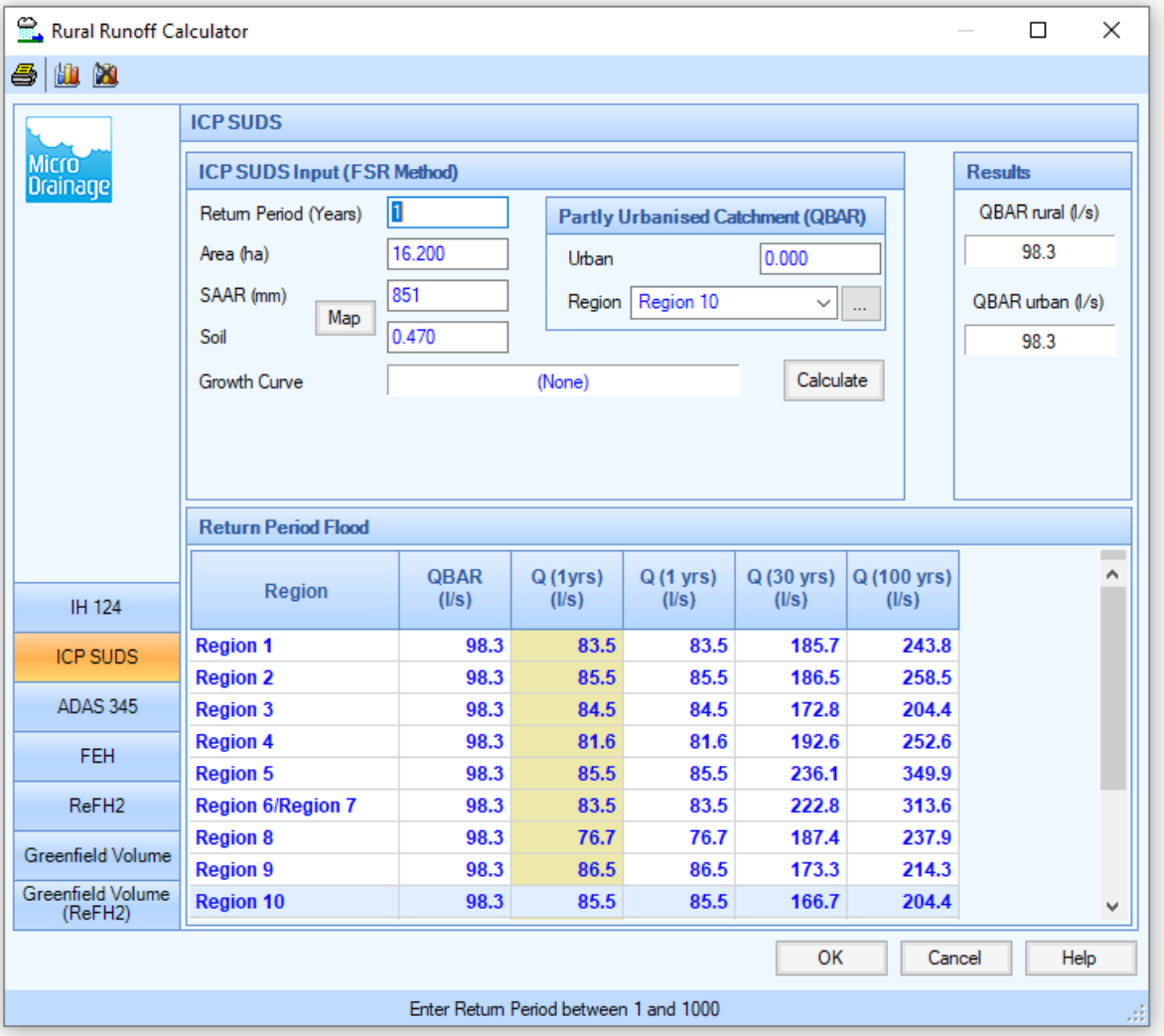
Public

Area to north watercourse



Region	QBAR (l/s)	Q (1yrs) (l/s)	Q (1 yrs) (l/s)	Q (30 yrs) (l/s)	Q (100 yrs) (l/s)
Region 1	16.7	14.2	14.2	31.6	41.5
Region 2	16.7	14.6	14.6	31.8	44.0
Region 3	16.7	14.4	14.4	29.4	34.8
Region 4	16.7	13.9	13.9	32.8	43.0
Region 5	16.7	14.6	14.6	40.2	59.6
Region 6/Region 7	16.7	14.2	14.2	38.0	53.4
Region 8	16.7	13.1	13.1	31.9	40.5
Region 9	16.7	14.7	14.7	29.5	36.5
Region 10	16.7	14.6	14.6	28.4	34.8

Area to south watercourse



Region	QBAR (l/s)	Q (1yrs) (l/s)	Q (1 yrs) (l/s)	Q (30 yrs) (l/s)	Q (100 yrs) (l/s)
Region 1	98.3	83.5	83.5	185.7	243.8
Region 2	98.3	85.5	85.5	186.5	258.5
Region 3	98.3	84.5	84.5	172.8	204.4
Region 4	98.3	81.6	81.6	192.6	252.6
Region 5	98.3	85.5	85.5	236.1	349.9
Region 6/Region 7	98.3	83.5	83.5	222.8	313.6
Region 8	98.3	76.7	76.7	187.4	237.9
Region 9	98.3	86.5	86.5	173.3	214.3
Region 10	98.3	85.5	85.5	166.7	204.4

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

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

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.100	Storm Duration (mins)	30
Ratio R	0.403		

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Online Controls for Storm

Hydro-Brake® Optimum Manhole: S10, DS/PN: S12.036, Volume (m³): 339.3

Unit Reference	MD-SHE-0178-1670-1374-1670
Design Head (m)	1.374
Design Flow (l/s)	16.7
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	178
Invert Level (m)	21.226
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1500

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.374	16.7
Flush-Flo™	0.409	16.7
Kick-Flo®	0.899	13.7
Mean Flow over Head Range	-	14.4

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)
0.100	6.3	1.200	15.7	3.000	24.2	7.000	36.4
0.200	15.3	1.400	16.8	3.500	26.1	7.500	37.7
0.300	16.4	1.600	18.0	4.000	27.8	8.000	38.9
0.400	16.7	1.800	19.0	4.500	29.4	8.500	40.0
0.500	16.6	2.000	20.0	5.000	31.0	9.000	41.1
0.600	16.3	2.200	20.9	5.500	32.4	9.500	42.2
0.800	15.1	2.400	21.8	6.000	33.8		
1.000	14.4	2.600	22.6	6.500	35.2		

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

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.402
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 19.100 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 0.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status ON
DVD Status ON
Inertia Status ON

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) 100
Climate Change (%) 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S12.000	S28	15 Winter	100	+40%					23.359
S12.001	S28-1	15 Winter	100	+40%					23.359
S12.002	S28-2	15 Winter	100	+40%					23.358
S12.003	S28-3	15 Winter	100	+40%					23.358
S12.004	S28-4	15 Winter	100	+40%					23.356
S12.005	S28-5	15 Winter	100	+40%					23.355
S12.006	S28-6	15 Winter	100	+40%					23.353
S12.007	S28-7	15 Winter	100	+40%					23.351
S12.008	S28-8	15 Winter	100	+40%					23.349
S12.009	S28-9	15 Winter	100	+40%					23.347
S12.010	S28-10	15 Winter	100	+40%					23.345
S12.011	S28-11	15 Winter	100	+40%					23.343
S12.012	S28-12	15 Winter	100	+40%					23.342
S12.013	S28-13	15 Winter	100	+40%					23.340
S12.014	S28-14	15 Winter	100	+40%					23.338
S12.015	S28-15	15 Winter	100	+40%					23.336
S12.016	S28-16	15 Winter	100	+40%					23.334
S12.017	S28-17	15 Winter	100	+40%					23.333
S12.018	S28-18	15 Winter	100	+40%					23.331
S12.019	S28-19	15 Winter	100	+40%					23.329

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S12.000	S28	-0.591	0.000	0.02		9.5	OK	
S12.001	S28-1	-0.593	0.000	0.03		17.9	OK	
S12.002	S28-2	-0.594	0.000	0.05		26.1	OK	
S12.003	S28-3	-0.596	0.000	0.07		34.4	OK	
S12.004	S28-4	-0.599	0.000	0.08		42.5	OK	
S12.005	S28-5	-0.602	0.000	0.10		50.5	OK	
S12.006	S28-6	-0.605	0.000	0.11		58.4	OK	
S12.007	S28-7	-0.608	0.000	0.13		66.0	OK	
S12.008	S28-8	-0.611	0.000	0.14		74.2	OK	
S12.009	S28-9	-0.615	0.000	0.16		82.4	OK	
S12.010	S28-10	-0.618	0.000	0.17		90.5	OK	
S12.011	S28-11	-0.621	0.000	0.19		98.6	OK	
S12.012	S28-12	-0.624	0.000	0.20		106.6	OK	
S12.013	S28-13	-0.627	0.000	0.22		114.3	OK	
S12.014	S28-14	-0.630	0.000	0.23		121.9	OK	
S12.015	S28-15	-0.633	0.000	0.25		129.3	OK	
S12.016	S28-16	-0.636	0.000	0.26		136.4	OK	
S12.017	S28-17	-0.639	0.000	0.27		143.3	OK	
S12.018	S28-18	-0.643	0.000	0.29		149.8	OK	
S12.019	S28-19	-0.646	0.000	0.30		156.1	OK	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S12.020	S28-20	15 Winter	100	+40%				
S12.021	S28-21	15 Winter	100	+40%				
S12.022	S28-22	15 Winter	100	+40%				
S12.023	S28-23	15 Winter	100	+40%				
S12.024	S28-24	15 Winter	100	+40%				
S12.025	S28-25	15 Winter	100	+40%				
S12.026	S28-26	15 Winter	100	+40%				
S12.027	S28-27	15 Winter	100	+40%				
S12.028	S28-28	15 Winter	100	+40%				
S12.029	S28-29	15 Winter	100	+40%				
S12.030	S28-30	15 Winter	100	+40%				
S12.031	S28-31	15 Winter	100	+40%				
S12.032	S28-32	15 Winter	100	+40%				
S12.033	S10	360 Winter	100	+40%				
S12.034	S10	480 Winter	100	+40%	100/480 Winter	100/360 Winter		
S13.000	S31	15 Winter	100	+40%				
S13.001	S31-1	15 Winter	100	+40%				
S13.002	S31-2	15 Winter	100	+40%				
S13.003	S31-3	15 Winter	100	+40%				
S13.004	S31-4	15 Winter	100	+40%				
S13.005	S31-5	15 Winter	100	+40%				
S13.006	S31-6	15 Winter	100	+40%				
S13.007	S31-7	15 Winter	100	+40%				
S13.008	S31-8	15 Winter	100	+40%				
S13.009	S31-9	15 Winter	100	+40%				
S13.010	S31-10	15 Winter	100	+40%				
S13.011	S31-11	15 Winter	100	+40%				
S13.012	S31-12	15 Winter	100	+40%				
S13.013	S31-13	15 Winter	100	+40%				
S13.014	S31-14	15 Winter	100	+40%				
S13.015	S31-15	15 Winter	100	+40%				
S13.016	S31-16	15 Winter	100	+40%				
S13.017	S31-17	15 Winter	100	+40%				
S13.018	S31-18	15 Winter	100	+40%				
S13.019	S31-19	15 Winter	100	+40%				
S13.020	S31-20	15 Winter	100	+40%				
S13.021	S31-21	15 Winter	100	+40%				
S13.022	S31-22	15 Winter	100	+40%				
S13.023	S31-23	15 Winter	100	+40%				
S13.024	S31-24	15 Winter	100	+40%				
S13.025	S31-25	15 Winter	100	+40%				
S13.026	S31-26	15 Winter	100	+40%				
S13.027	S31-27	15 Winter	100	+40%				
S13.028	S31-28	15 Winter	100	+40%				
S13.029	S31-29	15 Winter	100	+40%				
S13.030	S32	15 Winter	100	+40%				
S12.035	S31	480 Winter	100	+40%				
S14.000	S31	15 Winter	100	+40%	100/15 Summer			
S14.001	S11	15 Winter	100	+40%	100/15 Summer			
S12.036	S10	480 Winter	100	+40%	100/15 Summer			

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S12.020	S28-20	23.327	-0.649	0.000	0.31		163.7	OK	
S12.021	S28-21	23.324	-0.653	0.000	0.33		171.1	OK	
S12.022	S28-22	23.321	-0.657	0.000	0.34		178.2	OK	
S12.023	S28-23	23.318	-0.662	0.000	0.35		185.0	OK	
S12.024	S28-24	23.315	-0.666	0.000	0.36		191.6	OK	
S12.025	S28-25	23.311	-0.672	0.000	0.38		197.9	OK	
S12.026	S28-26	23.306	-0.678	0.000	0.39		203.8	OK	
S12.027	S28-27	23.300	-0.685	0.000	0.40		209.3	OK	
S12.028	S28-28	23.294	-0.692	0.000	0.41		214.5	OK	
S12.029	S28-29	23.287	-0.700	0.000	0.42		219.3	OK	
S12.030	S28-30	23.279	-0.710	0.000	0.42		220.4	OK	
S12.031	S28-31	23.276	-0.713	0.000	0.42		222.4	OK	
S12.032	S28-32	23.274	-0.715	0.000	0.43		224.4	OK	
S12.033	S10	22.611	-0.133	0.000	0.06		45.6	OK	
S12.034	S10	22.600	0.000	0.000	0.02		107.9	FLOOD	1
S13.000	S31	23.679	-0.271	0.000	0.04		8.3	OK	
S13.001	S31-1	23.679	-0.271	0.000	0.06		13.5	OK	
S13.002	S31-2	23.678	-0.272	0.000	0.09		19.1	OK	
S13.003	S31-3	23.677	-0.273	0.000	0.11		24.7	OK	
S13.004	S31-4	23.675	-0.275	0.000	0.14		30.1	OK	
S13.005	S31-5	23.674	-0.276	0.000	0.16		36.1	OK	
S13.006	S31-6	23.672	-0.278	0.000	0.19		42.0	OK	
S13.007	S31-7	23.669	-0.281	0.000	0.22		47.7	OK	
S13.008	S31-8	23.666	-0.284	0.000	0.24		53.4	OK	
S13.009	S31-9	23.663	-0.287	0.000	0.27		58.9	OK	
S13.010	S31-10	23.660	-0.290	0.000	0.29		64.3	OK	
S13.011	S31-11	23.656	-0.294	0.000	0.31		69.5	OK	
S13.012	S31-12	23.651	-0.299	0.000	0.34		74.6	OK	
S13.013	S31-13	23.646	-0.304	0.000	0.36		79.5	OK	
S13.014	S31-14	23.641	-0.309	0.000	0.38		84.3	OK	
S13.015	S31-15	23.636	-0.314	0.000	0.40		89.0	OK	
S13.016	S31-16	23.630	-0.320	0.000	0.42		93.5	OK	
S13.017	S31-17	23.625	-0.325	0.000	0.45		98.5	OK	
S13.018	S31-18	23.619	-0.331	0.000	0.47		103.6	OK	
S13.019	S31-19	23.613	-0.337	0.000	0.49		108.3	OK	
S13.020	S31-20	23.606	-0.344	0.000	0.51		112.9	OK	
S13.021	S31-21	23.599	-0.351	0.000	0.53		117.3	OK	
S13.022	S31-22	23.592	-0.358	0.000	0.55		121.7	OK	
S13.023	S31-23	23.584	-0.366	0.000	0.57		126.1	OK	
S13.024	S31-24	23.576	-0.374	0.000	0.59		130.4	OK	
S13.025	S31-25	23.567	-0.383	0.000	0.61		134.8	OK	
S13.026	S31-26	23.559	-0.391	0.000	0.63		139.1	OK	
S13.027	S31-27	23.550	-0.400	0.000	0.37		140.3	OK	
S13.028	S31-28	23.546	-0.404	0.000	0.27		140.6	OK	
S13.029	S31-29	23.545	-0.405	0.000	0.33		141.6	OK	
S13.030	S32	22.930	-0.295	0.000	0.50		139.0	OK	
S12.035	S31	22.589	-0.011	0.000	0.00		14.6	OK	
S14.000	S31	23.880	0.080	0.000	1.06		160.2	SURCHARGED	
S14.001	S11	22.578	0.116	0.000	1.08		298.0	SURCHARGED	
S12.036	S10	22.560	0.734	0.000	0.05		16.7	SURCHARGED	

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STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	100	PIMP (%)	100
M5-60 (mm)	19.200	Add Flow / Climate Change (%)	40
Ratio R	0.403	Minimum Backdrop Height (m)	0.200
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 Storm

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S4.000	2.634	0.000	0.0	0.115	4.00	0.0	0.600	o	525	Pipe/Conduit	
S4.001	11.504	0.017	676.7	0.047	0.00	0.0	0.600	o	675	Pipe/Conduit	
S4.002	64.086	0.092	700.0	0.511	0.00	0.0	0.600	o	750	Pipe/Conduit	
S5.000	41.103	0.624	65.9	0.328	4.00	0.0	0.600	o	300	Pipe/Conduit	
S6.000	43.927	0.322	136.4	0.104	4.00	0.0	0.600	o	300	Pipe/Conduit	
S6.001	67.786	0.302	224.5	0.329	0.00	0.0	0.600	o	450	Pipe/Conduit	
S5.001	37.249	0.447	83.3	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S4.003	91.552	0.131	700.0	0.161	0.00	0.0	0.600	o	750	Pipe/Conduit	
S4.004	30.769	0.022	1400.0	0.207	0.00	0.0	0.600	o	750	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)
S4.000	50.00	4.20	22.071	0.115	0.0	0.0	6.2	0.22	46.6	21.8
S4.001	50.00	4.40	22.071	0.162	0.0	0.0	8.8	1.00	357.8	30.7
S4.002	50.00	5.41	22.071	0.673	0.0	0.0	36.5	1.05	463.9	127.6
S5.000	50.00	4.35	23.500	0.328	0.0	0.0	17.7	1.94	137.1	62.1
S6.000	50.00	4.54	23.500	0.104	0.0	0.0	5.6	1.34	95.0	19.7
S6.001	50.00	5.38	23.028	0.434	0.0	0.0	23.5	1.35	215.2	82.2
S5.001	50.00	5.66	22.726	0.761	0.0	0.0	41.2	2.23	354.4	144.3
S4.003	50.00	7.11	21.979	1.596	0.0	0.0	86.4	1.05	463.9	302.5
S4.004	50.00	7.81	21.848	1.802	0.0	0.0	97.6	0.74	326.5«	341.7

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S4.005	3.773	0.019	197.2	0.000	0.00	0.0	0.600	o	750	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)
S4.005	50.00	7.84	21.819	1.802	0.0	0.0	97.6	1.99	878.9	341.7

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Storage Structures	2
Number of Online Controls	2	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.200	Storm Duration (mins)	30
Ratio R	0.403		

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Online Controls for Storm

Non Return Valve Manhole: S5, DS/PN: S4.001, Volume (m³): 2.2

Hydro-Brake® Optimum Manhole: S6, DS/PN: S4.005, Volume (m³): 19.6

Unit Reference	MD-SHE-0291-5830-2674-5830
Design Head (m)	2.674
Design Flow (l/s)	58.3
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	291
Invert Level (m)	21.819
Minimum Outlet Pipe Diameter (mm)	375
Suggested Manhole Diameter (mm)	Site Specific Design (Contact Hydro International)

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.674	58.2
Flush-Flo™	0.775	58.3
Kick-Flo®	1.678	46.5
Mean Flow over Head Range	-	50.5

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	9.0	1.200	56.3	3.000	61.6	7.000	92.9
0.200	30.0	1.400	53.9	3.500	66.3	7.500	96.1
0.300	50.1	1.600	49.3	4.000	70.8	8.000	99.1
0.400	54.1	1.800	48.1	4.500	74.9	8.500	102.1
0.500	56.3	2.000	50.6	5.000	78.9	9.000	105.0
0.600	57.6	2.200	53.0	5.500	82.6	9.500	107.8
0.800	58.3	2.400	55.3	6.000	86.2		
1.000	57.6	2.600	57.5	6.500	89.6		

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Storage Structures for Storm

Tank or Pond Manhole: S4, DS/PN: S4.000

Invert Level (m) 22.071

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	212.9	0.600	1277.0

Cellular Storage Manhole: S5, DS/PN: S4.004

Invert Level (m) 21.848 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)
0.000	750.0	750.0	0.801	0.0	838.0
0.800	750.0	838.0			

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

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Storage Structures 2
Number of Online Controls 2 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.404
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 19.200 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 0.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status ON
DVD Status ON
Inertia Status ON

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) 100
Climate Change (%) 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S4.000	S4	360 Winter	100	+40%					22.356
S4.001	S5	360 Winter	100	+40%					22.369
S4.002	S3	15 Winter	100	+40%	100/15 Summer				22.971
S5.000	S4	15 Winter	100	+40%	100/15 Summer				24.741
S6.000	S5	15 Winter	100	+40%	100/15 Summer				24.125
S6.001	S6	15 Winter	100	+40%	100/15 Summer				24.008
S5.001	S5	15 Winter	100	+40%	100/15 Summer				23.629
S4.003	S4	15 Winter	100	+40%	100/15 Summer				22.930
S4.004	S5	120 Winter	100	+40%	100/120 Winter				22.636
S4.005	S6	120 Winter	100	+40%	100/120 Winter				22.742

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S4.000	S4	-0.240	0.000	0.12		20.3	OK	
S4.001	S5	-0.377	0.000	0.11		19.5	OK	
S4.002	S3	0.150	0.000	0.58		233.3	SURCHARGED	
S5.000	S4	0.941	0.000	1.41		180.4	SURCHARGED	

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S6.000	S5	0.325	0.000	0.67		59.5	SURCHARGED	
S6.001	S6	0.529	0.000	1.15		229.2	SURCHARGED	
S5.001	S5	0.453	0.000	1.25		390.4	SURCHARGED	
S4.003	S4	0.201	0.000	1.51		634.8	SURCHARGED	
S4.004	S5	0.038	0.000	0.42		99.9	SURCHARGED	
S4.005	S6	0.173	0.000	0.16		58.1	SURCHARGED	

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STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	100	PIMP (%)	100
M5-60 (mm)	19.100	Add Flow / Climate Change (%)	40
Ratio R	0.403	Minimum Backdrop Height (m)	0.200
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 Storm

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	87.315	0.092	946.7	1.030	4.00	0.0	0.600	o	675	Pipe/Conduit	
S2.000	27.147	1.338	20.3	0.308	4.00	0.0	0.600	o	600	Pipe/Conduit	
S3.000	12.916	1.538	8.4	0.265	4.00	0.0	0.600	o	600	Pipe/Conduit	
S1.001	89.998	0.159	567.2	0.000	0.00	0.0	0.600	o	750	Pipe/Conduit	
S4.000	27.393	1.465	18.7	0.172	4.00	0.0	0.600	o	600	Pipe/Conduit	
S5.000	10.556	1.665	6.3	0.139	4.00	0.0	0.600	o	600	Pipe/Conduit	
S1.002	56.603	0.127	445.9	0.133	0.00	0.0	0.600	o	750	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	50.00	5.73	21.765	1.030	0.0	0.0	55.8	0.84	301.9	195.3
S2.000	50.00	4.08	22.919	0.308	0.0	0.0	16.7	5.42	1533.2	58.4
S3.000	50.00	4.03	23.119	0.265	0.0	0.0	14.4	8.44	2385.2	50.2
S1.001	50.00	7.01	21.581	1.603	0.0	0.0	86.8	1.17	515.9	304.0
S4.000	50.00	4.08	22.910	0.172	0.0	0.0	9.3	5.65	1597.2	32.6
S5.000	50.00	4.02	23.119	0.139	0.0	0.0	7.5	9.71	2745.7	26.4
S1.002	50.00	7.73	21.454	2.048	0.0	0.0	110.9	1.32	582.6	388.2

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S6.000	9.963	1.792	5.6	0.187	4.00	0.0	0.600	o	600	Pipe/Conduit	
S1.003	63.465	0.127	500.0	0.000	0.00	0.0	0.600	o	750	Pipe/Conduit	
S7.000	4.604	1.549	3.0	0.178	4.00	0.0	0.600	o	600	Pipe/Conduit	
S1.004	29.520	0.059	500.0	0.000	0.00	0.0	0.600	o	750	Pipe/Conduit	
S8.000	28.794	1.778	16.2	0.215	4.00	0.0	0.600	o	600	Pipe/Conduit	
S1.005	95.845	0.126	763.7	0.000	0.00	0.0	0.600	o	750	Pipe/Conduit	
S1.006	80.485	0.115	700.0	0.000	0.00	0.0	0.600	o	750	Pipe/Conduit	
S9.000	71.825	0.479	150.0	0.536	4.00	0.0	0.600	ooo	300	Triple Pipe	
S9.001	55.293	0.130	425.3	1.993	0.00	0.0	0.600	o	975	Pipe/Conduit	
S10.000	22.679	0.358	63.4	0.424	4.00	0.0	0.600	o	600	Pipe/Conduit	
S11.000	34.743	0.836	41.6	0.226	4.00	0.0	0.600	o	525	Pipe/Conduit	
S9.002	59.007	0.130	453.9	0.000	0.00	0.0	0.600	o	975	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)
S6.000	50.00	4.02	23.119	0.187	0.0	0.0	10.1	10.37	2932.3	35.5
S1.003	50.00	8.57	21.327	2.235	0.0	0.0	121.0	1.24	549.9	423.6
S7.000	50.00	4.01	23.102	0.178	0.0	0.0	9.6	14.19	4011.7	33.7
S1.004	50.00	8.97	21.200	2.412	0.0	0.0	130.7	1.24	549.9	457.3
S8.000	50.00	4.08	22.919	0.215	0.0	0.0	11.6	6.07	1716.6	40.8
S1.005	50.00	10.56	21.141	2.627	0.0	0.0	142.3	1.00	443.9«	498.0
S1.006	50.00	11.84	21.015	2.627	0.0	0.0	142.3	1.05	463.9«	498.0
S9.000	50.00	4.93	22.493	0.536	0.0	0.0	29.0	1.28	271.7	101.6
S9.001	50.00	5.51	22.014	2.529	0.0	0.0	137.0	1.59	1187.0	479.5
S10.000	50.00	4.12	22.600	0.424	0.0	0.0	22.9	3.06	865.7	80.3
S11.000	50.00	4.17	23.413	0.226	0.0	0.0	12.2	3.48	753.7	42.8
S9.002	50.00	6.15	21.884	3.179	0.0	0.0	172.2	1.54	1148.8	602.6

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S12.000	22.770	0.354	64.3	0.387	4.00	0.0	0.600	o	600	Pipe/Conduit	
S13.000	34.395	0.968	35.5	0.258	4.00	0.0	0.600	o	525	Pipe/Conduit	
S9.003	57.256	0.130	440.4	0.000	0.00	0.0	0.600	o	1050	Pipe/Conduit	
S9.004	91.939	0.130	707.2	0.928	0.00	0.0	0.600	o	1050	Pipe/Conduit	
S14.000	48.181	0.345	139.7	0.314	4.00	0.0	0.600	o	525	Pipe/Conduit	
S15.000	20.599	0.128	161.0	0.199	4.00	0.0	0.600	o	525	Pipe/Conduit	
S9.005	89.688	0.176	511.0	0.344	0.00	0.0	0.600	o	1050	Pipe/Conduit	
S16.000	50.648	0.204	248.2	0.394	4.00	0.0	0.600	o	525	Pipe/Conduit	
S17.000	24.226	0.027	912.3	0.246	4.00	0.0	0.600	o	525	Pipe/Conduit	
S9.006	118.986	0.176	678.0	0.000	0.00	0.0	0.600	o	1050	Pipe/Conduit	
S18.000	49.165	0.062	797.7	0.392	4.00	0.0	0.600	o	525	Pipe/Conduit	
S19.000	70.753	0.207	342.1	0.124	4.00	0.0	0.600	o	525	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)
S12.000	50.00	4.12	22.500	0.387	0.0	0.0	21.0	3.04	859.5	73.4
S13.000	50.00	4.15	23.411	0.258	0.0	0.0	14.0	3.77	815.4	48.9
S9.003	50.00	6.74	21.750	3.824	0.0	0.0	207.1	1.64	1416.2	724.9
S9.004	50.00	7.93	21.620	4.752	0.0	0.0	257.4	1.29	1115.4	900.8
S14.000	50.00	4.42	21.839	0.314	0.0	0.0	17.0	1.89	409.8	59.5
S15.000	50.00	4.19	21.622	0.199	0.0	0.0	10.8	1.76	381.5	37.7
S9.005	50.00	8.91	21.494	5.609	0.0	0.0	303.8	1.52	1314.0	1063.4
S16.000	50.00	4.60	21.523	0.394	0.0	0.0	21.3	1.42	306.8	74.7
S17.000	50.00	4.55	21.346	0.246	0.0	0.0	13.3	0.73	158.8	46.6
S9.006	50.00	10.42	21.319	6.249	0.0	0.0	338.5	1.32	1139.4«	1184.7
S18.000	50.00	5.04	21.205	0.392	0.0	0.0	21.2	0.79	170.0	74.3
S19.000	50.00	4.98	21.350	0.124	0.0	0.0	6.7	1.21	260.9	23.5

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S9.007	64.921	0.118	550.1	0.000	0.00	0.0	0.600	o	1050	Pipe/Conduit	
S9.008	60.999	0.125	486.9	0.000	0.00	0.0	0.600	o	1050	Pipe/Conduit	
S20.000	118.346	1.096	107.9	1.066	4.00	0.0	0.600	CA	600	CastSlot	
S21.000	74.818	0.346	216.0	0.508	4.00	0.0	0.600	CA	500	CastSlot	
S20.001	86.077	0.100	860.8	3.440	0.00	0.0	0.600	o	975	Pipe/Conduit	
S22.000	8.428	0.001	8428.3	0.000	4.00	0.0	0.600	oo	750	Double Pipe	
S1.007	49.648	0.331	150.0	1.500	0.00	0.0	0.600	o	450	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)
S9.007	50.00	11.16	21.143	6.765	0.0	0.0	366.4	1.46	1266.0«	1282.5
S9.008	50.00	11.81	21.025	6.765	0.0	0.0	366.4	1.56	1346.5	1282.5
S20.000	50.00	4.82	22.996	1.066	0.0	0.0	57.7	2.40	1008.3	202.0
S21.000	50.00	4.89	22.246	0.508	0.0	0.0	27.5	1.40	331.2	96.3
S20.001	50.00	6.18	21.000	5.014	0.0	0.0	271.6	1.11	831.7«	950.5
S22.000	50.00	4.48	22.310	0.000	0.0	0.0	0.0	0.29	260.5	0.0
S1.007	50.00	12.34	20.900	15.906	0.0	0.0	861.6	1.66	263.6«	3015.4

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Storage Structures	17
Number of Online Controls	5	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.100	Storm Duration (mins)	30
Ratio R	0.403		

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Online Controls for Storm

Non Return Valve Manhole: S3, DS/PN: S1.006, Volume (m³): 51.7

Non Return Valve Manhole: S4, DS/PN: S9.001, Volume (m³): 21.2

Non Return Valve Manhole: S7, DS/PN: S9.008, Volume (m³): 63.3

Non Return Valve Manhole: S22, DS/PN: S20.001, Volume (m³): 74.5

Pump Manhole: S5, DS/PN: S1.007, Volume (m³): 167.6

Invert Level (m) 20.900

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.001	40.0000	2.650	40.0000

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Storage Structures for Storm

Cellular Storage Manhole: S3, DS/PN: S2.000

Invert Level (m) 22.919 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)
0.000	37.0	37.0	1.032	0.0	64.4
1.031	37.0	64.4			

Cellular Storage Manhole: S6, DS/PN: S3.000

Invert Level (m) 23.119 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)
0.000	37.0	37.0	1.032	0.0	64.4
1.031	37.0	64.4			

Cellular Storage Manhole: S7, DS/PN: S4.000

Invert Level (m) 22.910 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)
0.000	15.0	15.0	1.041	0.0	38.0
1.040	15.0	38.0			

Cellular Storage Manhole: S11, DS/PN: S5.000

Invert Level (m) 23.119 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)
0.000	15.0	15.0	1.032	0.0	38.0
1.031	15.0	38.0			

Cellular Storage Manhole: S16, DS/PN: S6.000

Invert Level (m) 23.119 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)
0.000	24.0	24.0	1.032	0.0	48.8
1.031	24.0	48.8			

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Cellular Storage Manhole: S201, DS/PN: S8.000

Invert Level (m) 22.919 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)
0.000	27.0	27.0	1.032	0.0	52.4
1.031	27.0	52.4			

Cellular Storage Manhole: S5, DS/PN: S9.000

Invert Level (m) 22.493 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)
0.000	39.0	39.0	1.378	0.0	66.8
1.377	39.0	66.8			

Cellular Storage Manhole: S95, DS/PN: S10.000

Invert Level (m) 22.600 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)
0.000	20.0	20.0	0.701	0.0	44.0
0.700	20.0	44.0			

Cellular Storage Manhole: S79, DS/PN: S11.000

Invert Level (m) 23.413 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)
0.000	16.0	16.0	0.538	0.0	39.2
0.537	16.0	39.2			

Cellular Storage Manhole: S9, DS/PN: S12.000

Invert Level (m) 22.500 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)
0.000	18.0	18.0	0.769	0.0	41.6
0.768	18.0	41.6			

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Cellular Storage Manhole: S106, DS/PN: S13.000

Invert Level (m) 23.411 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)
0.000	18.0	18.0	0.540	0.0	41.6
0.539	18.0	41.6			

Cellular Storage Manhole: S143, DS/PN: S14.000

Invert Level (m) 21.839 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)
0.000	25.0	25.0	2.112	25.0	50.0
2.111	25.0	50.0			

Cellular Storage Manhole: S145, DS/PN: S15.000

Invert Level (m) 21.622 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)
0.000	25.0	25.0	2.329	0.0	50.0
2.328	25.0	50.0			

Cellular Storage Manhole: S149, DS/PN: S18.000

Invert Level (m) 21.205 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)
0.000	56.0	56.0	2.746	0.0	87.2
2.745	56.0	87.2			

Cellular Storage Manhole: S156, DS/PN: S19.000

Invert Level (m) 21.350 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)
0.000	54.0	54.0	2.601	0.0	84.8
2.600	54.0	84.8			

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Tank or Pond Manhole: S38, DS/PN: S22.000

Invert Level (m) 22.310

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	6912.3	1.690	6912.3

Tank or Pond Manhole: S5, DS/PN: S1.007

Invert Level (m) 20.900

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	1564.9	3.100	1564.9

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