

Drainage Strategy Report
Markfield Services, Little Shaw Lane, Leicestershire, LE67 9PP
for
EG On the Move Limited

Revision	Date of issue	Comments	Prepared By	Checked By
01	13.04.2026	First Issue	RCTS	KTY



Contents

1.0	Project Information Brief	1
2.0	Introduction.....	2
3.0	Existing Site Drainage	3
4.0	Proposed Site Drainage	5
5.0	Drawings and Calculations	9

Appendices



iSTRUCT
consultants ltd

AA Business Centre Suite 5 326-340 Dunstable Road,
Luton, Bedfordshire, LU4 8JSJ

1.0 Project Information Brief

Project	EG-OTM Service Station
Project Location	Markfield Services, Little Shaw Lane, Leicestershire, LE67 9PP
Client	EG On the Move Ltd
Project Status	Planning
Construction Value	TBC
Our Reference	26008-IST-KV-R-01



2.0 Introduction

2.1 Background and Scope

The purpose of this report is to provide details on the design of both the surface water and foul drainage systems to support the EG on the Move Ltd planning application for the redevelopment of a roadside service station at the former Markfield Services, Leicestershire, LE67 9PP.

2.2 Site Description and Location

The existing brownfield site is the former motorway service area, Markfield Services, located adjacent to the M1/A511/A50 interchange at junction 22 of the M1 motorway, to the east of Markfield in Leicestershire, LE67 9PP.

The client intends to redevelop the existing site into an EG on the Move branded motorway / trunk road service area (MSA/TRSA) comprised of a petrol filling station (PFS), associated retail unit, with separate HGV filling bays. The proposals would also provide two drive-thru restaurants, while retaining the existing Travelodge hotel on site, with a shared parking provision of 150 car parking spaces, inclusive of disabled bays, 12 HGV parking bays, 12no. EV charging points, 2no. car jetwash bays, and associated landscaping.

The post code for the site is LE67 9PP, with OS Grid reference of E: 447702, N: 311124. A location plan for the site is outlined below in Figure 1.

The site which is approx. 2.4ha falls within Zone 1 of the EA flood maps.

A copy of the site's topographical survey can be found in Appendix A.

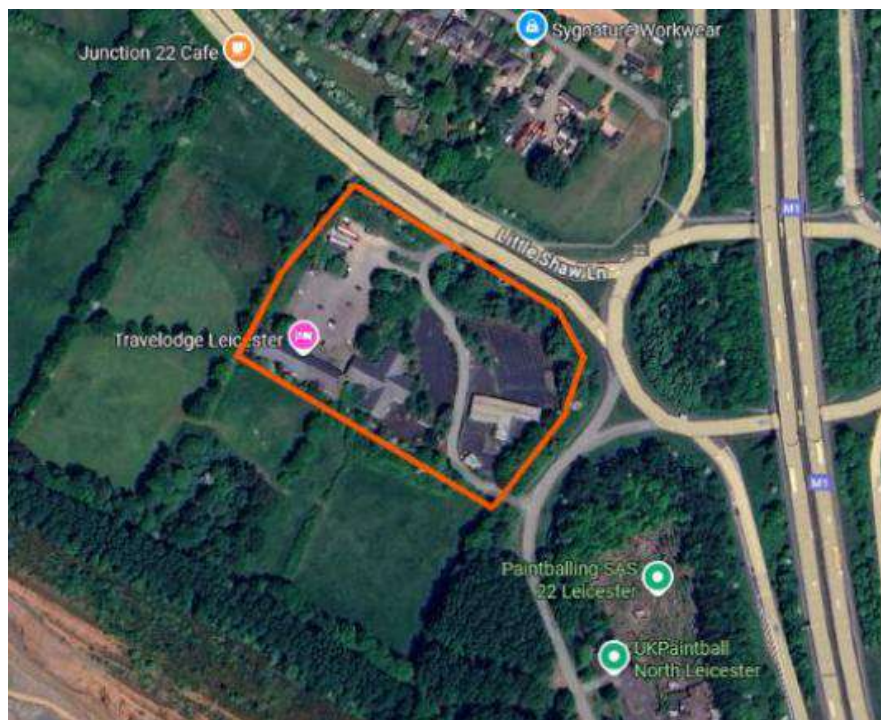


Figure 1: Site Location Plan

3.0 Existing Site Drainage and Geology

3.1 Existing Drainage

A combined topographic and underground utility survey (GPR) of the site identifies the existing surface foul water drains on site. The existing SW network discharges unattenuated out of the site via two outfall pipes, on either side of the site's entrance from the A511 Little Shaw Lane into the ditch course running immediately along the northern boundary of the site.

It is proposed to utilise the two existing SW outfall points to the ditch course by splitting the sustainable surface water drainage proposal for the overall site (2.4ha) into two separate networks discharging treated surface runoff at restricted discharge limits – see Chapter 4 below.

The combined topographic and GPR survey also shows an existing septic tank located adjacent to the site entrance where FW is discharged. It is proposed to discharge foul water from the new development to the existing septic tank outfall, in accordance with the Environment Agency (EA) General Binding Rules 2020.

Copies of the combined topographic and GPR survey are included in Appendix A.

The EA flood map identifies the site falls within Flood Zone 1, as shown in Figure 2 below, with a low probability of flooding from rivers and/or the sea.



Figure 2: Site in Flood Zone 1 (@EA Flood Map)

However, the northern portion of the site is at risk of surface water flooding, as shown in Figure 3 below. It is proposed to raise the finished floor level (FFL) of the drive-thru restaurant proposed in the northeast corner of the site by 300mm above existing levels. The remaining areas to the north

of the site are proposed for landscaping and parking spaces.



Figure 3: Surface Water Flood Risk (*©EA Flood Map*)

3.2 Geology and Existing Ground Conditions

Available geological data on the BGS mapping portal shows the site is underlain by bedrock geology of Cotgrave Sandstone, Edwalton Member Mudstone, and Gunthorpe Member Mudstone, and superficial geology of Oadby Till Member Diamicton, Alluvium Clay, and Head Clay.

4.0 Proposed Site Drainage

4.1 Surface Water Drainage

The existing site is a defunct motorway service area (brownfield) to be redevelop into an EG on the Move branded trunk road / motorway service station (TRSA/MSA), comprised of a petrol filling station (PFS), associated retail unit, with separate HGV filling bays. The proposals would also provide two drive-thru restaurants, while retaining the existing Travelodge hotel on site, with a shared parking provision of 150 car parking spaces, inclusive of disabled bays, 12 HGV parking bays, 12no. EV charging points, 2no. car jetwash bays, and associated landscaping.

The existing site is 78% (1.86ha) impermeable comprised of a PFS, associated amenity building, HGV filling bays and parking area, vast car parking and the Travelodge hotel. The impermeable area of the proposed new site layout is marginally less at approx. 1.68ha. Therefore, the design has assumed zero net difference in impermeable areas for both existing and proposed site layout.

The current brownfield site has been assessed to discharges unattenuated via two outfall pipes, on either side of the site's entrance from the A511 Little Shaw Lane into the ditch course running immediately along the northern boundary of the site, at circa 259.2l/s, based on the Modified Rational method of the Wallingford Procedure – see surface water discharge assessment sheet appended in Appendix C.

However, in accordance with the principles of sustainable drainage based on the CIRIA SuDS Manual (C753) guidance and the requirements of the LLFA, it is proposed to discharge the surface water runoff from the proposed development into the ditch course at a total restricted discharge rate of **6l/s** split for the two SW networks at the respective existing outfall points (**SW Network 1 – 2l/s, SW Network 2 – 4l/s**) via a Hydrobrake® flow control chambers, to control discharge volumes off site and attenuate surface water runoff generated by the development, providing a betterment of approx. 98% on the current brownfield discharge rate. Measures for pollution control in runoff water through the onsite system have been included to improve water quality before discharging into the public sewer.

4.2 SUDS Hierarchy

1. There is an existing watercourse (ditch) running immediately north of the site boundary, along the A511 Little Shaw Lane, which serves as the ultimate outlet for SW discharge from the site.
2. Available BGS geological mapping records suggests the ground conditions would not support soakaway drainage.
3. Water butts to be utilised to harvest rainwater from roof areas for reuse on site.
4. Flow-controlled discharge to existing ditch (watercourse). Restricted discharges of 2l/s (SW Network 1) and 4l/s (SW Network 2) respectively, giving a total discharge rate of 6l/s from the site.

The benefits of incorporating SuDS into a drainage solution include:



- i. Reducing runoff volumes, peak flows and discharge rates to watercourses or sewers subsequently reducing the risk of flooding downstream (Water quantity)
- ii. Improving the water quality into receiving bodies by removing or reducing the pollutants in runoff water (Water quality)
- iii. Creating and sustaining better places for nature (Biodiversity)
- iv. Creating and sustaining better places for people (Amenity)
- v. Allowing development to adapt to the effects of climate change.

The following SuDS features have been incorporated into the drainage strategy for the site, to further improve sustainable drainage index:

1. Discharge limit of **6.0l/s** and total attenuation volume of **1,200.9m³** to for surface runoff and volume control – **421.8m (SW Network 1) and 779.1m (SW Network 2) respectively.**
2. Water butts to be installed at the rear of the forecourt shop building to harvest roof water for reuse.
3. Surface water runoff from the petrol station forecourt and offset fill (OSF) areas have been designed in accordance with **Chapter 8 of the Blue Book of the Association of Petroleum & Explosives Administration (APEA)** for pollution control, contaminated water, and disposal. Therefore, surface runoff (grey water) from the forecourt, and offset fill areas, have been connected separately to the surface water drainage network via a 10000L forecourt interceptor (oil separator).
4. Soft landscaped planting area in frontage to filling station where Signboard is to be installed.

4.3 SUDS Management Train

In accordance with the requirements of the LLFA and CIRIA SuDS Manual (C753) guidance, a SuDS management train approach was applied in arriving at the sustainable surface water drainage solution designed for the site which is considered to be the most robust pollutant removal strategy for this site.

With the scheme proposals being for a petrol filling station, Table 1 provides the SUDS solutions determined for the development:

Table 1 SUDS Components within Management Train

SUDS Component	Interception	Primary Treatment	Secondary Treatment	Tertiary Treatment
Rainwater harvesting – Water Butts	✓	✓		
Permeable Paving	✓	✓		



Catchpits / Silt Traps / Aco Channel drains		✓	✓	
Proprietary treatment system – Petrol Interceptor			✓	✓

4.4 Hydraulic Design

A hydraulic design of the proposed site-specific surface water drainage network has been undertaken using Causeway Flow modelling package for all storm events up to and including the 100yr plus 45% climate change event. The simulation of the network's performance has also been carried out with the restricted discharge rate of **6.0l/s**, and attenuation tanks appropriately sized to a total of **1,200.9m³** for the storage storm events up to and including the 100yr rainfall event with 45% Climate Change. No flooding occurs in the drainage network proposed for this development.

Detailed calculations of the hydraulic modelling and simulation results can be found in Appendix C.

4.5 Operation and Maintenance Plan

The proposed surface water network for the filling station shall be maintained by the owner's management company in accordance with the maintenance regime recommended in Table 1 below.

Table 2 SW System Operation and Maintenance

SuDS Feature	Operation and Maintenance
Cellular Attenuation Tank	Inspect twice in the first year and after major storm events, desilt as required. Tank to be 'accessible' type with inspection chambers for maintenance.
Permeable Paving	Inspect rate of silt accumulation and establish appropriate brushing frequencies. Inspect for evidence of poor operation and/or weed growth – if required take remedial action. Monitor outlet catchpit / manhole / inspection chamber.
Hydrobrake	The Hydro-brake has no moving parts and no power requirements and provides reliable, low-maintenance, engineered flood management.



	Periodic desilting of the Hydrobrake sump as well as checking the emergency drain down mechanism is in good working order. The sump should be emptied/checked at least as follows (but with an annual inspection and additional cleansing if required): On completion of drainage works, Year 1, Year 3, then every 5 years.
Channel drains (Aco or similar)	- Regularly inspect and take off grating to remove debris and clogged up deposits to allow free flow of water through channel drains.
Inspection chambers, Manholes, Silt Trap	Inspect six-monthly, empty every 12 months and after every major storm or local flood event
Petrol Interceptor	Inspect and maintain in accordance with manufacturer's requirements

4.6 Foul Drainage

It is proposed to utilise a separate standard gravity pipe system for draining foul water to discharge into the existing foul outfall assumed to be a septic tank located adjacent to the site entrance.

Design discharge rates are based upon typical rates observed for EG on the Move sites.



5.0 Drawings and Calculations

26001-IST-KV-DR-C-0500 Drainage Strategy Plan

26001-IST-KV-DR-C-0501 Catchment Areas Plan

SD-300 Standard Details – Surfaces

SD-301 Standard Details – Joints

SD-302 Standard Details – Drainage

SD-303 Standard Details – Manholes

SD-304 Standard Details – Attenuation Tanks

SW Discharge Assessment

Hydraulic Model Calculation (FLOW)

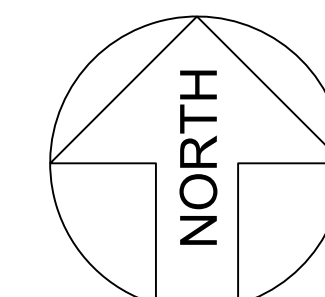
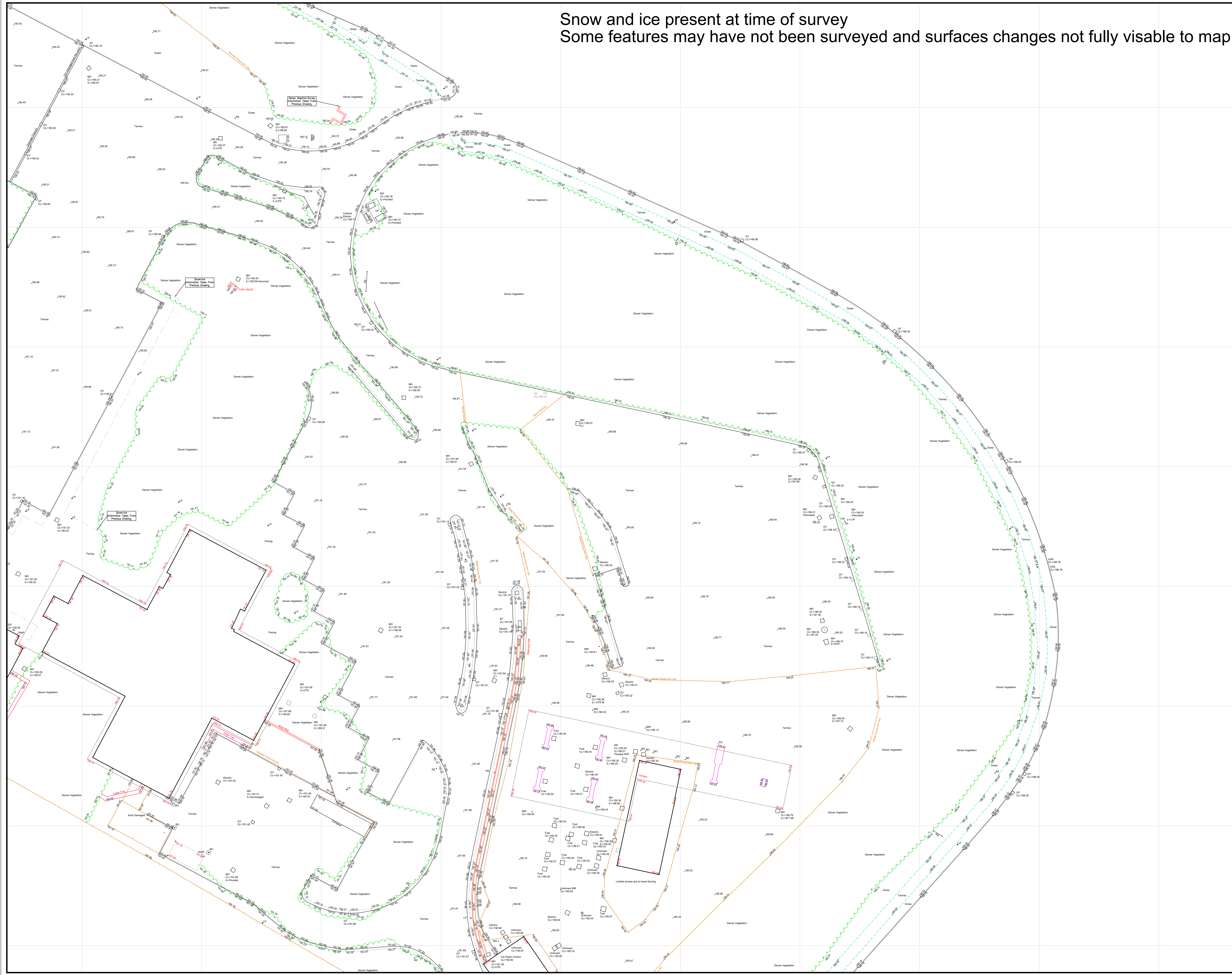


Appendix A
Topography
GPR Survey



Snow and ice present at time of survey
Some features may have not been surveyed and surfaces changes not fully visable to map

Some features may have not been surveyed and surfaces changes not fully visable to map



Topographic Legend

-----	Bottom of Bank	~~~~~	OH Electric
- - - - -	Top of Banking	=====	Railway Line
-----	Building	-----	Road Centre
-----	Building Canopy	-----	Road Markings
-----	Concrete Base	-----	SC Hard/Hard
-----	Contour Major	-----	SC Hard/Soft
-----	Contour Minor	-----	SC Soft/Soft
-----	Fences	-----	Steps
-----	General	-----	Tree Canopy
-----	Kerb Bottom	-----	Vegetation
-----	Kerb Drop	-----	Visible Trench
-----	Kerb Top	-----	Walls
-----	OH Conns	-----	Water Edge

AV	Air Valve	PB	Pedestrian Beacon
BH	Bell Handle	PG	Pipe Guard
BS(L)	Bush (illuminated)	PGR	Proximity Guard Rail
BS	Bus Stop	PM	Parking Meter
Cal	Call	P	Post
CL	Cable	RE	Reading Eye
CL ⁺	Cable (illuminated)	RE(SL)	Reading Eye (illuminated)
Conc	Concrete	RWP	Rain Water Pipe
CP	Cover Plate	RS	Road Sign (illuminated)
DFBn	Dog Foul Bin	SPCsm	Speed Camera
DP	Down Pipe	ST	Street
EP	Electricity Pole	SV	Street Valve
ER	Earth Road	SVP	Soft Valve
FR	Fire	SW	Switch
FF	Fire Freight	TL	Traffic Light
FP	Flag Pole	TP	Top of Fence Line
GP	Gate Post	TOW ⁺	Top of Wall Level
GV	Gas Valve	TP	Telecoms Pole
Gy	Gully	VP	Valve
I	Inspection Cover	WB	Waste Bin
KO	Kitchen Bottom	WM	Water Meter
LP	Lamp Post	WM	Water Meter
M	Manhole	WW	Wash Out
Marker	Marker	WT=	Window Top Level
MP	Marker Post	WV	Water Valve
	MW	Monitoring Well	

Measured Building Legend

	External Building Line
	Internal Building Line
	Building Overheads
	Stairs/Steps
	Doors
	Windows
	Sanitaryware
	Kitchen Furniture
	Direction of Stairs (Arrow points up)
	Direction of Sloped Ceiling (Arrow points down)
	Window Sill and Head Height
	
	Double door
	Single door
	Window
	CH=0.00 Ceiling Height
	FCH=0.00 False Ceiling Height
	FFL=0.00 Finished Floor Level

Utility Legend

	Air Line		SWD Sewer
	ADT Cable		Survey Extents
	BT Cable		Heating Pipe
	CATV Cable		HV Electric Cable
	Chamber Extent		Kingston Comm
	Comms Cable		Oil Pipe
	CWD Sewer		Rising Main
	Earth Wire/Tape		Traffic Control
	Electric Cable		Unknown Detection
	Fibre Optic Cable		Vent Pipe
	Fuel Line		GPR Detection
	FWD Sewer		Assumed Route
	Gas Pipe		Records Route
			Cable Riser
	Band of Cables		Drainage
	Emergency Service Duct		Backdrop

Utility Abbreviations			
CP	Cathodic Protection	LoS	Loss of Signal
Cut	Disconnected Utility	MDPE	Middle Density PE
DI	Ductile Iron	SI	Spun Iron
DoB	Depth of Bottom	TLC	Traffic Light Control
DoC	Depth of Cover	UDI	Unreliable Depth Info
ED	Empty Duct	uPVC	Unplasticised
EoT	End of Trace		Polyvinyl Chloride
PE	Polyethylene	UTR	Unable to Raise
HDPE	High Density PE	VC	Vitrified Clay

Manufacturer Stated Depths	
	Detected Using Electromagnetic Location Methods e.g. Any metallic pipe/cable. Accuracy $\pm 2.5\%$ of depth reading.
	Detected Using Electromagnetic Location Methods e.g. Using a Sonde to locate drainage pipework Accuracy $\pm 2.5\%$ of depth reading.
	Detected Using Ground Penetrating Radar e.g. A plastic pipe or service not located by other means. Accuracy depends on ground conditions.

CAUTION LIVE SERVICES PRESENT - EXTREME CARE
SHOULD BE TAKEN WHEN EXCAVATING

ZS Surveys Ltd, and their agents or partners, are not responsible for any situation, incident or loss resulting from actions or planning resulting from total reliance upon this drawing or accompanying information. The completeness of the underground network information cannot be wholly guaranteed and of such no guarantees or warranties are provided or intended. The location of any identification of a service will not positively indicate whether it is live or dead. A service indicated from records that has not been located or identified on site does not necessarily imply that it does not exist or is dead, however, its presence should be anticipated.

As the use of ground penetrating radar (GPR) detection techniques are not infallible and ground proofing for the actual position and depth of services should be established.

If this drawing and any associated drawings should be used in relation to works, we advise that the users of this information follow the principles detailed by the Health and Safety Executive guidance directive HSG(47, "Avoiding Danger from Underground Services". Further details of this directive are available at www.hse.gov.uk <<http://www.hse.gov.uk>>

Notes

THIS DRAWING SHOULD ONLY BE USED FOR ITS ORIGINAL PURPOSE.
ZS SURVEYS LTD. ACCEPTS NO RESPONSIBILITY FOR THIS DRAWING IF
SUPPLIED TO ANY PARTY OTHER THAN THE ORIGINAL CLIENT.

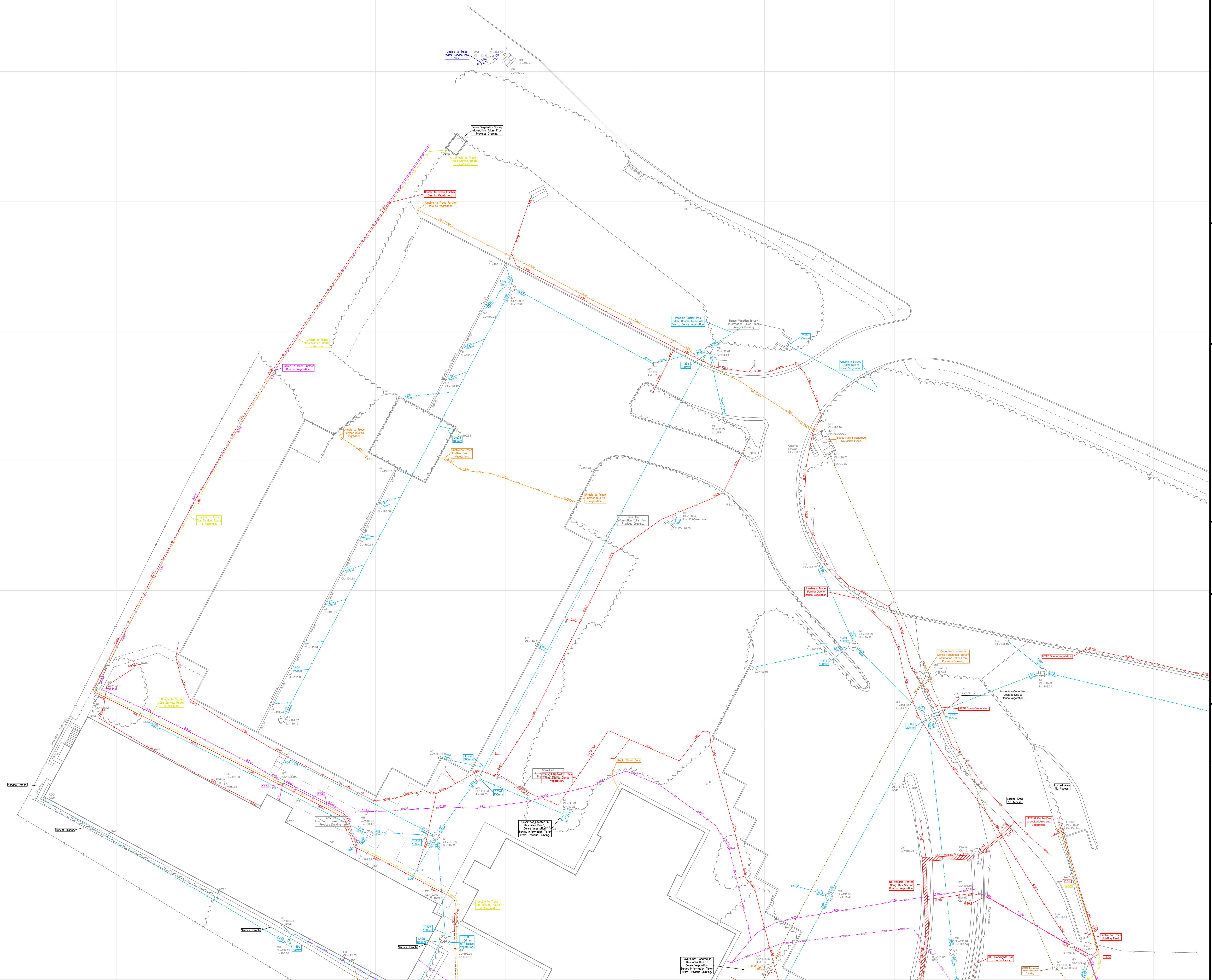
ALL LEVELS RELATED OSTN15 GRID PROJECTION.

ALL DIMENSIONS SHOULD BE VERIFIED ON SITE PRIOR TO CONSTRUCTION.

ALL HATCHING IS FOR PRESENTATIONAL PURPOSES ONLY.

Client	 on the move		
Site Location:	Travelodge Leicester Little Show Lane Markfield LE67 9PP		
Drawing Type:	Topographical Survey		
Surveyed: DR	Drawn: DR		
Checked: ZH	Authorised: SS		
Date: 09/11/26	Scale: 1:200@A0		
 Land, Building & Engineering Surveys www.zssurveys.com info@zssurveys.com			
 Constructionline		 Achilles  BETTER. FASTER. 	
Project Number:		4655	
Sheet Number:		SU002	

Snow and ice present at time of survey
Some features may have not been surveyed and surfaces changes not fully visable to map



NORTH	
Topographic Legend	
	OH Electric
	RA Railway Line
	RD Road Centre
	RM Road Markings
	SC Hard/Hard
	SC Hard/Soft
	SC Soft/Soft
	SC Soft/Soft
	Tree Canopy
	Vegetation
	Visible Trench
	Water Edge
Topographic Abbreviations	
AV Air Valve	PB Pedestrian Beacon
BS Borehole	PBX Post Box
BOL(B) Bolard (Illuminated)	PR Pedestrian Guard Rail
Bus Stop	Parking Meter
CAB Cabinet	PO Post
CL Cover Level	RE Roding Eye
COL Column	RS(L) Road Sign (Illuminated)
CV Valve	RA Rain Water Pipe
DC Drainage Channel	SP(L) Sign Post (Illuminated)
OFBn Dog Fouling	SPCM Speed Camera
Down Pipe	ST Stop Tap
EP Electricity Pole	SV Telephone Valve
ER Earth Road	SVP Soil Vent Pipe
FFL Finished Floor Level	TBox Traffic Box
FH Fire Hydrant	TL Traffic Lights
FP Flag Pole	TOF Top of Fence Level
Gate Post	TOW+ Top of Wall Level
GV Gas Valve	TP Telephone Pole
Gully	VP Vent Pipe
IK Inspection Cover	WB Waste Bin
KO Kerb Outlet	WB+ Window Bottom Level
LM Lamp Post	WM Water Meter
Manhole	WO Wash Out
Marker	WT+ Window Top Level
Market Post	VW Valve Water
	MW Monitoring Well
Measured Building Legend	
External Building Line	
Internal Building Line	
Building Overheads	
Stairs/Steps	
Doors	
Windows	
Sanitaryware	
Kitchen Furniture	
Direction of Stairs (Arrow points up)	
Direction of Sloping Ceiling (Arrow points down)	
Window Sill and Head Height	
	CH=0.00 Ceiling Height
	FL=0.00 False Ceiling Height
	FL=0.00 Finished Floor Level
Utility Legend	
	SWD Sewer
	SV Survey Extents
	HP Heating Pipe
	HV Electric Cable
	KG Kingston Corres
	OP Oil Pipe
	RM Rising Main
	TK Traffic Control
	UD Unknown Detection
	VP Vent Pipe
	GPR Detection
	AS Assumed Route
	RC Records Route
	CB Cable Bearer
	DR Drainage Backdrop
Utility Abbreviations	
CP Cathodic Protection	LoS Loss of Signal
DCP Disconnected Utility	MDPE Mapped Data Point Error
DI Ductile Iron	SI Spun Iron
DoB Depth of Bottom	TLC Traffic Light Control
DoC Depth of Cover	UI Unreliable Depth Info
DU Empty Duct	U Unreliable
EI End of Trace	UPVC Unpolyvinyl Chloride
PE Polyethylene	UPVC Unpolyvinyl Chloride
HDPE High Density PE	

Manufacturer Stated Depths

- Detected Using Electromagnetic Location Methods
e.g. Any metallic pipe/cable. Accuracy $\pm 2.5\%$ of depth reading.
- Detected Using Electromagnetic Location Methods
e.g. Using a Sonde to locate drainage pipework
Accuracy $\pm 2.5\%$ of depth reading.
- Detected Using Ground Penetrating Radar
e.g. A plastic pipe or service not located by other means.
Accuracy depends on ground conditions.

CAUTION LIVE SERVICES PRESENT! EXTREME CARE SHOULD BE TAKEN WHEN EXCAVATING

ZS Sureties Ltd., and their agents or partners, are not responsible for any situation, incident or loss resulting from actions or planning resulting from total reliance upon the information contained in this report. The completeness of the underground network information cannot be wholly guaranteed and as such no guarantees or warranties are provided or implied. The information is provided as a guide and does not positively indicate whether it is live or dead. A service indicated from records that has not been located or identified on site cannot be assumed to be present. The absence of a service, however, its presence should be anticipated.

The information provided in this detection technique is not infallible and ground profiling for the actual position and depth of services should be established.

If in this drawing, and any associated drawings should be used in relation to works, we advise that the users of this information should refer to the relevant British Standards and Safety Engineering guidance detail HSG 67, "Avoiding Danger from Underground Services". Further details of this directive are available at <http://www.hse.gov.uk/other/hsg67/>

Notes

THIS DRAWING SHOULD ONLY BE USED FOR ITS ORIGINAL PURPOSE. ZS SURVEYS LTD. ACCEPTS NO RESPONSIBILITY FOR THIS DRAWING IF SUPPLIED TO ANY PARTY OTHER THAN THE ORIGINAL CLIENT.

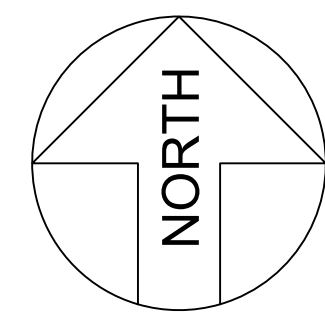
ALL LEVELS RELATED OSTM15 GRID POSITION.

ALL DIMENSIONS SHOULD BE VERIFIED ON SITE PRIOR TO CONSTRUCTION.

ALL HATCHING IS FOR PRESENTATIONAL PURPOSES ONLY

Client	 on the move		
Site Location:	Travelodge Leicester Little Shaw Lane Markfield LE87 9PP		
Drawing Type:	Underground Utility Survey		
Surveyed:	SL/MM	Drawn:	SL
Checked:	CR	Authorised:	SS
Date:	09/01/26	Scale:	1:200@A0
 Land, Building & Engineering Surveys www.zssurveys.com info@zssurveys.com			
 Constructionline	 ACHILLES INTEGRITY PLUS		
Project Number:	4655		
Sheet Number:	UT001		

Snow and ice present at time of survey
Some features may have not been surveyed and surfaces changes not fully visible to map



Topographic Legend	
	OH Electric
	Railway Line
	Road Centre
	Road Markings
	SC Hard/Hard
	SC Hard-Soft
	SC Soft-Soft
	Steps
	Tree Canopy
	Vegetation
	Visible Trench
	Walls
	Water Edge

Topographic Abbreviations	
AV	Air Valve
BH	Borehole
BO(L)	Bottom of Bank
BS	Bus Stop
CB	Cabinet
CL	Cover Level
COL	Column
Conc	Concrete
DC	Drainage Channel
DFB	Dog Foul Bin
DP	Down Pipe
EP	Electricity Pole
ER	Earth Rod
FFL	Finished Floor Level
FH	Fire Hydrant
FP	Flag Pole
GP	Gate Post
GV	Gas Valve
GY	Gully
IC	Inspection Cover
KO	Kerb Outlet
LP	Lamp Post
MH	Manhole
Mx	Marker
MP	Marker Post
MW	Monitoring Well
PB	Pedestrian Beacon
PBx	Post Box
PGR	Pedestrian Guard Rail
PM	Parking Meter
PO	Post
RE	Rodding Eye
RS(L)	Road Sign (Illuminated)
RWP	Rain Water Pipe
SP(L)	Sign Post (Illuminated)
SPCam	Speed Camera
SV	Sluice Valve
ST	Stop Tap
SVP	Soil Vent Pipe
TBox	Telephone Box
TL	Traffic Light
TOF	Top of Fence Level
TOWL	Top of Wall Level
TP	Telecoms Pole
VP	Vent Pipe
WB	Waste Bin
WM	Water Meter
WO	Wash Out
WT	Window Top Level
WV	Water Valve
WW	Water Valve

Measured Building Legend	
	External Building Line
	Internal Building Line
	Building Overheads
	Stairs/Steps
	Doors
	Windows
	Sanitaryware
	Kitchen Furniture
	Direction of Stairs (Arrow points up)
	Direction of Sloped Ceiling (Arrow points down)
	Window Sill and Head Height

	CH=0.00	Ceiling Height
	FC=0.00	False Ceiling Height
	FFL=0.00	Finished Floor Level

Utility Legend	
	SWD Sewer
	Survey Extents
	Heating Pipe
	HV Electric Cable
	Kinlon Comms
	OH Electric
	Rising Main
	Traffic Control
	Unknown Detection
	UPV
	UPVC
	UPVC
	UPVC
	UPVC

Utility Abbreviations	
CP	Cathodic Protection
CU	Disconnected Utility
DI	Depth of Bottom
DoC	Depth of Cover
ED	Empty Duct
EP	End of Trace
PE	Polyethylene
HDPE	High Density PE
LoS	Loss of Signal
MDPE	Middle Density PE
SL	Spun In
TLC	Traffic Light Control
UD	Unreliable Depth Info
UPVC	Unplasticised
UPVC	Polyvinyl Chloride
UTR	Unstable to Route
VC	Vitrified Clay

Manufacturer Stated Depths	
	Detected Using Electromagnetic Location Methods e.g. Any metallic pipe/cable. Accuracy ± 2.5% of depth reading.
	Detected Using Electromagnetic Location Methods e.g. Using a Sonde to locate drainage pipework. Accuracy ± 2.5% of depth reading.
	Detected Using Ground Penetrating Radar e.g. A plastic pipe or service not located by other means. Accuracy depends on ground conditions.

CAUTION - SERVICES PRESENT - EXTREME CARE SHOULD BE TAKEN WHEN EXCAVATING

ZS Surveys Ltd, and their agents or partners, are not responsible for any situation, incident or loss resulting from actions or planning resulting from total reliance upon this drawing or accompanying information. The completeness of the underground network information cannot be wholly guaranteed and as such no guarantees or warranties are provided or implied. The location and/or identification of a service will not positively indicate whether it is live or dead. A service indicated from records that has not been located or identified on site does not necessarily imply that it does not exist or is dead, however, its presence should be anticipated. The results of Electric Magnetic and GPR detection techniques are not infallible and ground profiling for the actual position and depth of services should be established.

If this drawing and any associated drawings should be used in relation to works, we advise that the users of this information follow the principles detailed by the Health and Safety Executive guidance directive HSG 47, 'Avoiding Danger from Underground Services'. Further details of this directive are available at www.hse.gov.uk - <http://www.hse.gov.uk/>

Notes
THIS DRAWING SHOULD ONLY BE USED FOR ITS ORIGINAL PURPOSE. ZS SURVEYS LTD ACCEPTS NO RESPONSIBILITY FOR THIS DRAWING IF SUPPLIED TO ANY PARTY OTHER THAN THE ORIGINAL CLIENT.

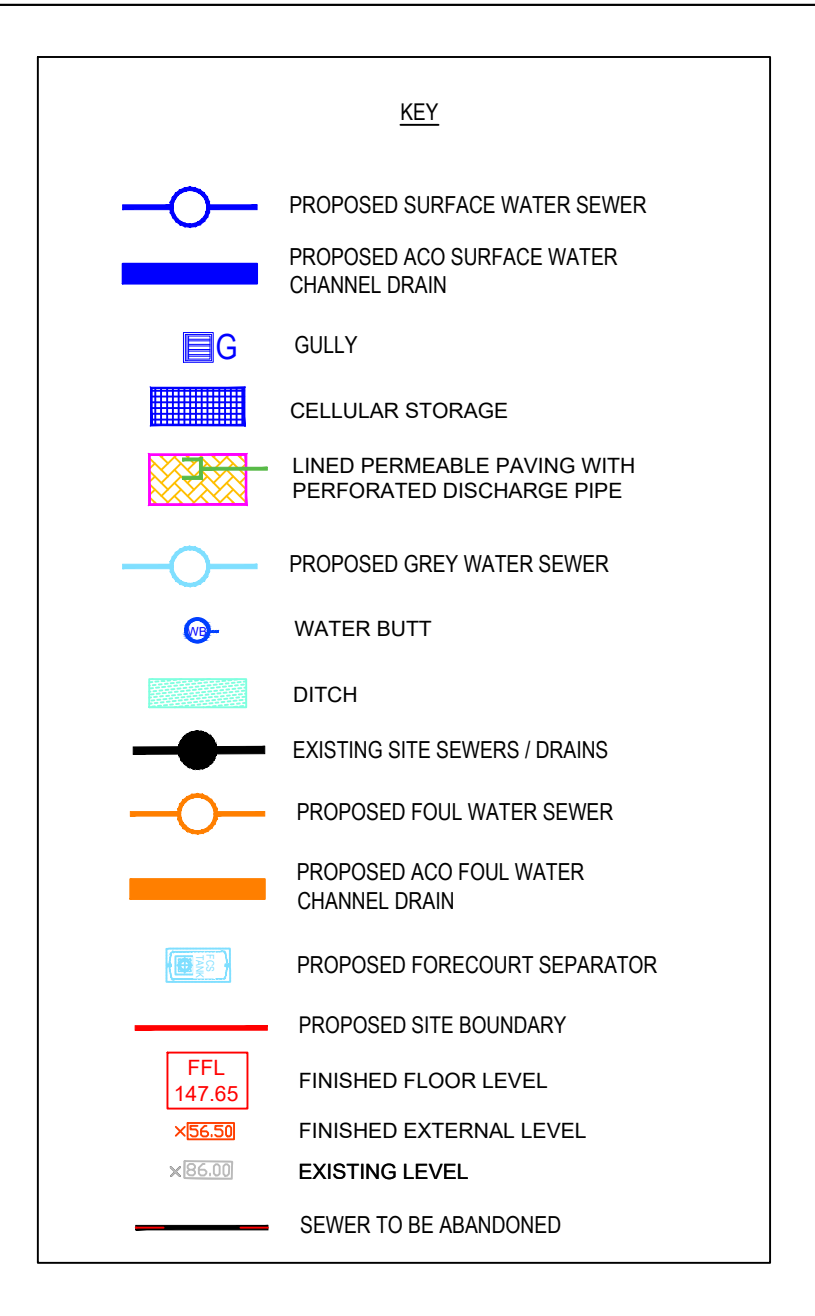
ALL LEVELS RELATED OSTN15 GRID PROJECTION.
ALL DIMENSIONS SHOULD BE VERIFIED ON SITE PRIOR TO CONSTRUCTION.
ALL HATCHING IS FOR PRESENTATIONAL PURPOSES ONLY.

Client	 on the move		
Site Location:	Travelodge Leicester Little Shaw Lane Markfield LE67 9PP		
Drawing Type:	Underground Utility Survey		
Surveyed:	SL/MM	Drawn:	SL
Checked:	CR	Authorised:	SS
Date:	09/01/26	Scale:	1:200@A0
 Land, Building & Engineering Surveyors www.zssurveys.com info@zssurveys.com   REGISTERED MEMBER			
Project Number:	4655		
Sheet Number:	UT002		

Appendix B

Drawings





SW Network 2 Manhole Schedule

MH	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Link	IL (m)	Dia (mm)
S9	447683.180	311067.640	191.850	1.300	1200	2.000	190.550	150
S7	447641.190	311098.800	192.000	1.350	650	1.000	190.650	150
S8	447667.910	311084.040	191.700	1.430	1200	1.001	190.270	150
S10	447674.830	311064.280	191.700	1.670	1200	2.000	190.160	150
S11	447672.460	311122.060	191.650	1.350	1000	3.000	190.300	150
S12	447689.890	311112.700	191.700	2.240	1200	3.000	189.610	150
Ex-SMh-8	447708.490	311104.090	191.600	2.100	1200	4.000	189.500	225
Ex-SMh-9	447704.830	311140.670	191.200	2.190	1200	4.000	189.685	225
S13	447691.260	311157.910	191.550	2.050	1000	1.003	189.010	300
Ex-SMh-10	447722.450	311146.950	190.150	1.650	1200	5.000	188.575	225
Ex-SMh-11	447762.080	311138.070	189.400	2.340	1200	1.004	188.500	300
S14	447720.450	311046.310	190.850	2.250	1200	1.005	188.500	300
S15	447743.720	311059.900	190.450	2.180	1200	1.006	187.160	300
S16	447756.300	311062.510	189.800	1.820	1200	1.006	187.060	400
Ex-SMh-12	447767.820	311096.160	189.620	1.990	1200	6.002	187.720	300
S17	447741.020	311100.320	190.570	2.370	1200	6.003	187.720	300
Ex-SMh-13	447783.360	311114.490	186.450	2.080	1200	8.000	187.640	150
S18 FCC	447773.860	311135.780	186.000	2.190	1200	6.003	187.490	300
GW1	447713.630	311093.780	191.700	1.700	1000	6.004	187.390	400
GW2	447739.040	311078.810	190.700	2.200	1000	6.004	186.900	400
Ex-Outfall-02	447776.360	311137.190	186.000	2.135	1200	1.007	186.900	300

SW Network 1 Manhole Schedule

MH	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Link	IL (m)	Dia (mm)
Ex-SMh-1	447620.300	311063.760	192.770	2.020	650	1.000	190.750	150
Ex-SMh-2	447629.900	311105.180	192.090	1.510	650	1.000	190.570	150
Ex-SMh-3	447618.530	311122.330	191.780	1.290	650	1.001	190.570	150
Ex-SMh-4	447628.910	311121.060	191.630	1.410	1000	2.000	190.295	150
Ex-SMh-5	447648.580	311125.430	191.670	1.350	650	1.001	190.295	150
Ex-SMh-6	447835.420	311130.070	191.280	1.230	1200	1.002	190.220	225
S1	447622.280	311173.860	190.570	1.070	1000	3.000	190.326	150
S2	447653.410	311163.660	190.610	1.410	1000	1.002	190.180	150
S3	447625.180	311204.340	190.780	1.380	1000	1.003	190.105	225
S4	447656.730	311167.920	190.750	1.697	1000	1.004	190.200	300
S5	447639.580	311214.160	190.650	1.350	650	5.000	189.400	150
S6	447662.790	311201.650	190.670	1.848	1000	6.000	189.923	150
Ex-SMh-7 FCC	447671.070	311198.970	190.670	2.098	1200	5.001	188.729	225
Outfall	447873.990	311201.740	190.250	1.772	600	5.002	188.572	300

NOTE
Design is based on information provided by the client, including site topographical survey and FFL that has been set on site.
Scheme is subject to obtaining S106 connection approval from the public Sewerage Undertaker.

Care to be taken while constructing the highway and drainage, not to damage any existing boundary/retaining wall. Wall will need to be assessed prior to any construction works.

GENERAL NOTES

- THIS DRAWING IS COPYRIGHT AND SHOULD NOT BE REPRODUCED IN WHOLE OR PART WITHOUT THE WRITTEN CONSENT OF ISTRUCT LTD.
- DO NOT SCALE FROM THIS DRAWING.
- ALL DIMENSIONS TO BE CHECKED ON SITE AND CO-ORDINATE WITH RELEVANT ARCHITECT'S DRAWINGS. ANY DISCREPANCIES TO BE REPORTED TO THE ENGINEER PRIOR TO CONSTRUCTION.
- ALL DIMENSIONS IN METERS UNLESS NOTED OTHERWISE.
- ALL LEVELS IN METERS.
- SIZES HEREON SHALL NOT BE MODIFIED WITHOUT THE WRITTEN APPROVAL OF THE ENGINEER.
- THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ENGINEERS DRAWINGS & SPECIFICATIONS.

NOTES:

- THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ENGINEERS AND ARCHITECT'S DETAILS.
- ALL WORK IS TO BE CARRIED OUT IN ACCORDANCE WITH THE CURRENT BRITISH STANDARDS, BUILDING REGULATIONS AND DESIGN AND CONSTRUCTION GUIDANCE (DCG) OF THE CODES FOR ADOPTION (CAI).
- THE EXACT POSITION, LEVEL, SIZE AND USE OF EXISTING SEWERS TO BE CONFIRMED ON SITE. ANY DISCREPANCIES TO BE REPORTED TO THE ENGINEER PRIOR TO COMMENCEMENT OF WORKS.
- ALL UNCOVERED AND SHALLOW PIPEWORK TO BE PROTECTED AGAINST CONSTRUCTION TRAFFIC AS PART OF THE CONTRACTORS TEMPORARY WORKS REQUIREMENTS. COVER LEVELS SHOWN ARE APPROXIMATE ONLY. SUBJECT TO THE ARCHITECT'S EXTERNAL WORKS AND LANDSCAPING SCHEME.
- ALL CONNECTIONS TO ROAD GULLIES AND CHANNELS SHALL BE 150MM NOMINAL BORE PIPEWORK. CONNECTIONS TO RWPS TO BE 100MM NOMINAL BORE PIPEWORK SUBJECT TO CONFIRMATION OF RWPS SIZES AND/OR DESIGN FLOW. NO PIPE WORK TO BE DOWN SIZED IN THE DIRECTION OF FLOW. CONNECTIONS TO FOUL TERMINAL FITTINGS TO BE 100MM NOMINAL BORE PIPEWORK SUBJECT TO CONFIRMATION OF ABOVE GROUND PIPE DIAMETERS AND/OR DESIGN FLOW. NO PIPE WORK TO BE DOWN SIZED IN THE DIRECTION OF FLOW.
- PIPES CONNECTING TO ADOPTED MANHOLES UP TO AND INCLUDING 300MM DIA. TO BE VITRIFIED CLAY OR PLASTIC (PVC-U).
- PLASTIC (PVC-U) PIPES REQUIRE ADEQUATE GRANULAR BEDDING AND PIPE SURROUND FOR SUPPORT.
- ALL PIPES CONNECTING TO ADOPTED MANHOLES GREATER THAN 300MM DIA. TO BE CONCRETE.
- ALL PIPEWORK ENTERING AND EXITING MANHOLES TO BE CONNECTED WITH PIPE SOFFITS LEVEL.
- PRE-FORMED CHANNELS TO BE USED AT ALL MANHOLES.
- HIGH STRENGTH CONCRETE BRANCHING TO BE STEEL TROWELLED TO A DENSE SMOOTH FACE NEATLY SHAPED AND FINISHED TO ALL BRANCH CONNECTIONS AND LAID IN ACCORDANCE WITH THE SPECIFICATION.
- PIPE BENDS TO BE PROVIDED TO SUIT DIRECTION OF FLOW.
- ALL MANHOLE COVERS AND FRAMES TO BE DUCTILE IRON HEAVY DUTY GRADE D400 DOUBLE TRIANGULAR TO BS EN 124 UNLESS OTHERWISE NOTED. COVERS TO BE LABELLED 'FW' AND 'SW' AS APPROPRIATE.
- GULLY TOPS AND MANHOLE COVERS TO BE PROVIDED IN ACCORDANCE WITH BS EN 124.
- ALL MANHOLE COVERS LOCATED INTERNALLY, TO BE RECESSED, DOUBLE SEAL, AIRTIGHT TYPE, ALUMINIUM OR STEEL. RECESS DEPTH TO ARCHITECT'S REQUIREMENTS TO SUIT FINISHES ETC.
- ALL NEW DRAINAGE TO BE CONSTRUCTED ADJACENT NEW AND PROPOSED TREE PLANTING TO BE PROTECTED AGAINST ROOT ACTIVITY USING ROOTCONTROL: ROOT BARRIER MATERIAL BY GREEN-TECH. ALL IN ACCORDANCE WITH THE MANUFACTURERS RECOMMENDATIONS.
- FIRST FLEXIBLE JOINT IN PIPES ADJACENT TO A MANHOLE SHALL BE 600MM MAX. FROM INSIDE FACE OF MANHOLE. CONNECTING TO ROCKER PIPE. FOR PIPE DIAMETERS 150MM - 450MM THE ROCKER PIPE LENGTH SHALL BE 500MM - 750MM AND FOR PIPE DIAMETERS 450MM - 675MM THE ROCKER PIPE LENGTH SHALL BE 750MM - 1000MM.
- MANHOLES WITH OUTGOING PIPES GREATER THAN 600MM DIA. SHALL BE FITTED WITH GUARD BARS, SAFETY CHAINS OR OTHER APPROVED SAFETY DEVICES.
- WHERE THE FORMATION OF A PIPE TRENCH IS ABOVE ORIGINAL GROUND LEVEL, LEVELS ARE TO BE MADE UP WITH COMPACTED DTP TYPE 2 MATERIAL OR BETTER.
- ALL PRIVATE DRIVES WHICH FALL TOWARDS A PUBLIC HIGHWAY AND EXCEED TWO PARKING BAYS IN AREA ARE TO BE PROVIDED WITH A SUITABLE GULLY OR DRAINAGE CHANNEL TO PREVENT WATER DISCHARGING ONTO THE HIGHWAY.
- ALL BURIED CONCRETE MUST CATER FOR CLASS 2 SULPHATES CONDITIONS IN ACCORDANCE WITH TABLE 1 OF BRE DIGEST 363.
- CONCRETE PROTECTION SHALL BE PROVIDED TO ALL PIPES WITH LESS THAN 300MM COVER IN PEDESTRIAN AREAS, TO ALL PIPES WITH LESS THAN 600MM COVER IN PRIVATE DRIVEWAYS NOT USED BY COMMERCIAL VEHICLES, AND TO ALL PIPES WITH LESS THAN 1200MM COVER IN ROADS OR PRIVATE DRIVEWAYS USED BY COMMERCIAL VEHICLES. WHERE CONCRETE SURROUND IS SPECIFIED FLEXIBILITY OF JOINTS IS TO BE MAINTAINED BY USING COMPRESSIBLE BITUMEN IMPREGNATED FIBREBOARD AT EACH POINT.

P02	ATT. TASKS POSITIONS REORIENTED	22.04.26	RL
P01	INITIAL ISSUE - LAYOUT 251141-SK02	13.04.26	RL
Rev.	Amendments	Date	By

Revisions

Client: **EG on the move**

Project: **MARKFIELD SERVICES LEICESTERSHIRE, LE67 9PP**

Title: **DRAINAGE STRATEGY PLAN**

At original size **A1**

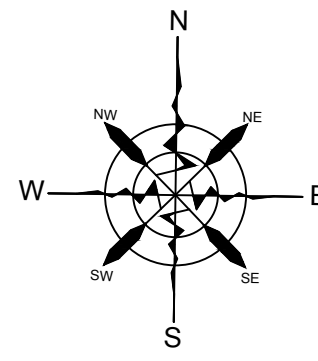
Status: PRELIMINARY	Drawn By: RDL	Date: 13.04.2026	Scale: 1:400
Drawing No.: 26008-IST-KV-DR-C-0500	Rev: P02		

NETWORK-01

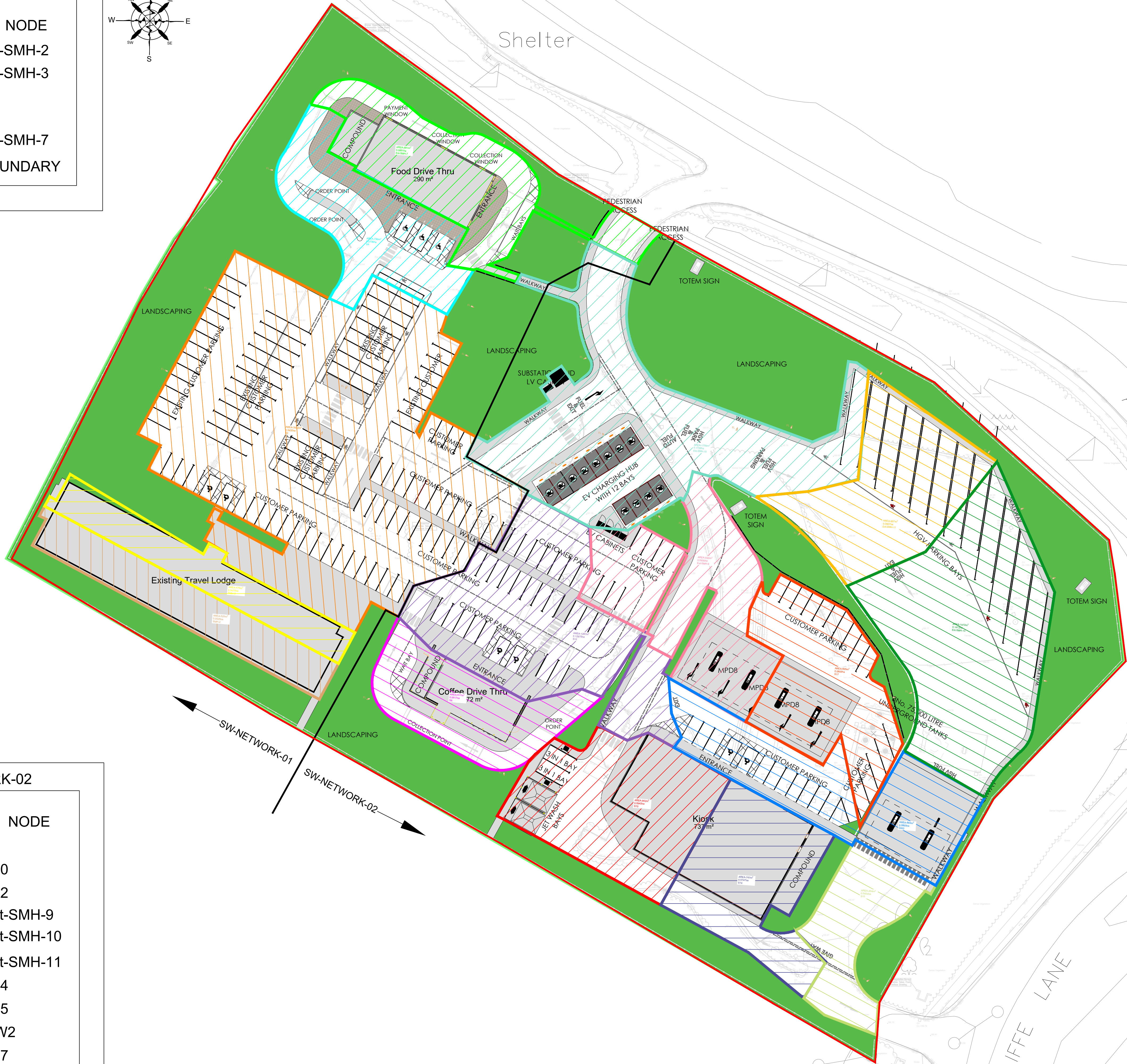
KEY

IMP AREA NODE

- Ext-SMH-2
- Ext-SMH-3
- S2
- S4
- Ext-SMH-7
- BOUNDARY



Shelter



NETWORK-02

KEY

IMP AREA NODE

- S8
- S10
- S12
- Ext-SMH-9
- Ext-SMH-10
- Ext-SMH-11
- S14
- S15
- GW2
- S17
- Ext-SMH-13
- BOUNDARY

GENERAL NOTES

- 1.1. THIS DRAWING IS COPYRIGHT AND SHOULD NOT BE REPRODUCED IN WHOLE OR PART WITHOUT THE WRITTEN CONSENT OF ISTRUCT LTD.
- 1.2. DO NOT SCALE FROM THIS DRAWING.
- 1.3. ALL DIMENSIONS TO BE CHECKED ON SITE AND CO-ORDINATE WITH RELEVANT ARCHITECTS DRAWINGS. ANY DISCREPANCIES TO BE REPORTED TO THE ENGINEER PRIOR TO CONSTRUCTION.
- 1.4. ALL DIMENSIONS IN METERS UNLESS NOTED OTHERWISE.
- 1.5. ALL LEVELS IN METERS.
- 1.6. SIZES HEREON SHALL NOT BE MODIFIED WITHOUT THE WRITTEN APPROVAL OF THE ENGINEER.
- 1.7. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ENGINEERS DRAWINGS & SPECIFICATIONS.

P01	INITIAL ISSUE - LAYOUT 251141-SK02	13.04.26	RL
Rev.	Amendments	Date	By

Revisions

iSTRUCT
consultants ltd

Suite E - AA Business Centre, 336-340 Dunstable Road,
Luton, Bedfordshire, LU4 8JS
Tel: 01582 455738 Email: info@istructconsultants.com

Client:

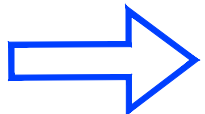
EG
on the move

Project: MARKFIELD SERVICES
LEICESTERSHIRE, LE67 9PP

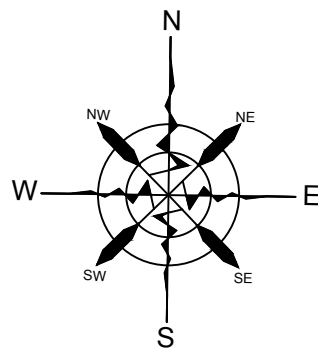
Title: CATCHMENT AREAS PLAN

At original size A1			
Status: PRELIMINARY	Drawn By: RDL	Date: 13.04.2026	Scale: 1:400
Drawing No.: 26008-IST-KV-DR-C-0501	Rev: P01		

FLOOD ROUTING DIRECTION ARROW



ROUTING SHOWN IS FOR EVENTS IN EXCEEDANCE OF THE DESIGN STORM



Shelter

A 511

CLIFFE LANE

GENERAL NOTES

- 1.1. THIS DRAWING IS COPYRIGHT AND SHOULD NOT BE REPRODUCED IN WHOLE OR PART WITHOUT THE WRITTEN CONSENT OF ISTRUCT LTD.
- 1.2. DO NOT SCALE FROM THIS DRAWING.
- 1.3. ALL DIMENSIONS TO BE CHECKED ON SITE AND CO-ORDINATE WITH RELEVANT ARCHITECTS DRAWINGS. ANY DISCREPANCIES TO BE REPORTED TO THE ENGINEER PRIOR TO CONSTRUCTION.
- 1.4. ALL DIMENSIONS IN METERS UNLESS NOTED OTHERWISE.
- 1.5. ALL LEVELS IN METERS.
- 1.6. SIZES HEREON SHALL NOT BE MODIFIED WITHOUT THE WRITTEN APPROVAL OF THE ENGINEER.
- 1.7. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ENGINEERS DRAWINGS & SPECIFICATIONS.

P01	INITIAL ISSUE - LAYOUT 251141-SK02	13.04.26	RL
Rev.	Amendments	Date	By

Revisions



iSTRUCT
consultants ltd

Suite E - AA Business Centre, 336-340 Dunstable Road,
Luton, Bedfordshire, LU4 8JS
Tel: 01582 455738 Email: info@istructconsultants.com

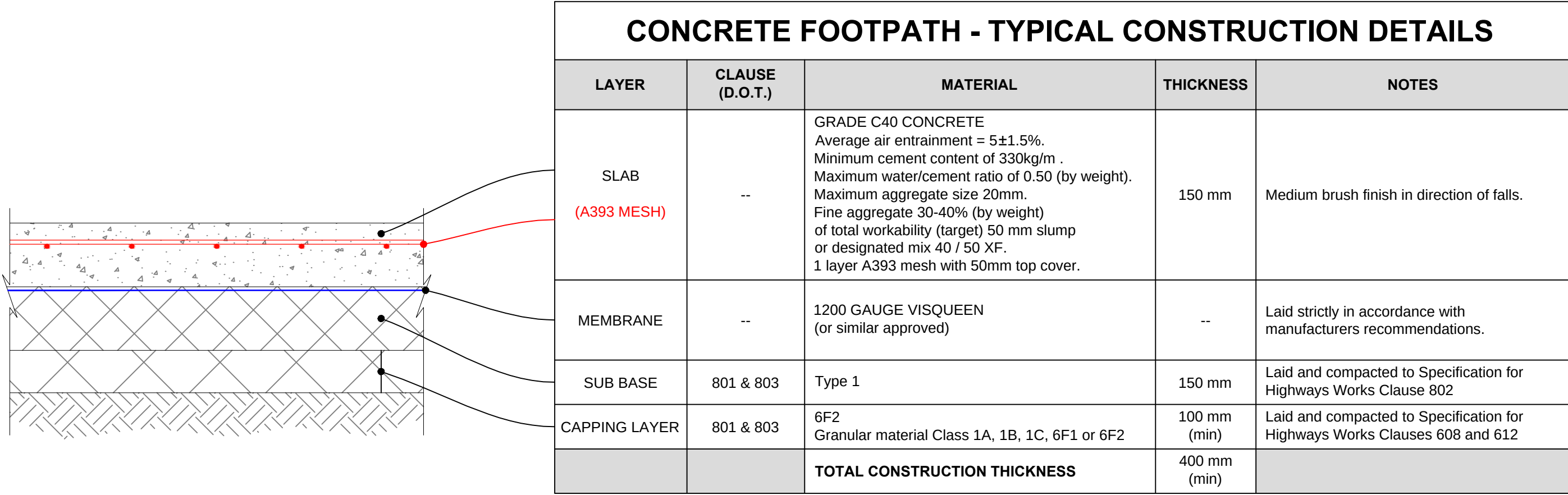
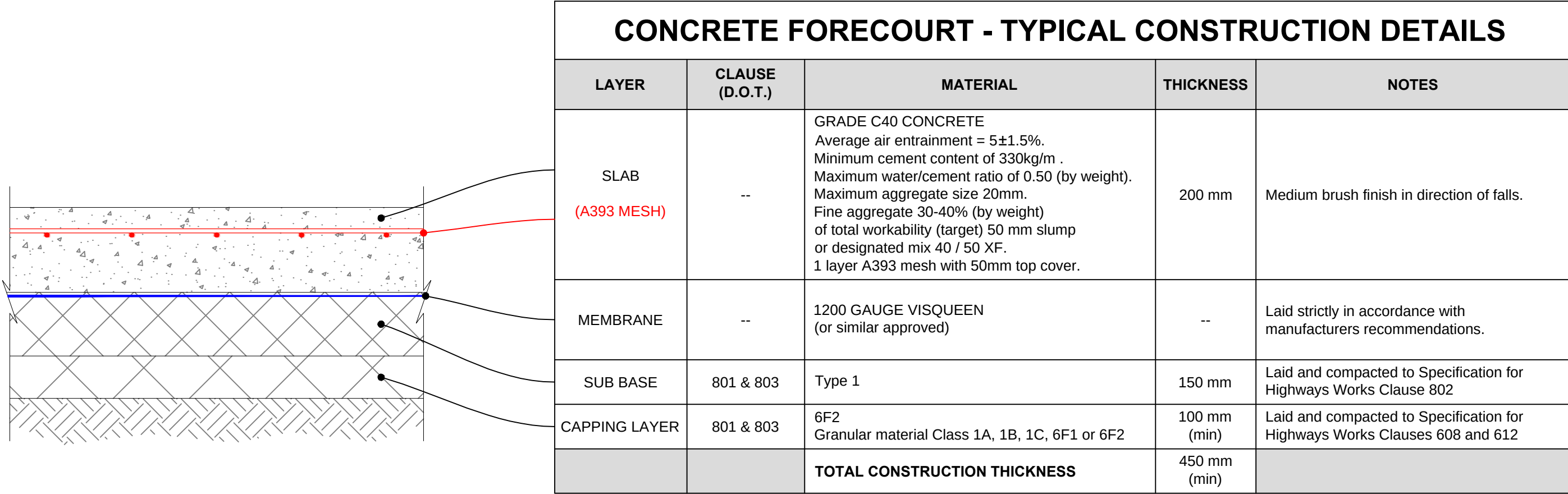
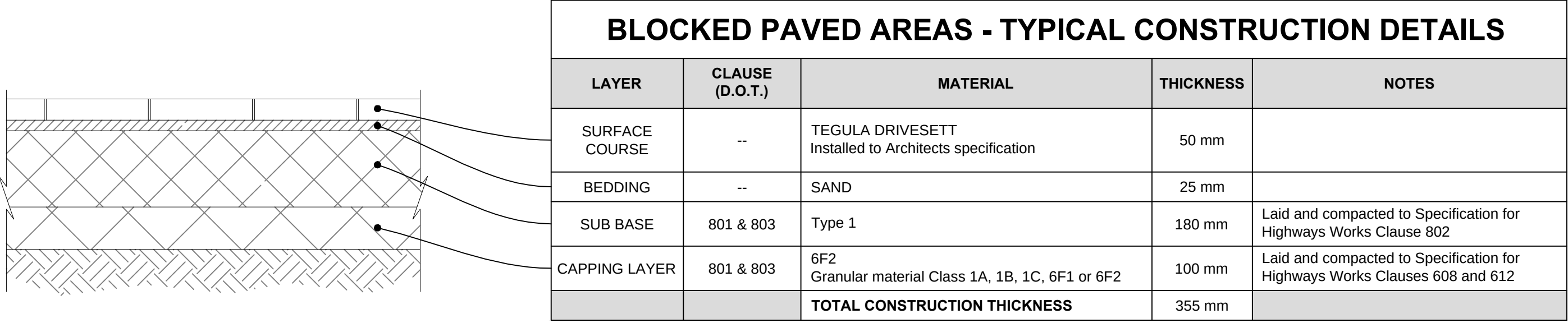
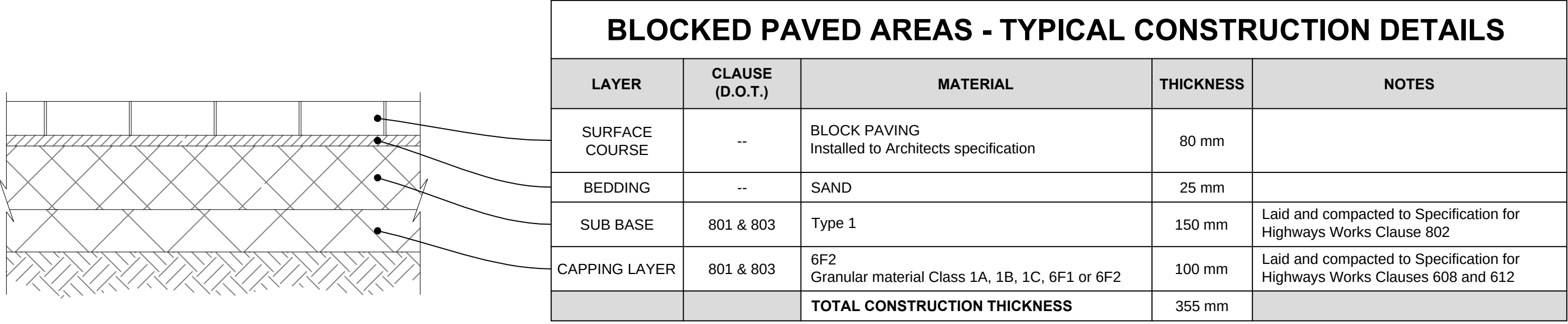
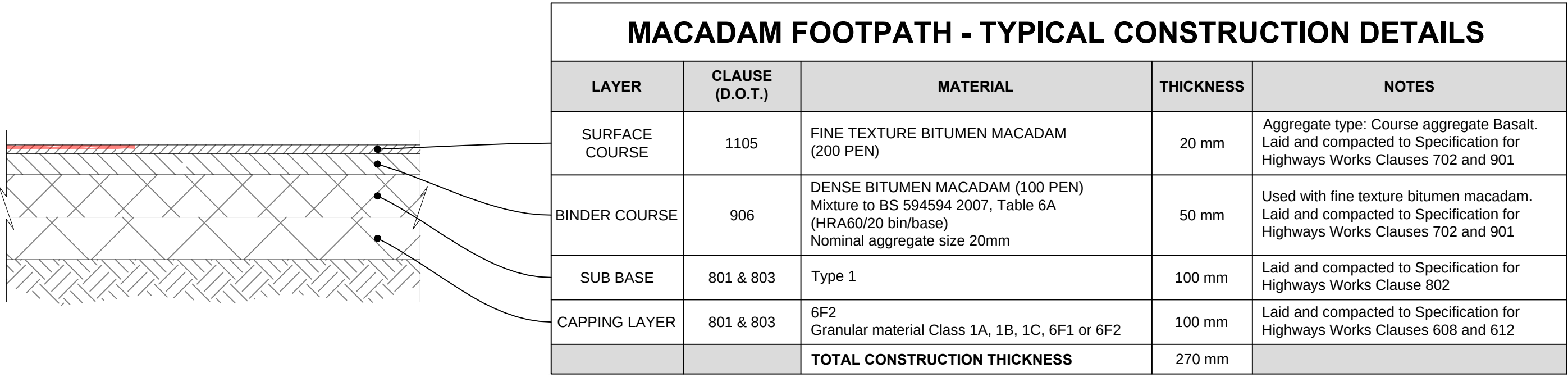
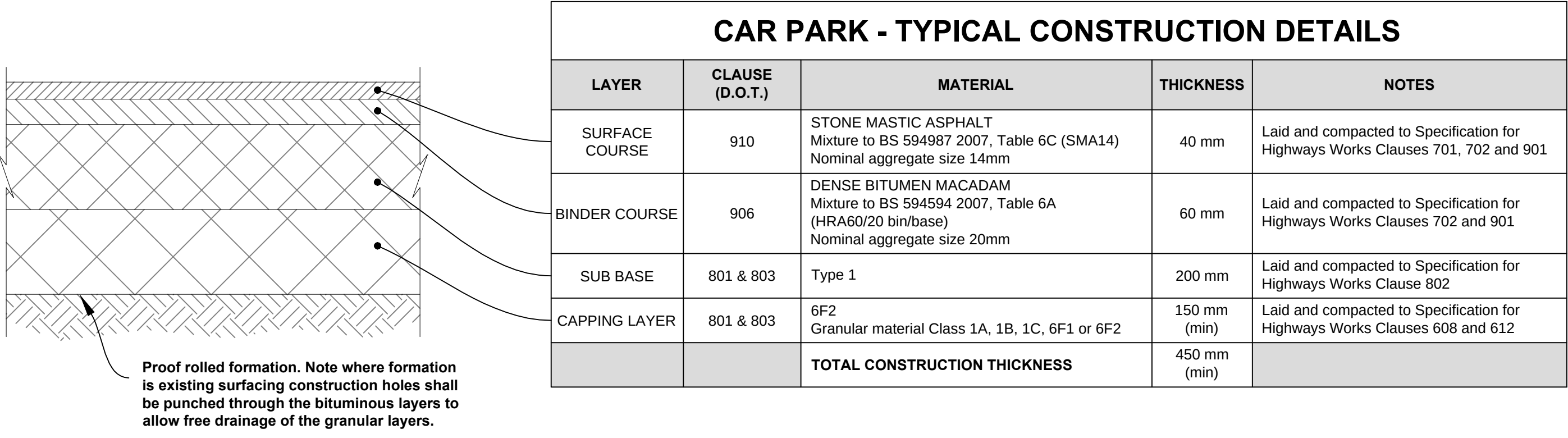
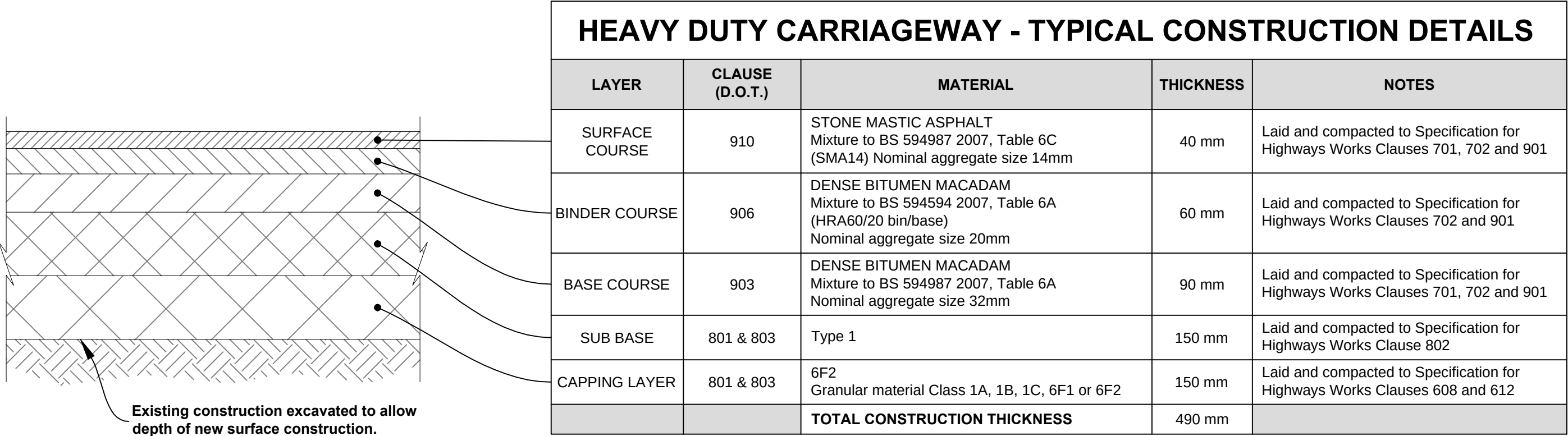
Client:



Project: MARKFIELD SERVICES
LEICESTERSHIRE, LE67 9PP

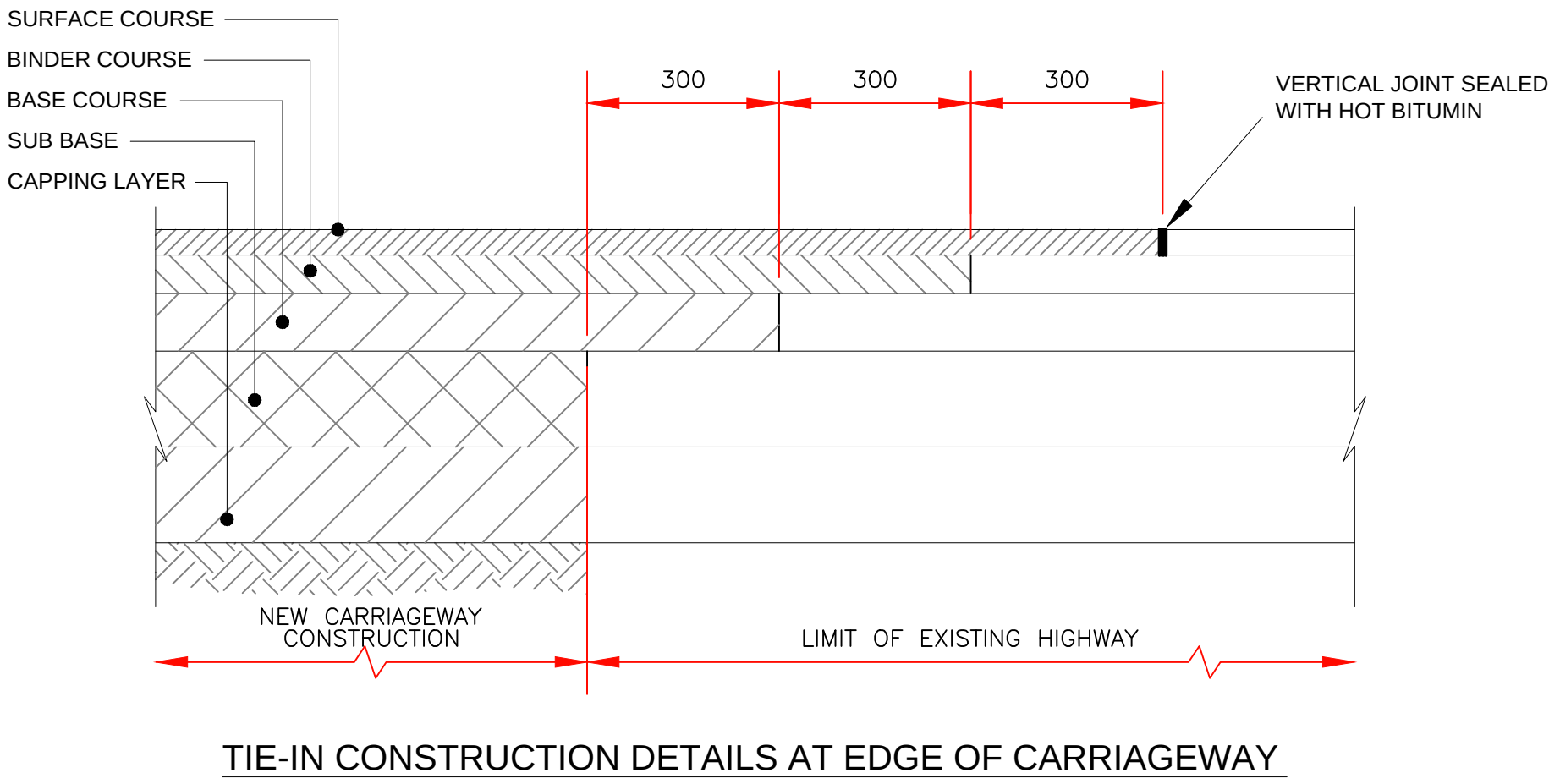
Title: EXCEEDANCE FLOW PLAN

At original size A1			
Status: PRELIMINARY	Drawn By: RDL	Date: 13.04.2026	Scale: 1:400
Drawing No.: 26008-IST-KV-DR-C-0502	Rev: P01		



NOTE:
CBR of 2% to be assumed for all road construction thicknesses unless ground testing determines otherwise.

FOUNDATION THICKNESS		
CBR %	GRANULAR SUB BASE - TYPE 1	CAPPING LAYER
>2	150	600
2	150	450
2.5	350	0
2.5	150	400
3	300	0
3	150	350
4	250	0
4	150	300
5	150	250
5	225	0
8	150	20
8	190	0
>15	150	



P1Standard IssueYA12/24

REV:DESCRIPTION:BY:DATE:STATUS:PLANNING



iSTRUCT

consultants Ltd

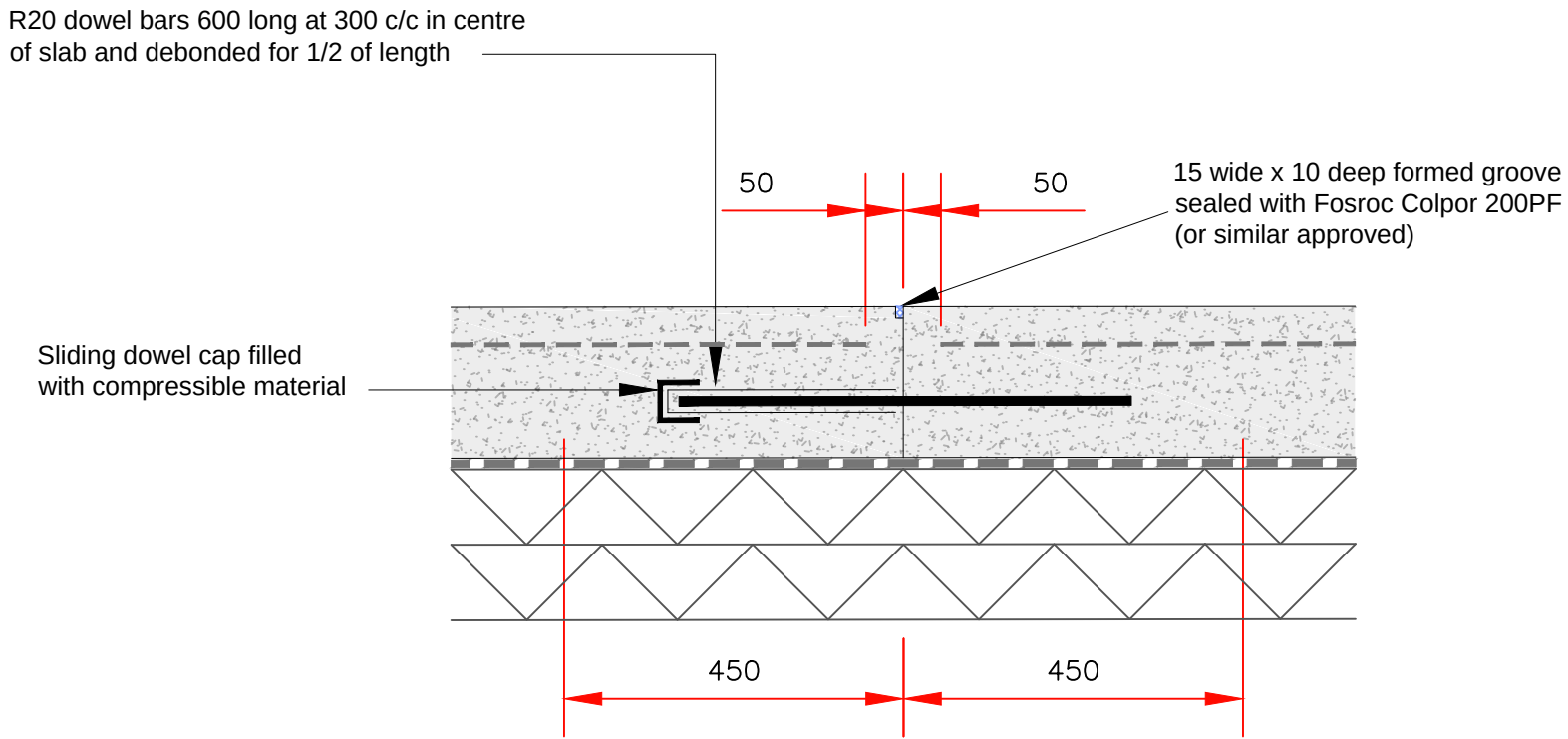
Suite E - AA Business Centre, 336-340 Dunstable Road, Luton, Bedfordshire, LU4 8JS
Tel: 01582 455738 Email: info@istructconsultants.com



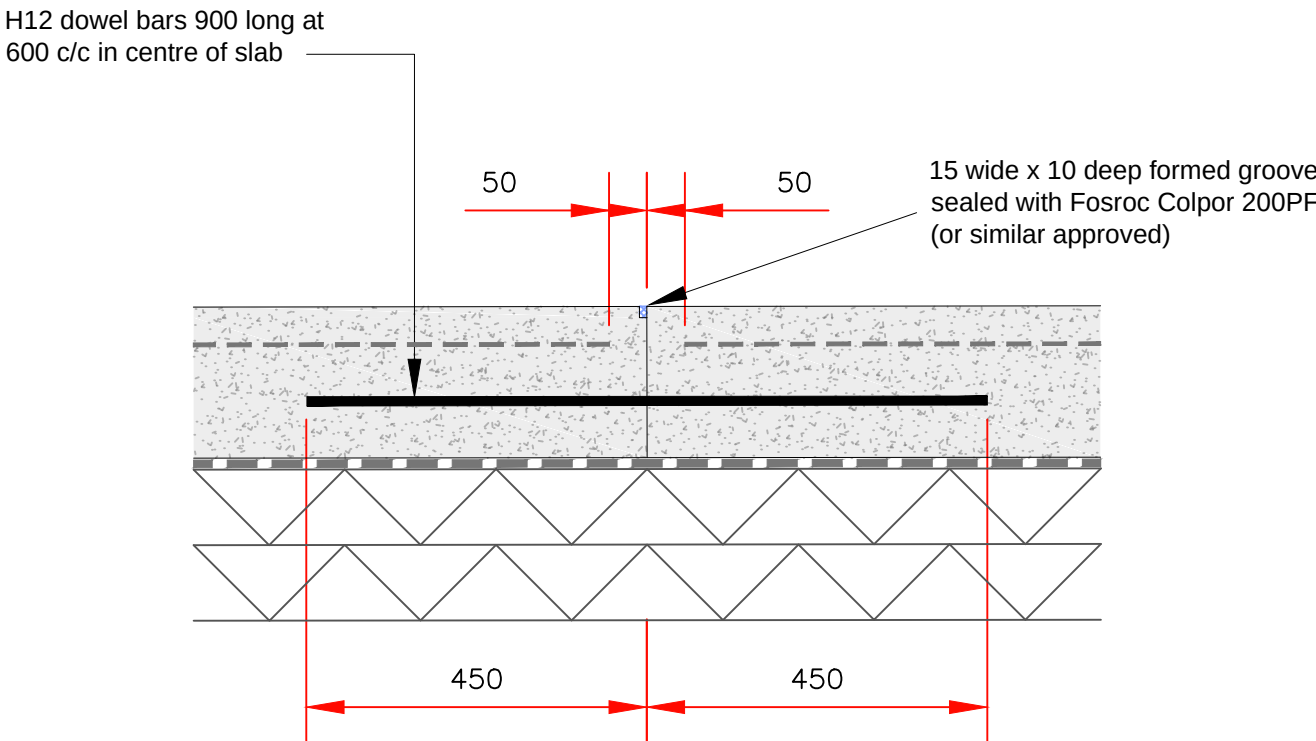
PROJECT:Proposed Development

TITLE:Standard Details
Surface Construction

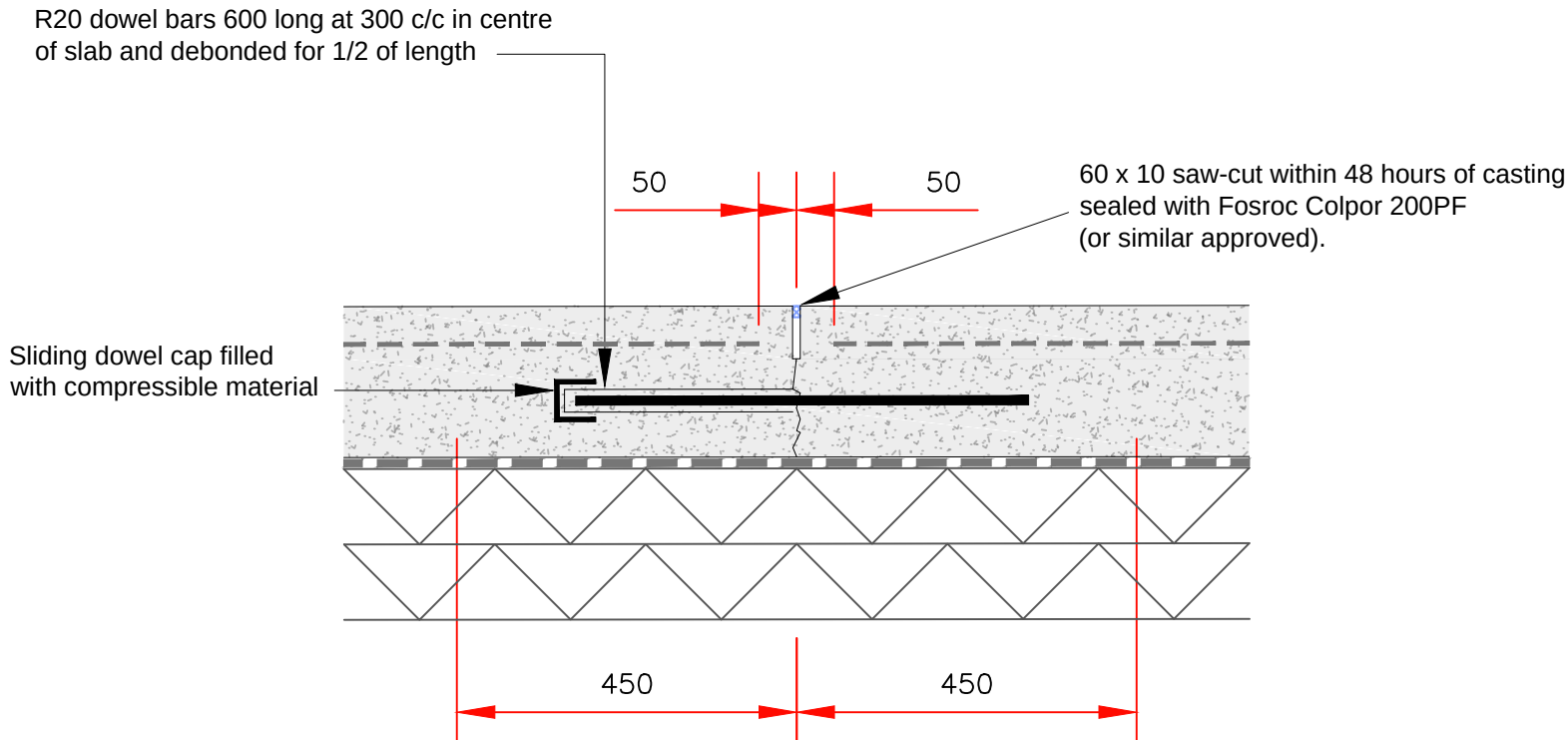
SCALE: AT A1:As ShownDATE:DEC 2024DRAWN:YACHECKED:MMPROJECT NO:-DRAWING NO:SD-300REVISION:P1



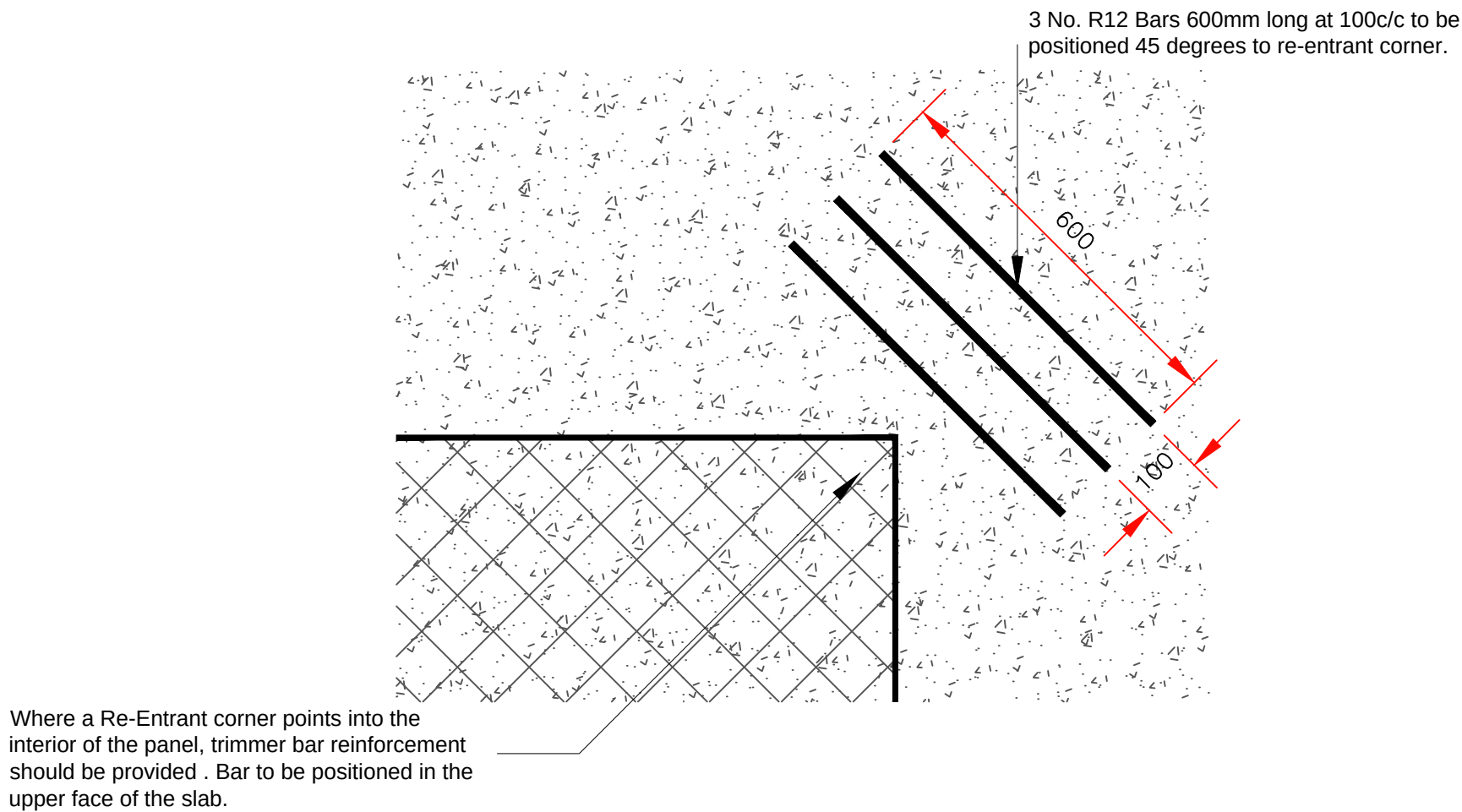
DEBONDED LONGITUDINAL JOINT (DLJ)



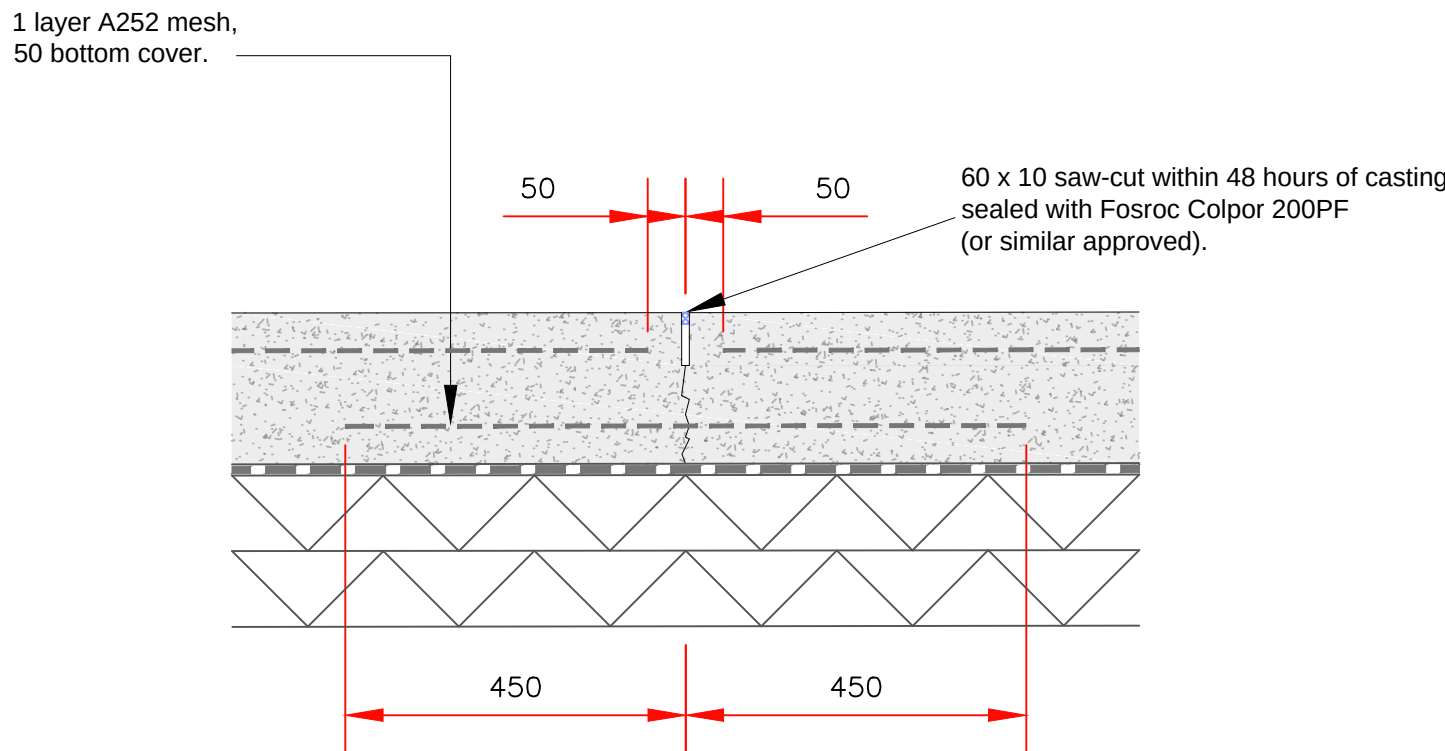
TIED LONGITUDINAL JOINT (TLJ)



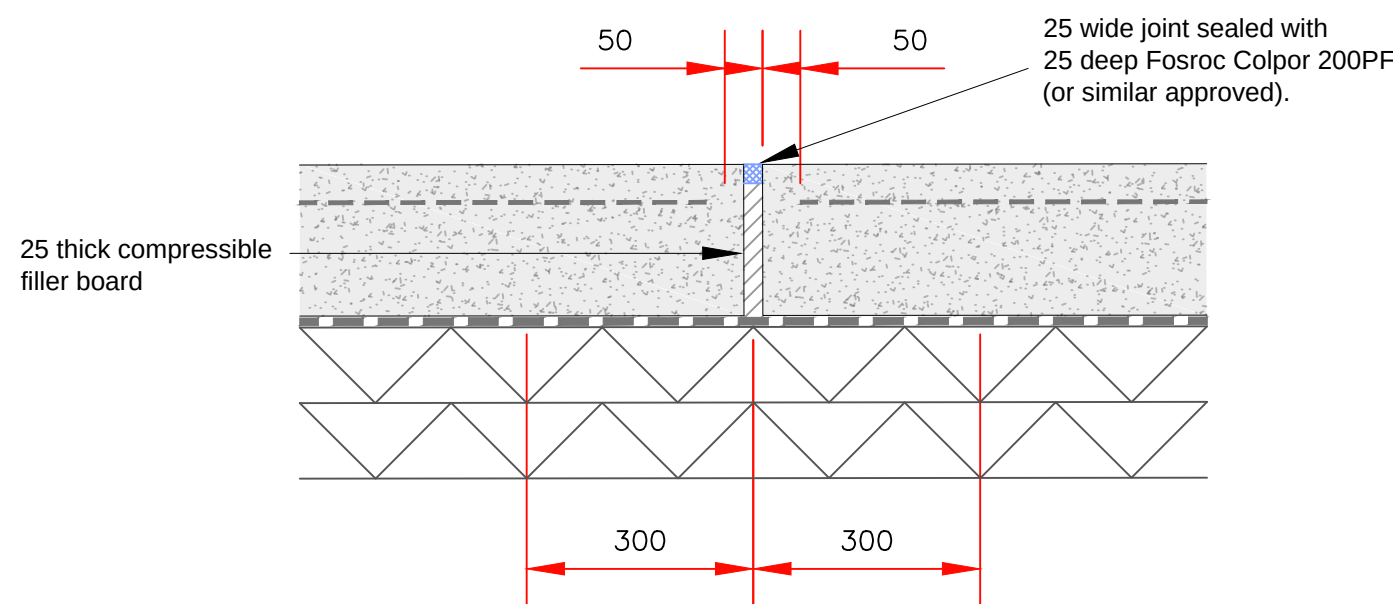
CONTRACTION JOINT (CJ)



TRIMMER BAR DETAIL FOR RE-ENTRANT CORNERS



INDUCED TIED JOINT (IJ)



ISOLATION JOINT (ISO)

P1	Standard Issue	YA	12/24
REV:	DESCRIPTION:	BY:	DATE:
STATUS: PLANNING			



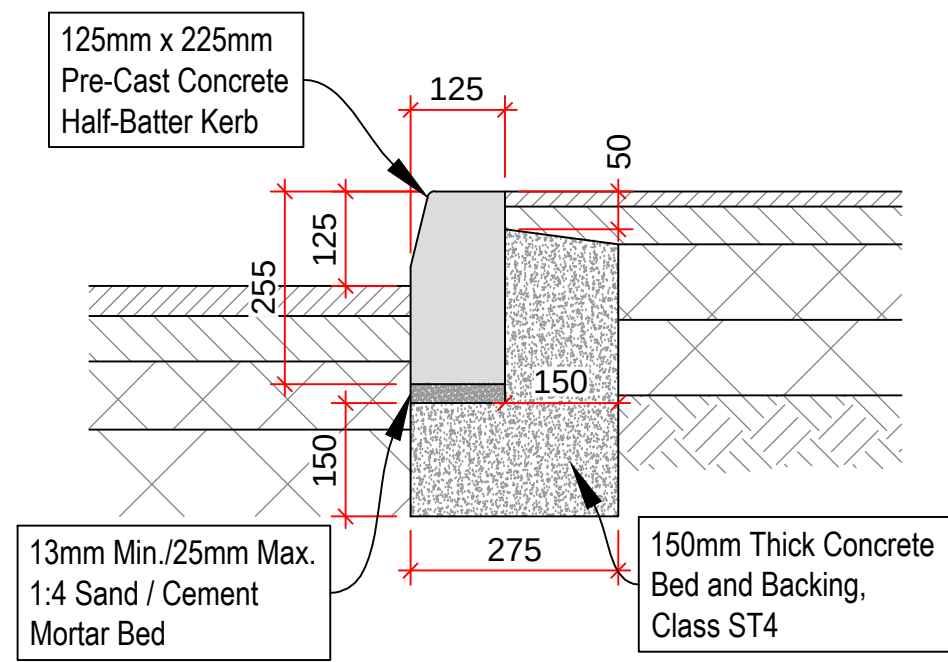
iSTRUCT
consultants Ltd

Suite E - AA Business Centre, 336-340 Dunstable Road,
Luton, Bedfordshire, LU4 8JS
Tel: 01582 455738 Email: info@istructconsultants.com

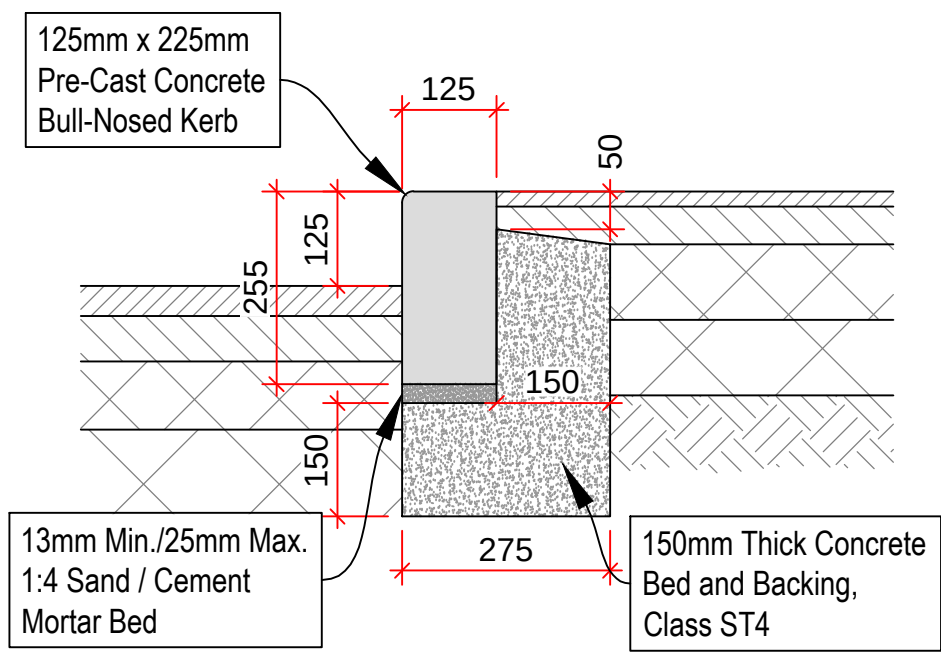
CLIENT:



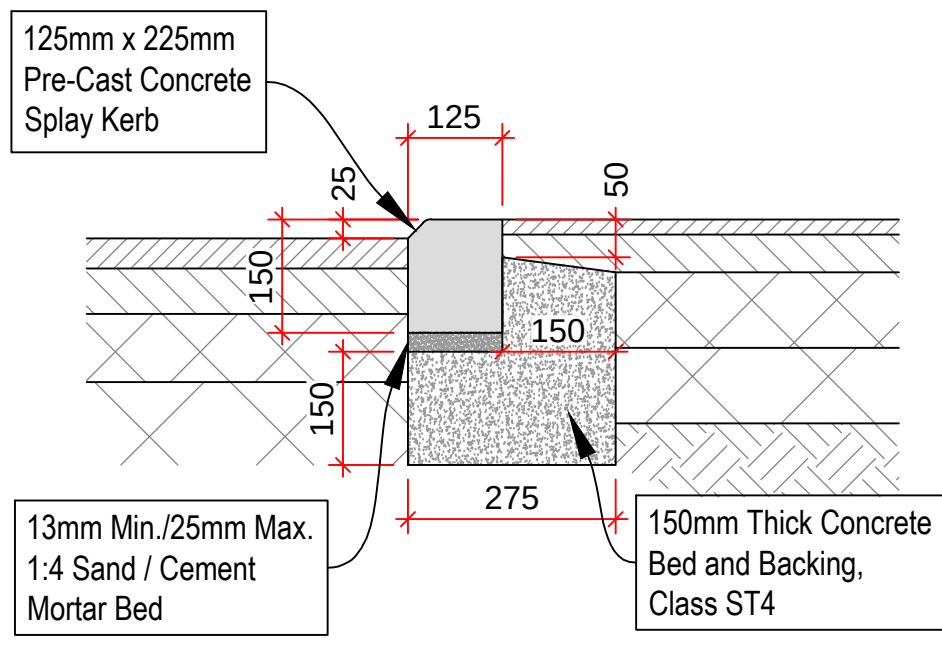
PROJECT: Proposed Development			
TITLE: Standard Details Construction Joints			
SCALE: AT A1: As Shown	DATE: DEC 2024	DRAWN: YA	CHECKED: MM
PROJECT NO: IST	DRAWING NO: 002	REVISION: P1	



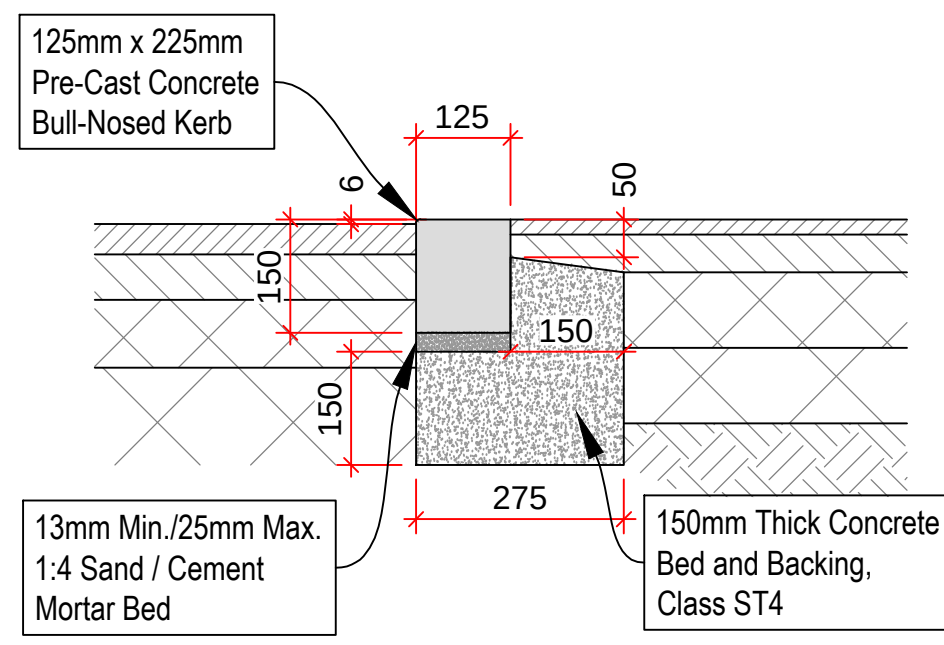
HALF-BATTER KERB - TYPICAL DETAIL



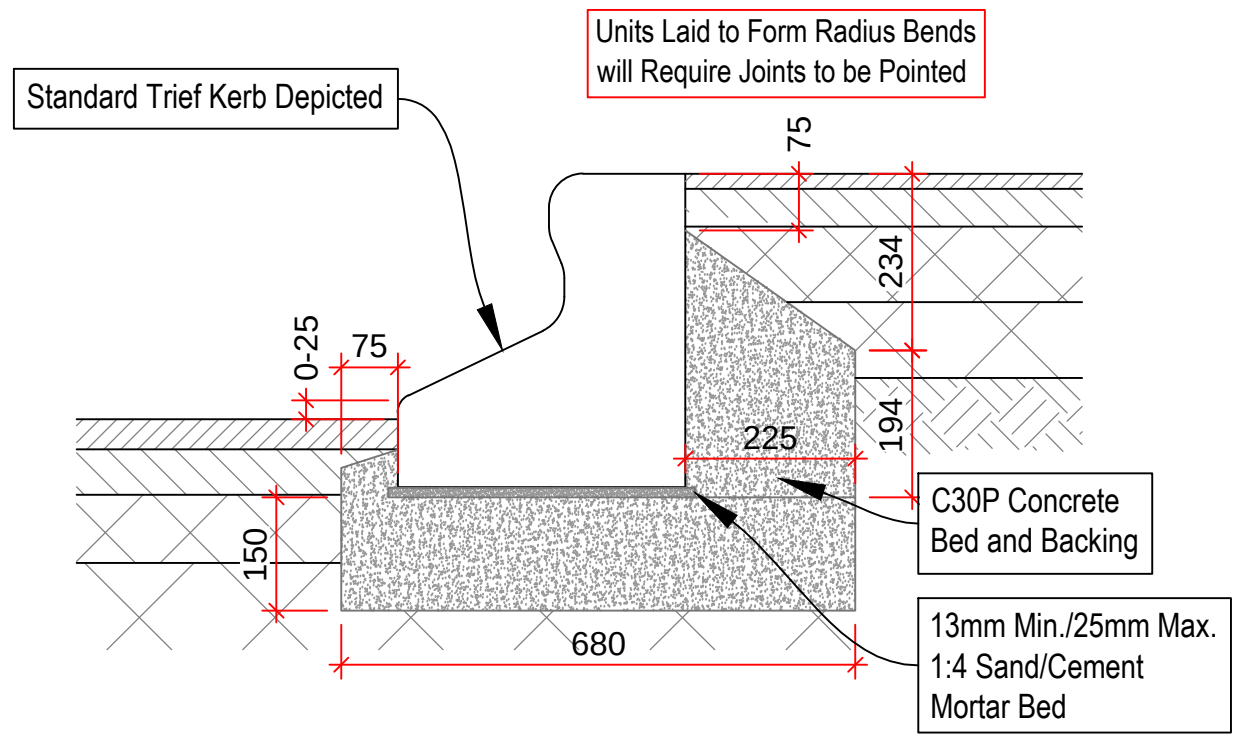
BULL-NOSE KERB - TYPICAL DETAIL



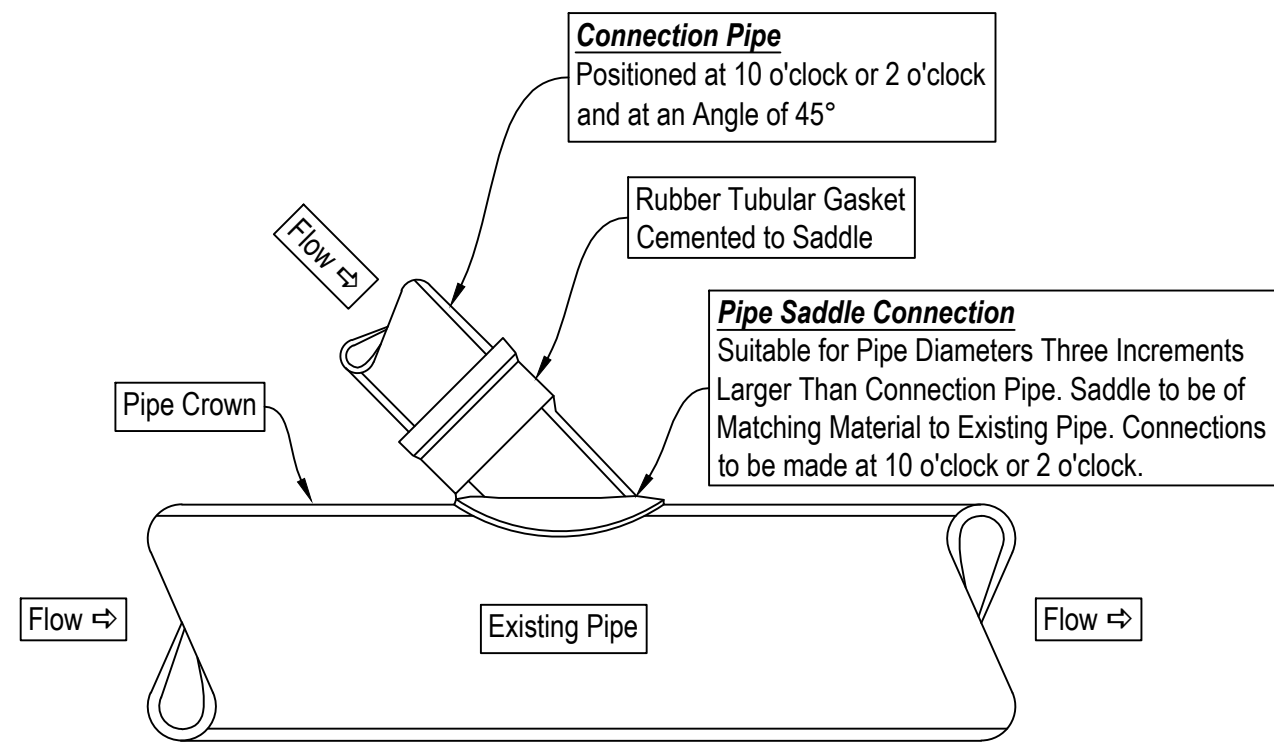
DROPPED KERB - TYPICAL DETAIL



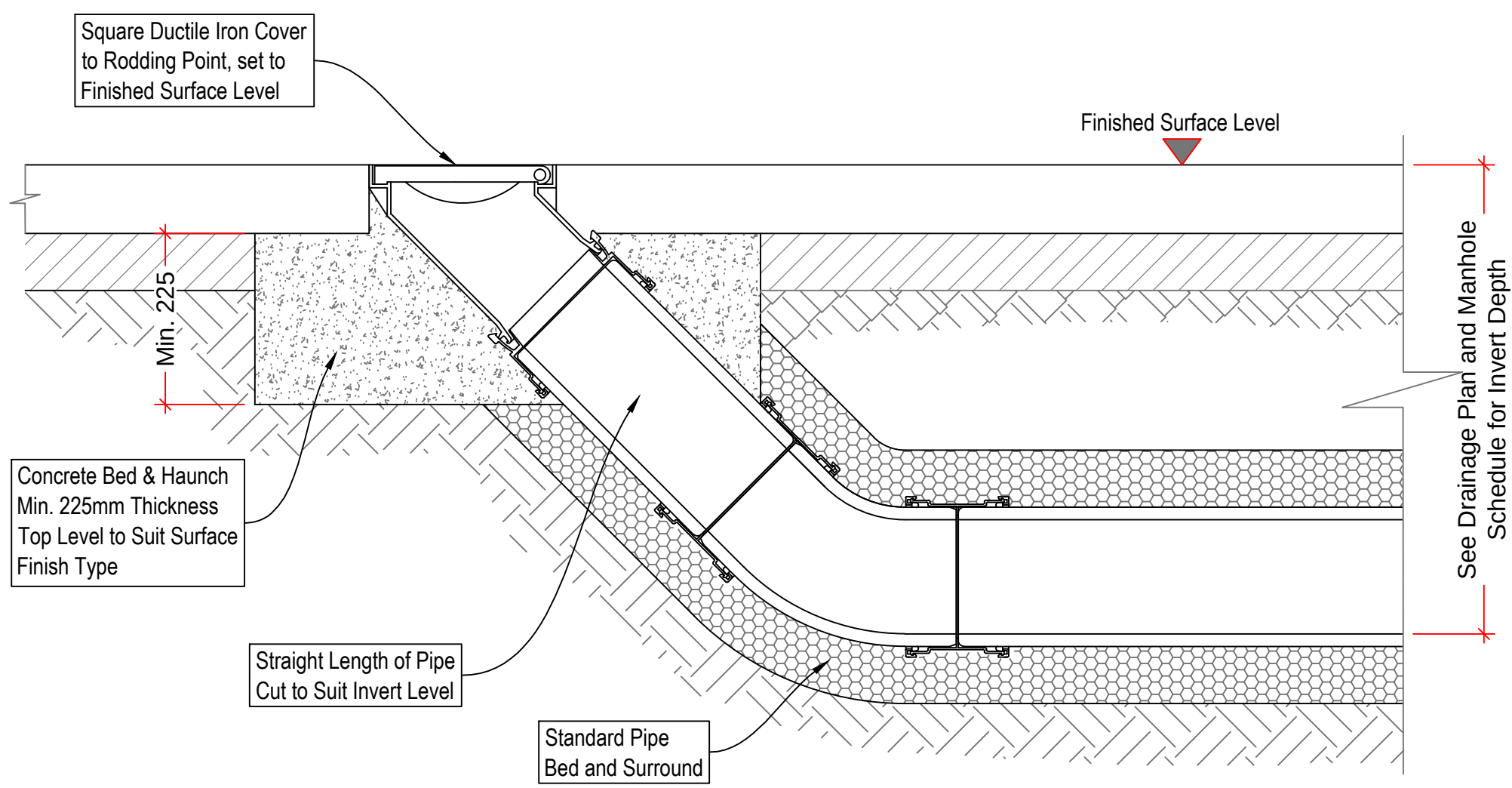
DROPPED KERB - TYPICAL DETAIL



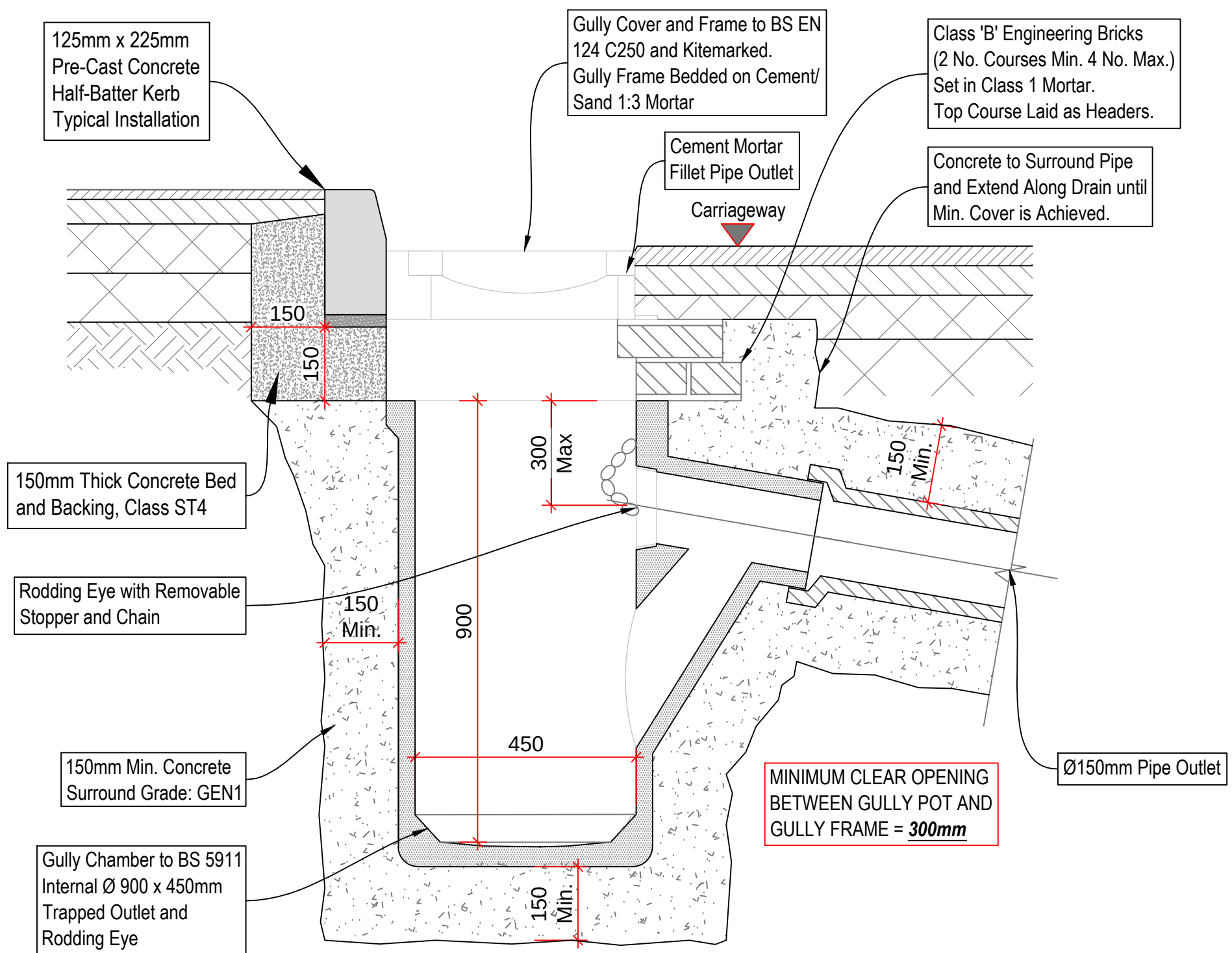
SAFETY KERB - TYPICAL DETAIL



SADDLE CONNECTION - TYPICAL DETAIL

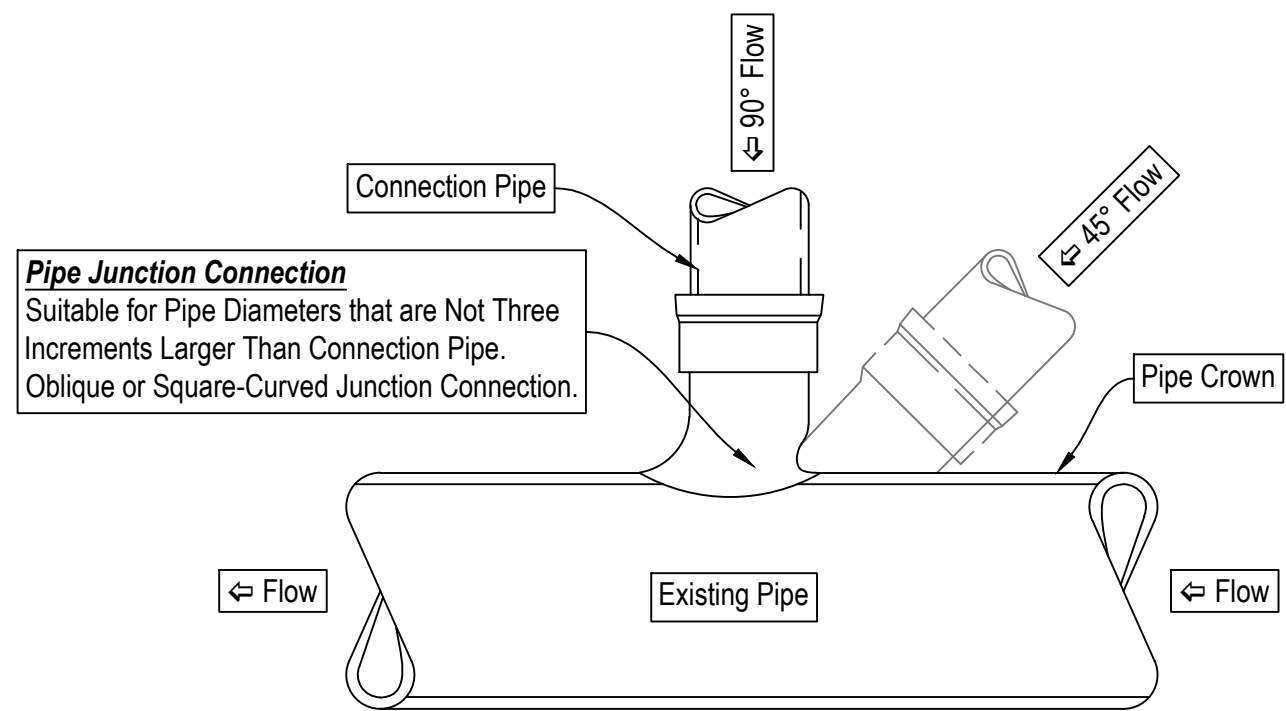


RODDING EYE - TYPICAL DETAIL

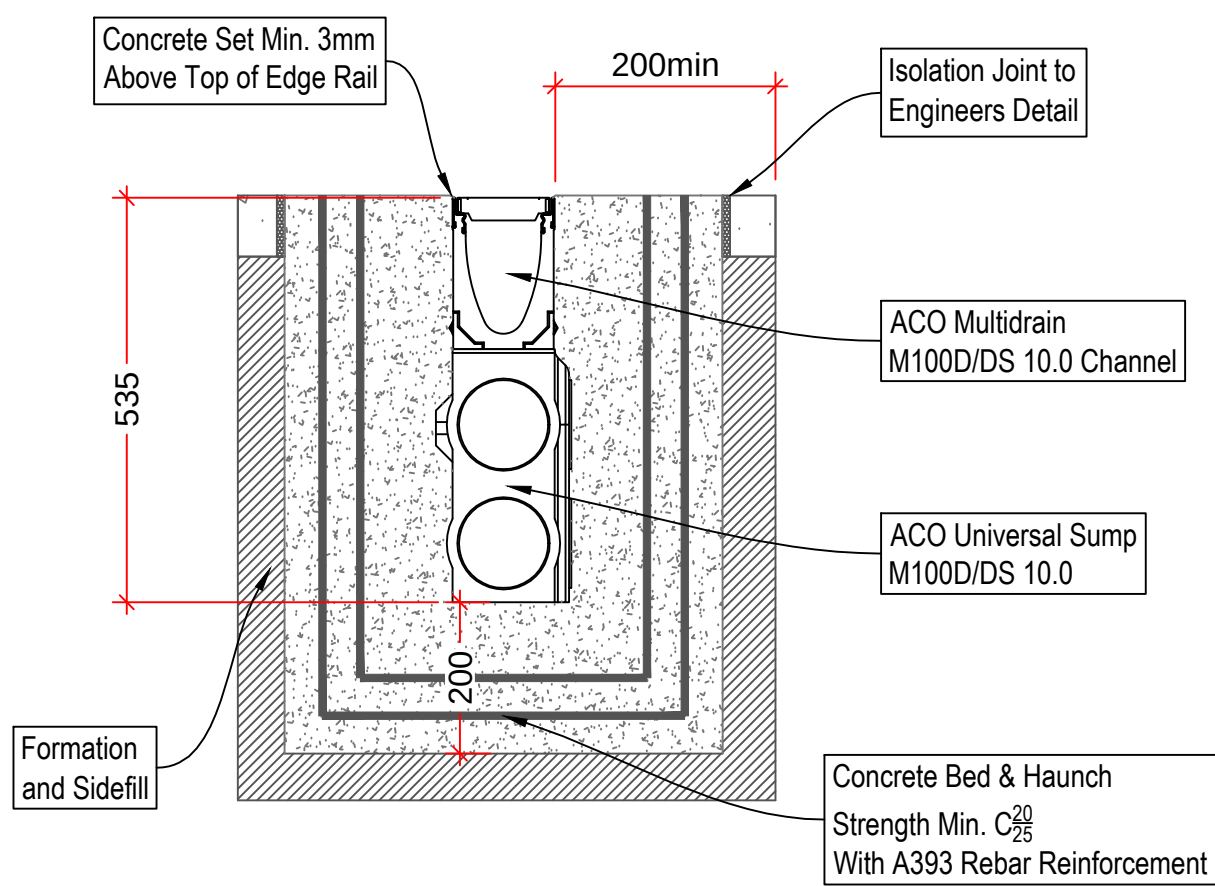


DRAINAGE GULLY - TYPICAL DETAIL

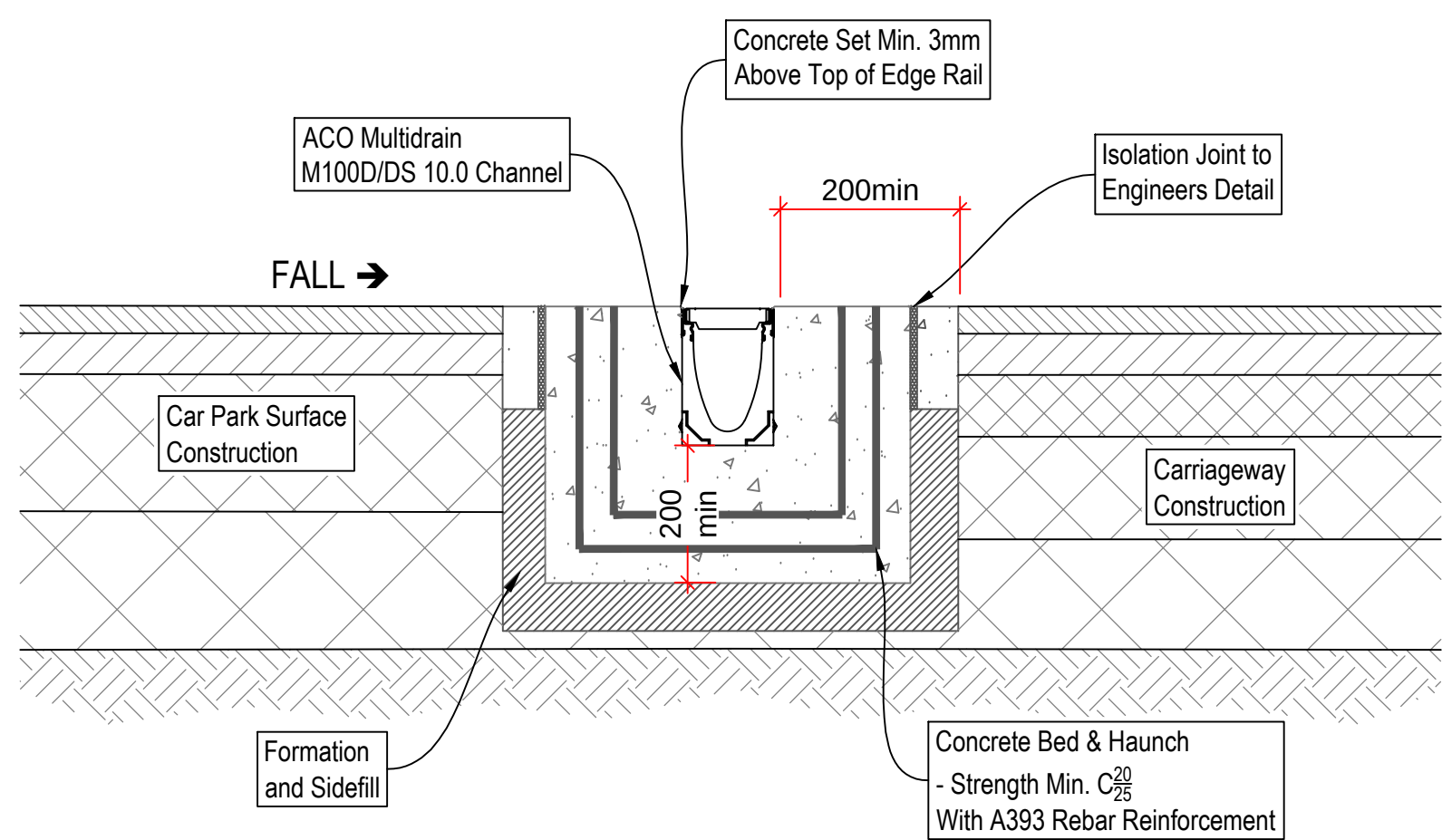
		EXISTING CONNECTION DIAMETER									
		100	150	225	300	375	450	525	600	675	750
PROPOSED CONNECTION Ø	100	Jun.	Jun.	Jun.	Sad.	Sad.	Sad.	Sad.	Sad.	Sad.	Sad.
	150		Jun.	Jun.	Jun.	Sad.	Sad.	Sad.	Sad.	Sad.	Sad.
	225			Jun.	Jun.	Sad.	Sad.	Sad.	Sad.	Sad.	Sad.
	300				Jun.	Jun.	Jun.	Sad.	Sad.	Sad.	Sad.
	375					Jun.	Jun.	Jun.	Sad.	Sad.	Sad.
	450						Jun.	Jun.	Jun.	Sad.	Sad.



JUNCTION CONNECTION - TYPICAL DETAIL



CHANNEL DRAIN SUMP - TYPICAL DETAIL

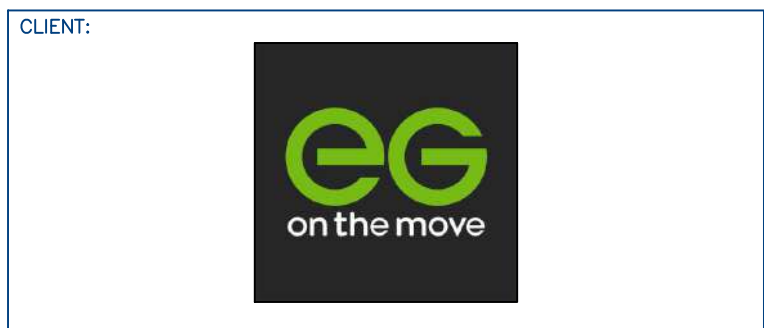


CHANNEL DRAIN - TYPICAL DETAIL

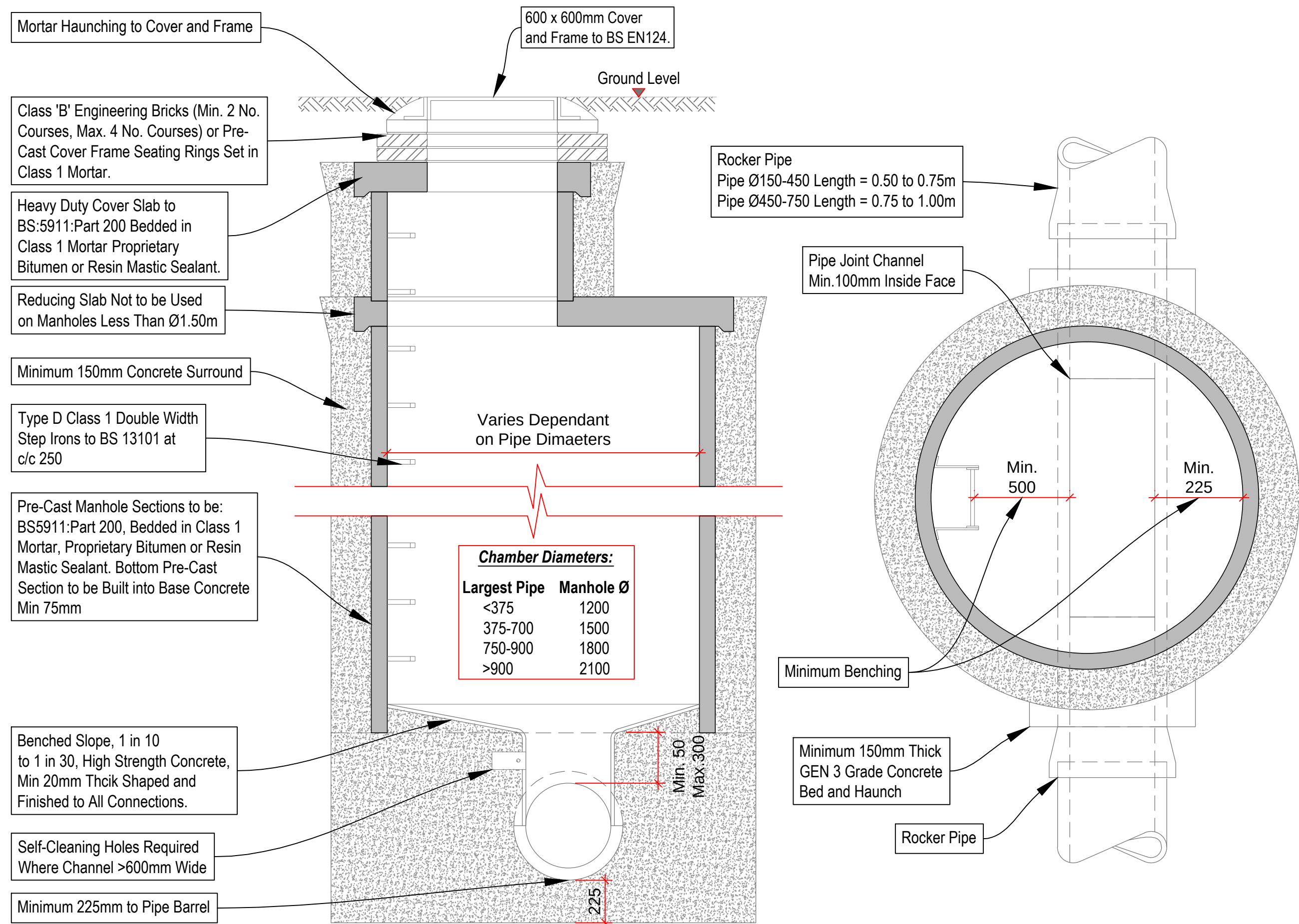
P1	Standard Issue	YA	12/24
REV:	DESCRIPTION:	BY:	DATE:
STATUS:	PLANNING		

iSTRUCT
consultants ltd

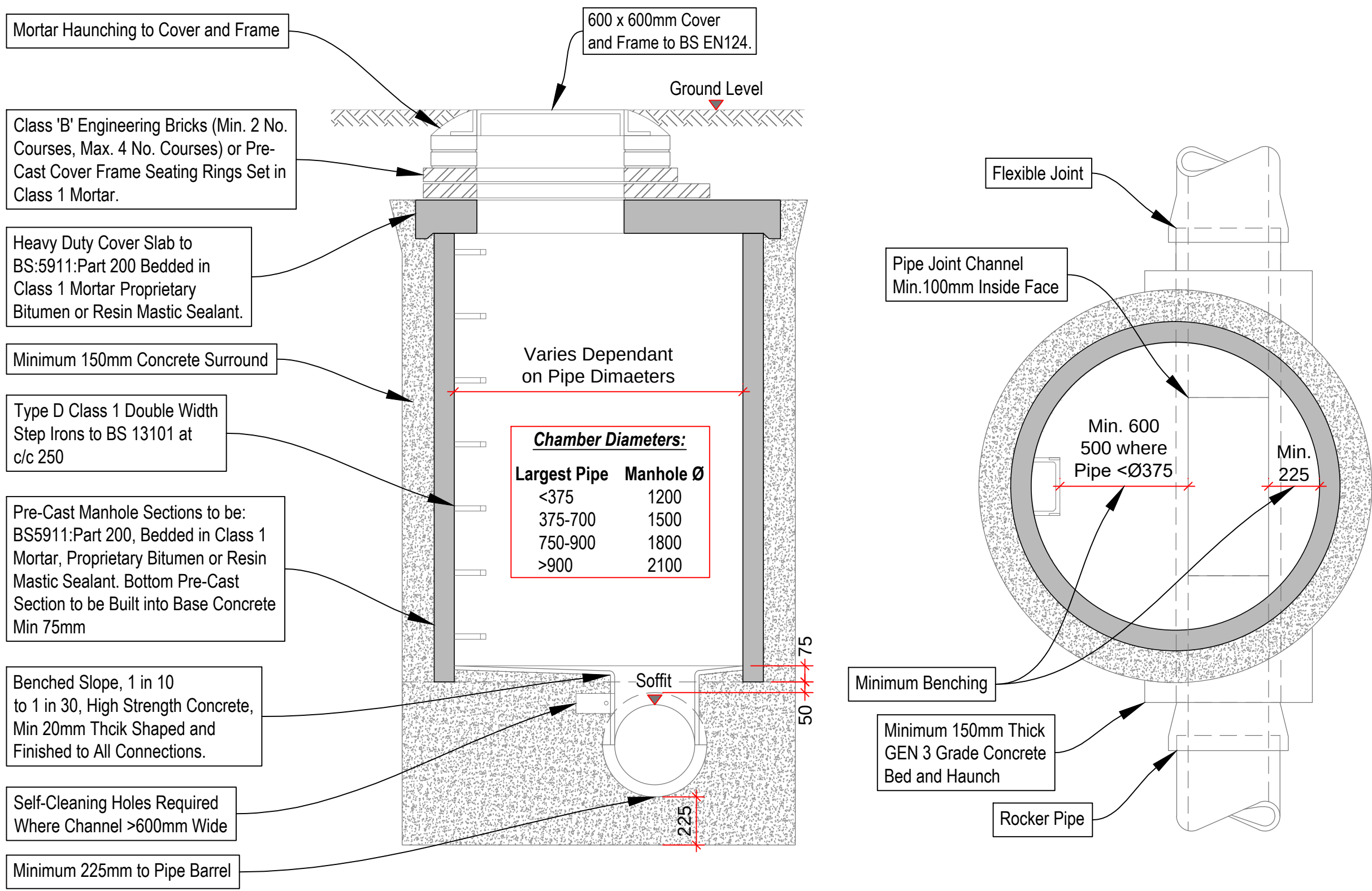
Suite E - AA Business Centre, 336-340 Dunstable Road,
Luton, Bedfordshire, LU4 8JS
Tel: 01582 455738 Email: info@istructconsultants.com



PROJECT:	Proposed Development		
TITLE:	Standard Details Drainage & External Details		
SCALE AT A1:	DATE:	DRAWN:	CHECKED:
As Shown	DEC_2024	YA	MM
PROJECT NO:	DRAWING NO:	REVISION:	
-	SD-302	P1	

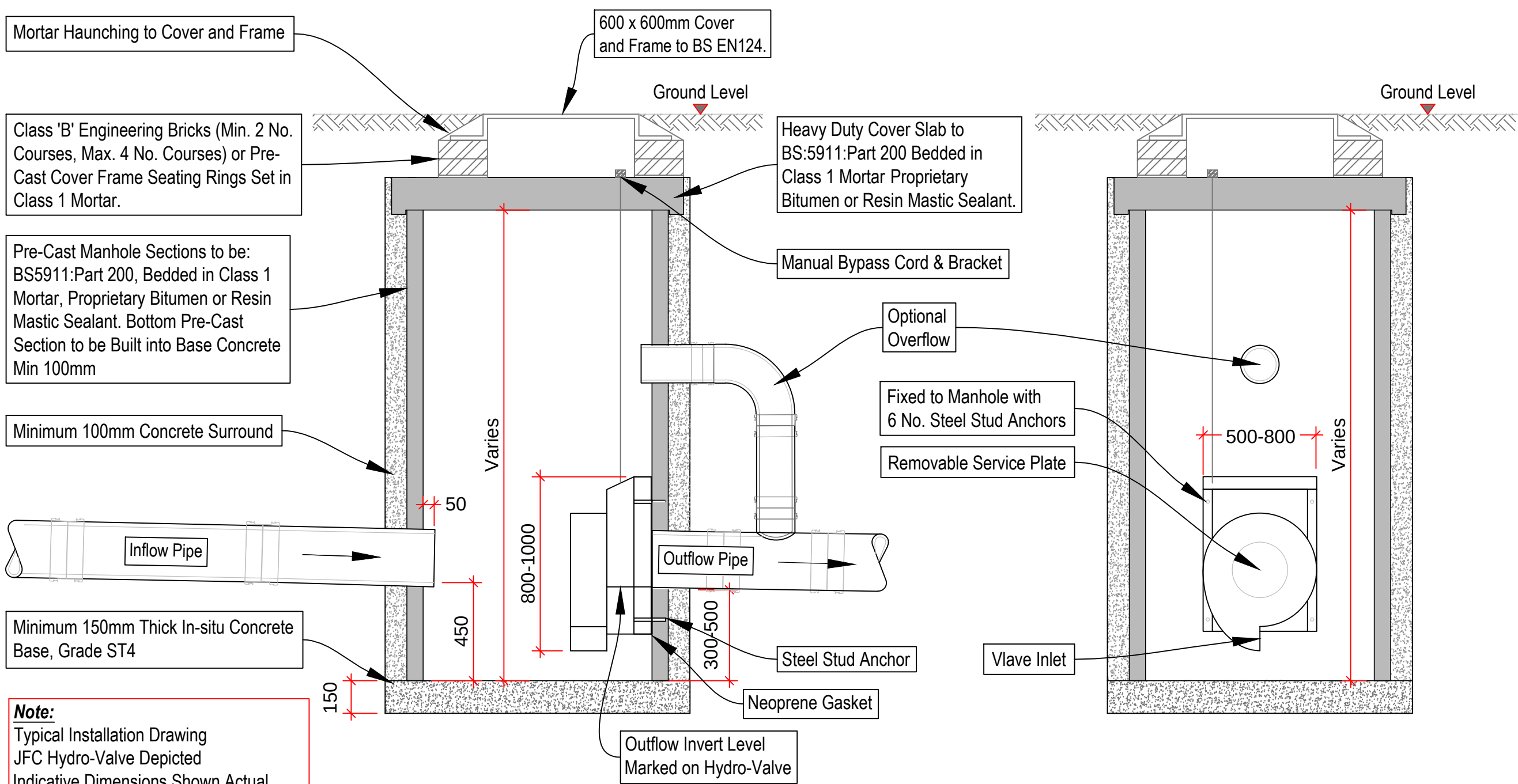


MANHOLE TYPE A - TYPICAL DETAILS

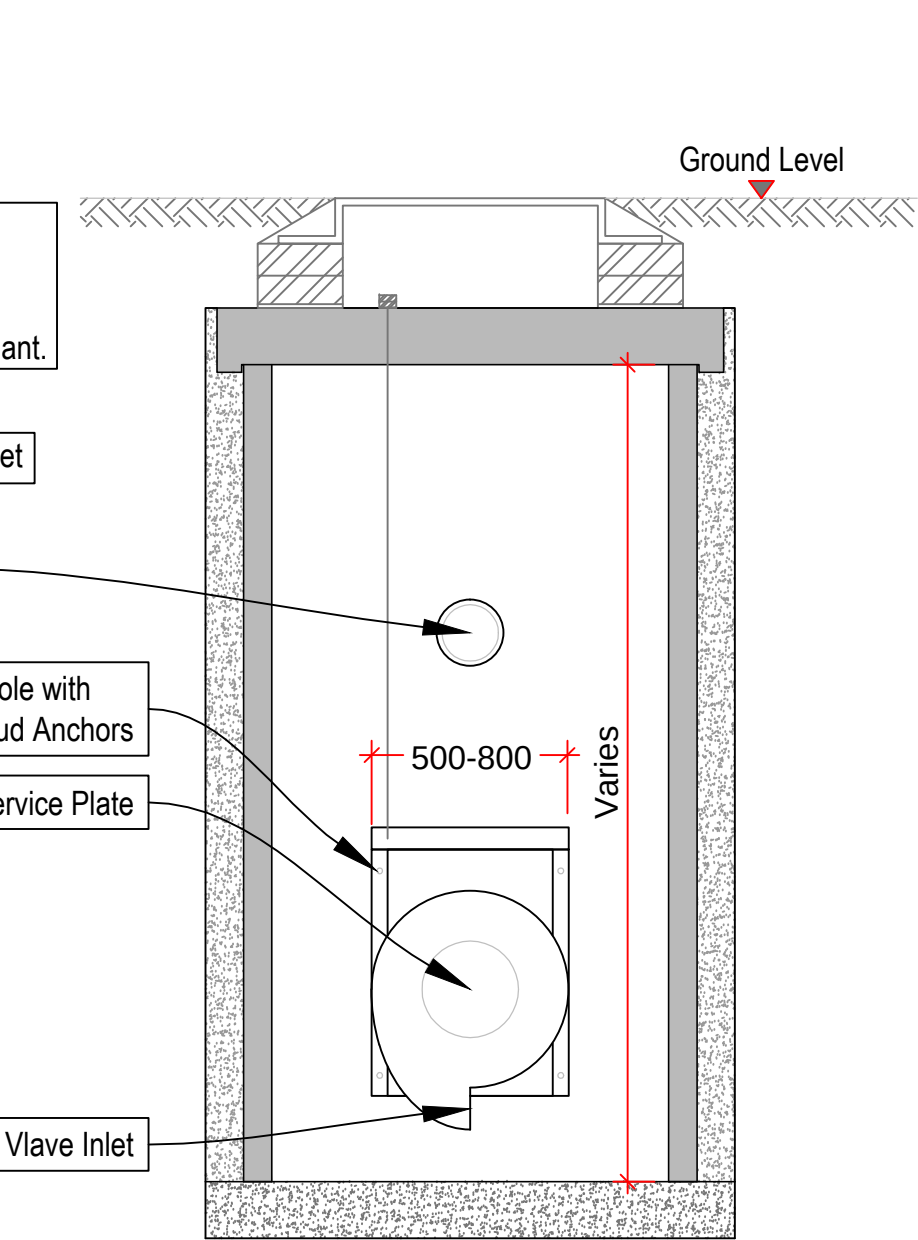


MANHOLE TYPE B - TYPICAL DETAILS

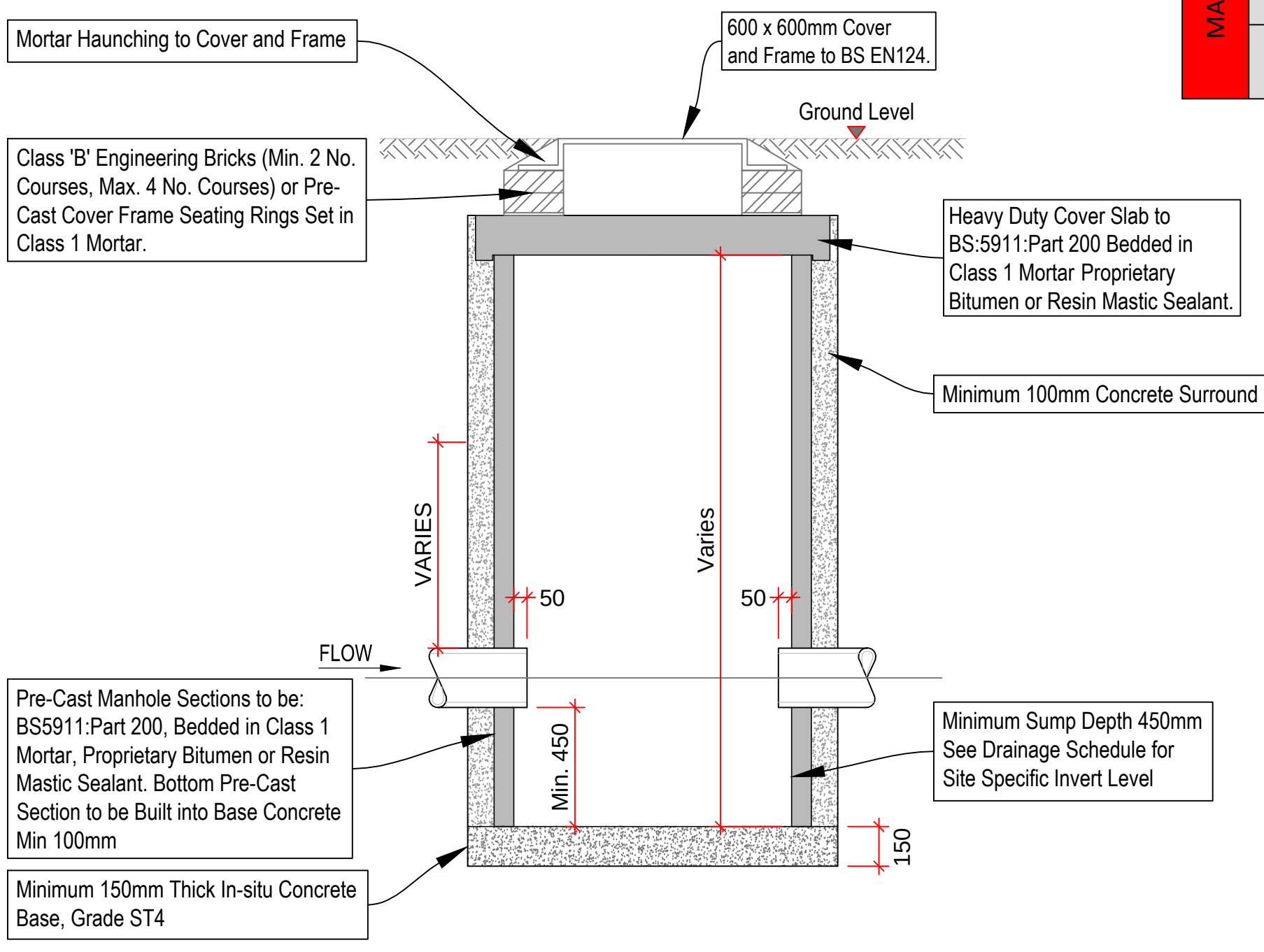
DIAMETERS AND OPENINGS			
MANHOLE DEPTH TO SOFFIT	<1500	LARGEST PIPE Ø	MANHOLE INTERNAL Ø
		150	1050
		300	1200
		450	1350
		700	1500
		900	1800
	>1500	1000	2100
		>1000	SEE SCHEDULE
		100 - 450	1200
		>450	1800+
>3000	>1000	SEE SCHEDULE	600 X 600
	STEPS	1050	600 X 600
	LADDERS	1200	600 X 600



FLOW RESTRICTOR - TYPICAL SECTION DETAIL



FLOW RESTRICTOR - TYPICAL PROFILE DETAIL



CATCHPIT SECTION - TYPICAL DETAIL

P1

Standard Issue

YA

12/24

REV:

DESCRIPTION:

BY:

DATE:

STATUS:

PLANNING

Suite E - AA Business Centre, 336-340 Dunstable Road,
Luton, Bedfordshire, LU4 8JS
Tel: 01 582 455738 Email: info@istructconsultants.com

on the move

PROJECT:

Proposed Development

TITLE:

Standard Details
Manhole Construction

SCALE AT A1:

DATE:

DRAWN:

CHECKED:

As Shown

DEC_2024

YA

MM

PROJECT NO:

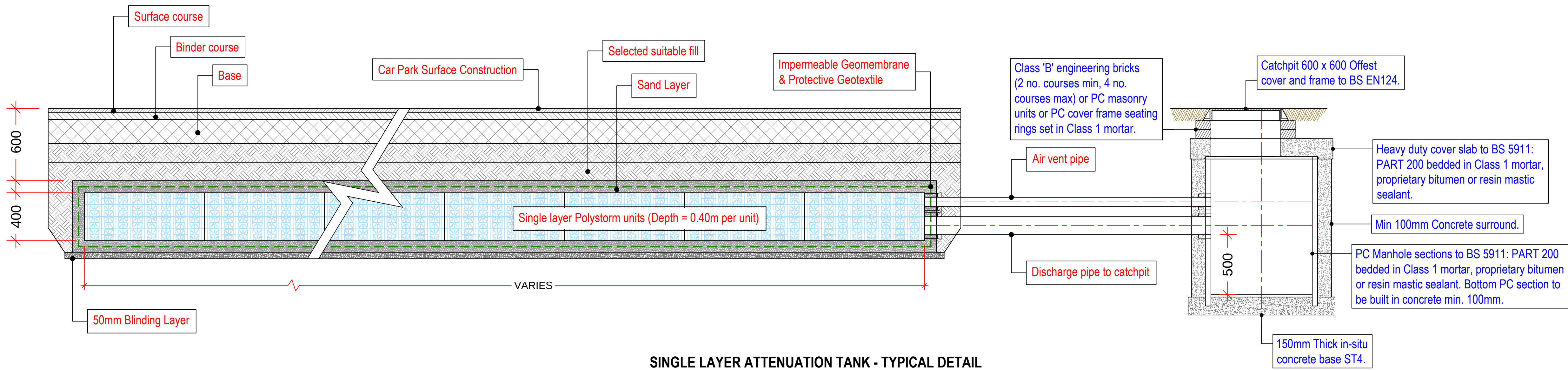
DRAWING NO:

REVISION:

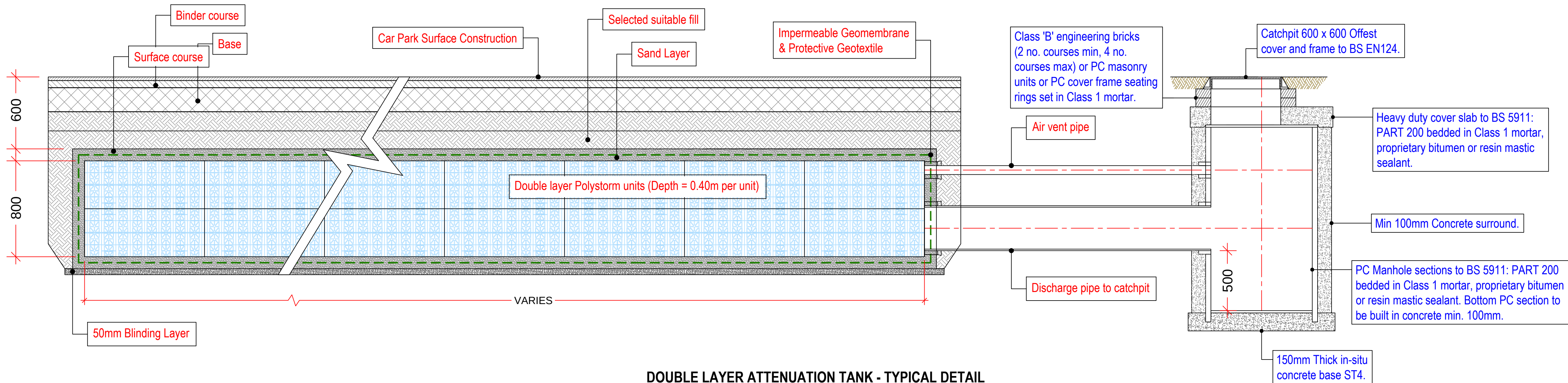
-

SD-303

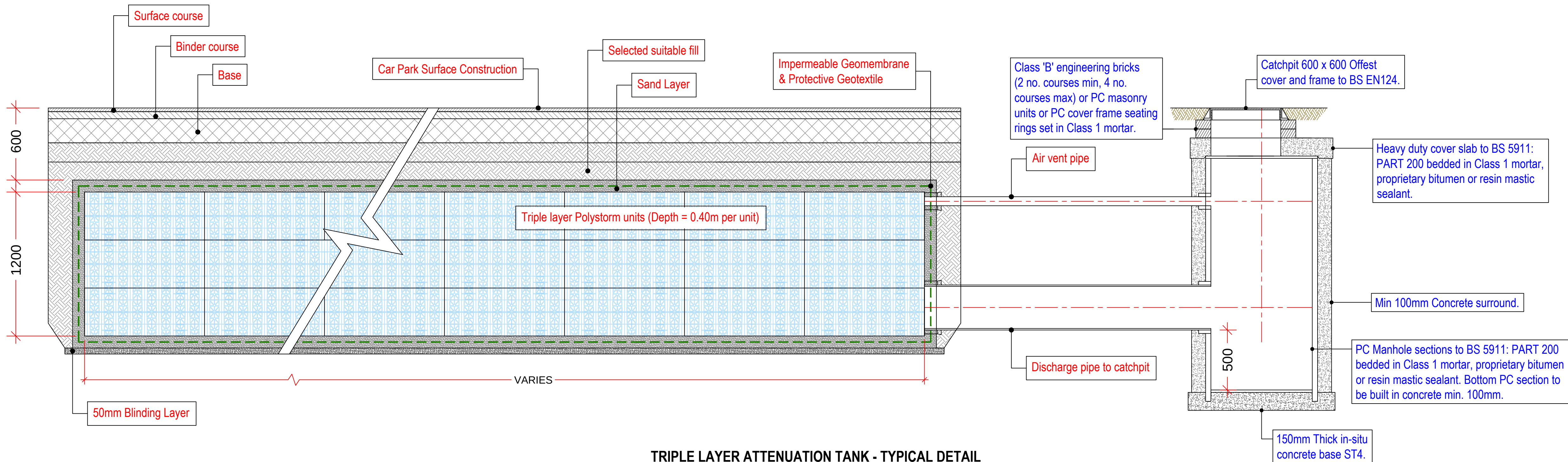
P1



SINGLE LAYER ATTENUATION TANK - TYPICAL DETAIL



DOUBLE LAYER ATTENUATION TANK - TYPICAL DETAIL



TRIPLE LAYER ATTENUATION TANK - TYPICAL DETAIL

P1	Standard Issue	YA	12/24
REV:	DESCRIPTION:	BY:	DATE:
STATUS: PLANNING			



iSTRUCT
consultants Ltd

Suite E - AA Business Centre, 336-340 Dunstable Road,
Luton, Bedfordshire, LU4 8JS
Tel: 01582 455738 Email: info@istructconsultants.com



EG
on the move

PROJECT: Proposed Development			
TITLE: Standard Details Attenuation Storage			
SCALE: AT A1: As Shown	DATE: DEC_2024	DRAWN: YA	CHECKED: MM
PROJECT NO: -	DRAWING NO: SD-304	REVISION: P1	

Appendix C

Hydraulic Modelling Calculations

SW Discharge Assessment



Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	1	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.400	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
Ext-SMh-1		5.00	192.770	650	447620.300	311093.760	2.020
Ext-SMh-2	0.053	5.00	192.080	650	447629.900	311106.180	1.510
Ext-SMh-3	0.047	5.00	191.760	650	447618.530	311122.330	1.290
Ext-SMh-4			191.630	1000	447628.910	311121.960	1.410
Ext-SMh-5		5.00	191.670	650	447648.580	311125.430	1.350
Ext-SMh-6			191.260	1200	447635.420	311130.970	1.230
S1		5.00	190.570	1000	447622.280	311173.660	1.070
S2	0.343	5.00	190.610	1000	447653.410	311163.660	1.410
S3		5.00	190.780	1000	447625.180	311204.340	1.380
S4	0.074	5.00	190.750	1000	447655.730	311187.920	1.697
S5		5.00	190.650	650	447639.580	311214.160	1.350
S6			190.670	1000	447662.790	311201.650	1.846
Ext-SMh-7 FCC	0.089	5.00	190.670	1200	447671.070	311196.970	2.098
Outfall			190.250	600	447673.990	311201.740	1.772

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	Ext-SMh-1	Ext-SMh-2	15.698	0.600	190.750	190.570	0.180	87.2	150	5.24	50.0
2.000	Ext-SMh-3	Ext-SMh-4	10.387	0.600	190.470	190.295	0.175	59.4	150	5.13	50.0
1.001	Ext-SMh-2	Ext-SMh-4	15.811	0.600	190.570	190.295	0.275	57.5	150	5.44	50.0
1.002	Ext-SMh-4	Ext-SMh-6	11.116	0.600	190.220	190.105	0.115	96.7	225	5.58	50.0
3.000	Ext-SMh-5	Ext-SMh-6	14.279	0.600	190.320	190.180	0.140	102.0	150	5.24	50.0
1.003	Ext-SMh-6	S2	41.652	0.600	190.030	189.260	0.770	54.1	300	5.90	49.4
1.004	S2	Ext-SMh-7 FCC	37.702	0.600	189.200	188.572	0.628	60.0	300	6.21	49.5
1.005	Ext-SMh-7 FCC	Outfall	5.593	0.600	188.572	188.478	0.094	59.5	300	6.26	49.4
5.000	S3	S4	34.683	0.600	189.400	189.053	0.347	100.0	150	5.58	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	1.077	19.0	0.0	1.870	1.360	0.000	0.0	0	0.000
2.000	1.308	23.1	6.4	1.140	1.185	0.047	0.0	54	1.117
1.001	1.329	23.5	7.2	1.360	1.185	0.053	0.0	57	1.172
1.002	1.330	52.9	13.6	1.185	0.930	0.100	0.0	78	1.119
3.000	0.995	17.6	0.0	1.200	0.930	0.000	0.0	0	0.000
1.003	2.142	151.4	13.4	0.930	1.050	0.100	0.0	60	1.339
1.004	2.033	143.7	59.5	1.110	1.798	0.443	0.0	134	1.941
1.005	2.042	144.3	81.1	1.798	1.472	0.606	0.0	161	2.098
5.000	1.005	17.8	0.0	1.230	1.547	0.000	0.0	0	0.000

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
5.001	S4	S6	15.439	0.600	189.053	188.899	0.154	100.0	150	5.83	50.0
5.002	S6	Ext-SMh-7 FCC	9.511	0.600	188.824	188.729	0.095	100.0	225	5.95	50.0
6.000	S5	S6	26.367	0.600	189.300	188.923	0.377	70.0	150	5.37	50.0
4.000	S1	S2	32.697	0.600	189.500	189.275	0.225	145.0	225	5.50	50.0

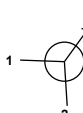
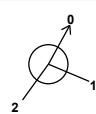
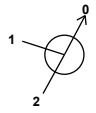
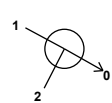
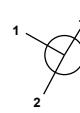
Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
5.001	1.005	17.8	10.0	1.547	1.621	0.074	0.0	81	1.034
5.002	1.307	52.0	10.0	1.621	1.716	0.074	0.0	66	1.012
6.000	1.203	21.3	0.0	1.200	1.597	0.000	0.0	0	0.000
4.000	1.083	43.1	0.0	0.845	1.110	0.000	0.0	0	0.000

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	15.698	87.2	150	Circular	192.770	190.750	1.870	192.080	190.570	1.360
2.000	10.387	59.4	150	Circular	191.760	190.470	1.140	191.630	190.295	1.185
1.001	15.811	57.5	150	Circular	192.080	190.570	1.360	191.630	190.295	1.185
1.002	11.116	96.7	225	Circular	191.630	190.220	1.185	191.260	190.105	0.930
3.000	14.279	102.0	150	Circular	191.670	190.320	1.200	191.260	190.180	0.930
1.003	41.652	54.1	300	Circular	191.260	190.030	0.930	190.610	189.260	1.050
1.004	37.702	60.0	300	Circular	190.610	189.200	1.110	190.670	188.572	1.798
1.005	5.593	59.5	300	Circular	190.670	188.572	1.798	190.250	188.478	1.472
5.000	34.683	100.0	150	Circular	190.780	189.400	1.230	190.750	189.053	1.547
5.001	15.439	100.0	150	Circular	190.750	189.053	1.547	190.670	188.899	1.621
5.002	9.511	100.0	225	Circular	190.670	188.824	1.621	190.670	188.729	1.716
6.000	26.367	70.0	150	Circular	190.650	189.300	1.200	190.670	188.923	1.597
4.000	32.697	145.0	225	Circular	190.570	189.500	0.845	190.610	189.275	1.110

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	Ext-SMh-1	650	Manhole	Adoptable	Ext-SMh-2	650	Manhole	Adoptable
2.000	Ext-SMh-3	650	Manhole	Adoptable	Ext-SMh-4	1000	Manhole	Adoptable
1.001	Ext-SMh-2	650	Manhole	Adoptable	Ext-SMh-4	1000	Manhole	Adoptable
1.002	Ext-SMh-4	1000	Manhole	Adoptable	Ext-SMh-6	1200	Manhole	Adoptable
3.000	Ext-SMh-5	650	Manhole	Adoptable	Ext-SMh-6	1200	Manhole	Adoptable
1.003	Ext-SMh-6	1200	Manhole	Adoptable	S2	1000	Manhole	Adoptable
1.004	S2	1000	Manhole	Adoptable	Ext-SMh-7 FCC	1200	Manhole	Adoptable
1.005	Ext-SMh-7 FCC	1200	Manhole	Adoptable	Outfall	600	Manhole	Adoptable
5.000	S3	1000	Manhole	Adoptable	S4	1000	Manhole	Adoptable
5.001	S4	1000	Manhole	Adoptable	S6	1000	Manhole	Adoptable
5.002	S6	1000	Manhole	Adoptable	Ext-SMh-7 FCC	1200	Manhole	Adoptable
6.000	S5	650	Manhole	Adoptable	S6	1000	Manhole	Adoptable
4.000	S1	1000	Manhole	Adoptable	S2	1000	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
Ext-SMh-1	447620.300	311093.760	192.770	2.020	650		0	1.000	190.750	150
Ext-SMh-2	447629.900	311106.180	192.080	1.510	650		1 0	1.000 1.001	190.570 190.570	150 150
Ext-SMh-3	447618.530	311122.330	191.760	1.290	650		0	2.000	190.470	150
Ext-SMh-4	447628.910	311121.960	191.630	1.410	1000		1 2 0	2.000 1.001 1.002	190.295 190.295 190.220	150 150 225
Ext-SMh-5	447648.580	311125.430	191.670	1.350	650		0	3.000	190.320	150
Ext-SMh-6	447635.420	311130.970	191.260	1.230	1200		1 2 0	3.000 1.002 1.003	190.180 190.105 190.030	150 225 300
S1	447622.280	311173.660	190.570	1.070	1000		0	4.000	189.500	225
S2	447653.410	311163.660	190.610	1.410	1000		1 2 0	4.000 1.003 1.004	189.275 189.260 189.200	225 300 300
S3	447625.180	311204.340	190.780	1.380	1000		0	5.000	189.400	150
S4	447655.730	311187.920	190.750	1.697	1000		1 0	5.000 5.001	189.053 189.053	150 150
S5	447639.580	311214.160	190.650	1.350	650		0	6.000	189.300	150
S6	447662.790	311201.650	190.670	1.846	1000		1 2 0	6.000 5.001 5.002	188.923 188.899 188.824	150 150 225
Ext-SMh-7 FCC	447671.070	311196.970	190.670	2.098	1200		1 2 0	5.002 1.004 1.005	188.729 188.572 188.572	225 300 300

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
Outfall	447673.990	311201.740	190.250	1.772	600	1	1.005	188.478	300



Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Normal
FSR Region	England and Wales	Skip Steady State	x
M5-60 (mm)	20.000	Drain Down Time (mins)	240
Ratio-R	0.400	Additional Storage (m³/ha)	20.0
Summer CV	0.750	Check Discharge Rate(s)	x
Winter CV	0.840	Check Discharge Volume	x

Storm Durations

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

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
30	45	0	0
100	45	0	0

Node Ext-SMh-7 FCC Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	188.572	Product Number	CTL-SHE-0064-2000-1200-2000
Design Depth (m)	1.200	Min Outlet Diameter (m)	0.100
Design Flow (l/s)	2.0	Min Node Diameter (mm)	1200

Node Ext-SMh-7 FCC Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	188.572
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	136.8	0.0	1.200	136.8	0.0	1.201	0.0	0.0

Node S4 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	189.053
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	95.0	0.0	1.200	95.0	0.0	1.201	0.0	0.0

Node S2 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	189.200
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	190.0	0.0	0.800	190.0	0.0	0.801	0.0	0.0

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
1 year 15 minute summer	109.521	30.991	30 year +45% CC 360 minute summer	45.271	11.650
1 year 15 minute winter	76.857	30.991	30 year +45% CC 360 minute winter	29.427	11.650
1 year 30 minute summer	71.439	20.215	30 year +45% CC 480 minute summer	35.270	9.321
1 year 30 minute winter	50.133	20.215	30 year +45% CC 480 minute winter	23.432	9.321
1 year 60 minute summer	48.435	12.800	30 year +45% CC 600 minute summer	28.646	7.835
1 year 60 minute winter	32.179	12.800	30 year +45% CC 600 minute winter	19.572	7.835
1 year 120 minute summer	30.053	7.942	30 year +45% CC 720 minute summer	25.360	6.797
1 year 120 minute winter	19.966	7.942	30 year +45% CC 720 minute winter	17.043	6.797
1 year 180 minute summer	23.233	5.979	30 year +45% CC 960 minute summer	20.612	5.428
1 year 180 minute winter	15.102	5.979	30 year +45% CC 960 minute winter	13.654	5.428
1 year 240 minute summer	18.475	4.882	30 year +45% CC 1440 minute summer	14.733	3.949
1 year 240 minute winter	12.274	4.882	30 year +45% CC 1440 minute winter	9.901	3.949
1 year 360 minute summer	14.169	3.646	100 year +45% CC 15 minute summer	505.670	143.087
1 year 360 minute winter	9.210	3.646	100 year +45% CC 15 minute winter	354.856	143.087
1 year 480 minute summer	11.185	2.956	100 year +45% CC 30 minute summer	332.000	93.944
1 year 480 minute winter	7.431	2.956	100 year +45% CC 30 minute winter	232.982	93.944
1 year 600 minute summer	9.182	2.511	100 year +45% CC 60 minute summer	222.268	58.739
1 year 600 minute winter	6.274	2.511	100 year +45% CC 60 minute winter	147.669	58.739
1 year 720 minute summer	8.203	2.199	100 year +45% CC 120 minute summer	134.215	35.469
1 year 720 minute winter	5.513	2.199	100 year +45% CC 120 minute winter	89.169	35.469
1 year 960 minute summer	6.768	1.782	100 year +45% CC 180 minute summer	101.219	26.047
1 year 960 minute winter	4.483	1.782	100 year +45% CC 180 minute winter	65.795	26.047
1 year 1440 minute summer	4.949	1.326	100 year +45% CC 240 minute summer	78.690	20.795
1 year 1440 minute winter	3.326	1.326	100 year +45% CC 240 minute winter	52.280	20.795
30 year +45% CC 15 minute summer	389.624	110.250	100 year +45% CC 360 minute summer	58.701	15.106
30 year +45% CC 15 minute winter	273.421	110.250	100 year +45% CC 360 minute winter	38.157	15.106
30 year +45% CC 30 minute summer	253.647	71.773	100 year +45% CC 480 minute summer	45.550	12.038
30 year +45% CC 30 minute winter	177.998	71.773	100 year +45% CC 480 minute winter	30.262	12.038
30 year +45% CC 60 minute summer	169.054	44.676	100 year +45% CC 600 minute summer	36.875	10.086
30 year +45% CC 60 minute winter	112.316	44.676	100 year +45% CC 600 minute winter	25.195	10.086
30 year +45% CC 120 minute summer	102.135	26.991	100 year +45% CC 720 minute summer	32.556	8.725
30 year +45% CC 120 minute winter	67.856	26.991	100 year +45% CC 720 minute winter	21.879	8.725
30 year +45% CC 180 minute summer	77.282	19.887	100 year +45% CC 960 minute summer	26.340	6.936
30 year +45% CC 180 minute winter	50.235	19.887	100 year +45% CC 960 minute winter	17.448	6.936
30 year +45% CC 240 minute summer	60.326	15.942	100 year +45% CC 1440 minute summer	18.700	5.012
30 year +45% CC 240 minute winter	40.079	15.942	100 year +45% CC 1440 minute winter	12.567	5.012

Results for 1 year Critical Storm Duration. Lowest mass balance: 99.09%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	Ext-SMh-1	1	190.750	0.000	0.0	0.0000	0.0000	OK
15 minute winter	Ext-SMh-2	10	190.630	0.060	7.5	0.0620	0.0000	OK
15 minute winter	Ext-SMh-3	10	190.528	0.058	6.6	0.0610	0.0000	OK
15 minute winter	Ext-SMh-4	10	190.304	0.083	13.8	0.0655	0.0000	OK
15 minute summer	Ext-SMh-5	1	190.320	0.000	0.0	0.0000	0.0000	OK
15 minute winter	Ext-SMh-6	11	190.092	0.062	13.7	0.0699	0.0000	OK
15 minute summer	S1	1	189.500	0.000	0.0	0.0000	0.0000	OK
30 minute winter	S2	22	189.297	0.097	48.0	18.9505	0.0000	OK
15 minute summer	S3	1	189.400	0.000	0.0	0.0000	0.0000	OK
480 minute winter	S4	464	189.110	0.057	1.5	5.5213	0.0000	OK
15 minute summer	S5	1	189.300	0.000	0.0	0.0000	0.0000	OK
480 minute winter	S6	464	189.110	0.286	1.2	0.2246	0.0000	SURCHARGED
480 minute winter	Ext-SMh-7 FCC	464	189.110	0.538	10.3	74.6751	0.0000	SURCHARGED
15 minute summer	Outfall	1	188.478	0.000	1.7	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	Ext-SMh-1	1.000	Ext-SMh-2	0.0	0.000	0.000	0.0497	
15 minute winter	Ext-SMh-2	1.001	Ext-SMh-4	7.3	1.148	0.312	0.1010	
15 minute winter	Ext-SMh-3	2.000	Ext-SMh-4	6.5	1.088	0.282	0.0622	
15 minute winter	Ext-SMh-4	1.002	Ext-SMh-6	13.7	1.077	0.259	0.1416	
15 minute summer	Ext-SMh-5	3.000	Ext-SMh-6	0.0	0.000	0.000	0.0000	
15 minute winter	Ext-SMh-6	1.003	S2	13.8	1.339	0.091	0.4297	
15 minute summer	S1	4.000	S2	0.0	0.000	0.000	0.0150	
30 minute winter	S2	1.004	Ext-SMh-7 FCC	32.4	1.675	0.225	1.3494	
15 minute summer	S3	5.000	S4	0.0	0.000	0.000	0.0542	
480 minute winter	S4	5.001	S6	1.2	0.570	0.069	0.1834	
15 minute summer	S5	6.000	S6	0.0	0.000	0.000	0.0000	
480 minute winter	S6	5.002	Ext-SMh-7 FCC	1.3	0.494	0.024	0.3783	
480 minute winter	Ext-SMh-7 FCC	Hydro-Brake®	Outfall	1.8				57.4

Results for 30 year +45% CC Critical Storm Duration. Lowest mass balance: 99.09%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	Ext-SMh-1	11	190.793	0.043	1.3	0.0143	0.0000	OK
15 minute winter	Ext-SMh-2	11	190.791	0.221	26.6	0.2289	0.0000	SURCHARGED
15 minute winter	Ext-SMh-3	11	190.641	0.171	23.6	0.1812	0.0000	SURCHARGED
15 minute winter	Ext-SMh-4	11	190.408	0.188	47.1	0.1475	0.0000	OK
15 minute summer	Ext-SMh-5	1	190.320	0.000	0.0	0.0000	0.0000	OK
15 minute summer	Ext-SMh-6	10	190.145	0.115	45.7	0.1300	0.0000	OK
960 minute winter	S1	930	189.753	0.253	0.1	0.1988	0.0000	SURCHARGED
960 minute winter	S2	930	189.753	0.553	14.1	108.2481	0.0000	SURCHARGED
960 minute winter	S3	930	189.753	0.353	0.1	0.2773	0.0000	SURCHARGED
960 minute winter	S4	930	189.753	0.700	6.0	67.6834	0.0000	SURCHARGED
960 minute winter	S5	930	189.753	0.453	0.1	0.1505	0.0000	SURCHARGED
960 minute winter	S6	930	189.753	0.929	4.0	0.7294	0.0000	SURCHARGED
960 minute winter	Ext-SMh-7 FCC	930	189.753	1.181	13.8	163.9243	0.0000	SURCHARGED
15 minute summer	Outfall	1	188.478	0.000	1.8	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	Ext-SMh-1	1.000	Ext-SMh-2	-1.3	-0.120	-0.066	0.1709	
15 minute winter	Ext-SMh-2	1.001	Ext-SMh-4	24.5	1.452	1.043	0.2734	
15 minute winter	Ext-SMh-3	2.000	Ext-SMh-4	22.6	1.404	0.979	0.1781	
15 minute winter	Ext-SMh-4	1.002	Ext-SMh-6	47.1	1.418	0.891	0.3685	
15 minute summer	Ext-SMh-5	3.000	Ext-SMh-6	0.0	0.000	0.000	0.0000	
15 minute summer	Ext-SMh-6	1.003	S2	45.9	1.795	0.303	1.3359	
960 minute winter	S1	4.000	S2	-0.1	-0.005	-0.003	1.3004	
960 minute winter	S2	1.004	Ext-SMh-7 FCC	11.4	0.708	0.079	2.6549	
960 minute winter	S3	5.000	S4	-0.1	-0.012	-0.008	0.6106	
960 minute winter	S4	5.001	S6	-3.9	0.534	-0.220	0.2718	
960 minute winter	S5	6.000	S6	-0.1	-0.009	-0.005	0.4642	
960 minute winter	S6	5.002	Ext-SMh-7 FCC	-4.0	0.411	-0.077	0.3783	
960 minute winter	Ext-SMh-7 FCC	Hydro-Brake®	Outfall	2.0				119.3

Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 99.09%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	Ext-SMh-1	11	191.098	0.348	5.1	0.1155	0.0000	SURCHARGED
15 minute winter	Ext-SMh-2	11	191.095	0.525	34.5	0.5430	0.0000	SURCHARGED
15 minute winter	Ext-SMh-3	11	190.878	0.408	30.6	0.4326	0.0000	SURCHARGED
15 minute winter	Ext-SMh-4	11	190.510	0.290	59.7	0.2278	0.0000	SURCHARGED
960 minute winter	Ext-SMh-5	930	190.467	0.147	0.2	0.0489	0.0000	OK
960 minute winter	Ext-SMh-6	930	190.467	0.437	4.1	0.4947	0.0000	SURCHARGED
960 minute winter	S1	930	190.467	0.967	0.2	0.7594	0.0000	FLOOD RISK
960 minute winter	S2	930	190.467	1.267	18.1	159.2571	0.0000	FLOOD RISK
960 minute winter	S3	930	190.467	1.067	0.2	0.8375	0.0000	SURCHARGED
960 minute winter	S4	930	190.467	1.414	6.2	116.3921	0.0000	FLOOD RISK
960 minute winter	S5	930	190.467	1.167	0.1	0.3875	0.0000	FLOOD RISK
960 minute winter	S6	930	190.467	1.643	4.2	1.2899	0.0000	FLOOD RISK
960 minute winter	Ext-SMh-7 FCC	930	190.467	1.895	15.0	167.9790	0.0000	FLOOD RISK
15 minute summer	Outfall	1	188.478	0.000	1.8	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	Ext-SMh-1	1.000	Ext-SMh-2	-5.1	-0.365	-0.269	0.2764	
15 minute winter	Ext-SMh-2	1.001	Ext-SMh-4	30.6	1.740	1.304	0.2783	
15 minute winter	Ext-SMh-3	2.000	Ext-SMh-4	29.1	1.651	1.258	0.1829	
15 minute winter	Ext-SMh-4	1.002	Ext-SMh-6	59.6	1.500	1.127	0.4281	
960 minute winter	Ext-SMh-5	3.000	Ext-SMh-6	-0.2	-0.013	-0.010	0.2509	
960 minute winter	Ext-SMh-6	1.003	S2	4.1	0.868	0.027	2.9331	
960 minute winter	S1	4.000	S2	-0.2	-0.008	-0.006	1.3004	
960 minute winter	S2	1.004	Ext-SMh-7 FCC	12.4	0.743	0.087	2.6549	
960 minute winter	S3	5.000	S4	-0.2	-0.014	-0.010	0.6106	
960 minute winter	S4	5.001	S6	-4.0	0.534	-0.228	0.2718	
960 minute winter	S5	6.000	S6	-0.1	-0.010	-0.006	0.4642	
960 minute winter	S6	5.002	Ext-SMh-7 FCC	-4.2	0.416	-0.080	0.3783	
960 minute winter	Ext-SMh-7 FCC	Hydro-Brake®	Outfall	2.5				133.3

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	1	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.400	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	x

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
S9		5.00	191.850	1200	447683.180	311067.640	1.300
S7		5.00	192.000	650	447641.190	311098.800	1.350
S8	0.062	5.00	191.700	1200	447667.910	311084.040	1.430
S10	0.094	5.00	191.700	1200	447674.630	311084.260	1.670
S11		5.00	191.650	1000	447672.460	311122.060	1.350
S12	0.129	5.00	191.700	1200	447689.890	311112.700	2.240
Ext-SMH-8		5.00	191.600	1200	447708.490	311104.090	2.100
Ext-SMH-9	0.093	5.00	191.200	1200	447704.630	311140.670	2.190
S13		5.00	191.550	1000	447691.260	311157.910	2.050
Ext-SMH-10	0.171	5.00	190.150	1200	447722.450	311146.950	1.650
Ext-SMH-11	0.086	5.00	189.400	1200	447762.080	311138.070	2.340
S14	0.075	5.00	190.850	1200	447720.450	311046.310	2.250
S15	0.045	5.00	190.450	1200	447743.720	311059.900	2.180
S16			189.800	1200	447756.300	311082.510	1.820
Ext-SMH-12			189.620	1200	447767.920	311096.160	1.900
S17	0.081	5.00	190.570	1200	447741.020	311100.320	2.370
Ext-SMH-13	0.147	5.00	189.450	1200	447763.360	311114.490	2.060
S18 FCC			189.000	1200	447773.890	311135.780	2.100
GW1		5.00	191.700	1000	447713.530	311093.760	1.700
GW2	0.087	5.00	190.700	1000	447739.040	311078.810	2.200
Ext-Outfall-02			189.000	1200	447776.360	311137.160	2.135

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	S7	S8	30.526	0.600	190.650	190.270	0.380	80.3	150	5.45	50.0
1.001	S8	S10	6.724	0.600	190.270	190.180	0.090	74.7	150	5.55	50.0
2.000	S9	S10	18.690	0.600	190.550	190.180	0.370	50.5	150	5.22	50.0
1.002	S10	S12	32.275	0.600	190.030	189.460	0.570	56.6	300	5.81	49.7
3.000	S11	S12	19.784	0.600	190.300	189.610	0.690	28.7	150	5.17	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	1.122	19.8	0.0	1.200	1.280	0.000	0.0	0	0.000
1.001	1.164	20.6	8.4	1.280	1.370	0.062	0.0	67	1.105
2.000	1.419	25.1	0.0	1.150	1.370	0.000	0.0	0	0.000
1.002	2.093	148.0	21.0	1.370	1.940	0.156	0.0	76	1.495
3.000	1.887	33.3	0.0	1.200	1.940	0.000	0.0	0	0.000

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.003	S12	Ext-SMH-9	31.616	0.600	189.460	189.010	0.450	70.3	300	6.09	50.0
1.004	Ext-SMH-9	Ext-SMH-10	18.894	0.600	189.010	188.500	0.510	37.0	300	6.21	49.6
1.005	Ext-SMH-10	Ext-SMH-11	40.613	0.600	188.500	187.160	1.340	30.3	300	6.44	48.6
1.006	Ext-SMH-11	S18 FCC	13.698	0.600	187.060	186.900	0.160	85.6	400	6.56	48.3
4.000	Ext-SMH-8	Ext-SMH-9	36.783	0.600	189.500	189.085	0.415	88.6	225	5.44	50.0
6.000	S14	S15	26.948	0.600	188.600	188.270	0.330	81.7	225	5.31	50.0
6.001	S15	S16	25.874	0.600	188.270	188.055	0.215	120.3	225	5.67	50.0
6.002	S16	Ext-SMH-12	17.926	0.600	187.980	187.720	0.260	68.9	300	5.83	50.0
6.003	Ext-SMH-12	Ext-SMH-13	18.889	0.600	187.720	187.490	0.230	82.1	300	6.01	49.9
8.000	S17	Ext-SMH-13	26.455	0.600	188.200	187.640	0.560	47.2	150	5.30	50.0
6.004	Ext-SMH-13	S18 FCC	25.861	0.600	187.390	186.900	0.490	52.8	400	6.18	49.1
7.000	GW1	GW2	29.568	0.600	190.000	188.500	1.500	19.7	225	5.17	50.0
7.001	GW2	S16	17.652	0.600	188.500	188.055	0.445	39.7	225	5.31	50.0
5.000	S13	Ext-SMH-10	33.060	0.600	189.500	188.575	0.925	35.7	225	5.25	50.0
1.007	S18 FCC	Ext-Outfall-02	2.829	0.600	186.900	186.865	0.035	80.0	300	6.58	48.2

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.003	1.878	132.7	38.6	1.940	1.890	0.285	0.0	110	1.635
1.004	2.591	183.1	50.8	1.890	1.350	0.378	0.0	108	2.226
1.005	2.866	202.6	72.3	1.350	1.940	0.549	0.0	123	2.631
1.006	2.041	256.4	83.1	1.940	1.700	0.635	0.0	156	1.828
4.000	1.389	55.2	0.0	1.875	1.890	0.000	0.0	0	0.000
6.000	1.448	57.6	10.2	2.025	1.955	0.075	0.0	64	1.097
6.001	1.190	47.3	16.3	1.955	1.520	0.120	0.0	91	1.083
6.002	1.896	134.0	28.1	1.520	1.600	0.207	0.0	93	1.510
6.003	1.736	122.7	28.0	1.600	1.660	0.207	0.0	97	1.415
8.000	1.467	25.9	11.0	2.220	1.660	0.081	0.0	68	1.409
6.004	2.602	327.0	57.9	1.660	1.700	0.435	0.0	113	1.979
7.000	2.960	117.7	0.0	1.475	1.975	0.000	0.0	0	0.000
7.001	2.083	82.8	11.8	1.975	1.520	0.087	0.0	57	1.480
5.000	2.195	87.3	0.0	1.825	1.350	0.000	0.0	0	0.000
1.007	1.759	124.3	139.7	1.800	1.835	1.070	0.0	300	1.782

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	30.526	80.3	150	Circular	192.000	190.650	1.200	191.700	190.270	1.280
1.001	6.724	74.7	150	Circular	191.700	190.270	1.280	191.700	190.180	1.370
2.000	18.690	50.5	150	Circular	191.850	190.550	1.150	191.700	190.180	1.370
1.002	32.275	56.6	300	Circular	191.700	190.030	1.370	191.700	189.460	1.940
3.000	19.784	28.7	150	Circular	191.650	190.300	1.200	191.700	189.610	1.940

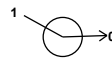
Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	S7	650	Manhole	Adoptable	S8	1200	Manhole	Adoptable
1.001	S8	1200	Manhole	Adoptable	S10	1200	Manhole	Adoptable
2.000	S9	1200	Manhole	Adoptable	S10	1200	Manhole	Adoptable
1.002	S10	1200	Manhole	Adoptable	S12	1200	Manhole	Adoptable
3.000	S11	1000	Manhole	Adoptable	S12	1200	Manhole	Adoptable

Pipeline Schedule

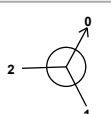
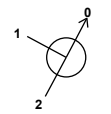
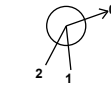
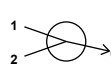
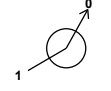
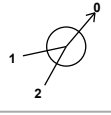
Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.003	31.616	70.3	300	Circular	191.700	189.460	1.940	191.200	189.010	1.890
1.004	18.894	37.0	300	Circular	191.200	189.010	1.890	190.150	188.500	1.350
1.005	40.613	30.3	300	Circular	190.150	188.500	1.350	189.400	187.160	1.940
1.006	13.698	85.6	400	Circular	189.400	187.060	1.940	189.000	186.900	1.700
4.000	36.783	88.6	225	Circular	191.600	189.500	1.875	191.200	189.085	1.890
6.000	26.948	81.7	225	Circular	190.850	188.600	2.025	190.450	188.270	1.955
6.001	25.874	120.3	225	Circular	190.450	188.270	1.955	189.800	188.055	1.520
6.002	17.926	68.9	300	Circular	189.800	187.980	1.520	189.620	187.720	1.600
6.003	18.889	82.1	300	Circular	189.620	187.720	1.600	189.450	187.490	1.660
8.000	26.455	47.2	150	Circular	190.570	188.200	2.220	189.450	187.640	1.660
6.004	25.861	52.8	400	Circular	189.450	187.390	1.660	189.000	186.900	1.700
7.000	29.568	19.7	225	Circular	191.700	190.000	1.475	190.700	188.500	1.975
7.001	17.652	39.7	225	Circular	190.700	188.500	1.975	189.800	188.055	1.520
5.000	33.060	35.7	225	Circular	191.550	189.500	1.825	190.150	188.575	1.350
1.007	2.829	80.0	300	Circular	189.000	186.900	1.800	189.000	186.865	1.835

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.003	S12	1200	Manhole	Adoptable	Ext-SMH-9	1200	Manhole	Adoptable
1.004	Ext-SMH-9	1200	Manhole	Adoptable	Ext-SMH-10	1200	Manhole	Adoptable
1.005	Ext-SMH-10	1200	Manhole	Adoptable	Ext-SMH-11	1200	Manhole	Adoptable
1.006	Ext-SMH-11	1200	Manhole	Adoptable	S18 FCC	1200	Manhole	Adoptable
4.000	Ext-SMH-8	1200	Manhole	Adoptable	Ext-SMH-9	1200	Manhole	Adoptable
6.000	S14	1200	Manhole	Adoptable	S15	1200	Manhole	Adoptable
6.001	S15	1200	Manhole	Adoptable	S16	1200	Manhole	Adoptable
6.002	S16	1200	Manhole	Adoptable	Ext-SMH-12	1200	Manhole	Adoptable
6.003	Ext-SMH-12	1200	Manhole	Adoptable	Ext-SMH-13	1200	Manhole	Adoptable
8.000	S17	1200	Manhole	Adoptable	Ext-SMH-13	1200	Manhole	Adoptable
6.004	Ext-SMH-13	1200	Manhole	Adoptable	S18 FCC	1200	Manhole	Adoptable
7.000	GW1	1000	Manhole	Adoptable	GW2	1000	Manhole	Adoptable
7.001	GW2	1000	Manhole	Adoptable	S16	1200	Manhole	Adoptable
5.000	S13	1000	Manhole	Adoptable	Ext-SMH-10	1200	Manhole	Adoptable
1.007	S18 FCC	1200	Manhole	Adoptable	Ext-Outfall-02	1200	Manhole	Adoptable

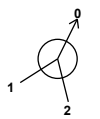
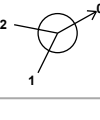
Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S9	447683.180	311067.640	191.850	1.300	1200				
						0	2.000	190.550	150
S7	447641.190	311098.800	192.000	1.350	650				
						0	1.000	190.650	150
S8	447667.910	311084.040	191.700	1.430	1200				
						1	1.000	190.270	150
						0	1.001	190.270	150

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
S10	447674.630	311084.260	191.700	1.670	1200		1	2.000	190.180	150
							2	1.001	190.180	150
							0	1.002	190.030	300
S11	447672.460	311122.060	191.650	1.350	1000		0	3.000	190.300	150
S12	447689.890	311112.700	191.700	2.240	1200		1	3.000	189.610	150
							2	1.002	189.460	300
							0	1.003	189.460	300
Ext-SMH-8	447708.490	311104.090	191.600	2.100	1200		0	4.000	189.500	225
Ext-SMH-9	447704.630	311140.670	191.200	2.190	1200		1	4.000	189.085	225
							2	1.003	189.010	300
							0	1.004	189.010	300
S13	447691.260	311157.910	191.550	2.050	1000		0	5.000	189.500	225
Ext-SMH-10	447722.450	311146.950	190.150	1.650	1200		1	5.000	188.575	225
							2	1.004	188.500	300
							0	1.005	188.500	300
Ext-SMH-11	447762.080	311138.070	189.400	2.340	1200		1	1.005	187.160	300
							0	1.006	187.060	400
S14	447720.450	311046.310	190.850	2.250	1200		0	6.000	188.600	225
S15	447743.720	311059.900	190.450	2.180	1200		1	6.000	188.270	225
							0	6.001	188.270	225
S16	447756.300	311082.510	189.800	1.820	1200		1	7.001	188.055	225
							2	6.001	188.055	225
							0	6.002	187.980	300
Ext-SMH-12	447767.920	311096.160	189.620	1.900	1200		1	6.002	187.720	300
							0	6.003	187.720	300
S17	447741.020	311100.320	190.570	2.370	1200		0	8.000	188.200	150

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
Ext-SMH-13	447763.360	311114.490	189.450	2.060	1200		1	8.000	187.640	150
							2	6.003	187.490	300
							0	6.004	187.390	400
S18 FCC	447773.890	311135.780	189.000	2.100	1200		1	6.004	186.900	400
							2	1.006	186.900	400
							0	1.007	186.900	300
GW1	447713.530	311093.760	191.700	1.700	1000		0	7.000	190.000	225
GW2	447739.040	311078.810	190.700	2.200	1000		1	7.000	188.500	225
							0	7.001	188.500	225
Ext-Outfall-02	447776.360	311137.160	189.000	2.135	1200		1	1.007	186.865	300

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Normal
FSR Region	England and Wales	Skip Steady State	x
M5-60 (mm)	20.000	Drain Down Time (mins)	240
Ratio-R	0.400	Additional Storage (m³/ha)	20.0
Summer CV	0.750	Check Discharge Rate(s)	x
Winter CV	0.840	Check Discharge Volume	x

Storm Durations

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

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
30	45	0	0
100	45	0	0

Node S18 FCC Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	186.900	Product Number	CTL-SHE-0092-4000-1200-4000
Design Depth (m)	1.200	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	4.0	Min Node Diameter (mm)	1200

Node S18 FCC Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	186.900
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	310.0	0.0	1.200	310.0	0.0	1.201	0.0	0.0

Node Ext-SMH-11 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	187.060
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	280.0	0.0	1.600	280.0	0.0	1.601	0.0	0.0

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
1 year 15 minute summer	109.521	30.991	30 year +45% CC 360 minute summer	45.271	11.650
1 year 15 minute winter	76.857	30.991	30 year +45% CC 360 minute winter	29.427	11.650
1 year 30 minute summer	71.439	20.215	30 year +45% CC 480 minute summer	35.270	9.321
1 year 30 minute winter	50.133	20.215	30 year +45% CC 480 minute winter	23.432	9.321
1 year 60 minute summer	48.435	12.800	30 year +45% CC 600 minute summer	28.646	7.835
1 year 60 minute winter	32.179	12.800	30 year +45% CC 600 minute winter	19.572	7.835
1 year 120 minute summer	30.053	7.942	30 year +45% CC 720 minute summer	25.360	6.797
1 year 120 minute winter	19.966	7.942	30 year +45% CC 720 minute winter	17.043	6.797
1 year 180 minute summer	23.233	5.979	30 year +45% CC 960 minute summer	20.612	5.428
1 year 180 minute winter	15.102	5.979	30 year +45% CC 960 minute winter	13.654	5.428
1 year 240 minute summer	18.475	4.882	30 year +45% CC 1440 minute summer	14.733	3.949
1 year 240 minute winter	12.274	4.882	30 year +45% CC 1440 minute winter	9.901	3.949
1 year 360 minute summer	14.169	3.646	100 year +45% CC 15 minute summer	505.670	143.087
1 year 360 minute winter	9.210	3.646	100 year +45% CC 15 minute winter	354.856	143.087
1 year 480 minute summer	11.185	2.956	100 year +45% CC 30 minute summer	332.000	93.944
1 year 480 minute winter	7.431	2.956	100 year +45% CC 30 minute winter	232.982	93.944
1 year 600 minute summer	9.182	2.511	100 year +45% CC 60 minute summer	222.268	58.739
1 year 600 minute winter	6.274	2.511	100 year +45% CC 60 minute winter	147.669	58.739
1 year 720 minute summer	8.203	2.199	100 year +45% CC 120 minute summer	134.215	35.469
1 year 720 minute winter	5.513	2.199	100 year +45% CC 120 minute winter	89.169	35.469
1 year 960 minute summer	6.768	1.782	100 year +45% CC 180 minute summer	101.219	26.047
1 year 960 minute winter	4.483	1.782	100 year +45% CC 180 minute winter	65.795	26.047
1 year 1440 minute summer	4.949	1.326	100 year +45% CC 240 minute summer	78.690	20.795
1 year 1440 minute winter	3.326	1.326	100 year +45% CC 240 minute winter	52.280	20.795
30 year +45% CC 15 minute summer	389.624	110.250	100 year +45% CC 360 minute summer	58.701	15.106
30 year +45% CC 15 minute winter	273.421	110.250	100 year +45% CC 360 minute winter	38.157	15.106
30 year +45% CC 30 minute summer	253.647	71.773	100 year +45% CC 480 minute summer	45.550	12.038
30 year +45% CC 30 minute winter	177.998	71.773	100 year +45% CC 480 minute winter	30.262	12.038
30 year +45% CC 60 minute summer	169.054	44.676	100 year +45% CC 600 minute summer	36.875	10.086
30 year +45% CC 60 minute winter	112.316	44.676	100 year +45% CC 600 minute winter	25.195	10.086
30 year +45% CC 120 minute summer	102.135	26.991	100 year +45% CC 720 minute summer	32.556	8.725
30 year +45% CC 120 minute winter	67.856	26.991	100 year +45% CC 720 minute winter	21.879	8.725
30 year +45% CC 180 minute summer	77.282	19.887	100 year +45% CC 960 minute summer	26.340	6.936
30 year +45% CC 180 minute winter	50.235	19.887	100 year +45% CC 960 minute winter	17.448	6.936
30 year +45% CC 240 minute summer	60.326	15.942	100 year +45% CC 1440 minute summer	18.700	5.012
30 year +45% CC 240 minute winter	40.079	15.942	100 year +45% CC 1440 minute winter	12.567	5.012

Results for 1 year Critical Storm Duration. Lowest mass balance: 98.78%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	S9	1	190.550	0.000	0.0	0.0000	0.0000	OK
15 minute summer	S7	1	190.650	0.000	0.0	0.0000	0.0000	OK
15 minute winter	S8	10	190.343	0.073	8.7	0.1464	0.0000	OK
15 minute winter	S10	10	190.107	0.077	21.7	0.1730	0.0000	OK
15 minute summer	S11	1	190.300	0.000	0.0	0.0000	0.0000	OK
15 minute winter	S12	10	189.575	0.115	39.6	0.2634	0.0000	OK
15 minute summer	Ext-SMH-8	1	189.500	0.000	0.0	0.0000	0.0000	OK
15 minute winter	Ext-SMH-9	11	189.123	0.113	51.9	0.2241	0.0000	OK
15 minute summer	S13	1	189.500	0.000	0.0	0.0000	0.0000	OK
15 minute winter	Ext-SMH-10	11	188.631	0.131	75.0	0.4198	0.0000	OK
360 minute winter	Ext-SMH-11	336	187.223	0.163	17.4	43.6675	0.0000	OK
15 minute winter	S14	10	188.665	0.065	10.6	0.1161	0.0000	OK
15 minute winter	S15	11	188.364	0.094	16.7	0.1458	0.0000	OK
15 minute winter	S16	11	188.078	0.098	28.2	0.1104	0.0000	OK
15 minute winter	Ext-SMH-12	11	187.824	0.104	28.4	0.1173	0.0000	OK
15 minute winter	S17	10	188.271	0.071	11.4	0.1290	0.0000	OK
15 minute summer	Ext-SMH-13	9	187.535	0.145	56.7	0.3714	0.0000	OK
360 minute winter	S18 FCC	328	187.223	0.323	22.3	95.5111	0.0000	SURCHARGED
15 minute summer	GW1	1	190.000	0.000	0.0	0.0000	0.0000	OK
15 minute winter	GW2	10	188.560	0.060	12.3	0.0946	0.0000	OK
15 minute summer	Ext-Outfall-02	1	186.865	0.000	3.6	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	S9	2.000	S10	0.0	0.000	0.000	0.0000	
15 minute summer	S7	1.000	S8	0.0	0.000	0.000	0.1260	
15 minute winter	S8	1.001	S10	8.4	1.049	0.410	0.0542	
15 minute winter	S10	1.002	S12	21.5	1.105	0.145	0.6314	
15 minute summer	S11	3.000	S12	0.0	0.000	0.000	0.0000	
15 minute winter	S12	1.003	Ext-SMH-9	38.9	1.587	0.293	0.7771	
15 minute summer	Ext-SMH-8	4.000	Ext-SMH-9	0.0	0.000	0.000	0.0732	
15 minute winter	Ext-SMH-9	1.004	Ext-SMH-10	51.8	1.925	0.283	0.5089	
15 minute summer	S13	5.000	Ext-SMH-10	0.0	0.000	0.000	0.1168	
15 minute winter	Ext-SMH-10	1.005	Ext-SMH-11	75.2	2.619	0.371	1.1669	
360 minute winter	Ext-SMH-11	1.006	S18 FCC	15.8	0.541	0.062	1.0671	
15 minute winter	S14	6.000	S15	10.5	0.839	0.182	0.3376	
15 minute winter	S15	6.001	S16	16.5	1.070	0.348	0.3984	
15 minute winter	S16	6.002	Ext-SMH-12	28.4	1.369	0.212	0.3716	
15 minute winter	Ext-SMH-12	6.003	Ext-SMH-13	28.6	1.379	0.233	0.3914	
15 minute winter	S17	8.000	Ext-SMH-13	11.2	1.390	0.431	0.2127	
15 minute summer	Ext-SMH-13	6.004	S18 FCC	57.8	2.769	0.177	0.5882	
360 minute winter	S18 FCC	Hydro-Brake®	Ext-Outfall-02	4.0				112.9
15 minute summer	GW1	7.000	GW2	0.0	0.000	0.000	0.1212	
15 minute winter	GW2	7.001	S16	12.0	1.458	0.145	0.1456	

Results for 30 year +45% CC Critical Storm Duration. Lowest mass balance: 98.78%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	S9	1	190.550	0.000	0.0	0.0000	0.0000	OK
15 minute summer	S7	1	190.650	0.000	0.0	0.0000	0.0000	OK
15 minute winter	S8	11	190.590	0.319	31.1	0.6383	0.0000	SURCHARGED
15 minute winter	S10	12	190.252	0.222	75.8	0.5001	0.0000	OK
15 minute summer	S11	1	190.300	0.000	0.0	0.0000	0.0000	OK
15 minute winter	S12	12	190.164	0.703	139.8	1.6061	0.0000	SURCHARGED
15 minute winter	Ext-SMH-8	12	189.756	0.256	16.4	0.2897	0.0000	SURCHARGED
15 minute winter	Ext-SMH-9	12	189.770	0.760	162.8	1.5045	0.0000	SURCHARGED
15 minute summer	S13	1	189.500	0.000	0.0	0.0000	0.0000	OK
15 minute winter	Ext-SMH-10	12	189.263	0.763	232.5	2.4444	0.0000	SURCHARGED
960 minute winter	Ext-SMH-11	930	188.012	0.952	20.2	254.9007	0.0000	SURCHARGED
15 minute winter	S14	11	188.737	0.137	37.6	0.2467	0.0000	OK
15 minute winter	S15	11	188.603	0.333	59.1	0.5138	0.0000	SURCHARGED
15 minute winter	S16	11	188.200	0.220	99.1	0.2489	0.0000	OK
960 minute winter	Ext-SMH-12	930	188.012	0.292	6.6	0.3298	0.0000	OK
15 minute winter	S17	11	189.006	0.806	40.6	1.4636	0.0000	SURCHARGED
960 minute winter	Ext-SMH-13	930	188.012	0.622	13.9	1.5900	0.0000	SURCHARGED
960 minute winter	S18 FCC	930	188.012	1.112	23.4	328.6169	0.0000	SURCHARGED
15 minute summer	GW1	1	190.000	0.000	0.0	0.0000	0.0000	OK
15 minute winter	GW2	10	188.622	0.122	43.6	0.1918	0.0000	OK
15 minute summer	Ext-Outfall-02	1	186.865	0.000	4.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	S9	2.000	S10	0.0	0.000	0.000	0.0018	
15 minute summer	S7	1.000	S8	0.0	0.000	0.000	0.2687	
15 minute winter	S8	1.001	S10	29.6	1.684	1.441	0.1172	
15 minute winter	S10	1.002	S12	75.1	1.375	0.508	2.0367	
15 minute summer	S11	3.000	S12	0.0	0.000	0.000	0.1742	
15 minute winter	S12	1.003	Ext-SMH-9	118.9	1.890	0.896	2.2264	
15 minute winter	Ext-SMH-8	4.000	Ext-SMH-9	-16.4	-0.507	-0.297	1.4629	
15 minute winter	Ext-SMH-9	1.004	Ext-SMH-10	154.4	2.235	0.843	1.3305	
15 minute summer	S13	5.000	Ext-SMH-10	0.0	0.000	0.000	0.6574	
15 minute winter	Ext-SMH-10	1.005	Ext-SMH-11	218.4	3.101	1.078	2.8599	
960 minute winter	Ext-SMH-11	1.006	S18 FCC	15.2	0.573	0.059	1.7149	
15 minute winter	S14	6.000	S15	36.5	1.063	0.634	0.8773	
15 minute winter	S15	6.001	S16	57.5	1.448	1.214	0.9917	
15 minute winter	S16	6.002	Ext-SMH-12	99.5	1.755	0.742	1.0181	
960 minute winter	Ext-SMH-12	6.003	Ext-SMH-13	6.6	0.922	0.054	1.3250	
15 minute winter	S17	8.000	Ext-SMH-13	36.1	2.051	1.393	0.4610	
960 minute winter	Ext-SMH-13	6.004	S18 FCC	13.5	1.087	0.041	3.2375	
960 minute winter	S18 FCC	Hydro-Brake®	Ext-Outfall-02	4.0				238.9
15 minute summer	GW1	7.000	GW2	0.0	0.000	0.000	0.3126	
15 minute winter	GW2	7.001	S16	43.2	1.860	0.522	0.4282	

Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 98.78%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S9	12	191.109	0.559	9.0	0.6318	0.0000	SURCHARGED
15 minute winter	S7	13	191.330	0.680	6.8	0.2259	0.0000	SURCHARGED
15 minute winter	S8	13	191.319	1.049	40.4	2.0967	0.0000	SURCHARGED
15 minute winter	S10	12	191.106	1.076	89.3	2.4281	0.0000	SURCHARGED
15 minute winter	S11	12	190.977	0.677	4.8	0.5314	0.0000	SURCHARGED
15 minute winter	S12	12	190.968	1.508	155.3	3.4424	0.0000	SURCHARGED
15 minute winter	Ext-SMH-8	12	190.503	1.003	16.2	1.1340	0.0000	SURCHARGED
15 minute winter	Ext-SMH-9	12	190.468	1.458	184.2	2.8869	0.0000	SURCHARGED
15 minute winter	S13	12	189.885	0.385	23.1	0.3022	0.0000	SURCHARGED
15 minute winter	Ext-SMH-10	12	189.862	1.362	271.3	4.3646	0.0000	FLOOD RISK
960 minute winter	Ext-SMH-11	930	188.594	1.534	25.9	410.8833	0.0000	SURCHARGED
15 minute winter	S14	11	189.133	0.533	48.8	0.9577	0.0000	SURCHARGED
15 minute winter	S15	11	188.901	0.631	72.3	0.9738	0.0000	SURCHARGED
960 minute winter	S16	930	188.594	0.614	8.4	0.6944	0.0000	SURCHARGED
960 minute winter	Ext-SMH-12	930	188.594	0.874	8.4	0.9884	0.0000	SURCHARGED
15 minute winter	S17	12	189.683	1.483	52.7	2.6913	0.0000	SURCHARGED
960 minute winter	Ext-SMH-13	930	188.594	1.204	17.7	3.0796	0.0000	SURCHARGED
960 minute winter	S18 FCC	930	188.594	1.694	25.0	355.4630	0.0000	SURCHARGED
15 minute summer	GW1	1	190.000	0.000	0.0	0.0000	0.0000	OK
15 minute winter	GW2	10	188.645	0.145	56.6	0.2288	0.0000	OK
15 minute summer	Ext-Outfall-02	1	186.865	0.000	4.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	S9	2.000	S10	-9.0	-0.512	-0.359	0.3290	
15 minute winter	S7	1.000	S8	-6.8	-0.384	-0.341	0.5374	
15 minute winter	S8	1.001	S10	31.8	1.805	1.545	0.1184	
15 minute winter	S10	1.002	S12	76.3	1.374	0.515	2.2728	
15 minute winter	S11	3.000	S12	8.6	0.579	0.259	0.3483	
15 minute winter	S12	1.003	Ext-SMH-9	128.1	1.887	0.965	2.2264	
15 minute winter	Ext-SMH-8	4.000	Ext-SMH-9	16.6	0.531	0.300	1.4629	
15 minute winter	Ext-SMH-9	1.004	Ext-SMH-10	172.1	2.444	0.940	1.3305	
15 minute winter	S13	5.000	Ext-SMH-10	-23.1	-0.616	-0.264	1.3148	
15 minute winter	Ext-SMH-10	1.005	Ext-SMH-11	253.1	3.595	1.250	2.8599	
960 minute winter	Ext-SMH-11	1.006	S18 FCC	18.5	0.615	0.072	1.7149	
15 minute winter	S14	6.000	S15	43.9	1.103	0.762	1.0718	
15 minute winter	S15	6.001	S16	70.0	1.759	1.478	1.0290	
960 minute winter	S16	6.002	Ext-SMH-12	8.4	1.023	0.063	1.2623	
960 minute winter	Ext-SMH-12	6.003	Ext-SMH-13	8.4	0.969	0.068	1.3302	
15 minute winter	S17	8.000	Ext-SMH-13	45.1	2.563	1.740	0.4610	
960 minute winter	Ext-SMH-13	6.004	S18 FCC	17.0	1.138	0.052	3.2375	
960 minute winter	S18 FCC	Hydro-Brake®	Ext-Outfall-02	4.7				271.8
15 minute summer	GW1	7.000	GW2	0.0	0.000	0.000	0.3839	
15 minute winter	GW2	7.001	S16	55.9	1.865	0.675	0.5837	

Surface Water Flow Discharge Assessment (Modified Rational Method)

Site **Markfield Services, Leicestershire, LE67 9PP** Date **13-Apr-26**

	Existing	Proposed
Total area =	23946 m2	23946 m2
Impermeable area flowing to Surface Water, Ap =	18646 m2	16800 m2
Rainfall intensity, R=	50 mm/hr	
where R		
Runoff, Q = $2.78 \cdot A_p \cdot R$	259.2 l/s	
Required runoff reduction=	97.7 %	
Allowable discharge, Qp=	6.0 l/s	