SALDANHA
DESIGN AND MANAGEMENT LIMITED

Drainage Strategy Report

For the proposed development at

Boldon ASDA Drive Through Restaurant, North Road, Bolden Colliery, NE35 9AR

Revision	Issue Date	Comments	Prepared By	Checked By
0	03/05/2022	Initial Issue	NJS	SDE

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Contents

1.0 Introduction

2.0 Existing Site

- 2.1 General Description
- 2.2 Site Topography
- 2.3 Existing Natural Drainage Features
- 2.4 Existing Drainage Infrastructure

3.0 Proposed Development

4.0 Site Drainage

- 4.1 Foul System
- 4.2 Surface Water System

5.0 Appendices – Drawings and Calculations

- 2798 – 001-A-ASDA Boldon Existing Areas
- 2798 – 002-A-ASDA Boldon Proposed Areas
- 2798 – 003-A-ASDA Boldon Proposed Overlay
- 2798 – 004-A-ASDA Boldon Proposed Drainage
- SD 001 Standard Details – Surfaces
- SD 002 Standard Details - Joints
- SD 003 Standard Details – Drainage
- SD 004 Standard Details – Manholes
- SD 005 Standard Detail – Attenuation Tanks
- ASDA Boldon DTR_Surface water assessment – existing and allowable discharge
- ASDA Boldon DTR_StormFlowOutput_100yrp30CC
- ASDA Boldon DTR – FLOW Report

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1.0 Introduction

The report provides details on the design of both the surface water and foul drainage systems for the Drive Through Restaurant development proposed at ASDA Boldon.

2.0 Existing Site

2.1 General Description

The proposed development is part of the existing car parking area of ASDA Boldon located at North Road, Bolden Colliery, NE35 9AR (Grid Ref: 434447E, 561617N).

See figure 1.

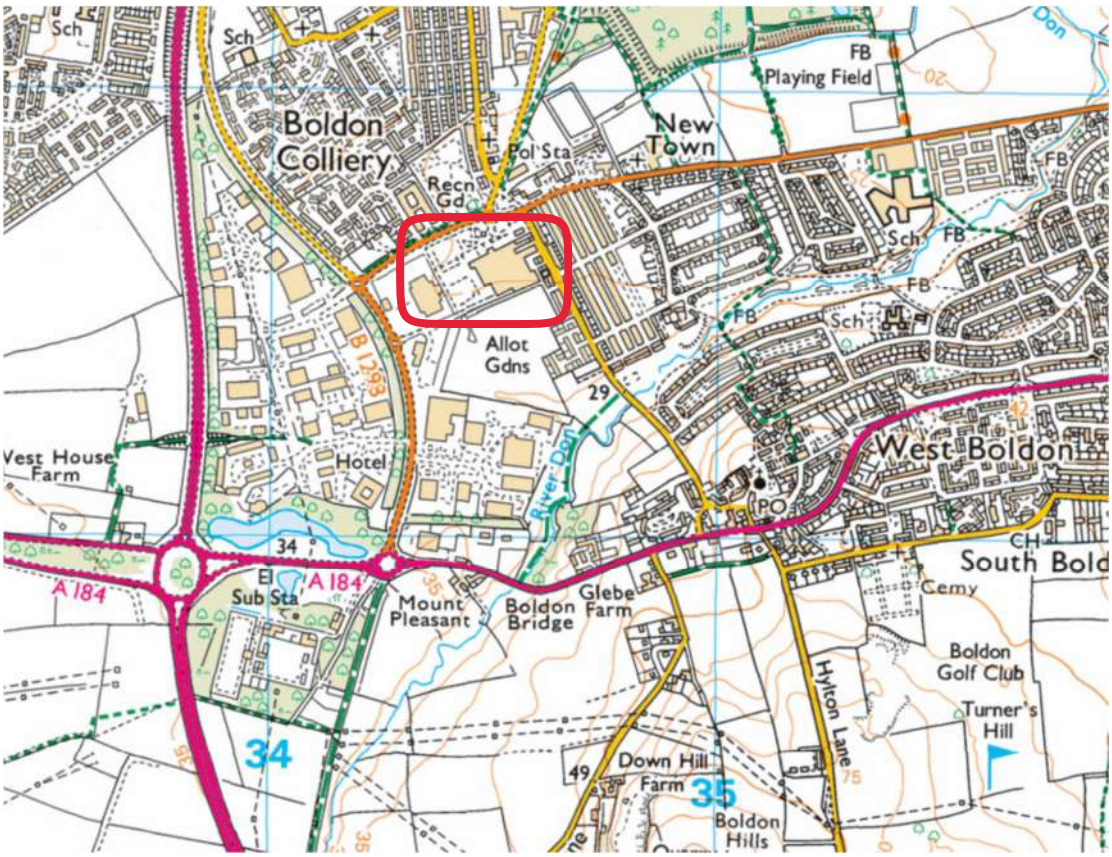


Figure 1

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2.2 Site Topography

The site area considered for the drainage analysis is 0.0.09ha in size. Based upon the topographic survey the existing car park site is relatively flat. The new building is located on the existing ASDA superstore carpark to the northwest corner of the store adjacent the ramp to deck car park.

2.3 Existing Natural Drainage Features

There are no natural drainage features in the vicinity of the proposed development.

2.4 Existing Drainage Infrastructure

There are separate foul sewers and surface water drains in the existing car park that serve the existing site infrastructure. It is proposed to connect both foul and surface water systems to the existing ASDA store site drainage systems.

3.0 Proposed Development

The development is to consist of a drive through restaurant with parking and access. The proposed site forms part of an existing ASDA car park and is presently almost entirely paved. The existing site arrangement is shown on the attached drawing 2798-001-A ASDA Boldon Existing Areas.

4.0 Site Drainage

The proposed development is shown on the attached drawing 2798–002-A ASDA Boldon-Proposed Areas.
Discharge from the site will be to separate surface water and foul systems.
The site is underlain by Made Ground overlying Clay and infiltration is not feasible. Surface water flow off the site is to be restricted to 70% of existing flows and on-site attenuation will be provided. Surface water flow off site will be restricted to 8.5l/s providing a 30% reduction on current off-site flow. There are no restrictions on foul flows
Separate statements on the foul and surface water systems are provided.

4.1 Foul System

The Drive Through Restaurant foul wastewater will discharge directly to the site foul system.

Design discharge rates are based upon typical rates observed for Euro Garages sites.

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4.2 Surface Water Systems

SuDS hierarchy will be used for the surface water drainage system design.

Infiltration is not viable for the site as the upper soils are impermeable.

Restricted discharge for surface water is proposed, with on-site attenuation provided as part of the overall larger site area development. The existing flow has been assessed for an impermeable area of 875m^2 giving 12.2l/s. A 30% reduction gives an allowable discharge of 8.5l/s.

Calculations for current run off assessment and proposed storage are attached.

Roof water from the buildings and canopies will discharge to the site surface water system.

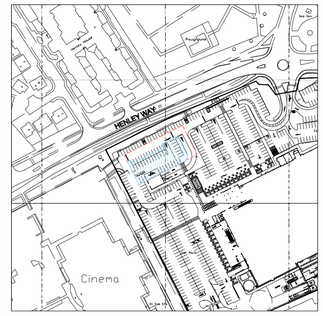
Surface water runoff will be collected by channel drains or trapped gullies and discharged to the ASDA car park drainage system.

Attenuation storage of 25m^3 in underground storage crates is proposed with further storage in the pipe system and manholes. The proposed surface water system has been analysed by use of Causeway Flow software and selected results are attached for reference. The storage volume is based on no surface water flooding for a 1 in 100-year return period plus 30% Climate Change allowance.

5.0 Drawings and calculations

2798 – 001-A-ASDA Boldon Existing Areas
2798 – 002-A-ASDA Boldon Proposed Areas
2798 – 003-A-ASDA Boldon Proposed Overlay
2798 – 004-A-ASDA Boldon Proposed Drainage
SD 001 Standard Details – Surfaces
SD 002 Standard Details - Joints
SD 003 Standard Details – Drainage
SD 004 Standard Details – Manholes
SD 005 Standard Detail – Attenuation Tanks
ASDA Boldon DTR_Surface water assessment – existing and allowable discharge
ASDA Boldon DTR_StormFlowOutput_100yrp30CC
ASDA Boldon DTR – FLOW Report

DO NOT SCALE



LOCATION PLAN

CROWN COPYRIGHT 2021
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WITHOUT PRIOR PERMISSION OF ORDNANCE SURVEY
CENTRAL GRID REFERENCE 434400mE 561640mN

0 2.5 5 7.5 10 12.5

1:125
DO NOT SCALE. METRES

LEGEND

	BOUNDARY CONSIDERED FOR DRAINAGE CALCULATIONS	AREA = 875m²
	EXISTING BUILDING	AREA = 0m²
	EXISTING LANDSCAPING	AREA = 0m²
	EXISTING IMPERMEABLE	AREA = 875m²

REV	DATE	BY	DESCRIPTION	CHK	APD
A	13/12/21	CJ	INITIAL DRAFT	SE	NJS

DRAWING STATUS: PLANNING

SALDANHA
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25 Westgate,
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BD18 3QX
T: (01274) 973191
E: norman@saldanha.co.uk
www.saldanha.co.uk

CLIENT: Euro Garages

PROJECT:
PROPOSED DEVELOPMENT
ASDA BOLDON SUPERSTORE
NORTH WAY, BOLDON, NE35 9ER

TITLE:
EXISTING SITE LAYOUT
AREA CALCULATION

SCALE:	SHEET:	DATE:
1:125	A1	11/04/2022
DRAWN: CJ	DRAWING CHECK: SE	DESIGN CHECK: NJS
PROJECT No: 2798	DRAWING No: 001	REV: A

LITTLE DT - OPTION 6
standard yard with HD

DELIVERY DRIVERS
DELIVERY DRIVERS
11.29m LONG DELIVERY LORRY
COLLECT & CLICK
LARGE ORDER BAY
LARGE ORDER BAY
ORDER POINT
CLICK & COLLECT
Speed Bump
Speed Bump
Pull Up Bollards
Height Limit
Maximum Headroom 2.2m
Canopy
Bike Park
Bike Park
Trolley Park
Trolley Park
Trolley Bay
Steps
To Upper Level
Bank Base
Wall
Tarmac
Grass
Foliage
Paved
Drain
Floodlight
STN2
STN3
HEALEY WAY
Cinema

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LOCATION PLAN
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CENTRAL GRID REFERENCE 434400mE 561640mN

0 2.5 5 7.5 10 12.5
1:125
DO NOT SCALE. METRES

LEGEND

	BOUNDARY CONSIDERED FOR DRAINAGE CALCULATIONS	AREA = 875m²
	PROPOSED BUILDING	AREA = 165m²
	PROPOSED LANDSCAPING	AREA = 0m²
	PROPOSED IMPERMEABLE	AREA = 710m²

REV	DATE	BY	DESCRIPTION	CHK	APD
A	11/04/22	CJ	INITIAL DRAFT	SE	NJS

DRAWING STATUS: PLANNING

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CLIENT: Euro Garages

PROJECT:
PROPOSED DEVELOPMENT
ASDA BOLDON SUPERSTORE
NORTH WAY, BOLDON, NE35 9ER

TITLE:
PROPOSED SITE LAYOUT
AREA CALCULATION

SCALE:	SHEET:	DATE:
1:125	A1	11/04/2022
DRAWN: CJ	DRAWING CHECK: SE	DESIGN CHECK: NJS
PROJECT No: 2798	DRAWING No: 002	REV: A

LITTLE DT - OPTION 6
standard yard with HD

11.29m LONG DELIVERY LORRY

DELIVERY DRIVERS

DELIVERY DRIVERS

LARGE ORDER BAY

LARGE ORDER BAY

CLICK & COLLECT

CLICK & COLLECT

ORDER POINT

Recycle Area

Bike Park

Bike Park

Trolley Park

Trolley Park

Trolley Bay

Maximum Headroom 2.2m

Canopy

Speed Bump

Speed Bump

Tactiles

Bollards

Height Limit

Steps

Wall

Tarmac

Grass

Foliage

Drain

Conc

Flat

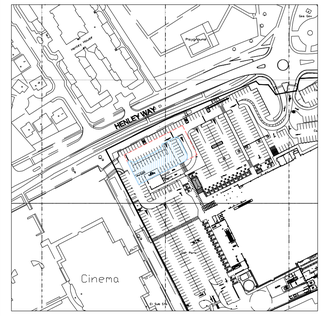
Paved

Floodlight

STN2

STN3

DO NOT SCALE



LOCATION PLAN
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CENTRAL GRID REFERENCE 434400mE 561640mN

0 2.5 5 7.5 10 12.5

1:125
DO NOT SCALE. METRES

LEGEND

	BOUNDARY CONSIDERED FOR DRAINAGE CALCULATIONS	AREA = 875m²
	PROPOSED BUILDING	AREA = 165m²
	PROPOSED LANDSCAPING	AREA = 0m²
	PROPOSED IMPERMEABLE	AREA = 710m²

REV	DATE	BY	DESCRIPTION	CHK	APD
A	11/04/22	CJ	INITIAL DRAFT	SE	NJS

DRAWING STATUS: PLANNING

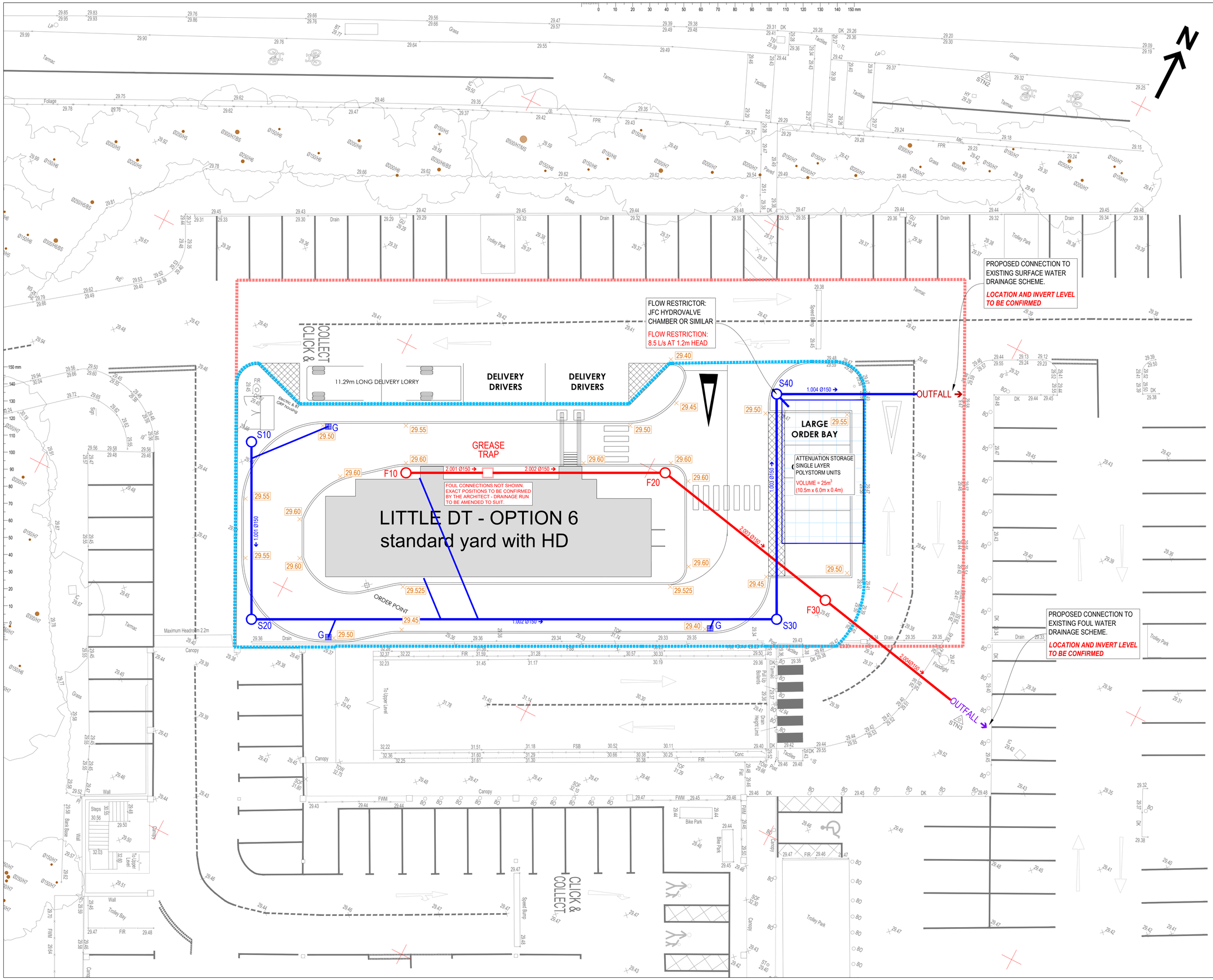
SALDANHA
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CLIENT: Euro Garages

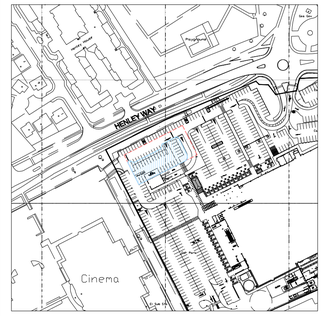
PROJECT:
PROPOSED DEVELOPMENT
ASDA BOLDON SUPERSTORE
NORTH WAY, BOLDON, NE35 9ER

TITLE:
PROPOSED SITE LAYOUT
EXISTING SITE OVERLAY

SCALE:	SHEET:	DATE:
1:125	A1	11/04/2022
DRAWN: CJ	DRAWING CHECK: SE	DESIGN CHECK: NJS
PROJECT No: 2798	DRAWING No: 003	REV: A



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CENTRAL GRID REFERENCE 434400mE 561640mN

0 2.5 5 7.5 10 12.5
1:125
DO NOT SCALE. METRES

LEGEND

- BOUNDARY CONSIDERED FOR DRAINAGE CALCULATIONS AREA = 875m²
- PROPOSED SURFACE WATER DRAINAGE
- PROPOSED SURFACE WATER MANHOLE
- PROPOSED ACO SURFACE WATER CHANNEL DRAIN
- EXISTING SITE SURFACE DRAINAGE
- PROPOSED FOUL WATER DRAINAGE
- PROPOSED FOUL WATER MANHOLE
- PROPOSED ACO FOUL WATER CHANNEL DRAIN
- EXISTING SITE FOUL DRAINAGE

REV	DATE	BY	DESCRIPTION	CHK	APD
A	11/04/22	CJ	INITIAL DRAFT	SE	NJS

DRAWING STATUS: PLANNING

SALDANHA
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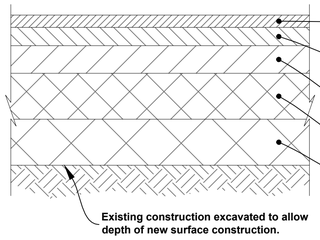
CLIENT: Euro Garages

PROJECT:
PROPOSED DEVELOPMENT
ASDA BOLDON SUPERSTORE
NORTH WAY, BOLDON, NE35 9ER

TITLE:
PROPOSED SITE LAYOUT
DRAINAGE SCHEME

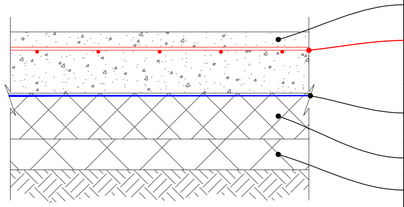
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DRAWN: CJ	DRAWING CHECK: SE	DESIGN CHECK: NJS
PROJECT No: 2798	DRAWING No: 004	REV: A

HEAVY DUTY CARRIAGEWAY - TYPICAL CONSTRUCTION DETAILS



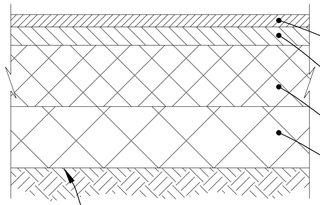
LAYER	CLAUSE (D.O.T.)	MATERIAL	THICKNESS	NOTES
SURFACE COURSE	910	STONE MASTIC ASPHALT Mixture to BS 594987 2007, Table 6C (SMA14) Nominal aggregate size 14mm	40 mm	Laid and compacted to Specification for Highways Works Clauses 701, 702 and 901
BINDER COURSE	906	DENSE BITUMEN MACADAM Mixture to BS 594594 2007, Table 6A (HRA60/20 bin/base) Nominal aggregate size 20mm	60 mm	Laid and compacted to Specification for Highways Works Clauses 702 and 901
BASE COURSE	903	DENSE BITUMEN MACADAM Mixture to BS 594987 2007, Table 6A Nominal aggregate size 32mm	90 mm	Laid and compacted to Specification for Highways Works Clauses 701, 702 and 901
SUB BASE	801 & 803	Type 1	150 mm	Laid and compacted to Specification for Highways Works Clause 802
CAPPING LAYER	801 & 803	6F2 Granular material Class 1A, 1B, 1C, 6F1 or 6F2	150 mm	Laid and compacted to Specification for Highways Works Clauses 608 and 612
		TOTAL CONSTRUCTION THICKNESS	490 mm	

CONCRETE FORECOURT - TYPICAL CONSTRUCTION DETAILS



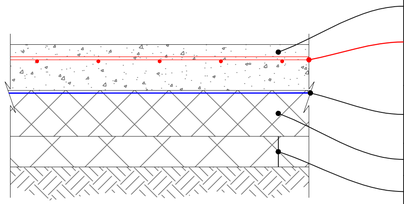
LAYER	CLAUSE (D.O.T.)	MATERIAL	THICKNESS	NOTES
SLAB (A393 MESH)	--	GRADE C40 CONCRETE Average air entrainment = 5±1.5%. Minimum cement content of 330kg/m . Maximum water/cement ratio of 0.50 (by weight). Maximum aggregate size 20mm. Fine aggregate 30-40% (by weight) of total workability (target) 50 mm slump or designated mix 40 / 50 XF. 1 layer A393 mesh with 50mm top cover.	200 mm	Medium brush finish in direction of falls.
MEMBRANE	--	1200 GAUGE VISQUEEN (or similar approved)	--	Laid strictly in accordance with manufacturers recommendations.
SUB BASE	801 & 803	Type 1	150 mm	Laid and compacted to Specification for Highways Works Clause 802
CAPPING LAYER	801 & 803	6F2 Granular material Class 1A, 1B, 1C, 6F1 or 6F2	100 mm (min)	Laid and compacted to Specification for Highways Works Clauses 608 and 612
		TOTAL CONSTRUCTION THICKNESS	450 mm (min)	

CAR PARK - TYPICAL CONSTRUCTION DETAILS



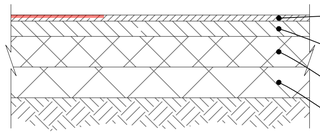
LAYER	CLAUSE (D.O.T.)	MATERIAL	THICKNESS	NOTES
SURFACE COURSE	910	STONE MASTIC ASPHALT Mixture to BS 594987 2007, Table 6C (SMA14) Nominal aggregate size 14mm	40 mm	Laid and compacted to Specification for Highways Works Clauses 701, 702 and 901
BINDER COURSE	906	DENSE BITUMEN MACADAM Mixture to BS 594594 2007, Table 6A (HRA60/20 bin/base) Nominal aggregate size 20mm	60 mm	Laid and compacted to Specification for Highways Works Clauses 702 and 901
SUB BASE	801 & 803	Type 1	200 mm	Laid and compacted to Specification for Highways Works Clause 802
CAPPING LAYER	801 & 803	6F2 Granular material Class 1A, 1B, 1C, 6F1 or 6F2	150 mm (min)	Laid and compacted to Specification for Highways Works Clauses 608 and 612
		TOTAL CONSTRUCTION THICKNESS	450 mm (min)	

CONCRETE FOOTPATH - TYPICAL CONSTRUCTION DETAILS



LAYER	CLAUSE (D.O.T.)	MATERIAL	THICKNESS	NOTES
SLAB (A393 MESH)	--	GRADE C40 CONCRETE Average air entrainment = 5±1.5%. Minimum cement content of 330kg/m . Maximum water/cement ratio of 0.50 (by weight). Maximum aggregate size 20mm. Fine aggregate 30-40% (by weight) of total workability (target) 50 mm slump or designated mix 40 / 50 XF. 1 layer A393 mesh with 50mm top cover.	150 mm	Medium brush finish in direction of falls.
MEMBRANE	--	1200 GAUGE VISQUEEN (or similar approved)	--	Laid strictly in accordance with manufacturers recommendations.
SUB BASE	801 & 803	Type 1	150 mm	Laid and compacted to Specification for Highways Works Clause 802
CAPPING LAYER	801 & 803	6F2 Granular material Class 1A, 1B, 1C, 6F1 or 6F2	100 mm (min)	Laid and compacted to Specification for Highways Works Clauses 608 and 612
		TOTAL CONSTRUCTION THICKNESS	400 mm (min)	

MACADAM FOOTPATH - TYPICAL CONSTRUCTION DETAILS



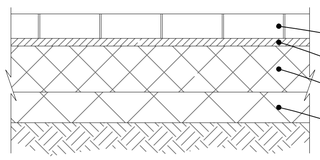
LAYER	CLAUSE (D.O.T.)	MATERIAL	THICKNESS	NOTES
SURFACE COURSE	1105	FINE TEXTURE BITUMEN MACADAM (200 PEN)	20 mm	Aggregate type: Course aggregate Basalt. Laid and compacted to Specification for Highways Works Clauses 702 and 901
BINDER COURSE	906	DENSE BITUMEN MACADAM (100 PEN) Mixture to BS 594594 2007, Table 6A (HRA60/20 bin/base) Nominal aggregate size 20mm	50 mm	Used with fine texture bitumen macadam. Laid and compacted to Specification for Highways Works Clauses 702 and 901
SUB BASE	801 & 803	Type 1	100 mm	Laid and compacted to Specification for Highways Works Clause 802
CAPPING LAYER	801 & 803	6F2 Granular material Class 1A, 1B, 1C, 6F1 or 6F2	100 mm	Laid and compacted to Specification for Highways Works Clauses 608 and 612
		TOTAL CONSTRUCTION THICKNESS	270 mm	

NOTE:

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

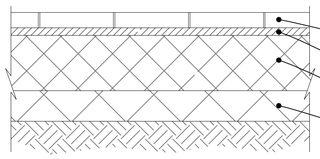
FOUNDATION THICKNESS		
CBR %	GRANULAR SUB BASE - TYPE 1	CAPPING LAYER
>2	150	600
2	150	450
2.5	350	0
2.5	150	400
3	300	0
3	150	350
4	250	0
4	150	300
5	150	250
5	225	0
8	150	20
8	190	0
>15	150	

BLOCKED PAVED AREAS - TYPICAL CONSTRUCTION DETAILS

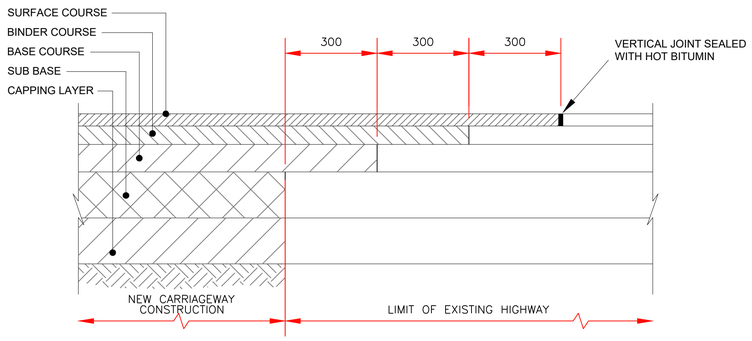


LAYER	CLAUSE (D.O.T.)	MATERIAL	THICKNESS	NOTES
SURFACE COURSE	--	BLOCK PAVING Installed to Architects specification	80 mm	
BEDDING	--	SAND	25 mm	
SUB BASE	801 & 803	Type 1	150 mm	Laid and compacted to Specification for Highways Works Clause 802
CAPPING LAYER	801 & 803	6F2 Granular material Class 1A, 1B, 1C, 6F1 or 6F2	100 mm	Laid and compacted to Specification for Highways Works Clauses 608 and 612
		TOTAL CONSTRUCTION THICKNESS	355 mm	

BLOCKED PAVED AREAS - TYPICAL CONSTRUCTION DETAILS



LAYER	CLAUSE (D.O.T.)	MATERIAL	THICKNESS	NOTES
SURFACE COURSE	--	TEGULA DRIVESETT Installed to Architects specification	50 mm	
BEDDING	--	SAND	25 mm	
SUB BASE	801 & 803	Type 1	180 mm	Laid and compacted to Specification for Highways Works Clause 802
CAPPING LAYER	801 & 803	6F2 Granular material Class 1A, 1B, 1C, 6F1 or 6F2	100 mm	Laid and compacted to Specification for Highways Works Clauses 608 and 612
		TOTAL CONSTRUCTION THICKNESS	355 mm	



TIE-IN CONSTRUCTION DETAILS AT EDGE OF CARRIAGEWAY

REV	DATE	BY	DESCRIPTION	CHK	APD
A	18/10/21	CJ	ISSUED FOR CONSTRUCTION	NJS	NJS

DRAWING STATUS: PLANNING

SALDANHA DESIGN AND MANAGEMENT LIMITED
25 Westgate,
Shipley,
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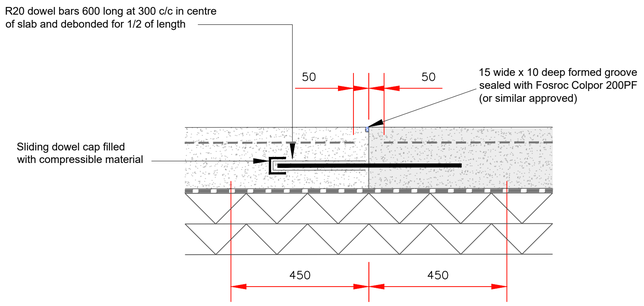
CLIENT: Euro Garages

PROJECT: PROPOSED DEVELOPMENT

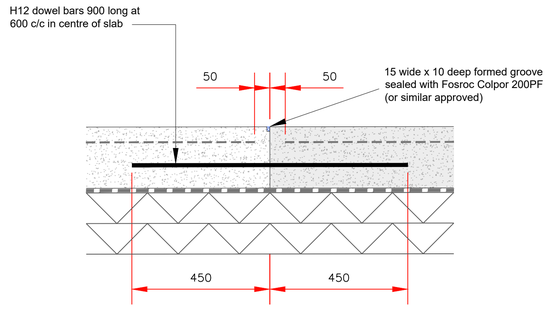
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SURFACE CONSTRUCTION

SCALE @ A1:	SCALE @ A1:	DATE:
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DRAWN:	DRAWING CHECK:	DESIGN CHECK:
CJ	NJS	NJS

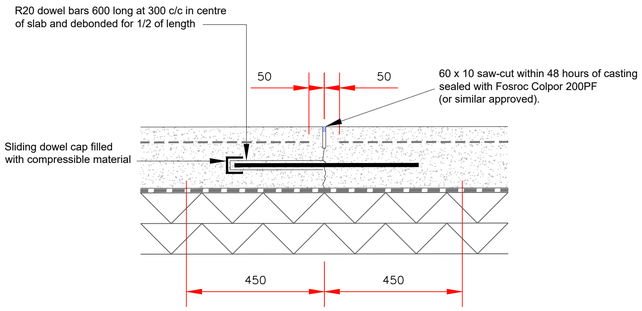
PROJECT No:	DRAWING No:	REV:
SD	001	A



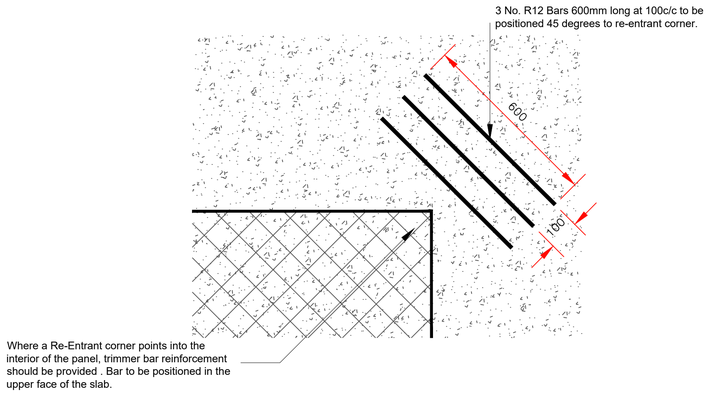
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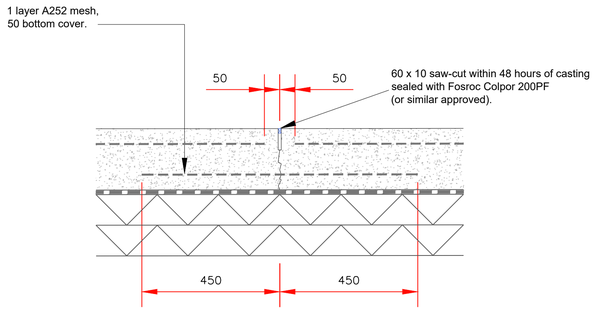
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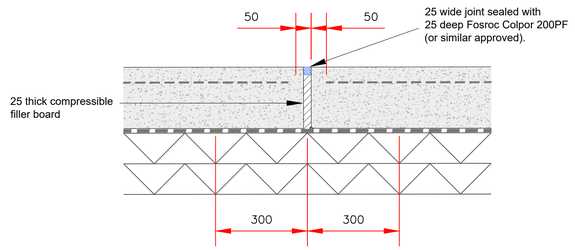
CONTRACTION JOINT (CJ)



TRIMMER BAR DETAIL FOR RE-ENTRANT CORNERS



INDUCED TIED JOINT (IJ)



ISOLATION JOINT (ISO)

REV	DATE	BY	DESCRIPTION	CHK	APD
A	18/10/21	CJ	ISSUED FOR CONSTRUCTION	NJS	NJS

DRAWING STATUS: PLANNING

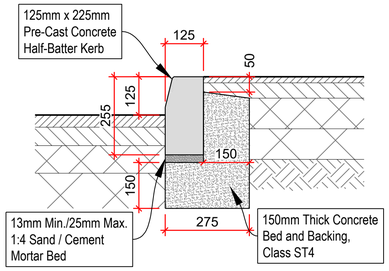
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CLIENT: Euro Garages

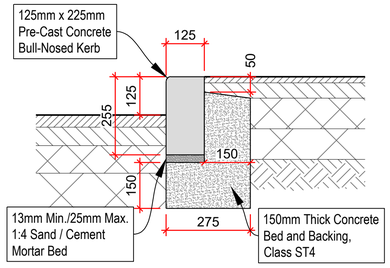
PROJECT: PROPOSED DEVELOPMENT

TITLE: STANDARD DETAILS
CONSTRUCTION JOINTS

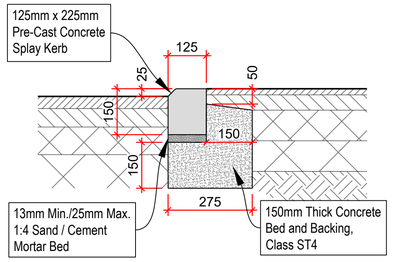
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CJ	NJS	NJS
PROJECT No:	DRAWING No:	REV:
SD	002	A



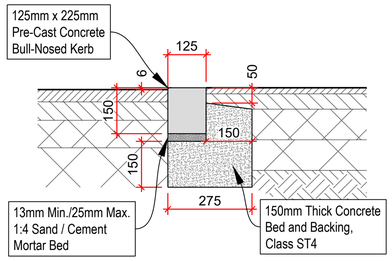
HALF-BATTER KERB - TYPICAL DETAIL



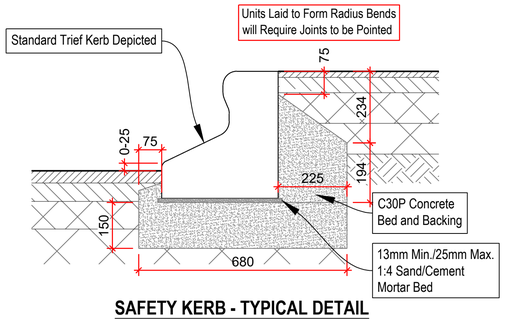
BULL-NOSE KERB - TYPICAL DETAIL



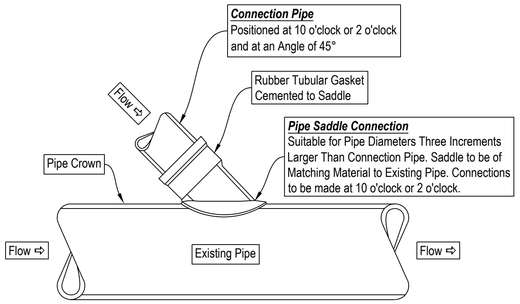
DROPPED KERB - TYPICAL DETAIL



DROPPED KERB - TYPICAL DETAIL



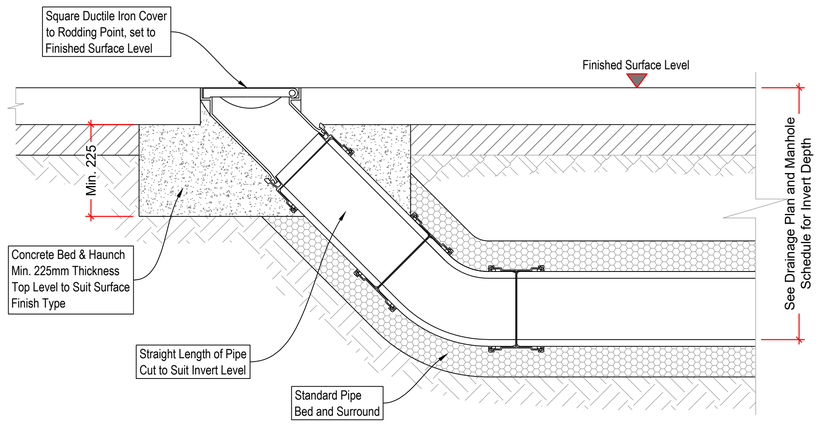
SAFETY KERB - TYPICAL DETAIL



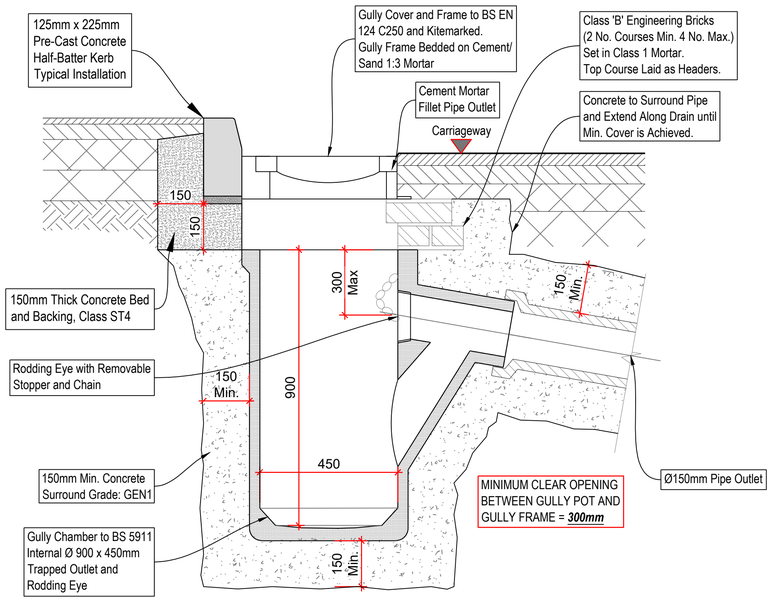
SADDLE CONNECTION - TYPICAL DETAIL

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

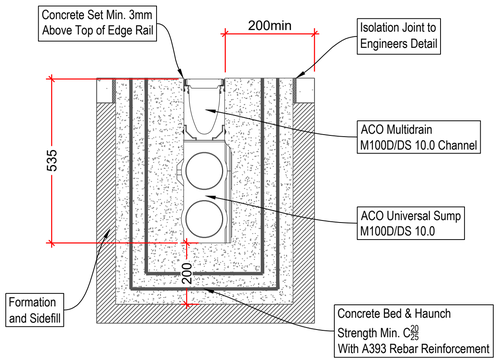
JUNCTION CONNECTION - TYPICAL DETAIL



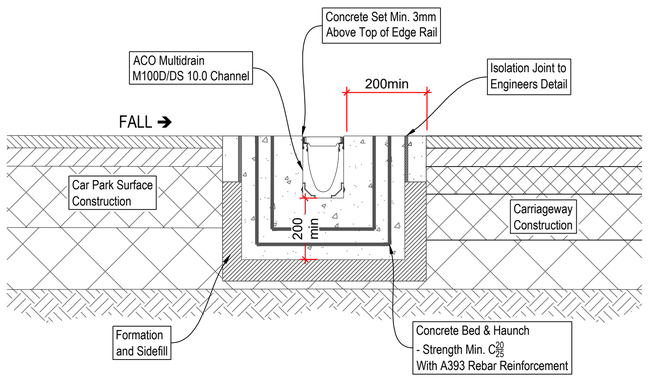
RODDING EYE - TYPICAL DETAIL



DRAINAGE GULLY - TYPICAL DETAIL



CHANNEL DRAIN SUMP - TYPICAL DETAIL



CHANNEL DRAIN - TYPICAL DETAIL

REV	DATE	BY	DESCRIPTION	CHK	APD
A	18/10/21	CJ	ISSUED FOR CONSTRUCTION	NJS	NJS

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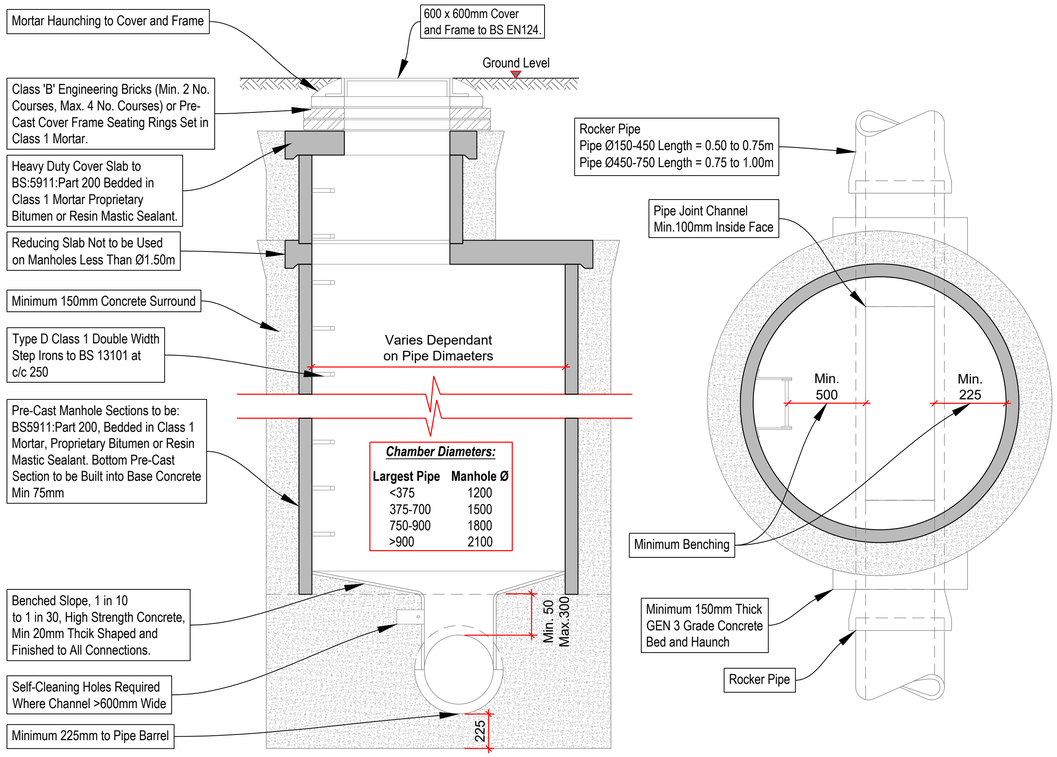
CLIENT: Euro Garages

PROJECT: PROPOSED DEVELOPMENT

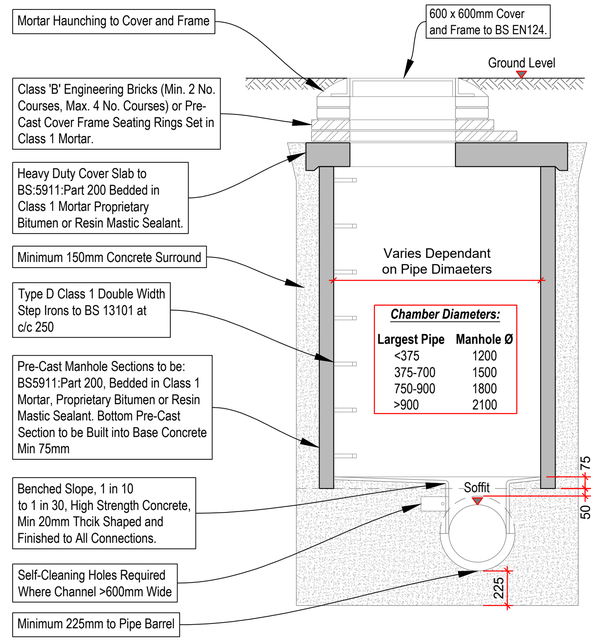
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DRAINAGE AND EXTERNAL DETAILS

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DRAWN: CJ	DRAWING CHECK: NJS	DESIGN CHECK: NJS

PROJECT No:	DRAWING No:	REV:
SD	003	A

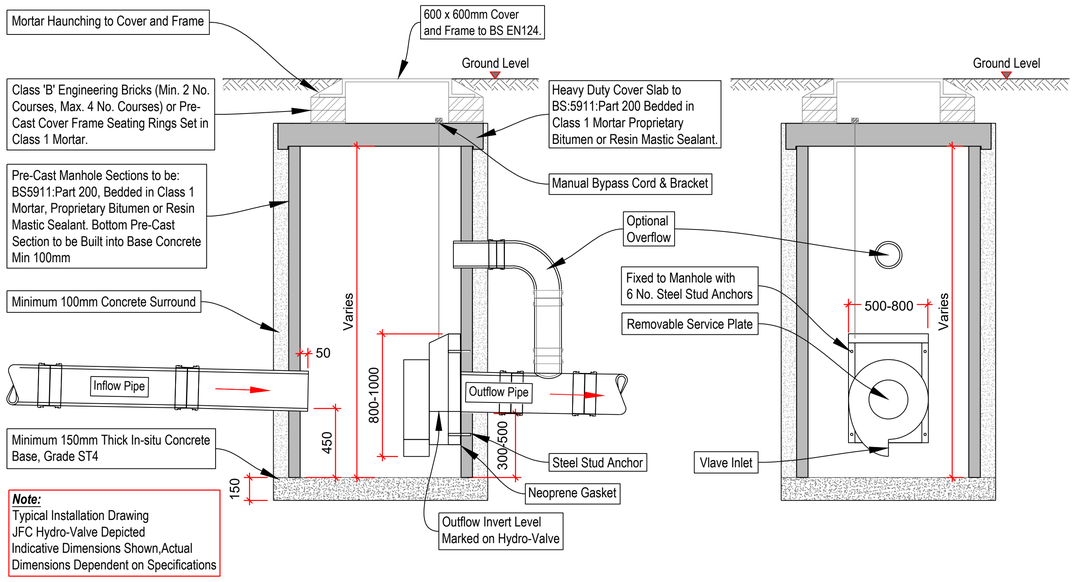


MANHOLE TYPE A - TYPICAL DETAILS



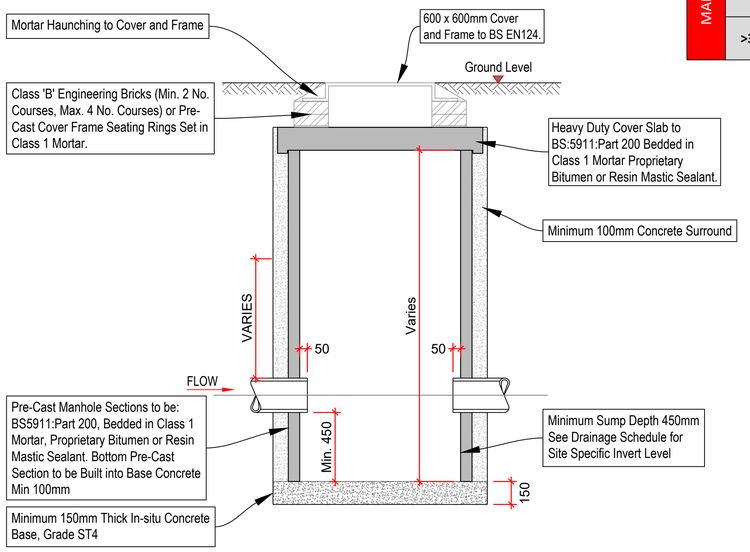
MANHOLE TYPE B - TYPICAL DETAILS

MANHOLE DEPTH TO SOFFIT		DIAMETERS AND OPENINGS: LARGEST PIPE Ø	MANHOLE INTERNAL Ø	MIN. CLEAR OPENING SIZE
<1500		150	1050	750 X 750
		300	1200	675 X 675 ECCENTRIC
		450	1350	675 X 675 ECCENTRIC
		700	1500	675 X 675
		900	1800	675 X 675
		1000	2100	675 X 675
		>1000	SEE SCHEDULE	750 X 675
>1500		100 - 450	1200	600 X 600
		>450	1800+	600 X 600
		>1000	SEE SCHEDULE	600 X 600
>3000		STEPS	1050	600 X 600
		LADDERS	1200	600 X 600



FLOW RESTRICTOR - TYPICAL SECTION DETAIL

FLOW RESTRICTOR - TYPICAL PROFILE DETAIL



CATCHPIT SECTION - TYPICAL DETAIL

REV	DATE	BY	DESCRIPTION	CHK	APD
A	18/10/21	CJ	ISSUED FOR CONSTRUCTION	NJS	NJS

DRAWING STATUS: PLANNING

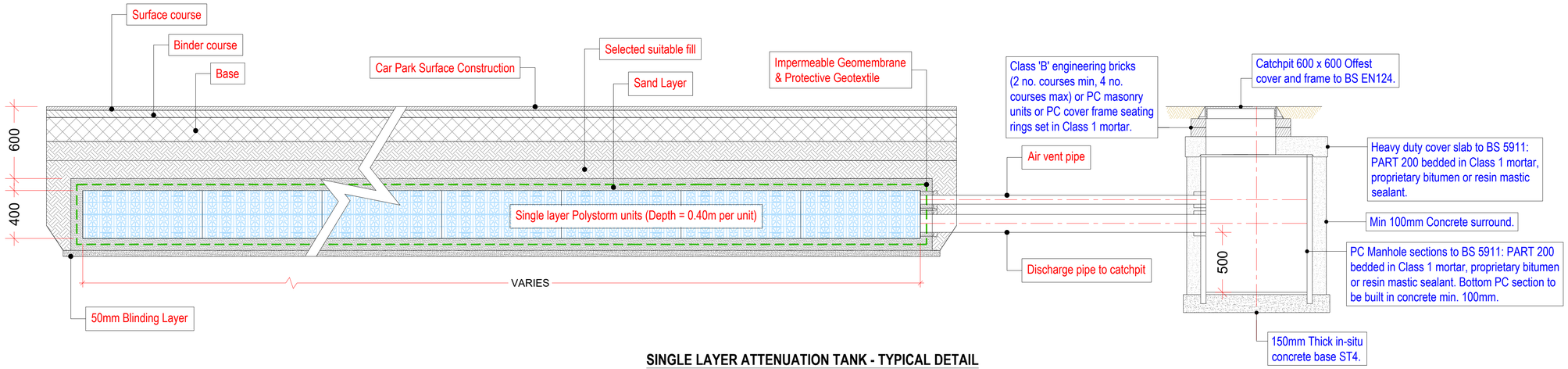
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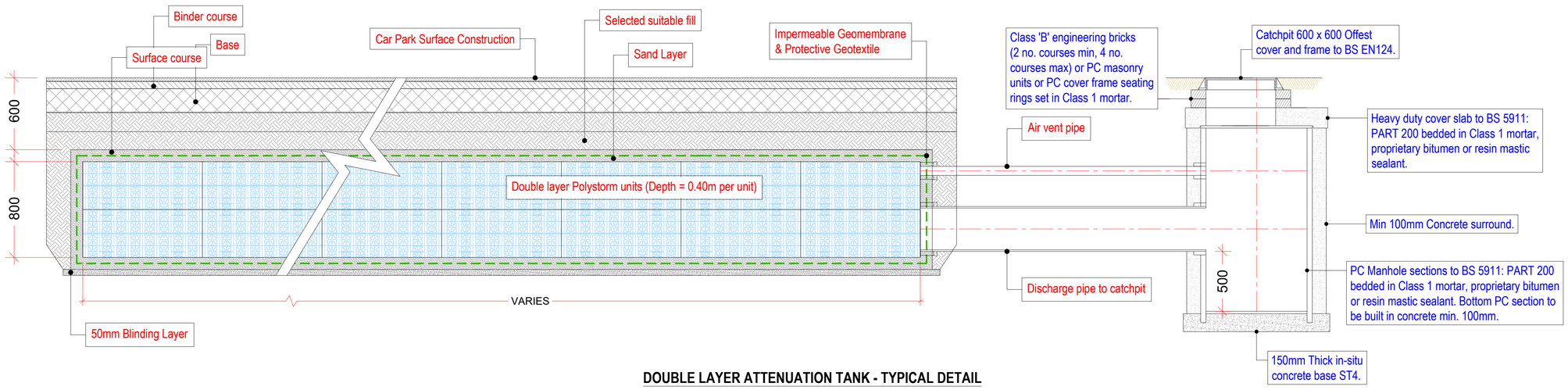
PROJECT: PROPOSED DEVELOPMENT

TITLE: STANDARD DETAILS MANHOLE CONSTRUCTION

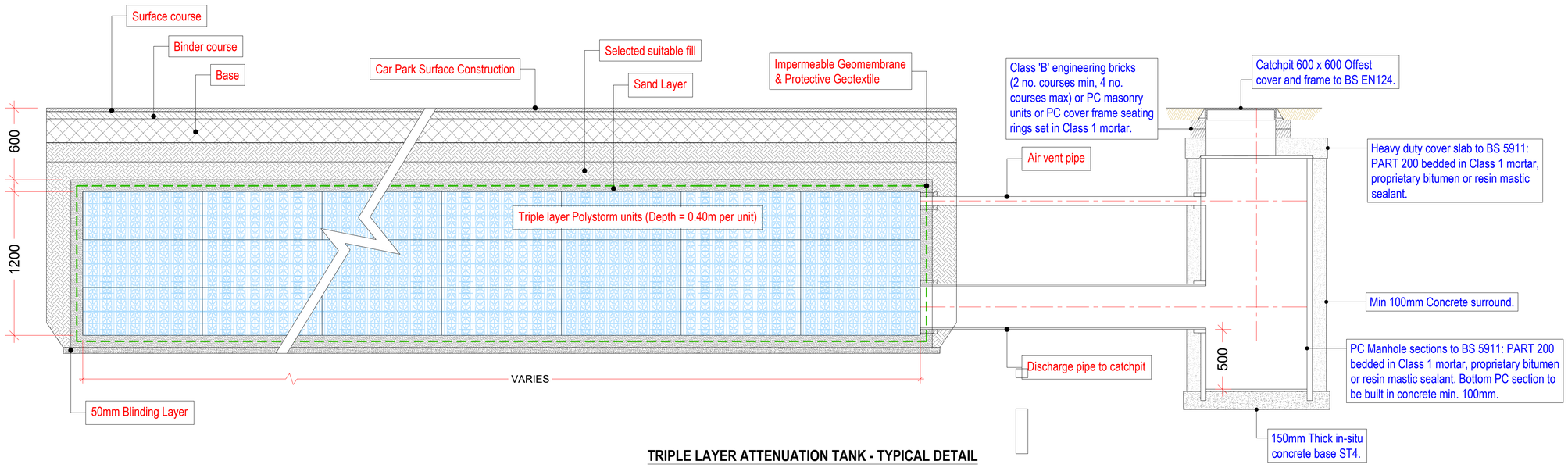
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DRAWN: CJ	DRAWING CHECK: NJS	DESIGN CHECK: NJS
PROJECT No: SD	DRAWING No: 004	REV: A



SINGLE LAYER ATTENUATION TANK - TYPICAL DETAIL



DOUBLE LAYER ATTENUATION TANK - TYPICAL DETAIL



TRIPLE LAYER ATTENUATION TANK - TYPICAL DETAIL

REV	DATE	BY	DESCRIPTION	CHK	APD
A	18/10/21	CJ	ISSUED FOR CONSTRUCTION	NJS	NJS

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CLIENT: Euro Garages

PROJECT: PROPOSED DEVELOPMENT

TITLE: STANDARD DETAILS ATTENUATION STORAGE

SCALE @ A1:	SCALE @ A1:	DATE:
NTS	A1	18/10/2021
DRAWN:	DRAWING CHECK:	DESIGN CHECK:
CJ	NJS	NJS
PROJECT No:	DRAWING No:	REV:
SD	005	A

Surface Water Flow Assessment

Site	ASDA Boldon		Date	08-Apr-22

	Existing		Proposed	
Total area =	875	m2	875	m2
Impermeable area flowing to Surface Water, Ap =	875	m2	875	m2
Roofs	0	m2	165	m2
Pavings	875	m2	710	m2
Landscape	0	m2	0	m2
Rainfall intensity, R=	50	mm/hr		
where R				
Runoff, Q = 2.78*Ap*R	12.2	l/s		
Required runoff reduction=	30	%		
Allowable discharge =	8.5	l/s		

Client:	EG Group
Project:	ASDA Boldon
Location:	Gateshead
Catchment:	

Catchment Details:

Buildings	165 m²	x 95 %
Dense surfacing	710 m²	x 90 %
Effective Area	795.75 m²	

Storage Details:

Length	10 m
Width	10 m
Depth	1 m
Porosity	100 %
Area Increase	0 %

Rainfall Details - FSR Method:

Return Period	100 years
Climate Change Factor	30 %
r value	0.35
M5-60	18 mm
Summer Storm Profile	

Duration	Intensity		Required
	mm	mm/h	storage(m³)
5 min	14.7	176.2	10.959
10 min	22.2	133.0	15.624
15 min	27.3	109.1	18.214
30 min	36.7	73.4	21.644
45 min	42.7	56.9	23.166
60 min	47.2	47.2	23.866
2 hours	58.7	29.4	23.660
6 hours	78.2	13.0	17.302
24 hours	108.2	4.5	7.594

Outflow Details:

Infiltration rate	0 m/hr
Attenuation Control	Orifice Plate
Control Diameter	94 mm
Discharge rate	8.4 l/s

Result:

Outcome	Pass
Critical Storm Duration	1.37 hrs
Hmax	0.241 m
Required Volume	24.141 m³
Time to half empty	23.9 min

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Adoptable Manhole Type

Max Width (mm)	Diameter (mm)	Max Width (mm)	Diameter (mm)	Max Width (mm)	Diameter (mm)	Max Width (mm)	Diameter (mm)
374	1200	499	1350	749	1500	900	1800

>900 Link+900 mm

Max Depth (m)	Diameter (mm)	Max Depth (m)	Diameter (mm)
1.500	1050	99.999	1200

Nodes

	Name	Area (ha)	T of E (mins)	Cover Level (m)	Node Type	Manhole Type	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
✓	S10	0.020	4.00	29.650	Manhole	Adoptable	1200	434378.534	561633.525	0.950
✓	S20	0.015	4.00	29.650	Manhole	Adoptable	1500	434373.122	561628.429	0.998
✓	S30	0.050	4.00	29.650	Manhole	Adoptable	1200	434379.037	561616.852	1.085
✓	S40			29.550	Manhole	Adoptable	1200	434413.321	561634.369	1.306
✓	S50			29.650	Manhole	Adoptable	1200	434405.814	561649.062	1.587
✓	OUTFALL			29.500	Manhole	Adoptable	1200	434416.556	561654.551	1.483
✓	ATT		4.00	29.550	Manhole	Adoptable	1200	434407.027	561648.635	1.486

Links (Input)

	Name	US Node	DS Node	Length (m)	ks (mm) / n	Velocity Equation	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	Link Type	T of C (mins)	Rain (mm/hr)
✓	1.001	S10	S20	7.434	0.600	Colebrook-White	28.700	28.652	0.048	154.9	150	Circular	4.15	50.8
✓	1.002	S20	S30	13.001	0.600	Colebrook-White	28.652	28.565	0.087	150.0	150	Circular	4.42	49.6
✓	1.003	S30	S40	38.500	0.600	Colebrook-White	28.565	28.319	0.246	156.5	150	Circular	5.22	46.5
✓	1.004	S40	S50	16.500	0.600	Colebrook-White	28.244	28.134	0.110	150.0	225	Circular	5.48	45.6
✓	1.005	S50	OUTFALL	12.063	0.600	Colebrook-White	28.063	28.017	0.046	262.2	225	Circular	5.73	44.8
✓	1.006	ATT	S50	1.286	0.600	Colebrook-White	28.064	28.063	0.001	1286.0	300	Circular	4.05	51.2

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Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Node Type	MH Type	Connections	Link	IL (m)	Dia (mm)	Link Type
S10	434378.534	561633.525	29.650	0.950	1200	Manhole	Adoptable	 0				
								0	1.001	28.700	150	Circular
S20	434373.122	561628.429	29.650	0.998	1500	Manhole	Adoptable	1	1.001	28.652	150	Circular
								 0				
								0	1.002	28.652	150	Circular
S30	434379.037	561616.852	29.650	1.085	1200	Manhole	Adoptable	1	1.002	28.565	150	Circular
												
								0	1.003	28.565	150	Circular
S40	434413.321	561634.369	29.550	1.306	1200	Manhole	Adoptable	1	1.003	28.319	150	Circular
												
								0	1.004	28.244	225	Circular
S50	434405.814	561649.062	29.650	1.587	1200	Manhole	Adoptable	1	1.006	28.063	300	Circular
								2	1.004	28.134	225	Circular
								 0				
								0	1.005	28.063	225	Circular
OUTFALL	434416.556	561654.551	29.500	1.483	1200	Manhole	Adoptable	1	1.005	28.017	225	Circular
												
ATT	434407.027	561648.635	29.550	1.486	1200	Manhole	Adoptable	 0				
								0	1.006	28.064	300	Circular

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Node S50 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	28.063	Product Number	CTL-SHE-0132-8500-1200-8500
Design Depth (m)	1.200	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	8.5	Min Node Diameter (mm)	1200

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Results for 30 year +30% CC Critical Storm Duration. Lowest mass balance: 99.76%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S10	12	29.265	0.565	8.6	0.8768	0.0000	SURCHARGED
15 minute winter	S20	12	29.254	0.602	11.5	1.2458	0.0000	SURCHARGED
15 minute winter	S30	12	29.202	0.637	27.9	1.3082	0.0000	SURCHARGED
15 minute winter	S40	12	28.373	0.129	24.0	0.1459	0.0000	OK
60 minute winter	S50	45	28.246	0.183	17.7	0.2073	0.0000	OK
15 minute summer	OUTFALL	1	28.017	0.000	7.6	0.0000	0.0000	OK
60 minute winter	ATT	45	28.246	0.182	11.1	13.8838	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	S10	1.001	S20	5.6	0.581	0.396	0.1309	
15 minute winter	S20	1.002	S30	11.2	0.639	0.778	0.2289	
15 minute winter	S30	1.003	S40	24.0	1.363	1.696	0.6642	
15 minute winter	S40	1.004	S50	24.0	1.066	0.567	0.3718	
60 minute winter	S50	Hydro-Brake®	OUTFALL	7.9				27.9
60 minute winter	ATT	1.006	S50	-11.1	-0.844	-0.365	0.0578	

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CAUSEWAY	Saldanha Design & Management	File: FLOW - Bolden.pfd Network: Storm Simon Evans 19/04/2022	Page 5

Results for 100 year +30% CC Critical Storm Duration. Lowest mass balance: 99.76%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S10	12	29.650	0.950	11.2	1.4744	0.0719	FLOOD
15 minute winter	S20	12	29.641	0.989	13.5	2.0450	0.0000	FLOOD RISK
15 minute winter	S30	12	29.574	1.009	33.5	2.0720	0.0000	FLOOD RISK
15 minute winter	S40	12	28.390	0.146	29.0	0.1655	0.0000	OK
60 minute winter	S50	49	28.324	0.261	22.4	0.2950	0.0000	SURCHARGED
15 minute summer	OUTFALL	1	28.017	0.000	7.6	0.0000	0.0000	OK
60 minute winter	ATT	47	28.323	0.259	14.3	19.7347	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	S10	1.001	S20	6.8	0.564	0.475	0.1309	
15 minute winter	S20	1.002	S30	13.8	0.785	0.956	0.2289	
15 minute winter	S30	1.003	S40	29.0	1.649	2.052	0.6709	
15 minute winter	S40	1.004	S50	29.0	1.110	0.685	0.4309	
60 minute winter	S50	Hydro-Brake®	OUTFALL	8.4				36.9
60 minute winter	ATT	1.006	S50	-14.3	-0.835	-0.471	0.0833	

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