

Project Name : Yapton Metal Company, Burndell Road, Yapton
Job No : 19-167
Note Title : Drainage Strategy Technical Note
Author : SG
Checked : LH
Approved : LH
Date : September 2020

1.0 INTRODUCTION

- 1.1 Odyssey has been instructed by Lakewood Homes to prepare this drainage technical note in support of their Planning application for the 4-unit residential development at Burndell Road, Yapton.
- 1.2 The description of the development at Planning was:
- ‘4 No. dwellings with associated ancillary services and access (resubmission following Y/108/15/PL. This application affects the setting of a Listed Building_
- 1.3 The aim of this report is to support the discharge of Conditions 3 and 4, which are set out below.

Condition 3

‘Development shall not commence until full details of the proposed surface water drainage scheme have been submitted to and approved in writing by the Local Planning Authority._

Condition 4

‘Development shall not commence until full details of the maintenance and management of the SuDS system is set out in a site-specific maintenance manual and submitted to, and approved in writing, by the Local Planning Authority. The manual is to include (a) details of financial management of the site including arrangement made in the event that the management company (or any subsequent management company) is no longer able to fulfil its duties; and (b) arrangements for the replacement of major components at the end of the manufacturers recommended design life._

2.0 EXISTING SITE

- 2.1 The proposed development site is a former scrap metal yard comprising of storage buildings, an area of hard standing, a car park and an area of green space formerly used by the listed cottage.
- 2.2 The site is bounded to the north by Burndell Road, residential dwellings to the east and south and an access road leading to a new residential development to the west.
- 2.3 The topographical survey shows the site to be generally flat with a slight fall from west to north-east. Levels range from 7.33m in the west to 6.44m in the north-east.
- 2.4 The existing drainage regime has not been confirmed but with no drainage features shown on the topographical survey, it is assumed that areas of existing hard standing drain to surrounding green areas.
- 2.5 Sewer records obtained from Southern Water indicate that there are no public surface water sewers in close proximity to the site.
- 2.6 Existing geology maps and further trial pit testing has proven that the underlying geology consists predominantly of sandy, gravelly clay above the Upper Chalk Formation. A mantle of Made Ground was also encountered overlying the natural strata in each trial pit.

3.0 SURFACE WATER DRAINAGE STRATEGY

- 3.1 The surface water drainage strategy for the proposed development is shown on the drawing listed below which can be found in Appendix A:

18-167/001 - Surface Water Drainage Strategy

- 3.2 It is proposed that the parking court area serving the 4 units be constructed as infiltrating permeable paving. Run off from roof areas and other non-porous surfaces will be collected and discharged into the base of the permeable paving via diffuser units. A surface water catchment plan showing the impermeable areas can be found within Appendix B.
- 3.3 The surface water drainage system has been designed to accommodate all rainfall events up to the 1 in 100 year event plus climate change (40%). Supporting calculations can be found within Appendix C.
- 3.4 During extreme events, excess flood water will be conveyed within the parking area to the sites access road south-west of the site. The overland flow routes can be found on drawing 19-167/003 in Appendix D.
- 3.5 Recent soakage testing undertaken by Geo-Environmental in February 2020, and in July 2019, recorded infiltration rates ranging from 6.8×10^{-6} m/s to 1.2×10^{-6} m/s. The worst case rate of 1.2×10^{-6} m/s recorded during testing in July 2019 has been used for this site.
- 3.6 Winter groundwater monitoring has been undertaken from the period of October 2019 to February 2020 to establish the peak annual groundwater level. Data obtained shows a maximum recorded elevation of 1.35m bgl which equates to a groundwater level of 5.850mAOD based on the topographical survey for the site. With the base of the permeable paving at 6.300mAOD, this would provide clearance to groundwater and ensure infiltration into the strata below.
- 3.7 Surface water treatment will be provided by the permeable paving via both the grit layer and geotextile that the blocks are bedded on, as well as the underlying gravel media comprising of washed no-fines material. These measures will provide filtration and the breakdown of hydrocarbons as the water is conveyed through the system and into the strata below. A detail showing the proposed construction of the paving is shown on drawing 19-167/004 in Appendix E.

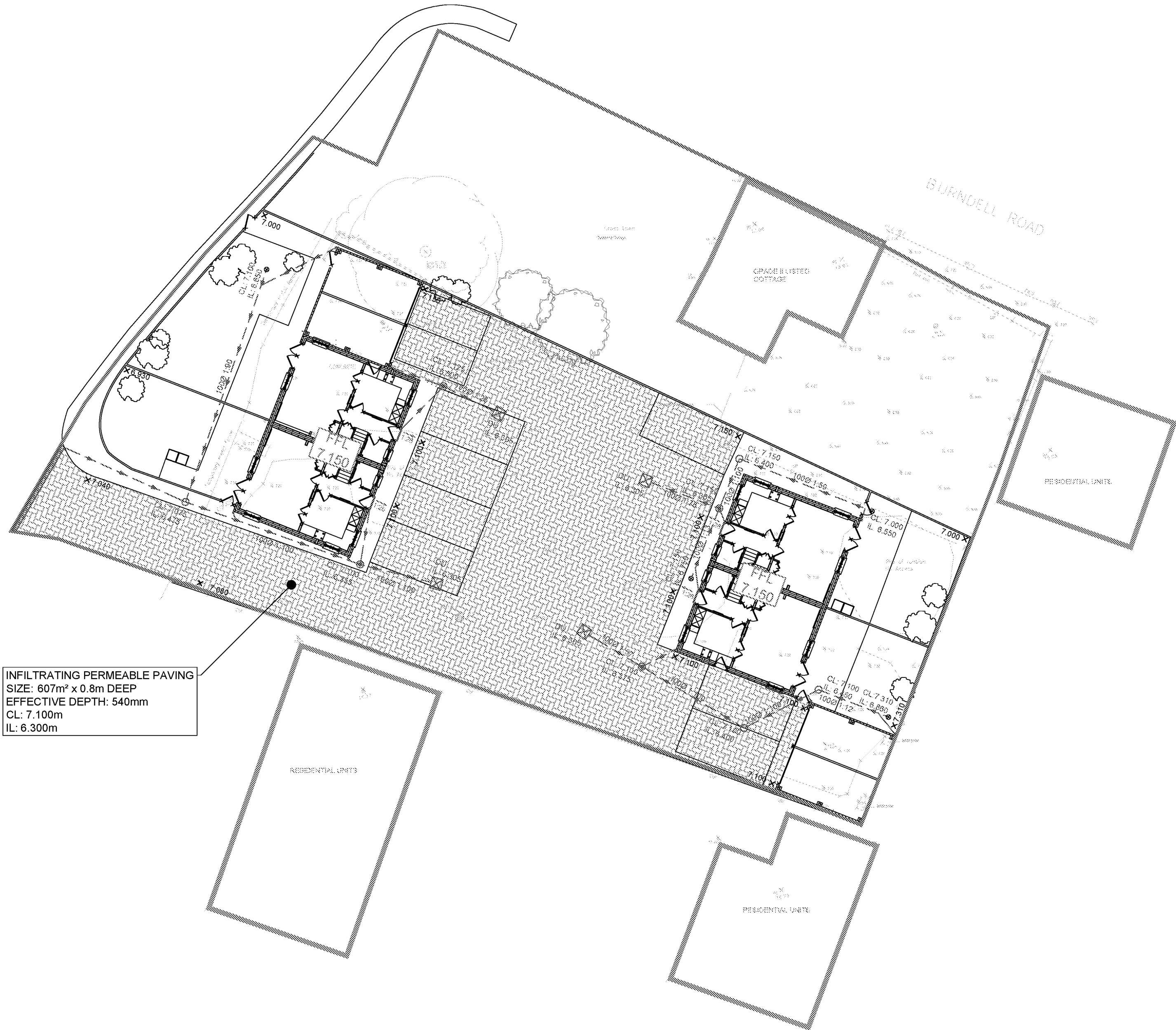
- 3.8 The details for the maintenance and management of the surface water network and SuDS features is covered under a separate report (Odyssey Report reference 19-197-02 Management & Maintenance Manual).
- 3.9 A completed Arun District Council surface water drainage proposal checklist is provided in Appendix F.

4.0 CONCLUSION

- 4.1 This technical note has provided details of the proposed surface water drainage system within the proposed development at the Yapton Metal Company site in Burndell Road, Yapton.
- 4.2 This technical note, combined with other documents submitted as part of the Planning application provides the detail required to discharge Conditions 3 and 4.
- 4.3 This note has demonstrated how the proposals accord with the local planning policies with regards to surface water drainage.

APPENDIX A

Odyssey Surface Water Drainage Strategy



INFILTRATING PERMEABLE PAVING
SIZE: 607m² x 0.8m DEEP
EFFECTIVE DEPTH: 540mm
CL: 7.100m
IL: 6.300m

FOR PLANNING
PURPOSES ONLY

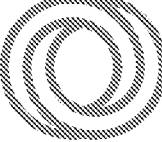
NOTES

- DO NOT SCALE FROM THIS DRAWING. WORK FROM FIGURED DIMENSIONS ONLY.
- ALL DIMENSIONS SHOWN ON THIS DRAWING ARE IN METRES.
- THIS DRAWING IS A PRELIMINARY REVIEW ONLY AND SUBJECT TO DETAILED DESIGN.
- TOPOGRAPHICAL SURVEY HAS BEEN TAKEN FROM ARCHIDATA LIMITED DRAWING AD19080_1_01, DATED APRIL 19'.
- PROPOSED SITE LAYOUT HAS BEEN PROVIDED BY LAKEWOOD HOMES.
- ODYSSEY ACCEPT NO LIABILITY FOR THE ACCURACY OF SURVEY INFORMATION AND LAYOUTS SUPPLIED BY OTHERS.
- INFILTRATING SUDS HAVE BEEN DESIGNED USING THE LOWEST RECORDED SOAKAGE RATE OF 1.2 x 10⁻⁶ FROM TESTING UNDERTAKEN IN JULY 2019 AND FEBRUARY 2020 BY GEO-ENVIRONMENTAL SERVICES LIMITED.
- WINTER GROUNDWATER MONITORING RECORDED A MAXIMUM GROUNDWATER LEVEL OF 1.35m bgl WHICH EQUATES TO 5.85mAOD BASED ON THE TOPOGRAPHICAL SURVEY FOR THE SITE.
- ALL SURFACE WATER PIPEWORK IS TO BE PVC-U PIPE CONFORMING TO BS EN 13476 -1:2018
- FOR CHAMBER COVER TYPES AND DETAILS, REFER TO ODYSSEY DRAWING 19-167/004.

LEGEND

- DEVELOPMENT BOUNDARY
- PROPOSED INFILTRATING PERMEABLE PAVING
- PROPOSED SURFACE WATER CHAMBER
- PROPOSED SURFACE WATER PIPE
- PROPOSED DIFFUSER UNIT
- PROPOSED LINEAR DRAINAGE CHANNEL
- PROPOSED CATCHPIT
- PROPOSED RODDING EYE
- PROPOSED FINISHED FLOOR LEVEL
- PROPOSED GROUND LEVEL

C	NOTES ADDED	SG	LH	LH	10.09.20
B	UPDATED TO SUIT DRAINAGE OFFICER COMMENTS	LP	LH	LH	28.08.20
A	NOTES UPDATED	JA	SG	LH	17.03.20
Rev	Amendments	Drn	Chk	App	Date



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Job Title

**YAPTON METAL COMPANY,
BURNDILL ROAD, YAPTON**

Drawing Title

**SURFACE WATER
DRAINAGE STRATEGY**

Client

LAKEWOOD HOMES

Scale	Date	Designed
1:200 @ A2	AUG 19	SG
Drawn	Checked	Approved
JA	SG	LH
Job No	Drawing No	Rev
19-167	19-167/001	C

APPENDIX B

Odyssey Catchment Plan



- NOTES
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 - PROPOSED SITE LAYOUT HAS BEEN PROVIDED BY LAKEWOOD HOMES.
 - FOR SURFACE WATER DRAINAGE STRATEGY REFER TO ODYSSEY DRAWING 19-167/001.

- LEGEND
- ROOF/ HARD LANDSCAPING
TOTAL AREA = 341m²
 - PERMEABLE PAVING
TOTAL AREA = 607m²
 - PROPOSED SURFACE WATER CHAMBER
 - PROPOSED SURFACE WATER PIPE
 - PROPOSED DIFFUSER UNIT
 - PROPOSED LINEAR DRAINAGE CHANNEL
 - PROPOSED CATCHPIT
 - PROPOSED RODDING EYE

FOR PLANNING
PURPOSES ONLY

A	DRAINAGE LAYOUT UPDATED	SG	LH	LH	10.09.20
Rev	Amendments	Drm	Chk	App	Date

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SURFACE WATER
CATCHMENT PLAN

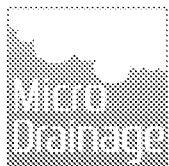
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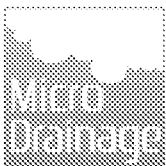
LAKEWOOD HOMES

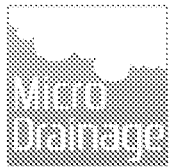
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1:200 @ A2	AUG 19	SG
Drawn	Checked	Approved
JA	SG	LH
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APPENDIX C

Microdrainage Calculations

Odyssey Markides LLP				Page 1																																																																																																																																																																																																																			
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<u>Summary of Results for 10 year Return Period (+40%)</u> Half Drain Time : 877 minutes. <table><thead><tr><th>Storm Event</th><th>Max Level (m)</th><th>Max Depth (m)</th><th>Max Infiltration (l/s)</th><th>Max Volume (m³)</th><th>Status</th></tr></thead><tbody><tr><td>15 min Summer</td><td>6.353</td><td>0.053</td><td>0.4</td><td>9.6</td><td>O K</td></tr><tr><td>30 min Summer</td><td>6.370</td><td>0.070</td><td>0.4</td><td>12.7</td><td>O K</td></tr><tr><td>60 min Summer</td><td>6.391</td><td>0.091</td><td>0.4</td><td>16.5</td><td>O K</td></tr><tr><td>120 min Summer</td><td>6.415</td><td>0.115</td><td>0.4</td><td>21.0</td><td>O K</td></tr><tr><td>180 min Summer</td><td>6.431</td><td>0.131</td><td>0.4</td><td>23.8</td><td>O K</td></tr><tr><td>240 min Summer</td><td>6.442</td><td>0.142</td><td>0.4</td><td>25.9</td><td>O K</td></tr><tr><td>360 min Summer</td><td>6.458</td><td>0.158</td><td>0.4</td><td>28.7</td><td>O K</td></tr><tr><td>480 min Summer</td><td>6.468</td><td>0.168</td><td>0.4</td><td>30.5</td><td>O K</td></tr><tr><td>600 min Summer</td><td>6.474</td><td>0.174</td><td>0.4</td><td>31.7</td><td>O K</td></tr><tr><td>720 min Summer</td><td>6.479</td><td>0.179</td><td>0.4</td><td>32.6</td><td>O K</td></tr><tr><td>960 min Summer</td><td>6.476</td><td>0.176</td><td>0.4</td><td>32.0</td><td>O K</td></tr><tr><td>1440 min Summer</td><td>6.469</td><td>0.169</td><td>0.4</td><td>30.8</td><td>O K</td></tr><tr><td>2160 min Summer</td><td>6.457</td><td>0.157</td><td>0.4</td><td>28.6</td><td>O K</td></tr><tr><td>2880 min Summer</td><td>6.444</td><td>0.144</td><td>0.4</td><td>26.2</td><td>O K</td></tr><tr><td>4320 min Summer</td><td>6.433</td><td>0.133</td><td>0.4</td><td>24.2</td><td>O K</td></tr><tr><td>5760 min Summer</td><td>6.420</td><td>0.120</td><td>0.4</td><td>21.9</td><td>O K</td></tr><tr><td>7200 min Summer</td><td>6.407</td><td>0.107</td><td>0.4</td><td>19.5</td><td>O K</td></tr><tr><td>8640 min Summer</td><td>6.395</td><td>0.095</td><td>0.4</td><td>17.3</td><td>O K</td></tr><tr><td>10080 min Summer</td><td>6.384</td><td>0.084</td><td>0.4</td><td>15.3</td><td>O K</td></tr><tr><td>15 min Winter</td><td>6.361</td><td>0.061</td><td>0.4</td><td>11.1</td><td>O K</td></tr></tbody></table> <table><thead><tr><th>Storm Event</th><th>Rain (mm/hr)</th><th>Flooded Volume (m³)</th><th>Time-Peak (mins)</th></tr></thead><tbody><tr><td>15 min Summer</td><td>72.148</td><td>0.0</td><td>19</td></tr><tr><td>30 min Summer</td><td>45.463</td><td>0.0</td><td>33</td></tr><tr><td>60 min Summer</td><td>28.648</td><td>0.0</td><td>64</td></tr><tr><td>120 min Summer</td><td>18.052</td><td>0.0</td><td>122</td></tr><tr><td>180 min Summer</td><td>13.779</td><td>0.0</td><td>182</td></tr><tr><td>240 min Summer</td><td>11.375</td><td>0.0</td><td>242</td></tr><tr><td>360 min Summer</td><td>8.683</td><td>0.0</td><td>362</td></tr><tr><td>480 min Summer</td><td>7.168</td><td>0.0</td><td>480</td></tr><tr><td>600 min Summer</td><td>6.178</td><td>0.0</td><td>600</td></tr><tr><td>720 min Summer</td><td>5.471</td><td>0.0</td><td>672</td></tr><tr><td>960 min Summer</td><td>4.332</td><td>0.0</td><td>778</td></tr><tr><td>1440 min Summer</td><td>3.118</td><td>0.0</td><td>1024</td></tr><tr><td>2160 min Summer</td><td>2.244</td><td>0.0</td><td>1428</td></tr><tr><td>2880 min Summer</td><td>1.777</td><td>0.0</td><td>1840</td></tr><tr><td>4320 min Summer</td><td>1.363</td><td>0.0</td><td>2636</td></tr><tr><td>5760 min Summer</td><td>1.130</td><td>0.0</td><td>3408</td></tr><tr><td>7200 min Summer</td><td>0.977</td><td>0.0</td><td>4176</td></tr><tr><td>8640 min Summer</td><td>0.867</td><td>0.0</td><td>4920</td></tr><tr><td>10080 min Summer</td><td>0.784</td><td>0.0</td><td>5640</td></tr><tr><td>15 min Winter</td><td>72.148</td><td>0.0</td><td>19</td></tr></tbody></table>						Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status	15 min Summer	6.353	0.053	0.4	9.6	O K	30 min 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Tuscany House White Hart Lane Basingstoke RG21 4AF		Yapton Metal Company Burndell Road Yapton			
Date 09/09/2020 15:51 File 19-167 PAVING (10YR + 4...		Designed by SG Checked by LH			
Micro Drainage		Source Control 2020.1			
<u>Summary of Results for 10 year Return Period (+40%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	6.381	0.081	0.4	14.7	O K
60 min Winter	6.404	0.104	0.4	19.0	O K
120 min Winter	6.432	0.132	0.4	24.0	O K
180 min Winter	6.450	0.150	0.4	27.3	O K
240 min Winter	6.463	0.163	0.4	29.6	O K
360 min Winter	6.481	0.181	0.4	33.0	O K
480 min Winter	6.493	0.193	0.4	35.2	O K
600 min Winter	6.502	0.202	0.4	36.8	O K
720 min Winter	6.508	0.208	0.4	37.9	O K
960 min Winter	6.504	0.204	0.4	37.1	O K
1440 min Winter	6.493	0.193	0.4	35.1	O K
2160 min Winter	6.475	0.175	0.4	31.9	O K
2880 min Winter	6.456	0.156	0.4	28.3	O K
4320 min Winter	6.434	0.134	0.4	24.5	O K
5760 min Winter	6.412	0.112	0.4	20.4	O K
7200 min Winter	6.391	0.091	0.4	16.5	O K
8640 min Winter	6.373	0.073	0.4	13.2	O K
10080 min Winter	6.359	0.059	0.4	10.7	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)		
30 min Winter	45.463	0.0	33		
60 min Winter	28.648	0.0	62		
120 min Winter	18.052	0.0	120		
180 min Winter	13.779	0.0	180		
240 min Winter	11.375	0.0	238		
360 min Winter	8.683	0.0	354		
480 min Winter	7.168	0.0	468		
600 min Winter	6.178	0.0	580		
720 min Winter	5.471	0.0	690		
960 min Winter	4.332	0.0	896		
1440 min Winter	3.118	0.0	1110		
2160 min Winter	2.244	0.0	1560		
2880 min Winter	1.777	0.0	1992		
4320 min Winter	1.363	0.0	2852		
5760 min Winter	1.130	0.0	3632		
7200 min Winter	0.977	0.0	4328		
8640 min Winter	0.867	0.0	5016		
10080 min Winter	0.784	0.0	5648		
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Tuscany House White Hart Lane Basingstoke RG21 4AF	Yapton Metal Company Burndell Road Yapton	
Date 09/09/2020 15:51 File 19-167 PAVING (10YR + 4...	Designed by SG Checked by LH	
Micro Drainage Source Control 2020.1		

Rainfall Details

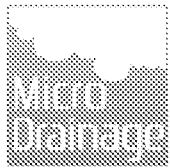
Rainfall Model	FEH
Return Period (years)	10
FEH Rainfall Version	1999
Site Location	GB 498650 101750 SU 98650 01750
C (1km)	-0.025
D1 (1km)	0.390
D2 (1km)	0.245
D3 (1km)	0.403
E (1km)	0.310
F (1km)	2.321
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40

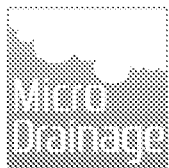
Time Area Diagram

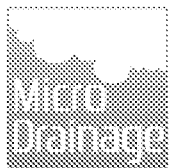
Total Area (ha) 0.095

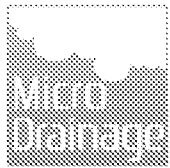
Time (mins)	Area
From:	To: (ha)
0	4 0.095

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Tuscany House White Hart Lane Basingstoke RG21 4AF	Yapton Metal Company Burndell Road Yapton																									
Date 09/09/2020 15:51 File 19-167 PAVING (10YR + 4...	Designed by SG Checked by LH																									
Micro Drainage Source Control 2020.1																										
<u>Model Details</u> Storage is Online Cover Level (m) 7.100 <u>Porous Car Park Structure</u> <table> <tr> <td>Infiltration Coefficient Base (m/hr)</td> <td>0.00432</td> <td>Width (m)</td> <td>10.0</td> </tr> <tr> <td>Membrane Percolation (mm/hr)</td> <td>1000</td> <td>Length (m)</td> <td>60.7</td> </tr> <tr> <td>Max Percolation (l/s)</td> <td>168.6</td> <td>Slope (1:X)</td> <td>0.0</td> </tr> <tr> <td>Safety Factor</td> <td>2.0</td> <td>Depression Storage (mm)</td> <td>5</td> </tr> <tr> <td>Porosity</td> <td>0.30</td> <td>Evaporation (mm/day)</td> <td>3</td> </tr> <tr> <td>Invert Level (m)</td> <td>6.300</td> <td>Membrane Depth (m)</td> <td>260</td> </tr> </table>			Infiltration Coefficient Base (m/hr)	0.00432	Width (m)	10.0	Membrane Percolation (mm/hr)	1000	Length (m)	60.7	Max Percolation (l/s)	168.6	Slope (1:X)	0.0	Safety Factor	2.0	Depression Storage (mm)	5	Porosity	0.30	Evaporation (mm/day)	3	Invert Level (m)	6.300	Membrane Depth (m)	260
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Summer</td><td>6.648</td><td>0.348</td><td>0.4</td><td>63.5</td><td>O K</td></tr><tr><td>600 min Summer</td><td>6.662</td><td>0.362</td><td>0.4</td><td>66.0</td><td>O K</td></tr><tr><td>720 min Summer</td><td>6.673</td><td>0.373</td><td>0.4</td><td>67.9</td><td>O K</td></tr><tr><td>960 min Summer</td><td>6.667</td><td>0.367</td><td>0.4</td><td>66.8</td><td>O K</td></tr><tr><td>1440 min Summer</td><td>6.647</td><td>0.347</td><td>0.4</td><td>63.2</td><td>O K</td></tr><tr><td>2160 min Summer</td><td>6.621</td><td>0.321</td><td>0.4</td><td>58.4</td><td>O K</td></tr><tr><td>2880 min Summer</td><td>6.598</td><td>0.298</td><td>0.4</td><td>54.3</td><td>O K</td></tr><tr><td>4320 min Summer</td><td>6.584</td><td>0.284</td><td>0.4</td><td>51.7</td><td>O K</td></tr><tr><td>5760 min Summer</td><td>6.567</td><td>0.267</td><td>0.4</td><td>48.6</td><td>O K</td></tr><tr><td>7200 min Summer</td><td>6.548</td><td>0.248</td><td>0.4</td><td>45.2</td><td>O K</td></tr><tr><td>8640 min Summer</td><td>6.529</td><td>0.229</td><td>0.4</td><td>41.8</td><td>O K</td></tr><tr><td>10080 min Summer</td><td>6.511</td><td>0.211</td><td>0.4</td><td>38.5</td><td>O K</td></tr><tr><td>15 min Winter</td><td>6.459</td><td>0.159</td><td>0.4</td><td>29.0</td><td>O K</td></tr></tbody></table> <table><thead><tr><th>Storm Event</th><th>Rain (mm/hr)</th><th>Flooded Volume (m³)</th><th>Time-Peak (mins)</th></tr></thead><tbody><tr><td>15 min Summer</td><td>162.161</td><td>0.0</td><td>19</td></tr><tr><td>30 min Summer</td><td>98.106</td><td>0.0</td><td>34</td></tr><tr><td>60 min Summer</td><td>59.354</td><td>0.0</td><td>64</td></tr><tr><td>120 min Summer</td><td>35.909</td><td>0.0</td><td>124</td></tr><tr><td>180 min Summer</td><td>26.763</td><td>0.0</td><td>184</td></tr><tr><td>240 min Summer</td><td>21.725</td><td>0.0</td><td>242</td></tr><tr><td>360 min Summer</td><td>16.191</td><td>0.0</td><td>362</td></tr><tr><td>480 min Summer</td><td>13.143</td><td>0.0</td><td>482</td></tr><tr><td>600 min Summer</td><td>11.180</td><td>0.0</td><td>602</td></tr><tr><td>720 min Summer</td><td>9.796</td><td>0.0</td><td>722</td></tr><tr><td>960 min Summer</td><td>7.627</td><td>0.0</td><td>960</td></tr><tr><td>1440 min Summer</td><td>5.360</td><td>0.0</td><td>1314</td></tr><tr><td>2160 min Summer</td><td>3.767</td><td>0.0</td><td>1644</td></tr><tr><td>2880 min Summer</td><td>2.933</td><td>0.0</td><td>2016</td></tr><tr><td>4320 min Summer</td><td>2.197</td><td>0.0</td><td>2852</td></tr><tr><td>5760 min Summer</td><td>1.790</td><td>0.0</td><td>3688</td></tr><tr><td>7200 min Summer</td><td>1.527</td><td>0.0</td><td>4472</td></tr><tr><td>8640 min Summer</td><td>1.341</td><td>0.0</td><td>5272</td></tr><tr><td>10080 min Summer</td><td>1.202</td><td>0.0</td><td>6048</td></tr><tr><td>15 min Winter</td><td>162.161</td><td>0.0</td><td>19</td></tr></tbody></table>						Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status	15 min Summer	6.440	0.140	0.4	25.6	O K	30 min Summer	6.473	0.173	0.4	31.4	O K	60 min Summer	6.510	0.210	0.4	38.3	O K	120 min Summer	6.553	0.253	0.4	46.1	O K	180 min Summer	6.581	0.281	0.4	51.1	O K	240 min Summer	6.601	0.301	0.4	54.8	O K	360 min Summer	6.629	0.329	0.4	59.9	O K	480 min Summer	6.648	0.348	0.4	63.5	O K	600 min Summer	6.662	0.362	0.4	66.0	O K	720 min Summer	6.673	0.373	0.4	67.9	O K	960 min Summer	6.667	0.367	0.4	66.8	O K	1440 min Summer	6.647	0.347	0.4	63.2	O K	2160 min Summer	6.621	0.321	0.4	58.4	O K	2880 min Summer	6.598	0.298	0.4	54.3	O K	4320 min Summer	6.584	0.284	0.4	51.7	O K	5760 min Summer	6.567	0.267	0.4	48.6	O K	7200 min Summer	6.548	0.248	0.4	45.2	O K	8640 min Summer	6.529	0.229	0.4	41.8	O K	10080 min Summer	6.511	0.211	0.4	38.5	O K	15 min Winter	6.459	0.159	0.4	29.0	O K	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)	15 min Summer	162.161	0.0	19	30 min Summer	98.106	0.0	34	60 min Summer	59.354	0.0	64	120 min Summer	35.909	0.0	124	180 min Summer	26.763	0.0	184	240 min Summer	21.725	0.0	242	360 min Summer	16.191	0.0	362	480 min Summer	13.143	0.0	482	600 min Summer	11.180	0.0	602	720 min Summer	9.796	0.0	722	960 min Summer	7.627	0.0	960	1440 min Summer	5.360	0.0	1314	2160 min Summer	3.767	0.0	1644	2880 min Summer	2.933	0.0	2016	4320 min Summer	2.197	0.0	2852	5760 min Summer	1.790	0.0	3688	7200 min Summer	1.527	0.0	4472	8640 min Summer	1.341	0.0	5272	10080 min Summer	1.202	0.0	6048	15 min Winter	162.161	0.0	19
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Date 09/09/2020 15:46 File 19-167 PAVING (100YR + ...		Designed by SG Checked by LH			
Micro Drainage		Source Control 2020.1			
<u>Summary of Results for 100 year Return Period (+40%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	6.495	0.195	0.4	35.6	O K
60 min Winter	6.538	0.238	0.4	43.3	O K
120 min Winter	6.587	0.287	0.4	52.2	O K
180 min Winter	6.618	0.318	0.4	57.9	O K
240 min Winter	6.641	0.341	0.4	62.1	O K
360 min Winter	6.674	0.374	0.4	68.1	O K
480 min Winter	6.697	0.397	0.4	72.3	O K
600 min Winter	6.714	0.414	0.4	75.4	O K
720 min Winter	6.727	0.427	0.4	77.7	O K
960 min Winter	6.723	0.423	0.4	77.0	O K
1440 min Winter	6.706	0.406	0.4	73.9	O K
2160 min Winter	6.671	0.371	0.4	67.6	O K
2880 min Winter	6.643	0.343	0.4	62.4	O K
4320 min Winter	6.619	0.319	0.4	58.1	O K
5760 min Winter	6.590	0.290	0.4	52.8	O K
7200 min Winter	6.559	0.259	0.4	47.1	O K
8640 min Winter	6.528	0.228	0.4	41.6	O K
10080 min Winter	6.499	0.199	0.4	36.2	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)		
30 min Winter	98.106	0.0	33		
60 min Winter	59.354	0.0	64		
120 min Winter	35.909	0.0	122		
180 min Winter	26.763	0.0	180		
240 min Winter	21.725	0.0	240		
360 min Winter	16.191	0.0	358		
480 min Winter	13.143	0.0	474		
600 min Winter	11.180	0.0	590		
720 min Winter	9.796	0.0	708		
960 min Winter	7.627	0.0	934		
1440 min Winter	5.360	0.0	1372		
2160 min Winter	3.767	0.0	1756		
2880 min Winter	2.933	0.0	2188		
4320 min Winter	2.197	0.0	3112		
5760 min Winter	1.790	0.0	3984		
7200 min Winter	1.527	0.0	4832		
8640 min Winter	1.341	0.0	5624		
10080 min Winter	1.202	0.0	6456		
©1982-2020 Innovyze					

Odyssey Markides LLP		Page 3
Tuscany House White Hart Lane Basingstoke RG21 4AF	Yapton Metal Company Brundell Road Yapton	
Date 09/09/2020 15:46 File 19-167 PAVING (100YR + ...	Designed by SG Checked by LH	
Micro Drainage Source Control 2020.1		

Rainfall Details

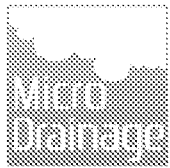
Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	1999
Site Location	GB 498650 101750 SU 98650 01750
C (1km)	-0.025
D1 (1km)	0.390
D2 (1km)	0.245
D3 (1km)	0.403
E (1km)	0.310
F (1km)	2.321
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.095

Time (mins)	Area
From:	To: (ha)
0	4 0.095

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Tuscany House White Hart Lane Basingstoke RG21 4AF	Yapton Metal Company Brundell Road Yapton																									
Date 09/09/2020 15:46 File 19-167 PAVING (100YR + ...	Designed by SG Checked by LH																									
Micro Drainage Source Control 2020.1																										
<u>Model Details</u> Storage is Online Cover Level (m) 7.100 <u>Porous Car Park Structure</u> <table> <tr> <td>Infiltration Coefficient Base (m/hr)</td> <td>0.00432</td> <td>Width (m)</td> <td>10.0</td> </tr> <tr> <td>Membrane Percolation (mm/hr)</td> <td>1000</td> <td>Length (m)</td> <td>60.7</td> </tr> <tr> <td>Max Percolation (l/s)</td> <td>168.6</td> <td>Slope (1:X)</td> <td>0.0</td> </tr> <tr> <td>Safety Factor</td> <td>2.0</td> <td>Depression Storage (mm)</td> <td>5</td> </tr> <tr> <td>Porosity</td> <td>0.30</td> <td>Evaporation (mm/day)</td> <td>3</td> </tr> <tr> <td>Invert Level (m)</td> <td>6.300</td> <td>Membrane Depth (m)</td> <td>260</td> </tr> </table>			Infiltration Coefficient Base (m/hr)	0.00432	Width (m)	10.0	Membrane Percolation (mm/hr)	1000	Length (m)	60.7	Max Percolation (l/s)	168.6	Slope (1:X)	0.0	Safety Factor	2.0	Depression Storage (mm)	5	Porosity	0.30	Evaporation (mm/day)	3	Invert Level (m)	6.300	Membrane Depth (m)	260
Infiltration Coefficient Base (m/hr)	0.00432	Width (m)	10.0																							
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Max Percolation (l/s)	168.6	Slope (1:X)	0.0																							
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Porosity	0.30	Evaporation (mm/day)	3																							
Invert Level (m)	6.300	Membrane Depth (m)	260																							
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APPENDIX D

Odyssey Overland Flow Routes

P:\19-167 - Yapton Metal Company, Burndell Road, Yapton\Tech\Acad\Drawings\19-167-003 Overland Flow Route.dwg



- NOTES
- DO NOT SCALE FROM THIS DRAWING. WORK FROM FIGURED DIMENSIONS ONLY.
 - ALL DIMENSIONS SHOWN ON THIS DRAWING ARE IN METRES.
 - THIS DRAWING IS A PRELIMINARY REVIEW ONLY AND SUBJECT TO DETAILED DESIGN.
 - TOPOGRAPHICAL SURVEY HAS BEEN TAKEN FROM ARCHIDATA LIMITED DRAWING AD19080_1_01, DATED APRIL 19'.
 - PROPOSED SITE LAYOUT HAS BEEN PROVIDED BY LAKEWOOD HOMES.
 - ODYSSEY ACCEPT NO LIABILITY FOR THE ACCURACY OF SURVEY INFORMATION AND LAYOUTS SUPPLIED BY OTHERS.

- LEGEND
- DEVELOPMENT BOUNDARY
 - INDICATIVE DIRECTION OF OVERLAND FLOW
 - x 7.060 PROPOSED GROUND LEVEL

FOR PLANNING
PURPOSES ONLY

A	LEVELS ADDED AND FLOW ROUTES ADJUSTED	SG	LH	LH	10.09.20
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Rev	Amendments	Drm	Chk	App	Date
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Job Title

YAPTON METAL COMPANY,
BURNDELL ROAD, YAPTON

Drawing Title

OVERLAND FLOW ROUTES

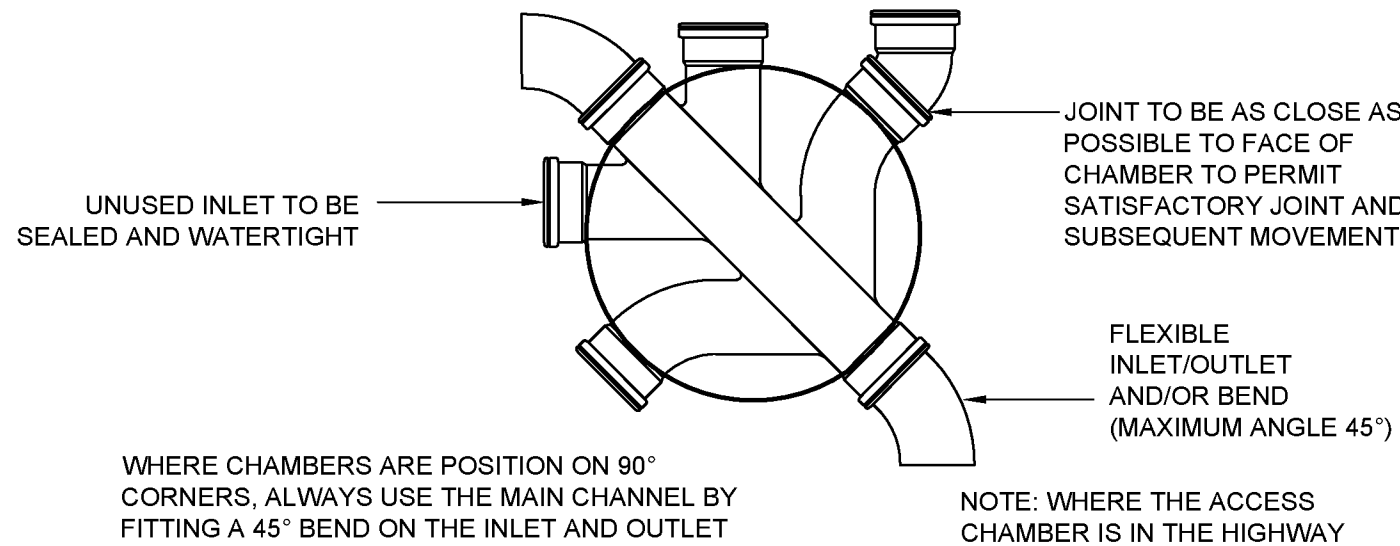
Client

LAKEWOOD HOMES

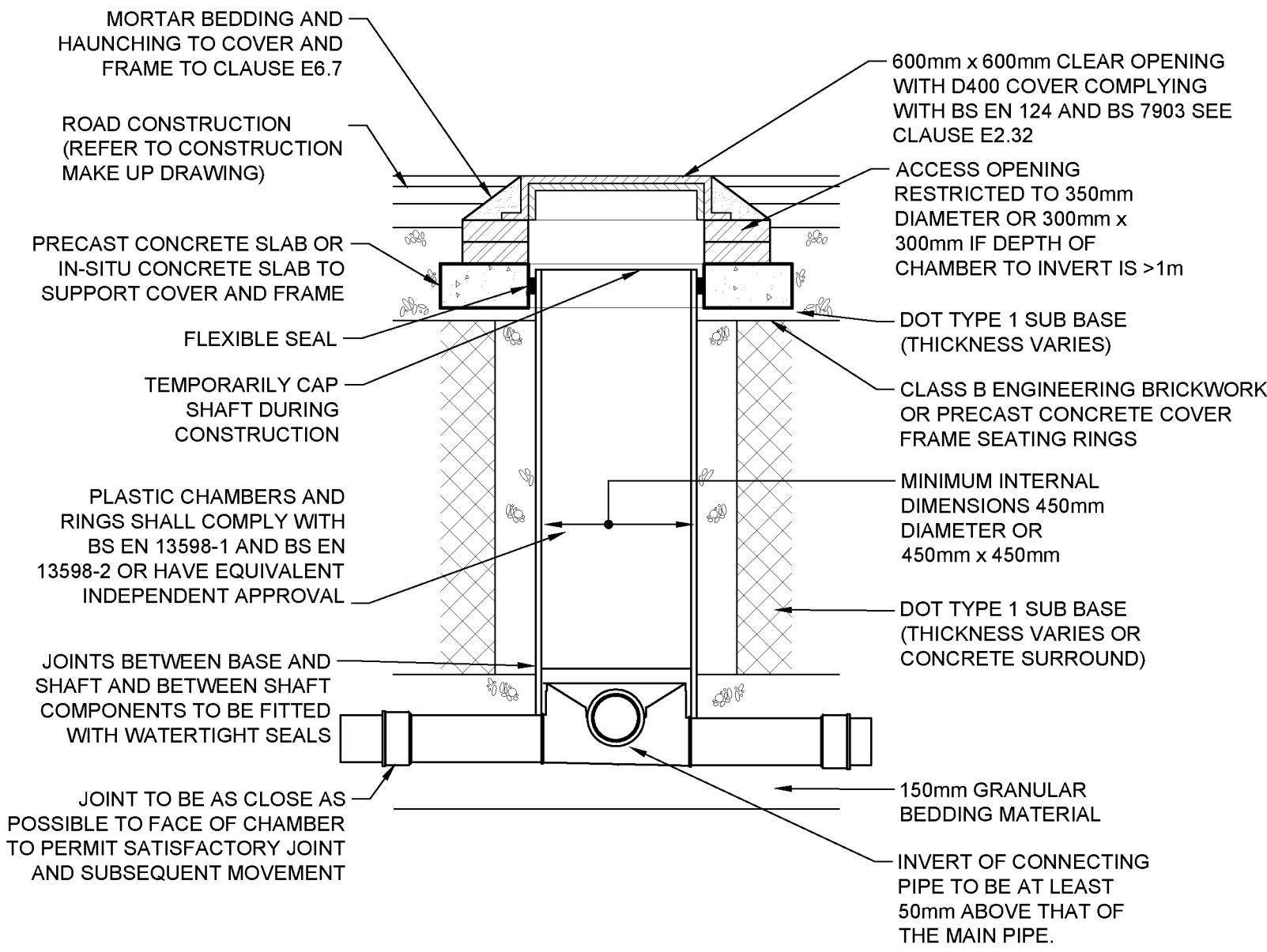
Scale	Date	Designed
1:200 @ A2	AUG 19	SG
Drawn	Checked	Approved
JA	SG	LH
Job No	Drawing No	Rev
19-167	19-167/003	A

APPENDIX E

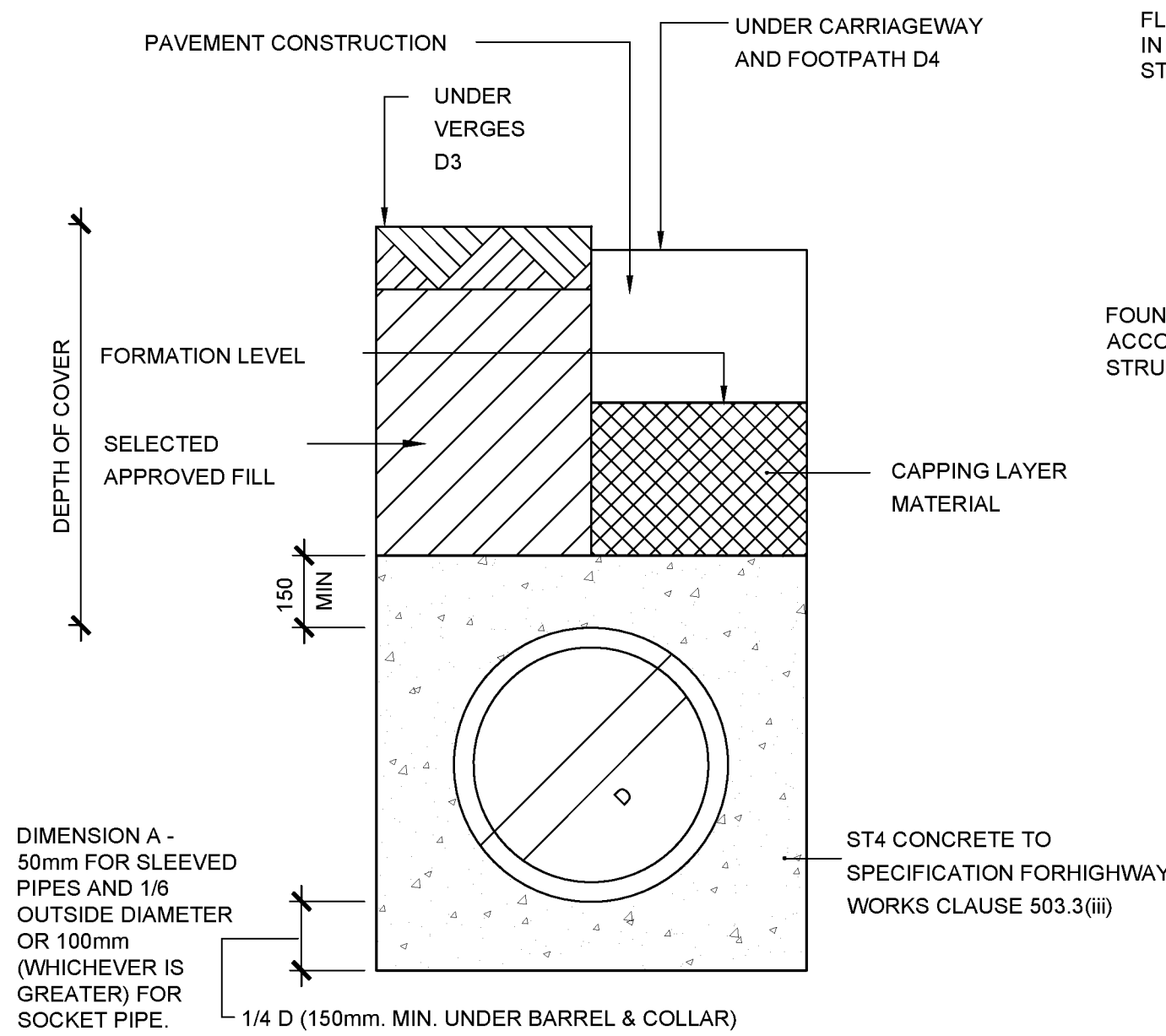
Odyssey Construction Details



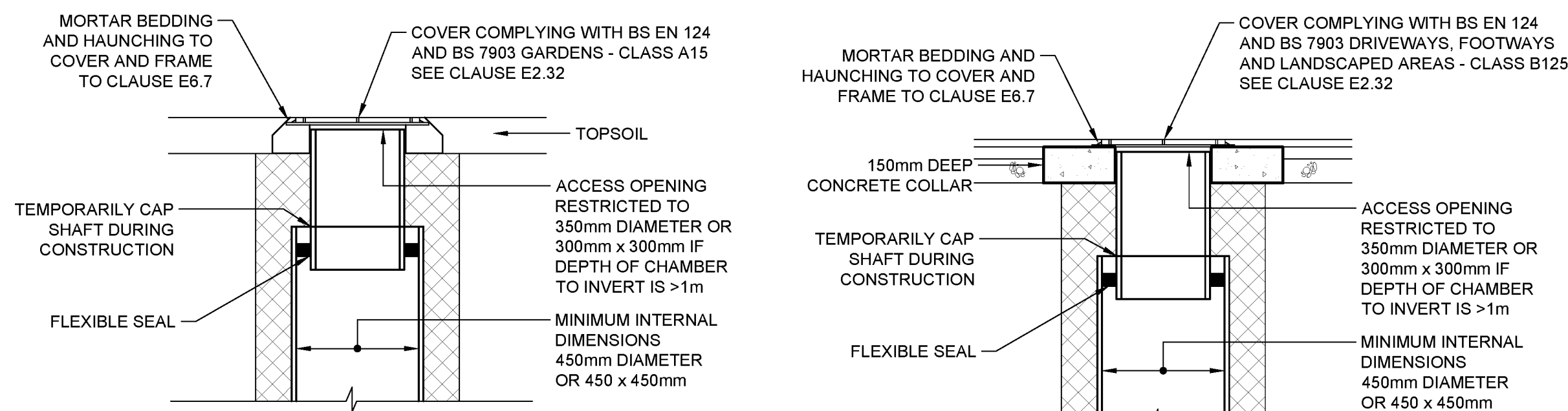
TYPICAL INSPECTION CHAMBER BASE LAYOUT - TYPE 3
(FLEXIBLE MATERIAL DETAIL)



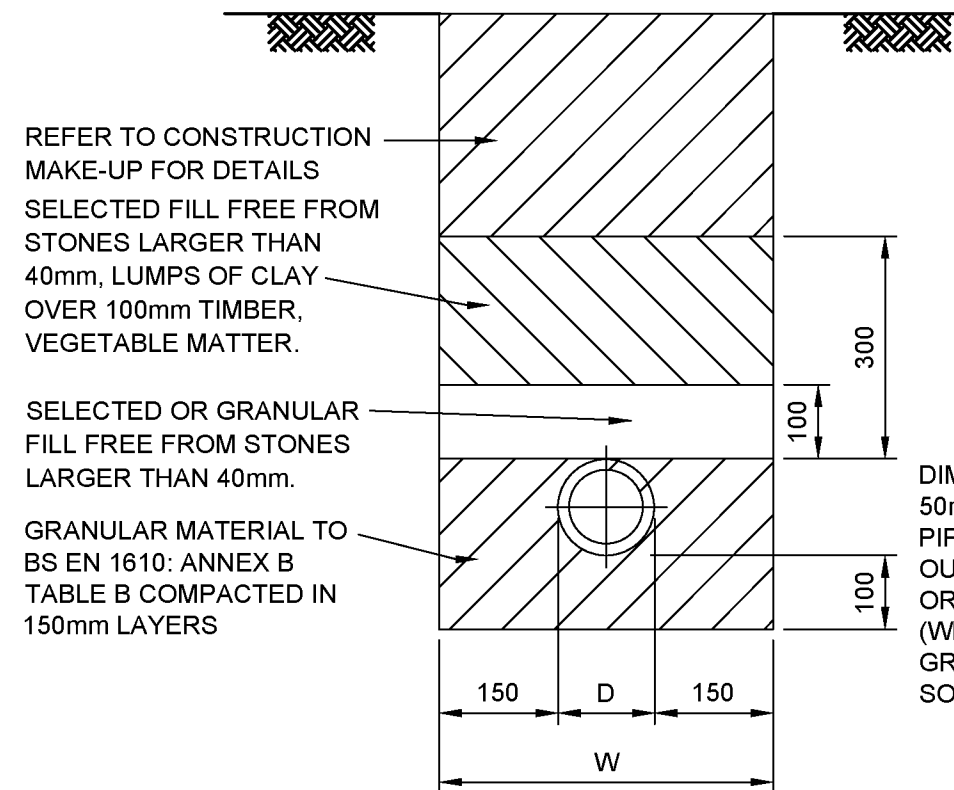
TYPICAL INSPECTION CHAMBER DETAIL - TYPE 3
(FLEXIBLE MATERIAL DETAIL) MAXIMUM DEPTH FROM COVER LEVEL TO SOFFIT OF PIPE IN AREAS SUBJECT TO VEHICLE LOADING 3m, NON-ENTRY



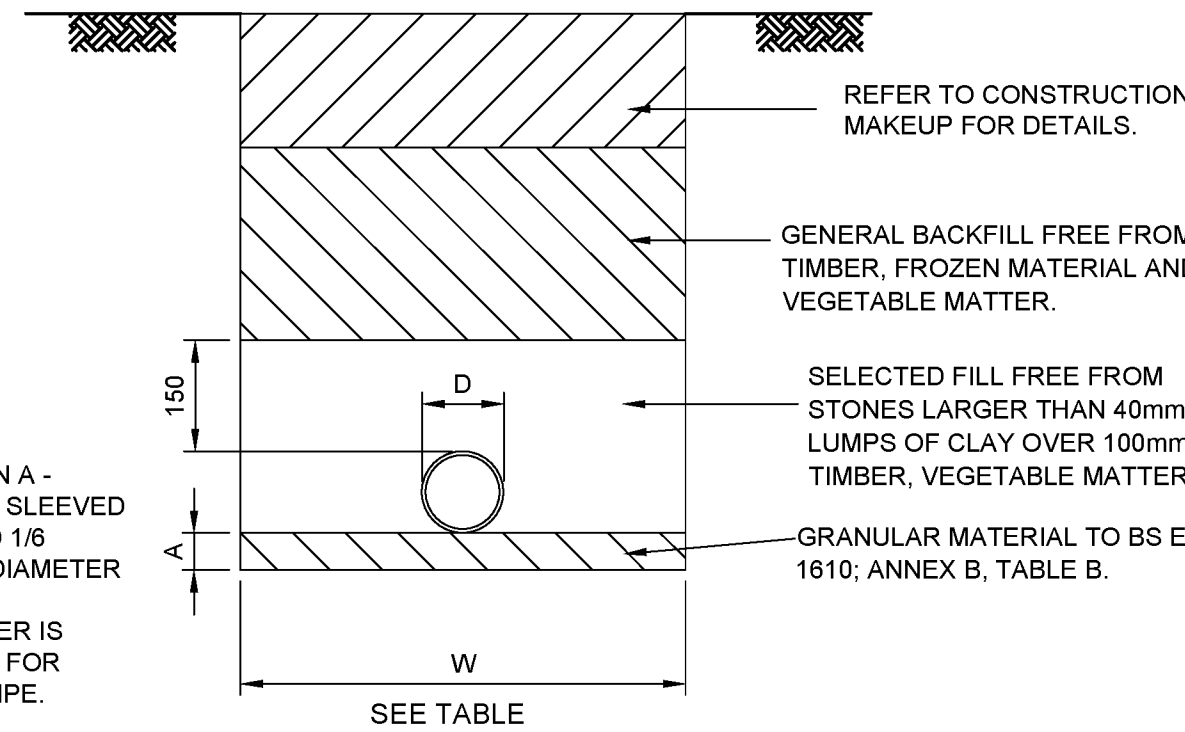
DESIGN D3 (UNDER VERGES - <900 COVER)
DESIGN D4 (UNDER CARRIAGEWAYS - <1200 COVER)
BEDDING DETAIL - CLASS 'Z'



**ALTERNATIVE TOP DETAILS FOR DOMESTIC DRIVEWAYS/
FOOTWAYS/ LANDSCAPED AREAS - TYPE 3**

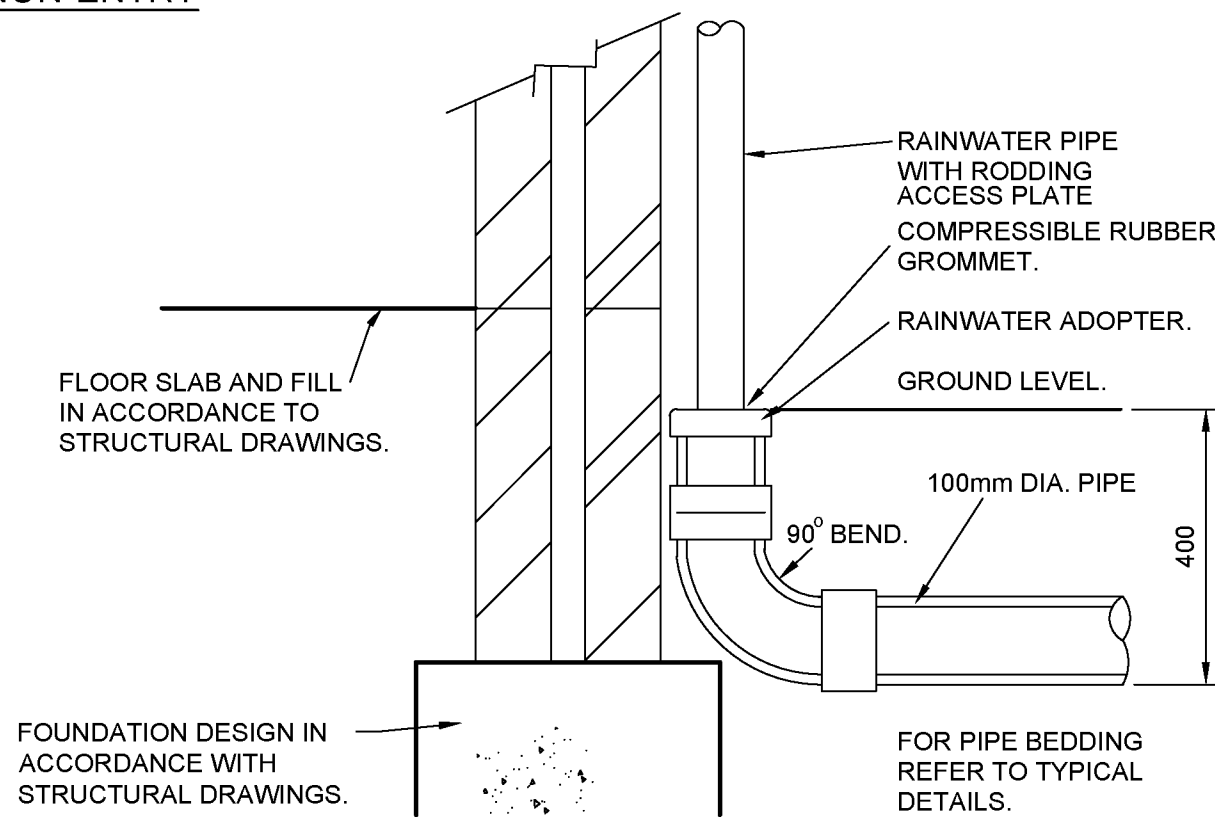


**TYPICAL PIPE BEDDING DETAIL:
TYPE 3 (UPVC PIPES)**
LOCATION: PEDESTRIAN AREAS: 0.6 m - 8.0 m DEEP.
VEHICLE AREAS: 1.2 m - 8.0 m DEEP.

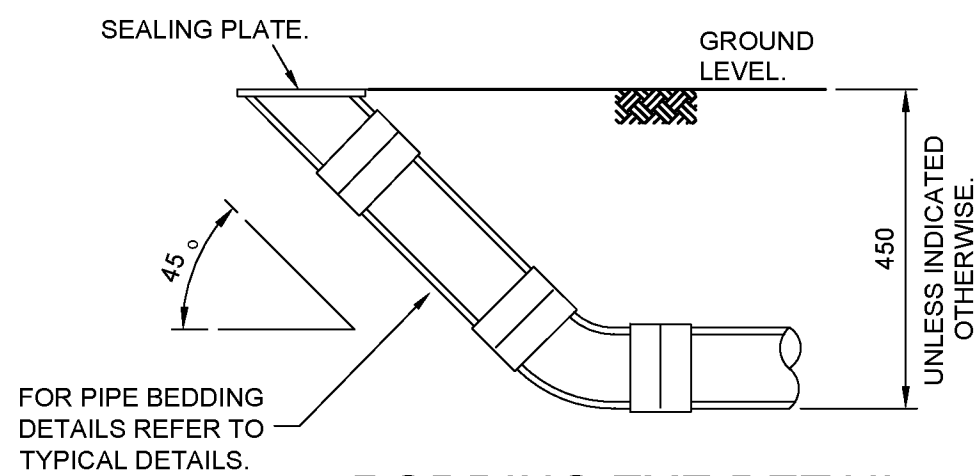


**TYPICAL PIPE BEDDING DETAIL:
TYPE 1 (CLAY PIPES) CLASS F**
LOCATION: PEDESTRIAN AREAS UP TO 8.0 m DEEP.
VEHICLE AREAS: 1.2 m - 8.0 m (100mm DIA. PIPE).
1.2 m - 8 m (150mm DIA. PIPE).

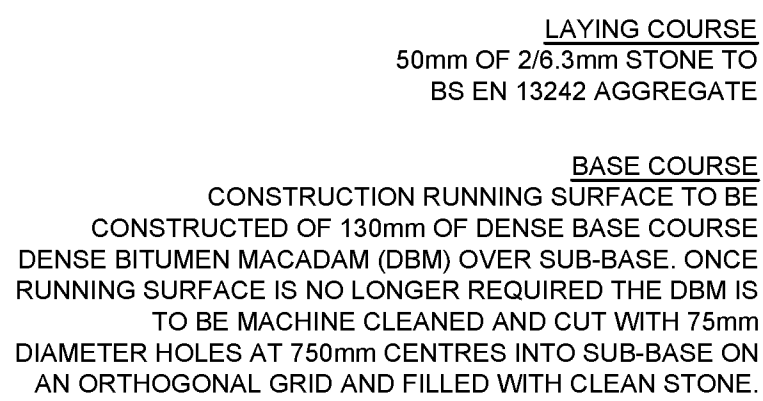
TRENCH WIDTHS FOR VARIOUS SIZE PIPES					
D	100	150	225	300	375
W	450	600	750	750	900



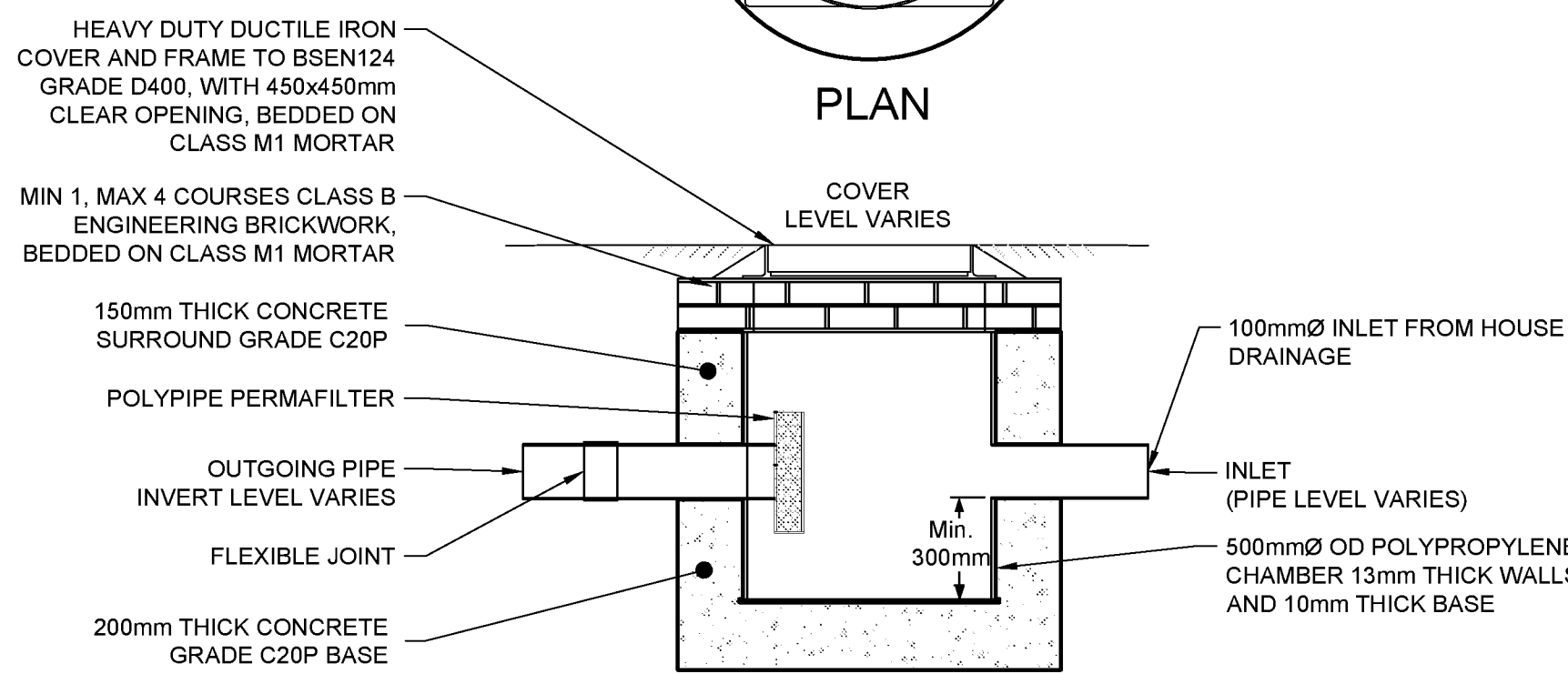
RAINWATER PIPE CONNECTION



RODDING EYE DETAIL
TO BE USED IN PEDESTRAIN AND LANDSCAPED AREAS NOT SUBJECT TO VEHICULAR LOADING.
MAXIMUM DEPTH TO INVERT 600mm.

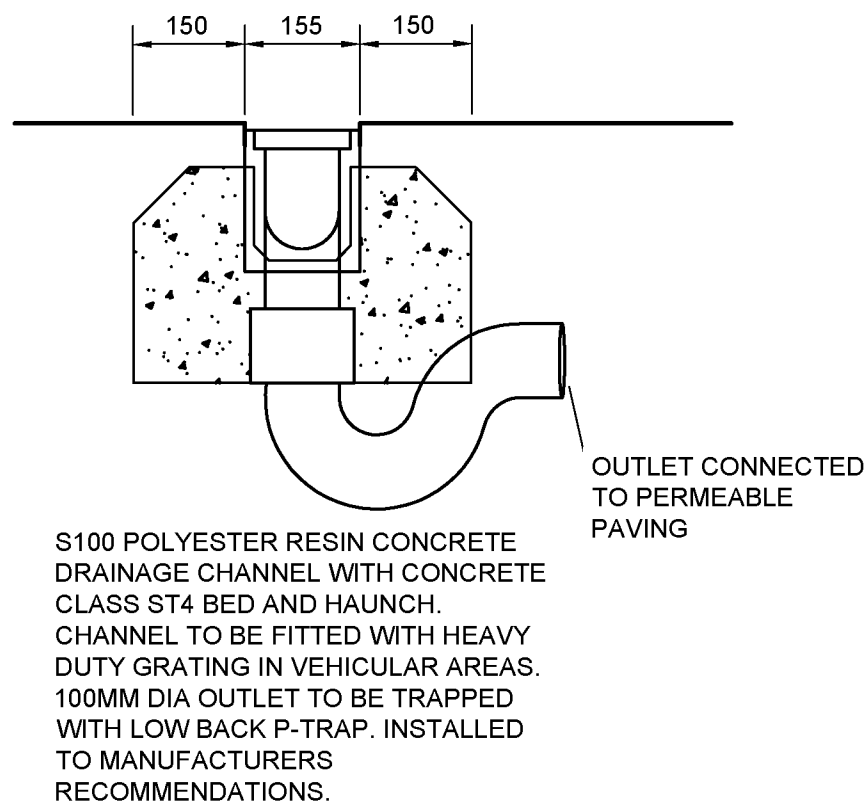


**POLYPIPE CATCHPIT INSPECTION CHAMBER
INCORPORATING DEBRIS DEVICE - NON ADOPTABLE
(OR SIMILAR APPROVED)**

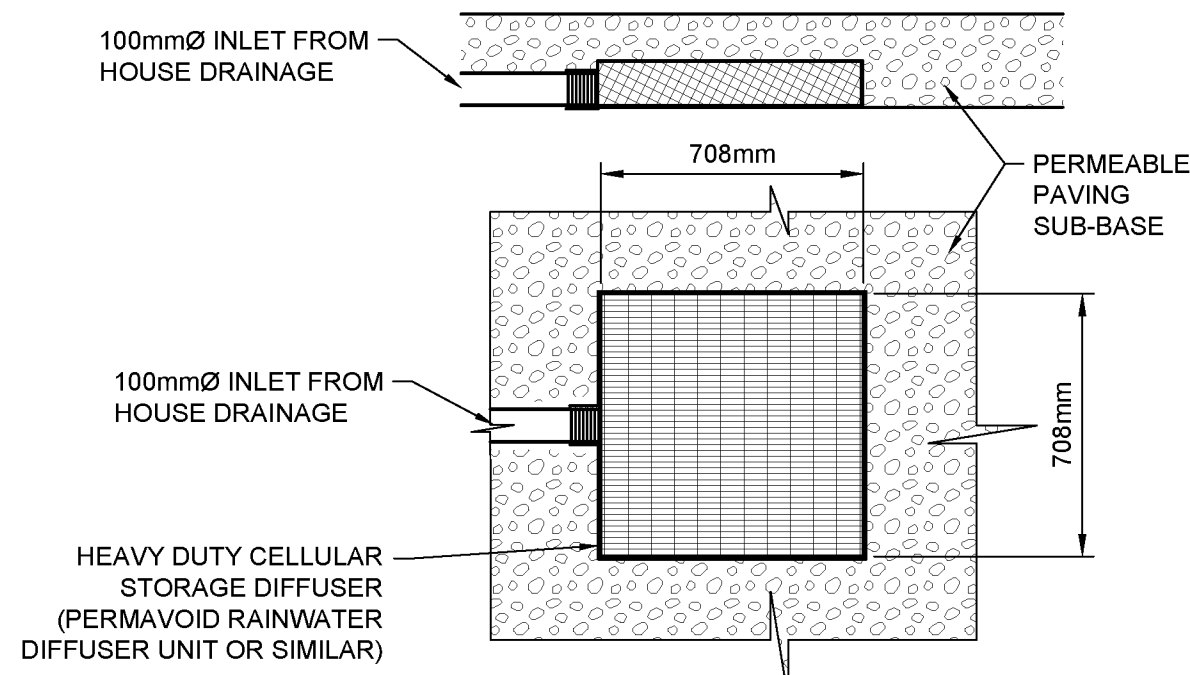


**TYPICAL SECTION THROUGH PERMEABLE
COURTYARDS AND PRIVATE DRIVEWAYS
(WITH CONSTRUCTION TRAFFIC / HGV's)**

(BASED ON CBR 3%)

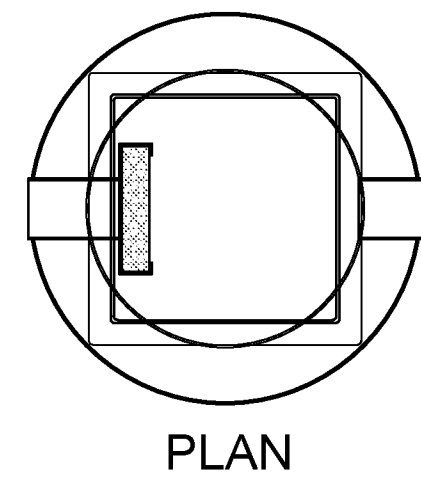


TYPICAL ACO DETAIL



**TYPICAL PLAN & SECTION
THROUGH DIFFUSER DETAIL**

PERMAVOID RAINWATER DIFFUSER
UNIT OR SIMILAR APPROVED



PLAN

- NOTES**
- DO NOT SCALE FROM THIS DRAWING. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE MANUAL FOR CONTRACT DOCUMENTS, VOLUME 1, SPECIFICATION FOR HIGHWAY WORKS AND ALL OTHER RELATED DRAWINGS ISSUED.
 - IF THERE IS ANY AMBIGUITY BETWEEN THE SPECIFICATION AND THE DRAWINGS, THE CONTRACTOR SHALL IMMEDIATELY INFORM THE ENGINEER.
 - DO NOT SCALE FROM THIS DRAWING. WORK FROM FIGURED DIMENSIONS ONLY.
 - ALL DIMENSIONS SHOWN ON THIS DRAWING ARE IN METRES.
 - ALL DIMENSIONS, LEVELS AND SURVEY GRID CO-ORDINATES ARE TO BE CHECKED ON SITE AND THE ENGINEER NOTIFIED IMMEDIATELY OF ANY DISCREPANCIES PRIOR TO THE COMMENCEMENT OF THE WORKS.
 - NO DEVIATION FROM THE DETAILS SHOWN ON THIS DRAWING IS PERMITTED WITHOUT PERMISSION FROM THE ENGINEER.

**FOR PLANNING
PURPOSES ONLY**

A CATCHPIT INSPECTION CHAMBER AND CLASS Z PIPE BEDDING DETAILS ADDED				SG	LH	LH	09.09.20
Rev	Amendments			Dm	Chk	App	Date
 ODYSSEY Tuscany House White Hart Lane Basingstoke Hampshire RG21 4AF Telephone: 01256 321144 Fax: 01256 321134 E: info@odysseyconsult.co.uk W: www.odysseyconsult.co.uk							
Job Title YAPTON METAL COMPANY, BURNDELL ROAD, YAPTON							
Drawing Title CONSTRUCTION DETAILS							
Client LAKEWOOD HOMES							
Scale NTS @ A1	Date AUG 19	Designed SG					
Drawn TSB	Checked SG	Approved LH					
Job No 19-167	Drawing No 19-167/004	Rev A					

APPENDIX F

Arun DC Surface Water Drainage Proposal Checklist



Surface Water Drainage Proposal Checklist

This 'Surface Water Drainage Proposals Checklist' has been designed to clearly define Arun District Council's and Chichester District Council's expectations and requirements for any surface water drainage proposals, submitted for appraisal by the council's Engineers, during the planning process.

Please be aware that it is in your interest to provide all of the requested information, as this will allow the council's Engineers to quickly and efficiently review your proposals. The omission of any requested information may lead to delays in the planning process.

This document will be of help to any applicant, or drainage consultant, preparing to submit a 'Discharge of Conditions Application' relating to surface water drainage conditions. Alternatively, it can also be used earlier in the planning process, if the applicant wishes to avoid pre-commencement conditions relating to surface water drainage. The Town and Country Planning Regulations now require pre-commencement conditions to have the prior agreement of the applicant regarding their wording and use. Therefore, if you wish to avoid pre-commencement conditions, in relation to surface water drainage, you will need to submit proposals that provide the information requested in this checklist and also align with the requirements of the following documents:

West Sussex Policy for the Management of Surface Water (WSCC)

'Supplementary Requirements for Surface Water Drainage Proposals'. (Arun DC)

'Supplementary Requirements for Surface Water Drainage Proposals'. (Chichester DC)

By submitting all of the information requested by this checklist you will enable the council's Engineers to determine whether your proposals follow the hierarchy for sustainable drainage and will adequately drain the site.

Please be aware that it will be difficult for the council's Engineers to undertake a timely assessment of your application if you fail to provide any of the information requested.

Surface Water Drainage Proposal Checklist

Ground Investigation Results				
Results Required	Results Provided?			
Winter groundwater monitoring results (Please refer to guidance note 1 below)	Yes	X	No	
Period of winter groundwater monitoring ^{Note 1}	From	24/10/19		
	To	26/02/20		
Maximum recorded groundwater level	5.850 mAOD 1.350 mBGL			
Winter infiltration test results ^{Note 2}	Yes	X	No	
Date of winter infiltration testing	24/02/20			
Details of the location and depth of the infiltration testing ^{Note 3}	Yes	X	No	
Minimum infiltration rate ^{Note 4}	1.3 x 10 ⁻⁶ m/s			

Guidance Notes

1. A full winters groundwater monitoring should be undertaken, (October to March inclusive) to enable the peak annual groundwater levels to be established. The extent of winter monitoring for developments of less than 5 properties should be discussed with the council's Engineers.
2. Infiltration testing should be undertaken during the wet winter months (typically January) and in line with BRE365, or a similar approved method. Tests should be repeated 3x, to replicate saturated ground conditions. Please note that infiltration testing is to be carried out at a time and depth agreed with the Councils engineers.
3. Infiltration testing should be undertaken at the location and depth of any proposed infiltration structures. This must be above the maximum recorded groundwater level in that vicinity.
4. The minimum infiltration rate obtained at the location and depth of the proposed infiltration structures should be used to inform the design of the structures.

Proposed Method of Surface Water Disposal				
Infiltration	Yes	X	No	
On-site, via soak-away structures				
If on-site infiltration is not to be used, has justification for this been provided? ^{Note 5}	Yes		No	
Attenuation (on-site) with a restricted discharge to a watercourse on, or adjacent to, the site	Yes		No	
Attenuation (on-site) with a restricted discharge to a surface water sewer on, or adjacent to, the site	Yes		No	
Attenuation (on-site) with a restricted discharge to a foul water sewer on, or adjacent to, the site	Yes		No	

Guidance Notes

5. If on-site infiltration is not being used to drain the site you will need to provide evidence that demonstrates on-site infiltration is unviable.

Drainage Design: Supporting Calculations					
Calculations Required			Calculations Provided?		
Infiltration Structures	Half-drain time for 10 year event (plus climate change allowance)	Yes	X	No	
		14.5 Hours			
	Half-drain time for 100 year event (plus climate change allowance)	Yes	X	No	
		30 Hours			
	Calculations demonstrating that the 1 in 100 year event, plus climate change allowance can be accommodated on-site. Note 7	Yes	X	No	
Attenuation and Subsequent Restricted Discharge	Lowest base level of infiltration structure	6.300 mAOD 0.800 mBGL			
	Has the design sought to provide treatment of potential contaminants? E.g. hydrocarbons.	Yes	X	No	
	Pre-development run-off rate calculations	Yes		No	
		l/s			
	Proposed discharge rate Note 6	l/s			
Attenuation and Subsequent Restricted Discharge	Calculations demonstrating that the 1 in 100 year event, plus climate change allowance can be accommodated on-site. Note 7	Yes		No	
	Has the design sought to provide treatment of potential contaminants? E.g. hydrocarbons.	Yes		No	
	If your proposed scheme incorporates any impermeable lined attenuation features we require calculations to demonstrate that appropriate resistance to floatation (due to groundwater levels) is catered for in the design	Yes		No	
	If you propose discharging into or altering an ordinary watercourse; have you sought Ordinary Watercourse/Land Drainage Consent? Note 8	Yes		No	
	If discharging to a watercourse, piped system or the sea, has the proposed drainage network been modelled against predicted top water levels for the 1 in 100 year storm event plus climate change allowance, within the existing system? Note 9	Yes		No	

Guidance Notes

- Any proposed discharge rate must be less than, or equal to, the pre-development rate. Greenfield sites must use the mean flow rate (Q_{bar}) and be based upon the area occupied by the development, ignoring significant open spaces. Please note that the minimum acceptable discharge rate is 2l/s when using formal flow control devices, unless otherwise agreed. Additionally, if you are developing a brownfield site, we expect you to provide fully detailed plans of the existing surface water drainage arrangements on site, including impermeable areas, gullies, outfalls, pipes & diameters, manholes, etc. We generally seek 50% betterment in terms of run off from brownfield sites.
- The appropriate factor of safety from the table below must be applied to your calculations to ensure your design is fully in accordance with CIRIA R156/ CIRIA C753.

Factor of Safety Table						
Size of Area to be Drained	Consequences of failure					
	No damage or inconvenience		Minor inconvenience, e.g. surface water on car park		Damage to buildings or structures or roads.	
	Cv=1.0	Cv=0.75	Cv=1.0	Cv=0.75	Cv=1.0	Cv=0.75
<100 m ²	1.5	2	2	3	10	13
100m ² to 1000m ²	1.5	2	3	4	10	13
>1000m ²	1.5	2	5	6.5	10	13

8. Ordinary Watercourse/Land Drainage Consent will need to be sought, ideally in parallel with planning permission, if you propose discharging into, culverting or altering a watercourse.
9. Modelling is required to ensure that problems, such as surcharged outfalls, are addressed.

Plans/Drawings/Diagrams				
Required	Provided?			
Plan detailing the location of groundwater monitoring and infiltration testing	Yes	X	No	
Detailed drainage layout plan Note 10	Yes	X	No	
Construction detail plans Note 11	Yes	X	No	
Exceedance flow route plans Note 12	Yes	X	No	
Impermeable area plan	Yes	X	No	
If ground levels are being raised $\geq 300\text{mm}$ above existing levels and is unavoidable, have fully detailed plans been provided, together with drainage proposals, to address any potential drainage related issues.	Yes		No	X

Guidance Notes

10. Drainage layout plans should include:
 - All surface water drainage pipes labelled with; diameters, pipe materials, falls and invert levels.
 - All infiltrating and attenuating structures (including permeable paving) labelled with; dimensions, invert and cover levels.
 - All manholes labelled with; cover levels, invert levels, cover types detailed.
 - All silt traps clearly labelled with sump depths.
 - Control structures with outflow rates and invert levels.
 - Proposed/existing levels of any areas subject to ground raising, together with suitable measures/detailed drawings for the associated management of surface water runoff. Please note that ground raising should be avoided unless there are exceptional circumstances.
11. Site specific construction detail plans should be supplied if your proposed drainage scheme includes any of the following elements: pipe bed and surround; infiltrating structures; attenuating structures; manholes; catch-pits/silt traps; control devices; permeable paving; headwalls.
12. Unless specifically requested by the council's drainage engineers 'Exceedance Flow Route Plans' are only required for developments of more than 5 residential properties or more than 0.5ha of commercial development .