Cameron + Ross

Civil + Structural Engineering

DRAINAGE STATEMENT

A/191327-MAINS OF CARNOUSIE, FORGLEN, TURRIFF.

1. EXISTING SITE CONDITIONS.

The site is located within agricultural land on the Mains of Carnousie in Forglen, between Turriff and Aberchirder. The site is in two parts, but effectively the same agricultural fields with a central tree belt strip between them.
The proposal is to construct new housing plots on the site, 8 plots in site 1 and 7 plots in site 2.
There are no known springs, wells or boreholes within 100m of the proposed site.

2. GROUND CONDITIONS.

Trial pit investigations were undertaken by Cameron + Ross on 20th September 2020. The summary of this would highlight the following:-
Topsoil was encountered as the uppermost horizon across the site with a general thickness of 0.3m-0.4m. The subsoils below this are generally described as dense slightly SILTY SANDS and GRAVELS. The subsoils are generally light brown or orange brown in colour. All trial pits remained stable. No ground water entries were encountered with all trial pits remaining dry to their final depths at the time of the investigation. Bedrock was not thought to have been encountered in any of the trial pits during the site investigation. Broken rock is present within the lower parts of the trial pits, this easily excavated through and providing good porosity through the open seams within this.
Infiltration testing was carried out and confirmed that the strata is suitable for soakaways in respect to surface and foul water.

3. FOUL DRAINAGE PROPOSALS.

Each property is proposed to have its own foul water soakaway. On site 1, the Vp value is calculated as 60sec/mm. On site 2 the porosity is slightly better and the Vp is calculated at 10 sec/mm. Site 1 is proposed to have septic tanks and soakaways, and site 2 in accordance with SEPA WAT-RM-04 will have treatment plants and soakaways. Refer to Appendix 2.

4. SURFACE WATER PROPOSALS.

It is proposed that all surface water run-off will be collected and be discharged into designed soakaways. See attached design calculation for the private surface water soakaway **Appendix 1 and Drawing 900 in Appendix 2.** The soakaways are adequately sized to accommodate the run-off from each plot.

The proposed roads at the two sites will be self-draining to the sub-soils. The construction with be a hardcore sub-base with granite stones and dusting to top surface. These will be laid to a slight cross-fall to shed any water and not allowing any ponding. No specific soakaways are required due to these areas being self-draining.

5.   CONSTRUCTION PHASE.

Should any existing surface water drains be encountered within the site they will inevitably be disturbed by construction works therefore, should it prove necessary these will be re-routed or connected to a new perimeter land drain to intercept site run-off. No such drains were encountered in the site investigation.

The measures for controlling surface water run-off will be continually reviewed in line with each stages of construction and any influencing factors.

Consideration is to be given, in the main, to surface water run off during and after topsoil strip, after any re-grading of the land and during site construction. Stripping of topsoil and vegetation is to be limited wherever possible and undertaken just prior to the construction in that particular area. This is to provide a means of reducing run off and to remove silts/fines from the water and aid natural absorption into the soils.

6.   FUTURE MAINTENANCE.

The on-site drainage systems will <u>not</u> be adopted by Scottish Water and will therefore, in terms of the maintenance of the soakaways the responsibility will lie with the owner of the property.
Each plot owner will be aware that a suitable maintenance regime is required and that they are responsible for this. The regime will be that the soakaways should be inspected on an annual basis. The distribution pipe system should be monitored for blockages and if necessary, the end caps removed and the pipes flushed through with a high volume, high pressure pump to dislodge any silts / sludge which may be causing blockage.
In the event of a failure, the failed element will be excavated and replaced to the same specification as existing.

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APPENDIX 1 – SUDS CALCULATIONS

CALCULATION

Cameron+Ross

Contract MAINS OF CARNOUSIE, TURRIFF

Part of Structure

FOUL DRAINAGE

Sheet No. 1   Rev

Contract No. 191327

Date 5/2/21

Designer GEL

Checker

POROSITY TESTING CARRIED OUT ON SITE

AVERAGE SITE 1 $V_p = 60$ secs/mm

2    $V_p = 10$ secs/mm

BRE 365 SOAKAWAY TESTS

AVERAGE OVER BOTH SITES $\Rightarrow$ $f = 1.667 \times 10^{-5}$ m/s

PLOTS 1 - 8

$A = V_p \, P \, 0.25$

PLOTS 1, 2, 3, 6 + 7 $A = 60 \times 6 \times 0.25$
$= 90 \text{m}^2$

PLOTS 4, 5 + 8 $A = 60 \times 7 \times 0.25$
$= 105 \text{m}^2$

PLOTS 9 - 15

$A = 3.6 \, P_E$ $\Rightarrow$ 9, 10, 13, 14 + 15
$A = 3.6 \times 6 = 21.6 \text{m}^2$

11 + 12 $A = 3.6 \times 7 = 25.2 \text{m}^2$

Cameron+Ross
Civil + Structural Engineering

Project: Address:	**Houses Carnousie Forglen** **Turriff**	Job No:	**A 191327**
		Date:	**Feb 2021**
Location:	**Plot 1 soakaway**	Calcs by:	**GGC**
		Page No:	BRE365

Design Rainfall

Additional flow multiplier   **30%**

From Wallingford Procedure, Volume 3 - Maps
Rainfall Depths (M5 - 60minutes)   *M5_60 =*   **16 mm**

from BRE Digest 365, fig. 1   *rainfall ratio r =* 0.250

Design Storm Return Period,   *P =* 30 years

D mins	M5_D	Z2	R = MP_D	Rainfall Intensity
5	4.7 mm	1.872	8.7 mm	105 mm/hr
10	7.0 mm	1.898	13.3 mm	80 mm/hr
15	8.7 mm	1.919	16.6 mm	67 mm/hr
30	12.0 mm	1.938	23.2 mm	46 mm/hr
60	16.0 mm	1.936	31.0 mm	31 mm/hr
120	21.0 mm	1.912	40.1 mm	20 mm/hr
240	27.3 mm	1.888	51.5 mm	13 mm/hr
360	31.7 mm	1.869	59.3 mm	10 mm/hr
600	38.3 mm	1.844	70.6 mm	7 mm/hr
1440	52.7 mm	1.780	93.8 mm	4 mm/hr
2880	67.8 mm	1.747	118.5 mm	2 mm/hr

● Scotland and Nth Ireland

○ England and Wales

Measured Infiltration Rate
1.67E-05

Infiltration Rate (eff)	1.67E-05	m/s	(OR Outlet Flow Rate	l/s)
Impermeable Area	136	m^2	ie	0 m^3/hr
Width	5.00	m		
Depth	1.00	m	Gravel Pit or Trench Soakaway	
Fixed Lgth (optional)	0	m	Gravel, free volume	30%

Insert 100% for Net Storage Chamber Volume

D	Length	Inflow	Outflow	Storage Req	t_{s50} (hrs)	Storage Prov	Overflow
5	1	1.2	0.0	1.2	1.67	1.2	
10	1	1.8	0.1	1.8	2.37	1.8	
15	1	2.3	0.1	2.2	2.80	2.2	
30	2	3.2	0.2	2.9	3.53	2.9	
60	3	4.2	0.5	3.8	4.18	3.8	
120	3	5.5	1.0	4.5	4.69	4.5	
240	3	7.0	2.0	5.0	5.00	5.0	
360	3	8.1	3.0	5.0	5.03	5.0	
600	3	9.6	4.9	4.7	4.82	4.7	
1440	2	12.8	9.9	2.8	3.43	2.8	
2880	0	16.1	15.5	0.6	0.91	0.6	

Time until system can cope with additional influx of 50% design storage volume < 24 hrs ~ OK

Provide gravel filled soakaway, 3.5 m x 5 m x 1 m deep

Minimum Free Volume = 30%
Total Pit Volume = 17.5m^3

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Civil + Structural Engineering

Project: Address:	**Houses Carnousie Forglen** **Turriff**	
Location:	**Plot 2 soakaway**	

Job No:	**A 191327**
Date:	**Feb 2021**
Calcs by:	**GGC**
Page No:	BRE365

Design Rainfall

Additional flow multiplier **30%**

From Wallingford Procedure, Volume 3 - Maps
Rainfall Depths (M5 - 60minutes) **M5_60 =** **16 mm**

from BRE Digest 365, fig. 1 *rainfall ratio r =* 0.250

Design Storm Return Period, *P =* 30 years

D mins	M5_D	Z2	R = MP_D	Rainfall Intensity
5	4.7 mm	1.872	8.7 mm	105 mm/hr
10	7.0 mm	1.898	13.3 mm	80 mm/hr
15	8.7 mm	1.919	16.6 mm	67 mm/hr
30	12.0 mm	1.938	23.2 mm	46 mm/hr
60	16.0 mm	1.936	31.0 mm	31 mm/hr
120	21.0 mm	1.912	40.1 mm	20 mm/hr
240	27.3 mm	1.888	51.5 mm	13 mm/hr
360	31.7 mm	1.869	59.3 mm	10 mm/hr
600	38.3 mm	1.844	70.6 mm	7 mm/hr
1440	52.7 mm	1.780	93.8 mm	4 mm/hr
2880	67.8 mm	1.747	118.5 mm	2 mm/hr

◉ Scotland and Nth Ireland

◯ England and Wales

Measured Infiltration Rate
1.67E-05

Infiltration Rate (eff)	1.67E-05	m/s
Impermeable Area	260	m^2
Width	5.00	m
Depth	1.00	m
Fixed Lgth (optional)	0	m

(OR Outlet Flow Rate [   ] l/s)

ie 0 m^3/hr

Gravel Pit or Trench Soakaway
Gravel, free volume 30%
Insert 100% for Net Storage Chamber Volume

D	Length	Inflow	Outflow	Storage Req	t_{s50} (hrs)	Storage Prov	Overflow
5	1	2.3	0.0	2.2	2.87	2.2	
10	2	3.5	0.1	3.4	3.89	3.4	
15	3	4.3	0.1	4.2	4.49	4.2	
30	4	6.0	0.3	5.8	5.43	5.8	
60	5	8.1	0.6	7.5	6.23	7.5	
120	6	10.4	1.3	9.1	6.85	9.1	
240	7	13.4	2.9	10.5	7.29	10.5	
360	7	15.4	4.4	11.0	7.42	11.0	
600	7	18.3	7.4	11.0	7.42	11.0	
1440	6	24.4	15.6	8.8	6.74	8.8	
2880	4	30.8	25.2	5.6	5.35	5.6	

Time until system can cope with additional influx of 50% design storage volume < 24 hrs ~ OK

Provide gravel filled soakaway, 7.5 m x 5 m x 1 m deep

Minimum Free Volume = 30%
Total Pit Volume = 37.5m^3

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Project:	**Houses Carnousie Forglen**	Job No:	**A 191327**
Address:	**Turriff**	Date:	**Feb 2021**
		Calcs by:	**GGC**
Location:	**Plot 4 soakaway**	Page No:	BRE365

Design Rainfall

Additional flow multiplier **30%**

From Wallingford Procedure, Volume 3 - Maps
Rainfall Depths (M5 - 60minutes)   **M5_60 =   16 mm**

from BRE Digest 365, fig. 1   *rainfall ratio r =* **0.250**

Design Storm Return Period,   **P = 30 years**

D mins	M5_D	Z2	R = MP_D	Rainfall Intensity
5	4.7 mm	1.872	8.7 mm	105 mm/hr
10	7.0 mm	1.898	13.3 mm	80 mm/hr
15	8.7 mm	1.919	16.6 mm	67 mm/hr
30	12.0 mm	1.938	23.2 mm	46 mm/hr
60	16.0 mm	1.936	31.0 mm	31 mm/hr
120	21.0 mm	1.912	40.1 mm	20 mm/hr
240	27.3 mm	1.888	51.5 mm	13 mm/hr
360	31.7 mm	1.869	59.3 mm	10 mm/hr
600	38.3 mm	1.844	70.6 mm	7 mm/hr
1440	52.7 mm	1.780	93.8 mm	4 mm/hr
2880	67.8 mm	1.747	118.5 mm	2 mm/hr

⦿ Scotland and Nth Ireland

◯ England and Wales

Measured Infiltration Rate
1.67E-05

Infiltration Rate (eff)	1.67E-05	m/s	(OR Outlet Flow Rate ___ l/s)	
Impermeable Area	260	m²	ie 0 m³/hr	
Width	5.00	m		
Depth	1.00	m	Gravel Pit or Trench Soakaway	
Fixed Lgth (optional)	0	m	Gravel, free volume **30%**	

Insert 100% for Net Storage Chamber Volume

D	Length	Inflow	Outflow	Storage Req	t_{s50} (hrs)	Storage Prov	Overflow
5	1	2.3	0.0	2.2	2.87	2.2	
10	2	3.5	0.1	3.4	3.89	3.4	
15	3	4.3	0.1	4.2	4.49	4.2	
30	4	6.0	0.3	5.8	5.43	5.8	
60	5	8.1	0.6	7.5	6.23	7.5	
120	6	10.4	1.3	9.1	6.85	9.1	
240	7	13.4	2.9	10.5	7.29	10.5	
360	7	15.4	4.4	11.0	7.42	11.0	
600	7	18.3	7.4	11.0	7.42	11.0	
1440	6	24.4	15.6	8.8	6.74	8.8	
2880	4	30.8	25.2	5.6	5.35	5.6	

Time until system can cope with additional influx of 50% design storage volume < 24 hrs ~ OK

Provide gravel filled soakaway, 7.5 m x 5 m x 1 m deep

Minimum Free Volume = 30%
Total Pit Volume = 37.5m^3

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APPENDIX 2- DRAINAGE PROPOSALS

GENERAL NOTES:-

This drawing is to be read in conjunction with all relevant engineers and architects drawings.

Drainage to be constructed in accordance with BS8301 and buildings regulation

Sewers laid within roads should have a minimum cover of 1.5m from final road surface to pipe soffit level. Where this cannot be achieved then ridged pipes shall be protected by a full concrete surround, similarly, flexible pipes shall be protected by a concrete slab at a depth less than 1.2m.

The contractor is responsible for checking the line and level of all existing services prior to commencement of works. Any discrepancies from design information must be reported to the site manager and site engineer in writing.

Surface Drainage Legend

- - - - Surface water sewer (uPVC Marley Quantum rigid solid pipework) unless otherwise noted on drawing.

Surface Water Soakaway
A - (25m² Area)
B - (35m² Area)
C - (40m² Area)

IC —○— Surface Water Inspection Chamber

Foul Drainage Legend

- - - - Foul water sewer (uPVC Marley Quantum rigid solid pipework) unless otherwise noted on drawing.

Foul Water Soakaway
1 - (90m² Area)
2 - (105m² Area)
3 - (22.5m² Area)
4- (27.5m² Area)

SC —○— Foul Water Sample Chamber

(ST) Septic Tank (Soakways 1 & 2 only)

(TP) Treatment Plant DMS3 WPL or similar approved. (Soakways 3 & 4 only)

Refer to Architects drawings for internal drainage runs and details.

Drainage tail positions to be confirmed on site to suit house type discharge points. A surface water and foul water branch should be established for each plot.
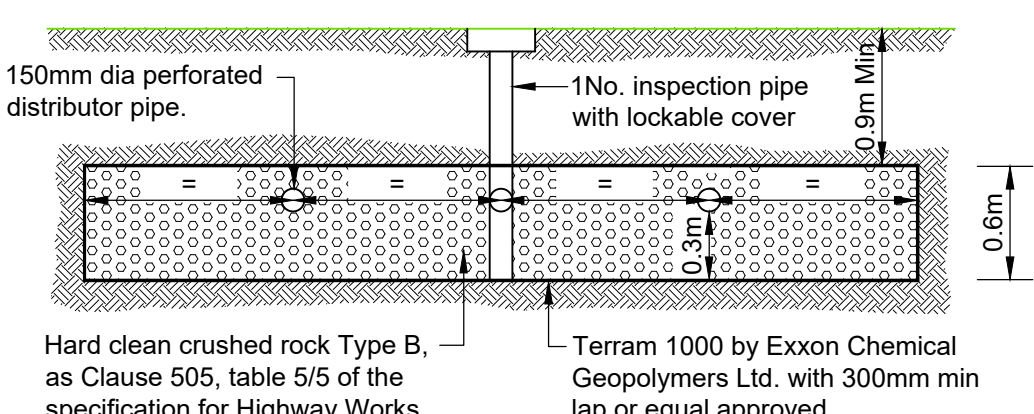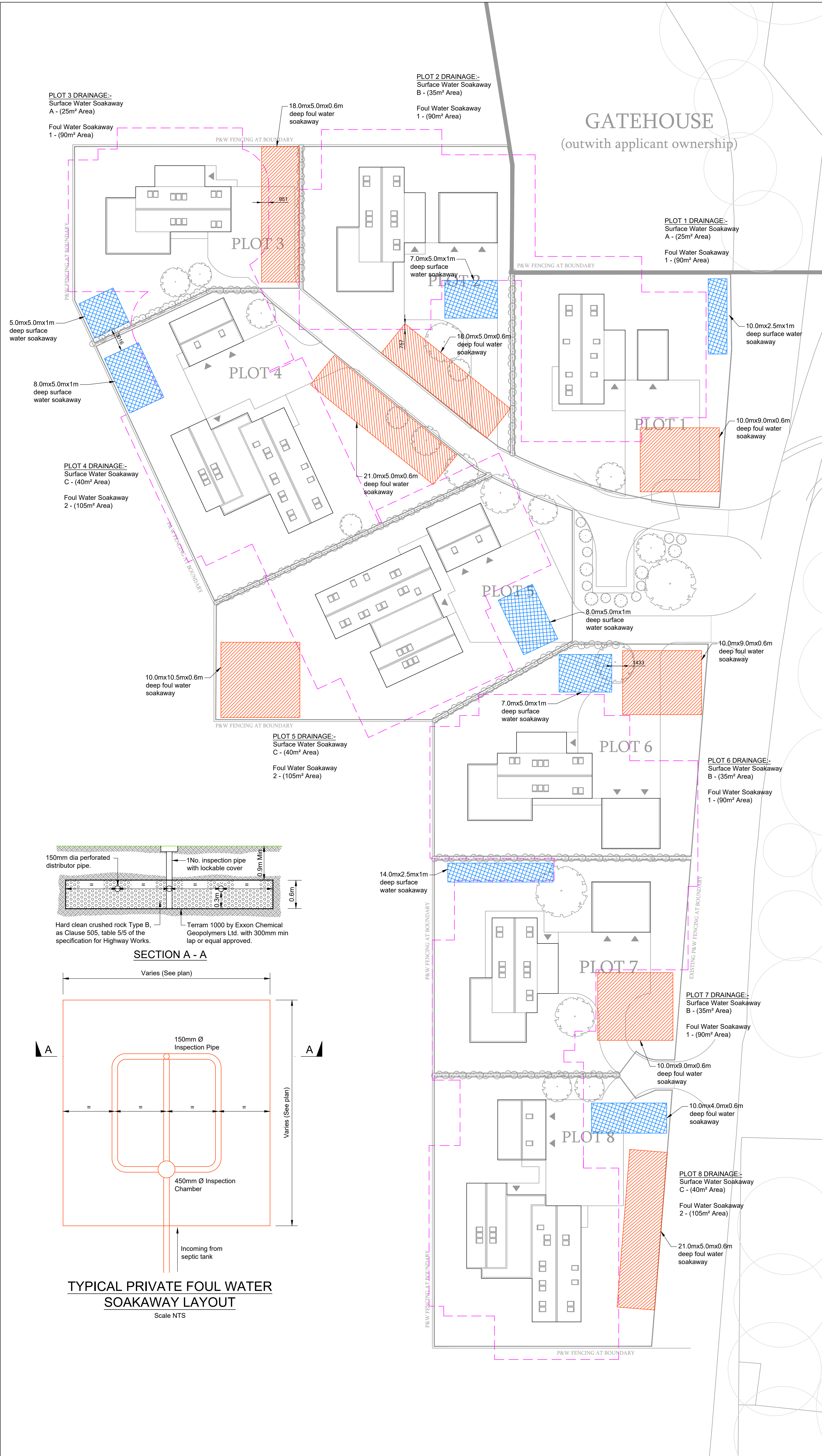
SOAKAWAY NOTES:-

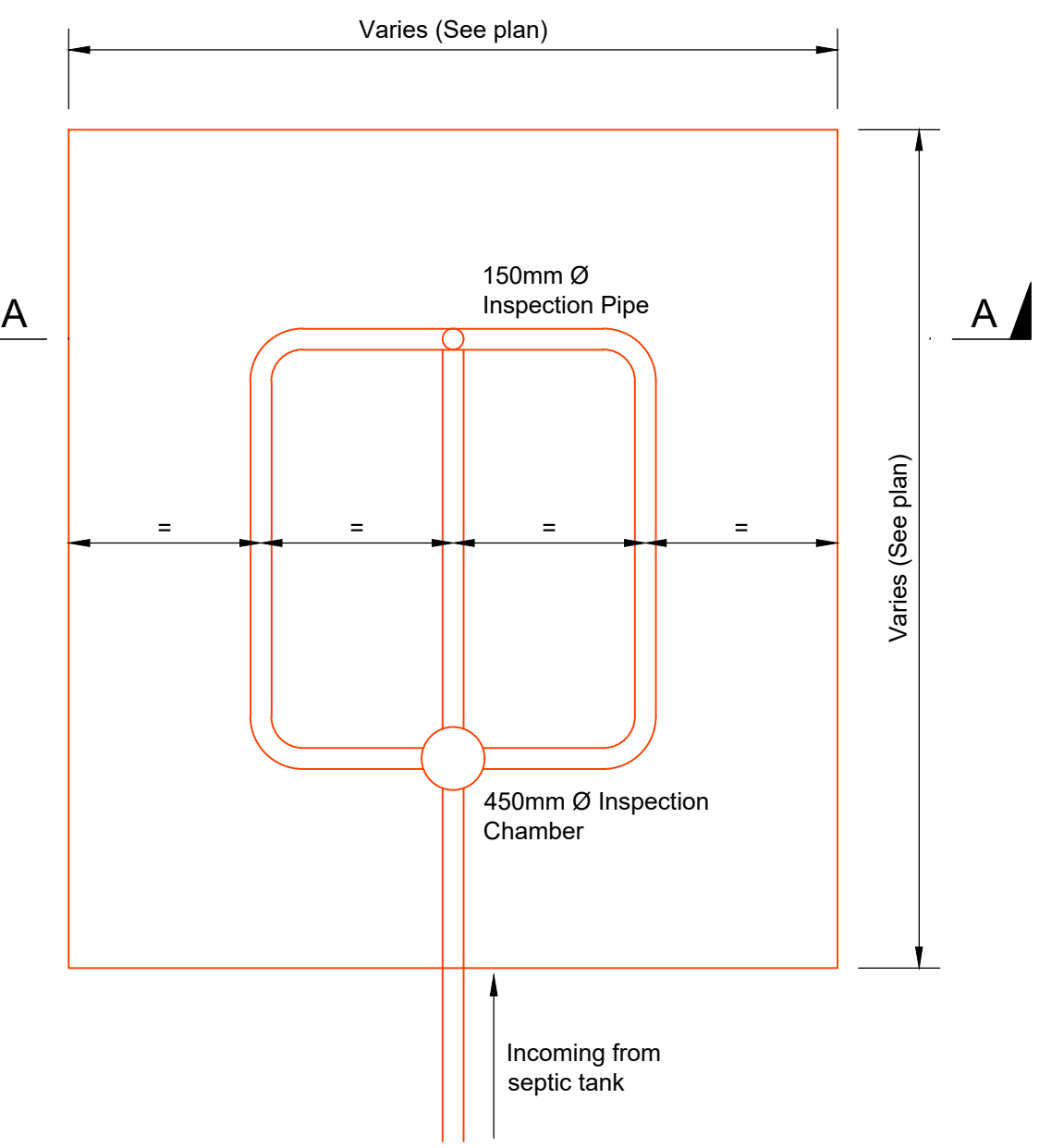Soakaway to be least 5m from building foundations.

Maintenance of proposed surface water drainage

1.Soakaway
Inlet chamber to be checked at six monthly intervals and any organic matter and silt build up removed. Soakaway to be checked also to ensure that there is no build up of standing water once a rainfall event has passed (six monthly). Surface over soakaway to be constructed of material that is easily removed (e.g. lock block) to allow filter gravel to be replaced if required in the future. No trees or large shrubs to be planted within 5 metres of the soakaway.

2.Drainage Pipes
Inlet pipes to be checked at six month intervals for blockages and silt build up. Blockages and structural damage to be repaired or cleaned as necessary.

GATEHOUSE
(outwith applicant ownership)

PLOT 3 DRAINAGE:-
Surface Water Soakaway
A - (25m² Area)

Foul Water Soakaway
1 - (90m² Area)

PLOT 2 DRAINAGE:-
Surface Water Soakaway
B - (35m² Area)

Foul Water Soakaway
1 - (90m² Area)

PLOT 1 DRAINAGE:-
Surface Water Soakaway
A - (25m³ Area)

Foul Water Soakaway
1 - (90m² Area)

18.0mx5.0mx0.6m deep foul water soakaway

PLOT 3

5.0mx5.0mx1m deep surface water soakaway

8.0mx5.0mx1m deep surface water soakaway

7.0mx5.0mx1m deep surface water soakaway

PLOT 4

18.0mx5.0mx0.6m deep foul water soakaway

10.0mx2.5mx1m deep surface water soakaway

21.0mx5.0mx0.6m deep foul water soakaway

PLOT 1

10.0mx9.0mx0.6m deep foul water soakaway

PLOT 4 DRAINAGE:-
Surface Water Soakaway
C - (40m² Area)

Foul Water Soakaway
2 - (105m² Area)

PLOT 5

8.0mx5.0mx1m deep surface water soakaway

10.0mx9.0mx0.6m deep foul water soakaway

10.0mx10.5mx0.6m deep foul water soakaway

7.0mx5.0mx1m deep surface water soakaway

PLOT 6

PLOT 5 DRAINAGE:-
Surface Water Soakaway
C - (40m² Area)

Foul Water Soakaway
2 - (105m² Area)

PLOT 6 DRAINAGE:-
Surface Water Soakaway
B - (35m² Area)

Foul Water Soakaway
1 - (90m² Area)

14.0mx2.5mx1m deep surface water soakaway

PLOT 7

PLOT 7 DRAINAGE:-
Surface Water Soakaway
B - (35m² Area)

Foul Water Soakaway
1 - (90m² Area)

10.0mx9.0mx0.6m deep foul water soakaway

10.0mx4.0mx0.6m deep foul water soakaway

PLOT 8

21.0mx5.0mx0.6m deep foul water soakaway

PLOT 8 DRAINAGE:-
Surface Water Soakaway
C - (40m² Area)

Foul Water Soakaway
2 - (105m² Area)

150mm dia perforated distributor pipe.

1No. inspection pipe with lockable cover

Hard clean crushed rock Type B, as Clause 505, table 5/5 of the specification for Highway Works.

Terram 1000 by Exxon Chemical Geopolymers Ltd. with 300mm min lap or equal approved.

SECTION A - A

Varies (See plan)

150mm Ø Inspection Pipe

A

A

450mm Ø Inspection Chamber

Incoming from septic tank

Varies (See plan)

TYPICAL PRIVATE FOUL WATER
SOAKAWAY LAYOUT
Scale NTS

Issue	Revision	Initial	Date

Cameron + Ross
CIVIL + STRUCTURAL ENGINEERING

Forbes House | 15 Victoria Street | Aberdeen | AB10 1XB
01224 642 400 | w : cameronross.co.uk
Mulberry House | 39-41 Harbour Road | Inverness | IV1 1UF
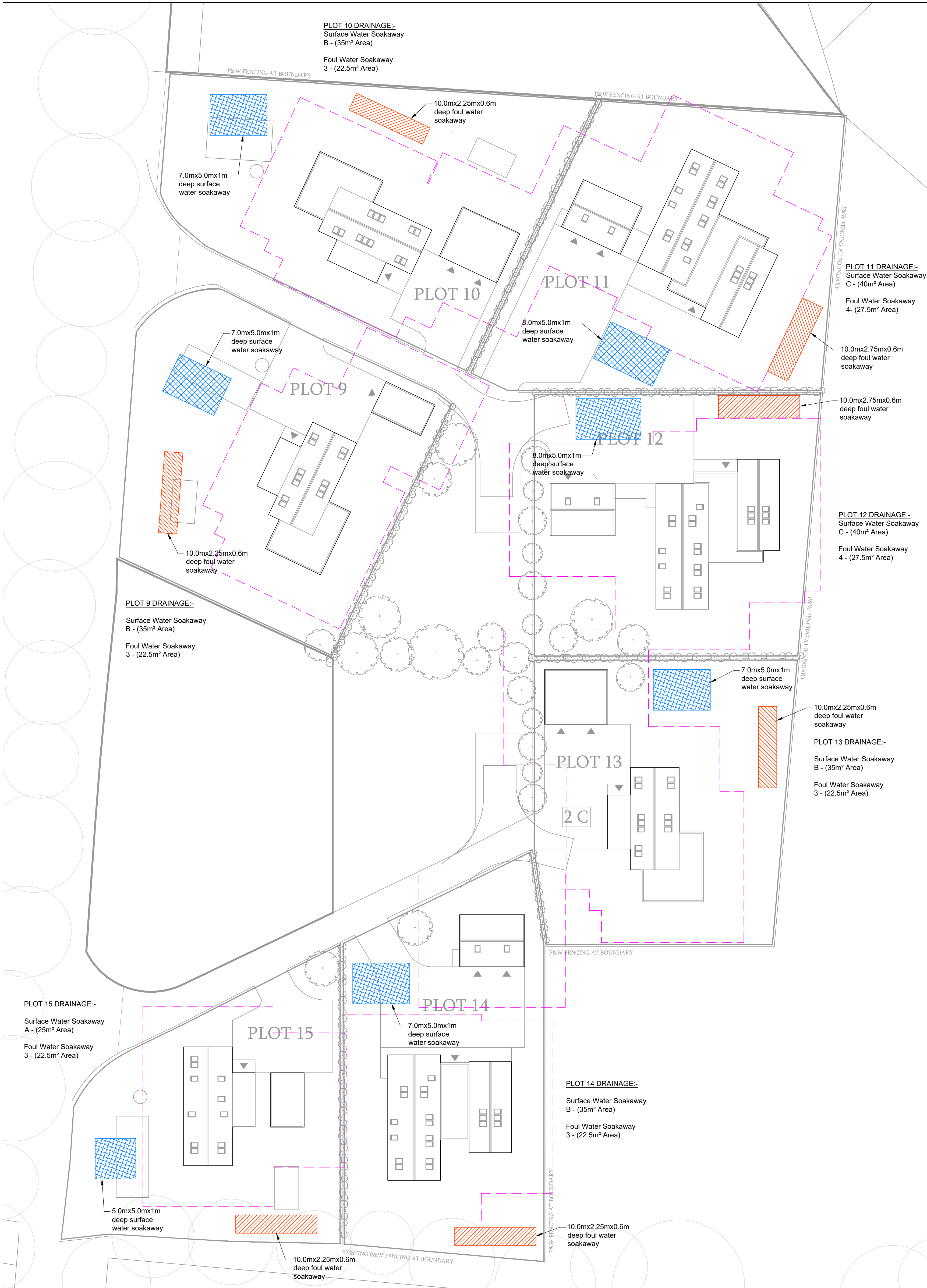t : 01463 570 100 | w : cameronross.co.uk

Client:
AKD LTD

Project:
HOUSING DEVELOPMENT
MAINS OF CARNOUSIE
TURRIFF, ABERDEENSHIRE

Drawing Title:
DRAINAGE LAYOUT
PLOTS 1-8

North

Status:
PLANNING

Scale:	1:250 @ A1	Date:	08/02/2020
By:	SAD	Checked: GGC	Approved: GGC

Dwg. No.	Rev.
191327-000-CAM-DR-C-901	-

DRAINAGE LAYOUT
PLOTS 1 - 8
Scale 1:250

PLOT 10 DRAINAGE:-
Surface Water Soakaway
B - (35m² Area)

Foul Water Soakaway
3 - (22.5m² Area)

P&W FENCING AT BOUNDARY

10.0mx2.25mx0.6m deep foul water soakaway

7.0mx5.0mx1m deep surface water soakaway

PLOT 10

PLOT 11

PLOT 11 DRAINAGE:-
Surface Water Soakaway
C - (40m² Area)

Foul Water Soakaway
4- (27.5m² Area)

10.0mx2.75mx0.6m deep foul water soakaway

8.0mx5.0mx1m deep surface water soakaway

10.0mx2.75mx0.6m deep foul water soakaway

7.0mx5.0mx1m deep surface water soakaway

PLOT 9

PLOT 12

8.0mx5.0mx1m deep surface water soakaway

PLOT 12 DRAINAGE:-
Surface Water Soakaway
C - (40m² Area)

Foul Water Soakaway
4 - (27.5m² Area)

10.0mx2.25mx0.6m deep foul water soakaway

PLOT 9 DRAINAGE:-

Surface Water Soakaway
B - (35m² Area)

Foul Water Soakaway
3 - (22.5m² Area)

7.0mx5.0mx1m deep surface water soakaway

10.0mx2.25mx0.6m deep foul water soakaway

PLOT 13

PLOT 13 DRAINAGE:-

Surface Water Soakaway
B - (35m² Area)

Foul Water Soakaway
3 - (22.5m² Area)

2 C

P&W FENCING AT BOUNDARY

PLOT 15 DRAINAGE:-

Surface Water Soakaway
A - (25m² Area)

Foul Water Soakaway
3 - (22.5m² Area)

PLOT 14

7.0mx5.0mx1m deep surface water soakaway

PLOT 15

PLOT 14 DRAINAGE:-

Surface Water Soakaway
B - (35m² Area)

Foul Water Soakaway
3 - (22.5m² Area)

5.0mx5.0mx1m deep surface water soakaway

10.0mx2.25mx0.6m deep foul water soakaway

EXISTING P&W FENCING AT BOUNDARY

10.0mx2.25mx0.6m deep foul water soakaway

DRAINAGE LAYOUT
PLOTS 9 - 15
Scale 1:250

Polypropylene Inspection Chamber

150mm dia porous distributor pipe.

Ground Level

1No. 150mm Ø inspection pipe with lockable cover

450 min

500

1m

Length Varies (See plan)

Hard clean crushed rock Type B, as Clause 505, table 5/5 of the specification for Highway Works.

Terram 1000 by Exxon Chemical Geopolymers Ltd. with 300mm min lap or equal approved.

TYPICAL PRIVATE SURFACE WATER
SOAKAWAY LONGITUDINAL SECTION
Scale NTS

Note:
Soakaway dimensions based on a soil infiltration rate (f) = 1.67×10^{-5} m/sec as determined by Cameron + Ross' site investigation of 20/09/2020 in accordance with in BRE Digest 365 with 30% free volume of fill material.

Issue	Revision	Initial	Date

Cameron + Ross
CIVIL + STRUCTURAL ENGINEERING
Forbes House | 15 Victoria Street | Aberdeen | AB10 1XB
01224 642 400 | w : cameronross.co.uk
Mulberry House | 39-41 Harbour Road | Inverness | IV1 1UF
t : 01463 570 100 | w : cameronross.co.uk

Client:
AKD LTD

Project:
HOUSING DEVELOPMENT
MAINS OF CARNOUSIE
TURRIFF, ABERDEENSHIRE

Drawing Title:
DRAINAGE LAYOUT
PLOTS 9-15

North

Status:
PLANNING

Scale:	1:250 @ A1	Date:	08/02/2020
By:	SAD	Checked: GGC	Approved: GGC

Dwg. No.
191327-000-CAM-DR-C-902

Rev.
-