Structural Engineers

184 Kellaway Avenue
Bristol
BS6 7YL

Telephone: 0117 9421199
Email: terryv@tmventham.com
Web: www.tmventham.com

T M Ventham
Practice

Construction of New Residential Apartments at Air Balloon Road

Design for the Disposal of Surface Water

For Mooshead Ltd

Ref 7451

February 2021

The proposed development will occupy a site that was once occupied by several terraced houses. The terraced houses were demolished some considerable time ago, and the site has been recently used as a location for an advertising hoarding.

The approved development occupies most of the site, with a landscaped area at one end. Most of the site is occupied by the building and some small courtyard areas. Drawing 7451-SK00 (copy appended) shows the impermeable catchment area of the site, which has been calculated as $257m^2$.

Some boreholes and trial holes have been sunk on the site, and the underlying subsoil has been found to be stiff red-brown clay over layers of sandstone and mudstone, i.e. all of low permeability.

With soil of low permeability and with the development occupying a high percentage of the site, soakaway drainage is not a realistic possibility. Any attempt at soakaway would not be able to comply with the building regulation requirement to be 5m from a building or boundary.

The project has been discussed with Wessex Water, who have agreed to allow the surface water to be taken to a nearby combined sewer, provided that the flow rate is attenuated to 2L/s.

An attenuation tank has been designed based on a 100 years storm plus 40% with the agreed discharge rate of 2L/s. See attenuation tank design sheet attached. Also see drawing 7451-SK03. This drawing shows the drainage layout. This shows the location of a $7.2m^3$ attenuation tank, and a flow control manhole with a discharge to the combined sewer at a rate of 2L/s.

See also drawing 7451-SK104, which shows the details of the adoptable sewer which have been agreed with Wessex.

T M Ventham CEng MIStructE

NOTES :-

GENERAL :-
THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DRAWINGS & SPECIFICATIONS.

no.	revision	by	chk'd	date
-	FIRST ISSUE	RKL	TMV	20.04.20
A	LEVELS UPDATED TO ORDNANCE DATUM	TJB	TMV	05.08.20

project

SITE ADJACENT
AIR BALLOON ROAD &
HILLSIDE ROAD
BRISTOL
BS5 8LB

drawing title

PROPOSED SITE LAYOUT
IMPERMEABLE AREA

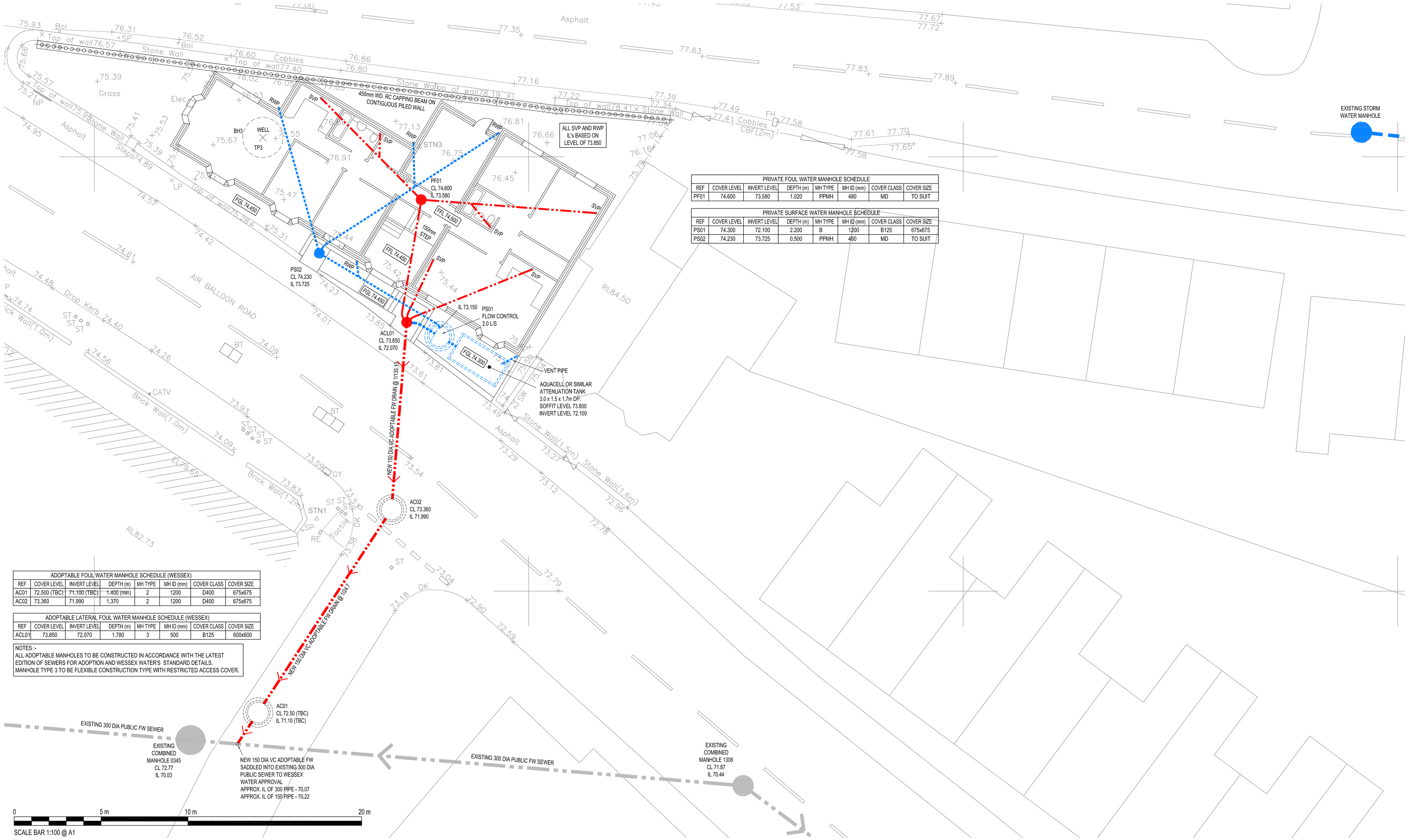
status: PRELIMINARY
date: APRIL 2020

Structural Engineers

184 Kellaway Avenue
Bristol
BS6 7YL
Tel: 0117 9421199
Email: terryv@tmventham.com

T M Ventham
Practice

scale@A1: 1:100
drawing number: 7451-SK 00
revision: _



PRIVATE FOUL WATER MANHOLE SCHEDULE							
REF	COVER LEVEL	INVERT LEVEL	DEPTH (m)	MH TYPE	MH ID (mm)	COVER CLASS	COVER SIZE
PF01	74.600	73.580	1.020	PPMH	480	MD	TO SUIT

PRIVATE SURFACE WATER MANHOLE SCHEDULE							
REF	COVER LEVEL	INVERT LEVEL	DEPTH (m)	MH TYPE	MH ID (mm)	COVER CLASS	COVER SIZE
PS01	74.300	72.100	2.200	B	1200	B125	675x675
PS02	74.230	73.725	0.500	PPMH	480	MD	TO SUIT

ADOPTABLE FOUL WATER MANHOLE SCHEDULE (WESSEX)							
REF	COVER LEVEL	INVERT LEVEL	DEPTH (m)	MH TYPE	MH ID (mm)	COVER CLASS	COVER SIZE
AC01	72.500 (TBC)	71.100 (TBC)	1.400 (min)	2	1200	D400	675x675
AC02	73.360	71.990	1.370	2	1200	D400	675x675

ADOPTABLE LATERAL FOUL WATER MANHOLE SCHEDULE (WESSEX)							
REF	COVER LEVEL	INVERT LEVEL	DEPTH (m)	MH TYPE	MH ID (mm)	COVER CLASS	COVER SIZE
ACL01	73.850	72.070	1.780	3	500	B125	600x600

NOTES :-
ALL ADOPTABLE MANHOLES TO BE CONSTRUCTED IN ACCORDANCE WITH THE LATEST EDITION OF SEWERS FOR ADOPTION AND WESSEX WATER'S STANDARD DETAILS.
MANHOLE TYPE 3 TO BE FLEXIBLE CONSTRUCTION TYPE WITH RESTRICTED ACCESS COVER.

NOTES :-
GENERAL :-
THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DRAWINGS & SPECIFICATIONS.

DO NOT SCALE THIS DRAWING USE FIGURED DIMENSIONS ONLY.

DRAINAGE :-
ALL PRIVATE DRAINS ARE TO BE 110mm Dia. UPVC EXCEPT WHERE NOTED OTHERWISE.

WHERE PRIVATE DRAINS PASS UNDER AN ADOPTABLE HIGHWAY / FOOTWAY THEY ARE TO BE 150mm Dia., & ARE TO CONSTRUCTED IN ACCORDANCE WITH THE LATEST EDITION OF 'SEWERS FOR ADOPTION'.

ALL LEVELS & DIMENSIONS ARE TO BE CHECKED & VERIFIED ON SITE PRIOR TO THE COMMENCEMENT OF ANY WORKS.

THE LOCATION, SIZE & DEPTH OF ALL EXISTING DRAINS ARE TO BE ESTABLISHED BY THE MAIN CONTRACTOR PRIOR TO THE COMMENCEMENT OF ANY WORKS.

ANY DISCREPANCIES FROM THE INFORMATION SHOWN ARE TO BE IMMEDIATELY REPORTED TO THE ENGINEER.

ALL PIPES ARE TO BE LAID WITH THEIR SOFFITS LEVEL.

ALL INVERT LEVELS SHOWN ARE TO THE OUTLET PIPE UNLESS NOTED OTHERWISE.

ALL PIPE GRADIENTS SHOWN ARE APPROXIMATE THEREFORE ALL PIPE RUNS ARE TO BE LAID TO THE INVERT LEVELS SHOWN,

ALL INTERNAL PRIVATE FOUL DRAINS ARE TO BE LAID AT A MINIMUM 1 IN 40 GRADIENT.

ALL SURFACE WATER DRAINS ARE TO BE LAID AT A MINIMUM 1 IN 100 GRADIENT.

ALL ADOPTABLE DRAINAGE WORKS ARE TO BE CONSTRUCTED IN ACCORDANCE WITH THE REQUIREMENTS OF THE LATEST EDITION OF 'SEWERS FOR ADOPTION'.

ALL INTERNAL MANHOLES ARE TO BE FITTED WITH SCREW DOWN DOUBLE SEAL COVERS RECESSED TO RECEIVE FLOOR FINISHES.

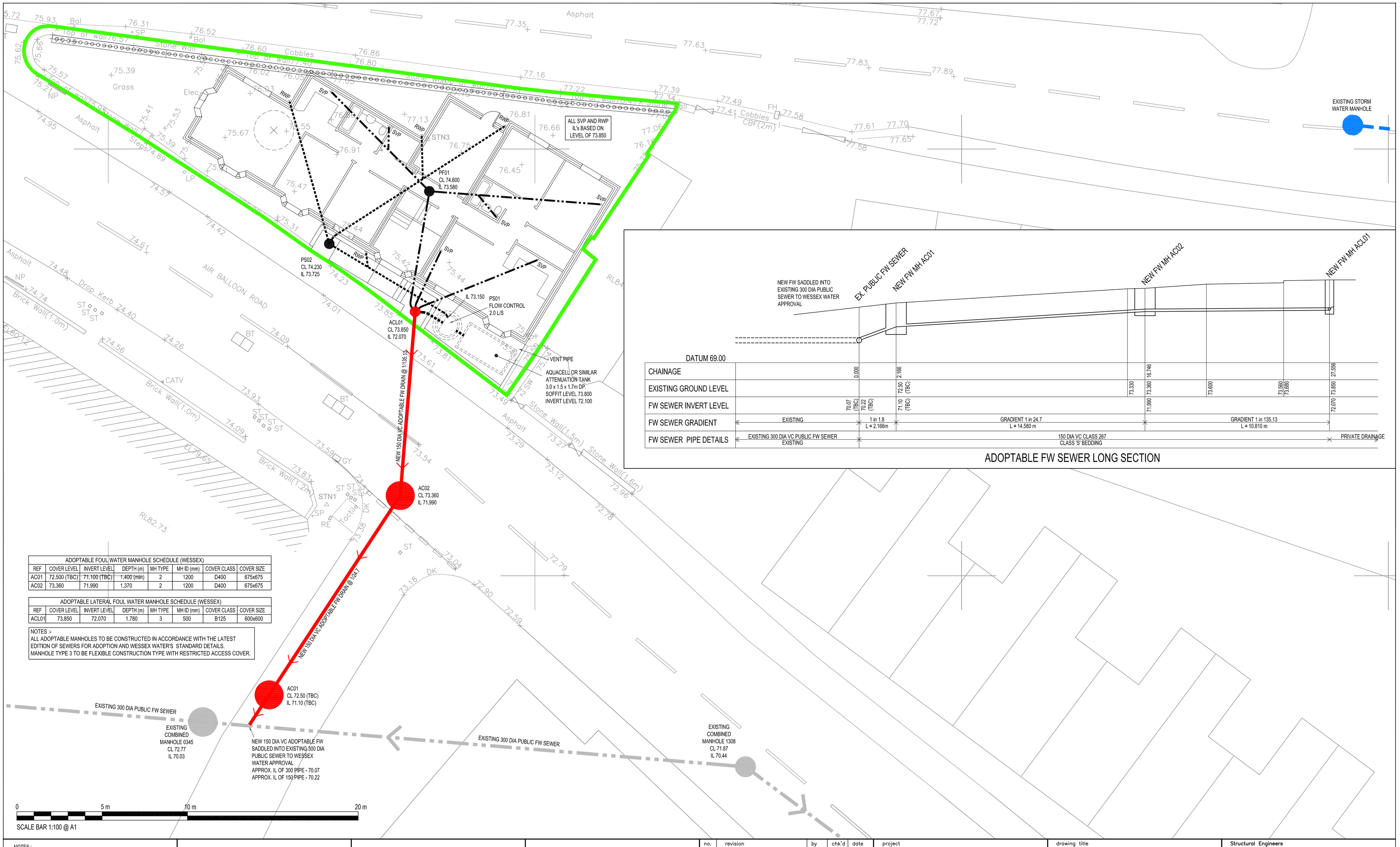
no.	revision	by	chk'd	date
-	FIRST ISSUE	RKL	TMV	20.04.20
A	LAYOUT AMENDED & LEVELS UPDATED TO ORDNANCE DATUM	TJB	TMV	05.08.20

project
SITE ADJACENT
AIR BALLOON ROAD &
HILLSIDE ROAD
BRISTOL
BS5 8LB

drawing title
PROPOSED DRAINAGE LAYOUT

status: PRELIMINARY
date: APRIL 2020
scale@A1: 1:100
drawing number: 7451-SK 03
revision: A

Structural Engineers
184 Kellaway Avenue
Bristol
BS6 7YL
Tel: 0117 9421199
Email: terryv@tmventham.com
TM Ventham
Practice



ADOPTABLE FW SEWER LONG SECTION

ADOPTABLE FOUL WATER MANHOLE SCHEDULE (WESSEX)							
REF	COVER LEVEL	INVERT LEVEL	DEPTH (m)	MH TYPE	MH ID (mm)	COVER CLASS	COVER SIZE
AC01	72.500 (TBC)	71.100 (TBC)	1.400 (min)	2	1200	D400	675x675
AC02	73.360	71.990	1.370	2	1200	D400	675x675

ADOPTABLE LATERAL FOUL WATER MANHOLE SCHEDULE (WESSEX)							
REF	COVER LEVEL	INVERT LEVEL	DEPTH (m)	MH TYPE	MH ID (mm)	COVER CLASS	COVER SIZE
ACL01	73.850	72.070	1.780	3	500	B125	600x600

NOTES :-
ALL ADOPTABLE MANHOLES TO BE CONSTRUCTED IN ACCORDANCE WITH THE LATEST EDITION OF SEWERS FOR ADOPTION AND WESSEX WATER'S STANDARD DETAILS.
MANHOLE TYPE 3 TO BE FLEXIBLE CONSTRUCTION TYPE WITH RESTRICTED ACCESS COVER.

NOTES :-
GENERAL :-
THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DRAWINGS & SPECIFICATIONS.

DO NOT SCALE THIS DRAWING USE FIGURED DIMENSIONS ONLY.

DRAINAGE :-
ALL PRIVATE DRAINS ARE TO BE 110mm Dia. UPVC EXCEPT WHERE NOTED OTHERWISE.

WHERE PRIVATE DRAINS PASS UNDER AN ADOPTABLE HIGHWAY / FOOTWAY THEY ARE TO BE 150mm Dia.. & ARE TO CONSTRUCTED IN ACCORDANCE WITH THE LATEST EDITION OF 'SEWERS FOR ADOPTION'.

ALL LEVELS & DIMENSIONS ARE TO BE CHECKED & VERIFIED ON SITE PRIOR TO THE COMMENCEMENT OF ANY WORKS.

THE LOCATION, SIZE & DEPTH OF ALL EXISTING DRAINS ARE TO BE ESTABLISHED BY THE MAIN CONTRACTOR PRIOR TO THE COMMENCEMENT OF ANY WORKS.

ANY DISCREPANCIES FROM THE INFORMATION SHOWN ARE TO BE IMMEDIATELY REPORTED TO THE ENGINEER.

ALL PIPES ARE TO BE LAID WITH THEIR SOFFITS LEVEL.

ALL INVERT LEVELS SHOWN ARE TO THE OUTLET PIPE UNLESS NOTED OTHERWISE.

ALL PIPE GRADIENTS SHOWN ARE APPROXIMATE THEREFORE ALL PIPE RUNS ARE TO BE LAID TO THE INVERT LEVELS SHOWN.

ALL INTERNAL PRIVATE FOUL DRAINS ARE TO BE LAID AT A MINIMUM 1 IN 40 GRADIENT.

ALL SURFACE WATER DRAINS ARE TO BE LAID AT A MINIMUM 1 IN 100 GRADIENT.

ALL ADOPTABLE DRAINAGE WORKS ARE TO BE CONSTRUCTED IN ACCORDANCE WITH THE REQUIREMENTS OF THE LATEST EDITION OF 'SEWERS FOR ADOPTION'.

ALL INTERNAL MANHOLES ARE TO BE FITTED WITH SCREW DOWN DOUBLE SEAL COVERS RECESSED TO RECEIVE FLOOR FINISHES.

KEY :-

ADOPTABLE SEWER

SITE BOUNDARY

no.	revision	by	chk'd	date
-	FIRST ISSUE	RKL	TMV	20.04.20
A	LAYOUT AMENEDED & LEVELS UPDATED TO ORDNANCE DATUM	TJB	TMV	05.08.20

project
SITE ADJACENT
AIR BALLOON ROAD &
HILLSIDE ROAD
BRISTOL
BS5 8LB

drawing title
SECTION 104 AGREEMENT
LEGAL COLOURS

status: PRELIMINARY
date: APRIL. 2019

Structural Engineers
184 Kellaway Avenue
Bristol
BS6 7YL
Tel: 0117 9421199
Email: terryv@tmventham.com
T M Ventham
Practice

scale@A1: 1:100
drawing number: 7451-SK S104
revision: A

Job :

Housing Development
AIR BALOON ROAD
BRISTOL
BS5 8LB

Structural Engineers

184 Kellaway Avenue
Bristol
BS6 7YL

Telephone : 0117 9421199

Email : terryv@tmventham.com

Job number	Sheet	date
7451	02A	22/02/21

T M Ventham
Practice

Attenuation Tank Design

Return Period 100 Years **+ 40%**

Location England and Wales
Ratio of 60 minute to 2 day rainfalls of 5 year return period (BRE digest 365-fig 1) r = 0.35
Impermeable area (sq.m.) 257
Outflow from tank in litres/second 2
Depth of tank (m) 1.6

Duration	M5 rainfalls	Growth factor Z2	Return Period rainfall	Inflow m3	Outflow m3	Storage required m3
5mins	7.10	1.86	13.22	4.76	0.60	4.16
10mins	10.10	1.93	19.45	7.00	1.20	5.80
15mins	12.30	1.96	24.08	8.67	1.80	6.87
30mins	15.70	2.00	31.37	11.29	3.60	7.69
1 hour	20.00	2.03	40.60	14.61	7.20	7.41
2 hour	24.40	2.01	49.04	17.65	14.40	3.25
4 hour	29.90	1.97	58.90	21.19	28.80	-7.61
6 hour	33.80	1.94	65.50	23.57	43.20	-19.63
10 hour	38.90	1.90	73.83	26.56	72.00	-45.44
24 hour	49.60	1.81	89.78	32.30	172.80	-140.50

Note:- If Orifice plate used then only 50% of outflow rate used

Max storage required = 7.69 cubic metres

√(Max storage required/tank depth) 2.19 Square Tank required

Use Hydrobrake at 2 Litres / Second

Use 3.0 x 1.5 x 1.6m deep = 7.20 cubic metres

Note additional storage provided in the Flow Control manhole = 1.80 cubic metres

Total storrage provided 7.20 + 1.8 = 9.0 cubic metres.