



STRUKTURA

2-4 Kestrel Close, Prestwich Structural Calculations

Issue 1

12 Dec 2024





Quality Management

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Project	2-4 Kestrel Close		
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Authorised by	K Hill, CEng, MICE	Signature (for file)	

Revision Status / History

Rev	Date	Issue / Purpose/ Comment	Prepared	Checked	Authorised
1	12/12/2024	Building control	OB	AT	KH



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Introduction

Struktura Engineering Services have been commissioned by TJ Murphy to carry out a percolation test prior to new drainage system being installed at 2-4 Kestrel Close, Prestwich. The purpose of the test is to check the suitability of the ground conditions to evaluate whether a soakaway would be suitable as a drainage option as part of implementation of Sustainable Drainage Systems (SUDS).

The National Planning Practice Guidance sets out The Hierarchy of Drainage to promote the use of Sustainable Drainage Systems, by aligning modern drainage systems with natural water processes. The aim of Hierarchy of Drainage is to drain surface water run-off as sustainable, as reasonably practicable.

- An **adequate soakaway** or other infiltration system
- To a **surface water body** (e.g. an ordinary watercourse)
- To a surface water sewer, highway drain, or other another drainage system
- To a combined sewer



Findings

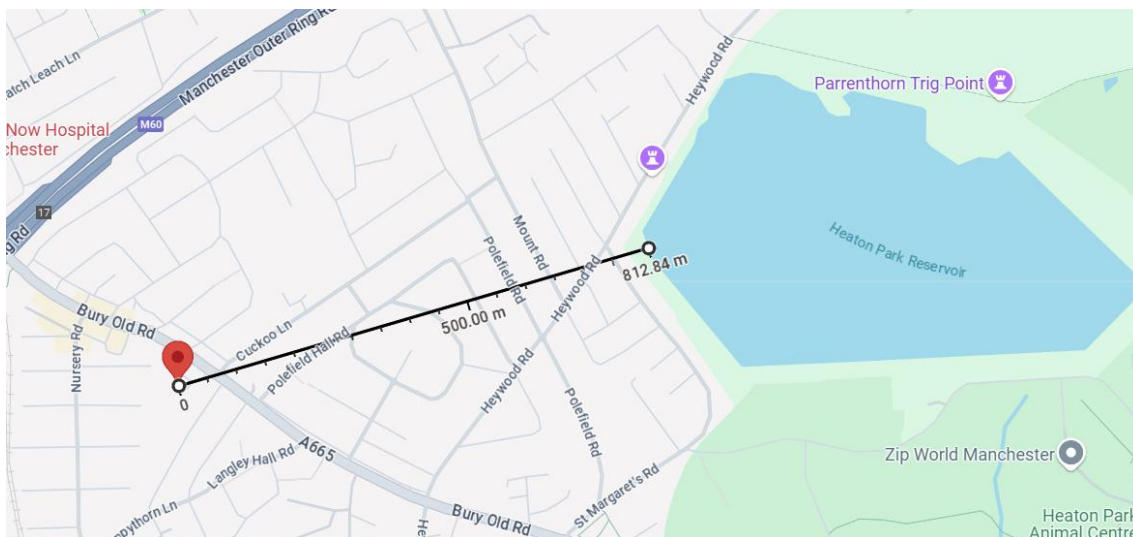
1. Percolation Test

The percolation test consisted of digging a hole 1m in width, length and depth and filled with water up to 750mm high (75% of capacity). Then the timer was set to find out how long it would take for the water level to reach 250mm mark (25% capacity) to find out the rate of infiltration of the existing ground.

After 24 hours had elapsed, the water level was still on the 750mm mark illustrating that the **existing ground is not suitable for an infiltration drainage system.**

2. Nearest Watercourse

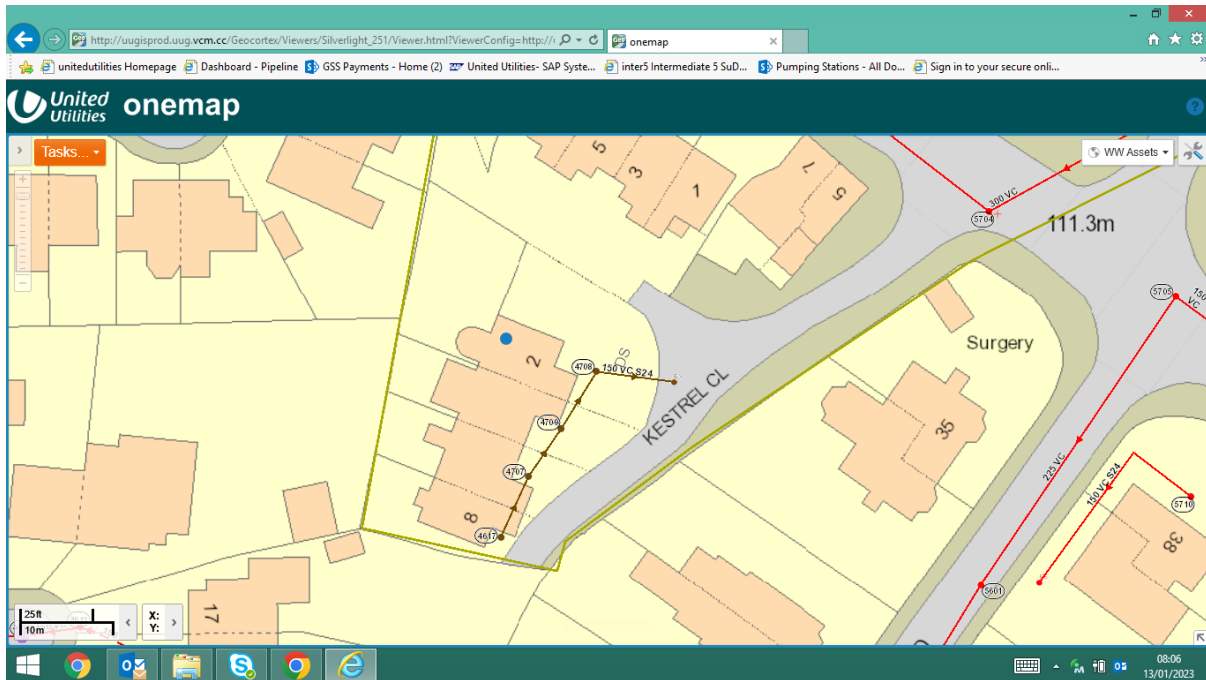
Given that the nearest surface water body which is located 812m away from the site and the fact that the site is in a heavily built-up area, connecting to the existing water course is not a viable option (refer to map below).





3. Surface water sewer

There is no surface water sewer in the vicinity of the site as shown on UU maps with only a combined water manhole located on Kestrel Close.



UU Maps (Kestrel Close)

4. Combined water

Based on investigations above, and going through the SuDS hierarchy, it was established that the drainage runoff would be discharged onto the existing combined water manhole on Kestrel Close as shown on drawing 23001-49-XX-XX-DR-S-4001_P01.

Design standards adopted as below:

BRE Digest 365 - Soakaway design



Appendix A – Infiltration tests

Project				Job no.	
2-4 KESTREL CLOSE				23001-49	
Calcs for				Start page no./Revision	
PERCOLATION TEST				1	
Calcs by	Calcs date	Checked by	Checked date	Approved by	Approved date
OB	11/12/2024	AT	11/12/2024	KH	11/12/2024

SOAKAWAY DESIGN

In accordance with BRE Digest 365 - Soakaway design

Tedds calculation version 2.0.05

Design rainfall intensity

Location of catchment area	Manchester
Impermeable area drained to the system	A = 100.0 m ²
Return period	Period = 10 yr
Ratio 60 min to 2 day rainfall of 5 yr return period	r = 0.360
5-year return period rainfall of 60 minutes duration	M5_60min = 19.0 mm
Increase of rainfall intensity due to global warming	p _{climate} = 0 %

Soakaway / infiltration trench details

Soakaway type	Rectangular
Minimum depth of pit (below incoming invert)	d = 1000 mm
Width of pit	w = 1000 mm
Length of pit	l = 1000 mm
Percentage free volume	V _{free} = 25 %

Soil infiltration rate (BRE digest 365)

Length of trial pit	l _{trial} = 1000 mm
Width of trial pit	b _{trial} = 1000 mm
Depth of trial pit (below invert)	d _{trial} = 1000 mm
Free volume (if fill used)	V _{trial} = 100 %
75% depth of pit	d ₇₅ = (d _{trial} × 0.75) = 750.00 mm
50% depth of pit	d ₅₀ = (d _{trial} × 0.50) = 500.00 mm
25% depth of pit	d ₂₅ = (d _{trial} × 0.25) = 250.00 mm
Test 1 - time to fall from 75% depth to 25% depth	T1 = 99999999 min
Test 2 - time to fall from 75% depth to 25% depth	T2 = 99999999 min
Test 3 - time to fall from 75% depth to 25% depth	T3 = 99999999 min
Longest time to fall from 75% depth to 25% depth	t _{lg} = max(T1, T2, T3) = 99999999 min
Storage volume from 75% to 25% depth	V _{p75_25} = (l _{trial} × b _{trial} × (d ₇₅ - d ₂₅)) × V _{trial} = 0.50 m ³
Internal surface area to 50% depth	a _{p50} = ((l _{trial} × b _{trial}) + (l _{trial} + b _{trial}) × 2 × d ₅₀) = 3.00 m ²
Surface area of soakaway to 50% storage depth	A _{s50} = 2 × (l _{trial} + b _{trial}) × d _{trial} / 2 = 2.000 m ²
Soil infiltration rate	f = V _{p75_25} / (a _{p50} × t _{lg}) = 27.8×10⁻¹² m/s
Wetted area of pit 50% full	a _{s50} = l × d + w × d = 2000000 mm ²

Table equations

Inflow (cl.3.3.1)	I = M10 × A
Outflow (cl.3.3.2)	O = a _{s50} × f × D
Storage (cl.3.3.3)	S = I - O

Duration, D (min)	Growth factor Z1	M5 rainfalls (mm)	Growth factor Z2	10 year rainfall, M10 (mm)	Inflow (m ³)	Outflow (m ³)	Storage required (m ³)
5	0.36;	6.8;	1.20;	8.2;	0.82;	0.00;	0.82
10	0.51;	9.7;	1.22;	11.8;	1.18;	0.00;	1.18
15	0.62;	11.8;	1.23;	14.5;	1.45;	0.00;	1.45

Project 2-4 KESTREL CLOSE				Job no. 23001-49	
Calcs for PERCOLATION TEST				Start page no./Revision 2	
Calcs by OB	Calcs date 11/12/2024	Checked by AT	Checked date 11/12/2024	Approved by KH	Approved date 11/12/2024

Duration, D (min)	Growth factor Z1	M5 rainfalls (mm)	Growth factor Z2	10 year rainfall, M10 (mm)	Inflow (m³)	Outflow (m³)	Storage required (m³)
30	0.79;	15.0;	1.24;	18.6;	1.86;	0.00;	1.86
60	1.00;	19.0;	1.24;	23.6;	2.36;	0.00;	2.36
120	1.22;	23.2;	1.24;	28.7;	2.87;	0.00;	2.87
240	1.48;	28.1;	1.23;	34.5;	3.45;	0.00;	3.45
360	1.67;	31.7;	1.21;	38.5;	3.85;	0.00;	3.85
600	1.90;	36.1;	1.20;	43.4;	4.34;	0.00;	4.34
1440	2.42;	46.0;	1.18;	54.2;	5.42;	0.00;	5.42

Required storage volume $S_{req} = 5.42 \text{ m}^3$

Soakaway storage volume $S_{act} = l \times d \times w \times V_{free} = 0.25 \text{ m}^3$

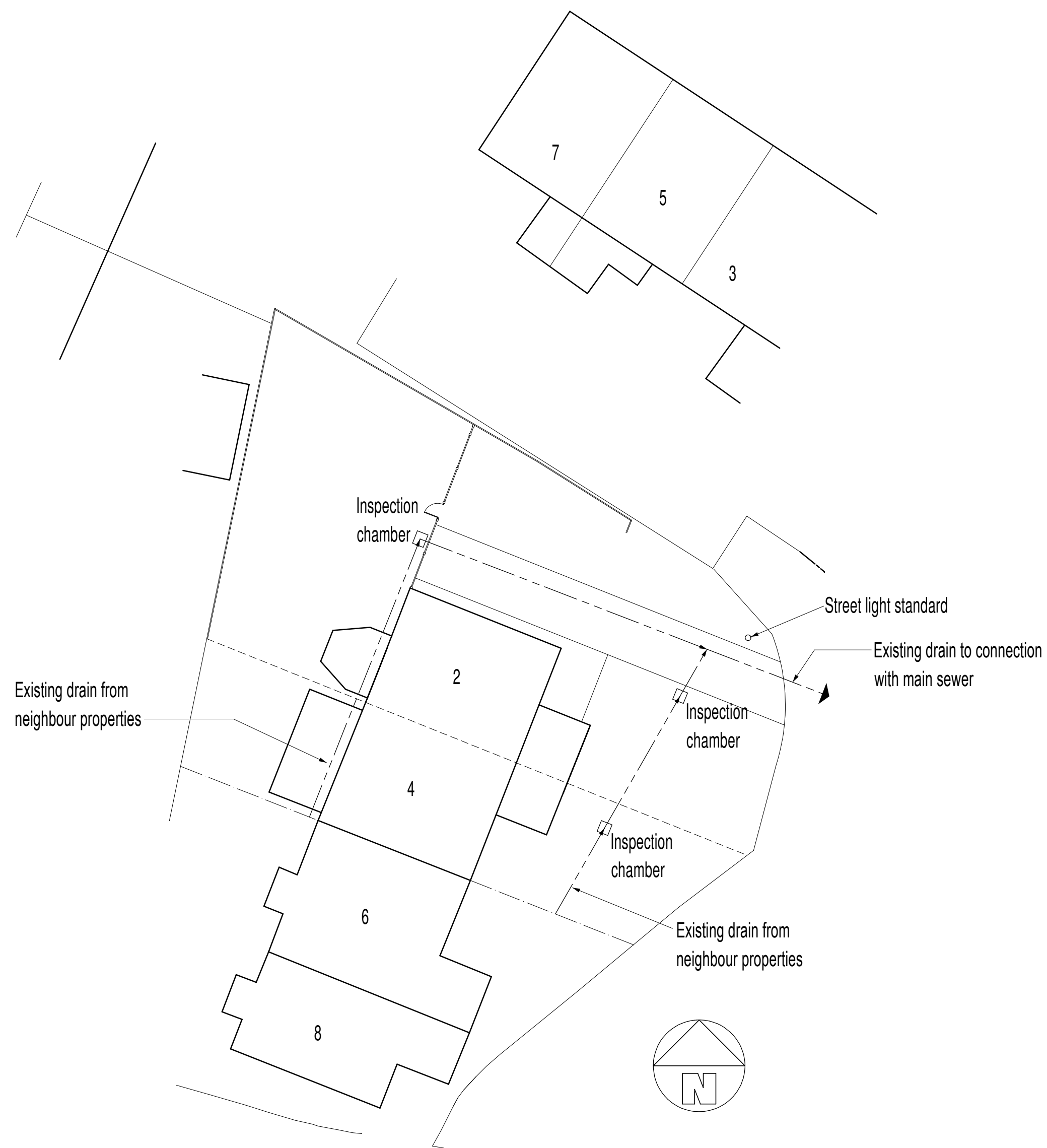
FAIL - Soakaway storage volume inadequate

Time for emptying soakaway to half volume $t_{s50} = S_{req} \times 0.5 / (a_{s50} \times f) = -596523\text{hr} -14\text{min} -8\text{s}$

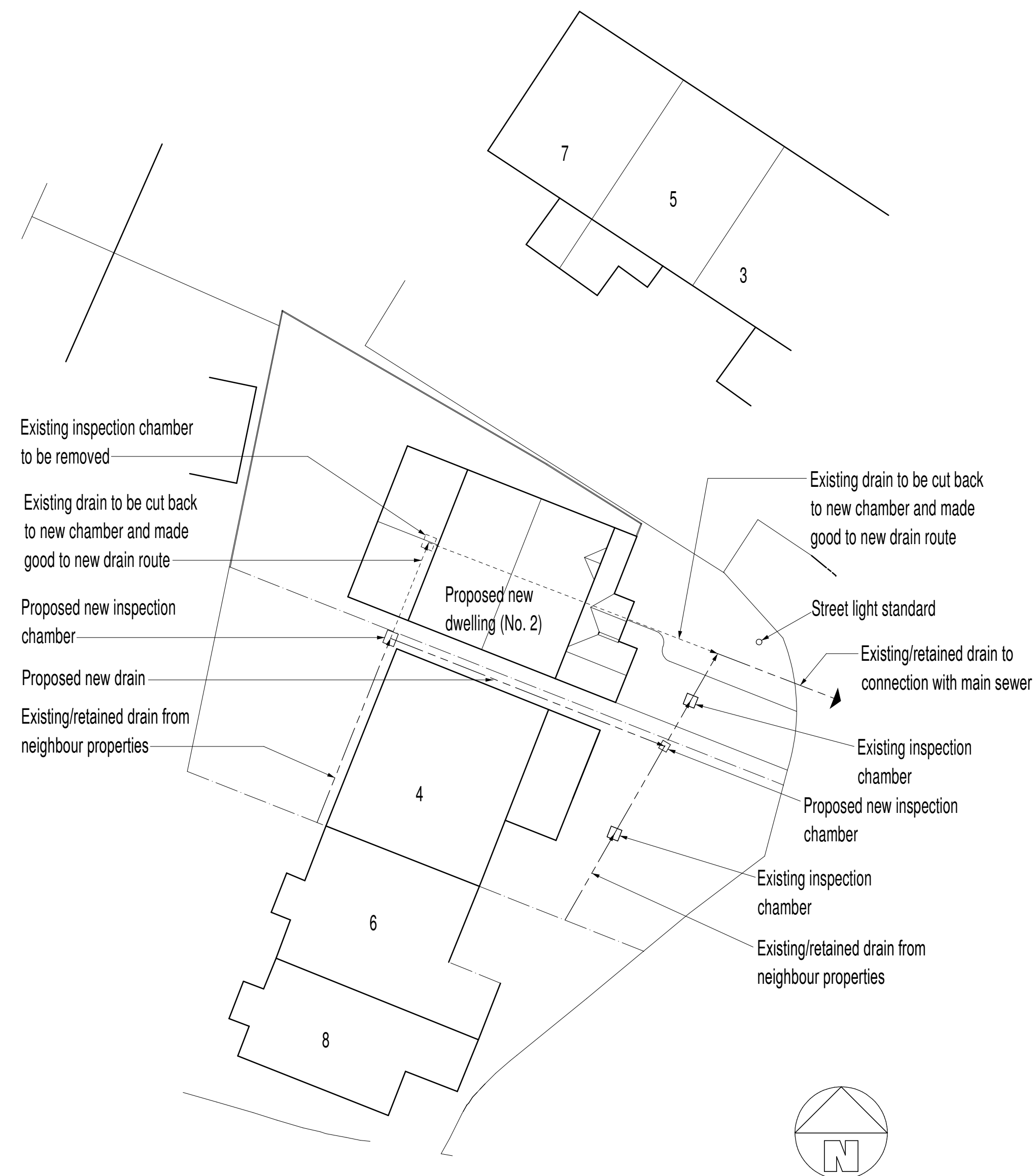
FAIL - Soakaway discharge time greater than 24 hours



Appendix B - Drawings



EXISTING SITE PLAN (Scale 1/200)



PROPOSED SITE PLAN (Scale 1/200)

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REVISION DETAILS
 REV

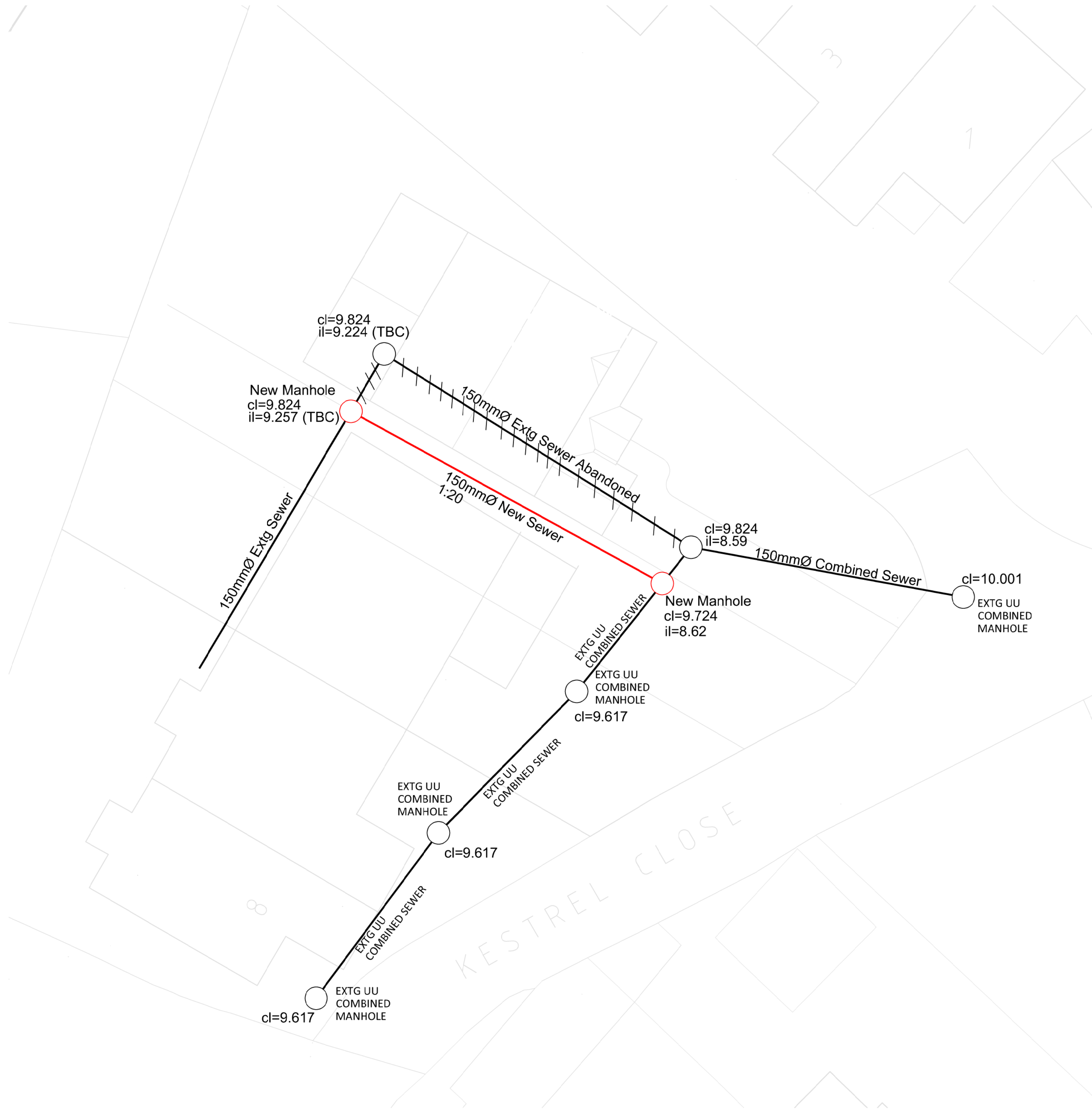
NASH BUILDING CONSULTANTS LIMITED
 ARCHITECTURAL DESIGN
 PLANNING
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 Heathcroft 38, Heath Lane, Lowton, Warrington, WA3 1JA
 Tel No 01942 722002 / 07879 633662
 Email: gordon@gordonnash.co.uk

CLIENT: MR. M. MURPHY
PROJECT: REPLACEMENT DWELLING AT 2, KESTREL CLOSE AND ALTERATIONS TO RETAINED DWELLING, AT 4, KESTREL CLOSE, WHITEFIELD M45 6SB
DRG. TITLE: EXISTING AND PROPOSED SITE PLANS
DRAWING No: 2020/881-02 **REV.** Original
ISSUE DATE: 25/01/2022 **SCALE:** 1/200 @ A1



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CLIENT:	MR. M. MURPHY																						
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DRG. TITLE:	LOCATION PLAN																						
DRAWING No:	2020/881-01	REV.	Original																				
ISSUE DATE:	24/03/2023	SCALE:	1/500 at A3																				

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**PROPOSED DRAINAGE
PLAN**
1:100

- NOTES**
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 - THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS, ENGINEERS AND SPECIALIST DRAWINGS AND SPECIFICATIONS.

- = NEW COMBINED DRAINAGE
- = EXISTING DRAINAGE

P01	ISSUED FOR INFORMATION	OB	AT	KH	09-05-23
REV	MODIFICATIONS	BY	RE	AP	DATE
PURPOSE OF ISSUE				STATUS	
ISSUED FOR INFORMATION				S2	
CLIENT:					
TJ MURPHY LTD					
PROJECT:					
2 KESTREL CLOSE, WHITEFIELD					
TITLE:					
NEW DRAINAGE LAYOUT AND TYPICAL DETAILS					
DESIGNED BY	DRAWN BY	REVIEWED BY	AUTHORISED BY		
AT	OB	KH	KH		
DATE	SCALE @ A1	JOB REF:	REVISION		
MAY 2023	1:100	23001-49	P01		
DRAWING NUMBER					
23001-49-STK-XX-XX-DR-S-4001					
STRUKTURA					



Appendix C - UU (United Utilities) Correspondence

FW: Our reference - 04031722 2 KESTREL CLOSE M45 6SB

From: wastewaterdeveloperservices@uuplc.co.uk <wastewaterdeveloperservices@uuplc.co.uk>
Sent: Friday, October 13, 2023 1:02 PM
To: athiao@strukturaes.com
Cc: TJ Murphy Ltd <tjmcontracts@tjmltd.co.uk>
Subject: RE: Our reference - 04031722 2 KESTRAL CLOSE M45 6SB

Hi Michael

As you need to move a small 100mm pipe at no 2 Kestrel Close this can be done under building regs under protocol part h4 and you do not need to come to United Utilities ,it can just be moved out of the line of the build drawing no 2020/881/02.

Kind regards JILL



Jill Ellis
Customer Advisor Advanced
Developer Services & Metering
Customer Services
Direct Tel: 01925 233 064
Tel: 0345 072 6067
unitedutilities.com

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