

Temporary Orchard Theatre, Dartford

Drainage & SuDS Strategy

Curtins Ref: 085074-CUR-00-XX-T-C-92001

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Client Name: Dartford Borough Council

Site Address: Orchard Street,
Temple Hill,
Dartford,
Kent,
DA1 1BX,

Rev	Description	Issued by	Checked	Date
P01	Preliminary Issue	MM	MCS	15 November 2023
P02	Revised Planning Description	MM	MCS	07 December 2023

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CONTENTS

1	Introduction	5
1.1	<i>Project Overview.....</i>	5
1.2	<i>Site Location</i>	5
1.3	<i>Site Description</i>	5
1.4	<i>Existing Site Drainage.....</i>	6
1.5	<i>Existing Watercourses</i>	6
1.6	<i>Project Proposal.....</i>	6
2	Flood Risk Summary.....	6
3	Proposed Drainage Strategy.....	7
3.1	<i>General.....</i>	7
3.2	<i>Surface Water.....</i>	7
3.2.1	<i>Proposed Site Discharge</i>	8
3.2.2	<i>Attenuation</i>	8
3.2.3	<i>Water Quality.....</i>	8
3.2.4	<i>Flood Exceedance.....</i>	8
3.3	<i>Foul Water.....</i>	8
4	Conclusions and Recommendations	9
5	Appendices.....	10
	<i>Appendix A – Proposed Development.....</i>	10
	<i>Appendix B – Topographical and GPR Survey.....</i>	10
	<i>Appendix C – Thames Water Sewer Records</i>	10
	<i>Appendix D – Proposed Drainage Strategy</i>	10
	<i>Appendix E – Causeway Flow Results</i>	10
	<i>Appendix F – LLFA correspondence.....</i>	10
	Appendix A – Proposed Development.....	11
	Appendix B – Topographical and GPR Survey	12
	Appendix C – Thames Water Sewer Records	13
	Appendix D – Proposed Drainage Strategy	14

Appendix E – Causeway Flow Results 15

Appendix F – LLFA correspondence 16

Tables

Table 1: Discharge Opportunities 7

1 Introduction

1.1 Project Overview

Curtins have been appointed by Dartford Borough Council to provide a Drainage Strategy report for a new temporary theatre located on Orchard Street in the centre of Dartford. The development is proposed to be in use for a period until January 2025 and its use beyond this is proposed to be prohibited by use of a planning condition. The purpose of the development is to allow for remediation works in relation to RAAC to take place at Orchard Theatre. The proposed site plan is contained in **Appendix A**.

Proposals contained or forming part of this report represent the design intent and may be subject to alteration or adjustment in completing the detailed design for this project. Where such adjustments are undertaken as part of the detailed design and are deemed a material derivation from the intent contained in this document, prior approval shall be obtained from the relevant authority in advance of commencing such works.

1.2 Site Location

The location of the proposed development is in Dartford Town centre on an existing brownfield site to the east of Orchard Street approximately 100-150m south west from the existing Orchard Theatre. The site is located within a dense town centre with residential and commercial units surrounding the immediate vicinity. The grid reference for the site is X (Easting): 554091, Y (Northing): 174192, Figure 1 shows the site location with the site boundary in red.



1.3 Site Description

The existing site is a 0.57ha brownfield site with all previous buildings and utilities demolished. There is an existing façade to be unchanged by the development from the original Cooperative Society Buildings. The west of Orchard Street is an asphalt car park.

The site levels range from 6.20mAOD in the south, 5.15mAOD to the west, 4.80mAOD to the north and 4.74mAOD to the east. The main development area of the site is generally flat with a slight fall from south west to north east.

The site is currently being used as a contractors compound for town centre works. The site has areas of asphalt hardstanding that are undrained and appears to run-off overland uncontrolled with the rest of the site.

A topographical survey and GPR Survey are contained in **Appendix B**.

1.4 Existing Site Drainage

A GPR survey of the site is contained in **Appendix B**. This survey shows a 225mm surface water sewer that bisects the site flowing east. This sewer has been confirmed to connect to the 600mm Thames Water sewer in Hythe Street. The survey also shows 2 existing 150mm foul connections to Orchard street.

Thames Water asset plans show surface water sewers on all surrounding roads of Hythe Street, Spital Street and Kent Road ranging from 225mm to 600mm diameter sewers. This would allow connection at various points for the surface water discharge if required. The public foul sewers are also on all the previously mentioned roads ranging from 225mm to 375mm sewers plus a 225mm diameter pipe bisecting the site within Orchard Street.

The site is currently undrained, with rainwater leaving the site unmanaged. Furthermore, there are areas of hardstanding, installed for the contractors compound.

Thames Water sewer records are contained in **Appendix C**.

1.5 Existing Watercourses

There are no watercourses located on site, but the River Thames is located roughly 3km to the north east and the River Darent to the east is approximately 200m to the east.

1.6 Project Proposal

This planning application related to:

Retrospective planning application for temporary theatre (including auditorium, foyer, bar area, box office, toilets, stage, backstage and storage) (Sui Generis); together with associated servicing area; external waste storage, above ground fuel tanks, external heaters and power generators; pedestrian ramps (for external Stage Door and Fire Exits); alterations to and additional asphalt hardstanding; alterations to vehicle access gates on Hythe Street; alterations to means of enclosure to introduce fire escape gates; on-site security (V Mesh) fencing and external lighting.

The proposed development is for a new 1091 person temporary theatre located on Orchard Street in the centre of Dartford. The development is proposed to be in use for a period of approximately 14 months and its use beyond this is proposed to be prohibited by use of a planning condition. The purpose of the development is to allow for remediation works in relation to RAAC to take place at Orchard Theatre. The proposed site plan is contained in **Appendix A**. The structure consists of a series of steel A-frames that support a vinyl roof. The walls are formed out of either pre-formed panels or windows.

The structure is anchored to concrete blocks and the ground using 900mm ground anchors. There are no major excavations proposed for the development other than that required by service runs.

The proposed site is reusing the existing areas of hardstanding for entrance with some areas of new hardstanding also proposed. See Appendix A.

2 Flood Risk Summary

A detailed site-specific Flood Risk Assessment (FRA) has been written for this site (085074-CUR-00-XX-T-C-92000). The FRA outlines the existing flood risk posed to the site, as well as evaluating how the proposed development will affect these risks. Existing Drainage

3 Proposed Drainage Strategy

3.1 General

The existing site consists of undrained impermeable asphalt and compacted hardcore that is currently being used as a parking area and contractors' compound, for works being undertaken around Dartford centre. There does not appear to be any significant formal drainage and the majority of the area is expected to drain overland to Hythe Street to the East during high-intensity rainfall events.

A proposed surface water drainage strategy has been provided and is contained in **Appendix D**. The strategy has been designed to be appropriate for the temporary nature of the development and has been sized to service the 3920m² of proposed and existing impermeable area & roof area introduced by the temporary structure.

As the development will only be in place for just over 1 year, the system has been sized to not flood during a 1 in 10 year event. No climate change allowance has been applied owing to the temporary nature.

A Causeway Flow model has also been developed for the site, this is contained in **Appendix E**.

3.2 Surface Water

In line with the Drainage Hierarchy, surface water runoff from a site should endeavour to be controlled as close to the source as possible. Discharge from site should be via one of the methods detailed in **Table 1**, in descending priority;

Table 1: Discharge Opportunities

Sustainable Drainage Hierarchy	Site Specific Application
Store rainwater for later use	Due to the development being a temporary structure and only in place until early 2025, the use of rainwater harvesting has not been deemed suitable for this development.
Use infiltration techniques, such as porous surfaces in non-clay areas	A previous planning application for a permeant redevelopment of the centre of Dartford was submitted for the site in 2020. In response to this application the Environment Agency required that infiltration was not utilised due to concerns around mobilising contaminants into the underlying aquifer. This approach has been continued for this scheme
Discharge rainwater direct to a water course	There are no watercourses in the immediate vicinity that would be suitable for use.
Discharge rainwater to a surface water sewer/drain	A surface water sewer bisects the site, this is proposed to be the outfall for the sites surface water network.
Discharge rainwater to a combined sewer	Not required

3.2.1 Proposed Site Discharge

The proposed temporary drainage network will connect above ground rainwater pipes & linear channels to the existing sewer that bisects the site using 150mm diameter pipework. The proposed system connected to the existing network at 2 locations as shown in **Appendix D**. Following a survey of these connection points, it may be necessary to install new PPIC connection on the existing run, as existing manholes may not be in favourable locations.

The proposed network is to drain unrestricted to the existing sewer. As the development is only to be in place for one year, the provision of attenuation does not appear appropriate. This approach has been agreed with the Lead Local Flo Authority in a pre-application meeting held virtually on 10th November. The LLFA response is contained in **Appendix F**.

A pre-development enquiry has been submitted to Thames Water, at the time of writing no response has been received.

The Causeway Flow model that has been developed for the site provides the following discharge rates for various return periods.

Return Period	Discharge Rate (l/s)
1	64.3
5	96.9
10	105

The system does not flood for any of the above events. During the 1 in 30 year event, the system flood during the 15 minute and 30 minute event, generating 4.6m³ of flood water.

3.2.2 Attenuation

No attenuation has been provided due to the agreement with the LLFA for an unrestricted discharge. Equally, due to the development only being in operation until early 2025, climate change has not been included in the calculations as it is not anticipated to have an effect.

3.2.3 Water Quality

The proposed drainage strategy manages surface water run-off from the temporary vinyl roof and low / no trafficked areas. The external areas of hardstanding that are trafficked will only be used for occasional maintenance and HGV access for production set up. Therefore the risk of pollution for all areas of the catchment is low.

The site offers a betterment due to the formalisation of surface water drainage, leading to a reduction in overland flows and infiltration into potentially contaminated ground. The existing site also consists of an undrained car park – the removal of which will benefit water quality. Therefore, it is seen that the scheme provided a net improvement.

3.2.4 Flood Exceedance

The network has been designed to not flood during the 1 in 10 year event and only floods by 4.6m³ during the 1 in 30 year event. In the event of a more severe event, the floor waters will not impact the internal areas of the theatre. The proposed structure is elevated a minimum of 175mm above the surrounding ground, with a void beneath the finished floor level and existing ground. Therefore, in the event of an exceedance event, the flood waters would flow overground as they would in the pre-development scenario. These waters would flow east and join the below ground network via a gully on Hythe Street.

3.3 Foul Water

A foul water network has also been provided to serve the performers back of house area and guest toilets. This network is proposed to discharge to the Thames Water sewer to the north in Orchard Street. As the performance area is located to the south of the site, a macerator pump is proposed to be used to discharge to a demarcation chamber in the norther before flowing to the Thames Water sewer. The proposed strategy is shown in **Appendix D**.

4 Conclusions and Recommendations

This report is intended to provide further details on the design of the drainage systems for the proposed temporary Orchard West theatre, Dartford and to act as additional information in support of the planning application. The conclusions to be drawn from this report are as follows:

Summary of conclusions

- The proposed strategy will be to manage surface water from the roof only for a period of approximately 14-months.
- The proposed drainage strategy will look to discharge surface water to the existing surface water sewer that bisects the site. Initially infiltration was reviewed, however due to the site being underlain by an aquifer and the risk of remobilising contaminants, this was discounted.
- The surface water will connect to the existing sewer at two locations. The proposed discharge rate is to be unrestricted due to the temporary nature of the project.
- No attenuation is required due to the use of an unrestricted discharge.
- The proposed strategy has been agreed with the LLFA in a pre-application meeting. A pre-development enquiry has been submitted to Thames Water to ensure that the system has sufficient capacity, however at the time of writing nothing has been received.
- The proposed structure is elevated off the ground and therefore in the event of an exceedance event, water will be able to pass beneath the structure and flow overland to Hythe Street.
- As the system only drains roof water, no water quality measures are provided, and it is seen the system will provide a betterment.

5 Appendices

- Appendix A – Proposed Development**
- Appendix B – Topographical and GPR Survey**
- Appendix C – Thames Water Sewer Records**
- Appendix D – Proposed Drainage Strategy**
- Appendix E – Causeway Flow Results**
- Appendix F – LLFA correspondence**

Appendix A – Proposed Development



LEGEND

- Application Site
- Other Adjoining Land in Applicant's Ownership
- Proposed Temporary Theatre Buildings
- Proposed Asphalt Paving Area
- Existing Asphalt Paving Area
- F/E Proposed Fire Exit Door
- Proposed Ramp (Max 1:12 Gradient)
- Proposed Ramp Landing Area
- Proposed V Mesh Fencing
- Proposed Staff Only Gate
- 1100 Litre Waste Bin
- Wheelie Style Waste Bin
- H Heater (QTY:6)

NOTES

1. All dimensions are in metres unless otherwise specified.
2. The proposed temporary theatre buildings are designed by GL Events UK Ltd.
3. The Topographical survey information for Orchard Street and Hythe Street is based on the as-built drawing of Co-operative store demolition by John F Hunt Demolition Ltd.

PROJECT CENTRE IS A DESIGNER APPOINTED BY DARTFORD BOROUGH COUNCIL TO PROVIDE ENGINEERING CONSULTANCY SERVICES.

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION
 In addition to the hazards/risks normally associated with the type of work detailed on this drawing, note the following significant risks and information identified by the designer

▲ CONSTRUCTION
 C001 Existing utilities
 C002 Working at height above tents
 C003 Erection of temporary structure under strong wind

▲ DEMOLITION
 --- No significant hazards

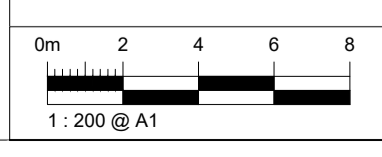
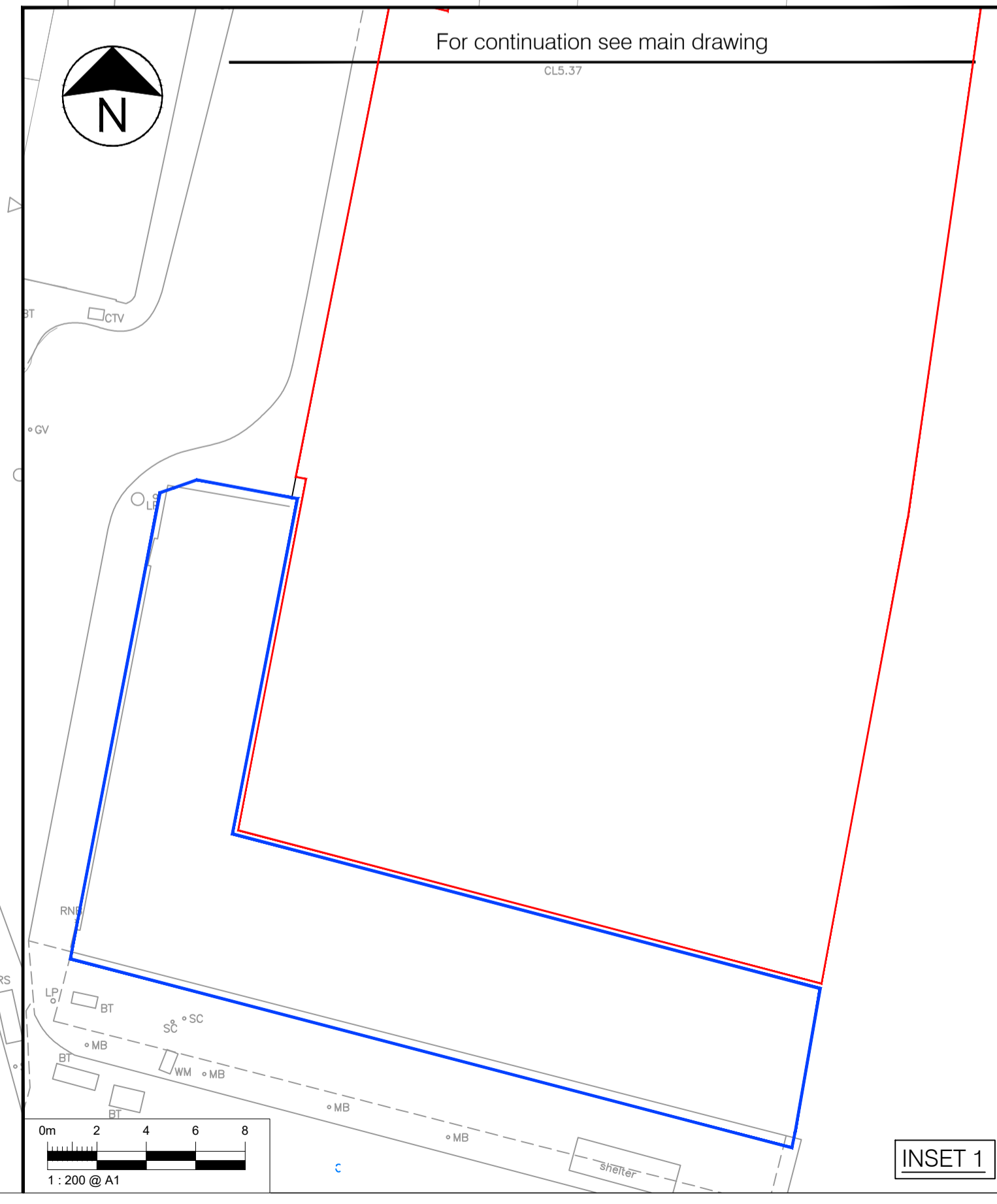
▲ MAINTENANCE & OPERATION
 M001 Impact of adverse weather conditions (strong wind, snow, ice) on tent structure
 M002 Flammable substance in fuel tank

It is assumed that all works be carried out by a competent contractor working to an approved method statement.

0	01/12/2023	ISSUED FOR PLANNING APPLICATION	IC	RT	NP
Rev	Date	Description	Drn	Chk	App



Client DARTFORD BOROUGH COUNCIL					
Project DARTFORD ORCHARD WEST TEMPORARY THEATRE					
Drawing Title PROPOSED SITE BLOCK PLAN					
Drawing Status FOR APPROVAL					
Drawn	Designed	Date	Scale	Size	
IC	RT	Dec 2023	1:200	A1	
Drawing No. 1000009506-4-0100-01					Rev 0





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Rev	Date	Description	Drn	Chk	App
0	01/12/2023	ISSUED FOR PLANNING APPLICATION	SL	RT	NP



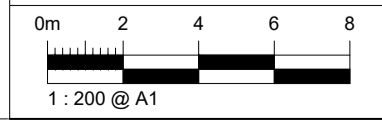
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DARTFORD BOROUGH COUNCIL

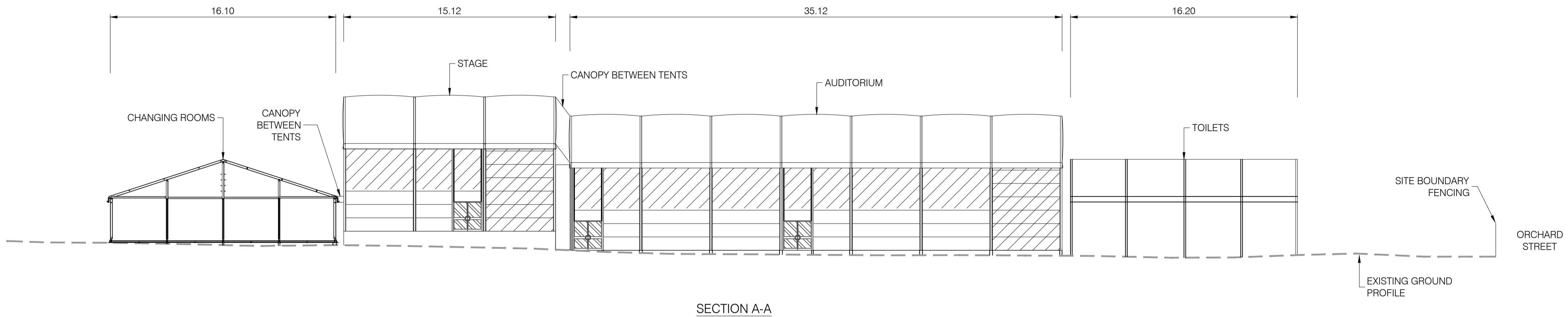
Project
 DARTFORD ORCHARD WEST
 TEMPORARY THEATRE

Drawing Title
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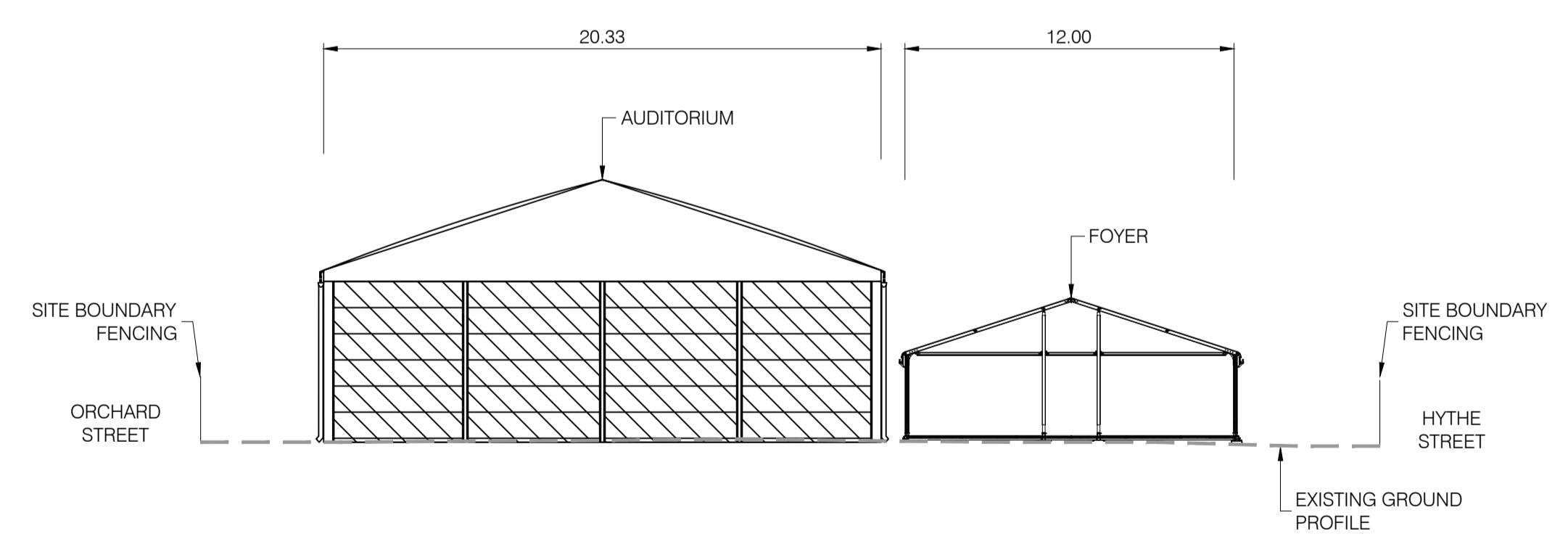
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FOR APPROVAL

Drawn	Designed	Date	Scale	Size
SL	RT	Dec 2023	1:200	A1





SECTION A-A



SECTION B-B



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Rev	Date	Description	IC	RT	NP
0	01/12/2023	ISSUED FOR PLANNING APPLICATION	IC	RT	NP

PROJECT CENTRE
www.marstonholdings.co.uk/projectcentre

Client
DARTFORD BOROUGH COUNCIL

Project
DARTFORD ORCHARD WEST TEMPORARY THEATRE

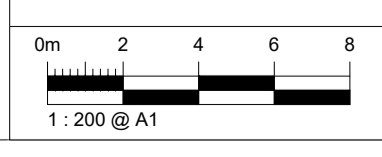
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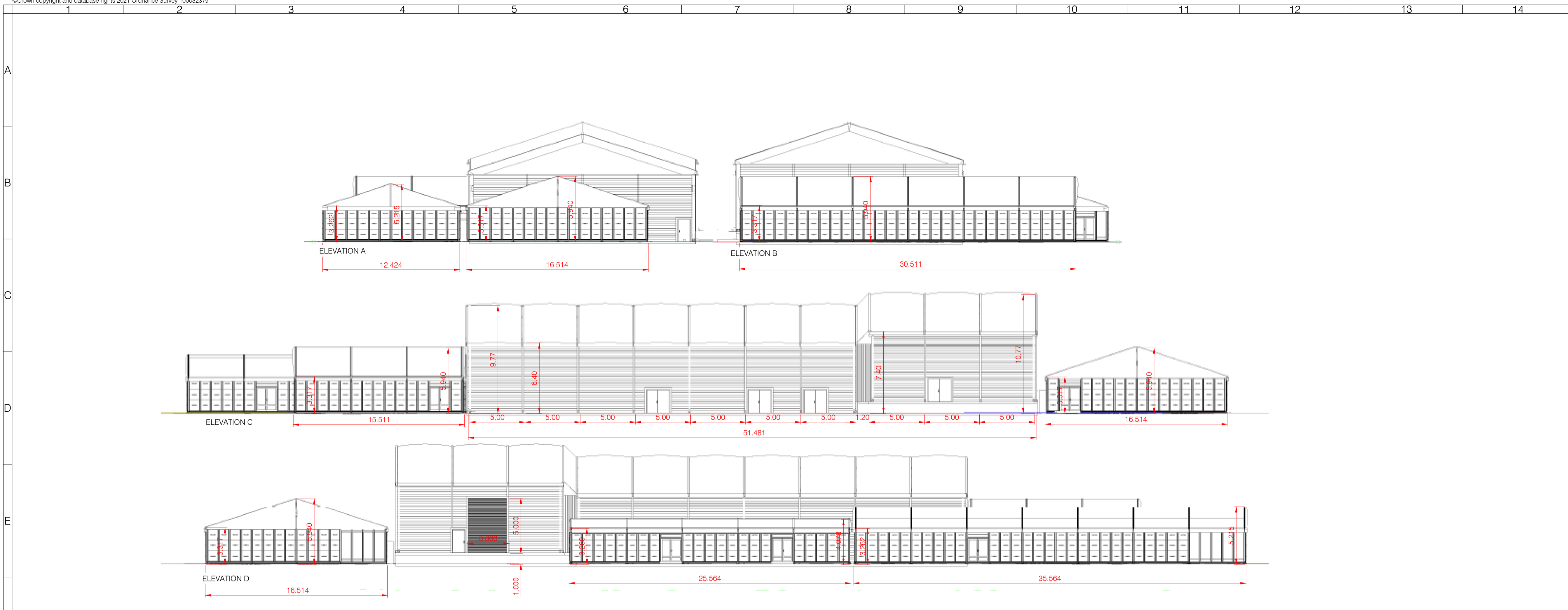
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Drawing No.
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Rev
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0	01/12/2023	ISSUED FOR PLANNING APPLICATION	SL	RT	NP

This drawing has been specifically prepared to meet the requirements of the named client and may contain design and innovative features which differ from conventional design standards.

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DARTFORD BOROUGH COUNCIL

Client
DARTFORD BOROUGH COUNCIL

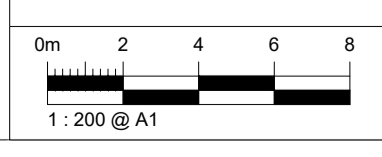
Project
 DARTFORD ORCHARD WEST TEMPORARY THEATRE

Drawing Title
 PROPOSED ELEVATIONS

Drawing Status
FOR APPROVAL

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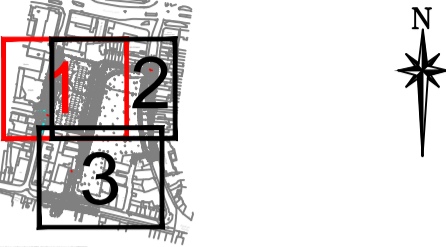
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Appendix B – Topographical and GPR Survey

NOTES:

NAVIGATION KEY



UTILITY KEY

- ELECTRIC CABLE
- ELECTRIC & COMMS CABLE
- EARTHING ROD / CABLE
- TRAFFIC SIGNAL CABLE
- TELECOMS CABLE
- CABLE TELEVISION
- COMMUNICATION CABLE
- WATER PIPE
- GAS PIPE
- FOUL DRAINAGE
- CONTAMINATED SURFACE
- SURFACE DRAINAGE
- COMBINED DRAINAGE
- PUMPING MAIN
- FUEL PIPE
- VENT PIPE
- OFFSET FILL PIPE
- GAUGE LINE
- VAPOUR RECOVERY
- HEATING PIPES
- SERVICE DUCTS
- UNIDENTIFIED
- TRENCH SCAR
- GROUND DEPRESSION
- SURVEY BOUNDARY

ABBREVIATIONS

- | | | | |
|------|----------------------------------|-------|--------------------|
| AC | ASBESTOS CEMENT | LP | LAMP POST |
| AR | ASSUMED ROUTE | MH | MANHOLE |
| BB | BASE BEND | MW | MONITORING WELL |
| BD | BACKDROP | OH | OVERHEAD |
| BH | BORING HOLE | OSA | OFF SURVEY AREA |
| BR | BRICK | PE | POLYETHYLENE |
| BT | BT INSPECTION CHAMBER | PL | PLASTIC |
| CATV | CATV INSPECTION CHAMBER | PR | PIPE RISER |
| CBX | CONTROL BOX | PVC | POLYVINYL CHLORIDE |
| CI | CAST IRON | RE | RODDING EYE |
| CL | COVER LEVEL | RWP | RAIN WATER PIPE |
| CR | CABLE RISER | S/A | SOAKAWAY |
| CP | CATCHPIT | SI | SPUN IRON |
| D | DEPTH | ST | STOP TAP |
| DI | DUCTILE IRON | S.T | STEEL |
| DP | DOWN PIPE | SV | SLUICE VALVE |
| ED | EMPTY DUCT | SVP | SOIL VENT PIPE |
| EOSC | END OF TRENCH SCAR | TE | TRAPPED EXIT |
| EOT | END OF TRACE | TR | TAKEN FROM RECORD |
| ER | EARTHING ROD | TL | TRAFFIC LIGHT |
| EP | ELECTRICITY POLE | TP | TELEGRAPH POLE |
| FH | FIRE HYDRANT | UT | UNABLE TO FIND |
| FL | FLOOD LIGHT | UTCTV | UNABLE TO CCTV |
| G | GULLY | UTL | UNABLE TO LIFT |
| GPR | GROUND PENETRATING RADAR | UTS | UNABLE TO SURVEY |
| GRP | GLASS REINFORCED PLASTIC | VC | VITRIFIED CLAY |
| GV | GAS VALVE | VP | VENT PIPE |
| HL | HIGH LEVEL | VR | VAPOUR RECOVERY |
| HOR | HEAD OF RUN | WM | WATER METER |
| IC | INSPECTION CHAMBER | WO | WASH OUT VALVE |
| IL | INVERT LEVEL | | |
| SWS | SURFACE WATER SEWER | | |
| CSWS | CONTAMINATED SURFACE WATER SEWER | | |
| FWS | FOUL WATER SEWER | | |
| CWS | COMBINED WATER SEWER | | |

DISCLAIMER

ELECTRO-MAGNETIC TECHNIQUES AND/OR GROUND PENETRATING RADAR HAVE BEEN USED IN THE LOCATION OF UNDERGROUND SERVICES. THE RESULTS ARE NOT INFALLIBLE AND TRIAL EXCAVATIONS SHOULD BE CARRIED OUT TO CONFIRM SERVICE IDENTIFICATION, POSITIONS AND PARTICULARLY DEPTHS, WHERE THESE ARE CRITICAL. ALTHOUGH ALL REASONABLE EFFORT HAS BEEN MADE IN SEARCHING AVAILABLE RECORD DRAWINGS, THE COMPLETENESS OF THE UNDERGROUND SERVICES INFORMATION CANNOT BE GUARANTEED. THE METHODS OF SURVEY DOES NOT DIFFERENTIATE BETWEEN LIVE AND DEAD SERVICES AND AS SUCH ALL SERVICES SHOULD BE TREATED AS LIVE. WHERE SERVICES ARE NON-METALLIC POSITIONS MAY BE TAKEN FROM RECORDS, TRENCH SCARS & SURFACE DETAIL. WHERE QUOTED, DEPTH ESTIMATIONS ARE GENERALLY TO THE CENTRE OF THE SERVICE. DEPTHS TO GRAVITY SEWERS AND DRAINS ARE GENERALLY TO INVERT LEVELS UNLESS OTHERWISE STATED. PIPE SIZES WHICH CANNOT BE OBTAINED BY VISUAL SURVEY ARE TAKEN FROM RECORD DRAWINGS OR MARKER PLATES WHERE AVAILABLE. WHERE GROUND PENETRATING RADAR HAS BEEN USED IT WILL PRIMARILY HAVE BEEN TO IDENTIFY UNDERGROUND UTILITIES. IF POSSIBLE WE WILL ALSO IDENTIFY UNDERGROUND STRUCTURES/ TANKS ETC, BUT CANNOT GUARANTEE TO HAVE LOCATED ALL SUCH ITEMS. THE USE OF RADAR CAN BE LIMITED BOTH BY SURFACE CONDITIONS AND ALSO BY SOIL TYPE. DEPTH ESTIMATES WOULD NOT NORMALLY BE PROVIDED FOR SERVICES LOCATED WITH GPR.

REV	DATE	COMMENT	CAD

CLIENT
BWB Consulting

PROJECT
Westgate
Dartford
DA1 2DJ

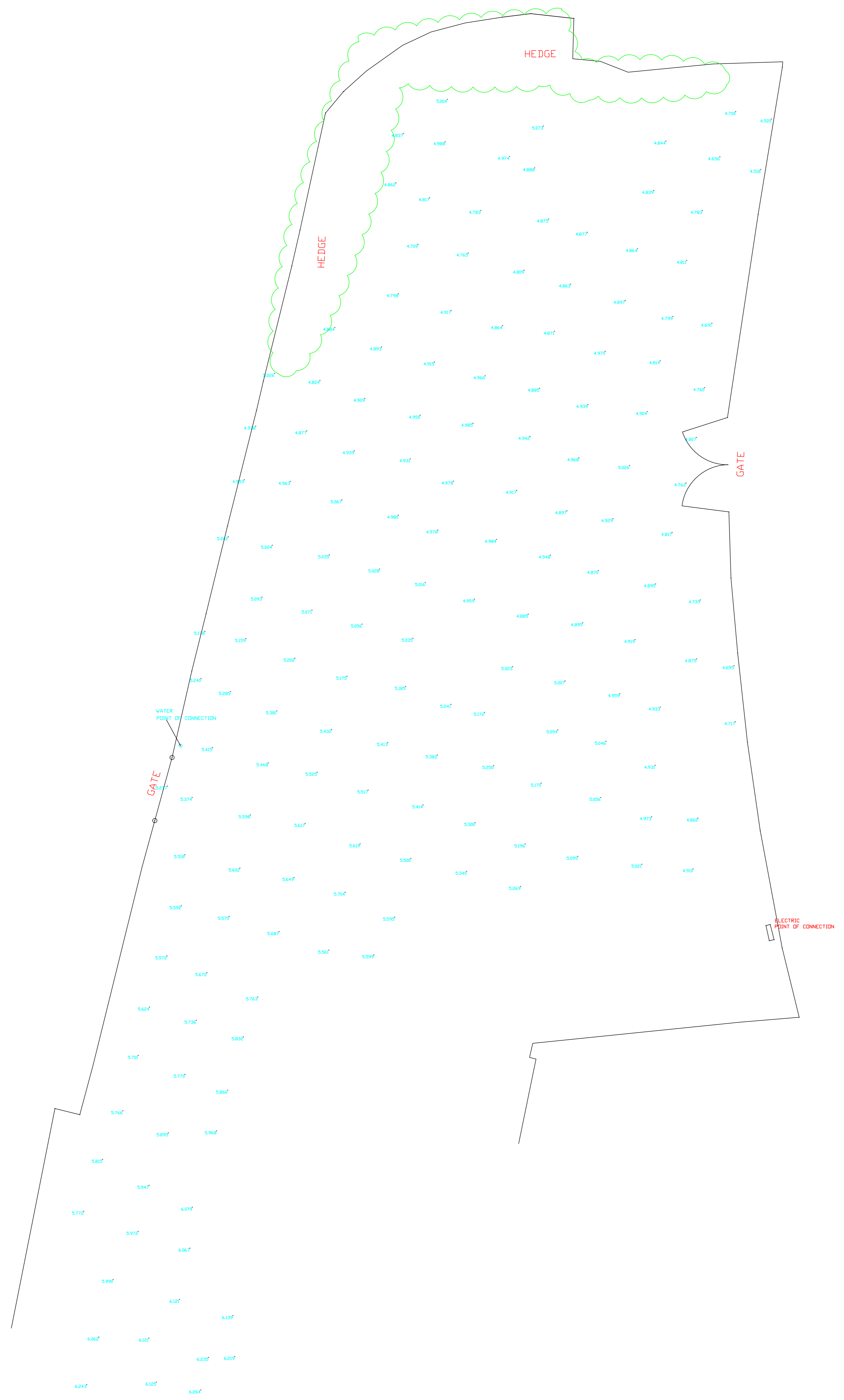
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Underground
Utility Survey

AMETHYST SURVEYS LIMITED

Unit 2 Davy Court, Central Park
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Tel: 01788 566740
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Email: enquiries@amethystsurveys.com
www.amethystsurveys.com

DATE: 11.06.18 JOB No: 13113
DRAWING No: 13113_UG_1 REV: 0
DRAWN: D.OT SURVEYED: JP
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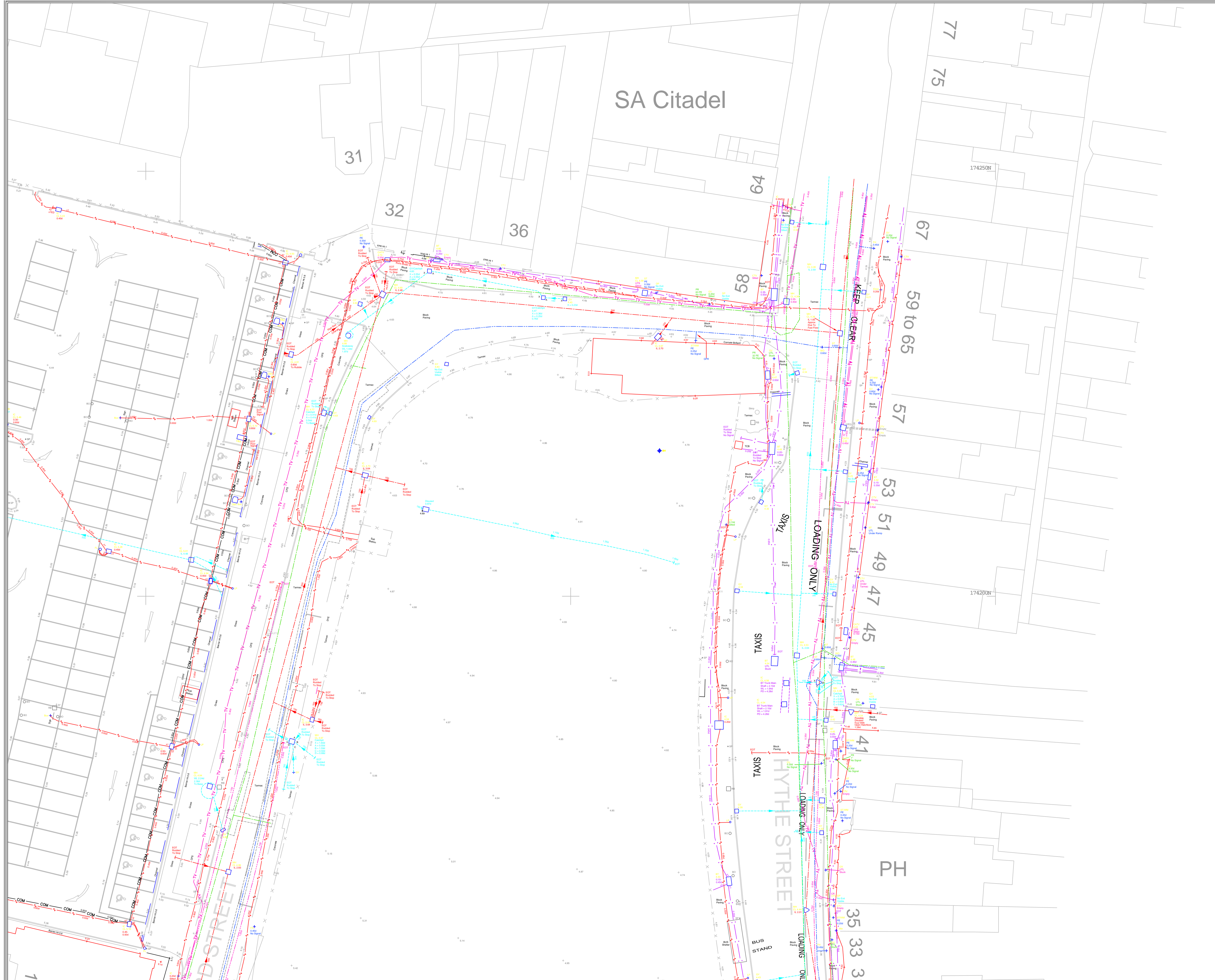


SITE
 DARTFORD TOWN CENTRE
 REGENERATION PHASE 2

TITLE
 GPS TOPOGRAPHICAL SURVEY

SCALE
 DATE 18.10.2023

DRAWING No. 01



NOTES;

NAVIGATION KEY

UTILITY KEY

	ELECTRIC CABLE		ELECTRIC & COMMS CABLE
	EARTHING ROD / CABLE		TRAFFIC SIGNAL CABLE
	ER		TELECOMS CABLE
	TS		CABLE TELEVISION
	TV		COMMUNICATION CABLE
	COM		WATER PIPE
			GAS PIPE
			FOUL DRAINAGE
			CONTAMINATED SURFACE
			SURFACE DRAINAGE
			COMBINED DRAINAGE
			PUMPING MAIN
			FUEL PIPE
			VENT PIPE
			OFFSET FILL PIPE
			GAUGE LINE
			VAPOUR RECOVERY
			HEATING PIPES
			SERVICE DUCTS
			UNIDENTIFIED
			TRENCH SCAR
			GROUND DEPRESSION
			SURVEY BOUNDARY

CABLE / PIPE RISER
 BACKDROP / TRAPPED EXIT
 DRAINAGE VALVE

END OF TRACE
 HEAD OF RUN / CAPPED
 PIPE INLET / OUTFALL

ABBREVIATIONS

AC	ASBESTOS CEMENT	LP	LAMP POST
AR	ASSUMED ROUTE	MH	MANHOLE
BB	BASE BEND	MW	MONITORING WELL
BD	BACKDROP	OH	OVERHEAD
BH	BORING HOLE	OSA	OFF SURVEY AREA
BR	BRICK	PE	POLYETHYLENE
BT	BT INSPECTION CHAMBER	PL	PLASTIC
CATV	CATV INSPECTION CHAMBER	PR	PIPE RISER
CBX	CONTROL BOX	PVC	POLYVINYL CHLORIDE
CI	CAST IRON	RE	RODDING EYE
CL	COVER LEVEL	RWP	RAIN WATER PIPE
CR	CABLE RISER	S/A	SOAKAWAY
CP	CATCHPIT	SI	SPUN IRON
D	DEPTH	ST	STOP TAP
DI	DUCTILE IRON	S.T	STEEL
DP	DOWN PIPE	SV	SLUICE VALVE
ED	EMPTY DUCT	SVP	SOIL VENT PIPE
EOSC	END OF TRENCH SCAR	TE	TRAPPED EXIT
EOT	END OF TRACE	TFR	TAKEN FROM RECORD
ER	EARTHING ROD	TL	TRAFFIC LIGHT
EP	ELECTRICITY POLE	TP	TELEGRAPH POLE
FH	FIRE HYDRANT	UTCCTV	UNABLE TO CCTV
FL	FLOOD LIGHT	UTL	UNABLE TO FIND
G	GULLY	UTL	UNABLE TO LIFT
GPR	GROUND PENETRATING RADAR	UTS	UNABLE TO SURVEY
GRP	GLASS REINFORCED PLASTIC	VC	VITRIFIED CLAY
GV	GAS VALVE	VP	VENT PIPE
HL	HIGH LEVEL	VR	VAPOUR RECOVERY
HOR	HEAD OF RUN	WL	WATER LEVEL
IC	INSPECTION CHAMBER	WM	WATER METER
IL	INVERT LEVEL	WO	WASH OUT VALVE

SWS SURFACE WATER SEWER
 CSWS CONTAMINATED SURFACE WATER SEWER
 PWS FOUL WATER SEWER
 CWS COMBINED WATER SEWER

DISCLAIMER

ELECTRO-MAGNETIC TECHNIQUES AND/OR GROUND PENETRATING RADAR HAVE BEEN USED IN THE LOCATION OF UNDERGROUND SERVICES. THE RESULTS ARE NOT INFALLIBLE AND TRIAL EXCAVATIONS SHOULD BE CARRIED OUT TO CONFIRM SERVICE IDENTIFICATION, POSITIONS AND PARTICULARLY DEPTHS, WHERE THESE ARE CRITICAL. ALTHOUGH ALL REASONABLE EFFORT HAS BEEN MADE IN SEARCHING AVAILABLE RECORD DRAWINGS, THE COMPLETENESS OF THE UNDERGROUND SERVICES INFORMATION CANNOT BE GUARANTEED. THE METHODS OF SURVEY DOES NOT DIFFERENTIATE BETWEEN LIVE AND DEAD SERVICES AND AS SUCH ALL SERVICES SHOULD BE TREATED AS LIVE. WHERE SERVICES ARE NON-METALLIC POSITIONS MAY BE TAKEN FROM RECORDS, TRENCH SCARS & SURFACE DETAIL. WHERE QUOTED, DEPTH ESTIMATIONS ARE GENERALLY TO THE CENTRE OF THE SERVICE. DEPTHS TO GRAVITY SEWERS AND DRAINS ARE GENERALLY TO INVERT LEVELS UNLESS OTHERWISE STATED. PIPE SIZES WHICH CANNOT BE OBTAINED BY VISUAL SURVEY ARE TAKEN FROM RECORD DRAWINGS OR MARKER PLATES WHERE AVAILABLE. WHERE GROUND PENETRATING RADAR HAS BEEN USED IT WILL PRIMARILY HAVE BEEN TO IDENTIFY UNDERGROUND UTILITIES. IF POSSIBLE WE WILL ALSO IDENTIFY UNDERGROUND STRUCTURES/ TANKS ETC, BUT CANNOT GUARANTEE TO HAVE LOCATED ALL SUCH ITEMS. THE USE OF RADAR CAN BE LIMITED BOTH BY SURFACE CONDITIONS AND ALSO BY SOIL TYPE. DEPTH ESTIMATES WOULD NOT NORMALLY BE PROVIDED FOR SERVICES LOCATED WITH GPR.

REV	DATE	COMMENT	CAD

CLIENT: **BWB Consulting**

PROJECT: **Westgate
Dartford
DA1 2DJ**

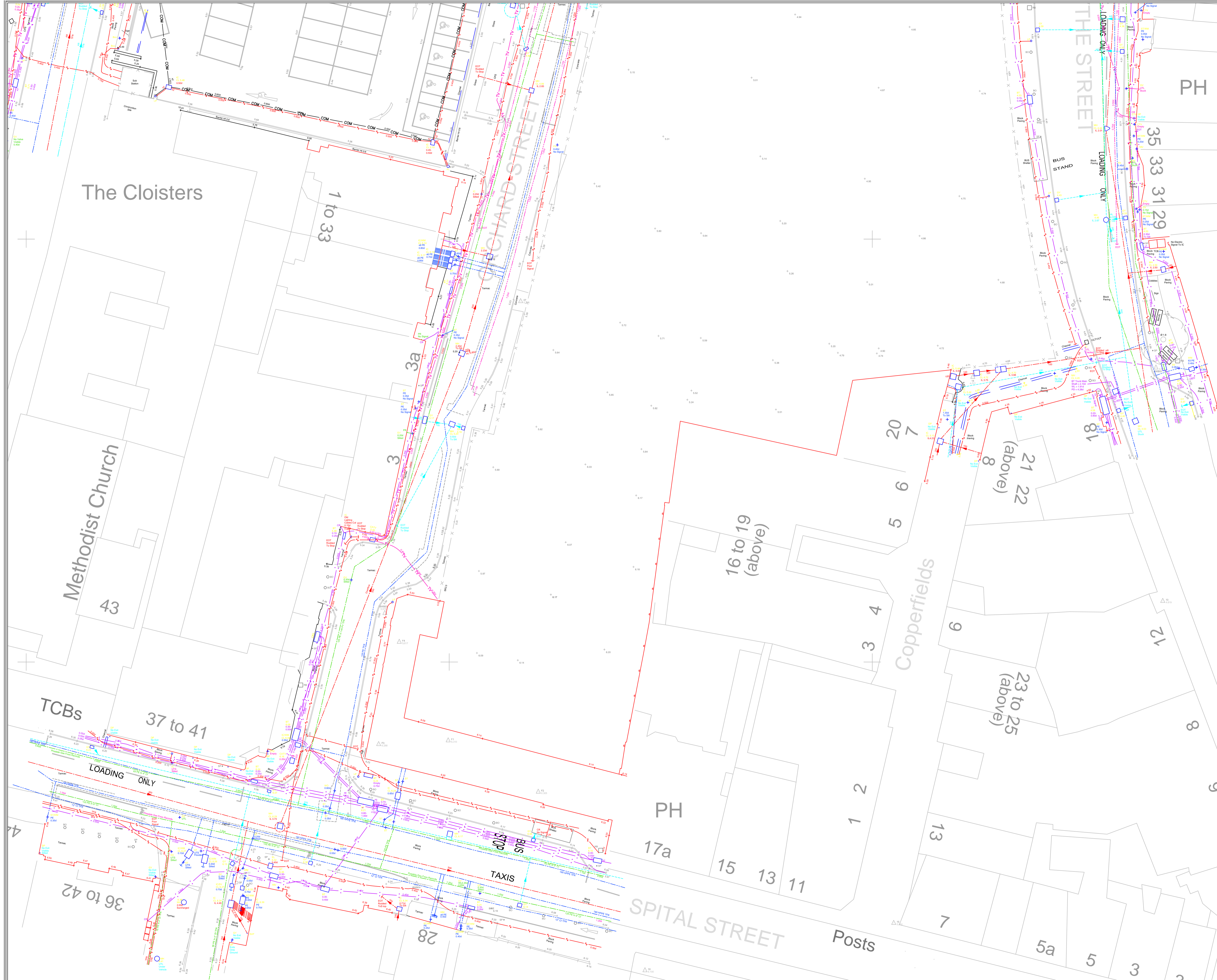
TITLE: **Underground
Utility Survey**

AMETHYST SURVEYS LIMITED

 Unit 2 Davy Court, Central Park
 Rugby, Warwickshire, CV23 0UZ
 Tel: 01788 566740
 Fax: 01788 571158
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 www.amethystsurveys.com

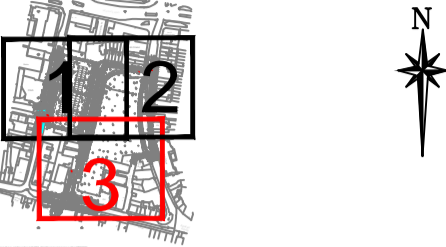
DATE: 11.06.18	JOB No: 13113
DRAWING No: 13113_UG_2	REV: 0
DRAWN: D.OT	SURVEYED: JP
APPROVED: MD	SCALE: 1:200 @ A1





NOTES:

NAVIGATION KEY



UTILITY KEY

- ELECTRIC CABLE
- ELECTRIC & COMMS CABLE
- EARTHING ROD / CABLE
- TRAFFIC SIGNAL CABLE
- TELECOMS CABLE
- CABLE TELEVISION
- COMMUNICATION CABLE
- WATER PIPE
- GAS PIPE
- FOUL DRAINAGE
- CONTAMINATED SURFACE
- SURFACE DRAINAGE
- COMBINED DRAINAGE
- PUMPING MAIN
- FUEL PIPE
- VENT PIPE
- OFFSET FILL PIPE
- GAUGE LINE
- VAPOUR RECOVERY
- HEATING PIPES
- SERVICE DUCTS
- UNIDENTIFIED
- TRENCH SCAR
- GROUND DEPRESSION
- SURVEY BOUNDARY

ABBREVIATIONS

- | | | | |
|------|----------------------------------|--------|--------------------|
| AC | ASBESTOS CEMENT | LP | LAMP POST |
| AR | ASSUMED ROUTE | MH | MANHOLE |
| BB | BASE BEND | MW | MONITORING WELL |
| BD | BACKDROP | OH | OVERHEAD |
| BH | BORING | OSA | OFF SURVEY AREA |
| BR | BRICK | PE | POLYETHYLENE |
| BT | BT INSPECTION CHAMBER | PL | PLASTIC |
| CATV | CATV INSPECTION CHAMBER | PR | PIPE RISER |
| CBX | CONTROL BOX | PVC | POLYVINYL CHLORIDE |
| CI | CAST IRON | RE | RODDING EYE |
| CL | COVER LEVEL | RWP | RAIN WATER PIPE |
| CR | CABLE RISER | S/A | SOAKAWAY |
| CP | CATCHPIT | SI | SPUN IRON |
| D | DEPTH | ST | STOP TAP |
| DI | DUCTILE IRON | S.T | STEEL |
| DP | DOWN PIPE | SV | SLUICE VALVE |
| ED | EMPTY DUCT | SVP | SOIL VENT PIPE |
| EOSC | END OF TRENCH SCAR | TE | TRAPPED EXIT |
| EOT | END OF TRACE | TFR | TAKEN FROM RECORD |
| ER | EARTHING ROD | TL | TRAFFIC LIGHT |
| EP | ELECTRICITY POLE | TP | TELEGRAPH POLE |
| FH | FIRE HYDRANT | UTCCTV | UNABLE TO CCTV |
| FL | FLOOD LIGHT | UNL | UNABLE TO FIND |
| G | GULLY | UNL | UNABLE TO LIFT |
| GPR | GROUND PENETRATING RADAR | UNL | UNABLE TO SURVEY |
| GRP | GLASS REINFORCED PLASTIC | VC | VITRIFIED CLAY |
| GV | GAS VALVE | VP | VENT PIPE |
| HL | HIGH LEVEL | VR | VAPOUR RECOVERY |
| HOR | HEAD OF RUN | WL | WATER LEVEL |
| IC | INSPECTION CHAMBER | WM | WATER METER |
| IL | INVERT LEVEL | WO | WASH OUT VALVE |
| SWS | SURFACE WATER SEWER | | |
| CSWS | CONTAMINATED SURFACE WATER SEWER | | |
| PWS | FULL WATER SEWER | | |
| CWS | COMBINED WATER SEWER | | |

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REV	DATE	COMMENT	CAD

CLIENT: **BWB Consulting**

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DA1 2DJ**

TITLE: **Underground
Utility Survey**

AMETHYST SURVEYS LIMITED

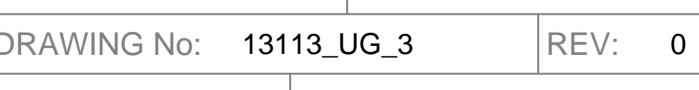
Unit 2 Davy Court, Central Park
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Tel: 01788 566740
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DATE: 11.06.18 JOB No: 13113

DRAWING No: 13113_UG_3 REV: 0

DRAWN: D.OT SURVEYED: JP

APPROVED: MD SCALE: 1:200 @ A1



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Appendix C – Thames Water Sewer Records

Asset Location Search Sewer Map - ALS/ALS Standard/2018 3779971



The width of the displayed area is 500 m and the centre of the map is located at OS coordinates 554068,174158
The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

Based on the Ordnance Survey Map with the Sanction of the controller of H.M. Stationery Office, License no. 100019345 Crown Copyright Reserved.

NB. Levels quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates that no survey information is available

Manhole Reference	Manhole Cover Level	Manhole Invert Level
2204	3.97	-.58
2203	3.9	2.4
2104	4.65	3.19
2108	4.52	2.59
2105	4.5	2.97
2106	4.59	2.74
2107	4.41	2.5
3101	4.54	2.58
2208	4.47	2.27
2207	4.27	2.02
2206	4.28	1.68
3202	3.83	1.46
3214	3.88	2.45
2205	4.18	2.33
3209	4.22	2.32
1012	4.76	n/a
1011	4.86	4.18
2024	5.17	4.51
1010	4.98	4.03
2018	5.28	3.38
1009	4.98	n/a
2014	n/a	4.09
1019	5.16	3.31
2019	5.03	3.24
1116	n/a	n/a
2110	4.58	3.06
2101	4.69	3.68
1117	3.59	2.57
2102	4.44	3.43
1118	3.16	2.31
111A	n/a	n/a
2103	n/a	3.31
111C	n/a	n/a
2109	4.48	2.7
1119	4.32	1.39
1103	n/a	n/a
1102	4.68	2.87
1215	4.37	3.46
1214	4.04	3.68
1212	4.3	n/a
1213	4.12	3.73
1225	4.31	1.37
121A	n/a	n/a
0302	4.71	3.31
0202	n/a	n/a
0203	4.68	2.48
021B	n/a	n/a
021C	n/a	n/a
0201	n/a	n/a
1217	4.74	3.04
1219	n/a	n/a
1218	4.29	2.46
1229	n/a	n/a
1206	4.42	1.78
1221	4.41	3.13
1222	n/a	n/a
1210	4.26	3.42
1209	4.06	3.17
1208	4.22	3.19
1207	4.27	3.17
1223	4.31	3.2
1205	4.06	3.44
1204	4.02	3.34
1203	4.48	3.2
1202	4.48	3.16
1201	4.2	2.99
1224	4.31	-.41
1226	4.38	.83
1308	4.29	3.1
2202	4.85	2.15
2209	4.41	3.16
2201	4.12	1.44
0001	6.18	5.01
0206	5.37	2.72
0002	6.257	3.637
0003	6.02	4.47
0104	5.2	3.03
0103	4.91	2.78
1216	n/a	n/a
1108	5.02	4.29
1107	n/a	n/a
1001	6.12	5.32
1106	4.86	3.76
1109	5.2	4.22
1114	n/a	n/a
1112	4.38	2.66
1104	4.38	2.11
1123	4.4	3.71
1006	5.17	4.57
1220	4.37	2.56
1007	5.18	4.91

Manhole Reference	Manhole Cover Level	Manhole Invert Level
1115	4.43	2.89
1211	4.33	1.93
1105	n/a	n/a
111B	n/a	n/a
1113	4.39	3.21
1110	4.91	3.76
1005	5.23	4.44
1111	4.48	2.16
1305	4.294	-4.486
0301	4.79	2.76
2301	4.3	1.11
1309	4.54	3.23
9306	4.87	3.57
9301	4.88	2.92
1307	4.17	2.5
1304	4.09	2.77
1302	4.19	2.35
1303	4.04	n/a
1301	n/a	n/a
1306	3.76	n/a
241A	n/a	n/a
1404	3.81	n/a
841H	n/a	n/a
841G	n/a	n/a
831D	n/a	n/a
8306	7.61	5.26
8308	n/a	n/a
9303	5	2.05
9305	4.96	3.53
9304	5.18	n/a
9201	5.34	n/a
8207	8.91	n/a
8205	8.92	6.27
921A	n/a	n/a
8304	7.5	4.82
8307	n/a	n/a
8303	6.99	4.04
9307	5.11	3.73
9302	5.14	3.07
9308	n/a	n/a
8301	7.648	4.108
8208	13.75	n/a
8110	n/a	n/a
8209	12.85	10.73
8204	9.99	4.64
821A	n/a	n/a
821B	n/a	n/a
8106	8.51	7.17
8105	7.99	6.78
9102	7.31	5.66
911C	n/a	n/a
911A	n/a	n/a
911H	n/a	n/a
911B	n/a	n/a
911E	n/a	n/a
9103	5.82	4.27
911F	n/a	n/a
9104	5.56	4.55
0102	5.61	3.83
0101	5.42	2.57
0105	5.39	4.15
0204	5.27	4.16
0205	5.21	3.98
8109	9.15	8.13
8101	9.124	4.834
8107	8.95	7.8
8108	9.05	7.66
8104	7.91	6.8
8103	7.59	6.54
8102	7.52	5.46
9001	7.48	6.1
9002	7.37	5.9
901D	n/a	n/a
9101	7.37	n/a
901E	n/a	n/a
9003	7.14	5.44
901F	n/a	n/a
9005	7.04	5.77
901C	n/a	n/a
9107	6.78	5.4
9106	6.99	4.65
9105	6.81	4.36
911G	n/a	n/a
9007	6.14	n/a
911D	n/a	n/a
9004	6.36	5.08
9108	6.14	4.72
021A	n/a	n/a
391A	n/a	n/a
2012	5.91	2.63
291A	n/a	n/a
2017	5.76	4.56
2011	5.85	3.05



















Manhole Reference	Manhole Cover Level	Manhole Invert Level
2010	5.6	3.34
2009	5.6	3.46
2008	5.6	3.52
291C	n/a	n/a
291B	n/a	n/a
2007	5.6	3.7
2006	n/a	n/a
2902	5.85	3.62
2901	5.76	3.48
2903	5.81	3.9
2001	5.8	3.32
3006	5.79	2.74
391C	n/a	n/a
391B	n/a	n/a
3005	5.62	2.92
1903	n/a	n/a
1906	5.32	4.19
1904	5.27	2.95
191C	n/a	n/a
191B	n/a	n/a
191A	n/a	n/a
2910	5.49	4.69
2911	5.59	5.04
2908	5.71	4.18
2905	5.99	n/a
291D	n/a	n/a
2909	5.67	4.51
2904	5.49	4.2
2906	5.57	4.12
1911	5.25	3.19
2913	n/a	n/a
2907	5.47	4.77
2912	n/a	n/a
1916	n/a	n/a
1902	5.39	n/a
1901	5.16	3.68
101A	n/a	n/a
1018	n/a	n/a
2016	5.4	3.9
2015	5.41	3.26
1016	5.39	3.13
2002	5.319	2.494
1017	5.1	3.13
1008	5.01	2.43
2022	5.49	3.69
2005	5.49	4.09
1015	5.12	3.42
1003	5.42	4.83
2004	5.2	4.35
1014	4.85	3.01
2003	5.1	n/a
2023	5.1	4.14
1004	5.42	4.14
1013	4.79	2.92
1002	5.77	4.02
8902	n/a	n/a
991D	n/a	n/a
991C	n/a	n/a
991B	n/a	n/a
991A	n/a	n/a
9903	6.88	6.23
9901	6.81	4.93
9907	6.92	n/a
8002	11.81	10.41
9006	n/a	n/a

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.








ALS Sewer Map Key

Public Sewer Types (Operated & Maintained by Thames Water)

-  **Foul:** A sewer designed to convey waste water from domestic and industrial sources to a treatment works.
-  **Surface Water:** A sewer designed to convey surface water (e.g. rain water from roofs, yards and car parks) to rivers or watercourses.
-  **Combined:** A sewer designed to convey both waste water and surface water from domestic and industrial sources to a treatment works.
-  Trunk Surface Water
-  Trunk Foul
-  Storm Relief
-  Trunk Combined
-  Vent Pipe
-  Bio-solids (Sludge)
-  Proposed Thames Surface Water Sewer
-  Proposed Thames Water Foul Sewer
-  Gallery
-  Foul Rising Main
-  Surface Water Rising Main
-  Combined Rising Main
-  Sludge Rising Main
-  Proposed Thames Water Rising Main
-  Vacuum





Sewer Fittings

A feature in a sewer that does not affect the flow in the pipe. Example: a vent is a fitting as the function of a vent is to release excess gas.

-  Air Valve
-  Dam Chase
-  Fitting
-  Meter
-  Vent Column




Operational Controls

A feature in a sewer that changes or diverts the flow in the sewer. Example: A hydrobrake limits the flow passing downstream.

-  Control Valve
-  Drop Pipe
-  Ancillary
-  Weir





End Items

End symbols appear at the start or end of a sewer pipe. Examples: an Undefined End at the start of a sewer indicates that Thames Water has no knowledge of the position of the sewer upstream of that symbol, Outfall on a surface water sewer indicates that the pipe discharges into a stream or river.

-  Outfall
-  Undefined End
-  Inlet






Other Symbols

Symbols used on maps which do not fall under other general categories








-  Public/Private Pumping Station
-  Change of characteristic indicator (C.O.C.I.)
-  Invert Level
-  Summit

Areas

Lines denoting areas of underground surveys, etc.

-  Agreement
-  Operational Site
-  Chamber
-  Tunnel
-  Conduit Bridge

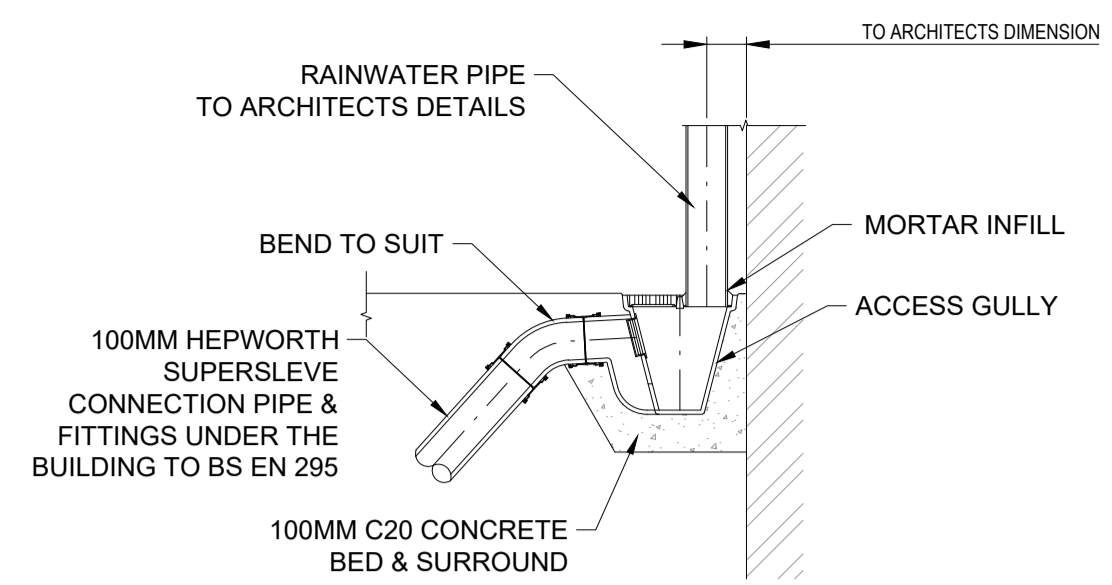
Other Sewer Types (Not Operated or Maintained by Thames Water)

-  Foul Sewer
-  Surface Water Sewer
-  Combined Sewer
-  Gully
-  Culverted Watercourse
-  Proposed
-  Abandoned Sewer

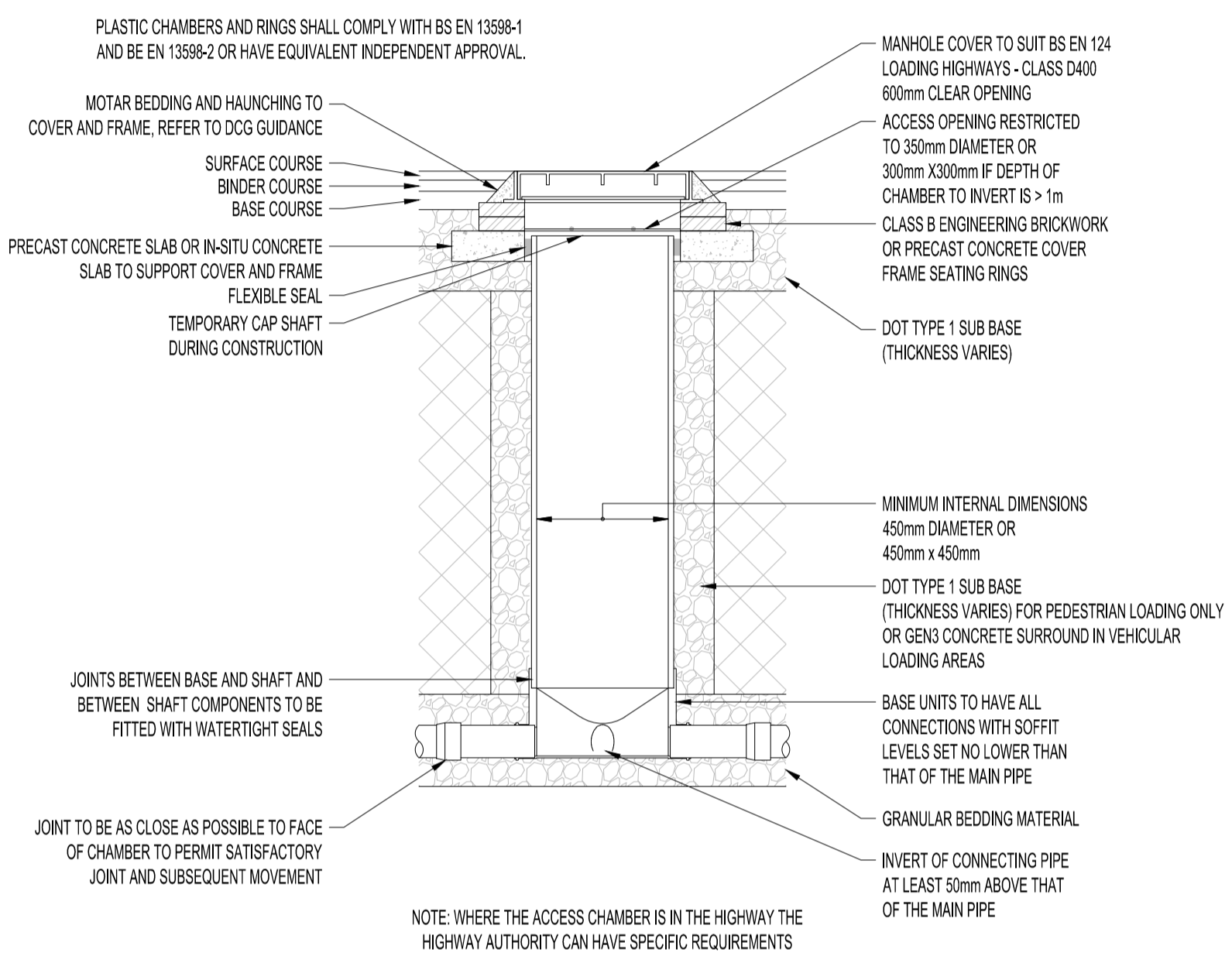
Notes:

- 1) All levels associated with the plans are to Ordnance Datum Newlyn.
- 2) All measurements on the plans are metric.
- 3) Arrows (on gravity fed sewers) or flecks (on rising mains) indicate direction of flow.
- 4) Most private pipes are not shown on our plans, as in the past, this information has not been recorded.
- 5) 'na' or '0' on a manhole level indicates that data is unavailable.
- 6) The text appearing alongside a sewer line indicates the internal diameter of the pipe in millimetres. Text next to a manhole indicates the manhole reference number and should not be taken as a measurement. If you are unsure about any text or symbology present on the plan, please contact a member of Property Insight on 0845 070 9148.

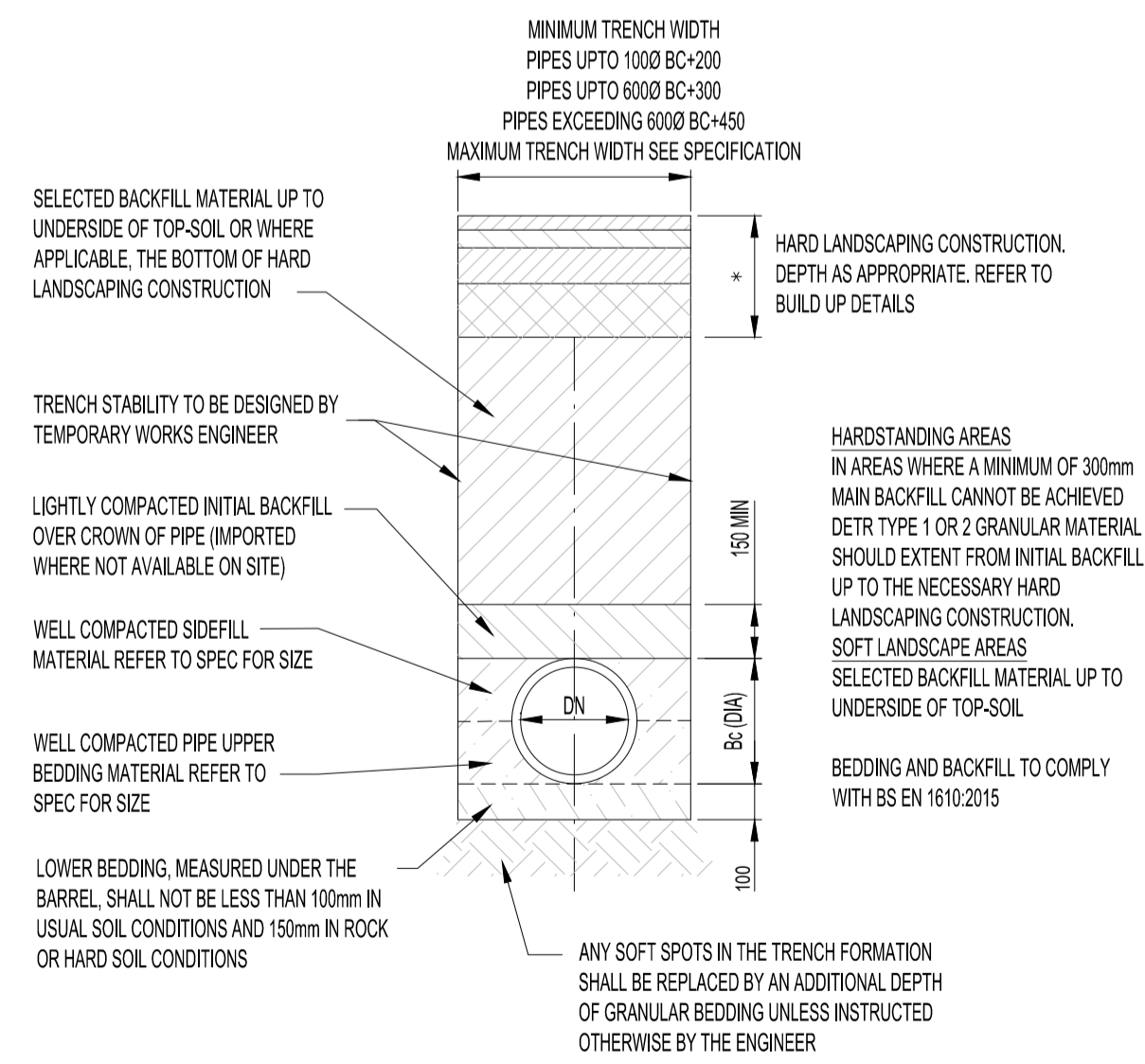
Appendix D – Proposed Drainage Strategy



TYPICAL EXTERNAL RWP ACCESS GULLY
(SCALE 1:20)

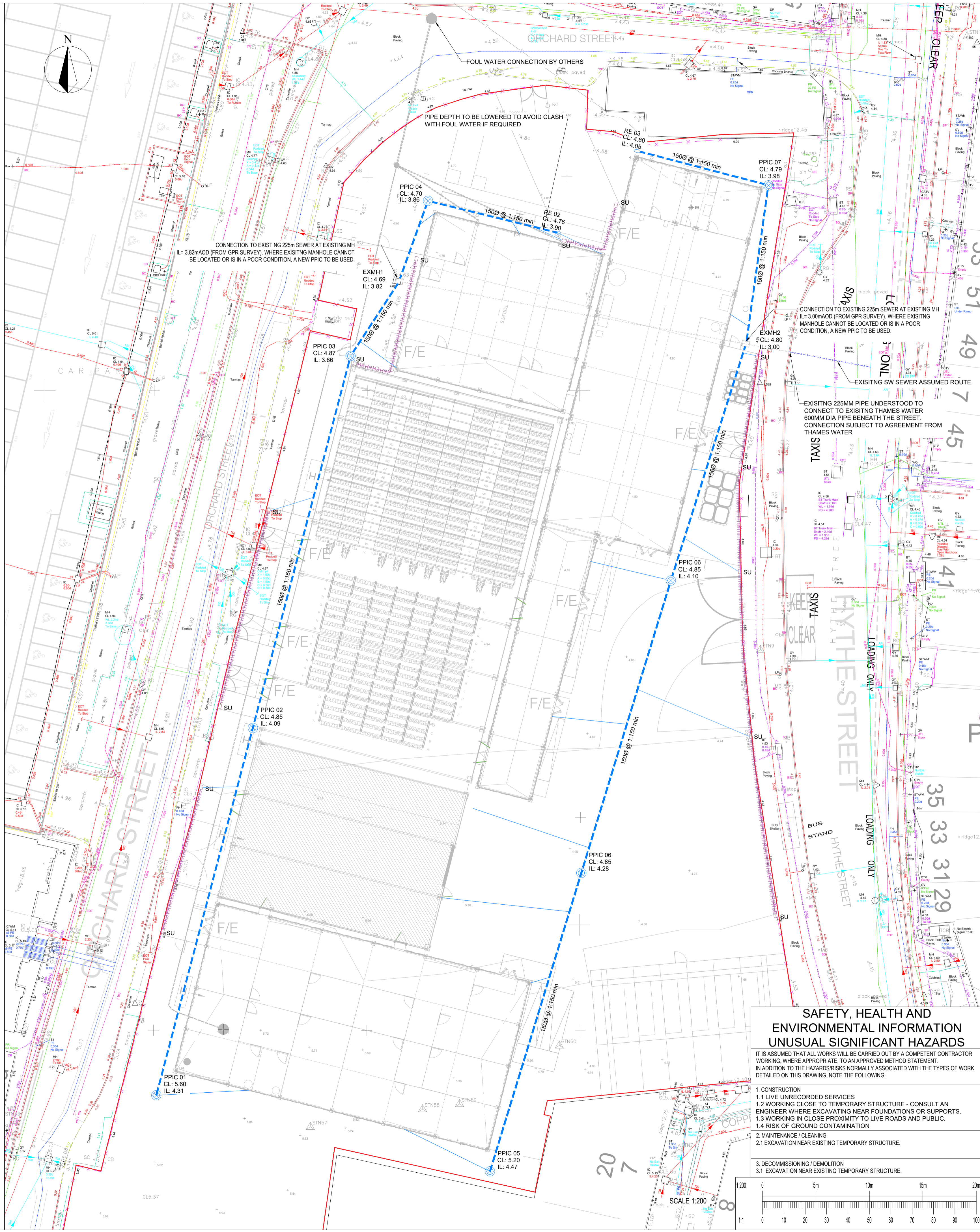
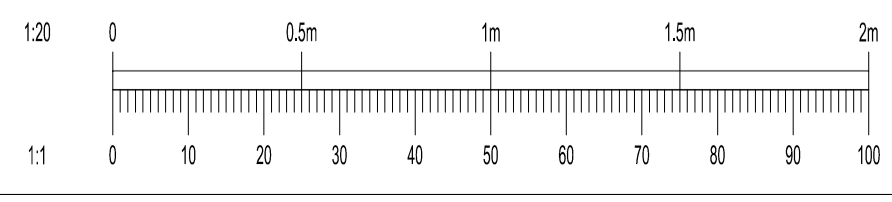


TYPICAL INSPECTION CHAMBER DETAIL - TYPE D (Flexible material detail)
Maximum depth from cover level to soffit of pipe in areas subject to vehicle loading 3 m, non-entry
(SCALE 1:20)



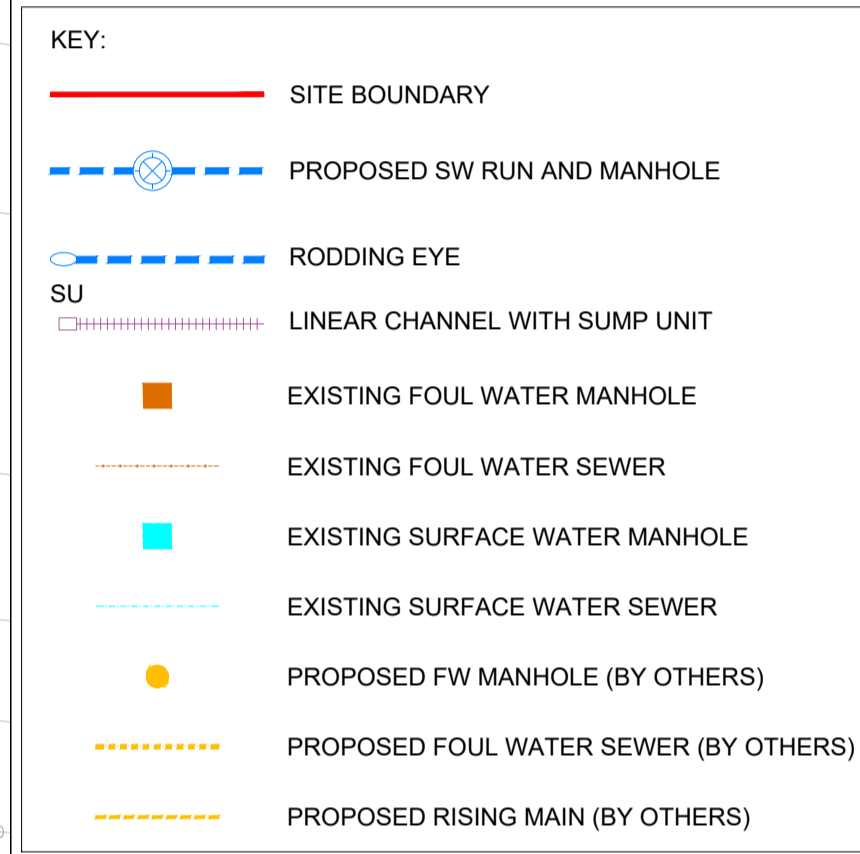
CLASS S 360° GRANULAR SURROUND PIPE BEDDING DETAIL
(SCALE 1:20)

SCALE 1:20



GENERAL NOTES:

- THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS AND ENGINEERS DRAWINGS AND SPECIFICATIONS.
- DO NOT SCALE THIS DRAWING. ANY AMBIGUITIES, OMISSIONS AND ERRORS ON DRAWINGS SHALL BE BROUGHT TO THE ENGINEERS ATTENTION IMMEDIATELY. ALL DIMENSIONS MUST BE CHECKED / VERIFIED ON SITE. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
- FOR GENERAL NOTES REFER TO DRAWING.
- RWP LOCATION TBC - BELOW GROUND NETWORK SUBJECT TO CHANGE FOLLOWING RECEIPT.
- EXISTING SEWER LEVELS TAKEN FROM SURVEY, TO BE CONFIRMED ON SITE.
- AGREEMENT WITH THAMES WATER REQUIRED WITH REGARDS TO INDIRECT S106 AND UNRESTRICTED DISCHARGE.
- COVER LEVELS OF EXISTING ASSETS, WHERE AVAILABLE, EXTRACTED FROM TOPOGRAPHICAL INFORMATION.
- AREAS OF EXISTING HARDSTANDING TO THE EAST OF THE DEVELOPMENT ARE ASSUMED TO CONTINUE TO DRAIN VIA EXISTING MEANS.
- THE STRUCTURAL DESIGN OF THE TEMPORARY STRUCTURE HAS BEEN UNDERTAKEN BY OTHERS. WHERE EXCAVATIONS ARE TAKING PLACE NEAR ANY ERRECTED STRUCTURE GUIDANCE SHOULD BE PROVIDED BY THE STRUCTURAL ENGINEER RESPONSIBLE FOR THE STRUCTURE SO NOT TO UNDERMINE THE SUPPORTS OR FOUNDATIONS.
- LINEAR CHANNEL LOCATION BASED ON TOPOGRAPHICAL INFORMATION. EXTERNAL LEVELS TO BE CONFIRMED BY OTHERS. LINEAR CHANNELS TO BE ADJUSTED TO SUIT.
- DRAWING IS TO BE USED FOR PLANNING PURPOSES ONLY AND NOT SUITABLE FOR CONSTRUCTION.



P02 LAYOUT UPDATED	08/12/23	EB	MS
P01 FIRST ISSUE	15/11/23	EB	MS
Rev:	Description:	Date:	By: Chkd:

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Status: **SUITABLE FOR INFORMATION** **S2**

Project: **ORCHARD WEST, DARTFORD**

Dig Title: **DRAINAGE GENERAL ARRANGEMENT**

Drawn By: EB | Designed By: MS | Checked By: MS

Date: 14/11/23 | Scales @ A1: 1:200

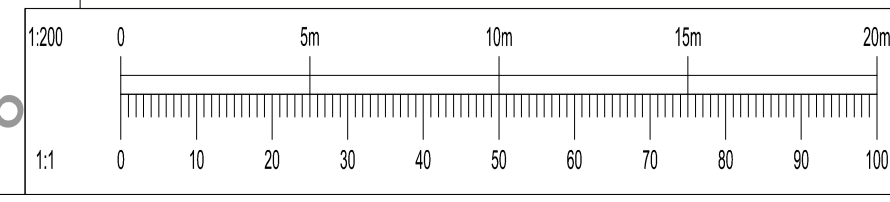
Project No - Originator - Function - Spatial - Form - Discipline - Number | Revision

085074 - CUR - XX - XX - D - C - 92000 | P02

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION UNUSUAL SIGNIFICANT HAZARDS

IT IS ASSUMED THAT ALL WORKS WILL BE CARRIED OUT BY A COMPETENT CONTRACTOR WORKING, WHERE APPROPRIATE, TO AN APPROVED METHOD STATEMENT.
IN ADDITION TO THE HAZARDS/RISKS NORMALLY ASSOCIATED WITH THE TYPES OF WORK DETAILED ON THIS DRAWING, NOTE THE FOLLOWING:

- CONSTRUCTION
 - 1.1 LIVE UNRECORDED SERVICES
 - 1.2 WORKING CLOSE TO TEMPORARY STRUCTURE - CONSULT AN ENGINEER WHERE EXCAVATING NEAR FOUNDATIONS OR SUPPORTS.
 - 1.3 WORKING IN CLOSE PROXIMITY TO LIVE ROADS AND PUBLIC.
 - 1.4 RISK OF GROUND CONTAMINATION
- MAINTENANCE / CLEANING
 - 2.1 EXCAVATION NEAR EXISTING TEMPORARY STRUCTURE.
- DECOMMISSIONING / DEMOLITION
 - 3.1 EXCAVATION NEAR EXISTING TEMPORARY STRUCTURE.



SCALE 1:200

Appendix E – Causeway Flow Results

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	100	Maximum Rainfall (mm/hr)	0.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	0.000
Ratio-R	0.400	Preferred Cover Depth (m)	0.000
CV	1.000	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Easting (m)	Northing (m)	Depth (m)
S1	0.075	5.00	5.600	554060.428	174134.058	1.290
S2	0.082	5.00	4.870	554078.595	174203.226	1.010
S4	0.032	5.00	4.760	554102.003	174213.950	0.860
S5			4.700	554085.830	174217.741	0.840
S3	0.012	5.00	4.630	554083.052	174210.248	1.409
S10	0.053	5.00	5.200	554091.632	174126.936	0.730
S11	0.081	5.00	4.850	554109.601	174181.759	0.750
S8	0.018	5.00	4.800	554105.088	174220.555	0.750
S9			4.790	554117.385	174217.369	0.810
S6	0.039	5.00	4.500	554115.618	174204.358	1.500
S7			4.300	554119.846	174203.540	1.329
S1a			5.150	554069.890	174170.072	1.088
S10a			4.950	554100.080	174154.527	0.672

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Detailed
FSR Region	England and Wales	Skip Steady State	✓
M5-60 (mm)	20.000	Drain Down Time (mins)	240
Ratio-R	0.400	Additional Storage (m ³ /ha)	20.0
Summer CV	1.000	Check Discharge Rate(s)	x
Winter CV	1.000	Check Discharge Volume	x

Storm Durations

15 | 30 | 60 | 120 | 180 | 240 | 360 | 480 | 600 | 720 | 960 | 1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
5	0	0	0
10	0	0	0
30	0	0	0

Results for 1 year Critical Storm Duration. Lowest mass balance: 98.97%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
15 minute summer	S1	10	4.425	0.115	13.3	0.1325	0.0000	OK
15 minute summer	S2	11	3.944	0.084	27.0	0.1365	0.0000	OK
15 minute summer	S4	10	3.986	0.086	5.8	0.0649	0.0000	OK
15 minute summer	S5	11	3.894	0.034	5.7	0.0000	0.0000	OK
15 minute summer	S3	11	3.480	0.259	34.2	0.0458	0.0000	SURCHARGED
15 minute summer	S10	10	4.560	0.090	9.5	0.1313	0.0000	OK
15 minute summer	S11	11	4.184	0.084	23.2	0.1801	0.0000	OK
15 minute summer	S8	10	4.104	0.054	3.3	0.0265	0.0000	OK
15 minute summer	S9	11	4.006	0.026	3.2	0.0000	0.0000	OK
15 minute summer	S6	11	3.319	0.319	65.4	0.1656	0.0000	SURCHARGED
15 minute summer	S7	11	3.175	0.204	64.3	0.0000	0.0000	OK
15 minute summer	S1a	11	4.188	0.126	13.1	0.0000	0.0000	OK
15 minute summer	S10a	11	4.371	0.093	9.3	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m ³)	Discharge Vol (m ³)
15 minute summer	S1	1.000	S1a	13.1	0.885	0.909	0.5594	
15 minute summer	S2	1.001	S3	26.4	1.793	0.532	0.1155	
15 minute summer	S4	2.000	S5	5.7	0.873	0.685	0.1181	
15 minute summer	S5	2.001	S3	5.7	0.515	0.112	0.0810	
15 minute summer	S3	1.002	S6	33.4	0.840	0.788	1.3162	
15 minute summer	S10	3.000	S10a	9.3	0.840	0.645	0.3243	
15 minute summer	S11	3.001	S6	23.2	1.489	0.600	0.3240	
15 minute summer	S8	4.000	S9	3.2	0.851	0.250	0.0507	
15 minute summer	S9	4.001	S6	3.2	0.272	0.067	0.1345	
15 minute summer	S6	1.003	S7	64.3	1.617	1.510	0.1673	30.3
15 minute summer	S1a	1.001_1	S2	12.9	1.047	0.935	0.4337	
15 minute summer	S10a	3.001_1	S11	9.3	0.885	0.665	0.3098	

Results for 5 year Critical Storm Duration. Lowest mass balance: 98.97%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	S1	12	5.120	0.810	22.3	0.9352	0.0000	SURCHARGED
15 minute summer	S2	12	4.350	0.490	38.9	0.7975	0.0000	SURCHARGED
15 minute summer	S4	10	4.016	0.116	9.7	0.0878	0.0000	OK
15 minute summer	S5	10	3.904	0.044	9.6	0.0000	0.0000	OK
15 minute summer	S3	12	3.848	0.627	49.3	0.1111	0.0000	SURCHARGED
15 minute summer	S10	12	4.752	0.282	15.9	0.4096	0.0000	SURCHARGED
15 minute summer	S11	12	4.421	0.321	35.2	0.6913	0.0000	SURCHARGED
15 minute summer	S8	10	4.121	0.071	5.5	0.0348	0.0000	OK
15 minute summer	S9	10	4.014	0.034	5.4	0.0000	0.0000	OK
15 minute summer	S6	12	3.497	0.497	96.9	0.2578	0.0000	SURCHARGED
15 minute summer	S7	9	3.184	0.213	96.9	0.0000	0.0000	OK
15 minute summer	S1a	12	4.688	0.626	17.9	0.0000	0.0000	SURCHARGED
15 minute summer	S10a	12	4.579	0.301	15.1	0.0000	0.0000	SURCHARGED

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 summer	S1	1.000	S1a	17.9	1.019	1.241	0.6556	
15 minute summer	S2	1.001	S3	37.0	2.100	0.746	0.1467	
15 minute summer	S4	2.000	S5	9.6	1.002	1.149	0.1672	
15 minute summer	S5	2.001	S3	9.5	0.728	0.187	0.0862	
15 minute summer	S3	1.002	S6	49.3	1.239	1.162	1.3162	
15 minute summer	S10	3.000	S10a	15.1	0.913	1.047	0.5080	
15 minute summer	S11	3.001	S6	32.4	1.841	0.836	0.4117	
15 minute summer	S8	4.000	S9	5.4	0.987	0.418	0.0726	
15 minute summer	S9	4.001	S6	5.4	0.434	0.112	0.1407	
15 minute summer	S6	1.003	S7	96.9	2.438	2.278	0.1696	51.0
15 minute summer	S1a	1.001_1	S2	18.7	1.130	1.363	0.6035	
15 minute summer	S10a	3.001_1	S11	14.3	1.040	1.025	0.5079	

Results for 10 year Critical Storm Duration. Lowest mass balance: 98.97%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
15 minute summer	S1	12	5.535	1.225	25.8	1.4144	0.0000	FLOOD RISK
15 minute summer	S2	12	4.581	0.721	43.5	1.1738	0.0000	FLOOD RISK
15 minute summer	S4	12	4.034	0.134	11.2	0.1016	0.0000	OK
15 minute summer	S5	12	3.980	0.120	11.1	0.0000	0.0000	OK
15 minute summer	S3	12	3.960	0.739	53.3	0.1308	0.0000	SURCHARGED
15 minute summer	S10	12	5.024	0.554	18.3	0.8048	0.0000	FLOOD RISK
15 minute summer	S11	12	4.638	0.538	39.9	1.1574	0.0000	FLOOD RISK
15 minute summer	S8	10	4.127	0.077	6.3	0.0375	0.0000	OK
15 minute summer	S9	10	4.017	0.037	6.2	0.0000	0.0000	OK
15 minute summer	S6	12	3.551	0.551	105.1	0.2857	0.0000	SURCHARGED
15 minute summer	S7	9	3.184	0.213	105.0	0.0000	0.0000	OK
15 minute summer	S1a	12	5.006	0.944	19.9	0.0000	0.0000	FLOOD RISK
15 minute summer	S10a	12	4.821	0.543	15.4	0.0000	0.0000	FLOOD RISK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m ³)	Discharge Vol (m ³)
15 minute summer	S1	1.000	S1a	19.9	1.128	1.374	0.6556	
15 minute summer	S2	1.001	S3	41.2	2.338	0.831	0.1467	
15 minute summer	S4	2.000	S5	11.1	1.008	1.326	0.2798	
15 minute summer	S5	2.001	S3	10.5	0.755	0.207	0.1285	
15 minute summer	S3	1.002	S6	53.4	1.342	1.259	1.3162	
15 minute summer	S10	3.000	S10a	15.4	0.919	1.067	0.5080	
15 minute summer	S11	3.001	S6	35.2	1.997	0.907	0.4117	
15 minute summer	S8	4.000	S9	6.2	1.025	0.479	0.0800	
15 minute summer	S9	4.001	S6	6.2	0.492	0.129	0.1428	
15 minute summer	S6	1.003	S7	105.0	2.639	2.466	0.1696	58.8
15 minute summer	S1a	1.001_1	S2	20.3	1.151	1.473	0.6035	
15 minute summer	S10a	3.001_1	S11	15.5	1.006	1.110	0.5079	

Results for 30 year Critical Storm Duration. Lowest mass balance: 98.97%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m ³)	Flood (m ³)	Status
15 minute summer	S1	10	5.600	1.290	32.7	1.4900	2.0198	FLOOD
15 minute summer	S2	12	4.870	1.010	51.5	1.6453	0.3173	FLOOD
15 minute summer	S4	12	4.249	0.349	14.3	0.2638	0.0000	SURCHARGED
15 minute summer	S5	12	4.162	0.302	12.2	0.0000	0.0000	SURCHARGED
15 minute summer	S3	12	4.131	0.910	59.3	0.1610	0.0000	SURCHARGED
15 minute summer	S10	11	5.200	0.730	23.3	1.0607	0.6680	FLOOD
15 minute summer	S11	11	4.850	0.750	45.7	1.6133	0.5453	FLOOD
15 minute summer	S8	10	4.138	0.088	8.0	0.0429	0.0000	OK
15 minute summer	S9	11	4.021	0.041	7.9	0.0000	0.0000	OK
15 minute summer	S6	12	3.646	0.646	118.7	0.3354	0.0000	SURCHARGED
15 minute summer	S7	8	3.184	0.213	117.9	0.0000	0.0000	OK
15 minute summer	S1a	11	5.150	1.088	21.1	0.0000	0.3751	FLOOD
15 minute winter	S10a	11	4.950	0.672	15.3	0.0000	0.7469	FLOOD

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m ³)	Discharge Vol (m ³)
15 minute summer	S1	1.000	S1a	21.1	1.200	1.462	0.6556	
15 minute summer	S2	1.001	S3	45.0	2.558	0.909	0.1467	
15 minute summer	S4	2.000	S5	12.2	0.994	1.462	0.3109	
15 minute summer	S5	2.001	S3	12.5	0.730	0.245	0.1386	
15 minute summer	S3	1.002	S6	58.4	1.469	1.379	1.3162	
15 minute summer	S10	3.000	S10a	15.3	0.925	1.060	0.5080	
15 minute summer	S11	3.001	S6	37.0	2.104	0.955	0.4117	
15 minute summer	S8	4.000	S9	7.9	1.099	0.610	0.0948	
15 minute summer	S9	4.001	S6	7.9	0.613	0.165	0.1471	
15 minute summer	S6	1.003	S7	117.9	2.964	2.769	0.1696	70.3
15 minute summer	S1a	1.001_1	S2	20.5	1.164	1.491	0.6035	
15 minute winter	S10a	3.001_1	S11	15.9	0.955	1.140	0.5079	

Appendix F – LLFA correspondence

Michael Smith

From: Daniel.Hoare@kent.gov.uk
Sent: 10 November 2023 12:29
To: Michael Smith; Emily.Neale@kent.gov.uk
Cc: justin@contourplanning.com; Paul.Bell@dartford.gov.uk; Danny.Chappell@dartford.gov.uk
Subject: RE: Orchard West Theatre - Discharge Rate

Hi Michael,

I can confirm that with the temporary marquee/ tent only being in place until early 2025, the LLFA would accept the principle of connecting to the surface water sewer unrestricted utilising the existing link on site. With the potential underlying ground conditions preventing infiltration and short-term nature of the theatre (to be restricted by condition), we would view that this would not be financially viable to incorporate attenuation to comply with greenfield rate restrictions as per usual major development applications.

Thames Water will need to be contacted to confirm their acceptance of proposal and that they have sufficient capacity within their network to receive this runoff. This should be provided as part of the retrospective planning application.

If there is any further queries then please get in contact.

Kind Regards,

Daniel

Daniel Hoare MCIWEM | Senior Flood Risk Officer | Flood & Water Management | Kent County Council | Invicta House, County Hall, Maidstone ME14 1XX | External: 03000 413550

As Lead Local Flood Authority (LLFA) for the County, we are the statutory consultee in planning to [promote](http://www.kent.gov.uk/waste-planning-and-land/flooding-and-drainage/sustainable-drainage-systems) the provision of Sustainable Drainage Systems. You can find out more by visiting: <http://www.kent.gov.uk/waste-planning-and-land/flooding-and-drainage/sustainable-drainage-systems>

From: Michael Smith <Michael.Smith@curtins.com>
Sent: Friday, November 10, 2023 11:23 AM
To: Daniel Hoare - GT - ECE <Daniel.Hoare@kent.gov.uk>; Emily Neale - GT - ECE <Emily.Neale@kent.gov.uk>
Cc: Justin Mills <justin@contourplanning.com>; Paul Bell <Paul.Bell@dartford.gov.uk>; Danny Chappell <Danny.Chappell@dartford.gov.uk>
Subject: Orchard West Theatre - Discharge Rate

Some people who received this message don't often get email from michael.smith@curtins.com. [Learn why this is important](#)

Hi Daniel & Emily,

Thank you for your time this morning regarding the proposals for the temporary Orchard West theatre in Dartford. I appreciate your attendance given the short notice.

For ease of reference and as a refresher if required, I have attached my initial email detailing the development.

As discussed in the meeting, the site is currently a mixture of largely undrained asphalt hardstanding and undrained compacted hardcore from the demolition in the early 2010's. The levels across the site mean that any rainfall currently landing on the site will flow over ground unrestricted and likely enter the below ground networks via a highway gully on Hythe Street. The GPR survey attached shows these gullies connect to the 600mm Thames Water sewer. There is a 225mm surface water sewer that bisects the site and flows east. It is anticipated that this connects to the Thames Water network beneath Hythe Steet.

With regards to the proposed surface water, there is only very minimal additional impermeable area proposed at ground level, with the majority of the development being the proposed tent roof area. It is proposed to drain this using guttering and RWPs connected to a below ground collection network. This network will drain towards the existing 225mm sewer that bisects the site. Due to the theatre only being in place until early 2025, it is not proposed to restrict discharge to the existing sewer. Please see the attached indicative mark up outlining the proposed methodology. Note that this is subject to change following receipt of the RWP locations.

Following the discussion in our meeting please can you confirm you are happy with this approach?

Please don't hesitate to get in touch should you require any additional information

Kind Regards

Michael Smith

Associate

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