



Drainage Philosophy

226254 – NETA Relocation, Stockton Riverside
College, Stockton-on-Tees, Teesside

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Drainage Philosophy

Project: NETA Relocation, Stockton Riverside College, Stockton-on-Tees, Teesside

Client: The Education Training Collective

LLFA: Stockton Borough Council

BGP Job No: 226254

Document Checking:

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RJW

Issue	Date	Status	Checked for Issue
001	19/04/2024	Planning	RJW

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Appendix C – Topographic and Utility Surveys

Appendix D – Northumbrian Water Records

Appendix E – Flood Maps for Planning

Appendix F – Proposed Drainage Drawings

Appendix G – Microdrainage Calculations

1. Executive Summary / Project Background

- 1.1. This Drainage Philosophy has been prepared to supplement the planning application for the new Car park at Stockton Riverside College, Stockton-on-Tees. See Appendix A for the Site Location Plan and Appendix B for the proposals.
- 1.2. The proposals are to construct a new car parking facility to provide additional parking for Stockton Riverside College and the future NETA Relocation building that will be submitted as a future planning application. The new car park will be constructed on a greenfield parcel of land adjacent to Harvard Avenue.
- 1.3. Northumbrian Water (NWL) records have been obtained and the Tees Valley SuDS Design Guidance has been reviewed.
- 1.4. A hierarchy for the appropriate disposal of surface water is included within Building Regulations Part H3 which states the following:

“Rainwater from a system provided ... shall discharge to one of the following, listed in order of priority:

 - 1) An adequate soakaway or some other adequate infiltration system; or, where this is not reasonably practicable,
 - 2) A watercourse; or, where that is not reasonably practicable,
 - 3) A surface water sewer.
 - 4) A combined sewer.
- 1.5. The following Drainage Philosophy addresses each element of the above hierarchy and details how the surface water and foul water will be discharged from site.
- 1.6. BGP have prepared this report based on the current information available. This report is subject to change should new information be presented.

2. Existing Site & Drainage

2.1. Site Location

- 2.1.1. Site Name: NETA Relocation, Stockton Riverside College
- 2.1.2. Site Address: Harvard Avenue, Thornaby, Stockton-on-Tees, TS17 6FB
- 2.1.3. OS Grid Reference: E: 445454, N: 518693
- 2.1.4. National Grid Reference: NZ454186

2.2. Site Description

- 2.2.1. Site Area: 1.149ha
- 2.2.2. Existing Land Use: Greenfield parcel of land.
- 2.2.3. Proposed Land Use: Construction of a new car parking facility.
- 2.2.4. Local Planning Authority: Stockton Borough Council
- 2.2.5. Sewer Undertaker: Northumbrian Water (NWL)
- 2.2.6. The site is located approximately 1km east of Stockton Town Centre and approximately 4.2km southwest of Middlesbrough Town Centre. The site is within the boundaries of Stockton Riverside College campus. The site is bound by Harvard Avenue to the eastern boundary, University Boulevard to the northern boundary, Durham University Queen's campus to the eastern boundary and Princeton Drive to the southern boundary. Existing private office buildings are in proximity to the proposed developments.

2.3. Existing Watercourses

- 2.3.1. The nearest named watercourse is the river Tees. This is located approximately 25m north west of site and flows South to North initially and then changes direction to flow West to East.

2.4. Existing Public and Private Drainage

- 2.4.1. See Appendix D for locations of existing Northumbrian Water public drains.
- 2.4.2. There is a 225mm adopted Foul Water sewer that runs from north to south along the western boundary within the existing grassed area. This heads towards Princeton drive and then travels east towards Durham University Queen's campus.
- 2.4.3. The Northumbrian Water records (Appendix D) show that there are no surface water drains located within close proximity to the site. An existing NWL surface water sewer is located approximately 90 metres to the south west of our site. This network is located close to the roundabout that links Harvard Avenue, Princeton Drive, Radcliffe Crescent, and Station Street.

2.5. Existing Ground Conditions

- 2.5.1. A 'Phase 2 Site Investigation' has been carried out by Solmek dated April 2023.
- 2.5.2. In the area of the proposed car park the ground consisted of sandy slightly gravelly clay topsoil to depths of between 0.10mbgl and 0.20mbgl. Made ground was relatively uniform in this area, comprising of very gravelly sand fill with low to medium cobble content. This was encountered to depths of between 2.00mbgl and 2.50mbgl. The extent of the excavation in these areas was 2.5m depth. It can be assumed that depths below this will be similar in composition to the borehole samples taken nearby. A layer of organic soft locally very soft peat was encountered to depths of 5.40mbgl and 7.40mbgl then natural ground generally comprised soft and very soft silty slightly sandy organic low strength clay to depths of between 11.5mbgl and 12.10mbgl.
- 2.5.3. The report notes Groundwater was encountered within the boreholes at depths of between 2.80m and 4.40m below ground level. Deeper strikes were encountered at depths between 9.30mbgl and 12.10mbgl.

2.6. Existing Flood Risk Assessment

- 2.6.1. A site-specific Flood Risk Assessment (April 2024) has been carried out by Billingham George & Partners and is to be provided separately to support this planning application.
- 2.6.2. The report states that the site is entirely within Flood Zone 1 and is at low risk of flooding from fluvial sources of flood risk. The surface water flood maps indicate the site is affected by overland surface water flooding due to the site levels being lower than surrounding levels. However, this will be mitigated by the introduction of a positive drainage system that will serve the car park. Therefore, the proposed site is suitable for development in accordance with the National Planning Policy Framework.
- 2.6.3. See Appendix E for Flood Maps for planning.

3. Review of Surface Water Discharge Hierarchy

3.1. Existing Wastewater Regime

- 3.1.1. Existing drainage is present that serves the existing Stockton Riverside College Buildings and car parks. It is understood that most of the surface water drainage outfalls to the River Tees via a headwall. It is understood that most of the existing foul drainage is collected via private drains within the site boundary and outfalls into the existing NWL foul sewer running close to the western boundary. This sewer is then directed east and runs parallel to Princeton Drive into the existing pumping station (NWL 5602) to the south east of Stockton Riverside College. See Appendix D for Existing NWL records. See Appendix C for existing utility information supplied by MurphyGS.

3.2. Current Guidelines

- 3.2.1. In accordance with Building Regulations and NPPF the disposal of surface water has been considered in the following order of priority; discharge to ground, where not reasonably practicable, a watercourse, or where not reasonably practicable a sewer.

3.3. Discharge to Ground

- 3.3.1. Discharge of surface water to ground via infiltration is suited to sites which have ground conditions made up of gravel, sand, or a mixture of the two. Sands and gravels permit rapid dispersion and infiltration of surface water which is necessary to ensure that overland flooding does not occur during intense rainfall periods.
- 3.3.2. A 'Phase 2 Site Investigation' has been carried out by Solmek dated April 2023. (Report No. S230207).
- 3.3.3. In the area of the proposed car park the ground consisted of sandy slightly gravelly clay topsoil to depths of between 0.10mbgl and 0.20mbgl. Made ground was relatively uniform in this area, comprising of very gravelly sand fill with low to medium cobble content. This was encountered to depths of between 2.00mbgl and 2.50mbgl. The extent of the excavation in these areas was 2.5m depth. It can be assumed that depths below this will be similar in composition to the borehole samples taken nearby. A layer of organic soft locally very soft peat was encountered to depths of 5.40mbgl and 7.40mbgl then natural ground generally comprised soft and very soft silty slightly sandy organic low strength clay to depths of between 11.5mbgl and 12.10mbgl.
- 3.3.4. The above made ground strata is not typically suitable for infiltration and the Soilscales website notes that this type of ground has 'impeded drainage' properties.
- 3.3.5. Due to the above findings, it is confirmed that it would not be feasible to discharge the sites surface water to the ground via infiltration.

3.4. Discharge to a Watercourse

- 3.4.1. The site is in close proximity to the River Tees and the majority of the existing site discharges to the river via an existing outfall. Under agreement with the LLFA, EA and Canal and Rivers trust, it is considered that surface water flows should outfall into the river via an indirect connection into the existing surface water sewer, located within the site, at a restricted discharge rate that is to be agreed.

3.5. Discharge to a Surface Water Sewer

- 3.5.1. As per the hierarchy and due to the suggestion of discharging to a watercourse, discharging to a surface water sewer is not required.

4. Proposed Surface Water Drainage Strategy

- 4.1. It is expected that surface water discharge rates will be restricted to as close to Greenfield rates as per the Tees Valley SuDS Design Guidance for Major Developments. BGP have conducted a greenfield run off estimation using the UK SuDS Tool (See Appendix G). The existing greenfield rate for the site is 2.55 l/s. This is considered too low to utilise due to the minimal orifice size that would be required. As such, a rate of 3.0 l/s has been used. This is subject to agreement with the LLFA, EA and Canal and Rivers trust.
- 4.2. Flows from the new training centre and car park will be collected and the discharge rate will be restricted to 3.0 l/s. All attenuation would be designed to store flows above this 3 l/s discharge rate for rainfall events up to and included the 1 in 100-year event with an allowance of 45% for climate change. An allowance will be made for additional volume within the attenuation tank to accommodate the future impermeable area from the proposed NETA Relocation Building as part of a future planning application. See blue dashed line on BGP drawing 226254-BGP-01-ZZ-D-C-01130 in Appendix F.
- 4.3. See Appendix F for the Proposed Drainage General Arrangement drawings. This is accompanied by the Microdrainage calculations for attenuation volume within Appendix G.
- 4.4. The proposed surface water system will be designed in line with Building Regulations Part H which ensures it is separate from the foul.
- 4.5. The proposed car park is situated to the west of the existing Stockton Riverside College Building 2 on an area of green open space. The proposals are to have impermeable tarmac access ways and utilise permeable paving as a means of surface water collection treatment and conveyance. Flows onto the access way will fall at a suitable gradient towards permeable paved bays. Flows will then percolate into the sub-base of the permeable paving and be collected within perforated pipes. Flows will then fall via gravity towards the proposed attenuation tank.
- 4.6. The proposed NETA Relocation building (shown within Appendix B) is currently proposed to be located within the extents of an existing car park. As such, the proposed drainage to the training centre will be routed and designed to minimise the amount of works to the existing car park. Flows will be collected and drain towards the proposed car park via the plaza area. A stub connection will be provided as part of the proposed car park works to enable a future connection. (See Appendix F for Proposed Drainage Strategy).
- 4.7. Attenuation crates will be utilised to minimise land take and enable the storage volume to be provided beneath the car park. See Appendix F. The cover to the attenuation crates has been considered in accordance with the manufacturers specification to ensure that they are not overloaded. As such, the crates are two high with a minimum of 900mm cover.
- 4.8. The flows from the overall area will be collected and restricted to 3l/s via a flow control device before connecting into the existing private surface water drain that eventually outfalls into the river tees approximately 20 metres downstream to the north west of the proposed car park.

5. Proposed Foul Water Drainage

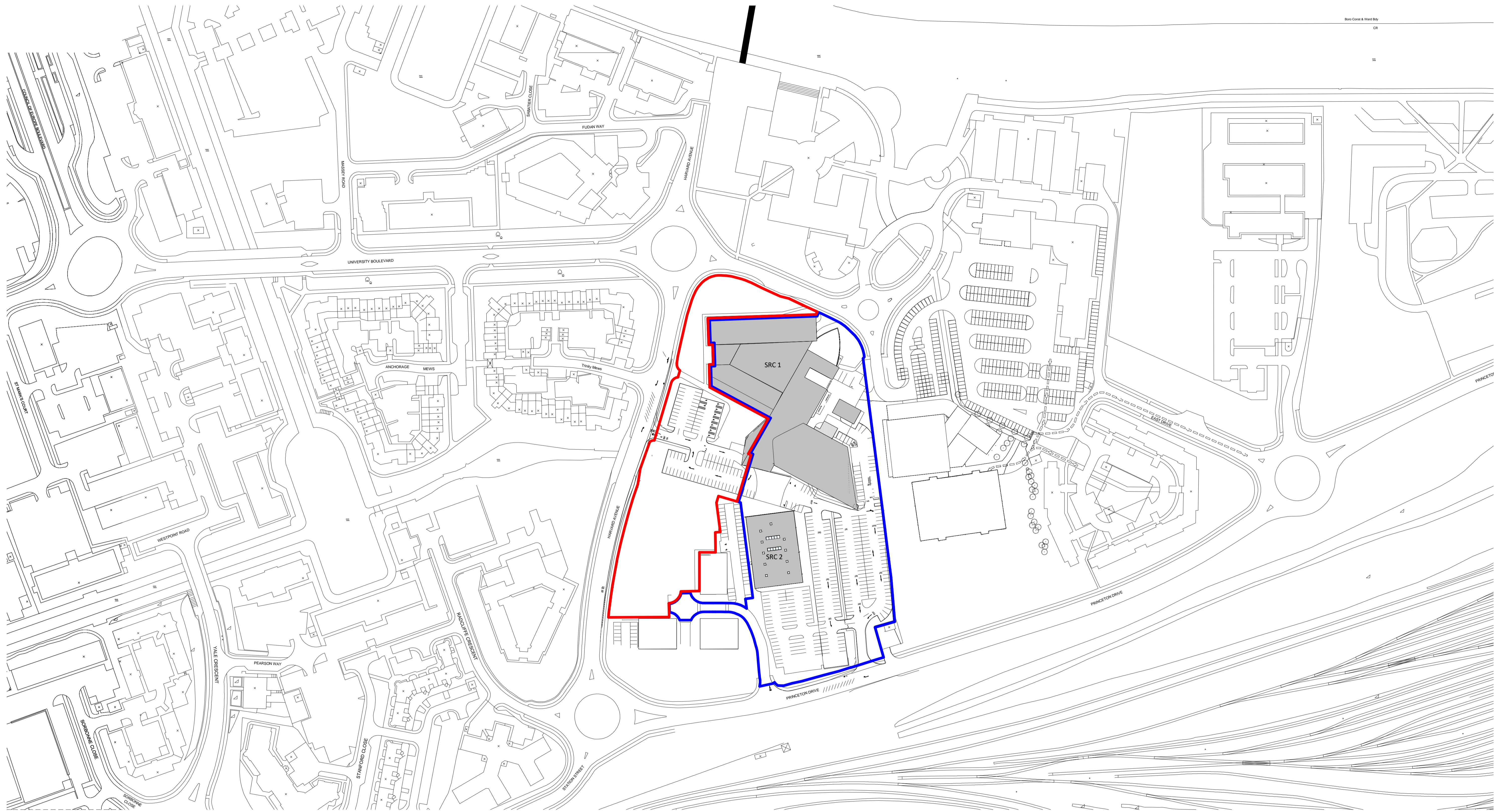
- 5.1. There are no foul water requirements for the Proposed Car Park as part of this planning application. However, the existing NWL foul sewer and easement has been considered as part of the design to ensure access is available for future maintenance.
- 5.2. Future foul drainage for the NETA training centre will be required and will connect to the existing private foul drainage located within the site. See Appendix C for Existing Utility Information. This private drainage then connects into the adopted NWL Sewer (MH references 3702,3601,3602). The sewer is located close to the western boundary and can be seen in Appendix D. This will be covered in more detail as part of a future planning application.

6. Conclusion

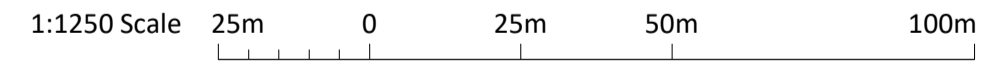
- 6.1. As per the hierarchy within Building Regulations Part H3, it is deemed necessary to discharge the surface water to a watercourse, due to the lack of infiltration capabilities in this location.
- 6.2. Discharge is to be restricted to suit the LLFA and EA requirements with attenuation provided for flows greater than this for design events up to the 1 in 100 year + 45% climate change rainfall event.
- 6.3. Proposed drainage layouts have been presenting within Appendix F with supporting calculations included within Appendix G.
- 6.4. This statement has been prepared with reference to the information available at the time of writing. The details of the report may be revised upon receipt of additional or further information.



Appendix A
Site Location Plan



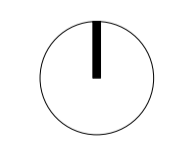
1. Existing Site Location Plan
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Legend

- Site Boundary
- Other Land Owned by Applicant

Key Plan



Project Title:
 NETA Relocation – Stockton Riverside College

Client:
 The Education Training Collective

Drawing Title:
 Site Location Plan


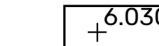





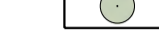



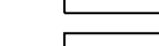


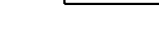
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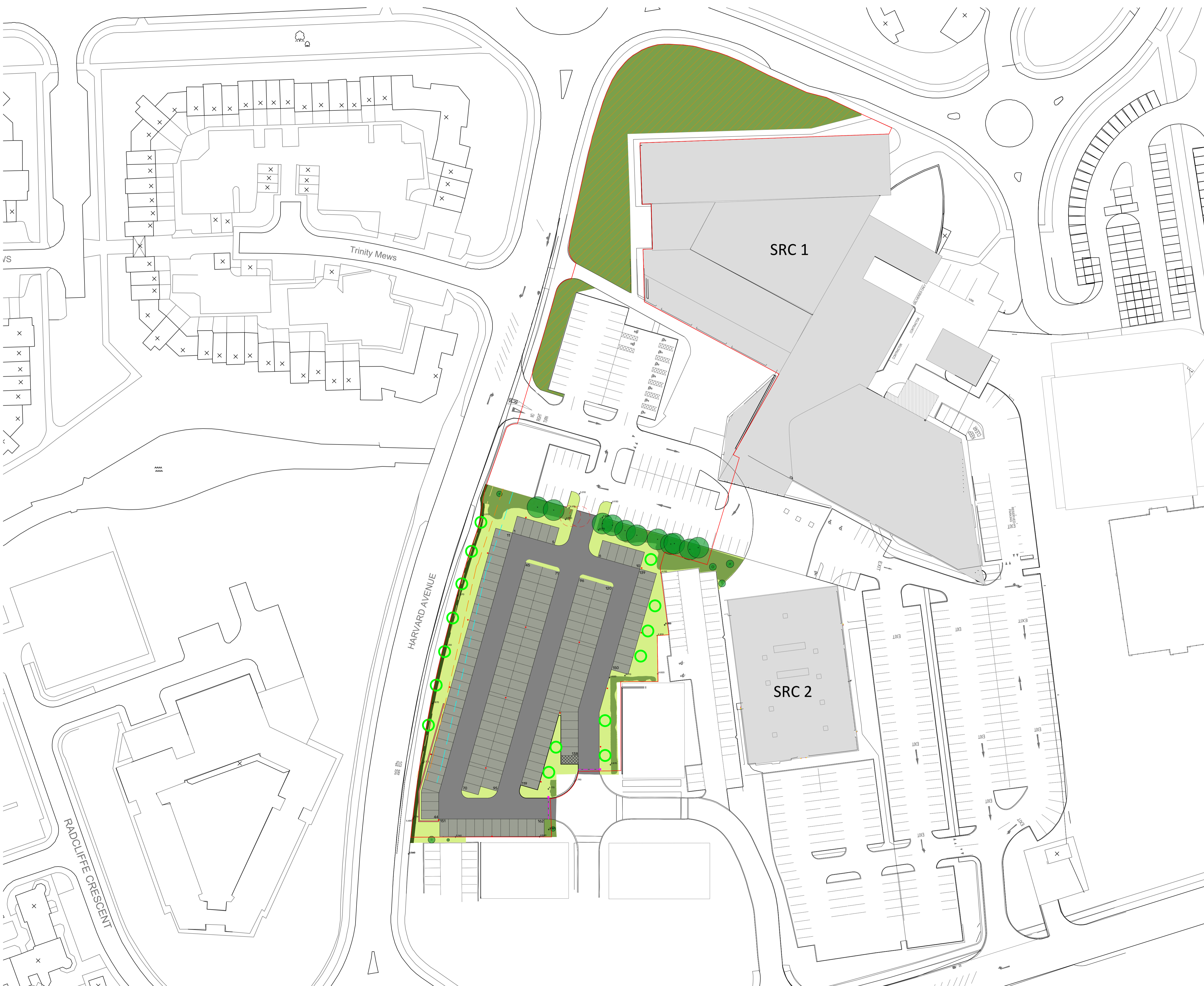
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Rev	Date	Drn	Chk	Description



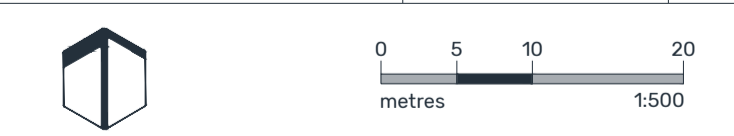
Appendix B
Proposed Site Layout

NOTES

- Legend
-  Site boundary
 -  Existing spot level retained (AOD)
 -  Retained vegetation
 -  Retained vegetation - grassland areas to be enhanced (ref BNG assessment)
 -  Species rich grassland
 -  Proposed native hedge
 -  Proposed native tree (small) (planted as standards)
 -  Existing trees to be retained
 -  Existing tree to be removed
 -  Tarmac
 -  Permeable block paving
 -  Proposed retaining wall (up to 1m)
 -  Proposed lighting column
 -  Adopted foul water sewer with 3 and 6m easement line shown
 -  Proposed vehicular barrier

















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PROJECT	NETA Relocation - Stockton Riverside College		
TITLE	Car Park Relocation - Overall Site		
DWG No.	N1366-ONE-ZZ-XX-DR-L-0001	REV	P01
STATUS	Preliminary		
SCALE	1:500	@ A1	DATE 18.04.24 DRN BY AC



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NOTES

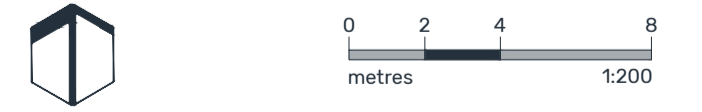
Legend

-  Site boundary
-  Existing spot level retained (AOD)
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-  Species rich grassland
-  Proposed native hedge
-  Proposed native tree (small) (planted as standards)
-  Existing trees to be retained
-  Existing tree to be removed
-  Tarmac
-  Permeable block paving
-  Proposed retaining wall (up to 1m)
-  Proposed lighting column
-  Adopted foul water sewer with 3 and 6m easement line shown
-  Proposed vehicular barrier



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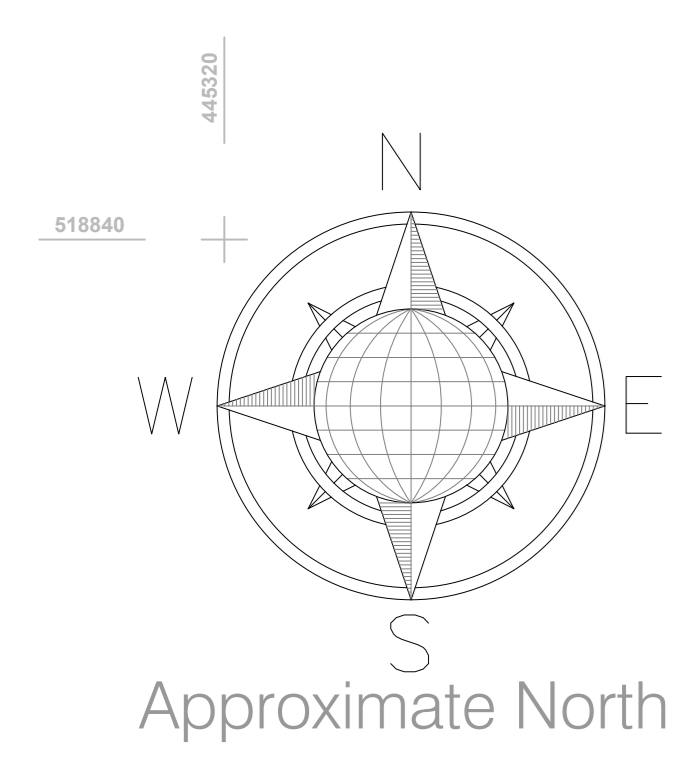
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Various amendments. Issued for planning			
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First Issue.			
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PROJECT	NETA Relocation - Stockton Riverside College		
TITLE	Car Park Relocation - General Arrangement Plan		
DWG No.	N1366-ONE-ZZ-XX-DR-L-0001	REV	P02
STATUS	Preliminary		
SCALE	1:200	@ A1	DATE 09.04.24 DRN BY TL





Appendix C Topographical & Utility Surveys





LEGEND			
Utility Survey Point Features			
Fire Hydrant	IC - Electric	MHF	MH - Foul
Gas Valve	IC - Round	MH	MH - Round
Gully	IC - Telecom	MHS	MH - Surface Water
Gully Round	IC - Traffic	SC	Stop Cock
Inspection Cover	IC - CATV	WM	Water Meter
IC - Comms	MH	WV	Water Valve
	Manhole		
Utility Survey Linework Features			
Communications	Electrical		
BT	Electrical Service		
Cable TV	Electrical Earth		
Closed Circuit TV	Electrical - Low Volt		
COMMS	Electrical - High Volt		
Fibre Optic Line	Electrical - Extra High Volt		
Fibre Optic Line - Coll	Electrical - TFL		
Fibre Optic Line - Enervig	Street Lighting		
Fibre Optic Line - Fibernet	Traffic Control System Unit		
Fibre Optic Line - Level 3	Gas		
Fibre Optic Line - Mercury	Gas Service		
Fibre Optic Line - MFS	Gas Low Pressure		
Fibre Optic Line - Tanet	Gas Intermediate Pressure		
Fibre Optic Line - Virgin	Gas Medium Pressure		
Fibre Optic Line - Vodafone	Gas High Pressure		
Fibre Optic Line - Verizon	GPR - Unknown		
Fibre Optic Line - WCOM	Empty Duct		
Telecom Service	GPR Anomaly		
	Unknown Asset		
Drainage	UA		
Combined Water	UA Passive Sweep		
Foul Water	Unknown Cable		
Surface Water	GPR Slab		
	GPR Survey Area		
Water	Other		
Fire Water	Manhole Chamber		
Rising Main	Manhole ID		
Water Main	Pot End		
Water Service	XX (AS)		
	Assumed Service		
	Scope of Works		
PAS128 Quality Levels			
(Consult document 'PAS128-2014.pdf' for full details)			
XX - A - Quality Level A	XX - B3 - Quality Level B3		
XX - B1 - Quality Level B1	XX - B3P - Quality Level B3P		
XX - B1P - Quality Level B1P	XX - B4 - Quality Level B4		
XX - B2 - Quality Level B2	XX - C - Quality Level C		
XX - B2P - Quality Level B2P	XX - D - Quality Level D		
Special Survey Features			
Datum Point	E-XXXXXXX	N-YYYYYYY	Survey Station
Photo Point	H-ZZZZZ		
Panoramic Photo Point	E-XXXXXXX	N-YYYYYYY	Scan Target
	H-ZZZZZ		
Utility Survey Abbreviations			
AB	Abandoned	FLD	Flooded
BLD	Blocked	IL	Invert Level
CL	Cover Level	NT	No Trace
CLUT	Disconnected Utility	OE	Overhead Electric
EOG	End of GPR Signal	OT	Overhead Telecom
EOT	End of Trace	P	Pilot
FOS	Full of Silt	SOF	Soffit Level
		TRR	Taken From Records
		UTO	Unable to Open
		UN	Unable to Survey
		UN/Unknown	Unknown
		WL	Water Level
		XXD	Service Depth - Grid to Top of Service
Utility Material Abbreviations			
AC	Asbestos Cement	CC	Concrete Chamber
BC	Brick Chamber	DI	Ductile Iron
CI	Cast Iron	PE	Polyethylene
		SI	Spun Iron
		ST	Steel
		WTR	Water

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Any concerns with the survey should be raised with Murphy Geospatial, who will endeavour to promptly provide a remedy. The Client shall not seek recourse through any third party until such time as Murphy Geospatial have had the opportunity to address any concerns raised.

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Location Plan

Revisions

Rev	Description	Surveyed by	Drawn by	Checked by
A	First Issue	DH - 18/07/22	CH - 03/08/22	MM - 10/08/22

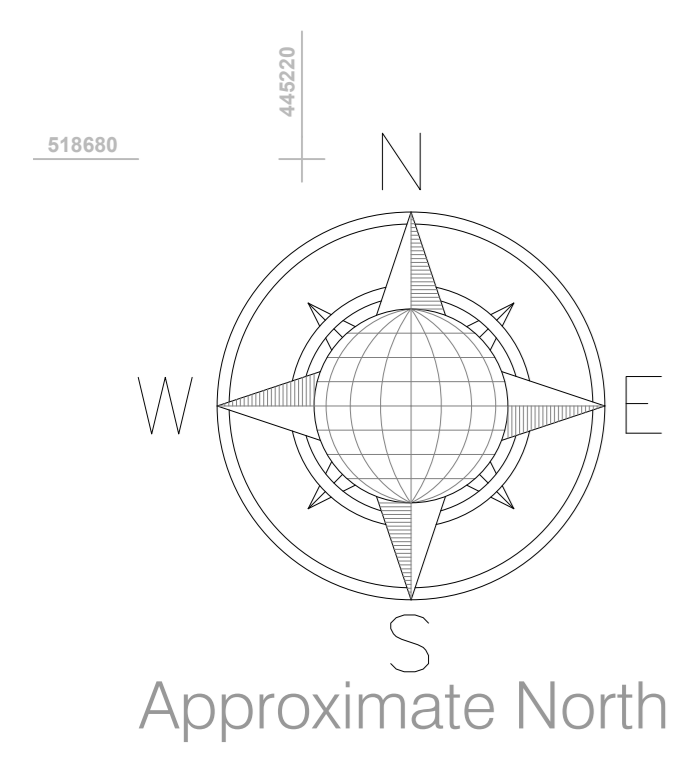


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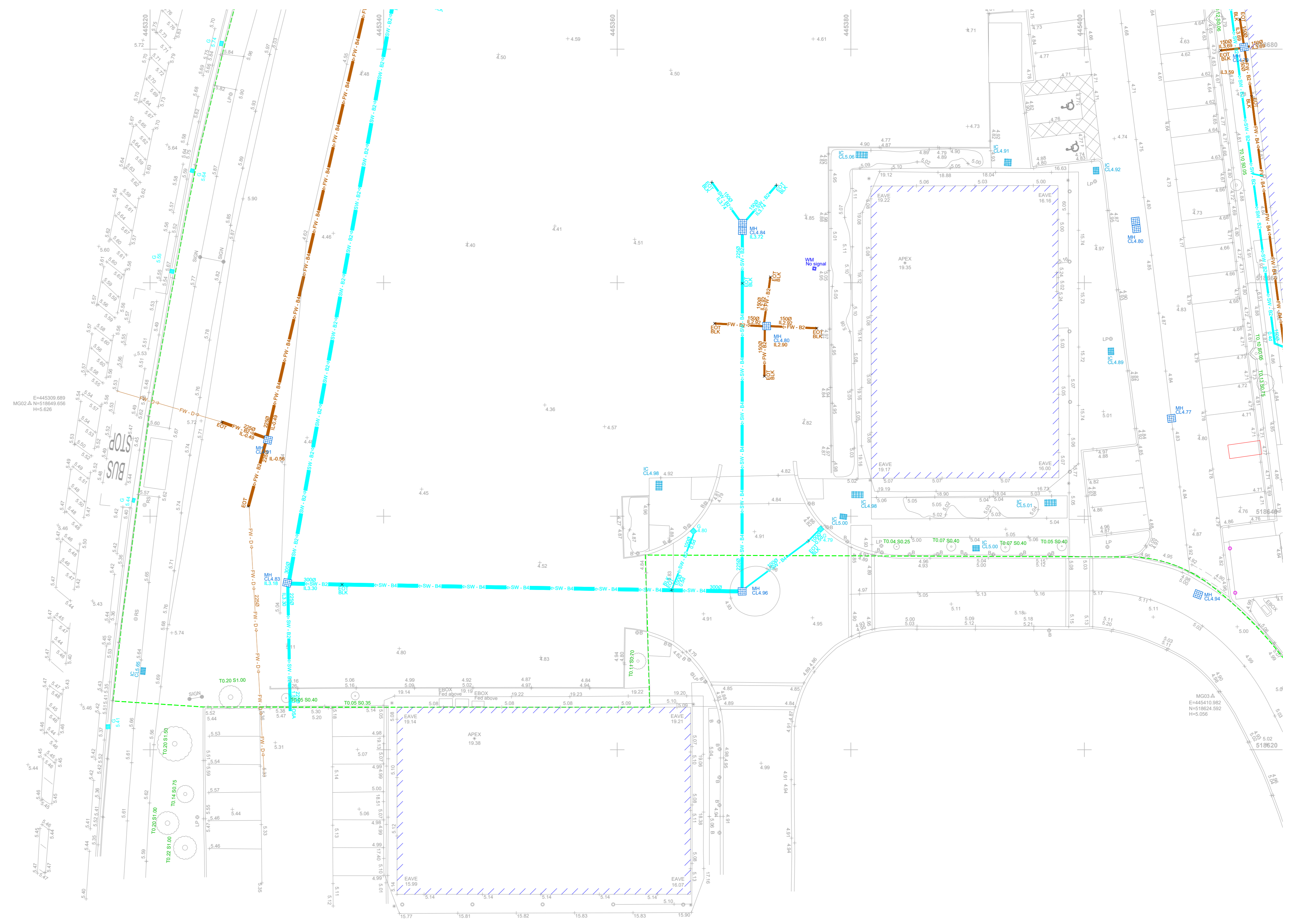
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 N7 9DP
 Phone: (+44) 0203 598 3775
 Email: info@murphygs.com

London Manchester Glasgow Belfast Cork Kildare

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Project	Stockton Riverside College
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Survey Datum	GNSS - Ordnance Datum Newlyn (ODN)
RICS Band	Band F
Drawing Scale	1:200 @ A0
Drawing Number	MGS47807-UT-ALL-01



518550
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518400



LEGEND Utility Survey Point Features		
FH	Fire Hydrant	IC - Electric
GV	Gas Valve	IC - Round
G	Gully	IC - Telecom
GR	Gully Round	IC - Traffic
IC	Inspection Cover	IC - CATV
ICC	IC - Comms	MH
		Manhole
		MHF
		MH - Foul
		MH
		MH - Round
		MHS
		MH - Surface Water
		SC
		Slip Cock
		WM
		Water Meter
		WV
		Water Valve

Utility Survey Linework Features	
-BT	British Telecom
-CATV	Cable TV
-CCTV	Closed Circuit TV
COMMS	Communications
-FOL	Fibre Optic Line
-FOLC	Fibre Optic Line - Coll
-FOLM	Fibre Optic Line - Energis
-FOLF	Fibre Optic Line - Fibernet
-FOLL	Fibre Optic Line - Level 3
-FOLM	Fibre Optic Line - Mercury
-FOLMF	Fibre Optic Line - MFS
-FOLV	Fibre Optic Line - Virgin
-FOLV	Fibre Optic Line - Virgin
-FOLV	Fibre Optic Line - Vodafone
-FOLW	Fibre Optic Line - Verizon
-FOLW	Fibre Optic Line - WCOM
-TS	Telecom Service
-E	Electrical
-EE	Electrical Service
-EE	Electrical Earth
-LV	Electrical - Low Volt
-HV	Electrical - High Volt
-EHV	Electrical - Extra High Volt
-TFL	Electrical - TFL
-SL	Street Lighting
-TCSU	Traffic Control System Unit
-G	Gas
-GLP	Gas Low Pressure
-GLP	Gas Intermediate Pressure
-GMP	Gas Medium Pressure
-GHP	Gas High Pressure
-GPR	GPR - Unknown
-ED	Empty Duct
-GPR	GPR Anomaly
-UA	Unknown Asset
-UAPS	UA Passive Sweep
-UCL	Unknown Cable
-GPR	GPR Sub
-GPR	GPR Survey Area
-MCH	Manhole Chamber
-MHID	Manhole ID
-PE	Pot End
-XX (AS)	XX (AS) Assumed Service
-SOW	Scope of Works

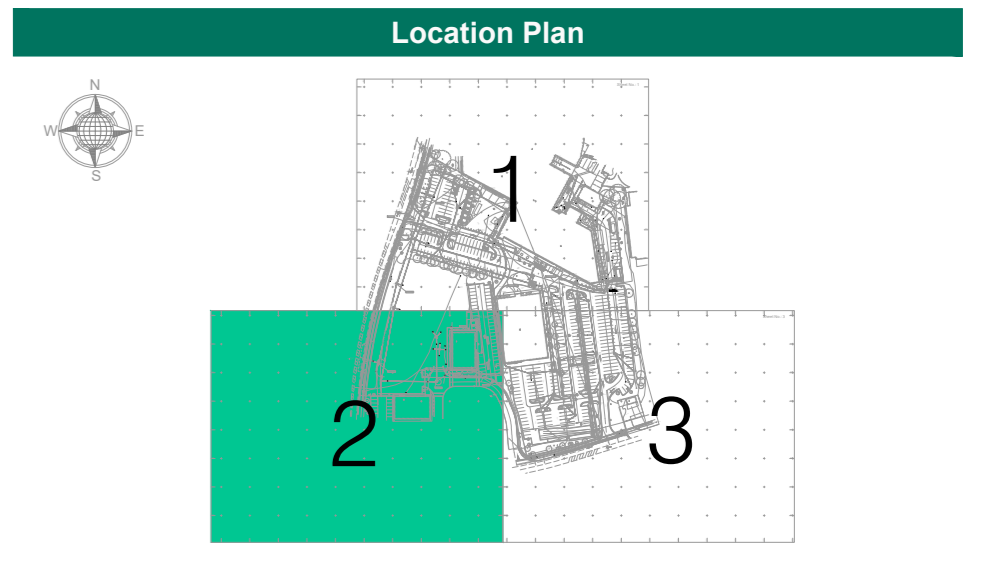
PAS128 Quality Levels (Consult document 'PAS128-2014.pdf' for full details)	
-XX - A	Quality Level A
-XX - B1	Quality Level B1
-XX - B1P	Quality Level B1P
-XX - B2	Quality Level B2
-XX - B2P	Quality Level B2P
-XX - B3	Quality Level B3
-XX - B3P	Quality Level B3P
-XX - B4	Quality Level B4
-XX - C	Quality Level C
-XX - D	Quality Level D

Special Survey Features	
DALUM	Datum Point
1224	Photo Point
1224	Panoramic Photo Point
E-XXXXXXX	Survey Station
N-YYYYYYY	Scan Target
H-ZZZZZ	

Utility Survey Abbreviations	
AB	Abandoned
BLD	Blocked
CL	Cover Level
CUT	Disconnected Utility
EDG	End of GPR Signal
EOT	End of Trace
FOS	Full of Silt
FLD	Flooded
IL	Invert Level
NT	No Trace
OE	Overhead Electric
OT	Overhead Telecom
P	Pilot
SOF	Soil Level
TFR	Taken From Records
UTO	Unable to Open
NT	No Trace
UN	Unknown
WL	Water Level
XXG	XXG Service Depth - Grid to Top of Service

Utility Material Abbreviations	
AC	Asbestos Cement
BC	Brick Chamber
CI	Cast Iron
CC	Concrete Chamber
DI	Ductile Iron
PE	Polyethylene
SI	Spun Iron
ST	Steel
WTR	Water

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 All reasonable endeavours have been used to capture the required data in the survey to the agreed standards of accuracy. Where features have been obscured due to a lack of access, the areas will be annotated as 'UTB' (Unable To Survey). The Company shall not be liable for any damage or consequential losses arising from the reliance on survey information beyond its specified scale and accuracy, or survey information used for purposes other than that stated in the Contract of Works.
 Any concerns with the survey should be raised with Murphy Geospatial, who will endeavour to promptly provide a remedy. The Client shall not seek recourse through any third party until such time as Murphy Geospatial have had the opportunity to address any concerns raised.
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Revisions				
Rev	Description	Surveyed by	Drawn by	Checked by
A	First Issue	DH - 18/07/22	CHB - 03/08/22	MM - 15/08/22



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 Email: info@murphygs.com

London Manchester Glasgow Belfast Cork Kildare

Client	Bond Bryan Architects
Project	Stockton Riverside College
Site Address	Riverside College Stockton TS17 6BQ
Description	Underground Utility Survey (PAS128)
Survey Grid	OSGB36(15) - Scale Factor 1.0
Survey Datum	GNSS - Ordnance Datum Newlyn (ODN)
RICS Band	Band F
Drawing Scale	1:200 @ A0
Drawing Number	MGS47807-UT-ALL-02



LEGEND

Utility Survey Point Features

FH	Fire Hydrant	ICE	IC - Electric	MHF	MH - Foul
GV	Gas Valve	ICR	IC - Round	MH	MH - Round
G	Gully	ICT	IC - Telecom	MHS	MH - Surface Water
GR	Gully Round	ICTC	IC - Traffic	SC	Stop Cock
IC	Inspection Cover	ICATV	IC - CATV	WM	Water Meter
ICC	IC - Comms	MH	Manhole	WV	Water Valve

Utility Survey Linework Features

BT	British Telecom	E	Electrical Service
CATV	Cable TV	EE	Electrical Earth
CCTV	Closed Circuit TV	LV	Electrical - Low Volt
COMMS	Communications	HV	Electrical - High Volt
FOL	Fibre Optic Line	EHV	Electrical - Extra High Volt
FOLC	Fibre Optic Line - Coll	TFL	Electrical - TFL
FOLM	Fibre Optic Line - Energis	SL	Street Lighting
FOLF	Fibre Optic Line - Fibernet	TCSU	Traffic Control System Unit
FOLL	Fibre Optic Line - Level 3	G	Gas
FOLM	Fibre Optic Line - Mercury	GLP	Gas Low Pressure
FOLV	Fibre Optic Line - Virgin	GLM	Gas Intermediate Pressure
FOLW	Fibre Optic Line - Vodafone	GMP	Gas Medium Pressure
FOLX	Fibre Optic Line - Verizon	GHP	Gas High Pressure
TS	Telecom Service	GPR	GPR Unknown
		ED	Empty Duct
		UA	Unknown Asset
		UAPS	UA Passive Sweep
		UCL	Unknown Cable
		GPR	GPR Survey Area

PAS 128 Quality Levels
(Consult document PAS128-2014.pdf for full details)

XX-A	Quality Level A	XX-B3	Quality Level B3
XX-B1	Quality Level B1	XX-B3P	Quality Level B3P
XX-B1P	Quality Level B1P	XX-B4	Quality Level B4
XX-B2	Quality Level B2	XX-C	Quality Level C
XX-B2P	Quality Level B2P	XX-D	Quality Level D

Special Survey Features

DATUM	Datum Point	E-XXXXXXX	Survey Station
1224	Photo Point	N-YYYYYYY	Scan Target
1224	Panoramic Photo Point	E-XXXXXXX	Scan Target
		N-YYYYYYY	Scan Target

Utility Survey Abbreviations

AB	Abandoned	FLD	Flooded	TFR	Taken From Records
BLD	Blocked	IL	Invert Level	UTO	Unable to Open
CL	Cover Level	NT	No Trace	UTS	Unable to Survey
CLUT	Disconnect Utility	OE	Overhead Electric	UNK	Unknown
EOG	End of GPR Signal/OT	OT	Overhead Telecom	WTL	Water Level
EOT	End of Trace	P	Pilot	XXd	Service Depth - Grid
FOS	Full of Silt	SOF	Soft Level		to Top of Service

Utility Material Abbreviations

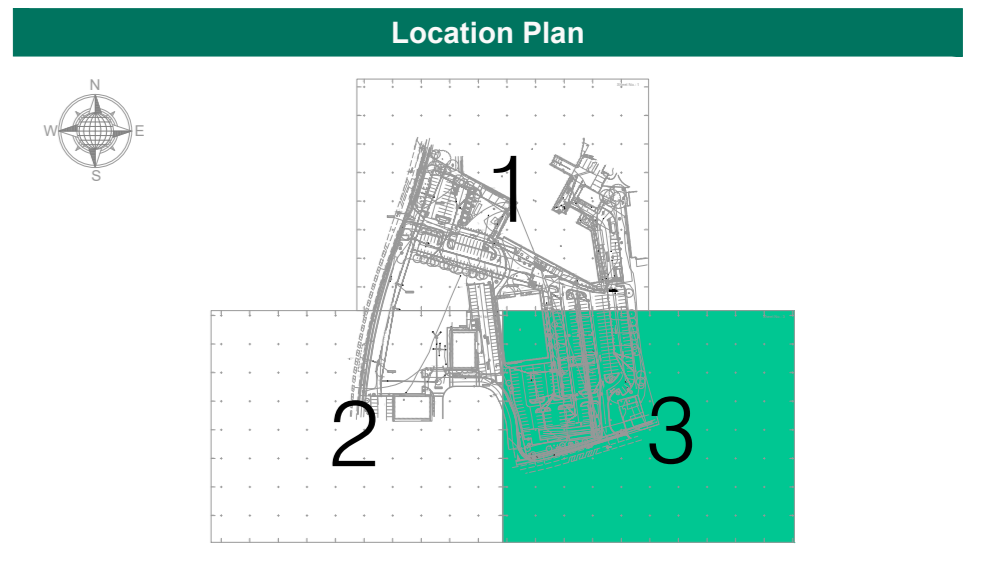
AC	Asbestos Cement	CC	Concrete Chamber	SI	Spun Iron
BC	Brick Chamber	DI	Ductile Iron	ST	Steel
CI	Cast Iron	PE	Polyethylene	WTR	Water

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Revisions

Rev	Description	Surveyed by	Drawn by	Checked by
A	First Issue	CH - 18/07/22	CH - 03/08/22	MM - 10/08/22



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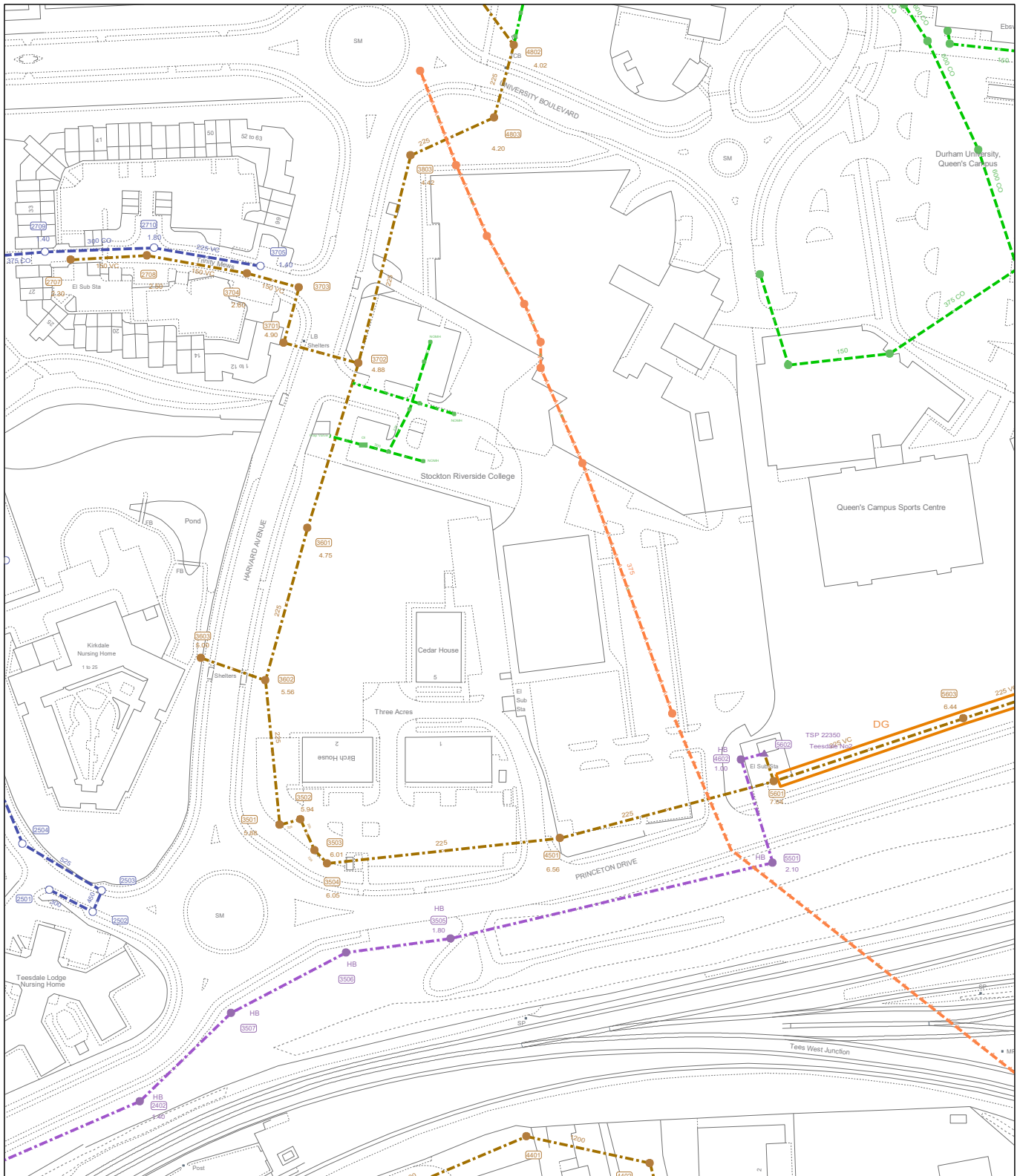
London Manchester Glasgow Belfast Cork Kildare

Client	Bond Bryan Architects
Project	Stockton Riverside College
Site Address	Riverside College Stockton TS17 6BQ
Description	Underground Utility Survey(PAS128)
Survey Grid	OSGB36(15) - Scale Factor 1.0
Survey Datum	GNSS - Ordnance Datum Newlyn (ODN)
RICS Band	Band F
Drawing Scale	1:200 @ A0
Drawing Number	MGS47807-UT-ALL-03

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Appendix D Northumbrian Water Records



NWL Responsibility		Private/Non NWL		Proposed		Annotations		Symbols	
Combined Foul	Orange dashed line	Combined Foul	Green dashed line	Combined Foul	Purple dashed line	Direction of flow	Arrow with tail	Chambers	Black circle
Surface	Blue dashed line	Surface Foul	Green dashed line	Surface	Purple dashed line	Backdrop	Black circle with dot	Capped End	Black square
Treated Eff	Blue solid line	Treated Eff	Green solid line			Abandoned	Red triangle	Balancing Pond	Black square with dot
Untreated Eff	Red solid line	Trade Eff	Yellow solid line			Rising Main	Black triangle	Termination Node	Black triangle with dot
Overflow	Red dashed line	Watercourse	Blue dashed line					Air Valve	Black diamond
								Property Connection	Black circle with 'P'
								Lamp Hole	Black square
								Hatchbox	Black circle with dot
								Dual Usage Chamber	Black circle with 'D'



User : DAWSJ1

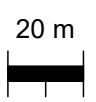
Date : 25/07/2022

Title : 0000

Centre Point : 445415,518676

Map Sheet : NZ4518NW

The material contained on this plot has been reproduced from an Ordnance Survey map with permission of the controller of H.M.S.O. Crown Copyright Reserved. Licence No. 100022480. The information shown on this plan should be regarded as approximate and is intended for guidance only. No Liability of any kind whatsoever is accepted by Northumbrian Water, its servants or agents for any omission. The actual position of any water mains or sewers shown on the plan must be established by taking trial holes in all cases. In the case of water mains Northumbrian Water must be given two working days notice of their intention to excavate trial holes. With effect from 1 October 2011, private lateral drains and sewers automatically transferred to Northumbrian Water under a scheme made by the Secretary of State pursuant to section 105A Water Industry Act 1991. These former private drains and sewers together with existing private connections may not be shown but their presence should be anticipated. WARNING... Where indicated on the plan there could be abandoned asbestos cement materials or shards of pipe. If excavating in the vicinity of these abandoned asbestos cement materials, the appropriate Health & Safety precautions should be taken. Northumbrian Water accepts no liability in respect of claims, costs, losses or other liabilities which arise as the result of the presence of the pipes or any failure to take adequate precautions. Emergency Telephone Number: 0345 717 1100





Appendix E Flood Maps for Planning

Flood map for planning

Your reference
<Unspecified>

Location (easting/northing)
445416/518713

Created
18 Apr 2024 9:27

Your selected location is in flood zone 3, an area with a high probability of flooding.

This means:

- you must complete a flood risk assessment for development in this area
- you should follow the Environment Agency's standing advice for carrying out a flood risk assessment (see www.gov.uk/guidance/flood-risk-assessment-standing-advice)

Notes

The flood map for planning shows river and sea flooding data only. It doesn't include other sources of flooding. It is for use in development planning and flood risk assessments.

This information relates to the selected location and is not specific to any property within it. The map is updated regularly and is correct at the time of printing.

Flood risk data is covered by the Open Government Licence which sets out the terms and conditions for using government data. <https://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/>

Use of the address and mapping data is subject to Ordnance Survey public viewing terms under Crown copyright and database rights 2022 OS 100024198. <https://flood-map-for-planning.service.gov.uk/os-terms>

Flood map for planning





Your reference
<Unspecified>

Location (easting/northing)
445416/518713

Scale
1:2500

Created
18 Apr 2024 9:27



-  Selected area
-  Flood zone 3
-  Flood zone 2
-  Flood zone 1
-  Flood defence
-  Main river
-  Water storage area

0 20 40 60m












Appendix F
Proposed Drainage Drawings

Notes

- All works to be carried out in accordance with:
 - Design and Construction Guidance (DCG) and Sewerage Sector Guidance (SSG) for all sewers proposed to be offered for adoption. (note - the SSG replaces Sewers for Adoption (SfA) for all new developments)
 - BS EN 752 - 'Drain and Sewer Systems Outside Buildings'
 - Current applicable Building Regulations
 - BGP Specifications
 - Manufacturer installation guidance and requirements
- All levels shown are in metres and are relative to ordnance datum (m AOD).
- Connection to Northumbrian Water sewers are only to be carried out under an S106 agreement by NWL approved term contractors unless agreed otherwise between both parties. (organised by main contractor)
- Invert levels of all existing chambers and connection points are to be confirmed and engineer advised prior to commencement of any Drainage Works.
- Where proposed sewers connect into existing sewers, the existing sewers must to be checked for line, level and condition preferably by a CCTV survey
- Concrete bed and surround is required to all gully leads and to all pipes in highways/hardstanding where cover to pipe <1200mm
- All pipes to be either extra strength V.C. to BS 65 or PVC certified to WIS 4-35-01 and BS/EN13476 or concrete pipes Class 120 to BS/EN 1916/BS5911-1 2002.
- All RWP and slab penetration locations are indicative and accurate positions should be taken from the Architects drawings. All slab penetrations to be roddable above ground level via access pipe
- Existing sewer positions are indicative and are not to be used in conjunction with design. Contractor to confirm location.
- All existing drainage to be cleaned and jetted as part of the contract
- All RWP connections to be 100Ø and Surface water sewers to be 150Ø unless noted otherwise.
- All FW drains to be 150Ø UNO unless noted otherwise.
- Contractor is responsible for positioning the MHs so they do not compromise line or level of kerbing or other delineation at the juncture of two surface materials.
- Cover levels shown are indicative and may vary on site. The contractor should adjust levels to suit site conditions
- All internal manholes to be Type Y with double seal covers u.n.o
- An underground attenuation tank is to be provided which has a capacity of 450m³. Tanks shall be designed by specialist contractor to provide the net volume of attenuation required and comply with recommendations by Ciria with regard to access for maintenance and strength. The strength of the tank should comply with Ciria document CT37 'Structural design of Modular Geocell drainage tanks'. The construction, installation and venting requirements of the tank shall be strictly in accordance with manufacturer guidance.
- Other services are not shown on this drawing, however their presence must be anticipated. The contractor is to confirm prior to commencing any works, the location and depth of all services that may affect the works the manufacturers requirements and recommendations.

S.H.E.
Do not excavate until all underground services have been identified and marked out. Refer to service providers drawings and to the utilities survey drawings. Unknown underground services may exist. Check for services by carrying out a scan with a cable avoidance tool.

Legend

- Proposed SW Drain 
- Proposed FW Drain 
- Existing FW Drain 
- Existing SW Drain 
- Site Boundary 
- PPIC MH / Silt Trap 
- PCC MH 
- Proposed Permeable Paving 
- Perforated Collector Pipe 

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Issued for Planning	ZW	P01	RJW	19.04.2024
AMENDMENT	BY	REV	CHK	DATE



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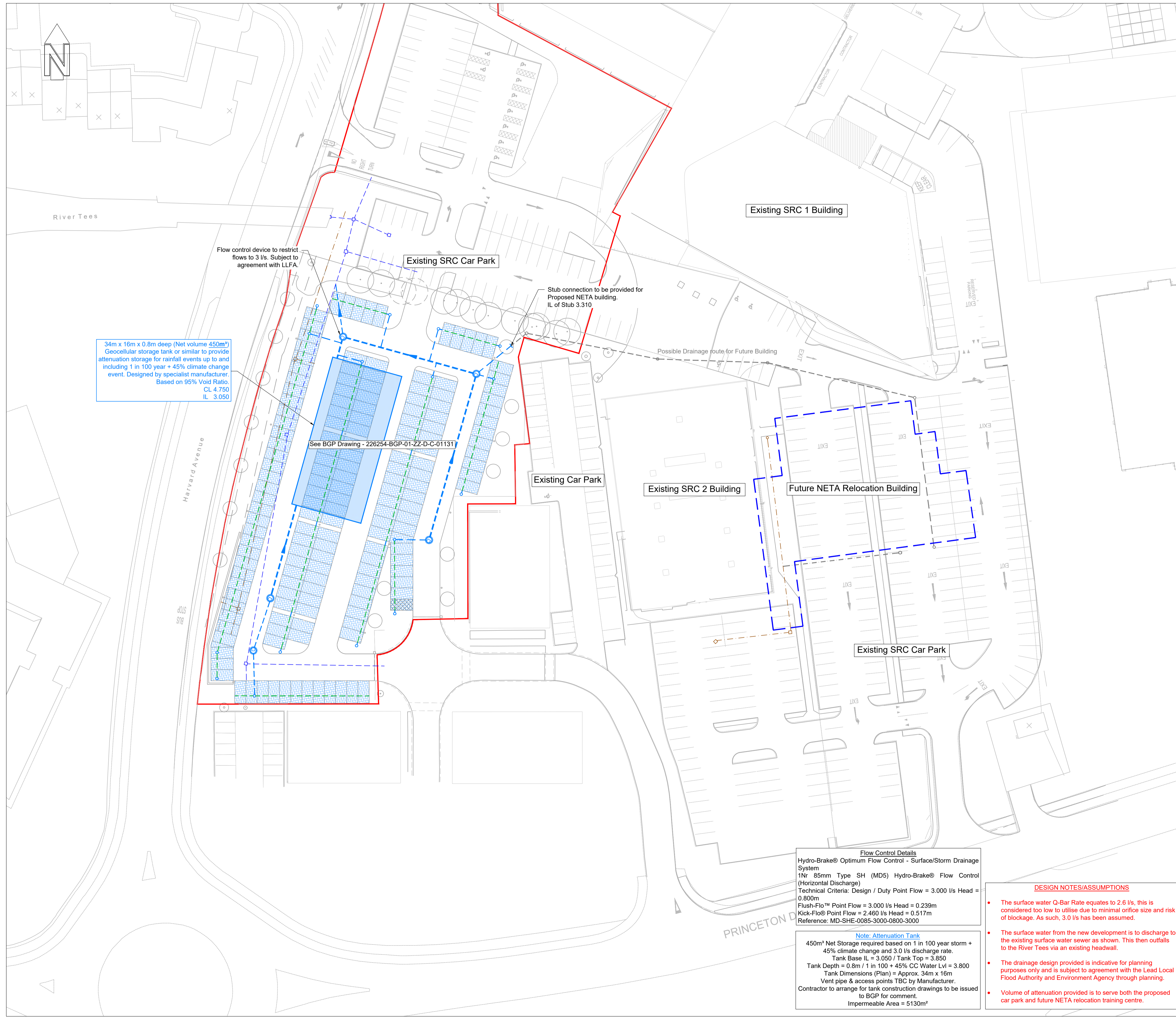
Teesside 01642 876470 Tyneside 0191 495 4100

Client The Education Training Collective
 Project NETA Relocation - Stockton Riverside College
 BGP Project No. 226254
 Drawing Title Drainage GA - Overall

Drawn	Date	Checked	Date	Size	Scale	Rev.
ZW	19.04.24	RJW	19.04.24	A1	1:400	P01

Location	Originator	Volume	Level	Form	Role	Unique No.
226254	BGP	01	ZZ	D	C	01130

File Reference 226254-BGP-01-ZZ-D-C-01130
In instances where this drawing completes or partly completes a contract, Billingham George & Partners will consider that its product has been validated, unless in a period not exceeding 90 working days, the client advises to the contrary.



34m x 16m x 0.8m deep (Net volume 450m³)
 Geocellular storage tank or similar to provide attenuation storage for rainfall events up to and including 1 in 100 year + 45% climate change event. Designed by specialist manufacturer. Based on 95% Void Ratio.
 CL 4.750
 IL 3.050

Flow control device to restrict flows to 3 l/s. Subject to agreement with LLFA.

Stub connection to be provided for Proposed NETA building. IL of Stub 3.310

See BGP Drawing - 226254-BGP-01-ZZ-D-C-01131

Possible Drainage route for Future Building

Flow Control Details
 Hydro-Brake® Optimum Flow Control - Surface/Storm Drainage System
 1x 85mm Type SH (MD5) Hydro-Brake® Flow Control (Horizontal Discharge)
 Technical Criteria: Design / Duty Point Flow = 3.000 l/s Head = 0.800m
 Flush-Flo™ Point Flow = 3.000 l/s Head = 0.239m
 Kick-Flo® Point Flow = 2.460 l/s Head = 0.517m
 Reference: MD-SHE-0085-3000-0800-3000

Note: Attenuation Tank
 450m³ Net Storage required based on 1 in 100 year storm + 45% climate change and 3.0 l/s discharge rate.
 Tank Base IL = 3.050 / Tank Top = 3.850
 Tank Depth = 0.8m / 1 in 100 + 45% CC Water Lvl = 3.800
 Tank Dimensions (Plan) = Approx. 34m x 16m
 Vent pipe & access points TBC by Manufacturer.
 Contractor to arrange for tank construction drawings to be issued to BGP for comment.
 Impermeable Area = 5130m²

- DESIGN NOTES/ASSUMPTIONS**
- The surface water Q-Bar Rate equates to 2.6 l/s, this is considered too low to utilise due to minimal orifice size and risk of blockage. As such, 3.0 l/s has been assumed.
 - The surface water from the new development is to discharge to the existing surface water sewer as shown. This then outfalls to the River Tees via an existing headwall.
 - The drainage design provided is indicative for planning purposes only and is subject to agreement with the Lead Local Flood Authority and Environment Agency through planning.
 - Volume of attenuation provided is to serve both the proposed car park and future NETA relocation training centre.

Notes

- All works to be carried out in accordance with:
 - Design and Construction Guidance (DCG) and Sewerage Sector Guidance (SSG) for all sewers proposed to be offered for adoption. (note - the SSG replaces Sewers for Adoption (SIA) for all new developments)
 - BS EN 752 - 'Drain and Sewer Systems Outside Buildings'
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- All pipes to be either extra strength V.C. to BS 65 or PVC certified to WIS 4-35-01 and BS EN 13476 or concrete pipes Class 120 to BS EN 1916/BS 5911-1:2002.
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- All FW drains to be 150Ø UNO unless noted otherwise.
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- Proposed SW Drain
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- Existing FW Sewer
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- Site Boundary
- PPIC MH / Silt Trap
- PCC MH
- Proposed Permeable Paving
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Issued for Planning ZW P01 RJW 19.04.2024
 AMENDMENT BY REV CHK DATE



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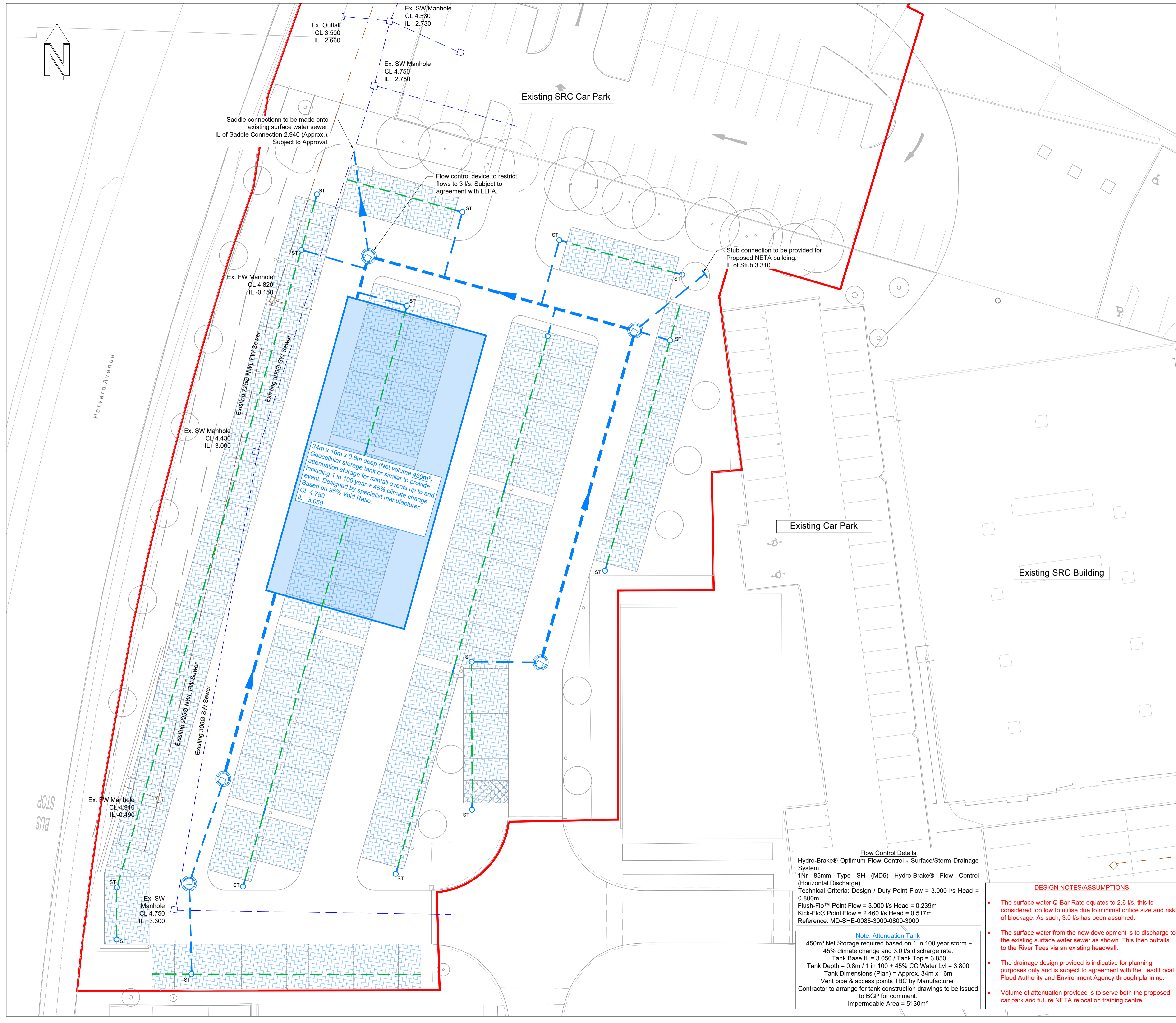
Teeside 01642 876470 Tyneside 0191 495 4100

Client The Education Training Collective
 Project NETA Relocation - Stockton Riverside College
 BGP Project No. 226254
 Drawing Title Drainage GA - Car Park

Drawn	Date	Checked	Date	Size	Scale	Rev.
ZW	17.04.24	RJW	17.04.24	A1	1:200	P01

Location	Originator	Volume	Level	Form	Role	Unique No.
226254	BGP	01	ZW	D	C	01131

File Reference 226254-BGP-01-ZZ-D-C-01131
In instances where this drawing completes or partly completes a contract, Billingham George & Partners will consider that its product has been validated, unless in a period not exceeding 90 working days, the client advises to the contrary.



Saddle connection to be made onto existing surface water sewer. IL of Saddle Connection 2.940 (Approx.). Subject to Approval.

Flow control device to restrict flows to 3 l/s. Subject to agreement with LLFA.

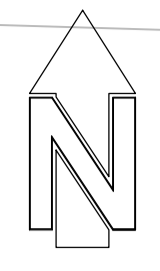
Stub connection to be provided for Proposed NETA building. IL of Stub 3.310

34m x 16m x 0.8m deep (Net volume 450m³) geocellular storage tank or similar, to provide attenuation storage for rainfall events up to and including 1 in 100 year + 45% climate change. Based on 95% Void Ratio. CL 4.750 IL 3.050. Designed by specialist manufacturer.

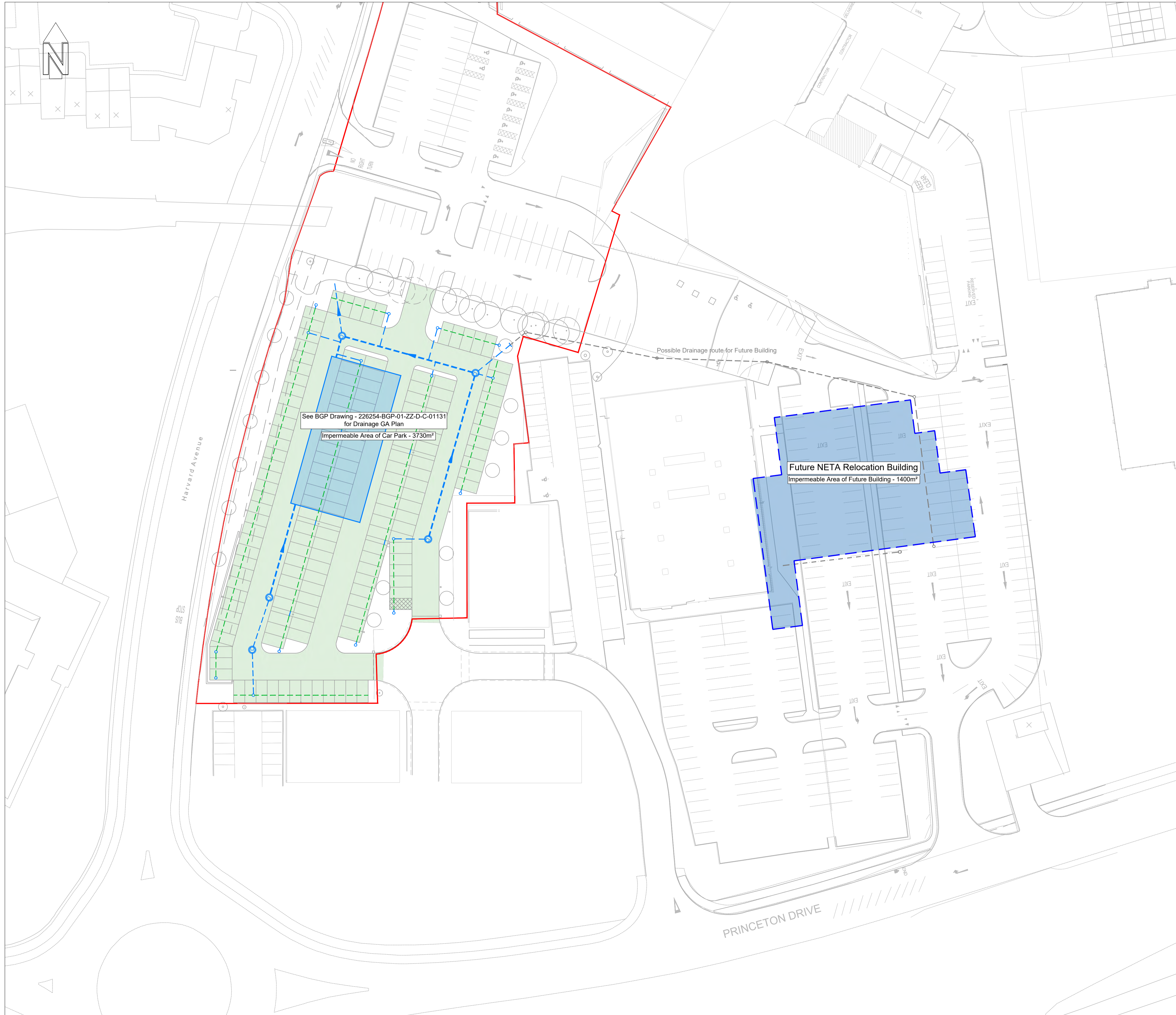
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 1Nr 85mm Type SH (MD5) Hydro-Brake® Flow Control (Horizontal Discharge)
 Technical Criteria: Design / Duty Point Flow = 3.000 l/s Head = 0.800m
 Flush-Flo™ Point Flow = 3.000 l/s Head = 0.239m
 Kick-Flo® Point Flow = 2.460 l/s Head = 0.517m
 Reference: MD-SHE-0085-3000-0800-3000

Note: Attenuation Tank
 450m³ Net Storage required based on 1 in 100 year storm + 45% climate change and 3.0 l/s discharge rate.
 Tank Base IL = 3.050 / Tank Top = 3.850
 Tank Depth = 0.8m / 1 in 100 + 45% CC Water Lvl = 3.800
 Tank Dimensions (Plan) = Approx. 34m x 16m
 Vent pipe & access points TBC by Manufacturer.
 Contractor to arrange for tank construction drawings to be issued to BGP for comment.
 Impermeable Area = 5130m²

- DESIGN NOTES/ASSUMPTIONS**
- The surface water Q-Bar Rate equates to 2.6 l/s, this is considered too low to utilise due to minimal orifice size and risk of blockage. As such, 3.0 l/s has been assumed.
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 - The drainage design provided is indicative for planning purposes only and is subject to agreement with the Lead Local Flood Authority and Environment Agency through planning.
 - Volume of attenuation provided is to serve both the proposed car park and future NETA relocation training centre.



STOP BUS



Impermeable Areas
 Proposed Car Park - 3730m² (0.373ha)
 Future NETA Relocation Building - 1400² (0.140ha)
 Total Area for Attenuation Calculation - 5130m² (0.513ha)

See BGP Drawing - 226254-BGP-01-ZZ-D-C-01131
 for Drainage GA Plan

Impermeable Area of Car Park - 3730m²

Future NETA Relocation Building

Impermeable Area of Future Building - 1400m²

Possible Drainage route for Future Building

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NOT FOR CONSTRUCTION

Issued for Planning ZW P01 RJW 19.04.2024
 AMENDMENT BY REV CHK DATE



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Client The Education Training Collective
Project NETA Relocation - Stockton Riverside College
BGP Project No. 226254
Drawing Title Impermeable Areas Plan

Drawn	Date	Checked	Date	Size	Scale	Rev.
ZW	19.04.24	RJW	19.04.24	A1	1:400	P01

Location	Originator	Volume	Level	Form	Role	Unique No.
226254	BGP	01	ZZ	D	C	01900

File Reference 226254-BGP-01-ZZ-D-C-01900

In instances where this drawing completes or partly completes a contract, Billinghurst George & Partners will consider that its product has been validated, unless in a period not exceeding 90 working days, the client advises to the contrary.



Appendix G

Microdrainage Calculations

Calculated by: Zach Waller

Site name: NETA

Site location: Stockton

Site Details

Latitude: 54.56156° N

Longitude: 1.29889° W

Reference: 870257775

Date: Apr 17 2024 14:57

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013), the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Runoff estimation approach IH124

Site characteristics

Total site area (ha): 0.645

Methodology

Q_{BAR} estimation method: Calculate from SPR and SAAR

SPR estimation method: Calculate from SOIL type

Notes

(1) Is $Q_{BAR} < 2.0$ l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

Soil characteristics

	Default	Edited
SOIL type:	4	4
HOST class:	N/A	N/A
SPR/SPRHOST:	0.47	0.47

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

Hydrological characteristics

	Default	Edited
SAAR (mm):	590	590
Hydrological region:	3	3
Growth curve factor 1 year:	0.86	0.86
Growth curve factor 30 years:	1.75	1.75
Growth curve factor 100 years:	2.08	2.08
Growth curve factor 200 years:	2.37	2.37

(3) Is $SPR/SPRHOST \leq 0.3$?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

Default Edited

Q_{BAR} (l/s):	2.55	2.55
1 in 1 year (l/s):	2.19	2.19
1 in 30 years (l/s):	4.46	4.46
1 in 100 year (l/s):	5.3	5.3
1 in 200 years (l/s):	6.04	6.04

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement , which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.

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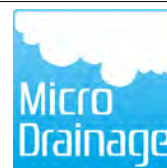
XP Solutions Source Control 2020.1.3

Summary of Results for 100 year Return Period (+45%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m ³)	Status
15 min Summer	3.338	0.288	3.0	155.4	O K
30 min Summer	3.431	0.381	3.0	205.6	O K
60 min Summer	3.529	0.479	3.0	258.4	O K
120 min Summer	3.628	0.578	3.0	312.2	O K
180 min Summer	3.683	0.633	3.0	341.6	O K
240 min Summer	3.717	0.667	3.0	360.4	O K
360 min Summer	3.757	0.707	3.0	381.7	O K
480 min Summer	3.778	0.728	3.0	393.1	O K
600 min Summer	3.790	0.740	3.0	399.6	O K
720 min Summer	3.795	0.745	3.0	402.5	O K
960 min Summer	3.793	0.743	3.0	401.5	O K
1440 min Summer	3.774	0.724	3.0	390.7	O K
2160 min Summer	3.740	0.690	3.0	372.5	O K
2880 min Summer	3.705	0.655	3.0	353.6	O K
4320 min Summer	3.635	0.585	3.0	315.8	O K
5760 min Summer	3.561	0.511	3.0	275.9	O K
7200 min Summer	3.485	0.435	3.0	234.6	O K
8640 min Summer	3.421	0.371	3.0	200.3	O K
10080 min Summer	3.366	0.316	3.0	170.6	O K
15 min Winter	3.338	0.288	3.0	155.4	O K
30 min Winter	3.431	0.381	3.0	205.6	O K
60 min Winter	3.529	0.479	3.0	258.4	O K
120 min Winter	3.628	0.578	3.0	312.2	O K
180 min Winter	3.683	0.633	3.0	341.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
15 min Summer	123.557	0.0	147.8	26
30 min Summer	82.014	0.0	194.6	41
60 min Summer	52.009	0.0	261.2	70
120 min Summer	31.946	0.0	320.3	130
180 min Summer	23.729	0.0	355.9	190
240 min Summer	19.111	0.0	381.0	248
360 min Summer	13.970	0.0	414.7	366
480 min Summer	11.166	0.0	437.1	486
600 min Summer	9.386	0.0	451.5	604
720 min Summer	8.141	0.0	457.7	722
960 min Summer	6.499	0.0	453.1	960
1440 min Summer	4.723	0.0	432.9	1200
2160 min Summer	3.426	0.0	627.8	1580
2880 min Summer	2.726	0.0	664.7	1992
4320 min Summer	1.971	0.0	714.1	2816
5760 min Summer	1.565	0.0	769.0	3640
7200 min Summer	1.307	0.0	802.8	4392
8640 min Summer	1.128	0.0	830.7	5104
10080 min Summer	0.996	0.0	853.5	5768
15 min Winter	123.557	0.0	147.8	26
30 min Winter	82.014	0.0	194.6	41
60 min Winter	52.009	0.0	261.2	70
120 min Winter	31.946	0.0	320.3	128
180 min Winter	23.729	0.0	355.9	186

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Summary of Results for 100 year Return Period (+45%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m ³)	Status
240 min Winter	3.718	0.668	3.0	360.8	O K
360 min Winter	3.758	0.708	3.0	382.3	O K
480 min Winter	3.780	0.730	3.0	394.1	O K
600 min Winter	3.793	0.743	3.0	401.0	O K
720 min Winter	3.799	0.749	3.0	404.3	O K
960 min Winter	3.799	0.749	3.0	404.3	O K
1440 min Winter	3.774	0.724	3.0	391.1	O K
2160 min Winter	3.731	0.681	3.0	367.7	O K
2880 min Winter	3.682	0.632	3.0	341.4	O K
4320 min Winter	3.574	0.524	3.0	283.1	O K
5760 min Winter	3.454	0.404	3.0	218.2	O K
7200 min Winter	3.359	0.309	3.0	167.1	O K
8640 min Winter	3.285	0.235	3.0	126.7	O K
10080 min Winter	3.230	0.180	3.0	97.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
240 min Winter	19.111	0.0	381.1	244
360 min Winter	13.970	0.0	414.7	360
480 min Winter	11.166	0.0	437.2	476
600 min Winter	9.386	0.0	451.7	590
720 min Winter	8.141	0.0	457.9	702
960 min Winter	6.499	0.0	453.5	924
1440 min Winter	4.723	0.0	434.0	1328
2160 min Winter	3.426	0.0	627.9	1652
2880 min Winter	2.726	0.0	664.8	2132
4320 min Winter	1.971	0.0	716.4	3064
5760 min Winter	1.565	0.0	769.1	3800
7200 min Winter	1.307	0.0	802.9	4480
8640 min Winter	1.128	0.0	830.8	5184
10080 min Winter	0.996	0.0	853.9	5760

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	1.000
Region	England and Wales	Cv (Winter)	1.000
M5-60 (mm)	17.800	Shortest Storm (mins)	15
Ratio R	0.379	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+45

Time Area Diagram

Total Area (ha) 0.513

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
From:	To:	From:	To:	From:	To:
0	4	0.171	4	8	0.171
				8	12
					0.171

Model Details

Storage is Online Cover Level (m) 4.750

Tank or Pond Structure

Invert Level (m) 3.050

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	540.0	0.800	540.0	0.801	0.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0085-3000-0800-3000
Design Head (m)	0.800
Design Flow (l/s)	3.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	85
Invert Level (m)	3.050
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.800	3.0	Kick-Flo®	0.517	2.5
Flush-Flo™	0.239	3.0	Mean Flow over Head Range	-	2.6

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.6	0.800	3.0	2.000	4.6	4.000	6.3	7.000	8.3
0.200	3.0	1.000	3.3	2.200	4.8	4.500	6.7	7.500	8.5
0.300	3.0	1.200	3.6	2.400	5.0	5.000	7.0	8.000	8.8
0.400	2.9	1.400	3.9	2.600	5.2	5.500	7.4	8.500	9.0
0.500	2.6	1.600	4.1	3.000	5.5	6.000	7.7	9.000	9.3
0.600	2.6	1.800	4.4	3.500	6.0	6.500	8.0	9.500	9.6