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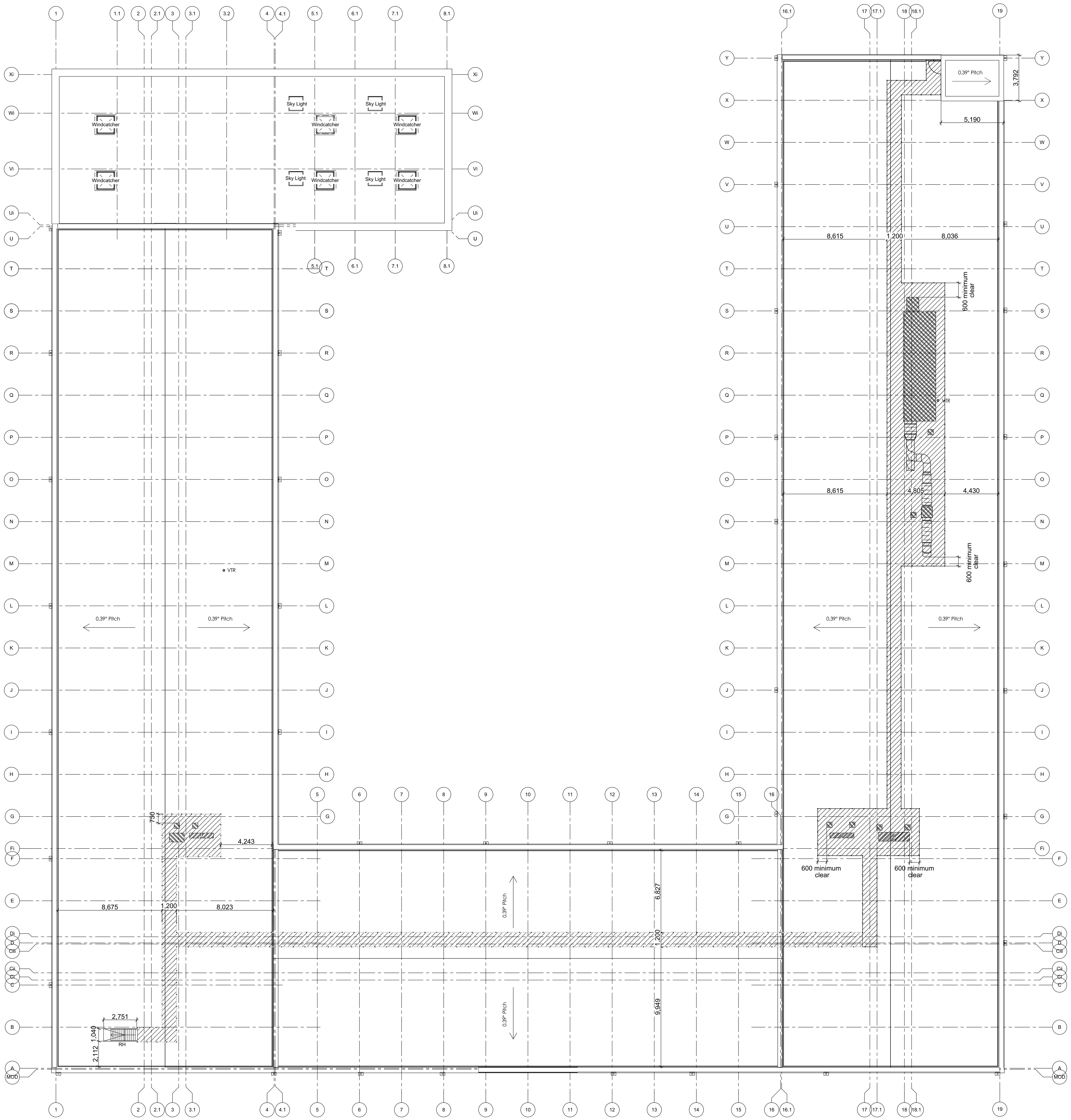
2. This drawing is to be read in conjunction with all other relevant drawings and specifications for this project and apparent inconsistencies brought to the attention of the Project Design Manager.

3. Do not scale directly from drawing - if in doubt ask!

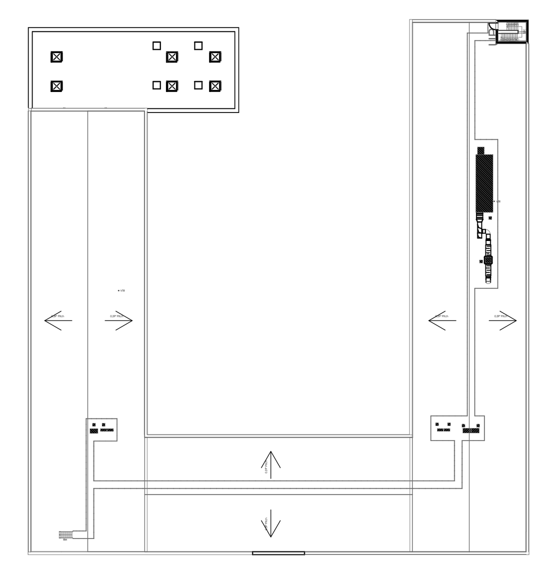
NOTES: Refer to AGL Roof Plan Plant drawing.

Roof Access:
Via stair 4 with emergency second access hatch and pull-down ladder at stair 1.
Access restricted to designated areas of walkway with permanent 1100mm high barrier.

Maintenance:
- Skylights - Self cleaning glass
- Windcatchers - maintained from ground floor by MEP
- RWP/Gutters: perimeter access by MEP
- Windows & Facade: Perimeter access cleaning by pole. SWFacade at property line accessed by MEWP.
- PLANT: Via designated areas of walkway.



0000 Proposed Roof Plan 1:200



KEY PLAN RF 1:1000

KEY	
(hatched)	Maintenance access walkway with safety railing.
(crossed box)	Windcatcher
(box)	Sky Light
○VTR	Fume cupboard extract vent
(symbol)	RWP + Hopper
(hatched)	Roof Plant Equipment: Exact sizes and locations TBC by MEP Sub Contractor
RH	Roof Hatch Refer to NBS L20/630

Rev	Description	Date	By	Chk
P05	NOTES REMOVED AS CML INSTRUCTION + ROOF M&E LAYOUT UPDATED	16/04/2019	HLM	HLM
P04	This drawing supersedes drawing No. FS0620-HLM-00-RF-PL-A-00-0013 ISSUED FOR CML REVIEW	01/04/19	HLM	HLM
P03	DRAFT PLANNING	08/02/2019	HLM	HLM
P02	ISSUED FOR DRAFT CP's	24/01/2019	VR	HLM
P01	PRELIMINARY ISSUE FOR COMMENT	18/01/19	HLM	HLM

Caledonian HLM

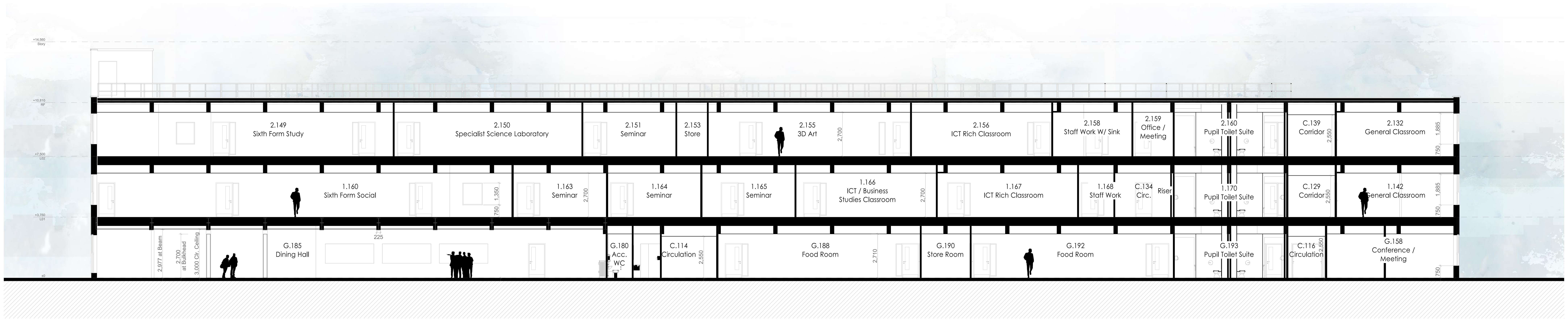
CLIENT:
CALEDONIAN MODULAR CONSTRUCTION

PROJECT REF:
SIR FREDERICK GIBBERD SCHOOL

DESCRIPTION:
ROOF GA PLAN

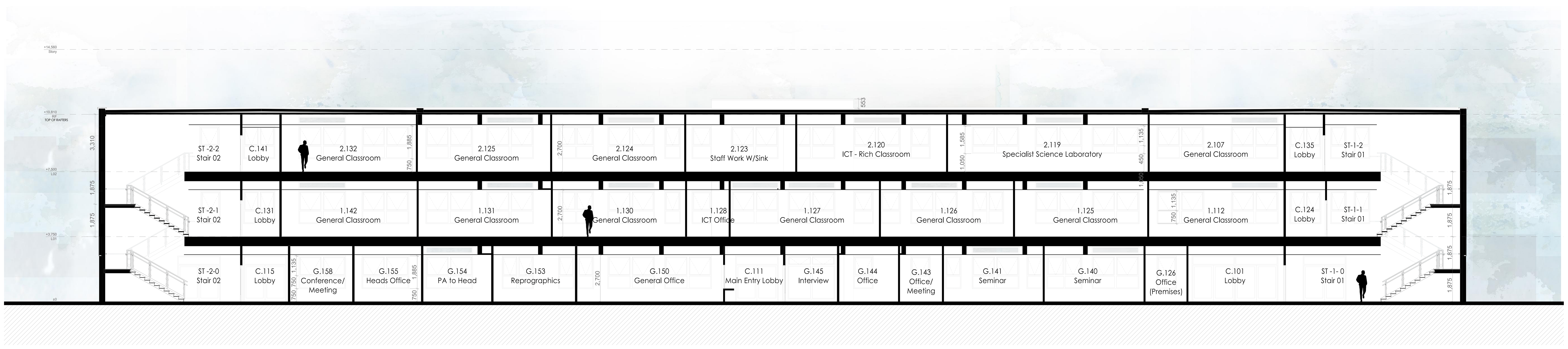
DOCUMENT REFERENCE No:
FS0620-HLM-MB-RF-DR-A-00-0015
Ref Orig Zone Level Type Role Classification Chrono No.

SCALE @ A1: 1:200
REV: P05
CONTRACT NUMBER:
DATE: 08/02/2019
SUITABILITY: S4



S01

1:100



S02

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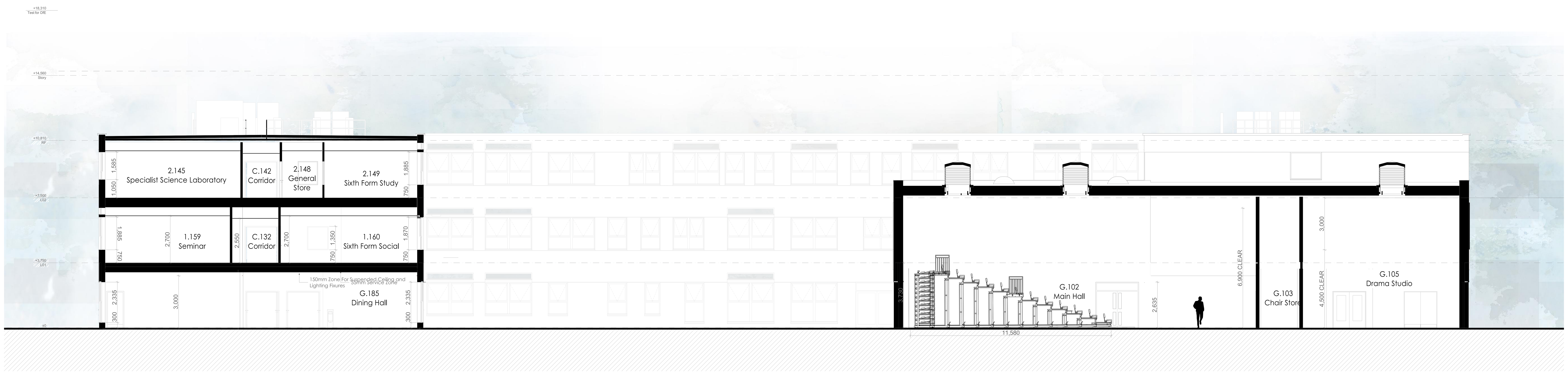

S03

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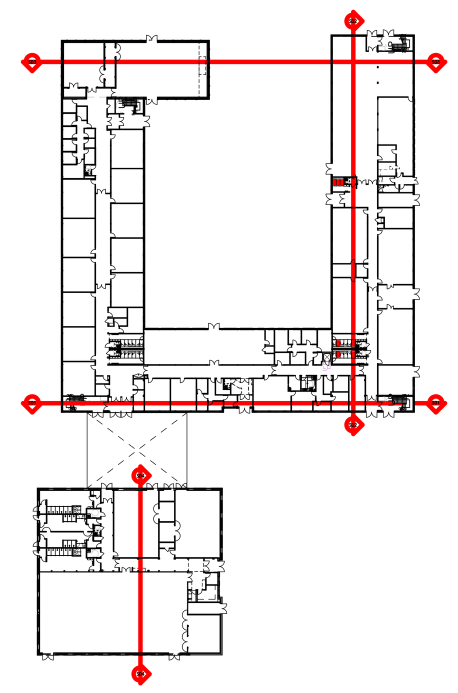


Rev	Description	Date	By	Chk
P05	NOTES REMOVED AS CML INSTRUCTION + COMMENTS ADDRESSED	12/04/2019	HLM	HLM
P04	ISSUED FOR CML REVIEW	01/04/19	HLM	HLM
P03	DRAFT PLANNING	08/02/2019	HLM	HLM
P02	ISSUED FOR DRAFT CP's	24/01/2019	VR	HLM
P01	PRELIMINARY ISSUE FOR COMMENT	18/01/19	HLM	HLM

Caledonian

HLM

CLIENT:
CALEDONIAN MODULAR CONSTRUCTION

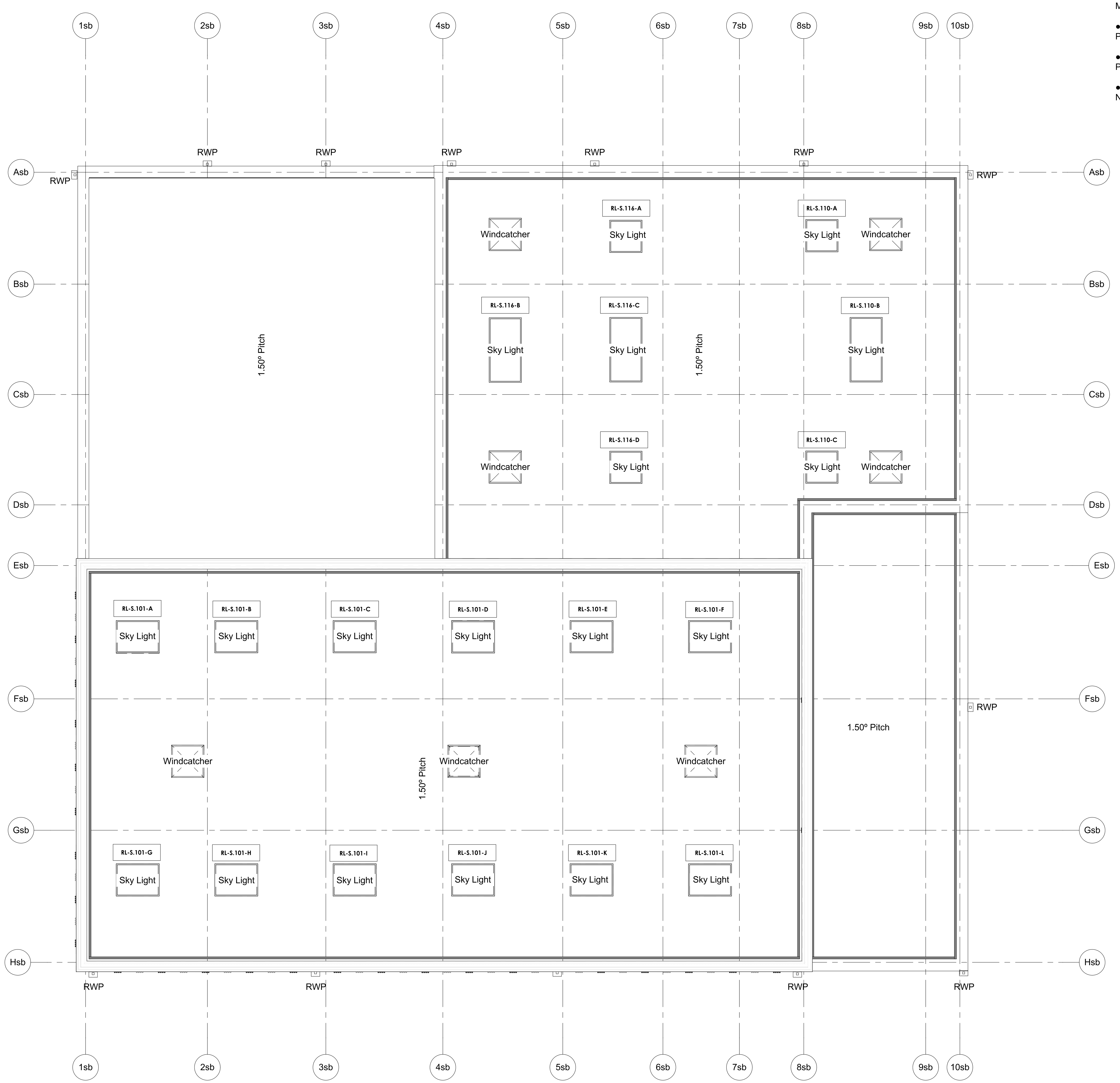
PROJECT REF:
SIR FREDERICK GIBBERD SCHOOL

DESCRIPTION:
MAIN BLOCK GA SECTIONS SHEET 1

DOCUMENT REFERENCE No:
FS0620-HLM-MB-SE-DR-A-00-0030

Ref Orig Zone Level Type Role Classification Chrono No.

SCALE @ A0: 1:100	REV: P05
CONTRACT NUMBER:	DATE: 08/02/2019
SUITABILITY: S4	



Sports Block RF 1:100

<u>Roof Access:</u>
None

<u>Roof Maintenance:</u>
- Skylights:
  Self cleaning glass
- Windcatchers:
  Maintained from ground floor by MEWP
- RWP/Gutters:
  Perimeter maintenace by MEWP
- Facade:
  Perimeter access be MEWP
- Plant:
  No plant on roof.

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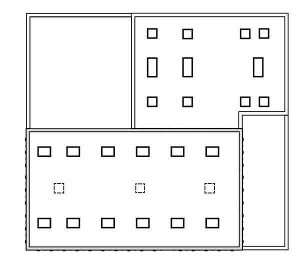
NOTES: Refer to AGL Roof Plan Plant drawing.



KEY PLAN SB RF 1:1000

KEY	
	Maintenance access walkway with safety railing.
	Windcatcher
	Sky Light
VTR	Fume cupboard extract vent
	RWP + Hopper
	Roof Plant Equipment: Exact sizes and locations TBC by MEP Sub Contractor
RH	Roof Hatch Refer to NBS L20/630

Rev	Description	Date	By	Chk
P05	NOTES REMOVED AS CML INSTRUCTION + ROOF M&E LAYOUT UPDATED	16/04/2019	HLM	HLM
P04	This drawing supersedes drawing No. FS0620-HLM-00-RF-PL-A-00-0015 ISSUED FOR CML REVIEW	01/04/19	HLM	HLM
P03	DRAFT PLANNING	08/02/2019	HLM	HLM
P02	ISSUED FOR DRAFT CP's	24/01/2019	VR	HLM
P01	PRELIMINARY ISSUE FOR COMMENT	18/01/19	HLM	HLM

Caledonian HLM

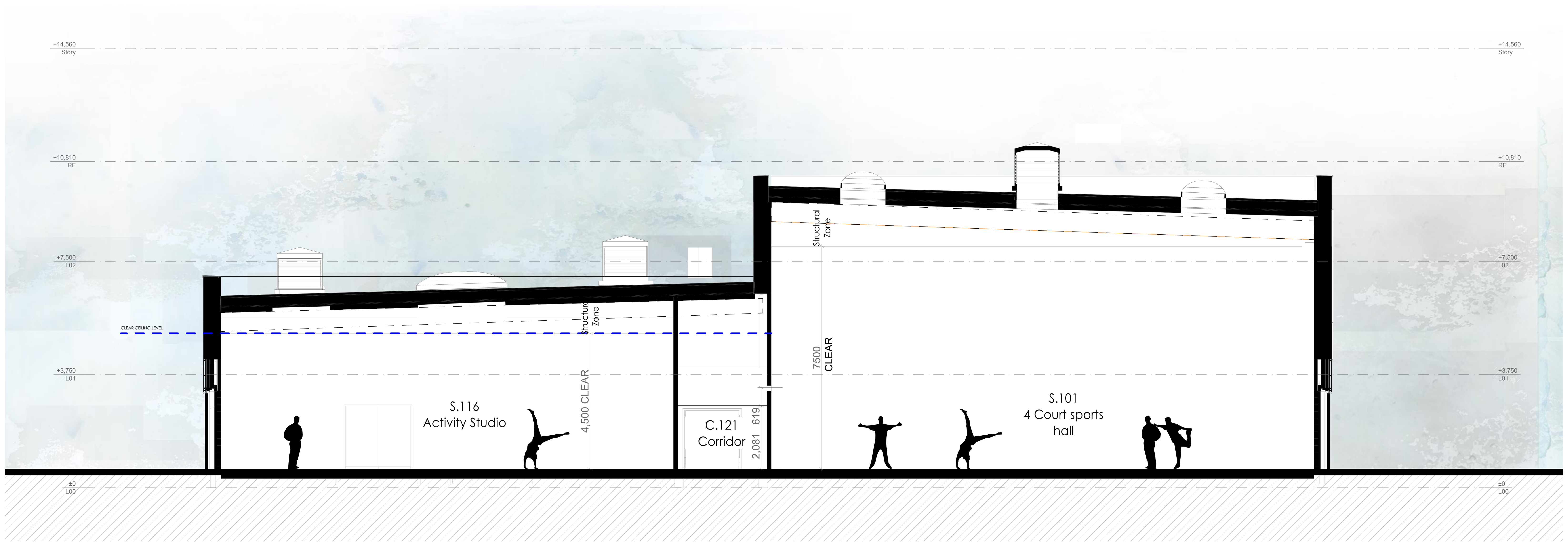
CLIENT:
CALEDONIAN MODULAR CONSTRUCTION

PROJECT REF:
SIR FREDERICK GIBBERD SCHOOL

DESCRIPTION:
ROOF GA PLAN SPORTS BLOCK

DOCUMENT REFERENCE No:
FS0620-HLM-SB-RF-DR-A-00-0015
Ref Orig Zone Level Type Role Classification Chrono No.

SCALE @ A1: 1:100	REV: P05
CONTRACT NUMBER:	DATE: 08/02/2019
SUITABILITY: S4	



S04 SB

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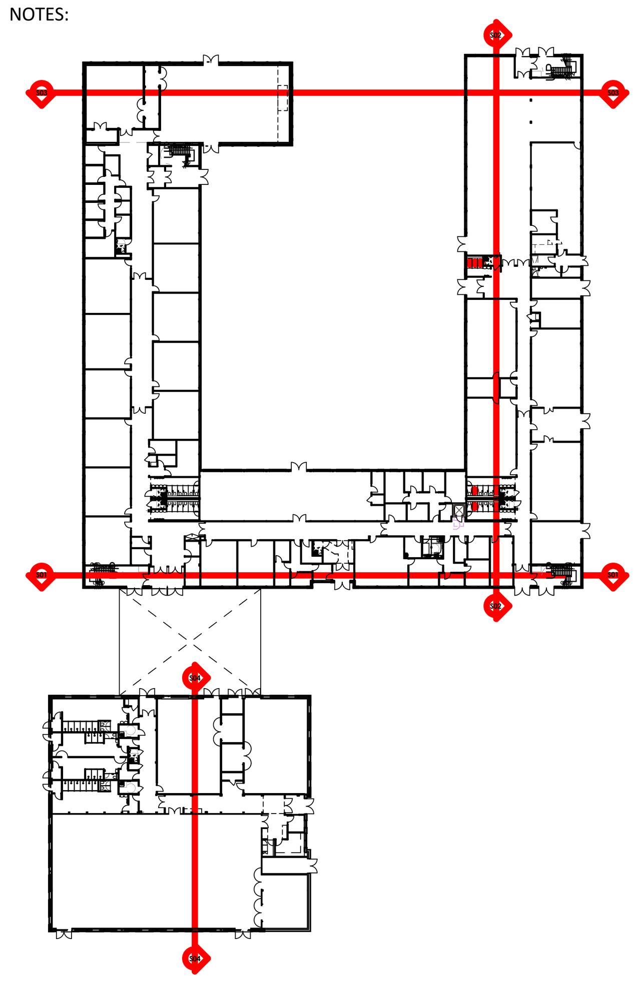

Rev	Description	Date	By	Chk
P05	NOTES REMOVED AS CML INSTRUCTION + COMMENTS ADDRESSED	12/04/2019	HLM	HLM
P04	This drawing supersedes drawing No. FS0620-HLM-SB-XX-SE-A-00-0035 ISSUED FOR CML REVIEW	01/04/19	HLM	HLM
P03	DRAFT PLANNING	08/02/2019	HLM	HLM
P02	ISSUED FOR DRAFT CP's	25/01/2019	HLM	HLM
P01	PRELIMINARY ISSUE FOR COMMENT	18/01/19	HLM	HLM

Caledonian

HLM

CLIENT:
CALEDONIAN MODULAR CONSTRUCTION

PROJECT REF:
SIR FREDERICK GIBBERD SCHOOL

DESCRIPTION:
SPORTS BLOCK GA SECTIONS SHEET 1

DOCUMENT REFERENCE No:
FS0620-HLM-SB-SE-DR-A-00-0035

Ref Orig Zone Level Type Role Classification Chrono No.

SCALE @ A1: 1:100 | REV: P05
CONTRACT NUMBER: | DATE: 08/02/2019
SUITABILITY: S4

DRAINAGE IMPACT ASSESSMENT FOR A PROPOSED SCHOOL DEVELOPMENT AT SIR FREDERICK GIBBERD SCHOOL, TENDRING ROAD, HARLOW, ESSEX

PROJECT NO. JAG/AD/JD/41632-Rp002

FEBRUARY 2019

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DRAINAGE IMPACT ASSESSMENT FOR A PROPOSED SCHOOL DEVELOPMENT AT SIR FREDERICK GIBBERD SCHOOL, TENDRING ROAD, HARLOW, ESSEX

Prepared by: A Dunn

Signed: ……………………………………………
Date: 14th February 2019

Approved by: J Gibson MEng (Hons), CEng, C.WEM MCIWEM
Director

Signed: ……………………………………………
Date: 14th February 2019

Issue	Revision	Revised by	Approved by	Revised Date

TABLE OF CONTENT

APPENDICES

1.0 INTRODUCTION

1.1 Background

1.1.1 Alan Wood & Partners were commissioned by Caledonian Modular on behalf of The Education Funding Authority to prepare a Drainage Impact Assessment for a proposed School development at Tendring Road, Harlow, Essex.

1.1.2 This report considers the drainage implications of the proposed development.

1.1.3 This report should be read in conjunction with the Flood Risk Assessment (FRA) which has been prepared for the development (ref: 41632-Rp001 FRA, Sir Frederick Gibberd School, Harlow, Essex).

2.0 EXISTING SITE DESCRIPTION

2.1 Location

2.1.1 The proposed development is located to the north of Tendring Road, Harlow, Essex incorporating the former Passmores School and adjacent vacant land, with a total site area of approximately 10.6 hectares.

2.1.2 An aerial photograph and location plan are included in Figures 1 and 2 below, which identify the location of the site.

Figure 1: Aerial Photograph

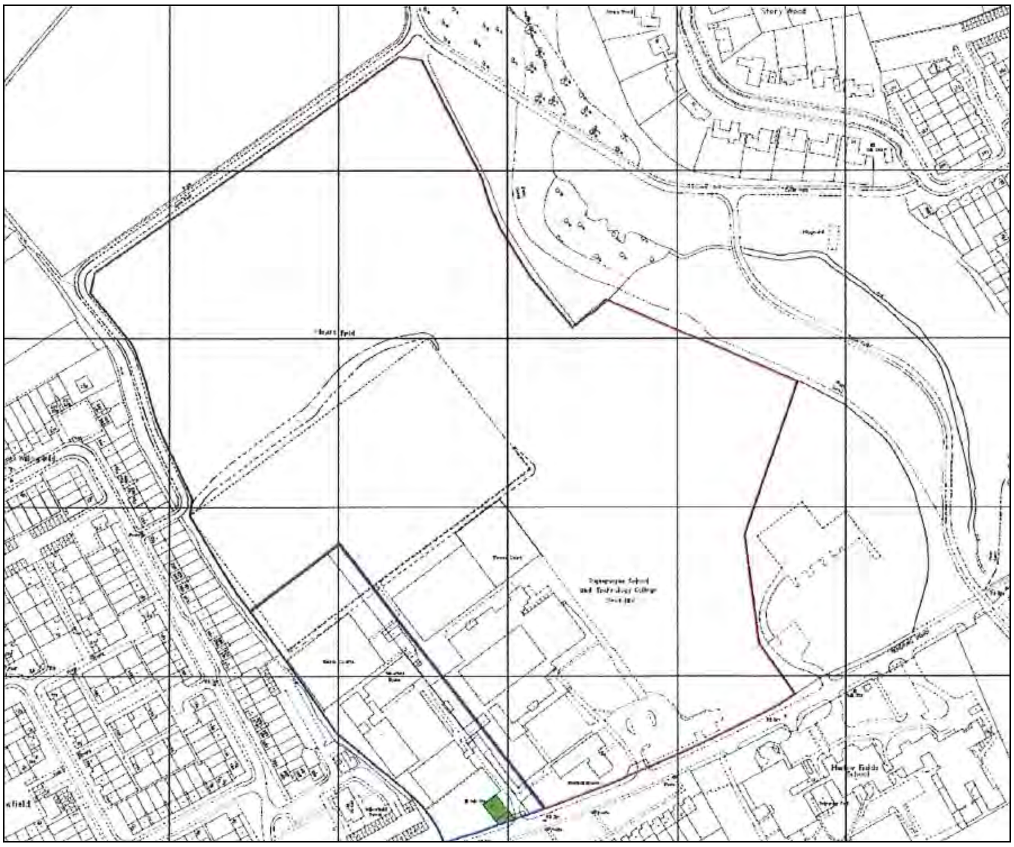


Figure 2: Location Plan

2.1.3 The Ordnance Survey grid reference for the centre of the development site is approximately 544925, 209020.

2.2 Surrounding Features

2.2.1 The southern site boundary fronts Tendring Road, beyond which are residential properties and a school development.

2.2.2 The eastern site boundary is a tree-lined field boundary with a small area of open woodland and an access track beyond, extending to a small open watercourse.

2.2.3 The northern site boundary adjoins a small access track, beyond which is an open field extending to the A1025 (Third Avenue).

2.2.4 The southern half of the western site boundary adjoins a former technical college which is to be demolished and re-developed.

2.2.5 To the north of this area the western boundary extends through to an open watercourse with a residential development beyond.

2.2.6 To the north of the development is Todd Brook.

2.2.7 There is an open pond to the north east of the site.

2.2.8 Canons Brook lies to the west of the site.

2.3 Topography

2.3.1 A topographic survey of the site has been undertaken which shows that the existing ground levels over the area of the proposed development vary from approximately 58.84m to 69.22m OD(N).

2.3.2 Copies of the topographic survey drawings are included in Appendix A.

2.4 Ground Conditions

2.4.1 Ground investigation works have been undertaken in respect of the proposed development.

2.4.2 The investigations revealed that the underlying ground conditions comprise made ground and Lowestoft Formation overlying London Clay Formation bedrock.

2.4.3 An abstract from the ground investigation report is included in Appendix B.

2.4.4 A desktop study of the British Geological Survey map reveals the underlying geology to comprise superficial deposits of Lowestoft Formation – Diamicton overlaying bedrock comprising London Clay Formation – Clay, Silt and Sand.

2.4.5 A study of the groundwater maps shows that the site does not overlay an aquifer or lie within a Groundwater Vulnerability Zone.

3.0 PROPOSED DEVELOPMENT

3.1 The proposed development involves the construction of a new school complex to include the following:-

- Demolition of the existing school buildings.
- Construction of a new 3-storey modular school building.
- Construction of a new sports building.
- Construction of a new site access road.
- Construction of new car parking areas.
- Areas of soft and hard playgrounds.
- New playing fields.
- New sports pitches.
- Fencing.
- Landscaping.

4.0 SURFACE WATER DRAINAGE

4.1 Existing Site

4.1.1 From the aerial photograph included in Figure 2 below, it can be seen that the development site currently comprises the former Passmores School and adjacent vacant land.

Figure 3: Aerial Photograph

4.1.2 We have calculated the unrestricted surface water run-off from the existing site to be approximately 125 litres per second based upon 111 l/s from impermeable areas and approximately 14 l/s from permeable surfacing, at an agricultural run-off rate of 1.4 l/s/ha.

4.2 Run-off Destination

4.2.1 Requirement H3 of the Building Regulations establishes a preferred hierarchy for disposal of surface water disposal. Consideration should firstly be given to soakaway, infiltration, watercourse and sewer in that priority order.

4.2.2 Ground conditions are considered to be unsuitable for soakaways to be used as a means of disposal of the surface water run-off from the development.

4.2.3 An abstract from the ground investigation report is in included in Appendix B.

4.2.4 The second preferred option would be to discharge the surface water run-off from the development to a watercourse.

4.2.5 There is an open watercourse located to the north of the proposed development (Todd Brook) and an open watercourse on the western site boundary.

4.2.6 It is proposed that the surface water run-off from the new development is discharged into the existing drainage network from the former school development which ultimately outfalls to these watercourses.

4.2.7 Formal consent will be required from the Local Authority to discharge surface water run-off from the development to these watercourses.

4.3 Peak Flow Control

4.3.1 Based upon the site layout drawing, the new site area becoming impermeable in the form of the roof of the new building and areas of impermeable sports pitches which would need to be positively drained has been calculated at approximately 2.4ha, with the remaining 8.1ha discharging at the greenfield run-off rate.

4.3.2 The uncontrolled surface water run-off from the new development would be approximately 333 litres per second, based on BS EN 752 calculations, using a rainfall intensity of 50mm/hour. However, to meet the flood risk planning requirements it is unacceptable to discharge flows freely from the proposed development site at an unrestricted rate. Therefore flows from the proposed development are normally limited to the brownfield runoff rate, based on the impermeable contributing area and with a 30% reduction from the current situation to provide a degree of improvement to the drainage network.

4.3.3 A survey of the existing site drainage network was undertaken in order to establish the existing points of discharge from the former school development and the previous discharge flow rates.

4.3.4 Hydraulic modelling was also undertaken in order to determine the capacity of the existing drainage network and the ultimate discharge rates from the former school development.

4.3.5 A copy of the hydraulic model study is included in Appendix C.

4.3.6 Drainage from the former school development currently discharges to the open watercourse which is located to the north of the site (Todd Brook) via the existing public sewer network.

4.3.7 Thames Water have been consulted regarding the discharge of the surface water run-off from the new development.

4.3.8 They have advised that surface water run-off from the new main school development can be discharged to the sewer and ultimately to Todd Brook at a maximum rate of 12 litres per second. (See correspondence in Appendix D).

4.3.9 In order to ensure the discharge of surface water will not increase the risk of flooding to other properties, it will therefore be necessary to attenuate the drainage by restricting the discharge and providing storage as required.

4.3.10 Based upon the design criteria set out above, calculations have been undertaken to determine the volume of surface water storage which would be required in respect of the main school development.

4.3.11 A summary of the calculations is included in Table 1 below.

Table 1: Volume of Surface Water Storage Required

Storm Event	30 Year Storm	100 Year Storm + 40%
Storage Volume Required	$380m^3$	$805m^3$
Additional Storage Volume Required	Nil	$425m^3$

4.3.12 The calculations show that the storage volume required to accommodate the run-off from a 30 year storm event is approximately $380m^3$, which will need to be stored below ground within oversized pipes or an appropriate storage tank.

4.3.13 It is envisaged that the additional storage volume required for the 100 year storm event plus climate change, calculated at approximately 425m^3, will be stored within an appropriate storage tank below ground level.

4.3.14 It is proposed that the surface water run-off from the adjoining refurbished sports pitches, which have an impermeable area of approximately 1 hectare is discharged to the western watercourse via the existing drainage outfall from the former school development, in addition to the outfall to Todd Brook.

4.3.15 Based upon a discharge rate of 5 l/s calculations have been undertaken to assess the likely storage volumes required.

4.3.16 A summary of the calculations is included in Table 2 below.

Table 2: Volume of Surface Water Storage Required

Storm Event	30 Year Storm	100 Year Storm + 40%
Storage Volume Required	310m^3	645m^3
Additional Storage Volume Required	Nil	335m^3

4.3.17 The calculations show that the storage volume required to accommodate the run-off from a 30 year storm event is approximately 310m^3, which will need to be stored below ground within oversized pipes or an appropriate storage tank.

4.3.18 It is envisaged that the additional storage volume required for the 100 year storm event plus climate change, calculated at approximately 335m^3, will be stored within an appropriate storage tank below ground level.

4.3.19 Copies of the surface water storage calculations are included in Appendix E

4.3.20 Schematic layout drawings of the proposed drainage network are included in Appendix F.

4.4 Flood Risk

4.4.1 For new developments, the current design criteria required for the surface water drainage will need to be based upon the critical 1 in 100 year storm event, with an additional allowance to account for climate change resulting from global warming. There should be no above ground flooding for the 1 in 30 year return period and no property flooding or off site flooding from the critical 1 in 100 year storm event, with the additional allowance to account for climate change.

4.5 Climate Change

4.5.1 Table 2.1 of European Standard EN 1990:2002 sets out the minimum design working life for structures, see Table 3 below.

Table 3: Extract from European Standards EN 1990:2002 (Table 2.1 – Indicative design working life)

Design working life category	Indicative design working life (years)	Examples
1	10	Temporary structures (1)
2	10 to 25	Replace structural parts, e.g. gantry girders, bearings
3	15 to 30	Agricultural and similar structures
4	50	Building structures and other common structures
5	100	Monumental building structures, bridges and other civil engineering structures
(1) Structures or parts of structures that can be dismantled with a view to being re-used should not be considered as temporary		

4.5.2 This development is educational and consequently has a design working life category of 4, with a stipulated indicative design working life of 50 years.

4.5.3 Table 2 of The Environment Agency publication 'Flood risk assessment: climate change allowances (2017)' sets out the central and upper end anticipated changes to peak rainfall intensity for small and urban catchments, see Table 4 below.

Table 4: Extract from Environment Agency publication 'Flood risk assessment: climate change allowances (2017) – Table 2

Applies across all of England	Total potential changes anticipated for '2020s' (2040 to 2039)	Total potential change anticipated for the '2050s' (2040 to 2069)	Total potential change anticipated for the '2080s' (2070 to 2115)
Upper end	10%	20%	40%
Central	5%	10%	20%

4.5.4 Assuming the maximum 50 year design life applies, the upper end potential change between the years of 2040 to 2069 is stated as 20%.

4.5.5 However, as this development is unlikely to be completed before late 2020, it is considered that the allowance of 40% should be applied from the next climate change category.

4.6 Volume Control

4.6.1 The run-off volume post development will be less than pre-development due to the reduction applied to the former discharge rate.

4.6.2 Due to the limitations on infiltrations methods of disposal and the fact that the surface water drainage system will be designed and constructed to meet the required standards, the opportunity to reduce the surface water discharge volume further is limited.

4.6.3 It is not considered to be feasible to restrict the discharge volume down to a rate which is equivalent to greenfield run-off. Whilst the greenfield rate will be exceeded at peak flow times, it is considered that this additional peak flow will be sufficient to create any exceedance issues as the former discharge rate from the site has been significantly reduced.

4.6.4 We consider that the impact on the receiving watercourse has been minimised as far as is reasonably practicable.

4.7 Pollution Control

4.7.1 It is a requirement to ensure that the quality of any receiving body is not adversely affected by the development.

4.7.2 Investigations have revealed that the development site does not overlay an Aquifer or lie within a Groundwater Vulnerability Zone.

4.7.3 However, in order to minimise the risk of pollution to the final watercourse, clean roof water drainage should discharge directly into the sealed drainage network (i.e. no via gullies) and then directly to the watercourse via the sewer network.

4.7.4 Discharge to a watercourse enables dilution to take place at the discharge point and thus reduces the likelihood of pollution occurring.

4.7.5 Surface water run-off from the paved areas should discharge to the sewer via trapped gullies or drainage channel outlets.

4.7.6 Surface water run-off from the car park areas will need to pass through an appropriate oil interceptor prior to the outfall to the main sewer network.

4.7.7 The final manhole chamber prior to the outfall to the sewer should incorporate a silt trap.

4.7.8 On this basis the risk of pollutants being discharged to the watercourse is extremely remote.

4.7.5 Copies of the matrix output from the assessment of the roof area and paved areas are included in Appendix G.

4.8 Designing for Exceedance

4.8.1 Overland flood risk from exceedance flows and from off-site sources will be mitigated to a large extent by the creation of the new surface water sewerage system as described above. Where possible proposed ground levels will be set to channel flows away from the proposed buildings. Furthermore, the ground floor construction level for the buildings will be raised by approximately 150mm above the finished ground level, which will provide additional clearance above any likely flooding.

4.8.2 The existing overland flow routes should generally be maintained within the final layout of the development site without increasing the flood risk to off-site parties.

4.8.3 Any existing flood risk may reduce by the creation of a formal surface water drainage system but cannot be entirely removed.

4.8.4 Drawings showing the existing and anticipated overland surface water exceedance flood routing for the development are included in Appendix H.

4.9 Highways Drainage

4.9.1 The development does not incorporate any formal highway drainage.

4.10 Urban Creep

4.10.1 The project is an educational development and under the control of a single developer. Consequently, it is considered that there is no requirement to allow an additional 10% to the calculated impermeable areas for urban creep.

4.11 Operation and Maintenance

4.11.1 The drainage pipework is designed with self-cleansing gradients and consequently the network should require little or no maintenance.

4.11.2 All road gullies or drainage channel systems serving areas of hardstanding will need to be regularly inspected to ensure the system remains operable. See Table 1 in Appendix J.

4.11.3 The inspection chambers should be regularly inspected to ensure the system is free-flowing. See Table 1 in Appendix J.

4.11.4 The flow control valve on the surface water outfall should be regularly maintained as set out in Table 2 in Appendix J.

4.11.5 The petrol interceptor should be regularly maintained as set out in Table 3 in Appendix J.

4.11.6 Operation and maintenance requirements of the drainage components, as listed above, should be undertaken in accordance with Chapter 32 of the CIRIA SuDS Manual, along with the relevant tables included in Appendix J and any relevant manufacturer's recommendations. See also BS 8582:2013 Code of Practice for Surface Water Management for Development Sites Section 11 and Susdrain Fact Sheet on SuDS Maintenance and Adoption Options (England) dated September 2015.

4.11.7 The personnel undertaking the maintenance should have appropriate experience of SuDS and drainage maintenance and should be capable of keeping sufficiently detailed records of any inspections. An example of a checklist for SuDS maintenance can be found within Appendix B of the CIRIA C753 SuDS Manual v2. If personnel do not have appropriate experience, then specific inspection visits may be necessary. During the first year of operations of SuDS, inspections should usually be carried out at monthly intervals (and after significant storm events).

4.11.8 The responsibility for the operation and maintenance of the drainage and SuDS will lie with Essex County Council, or any subsequent owner of the site.

5.0 FOUL WATER DRAINAGE

5.1 Based upon the British Code of Practice 'Flows and Loads – 4' and a maximum number of occupants which has been estimated to be approximately 1600, the peak foul water flow generated by the new school building would be approximately 1.6 litres per second.

5.2 Allowing for factoring, the peak flow rate would be less than 3 litres per second.

5.3 It is proposed that the foul water discharge from the development will be connected to the existing site drainage network which outfalls to the public sewer network in Tendring Road.

5.4 It is envisaged that the connection to the existing sewer can be achieved by means of a gravity outfall.

5.5 As this network currently serves the existing main school building which is to be demolished, the existing discharge rate will only be marginally increased and there should be no impact on the sewer network resulting from the development.

5.6 Pipe sizes are likely to range from 100mm to 150mm in diameter, with gradients ranging from 1:40 to 1:100 to comply with current Building Regulation requirements.

5.7 An indicative foul water drainage layout drawing is included in Appendix F.

6.0 SUMMARY

6.1 This report has been prepared to assess the drainage implications for the new Frederick Gibberd School development at Tendring Road, Harlow, Essex.

6.2 The drainage for the development should generally be installed in accordance with Sections 4 and 5 of this report to ensure the drainage network complies with the required standards.

6.3 Surface water run-off from the school development will be discharged to the existing watercourse located to the north east of the site via the existing site drainage outfall.

6.4 Surface water from the refurbished sports pitches will be discharged to the existing watercourse located to the west of the site via an existing site drainage outfall.

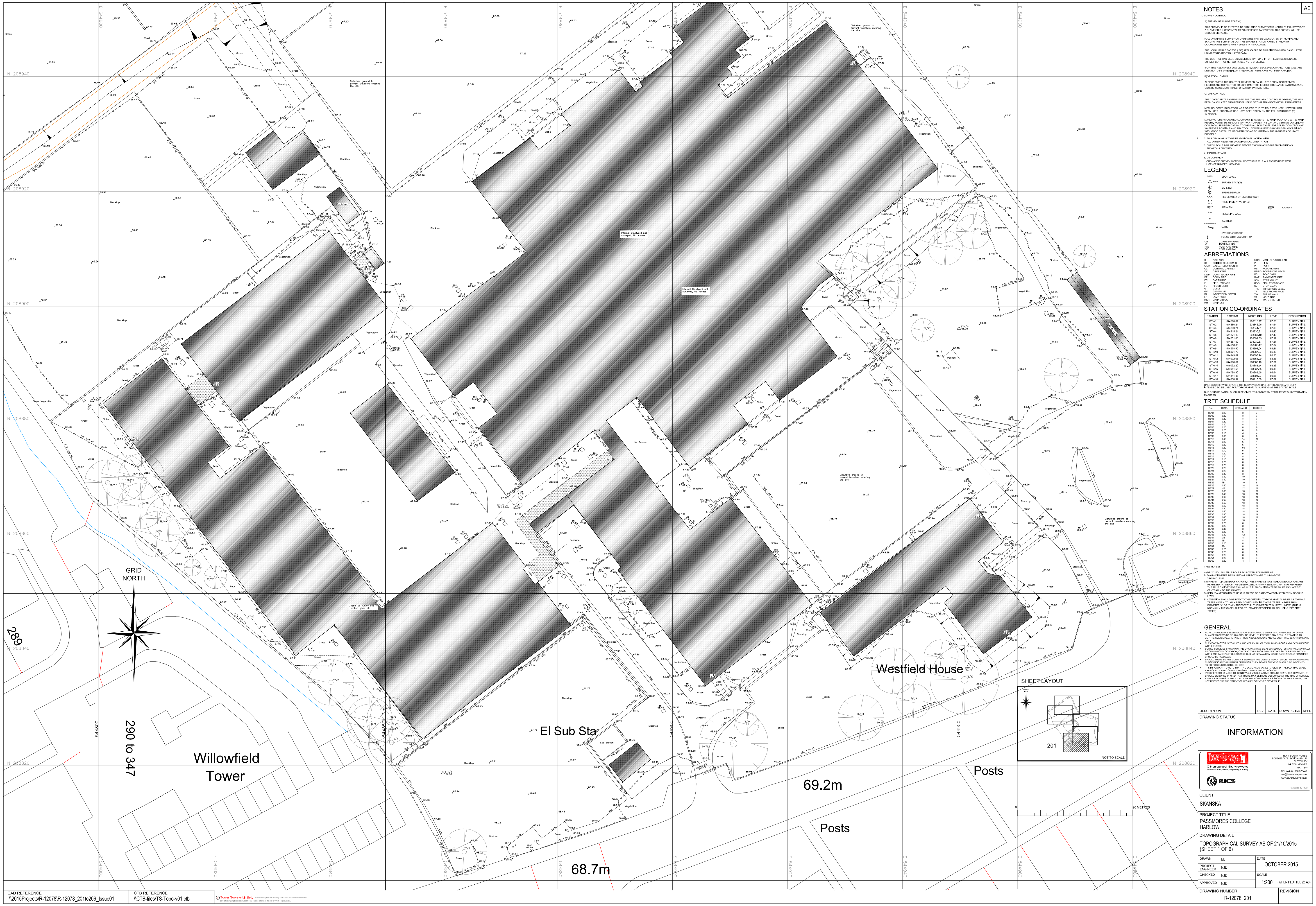
6.5 Foul water will be discharged to the existing site drainage network which outfalls to the public sewer in Tendring Road.

6.6 The drainage network will be privately owned and will be designed and constructed to meet the requirements of the Building Regulations.

6.7 The supporting calculations and indicative drawings provide a robust case for justifying the proposed means of disposal of the surface water and waste water from the development and to prove that the site can be suitably drained.

APPENDIX A

Topographic Survey Drawings


NOTES
LEGEND
ABBREVIATIONS
STATION CO-ORDINATES
TREE SCHEDULE
GENERAL
GRID NORTH
289
290 to 347
Willowfield Tower
El Sub Sta
68.7m
69.2m
Westfield House
Posts
Posts
SHEET LAYOUT
NOT TO SCALE
20 METRES
DESCRIPTION
REV
DATE
DRWN
CHKD
APPR
DRAWING STATUS
INFORMATION
Tower Surveys Ltd
Chartered Surveyors
Geomatics - Land, Utilities, Engineering & Building
NO. 1 SOUTH HOUSE
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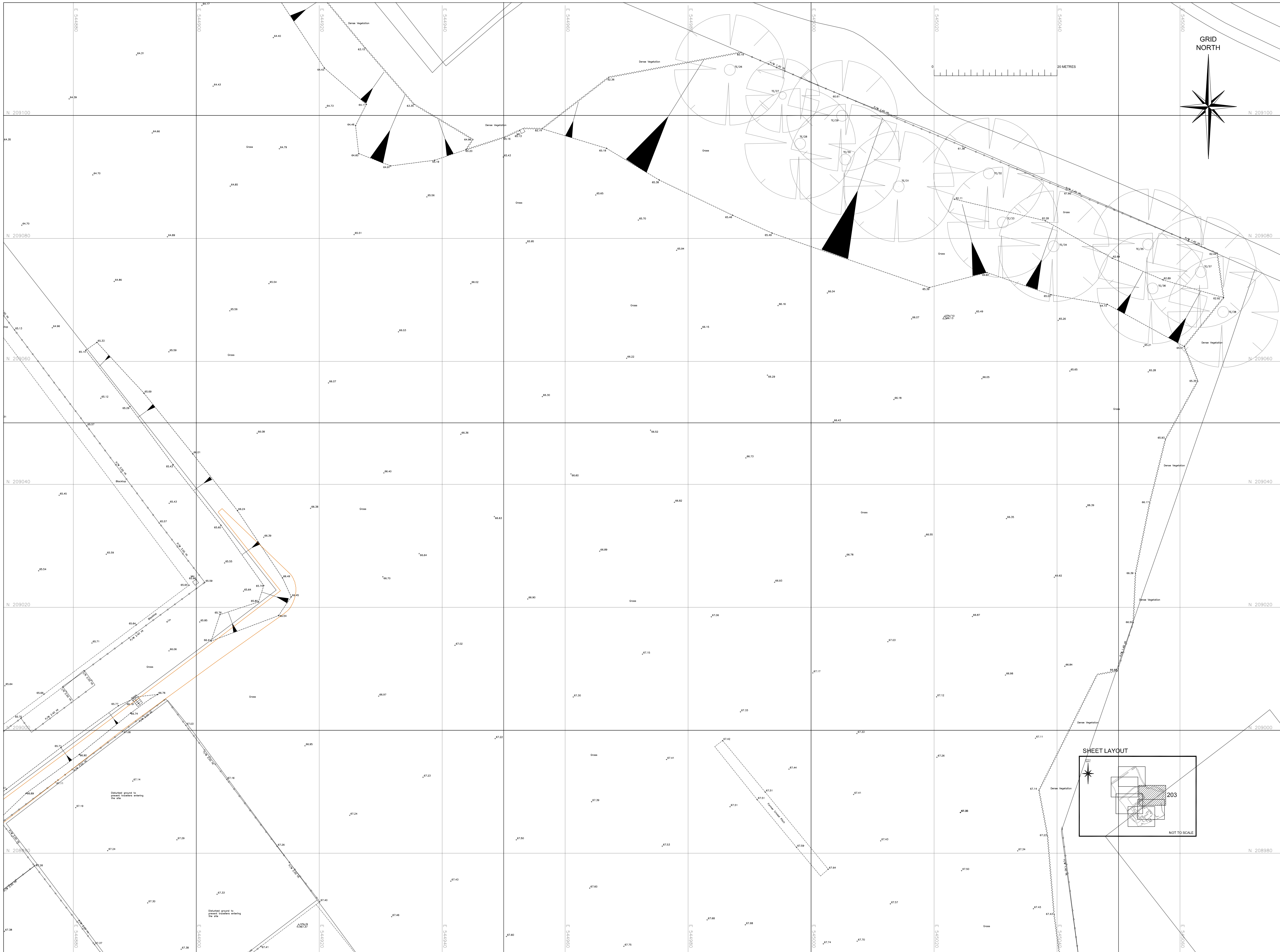
SKANSKA
PROJECT TITLE
PASSMORES COLLEGE
HARLOW
DRAWING DETAIL
TOPOGRAPHICAL SURVEY AS OF 21/10/2015
(SHEET 1 OF 6)
DRAWN MJ
PROJECT ENGINEER NJD
CHECKED NJD
APPROVED NJD
DATE OCTOBER 2015
SCALE 1:200 (WHEN PLOTTED @ A0)
DRAWING NUMBER R-12078_201
REVISION
CAD REFERENCE
\\2015Projects\R-12078\R-12078_201to206_Issue01
CTB REFERENCE
\\CTB-files\TS-Topo-v01.ctb


GRID NORTH
NOTES
LEGEND
ABBREVIATIONS
STATION CO-ORDINATES
TREE SCHEDULE
GENERAL
SHEET LAYOUT
66.8m
DRAWING STATUS
INFORMATION
CLIENT
SKANSKA
PROJECT TITLE
PASSMORES COLLEGE
HARLOW
DRAWING DETAIL
TOPOGRAPHICAL SURVEY AS OF 21/10/2015
(SHEET 2 OF 6)
DATE
OCTOBER 2015
SCALE
1:200
DRAWING NUMBER
R-12078_202
CAD REFERENCE
CTB REFERENCE



A0

NOTES

LEGEND

ABBREVIATIONS

B	BOLLARD	MHC	MANHOLE-CIRCULAR
BT	BRITISH TELECOM IC	PI	PIPE
CATV	CABLE TELEVISION IC	P	POST
CC	CONTROL CABINET	RE	RODDING EYE
DK	DROP KERB	RF/RG	ROOF/RIDGE LEVEL
DWP	DOWN WATER PIPE	RS	ROAD SIGN
DP	DOWN PIPE	RWP	RAINWATER PIPE
ER	EARTH ROD	SGY	STRIP GULLY
FH	FIRE HYDRANT	SP/B	SIGN POST/BOARD
FL	FLOOD LIGHT	SV	STOP VALVE
G	GULLY	THL	THRESHOLD LEVEL
GV	GAS VALVE	TP	TELEPHONE POLE
IC	INSPECTION COVER	TWL	TOP OF WALL
LP	LAMP POST	VP	VENT PIPE
MKR	MARKER POST	WM	WATER METER
MH	MANHOLE		

STATION CO-ORDINATES

STATION	EASTING	NORTHING	LEVEL	DESCRIPTION
STN/1	544860.01	208818.72	67.50	SURVEY NAIL
STN/2	544885.24	208846.96	67.64	SURVEY NAIL
STN/3	544830.24	208841.81	67.09	SURVEY NAIL
STN/4	544915.24	208836.31	68.45	SURVEY NAIL
STN/5	544871.12	208865.10	67.40	SURVEY NAIL
STN/6	544851.03	208892.33	67.19	SURVEY NAIL
STN/7	544867.59	208930.67	67.21	SURVEY NAIL
STN/8	544916.65	208968.17	67.37	SURVEY NAIL
STN/9	544978.90	208891.04	68.41	SURVEY NAIL
STN/10	545021.72	209067.07	66.13	SURVEY NAIL
STN/11	544949.82	208896.14	68.35	SURVEY NAIL
STN/12	544972.05	208851.09	68.88	SURVEY NAIL
STN/13	544906.61	208866.10	67.31	SURVEY NAIL
STN/14	545032.20	208883.54	68.36	SURVEY NAIL
STN/15	544951.55	208837.55	69.16	SURVEY NAIL
STN/16	544798.90	208883.56	66.64	SURVEY NAIL
STN/17	544811.37	208893.07	66.66	SURVEY NAIL
STN/18	544838.92	208915.80	67.02	SURVEY NAIL

UNLESS OTHERWISE STATED THE SURVEY STATIONS LISTED ABOVE ARE ONLY INTENDED TO BE USED FOR TOPOGRAPHICAL SURVEYS AT THE STATED SCALE.

DUE CONSIDERATION SHOULD BE GIVEN TO LONG-TERM STABILITY OF SURVEY STATION MARKERS.

TREE SCHEDULE

TREE NOTES:

GENERAL

DESCRIPTION	REV	DATE	DRWN	CHKD	APPR

DRAWING STATUS

INFORMATION

Tower Surveys Ltd
Chartered Surveyors
Geomatics - Land, Utilities, Engineering & Building

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PASSMORES COLLEGE
HARLOW

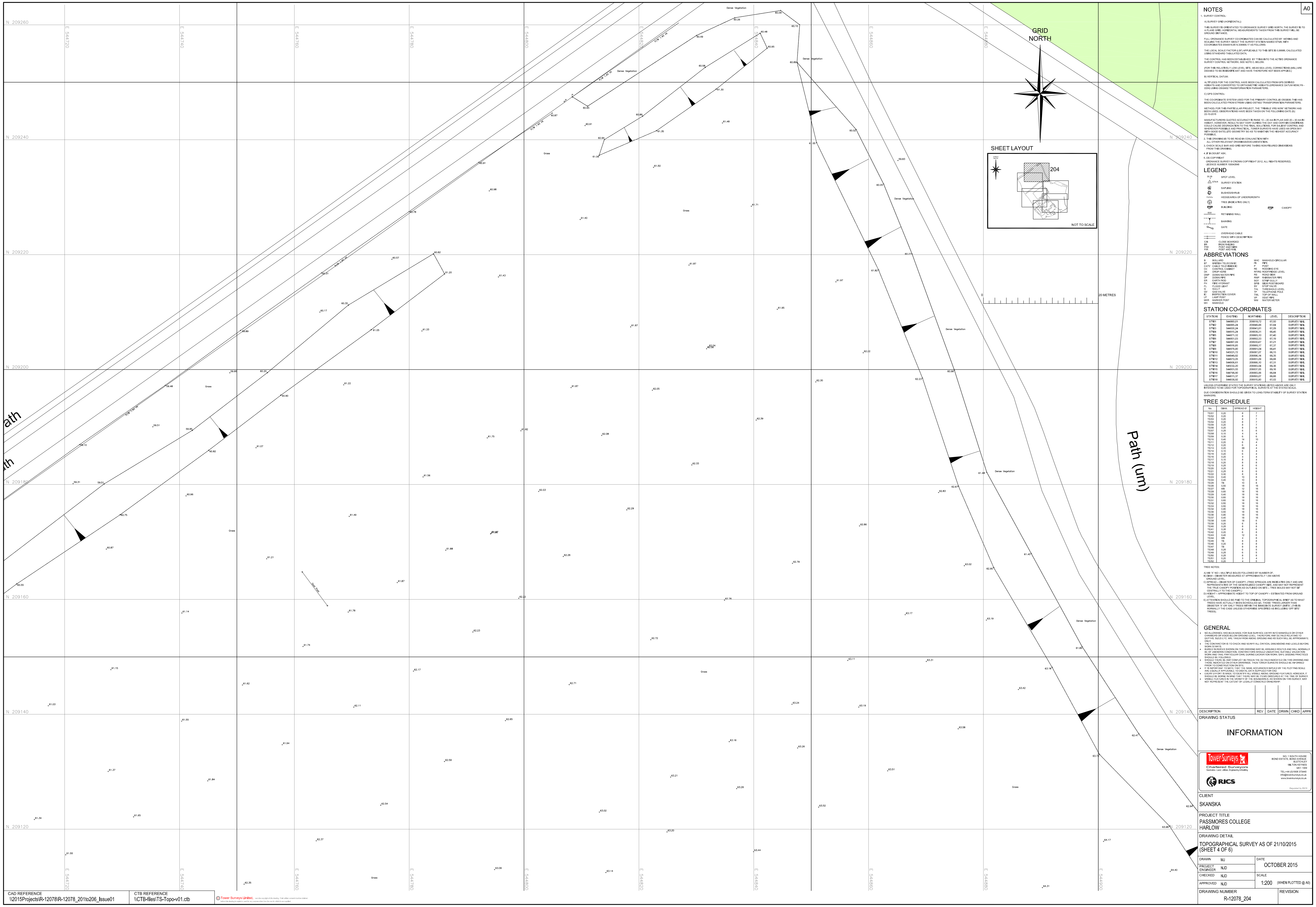
DRAWING DETAIL
TOPOGRAPHICAL SURVEY AS OF 21/10/2015
(SHEET 3 OF 6)

DRAWN	MJ	DATE	OCTOBER 2015
PROJECT ENGINEER	NJD		
CHECKED	NJD	SCALE	1:200 (WHEN PLOTTED @ A0)
APPROVED	NJD		

DRAWING NUMBER: R-12078_203
REVISION:

CAD REFERENCE
\\2015Projects\R-12078\R-12078_201to206_Issue01

CTB REFERENCE
\\CTB-files\TS-Topo-v01.ctb



A0
GRID NORTH
SHEET LAYOUT
204
NOT TO SCALE
20 METRES
Path (um)
NOTES
LEGEND
ABBREVIATIONS
STATION CO-ORDINATES
TREE SCHEDULE
GENERAL
SHOULD THERE BE ANY CONFLICT BETWEEN THE DETAILS INDICATED ON THIS DRAWING AND THOSE INDICATED ON OTHER DRAWINGS, THEN TOWER SURVEYS SHOULD BE INFORMED PRIOR TO CONSTRUCTION ON SITE.
IT IS IMPORTANT TO NOTE THAT THE SAME ACCURACIES IMPLIED BY THE PLOTTING SCALE ARE EQUALLY APPLICABLE TO DIGITAL DATA SUPPLIED FOR CAD.
EVERY EFFORT IS MADE TO IDENTIFY ALL VISIBLE ABOVE GROUND FEATURES. HOWEVER, IT SHOULD BE BORNE IN MIND THAT THERE MAY BE ITEMS OBSCURED AT THE TIME OF SURVEY.
VISIBLE FEATURES IN THE VICINITY OF THE BOUNDARIES, AS SHOWN ON THIS SURVEY, MAY NOT REPRESENT THE EXTENT OF LEGALLY CONVEYED OWNERSHIP.
DESCRIPTION
REV
DATE
DRWN
CHKD
APPR
DRAWING STATUS
INFORMATION
Tower Surveys Ltd
Chartered Surveyors
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RICS
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PROJECT TITLE
PASSMORES COLLEGE
HARLOW
DRAWING DETAIL
TOPOGRAPHICAL SURVEY AS OF 21/10/2015
(SHEET 4 OF 6)
DRAWN MJ
PROJECT ENGINEER NJD
CHECKED NJD
APPROVED NJD
DATE
OCTOBER 2015
SCALE
1:200 (WHEN PLOTTED @ A0)
DRAWING NUMBER
R-12078_204
REVISION
CAD REFERENCE
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CTB REFERENCE
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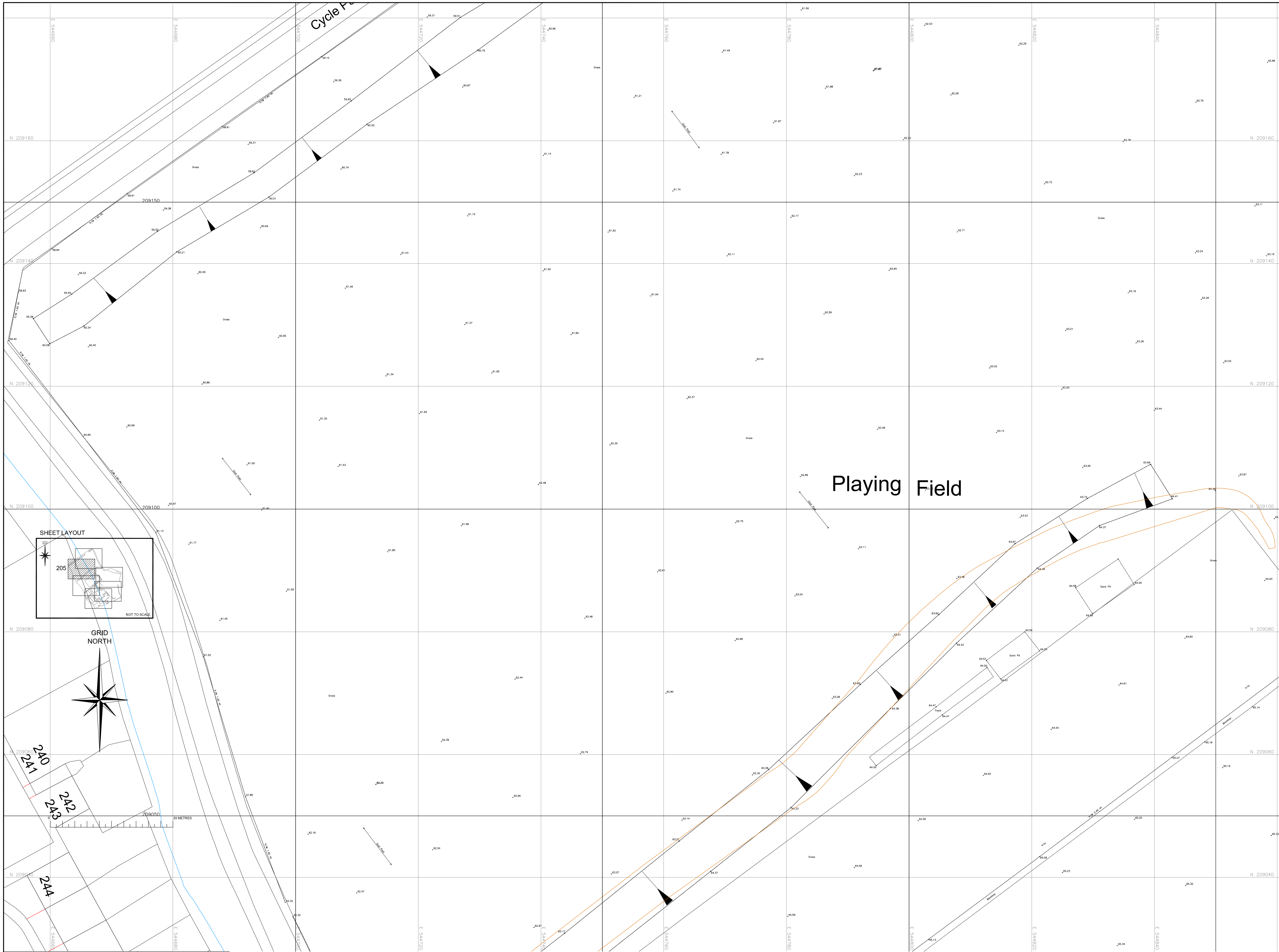


CAD REFERENCE
\\2015Projects\R-12078\R-12078_201to206_Issue01

CTB REFERENCE
\\CTB-files\TS-Topo-v01.ctb

NOTES

LEGEND

ABBREVIATIONS

STATION CO-ORDINATES

TREE SCHEDULE

GENERAL

DESCRIPTION	REV	DATE	DRAWN	CHKD	APPR

DRAWING STATUS

INFORMATION

Tower Surveys
Chartered Surveyors

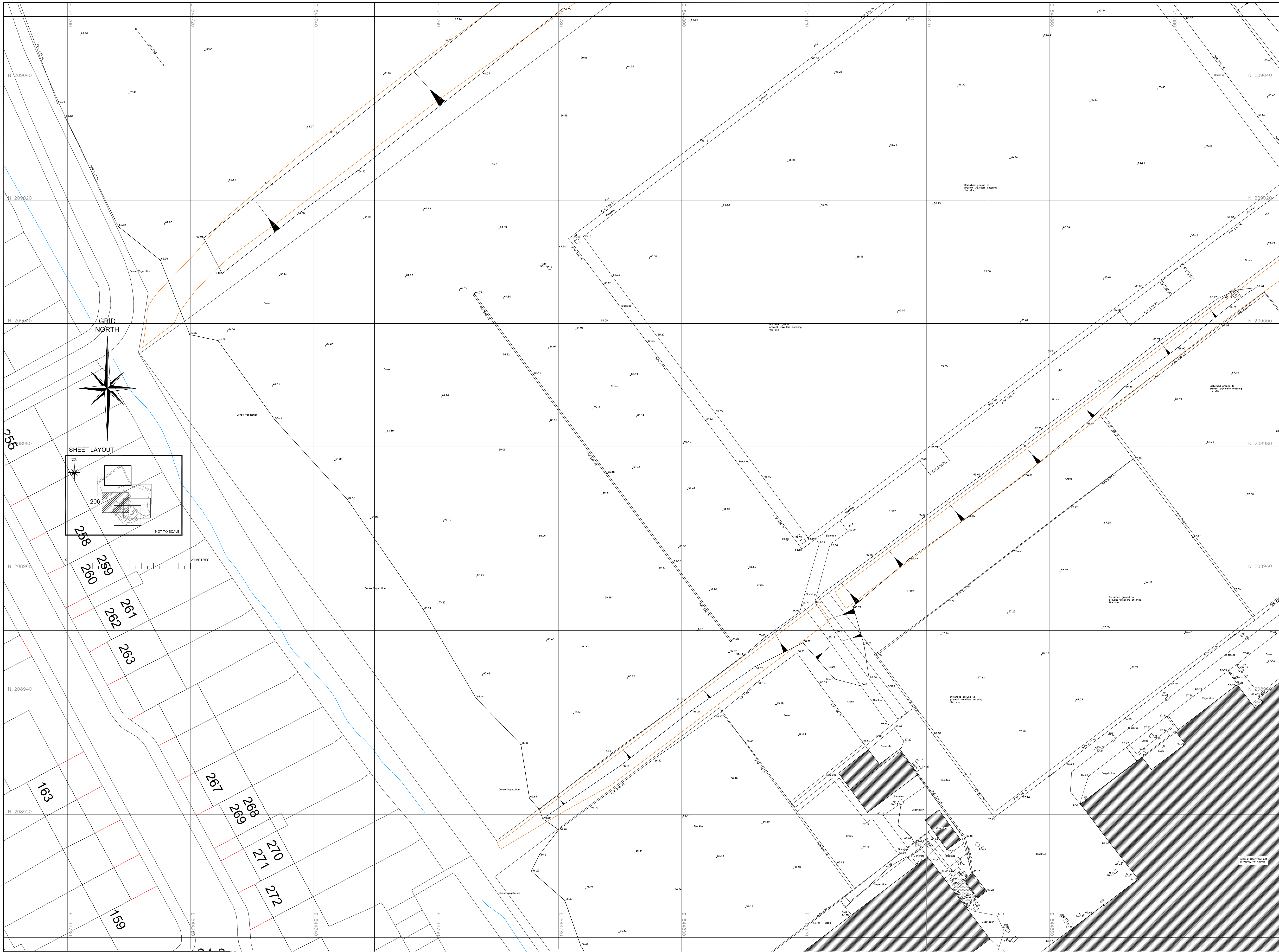
CLIENT
SKANSKA

PROJECT TITLE
PASSMORES COLLEGE
HARLOW

DRAWING DETAIL
TOPOGRAPHICAL SURVEY AS OF 21/10/2015
(SHEET 5 OF 6)

DRAWN	NJ	DATE	OCTOBER 2015
PROJECT ENGINEER	NJD		
CHECKED	NJD	SCALE	1:200 (WHEN PLOTTED @ A0)
APPROVED	NJD		
DRAWING NUMBER	R-12078_205	REVISION	

A0



NOTES

A0

1. SURVEY CONTROL:

A) SURVEY GRID (HORIZONTAL):

THIS SURVEY IS ORIENTATED TO ORDNANCE SURVEY GRID NORTH. THE SURVEY IS TO A PLANE GRID. HORIZONTAL MEASUREMENTS TAKEN FROM THIS SURVEY WILL BE GROUND DISTANCE.

FULL ORDNANCE SURVEY CO-ORDINATES CAN BE CALCULATED BY MOVING AND SCALING THE SURVEY ABOUT THE SURVEY STATION NAMED STN/8, WITH CO-ORDINATES E544916.65 N 208968.17 AS FOLLOWS:

THE LOCAL SCALE FACTOR (LSF) APPLICABLE TO THIS SITE IS 0.99986, CALCULATED USING STANDARD TABULATED DATA.

THE CONTROL HAS BEEN ESTABLISHED BY TYING INTO THE ACTIVE ORDNANCE SURVEY CONTROL NETWORK. SEE NOTE C. BELOW.

(FOR THIS RELATIVELY LOW LEVEL SITE, MEAN SEA LEVEL CORRECTIONS (MSL) ARE DEEMED TO BE INSIGNIFICANT AND HAVE THEREFORE NOT BEEN APPLIED.)

B) VERTICAL DATUM:

ALTITUDES FOR THE CONTROL HAVE BEEN CALCULATED FROM GPS DERIVED HEIGHTS AND CONVERTED TO ORTHOMETRIC HEIGHTS (ORDNANCE DATUM NEWLYN - ODN) USING OSGM02 TRANSFORMATION PARAMETERS.

C) GPS CONTROL:

THE CO-ORDINATE SYSTEM USED FOR THE PRIMARY CONTROL IS OSGB36; THIS HAS BEEN CALCULATED FROM ETRS89 USING OSTN02 TRANSFORMATION PARAMETERS.

METHOD: FOR THIS PARTICULAR PROJECT, THE "TRIMBLE VRS NOW" NETWORK HAS BEEN USED. OBSERVATIONS HAVE BEEN TAKEN ON THE FOLLOWING DATE (S): 22-10-2015

MANUFACTURERS QUOTED ACCURACY IS RMSE 10 – 20 mm IN PLAN AND 20 – 30 mm IN HEIGHT. HOWEVER, RESULTS MAY VARY DURING THE DAY AND CERTAIN CONDITIONS COULD CAUSE DEGRADATION TO THE FINAL SOLUTIONS. FOR SALIENT CONTROL AND WHEREVER POSSIBLE AND PRACTICAL, TOWER SURVEYS HAVE USED AN OPEN SKY WITH GOOD SATELLITE GEOMETRY SO AS TO MAINTAIN THE HIGHEST ACCURACY POSSIBLE.

2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DRAWINGS/DOCUMENTATION.
3. CHECK SCALE BAR AND GRID BEFORE TAKING NON-FIGURED DIMENSIONS FROM THIS DRAWING.
4. IF IN DOUBT ASK.
5. OS COPYRIGHT

LEGEND

30.29 SPOT LEVEL
STN/4 SURVEY STATION
SAPLING
BUSHES/SHRUB
HEDGE/AREA OF UNDERGROWTH
TREE (INDICATIVE ONLY)
BUILDING
CANOPY
R/W RETAINING WALL
BANKING
GATE
OVERHEAD CABLE
FENCE WITH DESCRIPTION

C/B CLOSE BOARDED
I/R IRON RAILING
P/W POST AND WIRE
P/R POST AND RAIL

ABBREVIATIONS

B	BOLLARD	MHC	MANHOLE-CIRCULAR
BT	BRITISH TELECOM IC	PI	PIPE
CATV	CABLE TELEVISION IC	P	POST
CC	CONTROL CABINET	RE	RODDING EYE
DK	DROP KERB	RF/RG	ROOF/RIDGE LEVEL
DWP	DOWN WATER PIPE	RS	ROAD SIGN
DP	DOWN PIPE	RWP	RAINWATER PIPE
ER	EARTH ROD	SGY	STRIP GULLY
FH	FIRE HYDRANT	SP/B	SIGN POST/BOARD
FL	FLOOD LIGHT	SV	STOP VALVE
G	GULLY	THL	THRESHOLD LEVEL
GV	GAS VALVE	TP	TELEPHONE POLE
IC	INSPECTION COVER	TWL	TOP OF WALL
LP	LAMP POST	VP	VENT PIPE
MKR	MARKER POST	WM	WATER METER
MH	MANHOLE		

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STN/14	545032.20	208883.54	68.36	SURVEY NAIL
STN/15	544951.55	208837.55	69.16	SURVEY NAIL
STN/16	544798.90	208883.56	66.64	SURVEY NAIL
STN/17	544811.37	208893.07	66.66	SURVEY NAIL
STN/18	544838.92	208915.80	67.02	SURVEY NAIL

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DUE CONSIDERATION SHOULD BE GIVEN TO LONG-TERM STABILITY OF SURVEY STATION MARKERS.

TREE SCHEDULE

No.	DIAM.	SPREAD Ø	HEIGHT
TE/01	0.20	8	7
TE/02	0.20	8	7
TE/03	0.20	8	7
TE/04	0.20	8	7
TE/05	0.20	8	7
TE/06	0.20	8	6
TE/07	0.25	6	6
TE/08	0.10	4	4
TE/09	0.30	6	6
TE/10	0.40	14	10
TE/11	0.20	6	4
TE/12	0.20	6	4
TE/13	0.20	66	4
TE/14	0.10	6	4
TE/15	0.20	6	4
TE/16	0.20	4	4
TE/17	0.10	8	4
TE/18	0.20	8	8
TE/19	0.25	8	6
TE/20	0.25	8	6
TE/21	0.25	8	6
TE/22	0.30	8	8
TE/23	0.40	10	8
TE/24	0.40	10	8
TE/25	TB	10	8
TE/26	0.50	18	16
TE/27	MB	12	16
TE/28	0.60	18	16
TE/29	0.40	18	16
TE/30	0.60	18	16
TE/31	0.60	18	16
TE/32	0.50	18	16
TE/33	0.50	18	16
TE/34	0.80	18	16
TE/35	0.50	18	16
TE/36	0.80	18	16
TE/37	0.40	18	16
TE/38	0.60	18	6
TE/39	0.20	6	8
TE/40	0.25	8	8
TE/41	0.35	8	6
TE/42	0.20	6	8
TE/43	0.40	12	6
TE/44	MB	4	8
TE/45	TB	8	8
TE/46	0.20	8	8
TE/47	TB	8	8
TE/48	0.25	6	5
TE/49	0.25	6	5
TE/50	0.25	8	8
TE/51	0.20	3	4
TE/52	0.20	4	5

TREE NOTES:

A) MB "X" NO – MULTIPLE BOLES FOLLOWED BY NUMBER OF.
B) DIAM – DIAMETER MEASURED AT APPROXIMATELY 1.5M ABOVE GROUND LEVEL.
C) SPREAD – DIAMETER OF CANOPY. (TREE SPREADS ARE INDICATIVE ONLY AND ARE REPRESENTATIVE OF THE GENERALISED CANOPY SIZE, AND MAY NOT REPRESENT THE TRUE CANOPY POSITION AS OUTLINED ON SITE – TREE BOLES MAY NOT SIT CENTRALLY TO THE CANOPY.)
D) HEIGHT – APPROXIMATE HEIGHT TO TOP OF CANOPY – ESTIMATED FROM GROUND LEVEL.
E) ATTENTION SHOULD BE PAID TO THE ORIGINAL TOPOGRAPHICAL BRIEF AS TO WHAT TREES HAVE ACTUALLY BEEN SCHEDULED; I.E. THOSE "TREES LARGER THAN DIAMETER "X" OR "ONLY TREES WITHIN THE IMMEDIATE SURVEY LIMITS". (THIS IS NORMALLY THE CASE UNLESS OTHERWISE SPECIFIED AS INCLUDING "OFF SITE" TREES).

GENERAL

- NO ALLOWANCE HAS BEEN MADE FOR SUB SURFACE ENTRY INTO MANHOLES OR OTHER CHAMBERS OR VOIDS BELOW GROUND LEVEL. THEREFORE ANY DETAILS RELATING TO DEPTHS, SIZES ETC. ARE TAKEN FROM ABOVE GROUND AND AS SUCH WILL BE APPROXIMATE ONLY.
- THE CONTRACTOR IS TO CHECK AND VERIFY ALL CRITICAL DIMENSIONS AND LEVELS BEFORE WORK STARTS.
- BURIED SERVICES SHOWN ON THIS DRAWING MAY BE ASSUMED ROUTES AND WILL NORMALLY BE OF UNKNOWN CONDITION, CONTRACTORS SHOULD UNDERTAKE SUITABLE VALIDATION WORK AND TAKE PARTICULAR CARE DURING EXCAVATION WORK; SAFE DIGGING PRACTICES SHOULD BE FOLLOWED.
- SHOULD THERE BE ANY CONFLICT BETWEEN THE DETAILS INDICATED ON THIS DRAWING AND THOSE INDICATED ON OTHER DRAWINGS, THEN TOWER SURVEYS SHOULD BE INFORMED PRIOR TO CONSTRUCTION ON SITE.
- IT IS IMPORTANT TO NOTE THAT THE SAME ACCURACIES IMPLIED BY THE PLOTTING SCALE ARE EQUALLY APPLICABLE TO DIGITAL DATA SUPPLIED FOR CAD.
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- VISIBLE FEATURES IN THE VICINITY OF THE BOUNDARIES, AS SHOWN ON THIS SURVEY, MAY NOT REPRESENT THE EXTENT OF LEGALLY CONVEYED OWNERSHIP.

DESCRIPTION	REV	DATE	DRWN	CHKD	APPR

DRAWING STATUS

INFORMATION

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Chartered Surveyors
Geomatics - Land, Utilities, Engineering & Building
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CLIENT
SKANSKA

PROJECT TITLE
PASSMORES COLLEGE
HARLOW

DRAWING DETAIL
TOPOGRAPHICAL SURVEY AS OF 21/10/2015
(SHEET 6 OF 6)

DRAWN	MJ	DATE	OCTOBER 2015
PROJECT ENGINEER	NJD		
CHECKED	NJD	SCALE	1:200 (WHEN PLOTTED @ A0)
APPROVED	NJD		

DRAWING NUMBER R-12078_206
REVISION

CAD REFERENCE \\2015Projects\R-12078\R-12078_201to206_Issue01
CTB REFERENCE \\CTB-files\TS-Topo-v01.ctb

APPENDIX B

Abstract from Ground Investigation Report

1 INTRODUCTION

RSK Environment Limited (RSK) was commissioned by Mace Group Ltd to carry out a preliminary risk assessment of the land at the former Passmores School, Tendring Road, Harlow, Essex, CM18 6RW. It is understood the site is being considered for redevelopment as a new build college (named Sir Frederick Gibberd College).

This report is subject to the RSK service constraints given in **Appendix A**.

A summary of legislation and policy relating to contaminated land is given in **Appendix B**.

1.1 Background

Sir Frederick Gibberd College will be a 1200 place 11 to 16 school with an additional 500 places for post 16 year old students. The site for the school is being procured under lease from Essex County Council and comprises of an old school known as Passmores Secondary School. It is envisaged that the school will be a 100% new build for the new college and therefore the dated Passmores buildings will need to be demolished and cleared.

The objective of the work is obtain and collate information on the ground conditions in relation to the construction of the new build college and supporting infrastructure.

1.2 Scope

The scope of the investigation and layout of this report has been designed with consideration of CLR11 (Environment Agency, 2014) and BS 10175: 2013 (BSI, 2013) and guidance on land contamination reports issued by the Environment Agency (EA) (2010a).

The project was carried out to an agreed brief as set out in RSK's proposal (ref. 29763 T01, dated 26th January 2018). The scope of works for the assessment included:

- A preliminary risk assessment (PRA) to include a review of existing reports, geological, hydrogeological and hydrological information, a commercially available environmental database, and historical plans; correspondence with regulatory authorities; and a site walkover – this information is used to develop an initial conceptual site model (CSM) to consider any potentially complete pollutant linkages;
- An intrusive investigation consisting of:
    - 5 No. light cable percussive (LCP) boreholes to a maximum depth of 25 mbgl;
    - 10 No. trial pits to a maximum depth of 2m bgl;
    - 9 No. trial pits to a maximum depth of 3m bgl to inspect current foundation profiles of the former Passmores School buildings;
    - 2 No. CBR tests at a depth of provisionally 1m bgl;

- Laboratory analysis of representative samples; and
    - Subsequent groundwater and gas monitoring.
- Development of a refined CSM followed by generic quantitative risk assessment (GQRA) to assess complete pollutant linkages that may require the implementation of mitigation measures to facilitate redevelopment;
- Identification of outline mitigation measures for complete pollutant linkages or recommendations for further work;
- Interpretation of ground conditions and geotechnical data to provide recommendations with respect to foundations and infrastructure design; and
- A factual and interpretative report with recommendations for further works (i.e. undertake a remedial options appraisal to identify appropriate mitigation measures/produce a remedial implementation and verification plan) and/or remediation as necessary.

1.3 Existing reports

RSK is unaware of any existing reports pertaining to the site.

1.4 Limitations

The comments given in this report and the opinions expressed are based on the ground conditions encountered during the site work and on the results of tests made in the field and in the laboratory. However, there may be conditions pertaining to the site that have not been disclosed by the investigation and therefore could not be taken into account. In particular, it should be noted that there may be areas of made ground not detected due to the limited nature of the investigation or the thickness and quality of made ground across the site may be variable. In addition, groundwater levels and ground gas concentrations and flows may vary from those reported due to seasonal, or other, effects.

While asbestos-containing material has been encountered during the supporting laboratory analysis, the history of the site indicates that asbestos may also be present in additional areas that have not been detailed herein. Asbestos is often present in discrete areas and even where it has not been encountered during the site investigation, it may be found during more extensive ground works.

2 THE SITE

2.1 Site location and description

The site is located at the former Passmores School site, Tendring Road, Harlow, Essex, CM18 6RW at National Grid reference TL 448090 as shown on **Figure 1**.

The site covers approximately 10 hectares at an elevation of between 60m and 68m above Ordnance Datum (AOD). The site slopes up towards the south and there is a steep slope up onto the playing fields in the east of the site. A small steep incline is also present in the south between the former tennis courts.

The site currently comprises former school buildings and sports courts in the southwest and playing fields across the remainder of the site.

The area around the site is predominantly residential as detailed in Table 1.

Table 1: Site setting

To the north:	The site is bounded to the north by a cycle path with an open field beyond. Todd Brook runs through this open field, approximately 130m north of the site.
To the east:	Westfield Park is present to the east comprising open grassland and mature trees, with a path running close to the site boundary. A stream also runs through this area, approximately 50m from the site. Residential properties are present further to the east.
To the south:	Tendring Road runs along the southern boundary with Harlow Fields School and College and residential properties present beyond.
To the west:	Part of the former Passmores School site is present to the west. Residential properties are present beyond as well as a stream approximately 280m from site.

2.2 Proposed development

The site in question is being considered for redevelopment as a new build college for at least 1200 students. The planned layout of the site is shown on **Figure 3**.

3 PRELIMINARY RISK ASSESSMENT (PRA)

3.1 Site walkover

The site was visited on 9th March 2018 to undertake a site walkover. Photographs and the site walkover checklist are provided in **Appendix C**.

No potentially significant ground contamination or geotechnical issues were identified during the site reconnaissance survey, however an electricity substation was confirmed to be present adjacent to the west of the site as well as areas of made ground across the site.

Japanese knotweed is a non-native, highly invasive species and spreads via rhizomes (underground 'stems') rather than seeds in the UK. It is found in a range of habitats across the UK including roadsides, riverbanks and derelict land.

Japanese knotweed was not identified during the site visit. However, Japanese knotweed is difficult to identify outside the growing season (March to September/October). As the site visit was conducted in early March, it is unlikely that any Japanese knotweed present could be identified accurately and, as such, we recommend that the site be resurveyed during the growing season.

The site reconnaissance survey revealed potential issues associated with ground stability in relation to the steep slopes noted along the eastern boundary and between the former sports courts in the south.

3.2 Ground conditions

3.2.1 Geology

Published records (British Geological Survey (BGS), 1981) for the area indicated the geology of the site to be characterised by the succession recorded in Table 2.

Table 2: Geology at the site

Geological unit	Description	Estimated thickness (m)
Lowestoft Formation	Sands, gravels, silts and clays characterised by chalk and flint content.	10
Kesgrave Sands and Gravels	Sands, sandy gravels and gravels.	5
London Clay Formation	Blue to grey mottled firm to stiff sandy clay with occasional claystone.	50
Lambeth Group	Mottled clay with sand and pebble beds.	10
Thanet Sand Formation	Fine grained sand.	10

Geological unit	Description	Estimated thickness (m)
Upper Chalk	White chalk with flints.	100
Source: 1:50000 British Geological Survey of England and Wales Bedrock and Superficial map (Sheet No. 240 Epping)		

Head deposits (clay, silt, sand and gravel) are indicated along the eastern boundary of site. The BGS geological map also indicates an area of made ground (filled gravel workings, industrial and household refuse) in the central eastern area of site. Made ground should also be expected around the former school buildings owing to the history of development.

3.2.2 Radon

The environmental database report (Envirocheck, 06/03/2018) indicates that the site is not located within an 'Affected Area' as defined by the Documents of the National Radiological Protection Board (Radon Atlas of England and Wales, NRPB-W26-2002) and therefore the risk of significant ingress of radon into structures on-site is considered low.

3.2.3 Mining and quarrying

Evidence has been sought to identify any mining and quarrying operations, past and present, which have taken place in the vicinity of the site. The sources of information referenced in this element of the desk study include:

- An environmental database report (**Appendix D**)
- Records held by local authority/EA
- Old Ordnance Survey maps and plans (see **Section 3.5**)
- Geological maps (see **Section 3.2.1**)

With reference to the above data, there are no recorded mines or quarries within a 1km radius of the site. However, there are nine mineral sites within a 1km radius of the site. The nearest is a ceased opencast gravel pit 40m to the north. This has been filled but with unknown material.

3.2.4 Landfilling and land reclamation

Evidence has been sought to identify any landfilling or land reclamation operations, past and present, which have taken place in the vicinity of the site. The sources of information referenced in this element of the desk study include:

- Environmental database report
- Records held by local authority/EA
- Old Ordnance Survey maps and plans (see **Section 3.5**)
- Geological maps (see **Section 3.2.1**)

There are no records of landfill sites (former or current) within 250m of the site (i.e. within the planning consultation zone). Furthermore, there are no records of landfills within a 1km radius of the site. However, as referenced above, there is a record of a ceased opencast gravel pit 40m north of the site. This has since been infilled but with unknown material.

In addition, with reference to the geological maps (**Section 3.2.1**), there is an area of made ground noted on site in the central eastern area, and made ground should also be expected around the former school buildings.

3.3 Hydrogeology

3.3.1 Aquifer characteristics

Based on the published geological map referred to above, the hydrogeology of the site is likely to be characterised by the presence of an unconfined shallow aquifer comprising the Lowestoft Formation overlying the London Clay Formation, an aquitard.

Confined by the London Clay Formation is a deep aquifer, comprising a sequence of deposits consisting of the lower part of the Lambeth Group and Thanet Sands (Basal Sands) and the White Chalk. These units are expected to be in hydraulic continuity.

The anticipated depth to the groundwater table is in the order of 6m below ground level. Shallow groundwater in the site area is anticipated to flow in a northerly direction, i.e. following topography, towards Todd Brook.

The piezometric surface in the deeper aquifer is anticipated to be at approximately 60m bgl. The regional direction of groundwater flow is to the north.

It is also possible that localised perched water may also be present in the made ground.

The presence of low permeability clay at relatively shallow depths beneath the site, while restricting downwards migration, may increase the potential for lateral migration of shallow groundwater (and therefore mobile contamination, if present).

3.3.2 Vulnerability of groundwater resources

The site has been classified by the EA website to overlie a:

- Secondary undifferentiated aquifer: it has not been possible to attribute either a category A or B to a rock type. In most cases this means that it was previously designated as both minor and non-aquifer in different locations owing to the variable characteristics.

The soils beneath the site are classified as having LOW (L) leaching potential.

L – soils where pollutants are unlikely to penetrate the soil layer either as a result of largely horizontal water movement or because the soil has the ability to attenuate diffuse pollutants. Lateral flow in these soils may contribute to groundwater recharge elsewhere in the catchment and generally have a high clay content.

3.3.3 Licensed groundwater abstraction

No groundwater abstractions were identified within a 2km radius of the site.

In terms of aquifer protection, the EA generally adopts a three-fold classification of source protection zones (SPZ) for public supply abstraction wells.

- Zone 1 or 'inner protection zone' is located immediately adjacent to the groundwater source and is based on a 50-day travel time from any point below the water table to the source. It is designed to protect against the effects of human activity and biological/chemical contaminants that may have an immediate effect on the source.
- Zone 2 or 'outer protection zone' is defined by a 400-day travel time from a point below the water table to the source. The travel time is designed to provide delay and attenuation of slowly degrading pollutants.
- Zone 3 or 'total catchment' is the area around the source within which all groundwater recharge is presumed to be discharged at the source.

Information available on the EA website indicates that the site does not lie within a currently designated groundwater SPZ.

3.4 Hydrology

3.4.1 Surface watercourses

There are no ponds, streams or drainage ditches on the site. The nearest identified surface watercourse to the site is a drain located 5m west of the site. There is also an unnamed stream located approximately 50m to the east of the site. Todd Brook is also present 130m to the north of the site and another unnamed stream is present 280m to the west.

The environmental database report (Envirocheck report, 06/03/18) indicates that there are no currently licensed surface water abstractions within a 2km radius of the site.

The base flow of the Todd Brook is likely to be recharged by groundwater in the shallow aquifer in the site area. A linkage between the river and any ground or groundwater contamination beneath the site may therefore exist.

There is only one record of a discharge consent within a 1km radius of the site. This relates to a historic discharge of 'other matter/surface water' into a tributary of Todd Brook 511m southeast of the site. Due to the historic nature and distance from site, this is not expected to have affected the site.

There are many records of pollution incidents to controlled waters within a 1km radius of the site. The incidents classified as 'Category 2 - significant' within a 500m radius are detailed below:

- 132m north – storm sewage in 1999;
- 236m north - unknown sewage in 1994;
- 310m west – chemicals (unknown) in 1990;
- 335m north – unknown sewage in 1997;
- 429m northeast – chemicals (unknown) at unknown date; and
- 489m northeast – unknown sewage in 1997.

There are also three records on the Substantiated Pollution Incident Register within 500 m of the site:

- 45m northeast – crude sewage causing 'Category 2–significant incident' on water in 2006;
- 94m north – crude sewage causing 'Category 2-significant incident' on water and 'Category 3-minor incident' on land in 2005; and
- 142m north – crude sewage causing 'Category 2–significant incident' on water in 2005.

3.4.2 Surface water abstractions

No surface water abstractions were identified within a 2km radius of the site.

3.4.3 Site drainage

Surface drainage from the southwest of the site, around the former school buildings, appears to be discharged into the main drainage network via surface drainage covers. Across the playing fields, surface drainage is expected to be via infiltration into the ground.

3.4.4 Preliminary flood risk assessment

The site lies within Flood Zone 1, which indicates there is a low probability of flooding from rivers or the sea, however the area to the central east of the site is classed as having the potential for groundwater flooding of property situated below ground level.

3.5 History of site and surrounding area

The history of the land-use and development of the site and surrounding area has been assessed based on the following sources:

- Historical maps within the environmental database from 1873 to 2018;
- Town plans;
- Internet search;
- Information from the local planning authority; and
- Aerial photography.

Copies of OS and County Series maps are included in the environmental database report in **Appendix D**. Reference to historical maps provides invaluable information regarding the land use history of the site, but historical evidence may be incomplete for the period pre-dating the first edition and between successive maps.

Planning records held by Harlow Council pertaining to the site date from 2006. There are only two planning consents, which are referenced in Table 3.

4 SITE INVESTIGATION METHODOLOGY

RSK carried out intrusive investigation work between 16 and 24 April 2018 with subsequent ground gas and groundwater monitoring between 30 April and 15 May 2018 to further investigate the potential pollutant linkages identified in the initial CSM and to inform geotechnical parameters for the subsequent design of foundations, roads and drainage.

4.1 Sampling strategy and methodology

The techniques adopted for the investigation have been chosen considering the anticipated ground conditions, existing land use and the proposed development.

The site works were carried out in accordance with the scope of works provided by Mace Ltd. The works carried out by RSK are summarised in Table 7, which includes a justification for each exploratory hole location.

The investigation and the soil descriptions were carried out in general accordance with BS5930: 2015 - Code of Practice for Ground Investigations. The exploratory hole logs and other site work records are presented in **Appendix G** and the locations of the intrusive investigations are shown in **Figure 2**.

Table 7: Exploratory hole and monitoring well location rationale

Investigation Type	Exploratory hole number	Rationale
Hand dug trial pits (to a maximum depth of 1.5 mbgl)	TP1 to TP9	To inspect foundations of existing structures as per the client specification.
Machine excavated trial pits (to a maximum depth of 3.5 mbgl)	TP10 to TP19	To characterise the shallow soils beneath the site, allow collection of samples for geoenvironmental purposes and allow CBR analysis in two locations.
Cable percussive boreholes (to a maximum depth of 25 mbgl)	BH1 to BH5	To characterise ground conditions beneath the site, allow collection of samples for geotechnical purposes and install groundwater monitoring wells.
Window sampling boreholes (to a maximum depth of 3.0 mbgl)	WS1 to WS5	To characterise the shallow soils beneath the site and allow installation of gas monitoring wells. Shallow soil ground gas monitoring installation to target stratum suspected of generating gas, likely to be made ground.

The investigation points were located approximately by reference to physical features present on the site at the time of investigation.

4.1.1 Health, safety and environment considerations

Service plans were obtained prior to intrusive site works commencing. Each exploratory location was cleared from underground services by specialist geophysics surveyor prior to any excavation works. In addition, each location was scanned by a geo-environmental engineer using a cable avoidance tool and signal general.

Hand dug inspection pits were excavated to a depth of 1.2 mbgl prior to any boreholes being progressed by drilling equipment.

4.1.2 Soil sampling, in-situ testing and laboratory analysis

Collected soil samples were recorded together with their depths on the exploratory hole records in **Appendix G**. Soils collected for laboratory analysis were collected in a variety of containers appropriate to the anticipated testing suite required. Samples were stored in accordance with the RSK quality procedures to maintain sample integrity and preservation and to minimise the chance of cross contamination. The samples were transported to the laboratory in chilled cool boxes. Laboratory chain of custody forms can be provided if required. The rationale for soil sample chemical analysis is presented in Table 8 and the laboratory certificates of analysis in **Appendix H**.

Table 8: Scheduled analysis – soil

Exploratory hole no. and sample depth (m bgl)	Analyte	Rationale
TP3 (0.20m), TP4 (0.15m), TP10 (0.10m), TP11 (0.15m), TP12 (0.15m), TP13 (0.25m), TP14 (0.15m), TP15 (2.30m), TP15 (3.15m), TP16 (0.10m), TP17 (0.10m), TP18 (0.20m), TP19 (0.40m), WS1 (0.30m), WS2 (0.60m), WS3 (0.10m), WS4 (0.40m) and WS5 (0.10m)	pH and sulphate (water and acid soluble)	Assess potential attack on buried concrete
	Metals (arsenic, cadmium, copper, chromium III, lead, mercury, nickel, selenium, zinc), PAH 16, TPH CWG including BTEX and MTBE	Common contaminants associated with made ground
	Asbestos in soil	Screening made ground for the presence of asbestos

4.1.3 Geotechnical

Standard penetration tests (SPTs) or cone penetration tests (CPTs) were carried out within cohesive deposits at regular intervals of approximately 3 m, alternated with U100 samples at the same frequency. SPTs or CPTs were undertaken at approximately 1.5 m intervals within granular deposits during the cable percussion in accordance with part 9 of BS 1377:1990 (BSI, 1990). Test results are given on the borehole records presented in **Appendix G**. Disturbed samples were taken from each stratum encountered for subsequent geotechnical analysis.

4.1.4 Groundwater monitoring

Depths to groundwater were recorded using an electronic dip meter on each return monitoring visit. The monitoring results are given in **Section 5.1.5**. One water sample was collected from each borehole (BH1-BH5) on the second return visit to site.

Laboratory chemical analysis of groundwater samples identified concentrations of water-soluble sulphate ranging between 151 mg/l (BH3) and 397 mg/l (BH1). A sample was unable to be taken from BH5 due to the low water level.

Groundwater analytical results are presented within **Appendix I**.

The groundwater monitoring data are given in **Appendix J**.

4.1.5 Ground gas monitoring

To provide an initial assessment of the ground gas concentrations of the site, three return visits were scheduled to monitor the installed boreholes. Monitoring included periods of falling atmospheric pressures and after rainfall.

An infrared gas meter was used to measure gas flow, concentrations of carbon dioxide (CO_2), methane (CH_4) and oxygen (O_2) in percentage by volume, while hydrogen sulphide (H_2S) and carbon monoxide (CO) were recorded in parts per million. Initial and steady state concentrations were recorded. In addition, during the first monitoring round, all wells were screened with a PID to establish if there are any interferences and cross-sensitivity of other hydrocarbons with the infrared gas meter.

The atmospheric pressure before and during monitoring, together with the weather conditions, was recorded.

All monitoring results together with the temporal conditions are contained within **Appendix J** and discussed in **Section 6.2.6**.

5 GROUND CONDITIONS

The results of the intrusive investigation and subsequent laboratory analysis undertaken are detailed below. The descriptions of the strata encountered, notes regarding visual or olfactory evidence of contamination, list of samples taken, field observations of soil and groundwater, in-situ testing and details of monitoring well installations are included on the exploratory hole records presented in **Appendix G**.

5.1 Soil

The exploratory holes revealed that the site is underlain by a variable thickness of made ground over Lowestoft Formation and Kesgrave Sands and Gravels with the London Clay Formation encountered at depth. This confirms the stratigraphical succession described within the initial conceptual model. For the purpose of discussion, the ground conditions are summarised in Table 9 and the strata discussed in subsequent subsections.

Table 9: General succession of strata encountered

Strata	Exploratory holes encountered	Depth to top of stratum m bgl	Thickness (m)
Made ground	All	Ground level	Up to 3.4
Lowestoft Formation	All	0.1 to 3.4	Upper band: up to 4.6 Lower band: Up to 9.0
Kesgrave Sands and Gravels	BH1, BH2, BH3, BH4, BH5	3.8 to 4.8	Upper band: up to 2.1 Lower band: Up to 4.9
London Clay Formation	BH1, BH2, BH3, BH4, BH5	15.80 to 18.70	Proven to 25 mbgl

5.1.1 Made ground

The thin veneer of made ground was generally encountered beneath an initial layer of topsoil or concrete/asphalt (around the existing school buildings). Conversely, however, a significant thickness of made ground was encountered within TP15, located within the north eastern area of the site.

The thin veneer of made ground typically comprised sand and gravel sized fragments of concrete, flint, brick, chalk and asphalt with occasional clay pockets. Occasional cobble sized fragments of brick, concrete and flint were encountered.

The significant thickness of made ground (encountered within TP15 only) comprised a dark brown gravelly clay with variable portions of anthropogenic materials including brick, wood, plastic, metal and concrete.

No visual or olfactory evidence of contamination was noted within this stratum.

5.1.2 Lowestoft Formation

This stratum was encountered beneath the made ground (locally interstratified by the Kesgrave Sands and Gravels) and comprised firm orangish brown sandy gravelly CLAY with occasional cobbles of flint, becoming stiff with depth.

A summary of the in-situ and laboratory test results in this stratum is presented in Table 10.

Table 10: Summary of in-situ and laboratory test results for Lowestoft Formation

Soil parameters	Range	Reference
Liquid limit (%)	39 to 48	**Appendix K**
Plasticity limit (%)	19 to 22	**Appendix K**
Plasticity index (%)	21 to 28	**Appendix K**
Plasticity classification	Intermediate	**Appendix K**
Modified plasticity index	17.0 to 25.5	-
NHBC Volume change potential	Low to Medium	-
Moisture content (%)	14 to 23	**Appendix K**
SPT 'N' values	19 to 53	**Appendix G**
Undrained shear strength (kN/m^2) from shear vane and undrained triaxial testing	52 to 214	**Appendix K**
Soil consistency inferred from field descriptions	Firm to stiff	**Appendix G**
Strength term	Medium to Very High	-

5.1.3 Kesgrave Sands and Gravels

This stratum was encountered at an initial depth of between 3.80m and 4.80m below ground level, with a thickness varying between 0.70m and 2.10m. Further horizons were encountered at a depth of between 11.40m and 14.90m below ground level, with thicknesses varying between 2.60m and 4.80m.

A summary of the in-situ and laboratory test results in this stratum is presented in Table 11.

Table 11: Summary of in-situ and laboratory test results for Kesgrave Sands and Gravels

Soil parameters	Range		Reference
Grading (%)	Gravel	18 to 78	**Appendix K**
	Sand	20 to 54	
	Silt/Clay	2 to 28	

Soil parameters	Range	Reference
	Generally described as either slightly clayey very sandy gravel or very clayey gravelly sand.	
SPT 'N' values	15 to >50	**Appendix G**
Density term	Medium Dense to Very Dense	-

5.1.4 London Clay Formation

The London Clay Formation was encountered at a depth of between 15.80m and 18.70m below ground level to the full depth of investigation. Based on the site descriptions and in-situ and laboratory testing carried out this stratum can be described as firm to very stiff medium to very high strength dark brownish grey sandy gravelly clay becoming grey silty clay with depth. Selenite crystals were observed within the stratum.

A summary of the in-situ and laboratory test results in this stratum is presented in Table 12.

Table 12: Summary of in-situ and laboratory test results for London Clay

Soil parameters	Range	Reference
Liquid limit (%)	81	**Appendix K**
Plasticity limit (%)	29 to 32	**Appendix K**
Plasticity index (%)	49 to 52	**Appendix K**
Plasticity classification	Very High	**Appendix K**
NHBC Volume change potential	High	-
Moisture content (%)	14 to 28	**Appendix K**
SPT 'N' values	20 to >50	**Appendix G**
Undrained shear strength inferred from SPT 'N' values (kN/m^2)	86 to >215	-
Undrained shear strength measured by triaxial testing (kN/m^2)	101 to 359	**Appendix K**
Soil consistency inferred from field descriptions	Firm to very stiff	**Appendix G**
Strength term	High to Very High	-

5.1.5 Groundwater

Groundwater seepages were recorded during the drilling of the cable percussive boreholes at depths of 4.50m, 15.20m and 15.20m below existing ground level within boreholes BH2, BH3 and BH4, respectively. Boreholes BH1 and BH5 remained dry during drilling. The results of the subsequent groundwater monitoring events are summarised within Table 13.

The recommended sub-grade soil CBR value for road pavement design is therefore 2.5%. This value assumes that during construction the formation level will be carefully compacted and any soft spots removed and replaced with well-compacted granular fill.

The sub-grade soils can be regarded as non-frost-susceptible, based upon the criteria given in Appendix 1 of TRRL (1970) Report Road Note 29. When the sub-grade is frost-susceptible the thickness of sub-base must be sufficient to give a total thickness of non-frost-susceptible pavement construction over the soil of not less than 450mm.

7.6 Chemical attack on buried concrete

The assessment of the potential for chemical attack on buried concrete is based on current BRE guidance (BRE Special Digest 1: 2005 Concrete in aggressive ground). The desk study and site walkover indicate that, for the purposes of this assessment of the aggressive chemical environment, the site should be considered as brownfield development. Chemical analyses appropriate to this assessment was carried out on 27 No. soil samples: 20 No. from the made ground; three from the Lowestoft Formation; one from the Kesgrave Catchment Sub Group; and three from the London Clay Formation. In addition, three groundwater samples were also tested. The results are given in **Appendix I** and **Appendix N**.

The maximum water – soluble sulphate content in soil of 1650mg/l has been taken as the characteristic value. As this value is below the limiting value of 3.0g/l consideration of magnesium is not required. Based on Table C in the BRE guidance, Result one for Design Sulphate Class for the site is DS-3.

The maximum water-soluble sulphate content in groundwater of 397mg/l has been taken as the characteristic value. As this value is below the limiting value of 3.0g/l consideration of magnesium is not required. Result two for Design Sulphate Class for the site is therefore DS-1.

Although for the purposes of assessment the site has been classified as brownfield, the pH is nowhere less than the limiting value of 5.5. The third assessment of Design Sulphate Class specific to brownfield sites is therefore not required in this case.

On the basis of the above assessment and assuming mobile groundwater conditions beneath the site, it is recommended that buried concrete is designed in accordance with Design Sulphate Class DS-3 and Aggressive Chemical Environment for Concrete Class AC-3 (ACEC-AC). This assumes nominally mobile groundwater conditions and that no significantly disturbed clay comes into contact with concrete foundations or structures. If significantly disturbed clay is likely to come into contact with concrete foundations or structures it will be necessary to carry out a re-evaluation of the ACEC Classification and Design Sulphate Class for the material, to take into consideration potential oxidation of available sulphides (e.g. pyrite), as defined in Table C2 (brownfield sites) BRE Special Digest 1: 2005.

7.7 Soakaways

The ground conditions do not appear suitable from a geotechnical viewpoint for the use of pit soakaways to discharge surface run-off water at shallow depths into the cohesive

Lowestoft Formation. Whilst granular deposits were encountered at depths below 4.5m, these were locally saturated and anticipated to be incoherent, consequently unlikely to be suitable to receive infiltration drainage. However, it is stressed that to-date no infiltration tests have been performed to confirm this preliminary assessment and the actual infiltration characteristics of the sub-soils. For environmental reasons, careful consideration will have to be given to selecting their locations and design details.

The EA should be contacted at the design stage in order to obtain a 'consent to discharge'. This may not be forthcoming where soakage will be into or just above the water table (i.e. where deeper made ground is present), particularly in the Agency's sensitive aquifer protection zones. In addition, planning approval will have to be sought for their use.

RSK

FINAL

TRIAL PIT LOG

Contract: SFGC, Harlow		Client: Mace LTD		Trial Pit: TP1
Contract Ref: 29763	Start: 18.04.18 End: 18.04.18	Ground Level: ---	Co-ordinates: ---	Sheet: 1 of 1

Depth	No	Type	Results	Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
						Apshalt. (MADE GROUND)	0.05	
						Concrete with rebar. (MADE GROUND)	0.20	
0.40	1	ES				Light brown mottled grey clayey very sandy GRAVEL of brick, concrete and flint with low large cobble content. (MADE GROUND)	0.45	
0.60		V	c_u=86			Firm light brownish orange mottled grey very sandy very gravelly CLAY with medium cobble content of flint. (LOWESTOFT FORMATION)	0.60	
						Trial pit terminated at 0.6mbgl.		

Plan (Not to Scale)

0.85 × 0.50

General Remarks

1. Trial pit remained dry and stable during excavation.
2. Ease of trial pit excavation: moderate.
3. Trial pit backfilled with arisings upon completion.

All dimensions in metres | Scale: 1:25

Method Used:	Inspection pit + Hand dug	Plant Used:	Hand tools	Logged By:	HBennett	Checked By:	DLS

AGS

FINAL

TRIAL PIT LOG

Contract: SFGC, Harlow		Client: Mace LTD		Trial Pit: TP4
Contract Ref: 29763	Start: 19.04.18 End: 19.04.18	Ground Level: ---	Co-ordinates: ---	Sheet: 1 of 1

Samples and In-situ Tests				Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
Depth	No	Type	Results					
						Soft to firm dark brown very sandy CLAY. (MADE GROUND)	0.10	
0.15	1	ES				Light brown mottled grey sandy gravelly CLAY. Gravel is subangular to subrounded fine to coarse flint. (LOWESTOFT FORMATION)	(1.40)	
1.40	1	D					1.50	
1.50		V	c_u=50			Trial pit terminated at 1.5mbgl.		

Plan (Not to Scale)

0.65 × 0.50

General Remarks

1. Trial pit remained dry and stable during excavation.
2. Ease of trial pit excavation: moderate.
3. Trial pit backfilled with arisings upon completion.

All dimensions in metres | Scale: 1:25

Method Used: Inspection pit + Hand dug	Plant Used: Hand tools	Logged By: HBennett	Checked By: DLS	AGS

FINAL

TRIAL PIT LOG

Contract: SFGC, Harlow		Client: Mace LTD		Trial Pit: TP7
Contract Ref: 29763	Start: 17.04.18 End: 17.04.18	Ground Level: ---	Co-ordinates: ---	Sheet: 1 of 1

Samples and In-situ Tests				Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
Depth	No	Type	Results					
						Asphalt overlying concrete. (MADE GROUND)	0.25	
						Light brownish grey sandy GRAVEL of angular to subrounded fine to coarse concrete, brick and asphalt with occasional cobbles. (MADE GROUND)	0.50	
0.60	1	ES				Firm orangish brown sandy gravelly CLAY. (LOWESTOFT FORMATION)	(0.40)	
0.80		V	c_u=40				0.90	
						Trial pit terminated at 0.9mbgl.		

Plan (Not to Scale)

0.50 × 0.65

General Remarks

1. Trial pit remained dry and stable during excavation.
2. Ease of trial pit excavation: difficult.
3. Trial pit backfilled with arisings upon completion.

All dimensions in metres | Scale: 1:25

Method Used:	Inspection pit + Hand dug	Plant Used:	Hand tools	Logged By:	HBennett	Checked By:	DLS

AGS

FINAL
TRIAL PIT LOG

Contract: SFGC, Harlow		Client: Mace LTD		Trial Pit: TP8
Contract Ref: 29763	Start: 17.04.18 End: 17.04.18	Ground Level: ---	Co-ordinates: ---	Sheet: 1 of 1

Samples and In-situ Tests				Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
Depth	No	Type	Results					
0.10	1	ES				Asphalt overlying bricks. (MADE GROUND)	0.10	
						Blackish grey sandy GRAVEL of angular to subrounded fine to coarse brick and asphalt with medium cobble content of brick. (MADE GROUND)	0.15	
						Concrete. (MADE GROUND)	0.25	
						Soft greyish brown sandy very gravelly CLAY. (LOWESTOFT FORMATION)	(1.15) 1.40	
1.40		V	c_u=40			Trial pit terminated at 1.4mbgl.		

Plan (Not to Scale)

0.70 × 0.50

General Remarks

1. Trial pit remained dry and stable during excavation.
2. Ease of trial pit excavation: moderate.
3. Trial pit backfilled with arisings upon completion.

All dimensions in metres | Scale: 1:25

Method Used: Inspection pit + Hand dug	Plant Used: Hand tools	Logged By: HBennett	Checked By: DLS	AGS

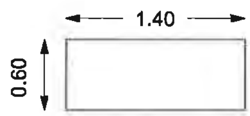
FINAL

TRIAL PIT LOG

Contract: SFGC, Harlow		Client: Mace LTD		Trial Pit: TP14
Contract Ref: 29763	Start: 18.04.18 End: 18.04.18	Ground Level: ---	Co-ordinates: ---	Sheet: 1 of 1

Samples and In-situ Tests				Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
Depth	No	Type	Results					
0.15	1	ES				Grass overlying dark brown clayey SAND with rare gravel of subangular fine to coarse flint and roots. (TOPSOIL)	(0.30) 0.30	
0.70	2	ES				Orange brown clayey SAND and GRAVEL with medium cobble content of flint. (LOWESTOFT FORMATION)	(0.70) 1.00	
						Trial pit terminated at 1.0mbgl.		

Plan (Not to Scale)



General Remarks

1. Trial pit remained dry and stable during excavation.
2. Ease of trial pit excavation: moderate.
3. Trial pit backfilled with arisings upon completion.

All dimensions in metres | Scale: 1:25

Method Used: Machine dug	Plant Used: JCB-3CX	Logged By: HBennett	Checked By: DLS	AGS

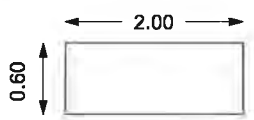
FINAL

TRIAL PIT LOG

Contract: SFGC, Harlow		Client: Mace LTD		Trial Pit: TP15
Contract Ref: 29763	Start: 17.04.18 End: 17.04.18	Ground Level: ---	Co-ordinates: ---	Sheet: 1 of 1

Samples and In-situ Tests: Depth	No	Type	Results	Water	Backfill	Description of Strata	Depth (Thickness)
						Grass overlying dark brown slightly gravelly clayey SAND with roots. (TOPSOIL)	0.20
2.30	1	ES				Soft orangish brown mottled dark brownish black gravelly CLAY with occasional cobbles of brick, wood, plastic and metal bar. Gravel is angular to subrounded fine to coarse brick and flint. (MADE GROUND)	(2.90) 3.10
3.15	2	ES				Blackish brown clayey gravelly SAND. Gravel is subangular to subrounded fine to coarse brick, plastic and flint. (MADE GROUND) Flint cobbles with depth and more gravelly.	(0.30) 3.40
						Orangish brown mottled dark brown clayey SAND and GRAVEL of flint with medium cobble content of flint. (LOWESTOFT FORMATION)	3.50
						Trial pit terminated at 3.5mbgl.	

Plan (Not to Scale)



General Remarks

1. Trial pit remained stable during excavation.
2. Slight water seepage from 2.9mbgl.
3. Ease of trial pit excavation: moderate.
4. Trial pit backfilled with arisings upon completion.

All dimensions in metres | Scale: 1:25

Method Used: Machine dug	Plant Used: JCB-3CX	Logged By: HBennett	Checked By: DLS	AGS

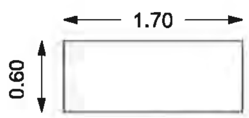
FINAL

TRIAL PIT LOG

Contract: SFGC, Harlow		Client: Mace LTD		Trial Pit: TP19
Contract Ref: 29763	Start: 17.04.18 End: 17.04.18	Ground Level: ---	Co-ordinates: ---	Sheet: 1 of 1

Samples and In-situ Tests				Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
Depth	No	Type	Results					
0.20	1	ES				Grass overlying dark brown clayey SAND with rare gravel of flint and roots. (TOPSOIL)	0.20	
0.40	2	ES				Light brown clayey gravelly SAND. Gravel is angular to subangular fine to coarse brick, concrete and flint. (MADE GROUND)	(0.40) 0.60	
						Firm light brown mottled grey sandy very gravelly CLAY. Gravel is subangular fine to coarse flint. (LOWESTOFT FORMATION)	(1.00) 1.60	
						Trial pit terminated at 1.6mbgl.		

Plan (Not to Scale)



General Remarks

1. Trial pit remained dry and stable during excavation.
2. Ease of trial pit excavation: moderate.
3. Trial pit backfilled with arisings upon completion.

All dimensions in metres | Scale: 1:25

Method Used: Machine dug	Plant Used: JCB-3CX	Logged By: HBennett	Checked By: DLS

FINAL
BOREHOLE LOG

Contract: SFGC, Harlow	Client: Mace LTD	Borehole: BH1
Contract Ref: 29763 — Start: 23.04.18 End: 24.04.18	Ground Level: --- — Co-ordinates: ---	Sheet: 1 of 3

Depth	No	Type	Results	Water	Backfill & Instru-mentation	Description of Strata	Depth (Thickness)	Material Graphic Legend
0.00-0.50	B1	B				Grass overlying dark brown sandy slightly gravelly CLAY with roots. Gravel is angular to subrounded fine to coarse flint. (TOPSOIL)	0.30	
0.50-1.00	B2	B				Firm dark brown mottled grey sandy gravelly CLAY. Gravel is angular fine chalk and flint. (LOWESTOFT FORMATION)		
1.10	D1	D						
1.20	U1	U	75 blows					
1.70	D2	D						
1.90	D3	D						
2.00-2.45	1	SPT	N=23					
							(4.30)	
2.70	D4	D						
3.00	U2	U	80 blows			. . . Becoming stiff with depth and with occasional cobbles of flint and chalk.		
3.50	D5	D						
3.80	D6	D						
4.00-4.45	2	SPT	N=32				4.60	
4.70	D7	D				Medium dense orange brown mottled white slightly clayey very sandy GRAVEL of fine to coarse angular to subrounded flint. (KESGRAVE CATCHMENT SUBGROUP)		
5.00-5.45	3	SPT(c)	N=37					
							(2.10)	
6.00	D8	D						
6.50-6.95	4	SPT(c)	N=15				6.70	
						Firm to stiff dark brown mottled grey sandy gravelly CLAY. Gravel is angular to subrounded chalk and flint. (LOWESTOFT FORMATION)		
7.50	D9	D						
8.00-8.45	5	SPT	N=36					

Boring Progress and Water Observations

Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth

Chiselling / Slow Progress

From	To	Duration (hh:mm)

General Remarks

1. Inspection pit hand dug to 1.2m depth.
2. No groundwater encountered.
3. Borehole complete at 25m depth.
4. Standpipe installed to 8.0mbgl, sealed with bentonite and capped with a flush cover.
5. Borehole drilled in 150mm to 19mbgl.

All dimensions in metres — Scale: 1:50

Method Used: Inspection pit + Cable percussion	Plant Used: Dando 2000 Mark 2	Drilled By: Dave Hutson	Logged By: HBennett	Checked By: DLS	AGS

FINAL

BOREHOLE LOG

Contract:	Client:	Borehole:
SFGC, Harlow	Mace LTD	BH2

Contract Ref:	Start:	Ground Level:	Co-ordinates:	Sheet:
29763	16.04.18	---	---	1 of 3
	End: 24.04.18			

Samples and In-situ Tests

Depth	No	Type	Results
1.20-1.65	1	SPT	N=16
2.00-2.45	2	SPT	N=22
3.00-3.45	3	SPT	N=28
4.00-4.45	U1	U	62 blows
4.45-4.50	D4	D	
5.00-5.45	4	SPT(c)	N=25
6.00	D6	D	
6.50-6.95	U2	U	60 blows
6.95-7.00	D7	D	
7.50	D8	D	
8.00-8.45	5	SPT	N=32

Description of Strata

Description of Strata	Depth (Thickness)
Tarmac overlying light grey gravelly SAND. Gravel is angular to subrounded fine to coarse concrete and flint. (MADE GROUND)	0.40
Firm to stiff orangish brown mottled grey silty sandy very gravelly CLAY. Gravel is angular to subrounded fine to medium chalk and flint. (LOWESTOFT FORMATION)	(4.00) 4.40
Reddish brown clayey very gravelly SAND with occasional medium to coarse cobble of flint. (KESGRAVE CATCHMENT SUBGROUP)	(0.60) 5.00
Medium dense orangish brown mottled white very sandy angular to subrounded fine to coarse GRAVEL with high cobble content. (KESGRAVE CATCHMENT SUBGROUP)	(1.20) 6.20
Firm grey silty sandy very gravelly CLAY. Gravel is angular to subangular fine chalk and flint. (LOWESTOFT FORMATION)	
. . . Fine flint cobbles with depth.	(5.60)

Boring Progress and Water Observations

Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth

Chiselling / Slow Progress

From	To	Duration (hh:mm)

General Remarks

1. Inspection pit hand dug to 1.2m depth.
2. Possible groundwater seepage at 4.5m depth.
3. Borehole complete at 25m depth.
4. Standpipe installed to 6mbgl, sealed with bentonite and capped with a flush cover.
5. Borehole drilled in 200mm casing to 12mbgl and 150mm to 25mbgl.

All dimensions in metres | Scale: 1:50

Method Used:	Plant Used:	Drilled By:	Logged By:	Checked By:
Inspection pit + Cable percussion	Dando 2000 Mark 2	Derick Watts	HBennett	DLS

AGS

FINAL

BOREHOLE LOG

Contract: SFGC, Harlow	Client: Mace LTD	Borehole: BH4
Contract Ref: 29763 / Start: 16.04.18 / End: 20.04.18	Ground Level: --- / Co-ordinates: ---	Sheet: 1 of 3

Depth	No	Type	Results	Water	Backfill & Instrumentation	Description of Strata	Depth (Thickness)	Material Graphic Legend
						Grass overlying dark brown slightly gravelly sandy CLAY with roots. Gravel is subangular to subrounded fine to medium flint. (TOPSOIL)	0.30	
0.30-0.80	B1	B				Firm dark brown sandy gravelly CLAY with occasional cobbles of flint. Gravel is angular to subrounded fine to coarse flint and chalk. (LOWESTOFT FORMATION)	(3.60)	
0.80-1.20	B2	B						
1.20	U1	U	40 blows					
1.45	D1	D						
2.00-2.45	1	SPT	N=19					
3.00	U2	U	60 blows					
3.45	D3	D					3.90	
4.00-4.45	2	SPT	N=7			Firm orangish brown slightly sandy slightly gravelly CLAY with low cobble content. Gravel is angular to subrounded fine to coarse flint. (LOWESTOFT FORMATION)	(0.60) 4.50	
						Medium dense orangish brown slightly clayey gravelly SAND. Gravel is subangular fine to coarse flint. (KESGRAVE CATCHMENT SUBGROUP)	(0.70) 5.20	
5.00-5.45	3	SPT(c)	N=15			Firm to stiff orangish brown mottled dark grey sandy gravelly CLAY. Gravel is subangular to subrounded fine to coarse flint and chalk. (LOWESTOFT FORMATION)		
6.50-6.95	4	SPT(c)	N=27					
7.50-7.95	5	SPT	N=30					

Boring Progress and Water Observations						Chiselling / Slow Progress		
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth	From	To	Duration (hh:mm)

General Remarks

1. Inspection pit hand dug to 1.2m depth.
2. Possible groundwater seepage at 15.2m depth.
3. Borehole complete at 25m depth.
4. Standpipe installed to 18mbgl, sealed with bentonite and capped with a flush cover.
5. Borehole drilled in 200mm casing to 12mbgl

All dimensions in metres | Scale: 1:50

Method Used: Inspection pit + Cable percussion	Plant Used: Dando 2000 Mark 2	Drilled By: Mark Bass	Logged By: HBennett	Checked By: DLS	AGS

FINAL
BOREHOLE LOG

Contract: SFGC, Harlow		Client: Mace LTD		Borehole: BH5
Contract Ref: 29763	Start: 16.04.18 End: 24.04.18	Ground Level: ---	Co-ordinates: ---	Sheet: 1 of 3

Depth	No	Type	Results	Water	Backfill & Instrumentation	Description of Strata	Depth (Thickness)	Material Graphic Legend
						Tarmac overlying light grey gravelly SAND. Gravel is angular to subangular fine to coarse concrete and flint. (MADE GROUND)	0.40	
						Firm dark brown sandy gravelly CLAY with low cobble content of flint and chalk. Gravel is angular to subrounded fine to coarse flint and chalk. (LOWESTOFT FORMATION)		
1.20-1.45	U1	U	50 blows					
1.65-1.70	D1	D						
2.00-2.45	1	SPT	N=24				(3.40)	
3.00-3.45	U2	U	46 blows					
3.45-3.50	D3	D					3.80	
						Medium dense orangish brown clayey gravelly SAND. Gravel is angular to subrounded fine to coarse flint. (KESGRAVE CATCHMENT SUBGROUP)		
4.00-4.45	2	SPT	N=19				(0.70)	
							4.50	
						Medium dense orangish brown mottled black sandy angular to subrounded fine to coarse GRAVEL with medium fine to medium cobble content. (KESGRAVE CATCHMENT SUBGROUP)		
5.00-5.45	3	SPT(c)	N=24				(1.40)	
							5.90	
						Firm to stiff orangish brown silty gravelly very sandy CLAY. Gravel is angular to subrounded fine to coarse flint and chalk. (LOWESTOFT FORMATION)		
6.00	D6	D						
6.50-6.95	U3	U	60 blows					
6.95-7.00	D7	D						
7.00	D8	D						
8.00-8.45	4	SPT	N=34					

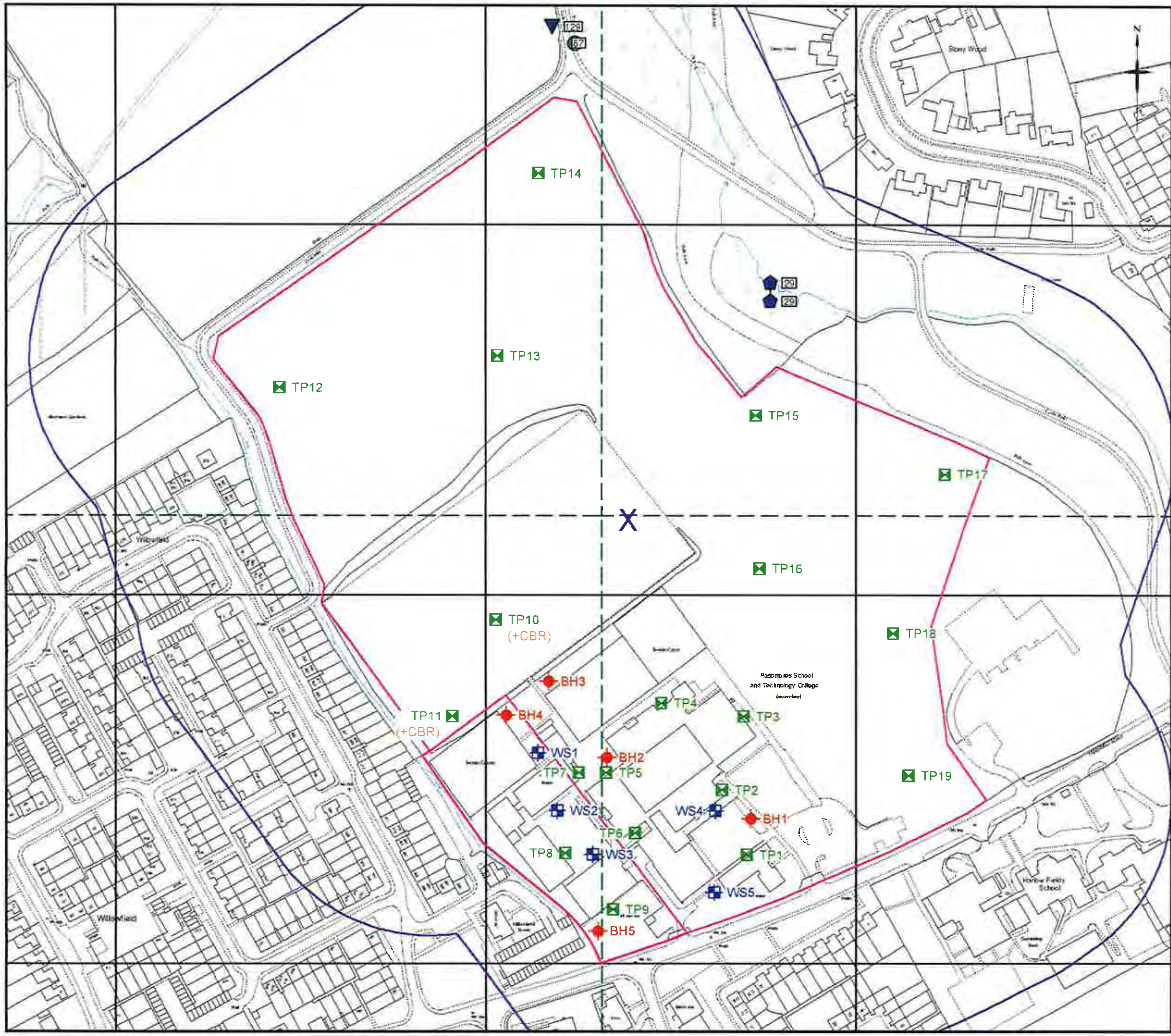
Boring Progress and Water Observations						Chiselling / Slow Progress		
Date	Time	Borehole Depth	Casing Depth	Borehole Diameter (mm)	Water Depth	From	To	Duration (hh:mm)

General Remarks

1. Inspection pit hand dug to 1.2m depth.
2. No groundwater encountered.
3. Borehole complete at 25m depth.
4. Standpipe installed to 6mbgl, sealed with bentonite and capped with a flush cover.
5. Borehole drilled in 250mm casing to 12.5mbgl and 150mm to 25mbgl.

All dimensions in metres | Scale: 1:50

Method Used: Inspection pit + Cable percussion	Plant Used: Dando 2000 Mark 2	Drilled By: Derick Watts	Logged By: HBennett	Checked By: DLS



LEGEND

- Site Boundary
- Borehole Location
- Window Sample Location
- Trial Pit Location
- CBR Location

Rev.	Date	Amendment	Drawn	Chkd.	Appd.

RSK

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Client

MACE GROUP LTD

Project Title

SIR FREDERICK GIBBERD COLLEGE

Drawing Title

EXPLORATORY HOLE LOCATION PLAN

Drawn	Date	Checked	Date	Approved	Date
ASC	05.04.18	HB	05.04.18	HB	05.04.18

Scale	Orig Size	Dimensions
1:2000	A3	m

Project No. 29763 - R01 (00)

Drawing File 29763 (R01-00) Fig 2.dwg

Drawing No. FIGURE 2

Rev P1

Scale 1 : 2,000
0 20 40 60 80 100m

Alan Wood & Partners

APPENDIX C

Hydraulic Model Study

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	100	PIMP (%)	100
M5-60 (mm)	20.000	Add Flow / Climate Change (%)	0
Ratio R	0.441	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for Storm

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	28.133	0.094	299.3	0.968	4.00	0.0	0.600	o	300	Pipe/Conduit	🔒
S1.001	98.693	0.479	206.0	1.000	0.00	0.0	0.600	o	375	Pipe/Conduit	🔒
S1.002	29.191	0.146	199.9	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	🔒

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	50.00	4.52	64.700	0.968	0.0	0.0	0.0	0.90	63.9«	131.1
S1.001	50.00	5.83	64.531	1.968	0.0	0.0	0.0	1.26	139.0«	266.5
S1.002	50.00	6.21	64.052	1.968	0.0	0.0	0.0	1.28	141.1«	266.5

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.968	0.968	0.968
1.001	-	-	100	1.000	1.000	1.000
1.002	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				1.968	1.968	1.968

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.002	S	67.550	63.906	0.000	0	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Storage Structures	0
Number of Online Controls	0	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Storm Duration (mins)	30
Ratio R	0.441		

Summary Wizard of 15 minute 1 year Summer I+0% for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Storage Structures 0
Number of Online Controls 0 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.441
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 20.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 60, 240
Return Period(s) (years) 1, 10, 30, 100
Climate Change (%) 0, 0, 0, 40

PN	US/MH Name	Storm Rank	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
S1.000	S1	16	65.783	0.783	0.000	1.87		108.1	SURCHARGED
S1.001	S2	16	65.522	0.616	0.000	1.40		186.3	SURCHARGED
S1.002	S3	16	64.571	0.144	0.000	1.45		179.8	SURCHARGED

Summary Wizard of 60 minute 1 year Summer I+0% for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Storage Structures 0
Number of Online Controls 0 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.441
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 20.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 60, 240
Return Period(s) (years) 1, 10, 30, 100
Climate Change (%) 0, 0, 0, 40

PN	US/MH Name	Storm Rank	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
S1.000	S1	18	65.237	0.237	0.000	1.39		80.0	SURCHARGED
S1.001	S2	18	65.078	0.172	0.000	1.13		150.2	SURCHARGED
S1.002	S3	18	64.471	0.044	0.000	1.19		147.5	SURCHARGED

Summary Wizard of 240 minute 1 year Summer I+0% for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	0
Number of Online Controls	0	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.441
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	20.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0	DVD Status	OFF
Analysis Timestep	Fine	Inertia Status	OFF
DTS Status	ON		

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 60, 240
Return Period(s) (years)	1, 10, 30, 100
Climate Change (%)	0, 0, 0, 40

PN	US/MH Name	Storm Rank	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
S1.000	S1	23	64.871	-0.129	0.000	0.62		35.8	OK
S1.001	S2	23	64.728	-0.178	0.000	0.53		71.4	OK
S1.002	S3	23	64.258	-0.169	0.000	0.57		70.7	OK

Summary Wizard of 15 minute 10 year Summer I+0% for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	0
Number of Online Controls	0	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.441
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	20.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0	DVD Status	OFF
Analysis Timestep	Fine	Inertia Status	OFF
DTS Status	ON		

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 60, 240
Return Period(s) (years)	1, 10, 30, 100
Climate Change (%)	0, 0, 0, 40

PN	US/MH Name	Storm Rank	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
S1.000	S1	9	67.406	2.406	16.440	2.56		147.6	FLOOD
S1.001	S2	8	67.228	2.322	0.000	2.10		280.3	SURCHARGED
S1.002	S3	9	65.008	0.581	0.000	2.24		278.5	SURCHARGED

Summary Wizard of 60 minute 10 year Summer I+0% for Storm

Simulation Criteria

Areal Reduction Factor 1.000
Hot Start (mins) 0
Hot Start Level (mm) 0
Manhole Headloss Coeff (Global) 0.500
Foul Sewage per hectare (l/s) 0.000
Additional Flow - % of Total Flow 0.000
MADD Factor * 10m³/ha Storage 2.000
Inlet Coeffiecient 0.800
Flow per Person per Day (l/per/day) 0.000

Number of Input Hydrographs 0
Number of Online Controls 0
Number of Offline Controls 0
Number of Storage Structures 0
Number of Time/Area Diagrams 0
Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR
Region England and Wales
M5-60 (mm) 20.000
Ratio R 0.441
Cv (Summer) 0.750
Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep Fine
DTS Status ON
DVD Status OFF
Inertia Status OFF

Profile(s) Summer and Winter
Duration(s) (mins) 15, 60, 240
Return Period(s) (years) 1, 10, 30, 100
Climate Change (%) 0, 0, 0, 40

PN	US/MH Name	Storm Rank	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
S1.000	S1	12	66.963	1.963	0.000	2.08		120.3	SURCHARGED
S1.001	S2	12	66.548	1.642	0.000	1.87		249.4	SURCHARGED
S1.002	S3	12	64.854	0.427	0.000	2.01		249.3	SURCHARGED

Summary Wizard of 240 minute 10 year Summer I+0% for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	0
Number of Online Controls	0	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.441
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	20.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0	DVD Status	OFF
Analysis Timestep	Fine	Inertia Status	OFF
DTS Status	ON		

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 60, 240
Return Period(s) (years)	1, 10, 30, 100
Climate Change (%)	0, 0, 0, 40

PN	US/MH Name	Storm Rank	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
S1.000	S1	20	65.006	0.006	0.000	1.10		63.7	SURCHARGED
S1.001	S2	20	64.826	-0.080	0.000	0.95		127.0	OK
S1.002	S3	20	64.382	-0.045	0.000	1.00		124.3	OK

Summary Wizard of 15 minute 30 year Summer I+0% for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	0
Number of Online Controls	0	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.441
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	20.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0	DVD Status	OFF
Analysis Timestep	Fine	Inertia Status	OFF
DTS Status	ON		

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 60, 240
Return Period(s) (years)	1, 10, 30, 100
Climate Change (%)	0, 0, 0, 40

PN	US/MH Name	Storm Rank	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
S1.000	S1	6	67.443	2.443	52.821	3.51		202.5	FLOOD
S1.001	S2	6	67.494	2.588	0.000	2.18		290.6	SURCHARGED
S1.002	S3	6	65.060	0.633	0.000	2.33		289.4	SURCHARGED

Summary Wizard of 60 minute 30 year Summer I+0% for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Storage Structures 0
Number of Online Controls 0 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.441
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 20.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 60, 240
Return Period(s) (years) 1, 10, 30, 100
Climate Change (%) 0, 0, 0, 40

PN	US/MH Name	Storm Rank	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
S1.000	S1	8	67.411	2.411	20.798	2.82		162.9	FLOOD
S1.001	S2	9	67.200	2.294	0.000	2.11		281.2	SURCHARGED
S1.002	S3	8	65.013	0.586	0.000	2.26		281.5	SURCHARGED

Summary Wizard of 240 minute 30 year Summer I+0% for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Storage Structures 0
Number of Online Controls 0 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.441
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 20.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 60, 240
Return Period(s) (years) 1, 10, 30, 100
Climate Change (%) 0, 0, 0, 40

PN	US/MH Name	Storm Rank	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
S1.000	S1	17	65.350	0.350	0.000	1.32		76.3	SURCHARGED
S1.001	S2	17	65.177	0.271	0.000	1.17		156.3	SURCHARGED
S1.002	S3	17	64.490	0.063	0.000	1.26		156.5	SURCHARGED

Summary Wizard of 15 minute 100 year Summer I+40% for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Storage Structures 0
Number of Online Controls 0 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.441
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 20.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 60, 240
Return Period(s) (years) 1, 10, 30, 100
Climate Change (%) 0, 0, 0, 40

PN	US/MH Name	Storm Rank	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
S1.000	S1	2	67.622	2.622	231.782	3.87		223.2	FLOOD
S1.001	S2	2	68.030	3.124	9.965	2.41		321.6	FLOOD
S1.002	S3	2	65.239	0.812	0.000	2.59		321.6	SURCHARGED

Summary Wizard of 60 minute 100 year Summer I+40% for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	0
Number of Online Controls	0	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.441
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	20.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0	DVD Status	OFF
Analysis Timestep	Fine	Inertia Status	OFF
DTS Status	ON		

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 60, 240
Return Period(s) (years)	1, 10, 30, 100
Climate Change (%)	0, 0, 0, 40

PN	US/MH Name	Storm Rank	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
S1.000	S1	4	67.600	2.600	209.632	3.59		207.3	FLOOD
S1.001	S2	3	67.679	2.773	0.000	2.28		304.3	SURCHARGED
S1.002	S3	3	65.142	0.715	0.000	2.45		304.2	SURCHARGED

Summary Wizard of 240 minute 100 year Summer I+40% for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	0
Number of Online Controls	0	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.441
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	20.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0	DVD Status	OFF
Analysis Timestep	Fine	Inertia Status	OFF
DTS Status	ON		

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 60, 240
Return Period(s) (years)	1, 10, 30, 100
Climate Change (%)	0, 0, 0, 40

PN	US/MH Name	Storm Rank	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
S1.000	S1	11	67.393	2.393	2.944	2.33		134.4	FLOOD
S1.001	S2	11	66.984	2.078	0.000	2.03		271.1	SURCHARGED
S1.002	S3	11	64.957	0.530	0.000	2.18		271.1	SURCHARGED

Summary Wizard of 15 minute 1 year Winter I+0% for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Storage Structures 0
Number of Online Controls 0 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.441
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 20.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 60, 240
Return Period(s) (years) 1, 10, 30, 100
Climate Change (%) 0, 0, 0, 40

PN	US/MH Name	Storm Rank	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
S1.000	S1	15	65.891	0.891	0.000	1.86		107.5	SURCHARGED
S1.001	S2	15	65.664	0.758	0.000	1.47		196.0	SURCHARGED
S1.002	S3	15	64.609	0.182	0.000	1.54		190.9	SURCHARGED

Summary Wizard of 60 minute 1 year Winter I+0% for Storm

Simulation Criteria

Areal Reduction Factor 1.000
Hot Start (mins) 0
Hot Start Level (mm) 0
Manhole Headloss Coeff (Global) 0.500
Foul Sewage per hectare (l/s) 0.000
Additional Flow - % of Total Flow 0.000
MADD Factor * 10m³/ha Storage 2.000
Inlet Coeffiecient 0.800
Flow per Person per Day (l/per/day) 0.000

Number of Input Hydrographs 0
Number of Online Controls 0
Number of Offline Controls 0
Number of Storage Structures 0
Number of Time/Area Diagrams 0
Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR
Region England and Wales
M5-60 (mm) 20.000
Ratio R 0.441
Cv (Summer) 0.750
Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep Fine
DTS Status ON
DVD Status OFF
Inertia Status OFF

Profile(s) Summer and Winter
Duration(s) (mins) 15, 60, 240
Return Period(s) (years) 1, 10, 30, 100
Climate Change (%) 0, 0, 0, 40

PN	US/MH Name	Storm Rank	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
S1.000	S1	19	65.041	0.041	0.000	1.21		69.6	SURCHARGED
S1.001	S2	19	64.914	0.008	0.000	1.01		134.5	SURCHARGED
S1.002	S3	19	64.432	0.005	0.000	1.07		133.6	SURCHARGED

Summary Wizard of 240 minute 1 year Winter I+0% for Storm

Simulation Criteria

Areal Reduction Factor 1.000
Hot Start (mins) 0
Hot Start Level (mm) 0
Manhole Headloss Coeff (Global) 0.500
Foul Sewage per hectare (l/s) 0.000
Additional Flow - % of Total Flow 0.000
MADD Factor * 10m³/ha Storage 2.000
Inlet Coeffiecient 0.800
Flow per Person per Day (l/per/day) 0.000

Number of Input Hydrographs 0
Number of Online Controls 0
Number of Offline Controls 0
Number of Storage Structures 0
Number of Time/Area Diagrams 0
Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR
Region England and Wales
M5-60 (mm) 20.000
Ratio R 0.441
Cv (Summer) 0.750
Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep Fine
DTS Status ON
DVD Status OFF
Inertia Status OFF

Profile(s) Summer and Winter
Duration(s) (mins) 15, 60, 240
Return Period(s) (years) 1, 10, 30, 100
Climate Change (%) 0, 0, 0, 40

PN	US/MH Name	Storm Rank	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
S1.000	S1	24	64.843	-0.157	0.000	0.46		26.6	OK
S1.001	S2	24	64.697	-0.209	0.000	0.40		54.0	OK
S1.002	S3	24	64.225	-0.202	0.000	0.43		53.9	OK

Summary Wizard of 15 minute 10 year Winter I+0% for Storm

Simulation Criteria

Areal Reduction Factor 1.000
Hot Start (mins) 0
Hot Start Level (mm) 0
Manhole Headloss Coeff (Global) 0.500
Foul Sewage per hectare (l/s) 0.000
Additional Flow - % of Total Flow 0.000
MADD Factor * 10m³/ha Storage 2.000
Inlet Coeffiecient 0.800
Flow per Person per Day (l/per/day) 0.000

Number of Input Hydrographs 0
Number of Online Controls 0
Number of Offline Controls 0
Number of Storage Structures 0
Number of Time/Area Diagrams 0
Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR
Region England and Wales
M5-60 (mm) 20.000
Ratio R 0.441
Cv (Summer) 0.750
Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep Fine
DTS Status ON
DVD Status OFF
Inertia Status OFF

Profile(s) Summer and Winter
Duration(s) (mins) 15, 60, 240
Return Period(s) (years) 1, 10, 30, 100
Climate Change (%) 0, 0, 0, 40

PN	US/MH Name	Storm Rank	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
S1.000	S1	7	67.418	2.418	28.302	3.10		178.8	FLOOD
S1.001	S2	7	67.342	2.436	0.000	2.14		285.6	SURCHARGED
S1.002	S3	7	65.037	0.610	0.000	2.29		284.9	SURCHARGED

Summary Wizard of 60 minute 10 year Winter I+0% for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Storage Structures 0
Number of Online Controls 0 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.441
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 20.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 60, 240
Return Period(s) (years) 1, 10, 30, 100
Climate Change (%) 0, 0, 0, 40

PN	US/MH Name	Storm Rank	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
S1.000	S1	13	66.596	1.596	0.000	1.94		112.0	SURCHARGED
S1.001	S2	13	66.245	1.339	0.000	1.74		232.0	SURCHARGED
S1.002	S3	13	64.767	0.340	0.000	1.86		231.6	SURCHARGED

Summary Wizard of 240 minute 10 year Winter I+0% for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	0
Number of Online Controls	0	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.441
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	20.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0	DVD Status	OFF
Analysis Timestep	Fine	Inertia Status	OFF
DTS Status	ON		

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 60, 240
Return Period(s) (years)	1, 10, 30, 100
Climate Change (%)	0, 0, 0, 40

PN	US/MH Name	Storm Rank	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
S1.000	S1	22	64.908	-0.092	0.000	0.82		47.4	OK
S1.001	S2	22	64.768	-0.138	0.000	0.72		96.1	OK
S1.002	S3	22	64.301	-0.126	0.000	0.77		95.9	OK

Summary Wizard of 15 minute 30 year Winter I+0% for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	0
Number of Online Controls	0	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.441
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	20.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0	DVD Status	OFF
Analysis Timestep	Fine	Inertia Status	OFF
DTS Status	ON		

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 60, 240
Return Period(s) (years)	1, 10, 30, 100
Climate Change (%)	0, 0, 0, 40

PN	US/MH Name	Storm Rank	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
S1.000	S1	5	67.464	2.464	73.629	3.66		211.4	FLOOD
S1.001	S2	5	67.502	2.596	0.000	2.20		293.6	SURCHARGED
S1.002	S3	5	65.076	0.649	0.000	2.36		293.4	SURCHARGED

Summary Wizard of 60 minute 30 year Winter I+0% for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Storage Structures 0
Number of Online Controls 0 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.441
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 20.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 60, 240
Return Period(s) (years) 1, 10, 30, 100
Climate Change (%) 0, 0, 0, 40

PN	US/MH Name	Storm Rank	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
S1.000	S1	10	67.400	2.400	10.470	2.57		148.5	FLOOD
S1.001	S2	10	67.079	2.173	0.000	2.07		276.1	SURCHARGED
S1.002	S3	10	64.982	0.555	0.000	2.21		275.3	SURCHARGED

Summary Wizard of 240 minute 30 year Winter I+0% for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Storage Structures 0
Number of Online Controls 0 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.441
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 20.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 60, 240
Return Period(s) (years) 1, 10, 30, 100
Climate Change (%) 0, 0, 0, 40

PN	US/MH Name	Storm Rank	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
S1.000	S1	21	65.000	0.000	0.000	1.05		60.6	OK
S1.001	S2	21	64.814	-0.092	0.000	0.92		122.4	OK
S1.002	S3	21	64.349	-0.078	0.000	0.98		122.3	OK

Summary Wizard of 15 minute 100 year Winter I+40% for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	0
Number of Online Controls	0	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.441
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	20.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0	DVD Status	OFF
Analysis Timestep	Fine	Inertia Status	OFF
DTS Status	ON		

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 60, 240
Return Period(s) (years)	1, 10, 30, 100
Climate Change (%)	0, 0, 0, 40

PN	US/MH Name	Storm Rank	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
S1.000	S1	1	67.673	2.673	283.458	3.90		225.0	FLOOD
S1.001	S2	1	68.037	3.131	17.165	2.41		322.1	FLOOD
S1.002	S3	1	65.242	0.815	0.000	2.59		322.1	SURCHARGED

Summary Wizard of 60 minute 100 year Winter I+40% for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Storage Structures 0
Number of Online Controls 0 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.441
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 20.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 60, 240
Return Period(s) (years) 1, 10, 30, 100
Climate Change (%) 0, 0, 0, 40

PN	US/MH Name	Storm Rank	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
S1.000	S1	3	67.619	2.619	229.085	3.79		218.7	FLOOD
S1.001	S2	4	67.575	2.669	0.000	2.25		300.7	SURCHARGED
S1.002	S3	4	65.118	0.691	0.000	2.42		300.6	SURCHARGED

Summary Wizard of 240 minute 100 year Winter I+40% for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Storage Structures 0
Number of Online Controls 0 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.441
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 20.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 60, 240
Return Period(s) (years) 1, 10, 30, 100
Climate Change (%) 0, 0, 0, 40

PN	US/MH Name	Storm Rank	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
S1.000	S1	14	66.351	1.351	0.000	1.87		107.9	SURCHARGED
S1.001	S2	14	66.022	1.116	0.000	1.65		220.0	SURCHARGED
S1.002	S3	14	64.720	0.293	0.000	1.76		219.4	SURCHARGED

APPENDIX D

Surface Water Storage Calculations

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	100.520	0.520	12.0	197.7	O K
30 min Summer	100.655	0.655	12.0	248.9	O K
60 min Summer	100.774	0.774	12.0	293.9	O K
120 min Summer	100.853	0.853	12.0	324.2	O K
180 min Summer	100.868	0.868	12.0	329.9	O K
240 min Summer	100.859	0.859	12.0	326.3	O K
360 min Summer	100.830	0.830	12.0	315.4	O K
480 min Summer	100.799	0.799	12.0	303.6	O K
600 min Summer	100.766	0.766	12.0	291.1	O K
720 min Summer	100.732	0.732	12.0	278.1	O K
960 min Summer	100.657	0.657	12.0	249.6	O K
1440 min Summer	100.521	0.521	12.0	197.9	O K
2160 min Summer	100.365	0.365	12.0	138.6	O K
2880 min Summer	100.261	0.261	11.9	99.4	O K
4320 min Summer	100.167	0.167	11.0	63.4	O K
5760 min Summer	100.139	0.139	9.1	52.8	O K
7200 min Summer	100.123	0.123	7.8	46.6	O K
8640 min Summer	100.111	0.111	6.7	42.3	O K
10080 min Summer	100.103	0.103	5.9	39.1	O K
15 min Winter	100.585	0.585	12.0	222.3	O K
30 min Winter	100.738	0.738	12.0	280.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	78.520	0.0	203.4	18
30 min Summer	50.324	0.0	261.3	33
60 min Summer	30.811	0.0	322.2	62
120 min Summer	18.318	0.0	383.3	122
180 min Summer	13.381	0.0	420.1	180
240 min Summer	10.667	0.0	446.6	224
360 min Summer	7.721	0.0	484.9	282
480 min Summer	6.139	0.0	514.1	346
600 min Summer	5.135	0.0	537.6	416
720 min Summer	4.437	0.0	557.4	486
960 min Summer	3.522	0.0	589.9	618
1440 min Summer	2.541	0.0	638.1	868
2160 min Summer	1.831	0.0	691.2	1232
2880 min Summer	1.450	0.0	730.0	1560
4320 min Summer	1.044	0.0	787.0	2208
5760 min Summer	0.826	0.0	832.0	2944
7200 min Summer	0.689	0.0	867.0	3672
8640 min Summer	0.593	0.0	896.3	4408
10080 min Summer	0.523	0.0	921.2	5136
15 min Winter	78.520	0.0	228.1	18
30 min Winter	50.324	0.0	292.9	33

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	100.872	0.872	12.0	331.5	O K
120 min Winter	100.968	0.968	12.0	367.8	O K
180 min Winter	100.992	0.992	12.0	376.9	O K
240 min Winter	100.987	0.987	12.0	375.1	O K
360 min Winter	100.947	0.947	12.0	359.9	O K
480 min Winter	100.908	0.908	12.0	345.0	O K
600 min Winter	100.863	0.863	12.0	328.0	O K
720 min Winter	100.816	0.816	12.0	310.0	O K
960 min Winter	100.715	0.715	12.0	271.7	O K
1440 min Winter	100.499	0.499	12.0	189.8	O K
2160 min Winter	100.281	0.281	11.9	106.9	O K
2880 min Winter	100.176	0.176	11.3	67.1	O K
4320 min Winter	100.132	0.132	8.5	50.0	O K
5760 min Winter	100.112	0.112	6.8	42.6	O K
7200 min Winter	100.100	0.100	5.7	38.0	O K
8640 min Winter	100.091	0.091	4.9	34.7	O K
10080 min Winter	100.085	0.085	4.3	32.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	30.811	0.0	361.0	62
120 min Winter	18.318	0.0	429.4	118
180 min Winter	13.381	0.0	470.6	176
240 min Winter	10.667	0.0	500.3	230
360 min Winter	7.721	0.0	543.2	294
480 min Winter	6.139	0.0	575.9	368
600 min Winter	5.135	0.0	602.2	446
720 min Winter	4.437	0.0	624.4	524
960 min Winter	3.522	0.0	660.8	676
1440 min Winter	2.541	0.0	714.9	926
2160 min Winter	1.831	0.0	774.3	1256
2880 min Winter	1.450	0.0	817.7	1532
4320 min Winter	1.044	0.0	881.8	2240
5760 min Winter	0.826	0.0	931.9	2936
7200 min Winter	0.689	0.0	971.1	3672
8640 min Winter	0.593	0.0	1004.1	4408
10080 min Winter	0.523	0.0	1032.1	5144

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.440	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 1.400

Time From:	**(mins) To:**	**Area (ha)**
0	4	1.400

Model Details

Storage is Online Cover Level (m) 102.000

Tank or Pond Structure

Invert Level (m) 100.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	380.0	1.000	380.0	1.001	0.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0158-1200-1000-1200
Design Head (m)	1.000
Design Flow (l/s)	12.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	158
Invert Level (m)	100.000
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	12.0
Flush-Flo™	0.312	12.0
Kick-Flo®	0.687	10.1
Mean Flow over Head Range	-	10.2

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)
0.100	5.7	1.200	13.1	3.000	20.2	7.000	30.4
0.200	11.6	1.400	14.1	3.500	21.8	7.500	31.4
0.300	12.0	1.600	15.0	4.000	23.2	8.000	32.4
0.400	11.8	1.800	15.8	4.500	24.6	8.500	33.4
0.500	11.6	2.000	16.7	5.000	25.8	9.000	34.3
0.600	11.1	2.200	17.4	5.500	27.0	9.500	35.2
0.800	10.8	2.400	18.2	6.000	28.2		
1.000	12.0	2.600	18.9	6.500	29.3		

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	100.455	0.455	12.0	366.5	O K
30 min Summer	100.582	0.582	12.0	468.9	O K
60 min Summer	100.703	0.703	12.0	566.1	O K
120 min Summer	100.806	0.806	12.0	648.9	O K
180 min Summer	100.849	0.849	12.0	683.8	O K
240 min Summer	100.868	0.868	12.0	698.8	O K
360 min Summer	100.872	0.872	12.0	702.0	O K
480 min Summer	100.859	0.859	12.0	691.2	O K
600 min Summer	100.842	0.842	12.0	678.0	O K
720 min Summer	100.825	0.825	12.0	664.4	O K
960 min Summer	100.791	0.791	12.0	636.5	O K
1440 min Summer	100.719	0.719	12.0	579.1	O K
2160 min Summer	100.604	0.604	12.0	486.6	O K
2880 min Summer	100.506	0.506	12.0	407.3	O K
4320 min Summer	100.352	0.352	12.0	283.7	O K
5760 min Summer	100.253	0.253	11.9	203.3	O K
7200 min Summer	100.193	0.193	11.5	155.3	O K
8640 min Summer	100.164	0.164	10.8	131.8	O K
10080 min Summer	100.148	0.148	9.8	119.2	O K
15 min Winter	100.511	0.511	12.0	411.3	O K
30 min Winter	100.655	0.655	12.0	527.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	142.829	0.0	361.6	19
30 min Summer	92.260	0.0	468.8	33
60 min Summer	56.713	0.0	588.8	64
120 min Summer	33.709	0.0	700.5	122
180 min Summer	24.562	0.0	765.9	182
240 min Summer	19.521	0.0	811.7	242
360 min Summer	14.048	0.0	876.3	360
480 min Summer	11.131	0.0	925.7	458
600 min Summer	9.286	0.0	965.1	510
720 min Summer	8.005	0.0	998.2	570
960 min Summer	6.329	0.0	1051.6	696
1440 min Summer	4.539	0.0	1129.2	978
2160 min Summer	3.251	0.0	1224.8	1364
2880 min Summer	2.564	0.0	1287.3	1732
4320 min Summer	1.832	0.0	1376.6	2464
5760 min Summer	1.442	0.0	1451.5	3120
7200 min Summer	1.198	0.0	1505.9	3752
8640 min Summer	1.029	0.0	1550.7	4416
10080 min Summer	0.904	0.0	1587.2	5144
15 min Winter	142.829	0.0	405.8	19
30 min Winter	92.260	0.0	525.3	33

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	100.791	0.791	12.0	636.8	O K
120 min Winter	100.908	0.908	12.0	731.2	O K
180 min Winter	100.960	0.960	12.0	772.6	O K
240 min Winter	100.984	0.984	12.0	791.9	O K
360 min Winter	100.995	0.995	12.0	800.8	O K
480 min Winter	100.986	0.986	12.0	794.0	O K
600 min Winter	100.967	0.967	12.0	778.2	O K
720 min Winter	100.942	0.942	12.0	758.2	O K
960 min Winter	100.899	0.899	12.0	723.9	O K
1440 min Winter	100.804	0.804	12.0	647.2	O K
2160 min Winter	100.640	0.640	12.0	515.4	O K
2880 min Winter	100.488	0.488	12.0	392.7	O K
4320 min Winter	100.275	0.275	11.9	221.3	O K
5760 min Winter	100.174	0.174	11.3	140.0	O K
7200 min Winter	100.147	0.147	9.7	117.9	O K
8640 min Winter	100.130	0.130	8.4	104.5	O K
10080 min Winter	100.119	0.119	7.4	95.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	56.713	0.0	659.9	62
120 min Winter	33.709	0.0	785.0	120
180 min Winter	24.562	0.0	858.2	178
240 min Winter	19.521	0.0	909.5	236
360 min Winter	14.048	0.0	981.7	350
480 min Winter	11.131	0.0	1037.0	460
600 min Winter	9.286	0.0	1081.1	564
720 min Winter	8.005	0.0	1118.0	606
960 min Winter	6.329	0.0	1177.7	742
1440 min Winter	4.539	0.0	1263.9	1052
2160 min Winter	3.251	0.0	1372.1	1492
2880 min Winter	2.564	0.0	1442.4	1848
4320 min Winter	1.832	0.0	1543.0	2512
5760 min Winter	1.442	0.0	1626.0	3064
7200 min Winter	1.198	0.0	1687.0	3744
8640 min Winter	1.029	0.0	1737.4	4488
10080 min Winter	0.904	0.0	1779.1	5152

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.440	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 1.400

Time From:	**(mins) To:**	**Area (ha)**
0	4	1.400

Model Details

Storage is Online Cover Level (m) 102.000

Tank or Pond Structure

Invert Level (m) 100.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	805.0	1.000	805.0	1.001	0.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0158-1200-1000-1200
Design Head (m)	1.000
Design Flow (l/s)	12.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	158
Invert Level (m)	100.000
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	12.0
Flush-Flo™	0.312	12.0
Kick-Flo®	0.687	10.1
Mean Flow over Head Range	-	10.2

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)
0.100	5.7	1.200	13.1	3.000	20.2	7.000	30.4
0.200	11.6	1.400	14.1	3.500	21.8	7.500	31.4
0.300	12.0	1.600	15.0	4.000	23.2	8.000	32.4
0.400	11.8	1.800	15.8	4.500	24.6	8.500	33.4
0.500	11.6	2.000	16.7	5.000	25.8	9.000	34.3
0.600	11.1	2.200	17.4	5.500	27.0	9.500	35.2
0.800	10.8	2.400	18.2	6.000	28.2		
1.000	12.0	2.600	18.9	6.500	29.3		

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	100.463	0.463	5.0	143.5	O K
30 min Summer	100.587	0.587	5.0	182.0	O K
60 min Summer	100.704	0.704	5.0	218.3	O K
120 min Summer	100.803	0.803	5.0	248.8	O K
180 min Summer	100.844	0.844	5.0	261.6	O K
240 min Summer	100.861	0.861	5.0	266.9	O K
360 min Summer	100.863	0.863	5.0	267.4	O K
480 min Summer	100.847	0.847	5.0	262.5	O K
600 min Summer	100.829	0.829	5.0	257.1	O K
720 min Summer	100.812	0.812	5.0	251.6	O K
960 min Summer	100.775	0.775	5.0	240.4	O K
1440 min Summer	100.703	0.703	5.0	218.0	O K
2160 min Summer	100.586	0.586	5.0	181.7	O K
2880 min Summer	100.482	0.482	5.0	149.4	O K
4320 min Summer	100.324	0.324	5.0	100.5	O K
5760 min Summer	100.224	0.224	4.9	69.5	O K
7200 min Summer	100.164	0.164	4.7	50.9	O K
8640 min Summer	100.130	0.130	4.5	40.3	O K
10080 min Summer	100.115	0.115	4.1	35.7	O K
15 min Winter	100.520	0.520	5.0	161.1	O K
30 min Winter	100.661	0.661	5.0	204.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	78.520	0.0	144.7	19
30 min Summer	50.324	0.0	185.7	33
60 min Summer	30.811	0.0	229.8	64
120 min Summer	18.318	0.0	273.4	122
180 min Summer	13.381	0.0	299.6	182
240 min Summer	10.667	0.0	318.5	242
360 min Summer	7.721	0.0	345.8	360
480 min Summer	6.139	0.0	366.6	440
600 min Summer	5.135	0.0	383.3	498
720 min Summer	4.437	0.0	397.4	560
960 min Summer	3.522	0.0	420.5	692
1440 min Summer	2.541	0.0	454.6	968
2160 min Summer	1.831	0.0	493.6	1364
2880 min Summer	1.450	0.0	521.3	1732
4320 min Summer	1.044	0.0	562.0	2424
5760 min Summer	0.826	0.0	594.2	3112
7200 min Summer	0.689	0.0	619.2	3816
8640 min Summer	0.593	0.0	640.1	4416
10080 min Summer	0.523	0.0	657.8	5144
15 min Winter	78.520	0.0	162.2	19
30 min Winter	50.324	0.0	208.0	33

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	100.793	0.793	5.0	245.7	O K
120 min Winter	100.906	0.906	5.0	280.9	O K
180 min Winter	100.956	0.956	5.0	296.4	O K
240 min Winter	100.979	0.979	5.0	303.6	O K
360 min Winter	100.989	0.989	5.0	306.6	O K
480 min Winter	100.978	0.978	5.0	303.2	O K
600 min Winter	100.956	0.956	5.0	296.2	O K
720 min Winter	100.931	0.931	5.0	288.6	O K
960 min Winter	100.886	0.886	5.0	274.6	O K
1440 min Winter	100.787	0.787	5.0	243.8	O K
2160 min Winter	100.621	0.621	5.0	192.6	O K
2880 min Winter	100.456	0.456	5.0	141.4	O K
4320 min Winter	100.242	0.242	4.9	75.1	O K
5760 min Winter	100.143	0.143	4.6	44.2	O K
7200 min Winter	100.112	0.112	4.0	34.6	O K
8640 min Winter	100.097	0.097	3.5	30.2	O K
10080 min Winter	100.088	0.088	3.1	27.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	30.811	0.0	257.5	62
120 min Winter	18.318	0.0	306.3	120
180 min Winter	13.381	0.0	335.7	178
240 min Winter	10.667	0.0	356.8	236
360 min Winter	7.721	0.0	387.4	348
480 min Winter	6.139	0.0	410.6	458
600 min Winter	5.135	0.0	429.4	560
720 min Winter	4.437	0.0	445.2	584
960 min Winter	3.522	0.0	470.9	732
1440 min Winter	2.541	0.0	509.0	1042
2160 min Winter	1.831	0.0	552.9	1492
2880 min Winter	1.450	0.0	583.9	1844
4320 min Winter	1.044	0.0	629.6	2508
5760 min Winter	0.826	0.0	665.6	3112
7200 min Winter	0.689	0.0	693.6	3744
8640 min Winter	0.593	0.0	717.1	4416
10080 min Winter	0.523	0.0	737.1	5144

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.440	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 1.000

Time From:	(mins) To:	Area (ha)
0	4	1.000

Model Details

Storage is Online Cover Level (m) 102.000

Tank or Pond Structure

Invert Level (m) 100.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	310.0	1.000	310.0	1.001	0.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0105-5000-1000-5000
Design Head (m)	1.000
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	105
Invert Level (m)	100.000
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	5.0
Flush-Flo™	0.296	5.0
Kick-Flo®	0.637	4.1
Mean Flow over Head Range	-	4.3

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)
0.100	3.6	1.200	5.4	3.000	8.4	7.000	12.5
0.200	4.8	1.400	5.8	3.500	9.0	7.500	12.9
0.300	5.0	1.600	6.2	4.000	9.6	8.000	13.3
0.400	4.9	1.800	6.6	4.500	10.1	8.500	13.7
0.500	4.7	2.000	6.9	5.000	10.6	9.000	14.1
0.600	4.3	2.200	7.2	5.500	11.1	9.500	14.5
0.800	4.5	2.400	7.5	6.000	11.6		
1.000	5.0	2.600	7.8	6.500	12.1		

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	100.410	0.410	5.0	264.2	O K
30 min Summer	100.526	0.526	5.0	339.3	O K
60 min Summer	100.640	0.640	5.0	412.6	O K
120 min Summer	100.745	0.745	5.0	480.3	O K
180 min Summer	100.797	0.797	5.0	514.0	O K
240 min Summer	100.827	0.827	5.0	533.6	O K
360 min Summer	100.857	0.857	5.0	553.0	O K
480 min Summer	100.870	0.870	5.0	561.4	O K
600 min Summer	100.873	0.873	5.0	562.9	O K
720 min Summer	100.868	0.868	5.0	560.1	O K
960 min Summer	100.848	0.848	5.0	547.2	O K
1440 min Summer	100.807	0.807	5.0	520.4	O K
2160 min Summer	100.747	0.747	5.0	481.5	O K
2880 min Summer	100.688	0.688	5.0	443.9	O K
4320 min Summer	100.565	0.565	5.0	364.5	O K
5760 min Summer	100.461	0.461	5.0	297.5	O K
7200 min Summer	100.376	0.376	5.0	242.3	O K
8640 min Summer	100.306	0.306	5.0	197.5	O K
10080 min Summer	100.252	0.252	5.0	162.6	O K
15 min Winter	100.459	0.459	5.0	296.2	O K
30 min Winter	100.590	0.590	5.0	380.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	142.829	0.0	253.3	19
30 min Summer	92.260	0.0	324.6	34
60 min Summer	56.713	0.0	418.2	64
120 min Summer	33.709	0.0	496.7	124
180 min Summer	24.562	0.0	542.3	182
240 min Summer	19.521	0.0	574.0	242
360 min Summer	14.048	0.0	618.0	362
480 min Summer	11.131	0.0	650.7	482
600 min Summer	9.286	0.0	675.8	600
720 min Summer	8.005	0.0	695.5	720
960 min Summer	6.329	0.0	721.2	896
1440 min Summer	4.539	0.0	713.0	1138
2160 min Summer	3.251	0.0	872.9	1516
2880 min Summer	2.564	0.0	917.0	1936
4320 min Summer	1.832	0.0	980.9	2724
5760 min Summer	1.442	0.0	1036.6	3464
7200 min Summer	1.198	0.0	1075.4	4184
8640 min Summer	1.029	0.0	1107.3	4848
10080 min Summer	0.904	0.0	1133.1	5544
15 min Winter	142.829	0.0	283.2	19
30 min Winter	92.260	0.0	359.1	33

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	100.718	0.718	5.0	463.4	O K
120 min Winter	100.837	0.837	5.0	540.1	O K
180 min Winter	100.898	0.898	5.0	579.0	O K
240 min Winter	100.933	0.933	5.0	602.0	O K
360 min Winter	100.971	0.971	5.0	626.1	O K
480 min Winter	100.989	0.989	5.0	638.0	O K
600 min Winter	100.996	0.996	5.0	642.2	O K
720 min Winter	100.995	0.995	5.0	641.6	O K
960 min Winter	100.979	0.979	5.0	631.8	O K
1440 min Winter	100.926	0.926	5.0	597.0	O K
2160 min Winter	100.850	0.850	5.0	548.4	O K
2880 min Winter	100.771	0.771	5.0	497.4	O K
4320 min Winter	100.596	0.596	5.0	384.5	O K
5760 min Winter	100.436	0.436	5.0	281.0	O K
7200 min Winter	100.315	0.315	5.0	202.9	O K
8640 min Winter	100.229	0.229	4.9	147.5	O K
10080 min Winter	100.171	0.171	4.7	110.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	56.713	0.0	468.2	64
120 min Winter	33.709	0.0	555.7	122
180 min Winter	24.562	0.0	606.1	180
240 min Winter	19.521	0.0	640.9	240
360 min Winter	14.048	0.0	688.2	356
480 min Winter	11.131	0.0	721.9	472
600 min Winter	9.286	0.0	745.1	584
720 min Winter	8.005	0.0	759.0	698
960 min Winter	6.329	0.0	759.7	914
1440 min Winter	4.539	0.0	728.2	1184
2160 min Winter	3.251	0.0	977.5	1624
2880 min Winter	2.564	0.0	1026.7	2104
4320 min Winter	1.832	0.0	1097.7	2980
5760 min Winter	1.442	0.0	1161.2	3688
7200 min Winter	1.198	0.0	1204.7	4392
8640 min Winter	1.029	0.0	1240.7	5008
10080 min Winter	0.904	0.0	1270.2	5552

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.440	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 1.000

Time From:	(mins) To:	Area (ha)
0	4	1.000

Model Details

Storage is Online Cover Level (m) 102.000

Tank or Pond Structure

Invert Level (m) 100.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	645.0	1.000	645.0	1.001	0.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0105-5000-1000-5000
Design Head (m)	1.000
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	105
Invert Level (m)	100.000
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	5.0
Flush-Flo™	0.296	5.0
Kick-Flo®	0.637	4.1
Mean Flow over Head Range	-	4.3

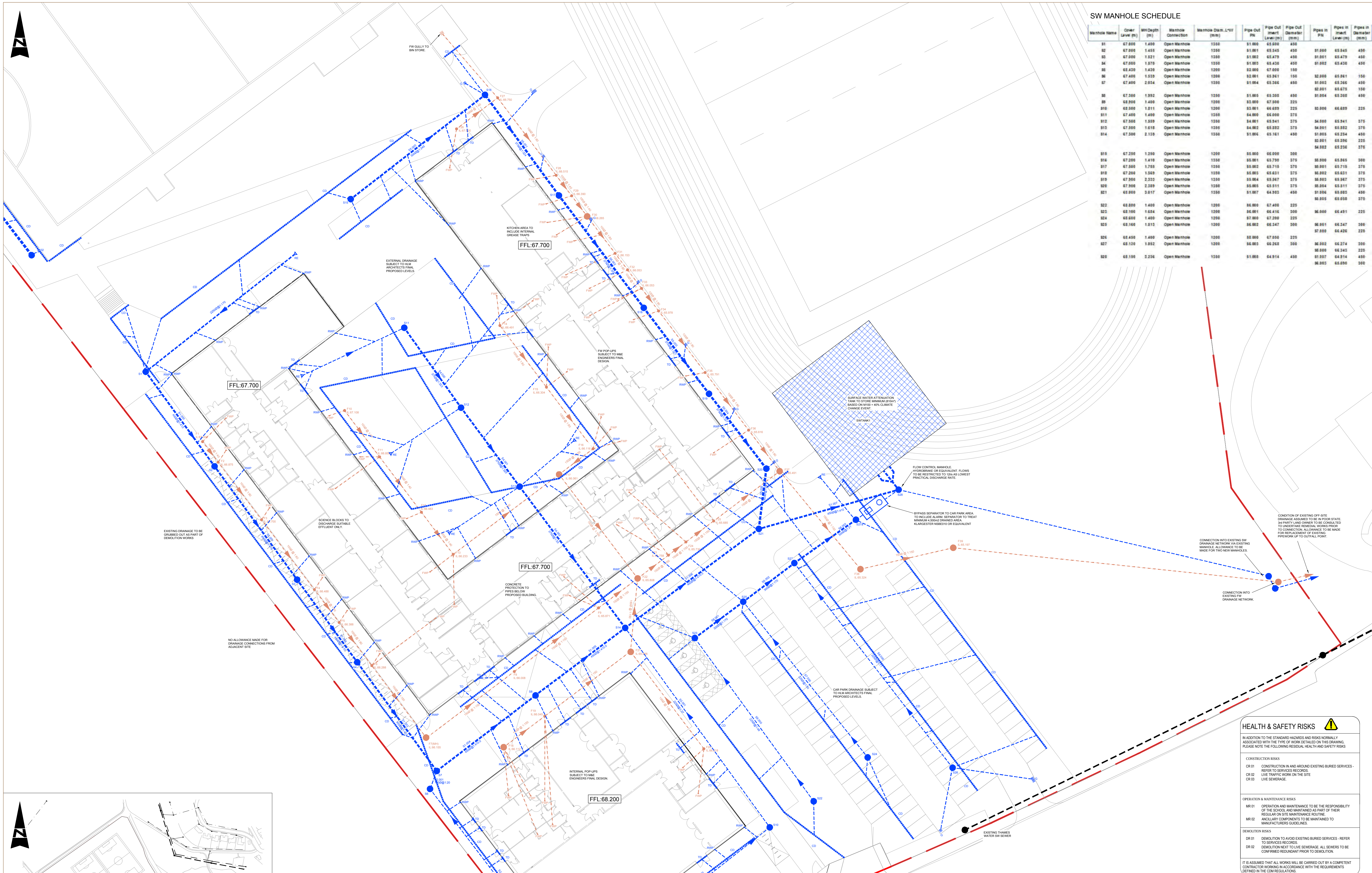
The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

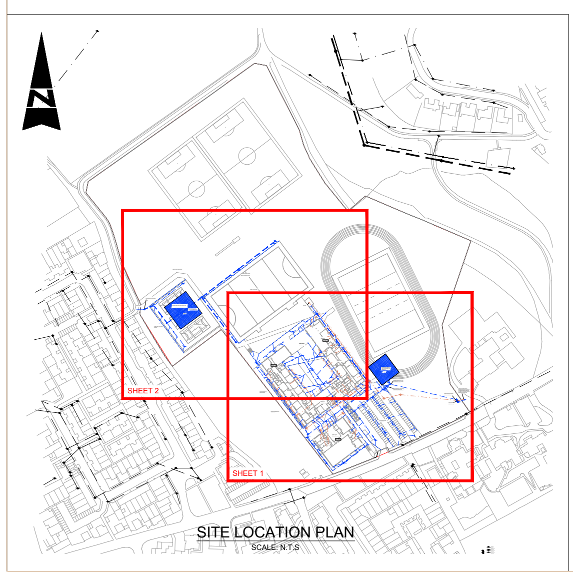
Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.6	1.200	5.4	3.000	8.4	7.000	12.5
0.200	4.8	1.400	5.8	3.500	9.0	7.500	12.9
0.300	5.0	1.600	6.2	4.000	9.6	8.000	13.3
0.400	4.9	1.800	6.6	4.500	10.1	8.500	13.7
0.500	4.7	2.000	6.9	5.000	10.6	9.000	14.1
0.600	4.3	2.200	7.2	5.500	11.1	9.500	14.5
0.800	4.5	2.400	7.5	6.000	11.6		
1.000	5.0	2.600	7.8	6.500	12.1		

Alan Wood & Partners

APPENDIX E

Indicative Drainage Layout Drawings





SW MANHOLE SCHEDULE

Manhole Name	Cover Level (m)	MH Depth (m)	Manhole Connection	Manhole Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)
S1	67.000	1.400	Open Manhole	1350	S1.000	65.600	450			
S2	67.000	1.455	Open Manhole	1350	S1.001	65.545	450	S1.000	65.545	450
S3	67.000	1.521	Open Manhole	1350	S1.002	65.475	450	S1.001	65.479	450
S4	67.000	1.570	Open Manhole	1350	S1.003	65.430	450	S1.002	65.430	450
S5	68.430	1.430	Open Manhole	1200	S2.000	67.000	150			
S6	67.400	1.539	Open Manhole	1200	S2.001	65.861	150	S2.000	65.861	150
S7	67.400	2.034	Open Manhole	1350	S1.004	65.366	450	S1.003	65.366	450
								S2.001	65.675	150
S8	67.300	1.992	Open Manhole	1350	S1.005	65.308	450	S1.004	65.308	450
S9	68.900	1.400	Open Manhole	1200	S3.000	67.500	225			
S10	68.500	1.811	Open Manhole	1200	S3.001	66.689	225	S3.000	66.689	225
S11	67.400	1.400	Open Manhole	1350	S4.000	66.000	375			
S12	67.500	1.559	Open Manhole	1350	S4.001	65.941	375	S4.000	65.941	375
S13	67.500	1.618	Open Manhole	1350	S4.002	65.882	375	S4.001	65.882	375
S14	67.300	2.139	Open Manhole	1350	S1.006	65.161	450	S1.005	65.254	450
								S3.001	65.396	225
								S4.002	65.236	375
S15	67.250	1.250	Open Manhole	1200	S5.000	66.000	300			
S16	67.200	1.410	Open Manhole	1350	S5.001	65.790	375	S5.000	65.865	300
S17	67.500	1.785	Open Manhole	1350	S5.002	65.715	375	S5.001	65.715	375
S18	67.200	1.569	Open Manhole	1350	S5.003	65.631	375	S5.002	65.631	375
S19	67.900	2.333	Open Manhole	1350	S5.004	65.567	375	S5.003	65.567	375
S20	67.900	2.389	Open Manhole	1350	S5.005	65.511	375	S5.004	65.511	375
S21	68.000	3.017	Open Manhole	1350	S1.007	64.983	450	S1.006	65.083	450
								S5.005	65.058	375
S22	68.800	1.400	Open Manhole	1200	S6.000	67.400	225			
S23	68.100	1.684	Open Manhole	1200	S6.001	66.416	300	S6.000	66.491	225
S24	68.600	1.400	Open Manhole	1200	S7.000	67.200	225			
S25	68.160	1.813	Open Manhole	1200	S6.002	66.347	300	S6.001	66.347	300
								S7.000	66.426	225
S26	68.450	1.400	Open Manhole	1200	S8.000	67.050	225			
S27	68.120	1.852	Open Manhole	1200	S6.003	66.268	300	S6.002	66.274	300
								S8.000	66.343	225
S28	68.150	3.236	Open Manhole	1350	S1.008	64.914	450	S1.007	64.914	450
								S6.003	65.090	300

NOTES:

1. This drawing has been prepared in accordance with the scope of CML's appointment with its clients and is subject to the terms and conditions of that appointment. CML accepts no liability for any use of this document other than by its client and only for the purposes for which it was prepared and provided.

2. This drawing is to be read in conjunction with all other relevant drawings and specifications for this project and apparent inconsistencies brought to the attention of the Project Design Manager.

3. Do not sclae directly from drawing - if in doubt ask!

PRIVATE DRAINAGE NOTES:

1. DRAINAGE SYSTEMS TO COMPLY WITH THE FOLLOWING STANDARDS:
- BS EN 752:2008
- BUILDING REGULATIONS APPROVED DOCUMENT PART H, 2015 EDITION

2. ALL COMPONENTS USED IN DRAINAGE SYSTEMS TO COMPLY WITH THE FOLLOWING: BS EN 476:2011
3. ALL DRAINAGE SYSTEMS AND COMPONENTS TO BE CONSTRUCTED AND TESTED TO THE FULL SATISFACTION OF BOTH BUILDING REGULATIONS AND WARRANTY PROVIDER INSPECTORS
4. ALL DRAINAGE TO BE CONSTRUCTED AND TESTED IN ACCORDANCE WITH BS EN 1610:2015.
5. V.C. DENOTES VITRIFIED CLAY, VITRIFIED CLAY PIPES AND FITTINGS TO COMPLY WITH THE RELEVANT PROVISIONS OF BS EN295-1:2013,-2:2013,-3:2012 AND BS 65 RESPECTIVELY AND BE KITEMARKED. ALL PIPES SHALL BE EXTRA STRENGTH TO BS 65 OR EQUIVALENT BS EN295 PIPE CRUSHING STRENGTH.
6. LATERAL DRAIN CONNECTIONS (PIPES CONNECTING INTO ADOPTABLE SEWERS) TO BE VITRIFIED CLAY. WHERE COVER IS LESS THAN 1.2m TO GROUND LEVEL PIPE PROTECTION IS REQUIRED IN THE FORM OF A CONCRETE COVER SLAB.
7. PVC-U DENOTES UNPLASTISED POLYVINYL CHLORIDE . PVC-U PIPES AND FITTINGS TO COMPLY WITH THE RELEVANT PROVISIONS OF BS EN1401, BS EN13476-2 AND BS4660:1989/2000 RESPECTIVELY AND BE KITEMARKED.
8. PRECAST CONCRETE MANHOLES TO BE IN ACCORDANCE WITH BS EN 1917:2002 AND BS 5911-3:2010,-4:2002 AND TO BE KITEMARKED. PRECAST CONCRETE RINGS AND COVER SLABS TO CONCRETE PIPES TO BE JOINTED WITH CEMENT MORTAR UNLESS NOTED OTHERWISE.
9. INSITU AND PRECAST CONCRETE UNITS SHALL HAVE SULPHATE RESISTING PORTLAND CEMENT TO BS EN 197-1:2011.
10. POLYPROPYLENE INSPECTION CHAMBERS TO COMPLY WITH BS EN 13598-1:2010,-2:2016 AND BS 7158:2001 AND TO BE KITEMARKED.
11. MANHOLE COVERS AND FRAMES SHALL COMPLY WITH THE RELEVANT PROVISIONS OF BS EN 124-1 TO 6:2015. MANHOLE COVERS AND FRAMES TO BE OF A NON-ROCKING DESIGN WITH CUSHION INSERTS AND KITEMARKED. LOAD CLASS A15 COVERS TO BE USED IN AREAS INACCESSIBLE TO VEHICLES; LOAD CLASS B125 COVERS TO BE USED IN PRIVATE DRIVES; LOAD CLASS D400 COVERS TO BE USED IN PRIVATE ROADS. ALL COVERS TO BE BADGED "FW" OR "SW" AS APPROPRIATE. MANHOLE COVER SLABS AND ACCESS TO BE IN ACCORDANCE WITH CONCRETE PIPE ASSOCIATION TECHNICAL BULLETIN ISSUED SEPTEMBER 2001.
12. POLYPROPYLENE INSPECTION CHAMBER COVERS AND FRAMES SHALL COMPLY WITH THE RELEVANT PROVISIONS OF BS EN 124-1 TO 6:2015. COVERS AND FRAMES TO BE OF A NON-ROCKING DESIGN WITH CUSHION INSERTS AND KITEMARKED. LOAD CLASS A15 COVERS TO BE USED IN AREAS INACCESSIBLE TO VEHICLES; LOAD CLASS B125 COVERS TO BE USED IN PRIVATE DRIVES; LOAD CLASS D400 COVERS TO BE USED IN PRIVATE ROADS.
13. CLASS Z BEDDING DETAIL SHALL BE PROVIDED:
- WHERE COVER TO PIPE BARREL IS;
  i) <1.2m IN VEHICULAR TRAFFICKED AREAS
  ii) <0.9m IN AREAS INACCESSIBLE TO VEHICLES.
- AT ALL ROAD GULLY, YARD GULLY, RWP, SVP AND DRAINAGE CHANNEL BRANCHES.
- AREAS OF DEEP ROOTING VEGETATION.
- PIPE RUNS NEAR BUILDINGS IN ACCORDANCE WITH TYPICAL SECTIONS ON AWP DETAILS DRAWING.
- WHERE TWO PIPES CROSS WITH A CLEAR GAP OF <300mm. CLASS Z SURROUND TO EXTEND A MINIMUM OF 1.0m FROM THE CENTRE OF THE CROSSING POINT & EXTENDED TO WITHIN 150mm OF THE NEAREST FLEXIBLE JOINT, WHERE REQUIRED.

14. NO MECHANICAL COMPACTION OF FILL MATERIAL WITHIN 300mm OF THE CROWN OF ANY PIPE.

HEALTH & SAFETY RISKS

IN ADDITION TO THE STANDARD HAZARDS AND RISKS NORMALLY ASSOCIATED WITH THE TYPE OF WORK DETAILED ON THIS DRAWING, PLEASE NOTE THE FOLLOWING RESIDUAL HEALTH AND SAFETY RISKS

CONSTRUCTION RISKS

- CR 01 CONSTRUCTION IN AND AROUND EXISTING BURIED SERVICES - REFER TO SERVICES RECORDS.
- CR 02 LIVE TRAFFIC WORK ON THE SITE
- CR 03 LIVE SEWERAGE.

OPERATION & MAINTENANCE RISKS

- MR 01 OPERATION AND MAINTENANCE TO BE THE RESPONSIBILITY OF THE SCHOOL AND MAINTAINED AS PART OF THEIR REGULAR ON SITE MAINTENANCE ROUTINE.
- MR 02 ANCILLARY COMPONENTS TO BE MAINTAINED TO MANUFACTURERS GUIDELINES.

DEMOLITION RISKS

- DR 01 DEMOLITION TO AVOID EXISTING BURIED SERVICES - REFER TO SERVICES RECORDS.
- DR 02 DEMOLITION NEXT TO LIVE SEWERAGE. ALL SEWERS TO BE CONFIRMED REDUNDANT PRIOR TO DEMOLITION.

IT IS ASSUMED THAT ALL WORKS WILL BE CARRIED OUT BY A COMPETENT CONTRACTOR WORKING IN ACCORDANCE WITH THE REQUIREMENTS DEFINED IN THE CDM REGULATIONS.

DRAINAGE KEY

EXG MH — EXISTING* MANHOLE
EXISTING* CW DRAIN RUN
EXISTING* SW DRAIN RUN
EXISTING* FW DRAIN RUN
DRAINAGE TO BE GRUBBED UP
PROPOSED FW DRAIN 100Ø PIPE @ MIN. 1/40 U.N.O
PPIC — PROPOSED FW INSPECTION CHAMBER
FWP — PROPOSED FW POP-UP - BRANCH PIPEWORK 100Ø @ MIN. 1/40
FWMH — PROPOSED FW MANHOLE
PROPOSED SW DRAIN - 150Ø PIPE @ MIN. 1/100 U.N.O
MH — PROPOSED SW MANHOLE
PPIC — PROPOSED SW INSPECTION CHAMBER (R/A DENOTES REDUCED ACCESS)
RWP — PROPOSED SW RAINWATER PIPE, C/W ACCESS PIPE & COVER FOR MAINTENANCE WHERE EXTERNAL. ALL PIPEWORK TO BE 100Ø
RE — PROPOSED SW RODDING EYE
CD — PROPOSED SW DRAINAGE CHANNEL - ACO M150D 0.0 C/W CLASS C250 COVERS WITH LOCKABLE GRATING
TD — PROPOSED SW THRESHOLD DRAINAGE CHANNEL REQUIREMENT TBC BY ARCHITECT
G — PROPOSED SW GULLY
INTERCEPTOR
PROPOSED SW ATTENUATION

* EXISTING SEWER BASED ON TOPOGRAPHICAL, GPR AND ON SITE CCTV SURVEY INFORMATION. ALL SEWERS TO BE LOCATED ON SITE PRIOR TO CONNECTION.

REFER TO ALL OTHER AWP DRAWINGS FOR DRAINAGE DETAILS AND SPECIFICATION.

JOB NO: 41632 - DRAINAGE - DRAWING REFERENCE TABLE

This Drawing to be Read in Conjunction with the Drawings Listed Below

Alan Wood & Partners (Civil)	Drawing Reference
Existing Surface Water Exceedance Flow Path	SFG-AWP-ZZ-XX-DR-C-3001
Proposed Surface Water Exceedance Flow Path	SFG-AWP-ZZ-XX-DR-C-3002
Existing Impermeable Areas	SFG-AWP-ZZ-XX-DR-C-3010
Proposed Impermeable Areas	SFG-AWP-ZZ-XX-DR-C-3011
Drainage Layouts - Sheets 1-2	SFG-AWP-ZZ-XX-DR-C-3300 to 3301
Drainage Details - Sheets 1-3	SFG-AWP-ZZ-XX-DR-C-3700 to 3702
Cut and Fill - Sheets 1-2	SFG-AWP-ZZ-XX-DR-C-4000 to 4001
Site Build up Areas	SFG-AWP-ZZ-XX-DR-C-4400
External Works Details	SFG-AWP-ZZ-XX-DR-C-4700
Drawings by others	**Date Received**
Tower Surveys - Topographical Survey	20.12.2018
HLM Architects - Proposed Site Plan	23.01.2019

REV	REASON FOR REVISION	DATE	BY	CHK
P04	UPDATED FOR PLANNING	14.02.19	LV	TW
P03	DRAWING NUMBER UPDATED	25.01.19	MJC	TW
P02	UPDATED TO SUIT LATEST SITE PLAN	24.01.19	MJC	TW
P01	FIRST ISSUE	17.01.19	GDV	TW

Caledonian

CLIENT:
CALEDONIAN MODULAR

PROJECT REF:
SIR FREDERICK GIBBERD SCHOOL, HARLOW ESSEX

DESCRIPTION:
DRAINAGE LAYOUT - SHEET 1 OF 2

DOCUMENT REFERENCE No:

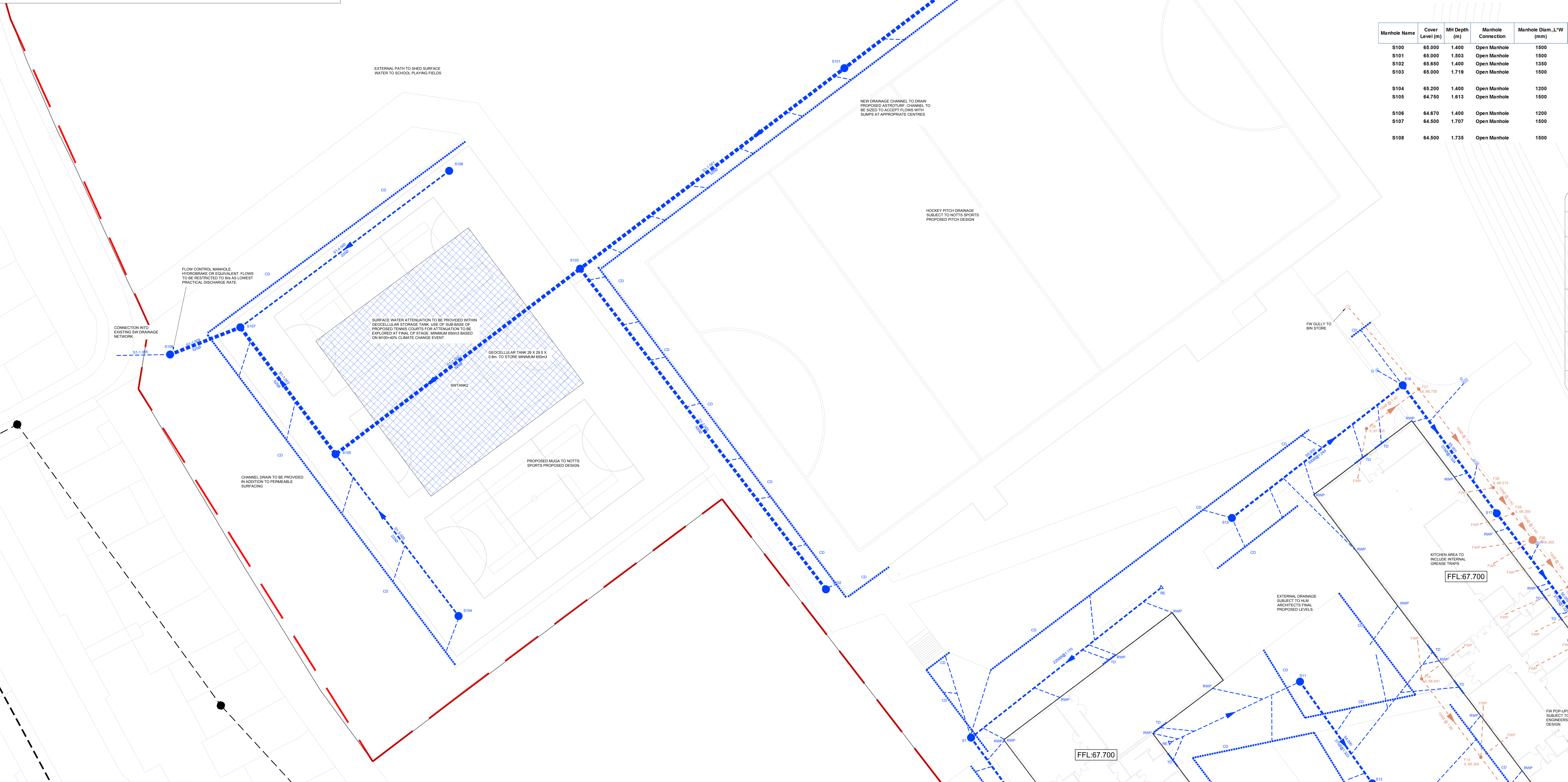
FS0620	AWP	ZZ	XX	DR	01	01-3300
Ref	Orig	Zone	Level	Type	Role	Element Chrono No.

SCALE @ A0: **1:250** REV: **P04**
CONTRACT NUMBER: **FS0620** DATE: **17.01.19**
INFORMATION STATUS: **WORK IN PROGRESS**

SUBCONTRACTOR COMPANY TRADE NAME: Alan Wood & Partners
SUBCONTRACTOR CONTRACT REF. No: **41632**

SITE LOCATION PLAN

SCALE: N.T.S



SW MANHOLE SCHEDULE

Manhole Name	Cover Level (m)	MH Depth (m)	Manhole Connection	Manhole Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)
S1	67.000	1.400	Open Manhole	1350	S1.000	65.600	450			
S2	67.000	1.455	Open Manhole	1350	S1.001	65.545	450	S1.000	65.545	450
S3	67.000	1.521	Open Manhole	1350	S1.002	65.479	450	S1.001	65.479	450
S4	67.000	1.570	Open Manhole	1350	S1.003	65.430	450	S1.002	65.430	450
S5	68.430	1.430	Open Manhole	1200	S2.000	67.000	150			
S6	67.400	1.539	Open Manhole	1200	S2.001	65.861	150	S2.000	65.861	150
S7	67.400	2.034	Open Manhole	1350	S1.004	65.366	450	S1.003	65.366	450
								S2.001	65.675	150
S8	67.300	1.992	Open Manhole	1350	S1.005	65.308	450	S1.004	65.308	450
S9	68.900	1.400	Open Manhole	1200	S3.000	67.500	225			
S10	68.500	1.811	Open Manhole	1200	S3.001	66.689	225	S3.000	66.689	225
S11	67.400	1.400	Open Manhole	1350	S4.000	66.000	375			
S12	67.500	1.559	Open Manhole	1350	S4.001	65.941	375	S4.000	65.941	375
S13	67.500	1.618	Open Manhole	1350	S4.002	65.882	375	S4.001	65.882	375
S14	67.300	2.139	Open Manhole	1350	S1.006	65.161	450	S1.005	65.254	450
								S3.001	65.396	225
								S4.002	65.236	375
S15	67.250	1.250	Open Manhole	1200	S5.000	66.000	300			
S16	67.200	1.410	Open Manhole	1350	S5.001	65.790	375	S5.000	65.865	300
S17	67.500	1.785	Open Manhole	1350	S5.002	65.715	375	S5.001	65.715	375
S18	67.200	1.569	Open Manhole	1350	S5.003	65.631	375	S5.002	65.631	375
S19	67.900	2.333	Open Manhole	1350	S5.004	65.567	375	S5.003	65.567	375
S20	67.900	2.389	Open Manhole	1350	S5.005	65.511	375	S5.004	65.511	375
S21	68.000	3.017	Open Manhole	1350	S1.007	64.983	450	S1.006	65.083	450
								S5.005	65.058	375
S22	68.800	1.400	Open Manhole	1200	S6.000	67.400	225			
S23	68.100	1.684	Open Manhole	1200	S6.001	66.416	300	S6.000	66.491	225
S24	68.600	1.400	Open Manhole	1200	S7.000	67.200	225			
S25	68.160	1.813	Open Manhole	1200	S6.002	66.347	300	S6.001	66.347	300
								S7.000	66.426	225
S26	68.450	1.400	Open Manhole	1200	S8.000	67.050	225			
S27	68.120	1.852	Open Manhole	1200	S6.003	66.268	300	S6.002	66.274	300
								S8.000	66.343	225
S28	68.150	3.236	Open Manhole	1350	S1.008	64.914	450	S1.007	64.914	450
								S6.003	65.090	300

Manhole Name	Cover Level (m)	MH Depth (m)	Manhole Connection	Manhole Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)
S100	65.000	1.400	Open Manhole	1500	S1.000	63.600	525			
S101	65.000	1.503	Open Manhole	1500	S1.001	63.498	525	S1.000	63.498	525
S102	65.650	1.400	Open Manhole	1350	S2.000	64.250	450			
S103	65.000	1.719	Open Manhole	1500	S1.002	63.281	525	S1.001	63.395	525
								S2.000	63.356	450
S104	65.200	1.400	Open Manhole	1200	S3.000	63.800	225			
S105	64.750	1.613	Open Manhole	1500	S1.003	63.137	525	S1.002	63.137	525
								S3.000	63.439	225
S106	64.670	1.400	Open Manhole	1200	S4.000	63.270	225			
S107	64.500	1.707	Open Manhole	1500	S1.004	62.793	525	S1.003	63.089	525
								S4.000	63.093	225
S108	64.500	1.735	Open Manhole	1500	S1.005	62.765	525	S1.004	62.765	525

HEALTH & SAFETY RISKS

IN ADDITION TO THE STANDARD HAZARDS AND RISKS NORMALLY ASSOCIATED WITH THE TYPE OF WORK DETAILED ON THIS DRAWING, PLEASE NOTE THE FOLLOWING RESIDUAL HEALTH AND SAFETY RISKS

CONSTRUCTION RISKS

CR 01 CONSTRUCTION IN AND AROUND EXISTING BURIED SERVICES - REFER TO SERVICES RECORDS.
CR 02 LIVE TRAFFIC WORK ON THE SITE
CR 03 LIVE SEWERAGE.

OPERATION & MAINTENANCE RISKS

MR 01 OPERATION AND MAINTENANCE TO BE THE RESPONSIBILITY OF THE SCHOOL AND MAINTAINED AS PART OF THEIR REGULAR ON SITE MAINTENANCE ROUTINE.
MR 02 ANCILLARY COMPONENTS TO BE MAINTAINED TO MANUFACTURERS GUIDELINES.

DEMOLITION RISKS

DR 01 DEMOLITION TO AVOID EXISTING BURIED SERVICES - REFER TO SERVICES RECORDS.
DR 02 DEMOLITION NEXT TO LIVE SEWERAGE. ALL SEWERS TO BE CONFIRMED REDUNDANT PRIOR TO DEMOLITION.

IT IS ASSUMED THAT ALL WORKS WILL BE CARRIED OUT BY A COMPETENT CONTRACTOR WORKING IN ACCORDANCE WITH THE REQUIREMENTS DEFINED IN THE CDM REGULATIONS.

DRAINAGE KEY

- EXG MH — EXISTING* MANHOLE
- EXISTING* CW DRAIN RUN
- EXISTING* SW DRAIN RUN
- EXISTING* FW DRAIN RUN
- DRAINAGE TO BE GRUBBED UP
- PROPOSED FW DRAIN 100Ø PIPE @ MIN. 1/40 U.N.O
- PPIC — PROPOSED FW INSPECTION CHAMBER
- FWP — PROPOSED FW POP-UP - BRANCH PIPEWORK 100Ø @ MIN. 1/40
- FWMH — PROPOSED FW MANHOLE
- PROPOSED SW ATTENUATION
- PROPOSED SW DRAIN - 150Ø PIPE @ MIN. 1/100 U.N.O
- MH — PROPOSED SW MANHOLE
- PPIC — PROPOSED SW INSPECTION CHAMBER (R/A DENOTES REDUCED ACCESS)
- RWP — PROPOSED SW RAINWATER PIPE, C/W ACCESS PIPE & COVER FOR MAINTENANCE WHERE EXTERNAL. ALL PIPEWORK TO BE 100Ø
- RE — PROPOSED SW RODDING EYE
- CD — PROPOSED SW DRAINAGE CHANNEL - ACO M150D 0.0 C/W CLASS C250 COVERS WITH LOCKABLE GRATING
- TD — PROPOSED SW THRESHOLD DRAINAGE CHANNEL REQUIREMENT TBC BY ARCHITECT
- G — PROPOSED SW GULLY
- INTERCEPTOR

* EXISTING SEWER BASED ON TOPOGRAPHICAL, GPR AND ON SITE CCTV SURVEY INFORMATION. ALL SEWERS TO BE LOCATED ON SITE PRIOR TO CONNECTION.

REFER TO ALL OTHER AWP DRAWINGS FOR DRAINAGE DETAILS AND SPECIFICATION.

JOB NO: 41632 - DRAINAGE - DRAWING REFERENCE TABLE

This Drawing to be Read in Conjunction with the Drawings Listed Below

Alan Wood & Partners (Civil)	Drawing Reference
Existing Surface Water Exceedance Flow Path	SFG-AWP-ZZ-XX-DR-C-3001
Proposed Surface Water Exceedance Flow Path	SFG-AWP-ZZ-XX-DR-C-3002
Existing Impermeable Areas	SFG-AWP-ZZ-XX-DR-C-3010
Proposed Impermeable Areas	SFG-AWP-ZZ-XX-DR-C-3011
Drainage Layouts - Sheets 1-2	SFG-AWP-ZZ-XX-DR-C-3300 to 3301
Drainage Details - Sheets 1-3	SFG-AWP-ZZ-XX-DR-C-3700 to 3702
Cut and Fill - Sheets 1-2	SFG-AWP-ZZ-XX-DR-C-4000 to 4001
Site Build up Areas	SFG-AWP-ZZ-XX-DR-C-4400
External Works Details	SFG-AWP-ZZ-XX-DR-C-4700
Drawings by others	**Date Received**
Tower Surveys - Topographical Survey	20.12.2018
HLM Architects - Proposed Site Plan	23.01.2019

NOTES:

1. This drawing has been prepared in accordance with the scope of CML's appointment with its clients and is subject to the terms and conditions of that appointment. CML accepts no liability for any use of this document other than by its client and only for the purposes for which it was prepared and provided.

2. This drawing is to be read in conjunction with all other relevant drawings and specifications for this project and apparent inconsistencies brought to the attention of the Project Design Manager.

3. Do not scale directly from drawing - if in doubt ask!

PRIVATE DRAINAGE NOTES:

1. DRAINAGE SYSTEMS TO COMPLY WITH THE FOLLOWING STANDARDS:
   - BS EN 752:2008
   - BUILDING REGULATIONS APPROVED DOCUMENT PART H, 2015 EDITION
2. ALL COMPONENTS USED IN DRAINAGE SYSTEMS TO COMPLY WITH THE FOLLOWING: BS EN 476:2011
3. ALL DRAINAGE SYSTEMS AND COMPONENTS TO BE CONSTRUCTED AND TESTED TO THE FULL SATISFACTION OF BOTH BUILDING REGULATIONS AND WARRANTY PROVIDER INSPECTORS
4. ALL DRAINAGE TO BE CONSTRUCTED AND TESTED IN ACCORDANCE WITH BS EN 1610:2015.
5. V.C. DENOTES VITRIFIED CLAY, VITRIFIED CLAY PIPES AND FITTINGS TO COMPLY WITH THE RELEVANT PROVISIONS OF BS EN295-1:2013,-2:2013,-3:2012 AND BS 65 RESPECTIVELY AND BE KITEMARKED. ALL PIPES SHALL BE EXTRA STRENGTH TO BS 65 OR EQUIVALENT BS EN295 PIPE CRUSHING STRENGTH.
6. LATERAL DRAIN CONNECTIONS (PIPES CONNECTING INTO ADOPTABLE SEWERS) TO BE VITRIFIED CLAY. WHERE COVER IS LESS THAN 1.2m TO GROUND LEVEL PIPE PROTECTION IS REQUIRED IN THE FORM OF A CONCRETE COVER SLAB.
7. PVC-U DENOTES UNPLASTISED POLYVINYL CHLORIDE . PVC-U PIPES AND FITTINGS TO COMPLY WITH THE RELEVANT PROVISIONS OF BS EN1401, BS EN13476-2 AND BS4660:1989/2000 RESPECTIVELY AND BE KITEMARKED.
8. PRECAST CONCRETE MANHOLES TO BE IN ACCORDANCE WITH BS EN 1917:2002 AND BS 5911-3:2010,-4:2002 AND TO BE KITEMARKED. PRECAST CONCRETE RINGS AND COVER SLABS TO CONCRETE PIPES TO BE JOINTED WITH CEMENT MORTAR UNLESS NOTED OTHERWISE.
9. INSITU AND PRECAST CONCRETE UNITS SHALL HAVE SULPHATE RESISTING PORTLAND CEMENT TO BS EN 197-1:2011.
10. POLYPROPYLENE INSPECTION CHAMBERS TO COMPLY WITH BS EN 13598-1:2010,-2:2016 AND BS 7158:2001 AND TO BE KITEMARKED.
11. MANHOLE COVERS AND FRAMES SHALL COMPLY WITH THE RELEVANT PROVISIONS OF BS EN 124-1 TO 6:2015. MANHOLE COVERS AND FRAMES TO BE OF A NON-ROCKING DESIGN WITH CUSHION INSERTS AND KITEMARKED. LOAD CLASS A15 COVERS TO BE USED IN AREAS INACCESSIBLE TO VEHICLES; LOAD CLASS B125 COVERS TO BE USED IN PRIVATE DRIVES; LOAD CLASS D400 COVERS TO BE USED IN PRIVATE ROADS. ALL COVERS TO BE BADGED "FW" OR "SW" AS APPROPRIATE. MANHOLE COVER SLABS AND ACCESS TO BE IN ACCORDANCE WITH CONCRETE PIPE ASSOCIATION TECHNICAL BULLETIN ISSUED SEPTEMBER 2001.
12. POLYPROPYLENE INSPECTION CHAMBER COVERS AND FRAMES SHALL COMPLY WITH THE RELEVANT PROVISIONS OF BS EN 124-1 TO 6:2015. COVERS AND FRAMES TO BE OF A NON-ROCKING DESIGN WITH CUSHION INSERTS AND KITEMARKED. LOAD CLASS A15 COVERS TO BE USED IN AREAS INACCESSIBLE TO VEHICLES; LOAD CLASS B125 COVERS TO BE USED IN PRIVATE DRIVES; LOAD CLASS D400 COVERS TO BE USED IN PRIVATE ROADS.
13. CLASS Z BEDDING DETAIL SHALL BE PROVIDED:
    - WHERE COVER TO PIPE BARREL IS;
      i) <1.2m IN VEHICULAR TRAFFICKED AREAS
      ii) <0.9m IN AREAS INACCESSIBLE TO VEHICLES.
    - AT ALL ROAD GULLY, YARD GULLY, RWP, SVP AND DRAINAGE CHANNEL BRANCHES.
    - AREAS OF DEEP ROOTING VEGETATION.
    - PIPE RUNS NEAR BUILDINGS IN ACCORDANCE WITH TYPICAL SECTIONS ON AWP DETAILS DRAWING.
    - WHERE TWO PIPES CROSS WITH A CLEAR GAP OF <300mm. CLASS Z SURROUND TO EXTEND A MINIMUM OF 1.0m FROM THE CENTRE OF THE CROSSING POINT & EXTENDED TO WITHIN 150mm OF THE NEAREST FLEXIBLE JOINT, WHERE REQUIRED.
14. NO MECHANICAL COMPACTION OF FILL MATERIAL WITHIN 300mm OF THE CROWN OF ANY PIPE.

REV	REASON FOR REVISION	DATE	BY	CHK
P03	UPDATED FOR PLANNING	14.02.19	LV	TW
P02	UPDATED TO SUIT LATEST SITE PLAN	24.01.19	MJC	TW
P01	FIRST ISSUE	17.01.19	GDV	TW

Caledonian

CLIENT:
CALEDONIAN MODULAR

PROJECT REF:
SIR FREDERICK GIBBERD SCHOOL, HARLOW ESSEX

DESCRIPTION:
DRAINAGE LAYOUT - SHEET 2 OF 2

DOCUMENT REFERENCE No:

Ref	Orig	Zone	Level	Type	Role	Element Chrono No.
FS0620	AWP	ZZ	XX	DR	C	01-3301

SCALE @ A0: **1:250** REV: **P03**
CONTRACT NUMBER: **FS0620** DATE: **17.01.19**
INFORMATION STATUS: **WORK IN PROGRESS**

SUBCONTRACTOR COMPANY TRADE NAME: Alan Wood & Partners
SUBCONTRACTOR CONTRACT REF. No: **41632**

APPENDIX F

CIRIA SuDS Manual Quality Matrix Output

SIMPLE INDEX APPROACH: TOOL

1. The steps set out in the tool should be applied for each inflow or 'runoff area' (ie each impermeable surface area separately discharging to a SuDS component).

2. The supporting 'Design Conditions' stated by the tool must be fully considered and implemented in all cases.

3. The process that is automated in this tool is described in the SuDS Manual, Chapter 26 (Section 26.7)

3. Relevant design examples are included in the SuDS Manual Appendix C.

4. Each of the steps below are part of the process set out in the flowchart on Sheet 3.

5. Sheet 4 summarises the selections made below and indicates the acceptability of the proposed SuDS components.

6. Interception should be delivered for all upstream impermeable areas as part of the strategy for water quantity and quality control for the site. This is required in order to deliver both of the water quality criteria set out in Chapter 4 of the SuDS Manual

[blue cell]	**DROP DOWN LIST**	**RELEVANT INPUTS NEED TO BE SELECTED FROM THESE LISTS, FOR EACH STEP**
[green cell]	**USER ENTRY**	**USER ENTRY CELLS ARE ONLY REQUIRED WHERE INDICATED BY THE TOOL**

STEP 1: Determine the Pollution Hazard Index for the runoff area discharging to the proposed SuDS scheme

This step requires the user to select the appropriate land use type for the area from which the runoff is occurring

If the land use varies across the 'runoff area', either:

- use the land use type with the highest Pollution Hazard Index
- apply the approach for each of the land use types to determine whether the proposed SuDS design is sufficient for all. If it is not, consider collecting more hazardous runoff separately and providing additional treatment.

If the generic land use types suggested are not applicable, select 'Other' and enter a description of the land use of the runoff area and agreed user defined indices in the row below the drop down lists.

	Runoff Area Land Use Description	*Pollution Hazard*	*Pollution Hazard Indices* Total Suspended Solids	Metals	Hydrocarbons
Select land use type from the drop down list (or 'Other' if none applicable): →	Non-residential parking with infrequent change (e.g. schools, offices, < 300 traffic movements a day)	Low	0.5	0.4	0.4
If the generic land use types in the drop down list above are not applicable, select 'Other' and enter a description of the land use of the runoff area and agreed user defined indices in this row:					
	Landuse Pollution Hazard Index	**Low**	**0.5**	**0.4**	**0.4**

DESIGN CONDITIONS

1	2

STEP 2A: Determine the Pollution Mitigation Index for the proposed SuDS components

This step requires the user to select the proposed SuDS components that will be used to treat runoff - before it is discharged to a receiving surface waterbody or downstream infiltration component

If the runoff is discharged directly to an infiltration component, without upstream treatment, select 'None' for each of the 3 SuDS components and move to Step 2B

This step should be applied to evaluate the water quality protection provided by proposed SuDS components for discharges to receiving surface waters or downstream infiltration components (note: in England and Wales this will include components that allow any amount of infiltration, however small, even where infiltration is not specifically accounted for in the design).

If you have fewer than 3 components, select 'None' for the components that are not required

If the proposed component is bespoke and/or a proprietary treatment product and not generically described by the suggested components, then 'Proprietary treatment system' or 'User defined indices' should be selected and a description of the component and agreed user defined indices should be entered in the rows below the drop down lists

	SuDS Component Description		*Pollution Mitigation Indices* Total Suspended Solids	Metals	Hydrocarbons
Select SuDS Component 1 (i.e. the upstream SuDS component) from the drop down list: →	Proprietary treatment system	Enter User Defined Indices in row below			
Select SuDS Component 2 (i.e. the second SuDS component in a series) from the drop down list: →	Proprietary treatment system	Enter User Defined Indices in row below			
Select SuDS Component 3 (i.e. the third SuDS component in a series) from the drop down list: →	Proprietary treatment system	Enter User Defined Indices in row below			
If the proposed SuDS components are bespoke/proprietary and/or the generic indices above are not considered appropriate, select 'Proprietary treatment system' or 'User defined indices' and enter component descriptions and agreed user defined indices in these rows:	Petrol interceptor	SuDS Component 1	0.4	0.6	0.6
	Catchpit Manhole	SuDS Component 2	0.4	0.1	0.1
	Trapped Gullies	SuDS Component 3	0.3	0.1	0.1
	Aggregated Surface Water Pollution Mitigation Index		**0.75**	**0.7**	**0.7**

DESIGN CONDITIONS

	1	2	3
SuDS Component 1	Detailed assessment of performance of designed component in reducing inflow concentrations of each pollutant type required as evidence of adopted indices. Enter indices approved by the environmental regulator in appropriate 'User Defined Indices' row below	SEPA only considers proprietary treatment systems as appropriate in exceptional circumstances where other types of SuDS component are not practicable. Proprietary treatment systems may also be considered appropriate for existing sites that are causing pollution where there is a requirement to retrofit treatment. WAT-RM-08 (SEPA, 2014) also provides a flow chart with a summary of checks on suitability of a proprietary system	See Chapter 15 Proprietary treatment systems for approaches to demonstrate product performance. Note: a British Water/Environment Agency assessment Code of Practice is currently under development that will allow manufacturers to complete an agreed test protocol for systems intended to treat contaminated surface water runoff. Full details can be found at: http://www.britishwater.co.uk/Publications/codes-of-practise.aspx.
SuDS Component 2	Detailed assessment of performance of designed component in reducing inflow concentrations of each pollutant type required as evidence of adopted indices. Enter indices approved by the environmental regulator in appropriate 'User Defined Indices' row below	SEPA only considers proprietary treatment systems as appropriate in exceptional circumstances where other types of SuDS component are not practicable. Proprietary treatment systems may also be considered appropriate for existing sites that are causing pollution where there is a requirement to retrofit treatment. WAT-RM-08 (SEPA, 2014) also provides a flow chart with a summary of checks on suitability of a proprietary system	See Chapter 15 Proprietary treatment systems for approaches to demonstrate product performance. Note: a British Water/Environment Agency assessment Code of Practice is currently under development that will allow manufacturers to complete an agreed test protocol for systems intended to treat contaminated surface water runoff. Full details can be found at: http://www.britishwater.co.uk/Publications/codes-of-practise.aspx.
SuDS Component 3	Detailed assessment of performance of designed component in reducing inflow concentrations of each pollutant type required as evidence of adopted indices. Enter indices approved by the environmental regulator in appropriate 'User Defined Indices' row below	SEPA only considers proprietary treatment systems as appropriate in exceptional circumstances where other types of SuDS component are not practicable. Proprietary treatment systems may also be considered appropriate for existing sites that are causing pollution where there is a requirement to retrofit treatment. WAT-RM-08 (SEPA, 2014) also provides a flow chart with a summary of checks on suitability of a proprietary system	See Chapter 15 Proprietary treatment systems for approaches to demonstrate product performance. Note: a British Water/Environment Agency assessment Code of Practice is currently under development that will allow manufacturers to complete an agreed test protocol for systems intended to treat contaminated surface water runoff. Full details can be found at: http://www.britishwater.co.uk/Publications/codes-of-practise.aspx.

Note: If the total aggregated mitigation index is > 1 (which is not a realistic outcome), then the outcome is fixed at ">0.95". In this scenario, the proposed components are likely to have a very high mitigation potential for reducing pollutant levels in the runoff and should be sufficient for any proposed land use (note: where risk assessment is required, this outcome would need more detailed verification).

Is the runoff now discharged to an infiltration component?

Yes ? Go to Step 2B
No ? Go to Step 2C

STEP 2B: Determine the Pollution Mitigation Index for the proposed Groundwater Protection

This step requires the user to select the type of groundwater protection that is either part of the SuDS component or that lies between the component and the groundwater

This step should be applied where a SuDS component is specifically designed to infiltrate runoff (note: in England and Wales this will include components that allow any amount of infiltration, however small, even where infiltration is not specifically accounted for in the design).

'Groundwater protection' describes the proposed depth of soil or other material through which runoff will flow between the runoff surface and the underlying groundwater.

Where the discharge is to surface waters and risks to groundwater need not be considered, select 'None'

If the proposed groundwater protection is bespoke and/or a proprietary product and not generically described by the suggested measures, then a description of the protection and agreed user defined indices should be entered in the row below the drop down list

		Pollution Mitigation Indices Total Suspended Solids	Metals	Hydrocarbons
Select type of groundwater protection from the drop down list: →	None			
If the proposed groundwater protection is bespoke/proprietary and/or the generic indices above are not considered appropriate, select 'Proprietary product' or 'User defined indices' and enter a description of the protection and agreed user defined indices in this row:				
	Groundwater Protection Pollution Mitigation Index	**0**	**0**	**0**

DESIGN CONDITIONS

1	2	3	4

STEP 2C: Determine the Combined Pollution Mitigation Indices for the Runoff Area

This is an automatic step which combines the proposed SuDS Pollution Mitigation Indices with any Groundwater Protection Pollution Mitigation Indices

	Combined Pollution Mitigation Indices Total Suspended Solids	Metals	Hydrocarbons
Combined Pollution Mitigation Indices for the Runoff Area	**0.75**	**0.7**	**0.7**

Note: If the total aggregated mitigation index is > 1 (which is not a realistic outcome), then the outcome is fixed at ">0.95". In this scenario, the proposed components are likely to have a very high mitigation potential for reducing pollutant levels in the runoff and should be sufficient for any proposed land use (note: where risk assessment is required, this outcome would need more detailed verification).

STEP 2D: Determine Sufficiency of Pollution Mitigation Indices for Selected SuDS Components

This is an automatic step which compares the Combined Pollution Mitigation Indices with the Land Use Hazard Indices, to determine whether the proposed components are sufficient to manage each pollutant category type

When the combined mitigation index exceeds the land use pollution hazard index, then the proposed components are considered sufficient in providing pollution risk mitigation.

In England and Wales, where the discharge is to protected surface waters or groundwater, an additional treatment component (ie over and above that required for standard discharges), or other equivalent protection, is required that provides environmental protection in the event of an unexpected pollution event or poor system performance. Protected surface waters are those designated for drinking water abstraction. In England and Wales, protected groundwater resources are defined as Source Protection Zone 1. In Northern Ireland, a more precautionary approach may be required and this should be checked with the environmental regulator on a site by site basis.

Note: In order to meet both Water Quality criteria set out in the SuDS Manual (Chapter 4), Interception should be delivered for all impermeable areas wherever possible. Interception delivery and treatment may be met by the same components, but Interception requires separate evaluation.

Sufficiency of Pollution Mitigation Indices Total Suspended Solids	Metals	Hydrocarbons
Sufficient	**Sufficient**	**Sufficient**

DESIGN CONDITIONS

1
Reference to local planning documents should also be made to identify any additional protection required for sites due to habitat conservation (see *Chapter 7 The SuDS design process*). The implications of developments on or within close proximity to an area with an environmental designation, such as a Site of Special Scientific Interest (SSSI), should be considered via consultation with relevant conservation bodies such as Natural England

SIMPLE INDEX APPROACH: TOOL

1. The steps set out in the tool should be applied for each inflow or 'runoff area' (ie each impermeable surface area separately discharging to a SuDS component).

2. The supporting 'Design Conditions' stated by the tool must be fully considered and implemented in all cases.

3. The process that is automated in this tool is described in the SuDS Manual, Chapter 26 (Section 26.7)

3. Relevant design examples are included in the SuDS Manual Appendix C.

4. Each of the steps below are part of the process set out in the flowchart on Sheet 3.

5. Sheet 4 summarises the selections made below and indicates the acceptability of the proposed SuDS components.

6. Interception should be delivered for all upstream impermeable areas as part of the strategy for water quantity and quality control for the site. This is required in order to deliver both of the water quality criteria set out in Chapter 4 of the SuDS Manual

DROP DOWN LIST		RELEVANT INPUTS NEED TO BE SELECTED FROM THESE LISTS, FOR EACH STEP
USER ENTRY		USER ENTRY CELLS ARE ONLY REQUIRED WHERE INDICATED BY THE TOOL

STEP 1: Determine the Pollution Hazard Index for the runoff area discharging to the proposed SuDS scheme

This step requires the user to select the appropriate land use type for the area from which the runoff is occurring

If the land use varies across the 'runoff area', either:

- use the land use type with the highest Pollution Hazard Index
- apply the approach for each of the land use types to determine whether the proposed SuDS design is sufficient for all. If it is not, consider collecting more hazardous runoff separately and providing additional treatment.

If the generic land use types suggested are not applicable, select 'Other' and enter a description of the land use of the runoff area and agreed user defined indices in the row below the drop down lists.

	Runoff Area Land Use Description	*Pollution Hazard*	*Pollution Hazard Indices* Total Suspended Solids	Metals	Hydrocarbons
Select land use type from the drop down list (or 'Other' if none applicable): →	Residential roofing	Very low	0.2	0.2	0.05
If the generic land use types in the drop down list above are not applicable, select 'Other' and enter a description of the land use of the runoff area and agreed user defined indices in this row:					
	Landuse Pollution Hazard Index	**Very low**	**0.2**	**0.2**	**0.05**

DESIGN CONDITIONS

1	2

STEP 2A: Determine the Pollution Mitigation Index for the proposed SuDS components

This step requires the user to select the proposed SuDS components that will be used to treat runoff - before it is discharged to a receiving surface waterbody or downstream infiltration component
If the runoff is discharged directly to an infiltration component, without upstream treatment, select 'None' for each of the 3 SuDS components and move to Step 2B

This step should be applied to evaluate the water quality protection provided by proposed SuDS components for discharges to receiving surface waters or downstream infiltration components (note: in England and Wales this will include components that allow any amount of infiltration, however small, even where infiltration is not specifically accounted for in the design).

If you have fewer than 3 components, select 'None' for the components that are not required

If the proposed component is bespoke and/or a proprietary treatment product and not generically described by the suggested components, then 'Proprietary treatment system' or 'User defined indices' should be selected and a description of the component and agreed user defined indices should be entered in the rows below the drop down lists

	SuDS Component Description		*Pollution Mitigation Indices* Total Suspended Solids	Metals	Hydrocarbons
Select SuDS Component 1 (i.e. the upstream SuDS component) from the drop down list: →	None		0	0	0
Select SuDS Component 2 (i.e. the second SuDS component in a series) from the drop down list: →	Proprietary treatment system	Enter User Defined Indices in row below			
Select SuDS Component 3 (i.e. the third SuDS component in a series) from the drop down list: →	None		0	0	0
If the proposed SuDS components are bespoke/proprietary and/or the generic indices above are not considered appropriate, select 'Proprietary treatment system' or 'User defined indices' and enter component descriptions and agreed user defined indices in these rows:	Catchpit Manhole	SuDS Component 2	0.4	0.2	0.2
	Aggregated Surface Water Pollution Mitigation Index		**0.4**	**0.2**	**0.2**

DESIGN CONDITIONS

1	2	3
Detailed assessment of performance of designed component in reducing inflow concentrations of each pollutant type required as evidence of adopted indices. Enter indices approved by the environmental regulator in appropriate 'User Defined Indices' row below	SEPA only considers proprietary treatment systems as appropriate in exceptional circumstances where other types of SuDS component are not practicable. Proprietary treatment systems may also be considered appropriate for existing sites that are causing pollution where there is a requirement to retrofit treatment. WAT-RM-08 (SEPA, 2014) also provides a flow chart with a summary of checks on suitability of a proprietary system	See Chapter 15 Proprietary treatment systems for approaches to demonstrate product performance. Note: a British Water/Environment Agency assessment Code of Practice is currently under development that will allow manufacturers to complete an agreed test protocol for systems intended to treat contaminated surface water runoff. Full details can be found at: http://www.britishwater.co.uk/Publications/codes-of-practise.aspx.

Note: If the total aggregated mitigation index is > 1 (which is not a realistic outcome), then the outcome is fixed at ">0.95". In this scenario, the proposed components are likely to have a very high mitigation potential for reducing pollutant levels in the runoff and should be sufficient for any proposed land use (note: where risk assessment is required, this outcome would need more detailed verification).

Is the runoff now discharged to an infiltration component?

Yes ? Go to Step 2B
No ? Go to Step 2C

STEP 2B: Determine the Pollution Mitigation Index for the proposed Groundwater Protection

This step requires the user to select the type of groundwater protection that is either part of the SuDS component or that lies between the component and the groundwater

This step should be applied where a SuDS component is specifically designed to infiltrate runoff (note: in England and Wales this will include components that allow any amount of infiltration, however small, even where infiltration is not specifically accounted for in the design).

'Groundwater protection' describes the proposed depth of soil or other material through which runoff will flow between the runoff surface and the underlying groundwater.

Where the discharge is to surface waters and risks to groundwater need not be considered, select 'None'

If the proposed groundwater protection is bespoke and/or a proprietary product and not generically described by the suggested measures, then a description of the protection and agreed user defined indices should be entered in the row below the drop down list

		Pollution Mitigation Indices Total Suspended Solids	Metals	Hydrocarbons
Select type of groundwater protection from the drop down list: →	None			
If the proposed groundwater protection is bespoke/proprietary and/or the generic indices above are not considered appropriate, select 'Proprietary product' or 'User defined indices' and enter a description of the protection and agreed user defined indices in this row:				
	Groundwater Protection Pollution Mitigation Index	**0**	**0**	**0**

DESIGN CONDITIONS

1	2	3	4

STEP 2C: Determine the Combined Pollution Mitigation Indices for the Runoff Area

This is an automatic step which combines the proposed SuDS Pollution Mitigation Indices with any Groundwater Protection Pollution Mitigation Indices

	Combined Pollution Mitigation Indices Total Suspended Solids	Metals	Hydrocarbons
Combined Pollution Mitigation Indices for the Runoff Area	**0.4**	**0.2**	**0.2**

Note: If the total aggregated mitigation index is > 1 (which is not a realistic outcome), then the outcome is fixed at ">0.95". In this scenario, the proposed components are likely to have a very high mitigation potential for reducing pollutant levels in the runoff and should be sufficient for any proposed land use (note: where risk assessment is required, this outcome would need more detailed verification).

STEP 2D: Determine Sufficiency of Pollution Mitigation Indices for Selected SuDS Components

This is an automatic step which compares the Combined Pollution Mitigation Indices with the Land Use Hazard Indices, to determine whether the proposed components are sufficient to manage each pollutant category type

When the combined mitigation index exceeds the land use pollution hazard index, then the proposed components are considered sufficient in providing pollution risk mitigation.

In England and Wales, where the discharge is to protected surface waters or groundwater, an additional treatment component (ie over and above that required for standard discharges), or other equivalent protection, is required that provides environmental protection in the event of an unexpected pollution event or poor system performance. Protected surface waters are those designated for drinking water abstraction. In England and Wales, protected groundwater resources are defined as Source Protection Zone 1. In Northern Ireland, a more precautionary approach may be required and this should be checked with the environmental regulator on a site by site basis.

Note: In order to meet both Water Quality criteria set out in the SuDS Manual (Chapter 4), Interception should be delivered for all impermeable areas wherever possible. Interception delivery and treatment may be met by the same components, but Interception requires separate evaluation.

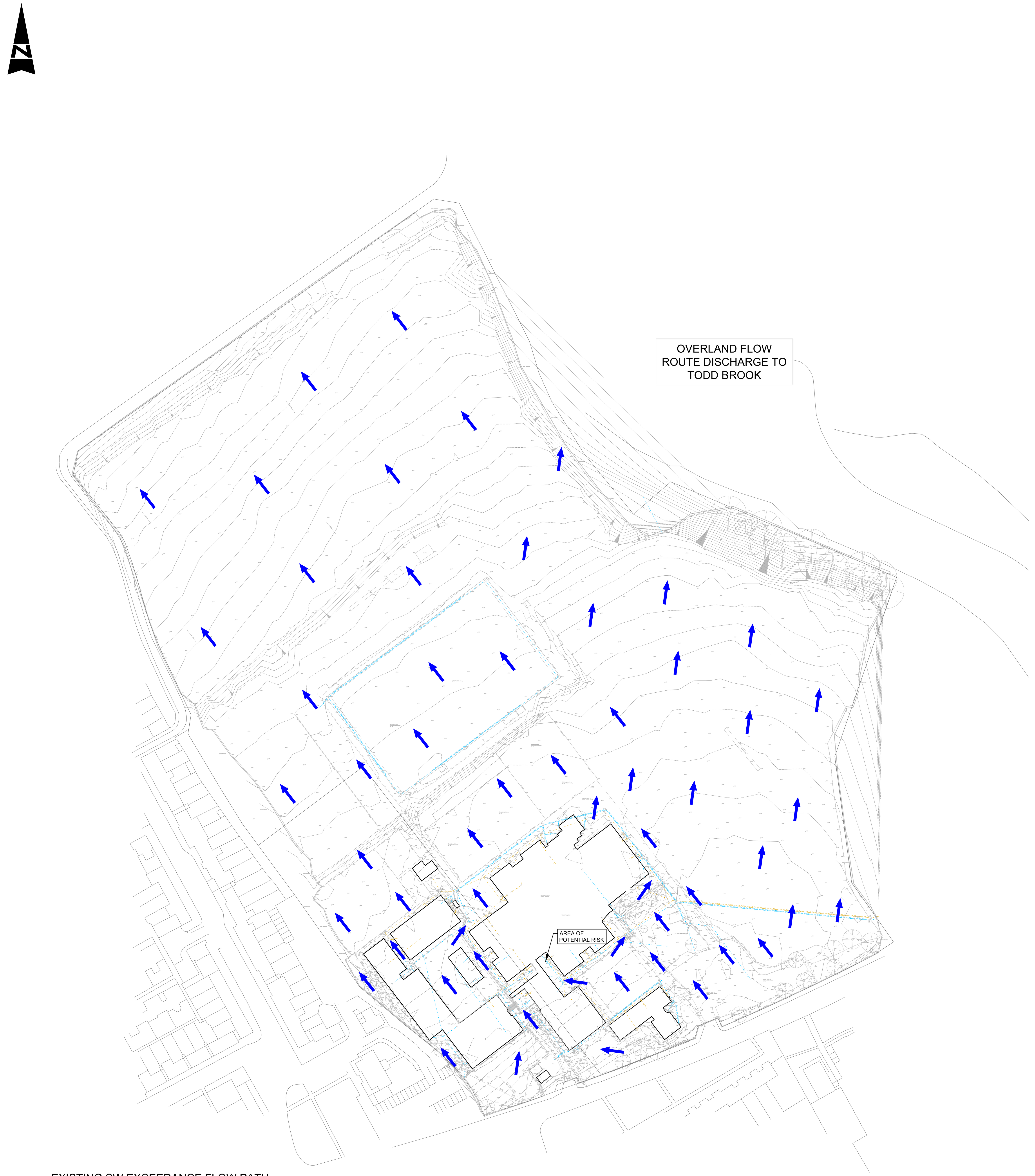
Sufficiency of Pollution Mitigation Indices Total Suspended Solids	Metals	Hydrocarbons
Sufficient	**Sufficient**	**Sufficient**

DESIGN CONDITIONS

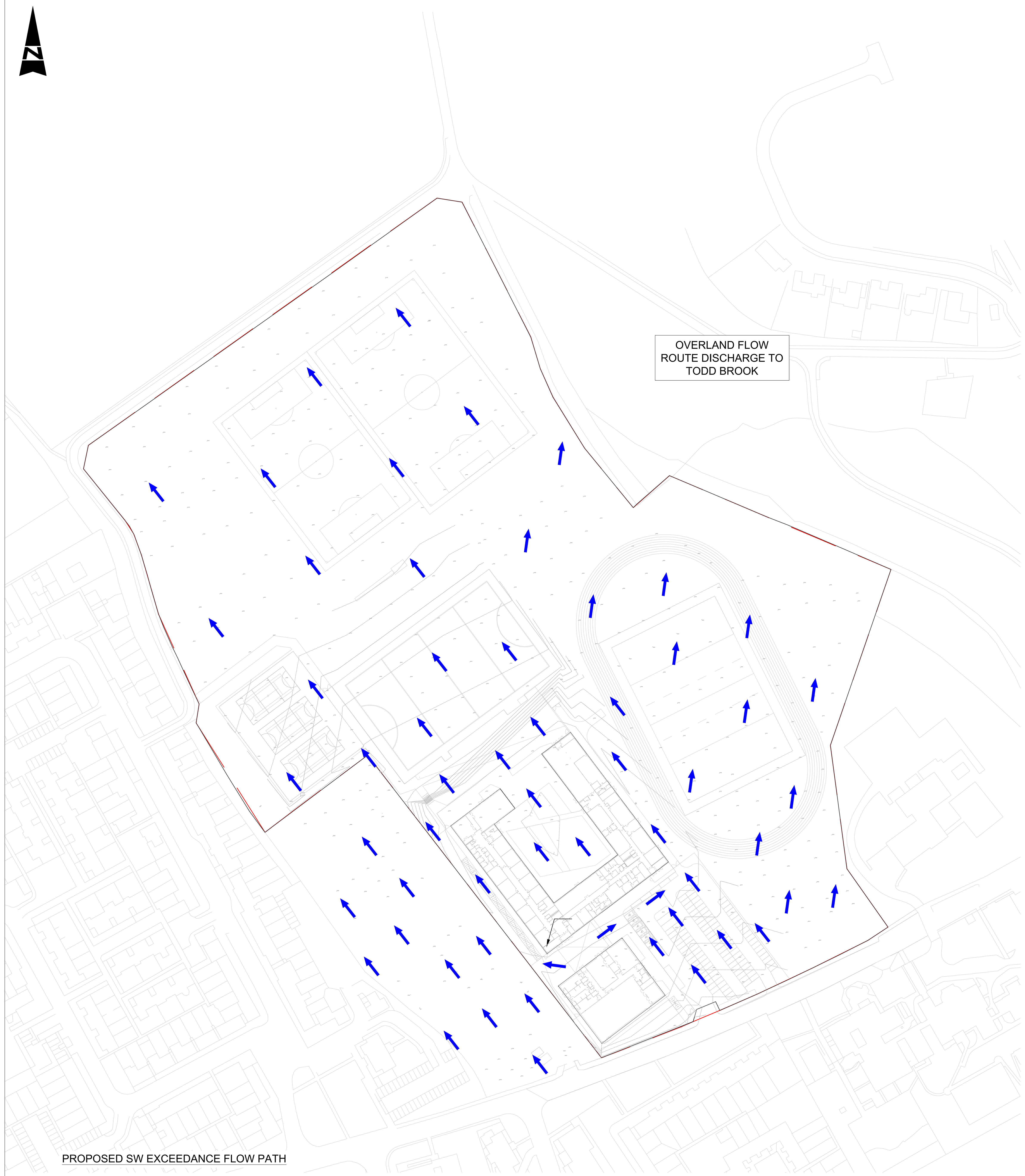
1
Reference to local planning documents should also be made to identify any additional protection required for sites due to habitat conservation (see *Chapter 7 The SuDS design process*). The implications of developments on or within close proximity to an area with an environmental designation, such as a Site of Special Scientific Interest (SSSI), should be considered via consultation with relevant conservation bodies such as Natural England

APPENDIX G

Surface Water Exceedance Flood Routing Drawings



EXISTING SW EXCEEDANCE FLOW PATH



PROPOSED SW EXCEEDANCE FLOW PATH

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2. This drawing is to be read in conjunction with all other relevant drawings and specifications for this project and apparent inconsistencies brought to the attention of the Project Design Manager.

3. Do not sclae directly from drawing - if in doubt ask!

NOTES:

FLOOD ROUTING PLAN KEY

ARROW SHOWING ROUTE OF SURFACE WATER EXCEEDANCE FLOW.

REV	REASON FOR REVISION	DATE	BY	CHK
P02	DRAWING NUMBER UPDATED	25.01.19	MJC	TW
P01	FIRST ISSUE	10.01.19	LV	TW

Caledonian

CLIENT:

CALEDONIAN MODULAR

PROJECT REF:

SIR FREDERICK GIBBERD SCHOOL, HARLOW ESSEX

DESCRIPTION:

SW EXCEEDANCE FLOW PATHS - EXISTING AND PROPOSED

DOCUMENT REFERENCE No:

Ref	Orig	Zone	Level	Type	Role	Element Chrono No.
FS0620	AWP	ZZ	XX	DR	C	01-3001

SCALE @ A0: **1:1000**

REV: **P02**

CONTRACT NUMBER: -

DATE: **25.01.19**

INFORMATION STATUS: **WORK IN PROGRESS**

SUBCONTRACTOR COMPANY TRADE NAME

Alan Wood & Partners

SUBCONTRACTOR CONTRACT REF. No

41632

Alan Wood & Partners

APPENDIX H

Operation and Maintenance Tables

Table 1: Operation and Maintenance Requirements for Silt Traps/Trapped Gullies (Based on CIRIA C753 Table 14.2)

Maintenance schedule	Required action	Typical frequency
Routine maintenance	Remove litter and debris and inspect for sediment, oil and grease accumulation	6 monthly
	Change the filter media	As recommended by manufacturer
	Remove sediment, oil, grease and floatables	As necessary – indicated by system inspections or immediately following significant spill
Remedial actions	Replace malfunctioning parts or structures	As required
Monitoring	Inspect for evidence of poor operation	6 monthly
	Inspect filter media and establish appropriate replacement frequencies	6 monthly
	Inspect sediment accumulation rates and establish appropriate removal frequencies	Monthly during first half year of operation, then every 6 months

*During the first year of operation, inspections should be carried out at least monthly (and after significant storm events) to ensure that the system is functioning as designed and that no damage is evident.

Table 2: Operation and Maintenance Requirements for Hydro-Brake® Vortex Flow Control Device (Based on Manufacturer's recommendations)

Maintenance schedule	Required action	Typical frequency
Routine maintenance	Remove litter and debris and inspect for sediment, oil and grease accumulation	6 monthly
	Remove sediment, oil, grease and floatables	As necessary – indicated by system inspections or immediately following significant spill
Remedial actions	Replace malfunctioning parts or structures	As required
Monitoring	Inspect for evidence of poor operation	Monthly during the first three months, then every 6 months
	Inspect sediment accumulation rates and establish appropriate removal frequencies	Monthly during first half year of operation, then every 6 months

Table 3: Operation and Maintenance Requirements for Oil Separators/Interceptors (Based on CIRIA C753 Section 14.12.2 and Environment Agency Document PPG3. To be read in conjunction with BS EN 858-2:2003)

Note: it is also usually required that separators are filled with clean water before being put into operation and each time after emptying for maintenance. Failure to do so will cause the separator to malfunction until surface water builds up the required permanent water level in the facility. It is possible to fit an alarm to separators that will indicate when the collected oil volume is at a maximum, and this may be a regulatory requirement. The alarms should be placed in a location that is clearly visible to those responsible for maintenance of the system.

Maintenance schedule	Required action	Typical frequency*
Routine maintenance	Assess the depth of accumulated silt and oil/sludge; empty the separator if required*	Six monthly
	Check thickness of light liquid	Six monthly
	Check function of automatic closure device	Six monthly
	Check the coalescing material, and clean or change if necessary	Six monthly
	Check the function of the warning device (if fitted)	Six monthly
Remedial actions	When major fuel spill occurs, empty the separator*	As required
Monitoring	Check water-tightness of system	Monthly during first half year of operation, then five yearly
	Check structural condition	Monthly during first half year of operation, then five yearly
	Check internal coatings	Monthly during first half year of operation, then five yearly
	Check in-built parts	Monthly during first half year of operation, then five yearly
	Check electrical devices and installations	Monthly during first half year of operation, then five yearly
	Check if adjustment of automatic closure devices is required	Monthly during first half year of operation, then five yearly

*If oil or silt levels exceed 90% of the storage volume, the separator should be emptied straight away. If an alarm if fitted, this is usually set to trigger just prior to this level. When the oil or silt reaches this level, or after a spillage, employ a registered waste removal company with experience in emptying separators to empty the separator. Ensure the company does not allow any of the contents to escape from the outlet during emptying.

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Geo-technical Investigations & Design
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Historic Building Services
Highway Design
Land Remediation Advice
Land Surveying
Marine Works
Mining Investigations
Modular Design
Parametric Modelling
Party Wall Surveyors
Planning Applications
Project Managers
Renewable Energy
Risk Assessments & Remediation
Road & Drainage Design
Site Investigations
Site Supervision
Structural Engineering
Sulphate Attack Specialists
Temporary Works
Topographic & Measured Surveys
Traffic Assessments

Quality Assurance Accreditation
ISO 9001 Registered firm
Certificate no. GB.02/07

Environmental Accreditation
ISO 14001Registered firm
Certificate no. GB.09/277b

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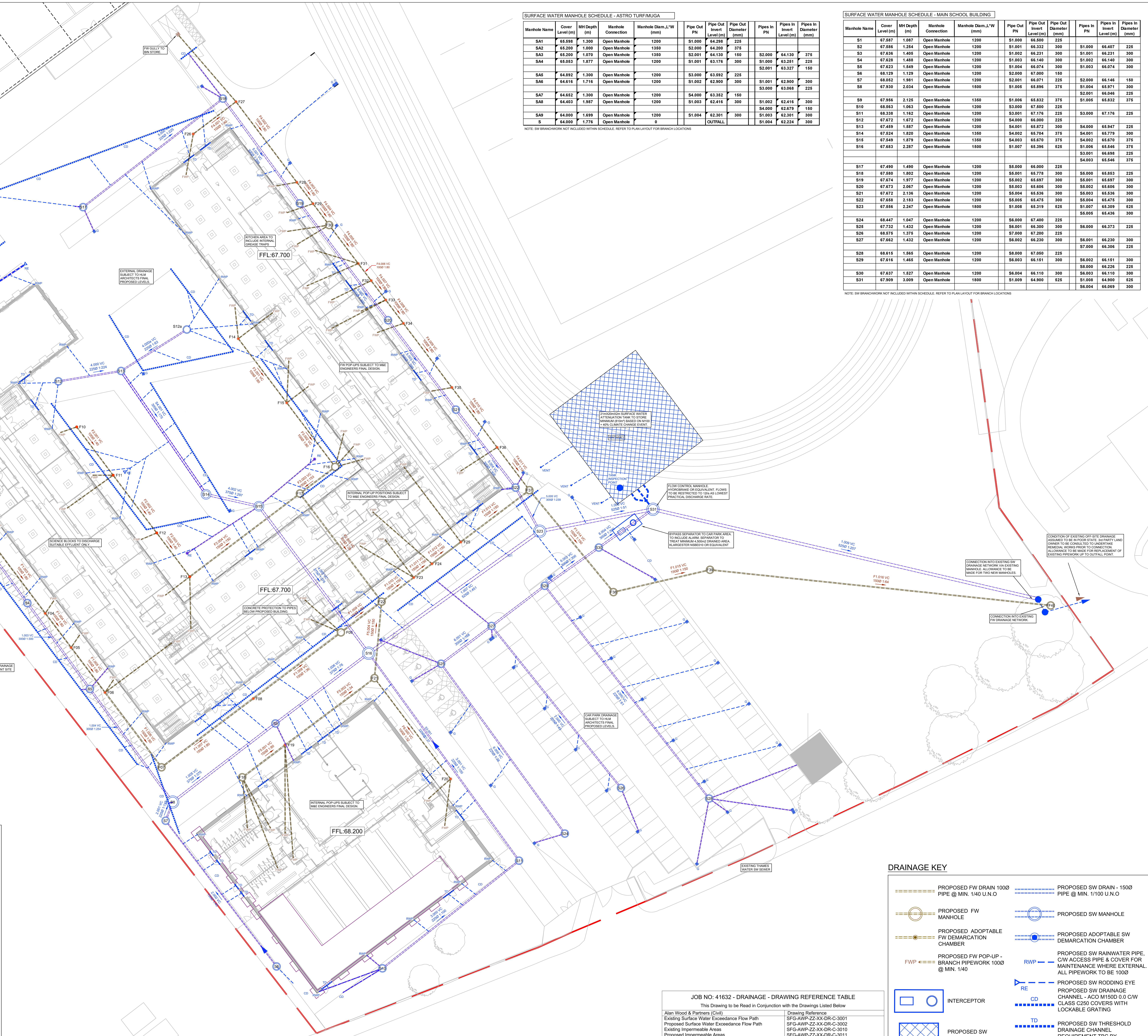

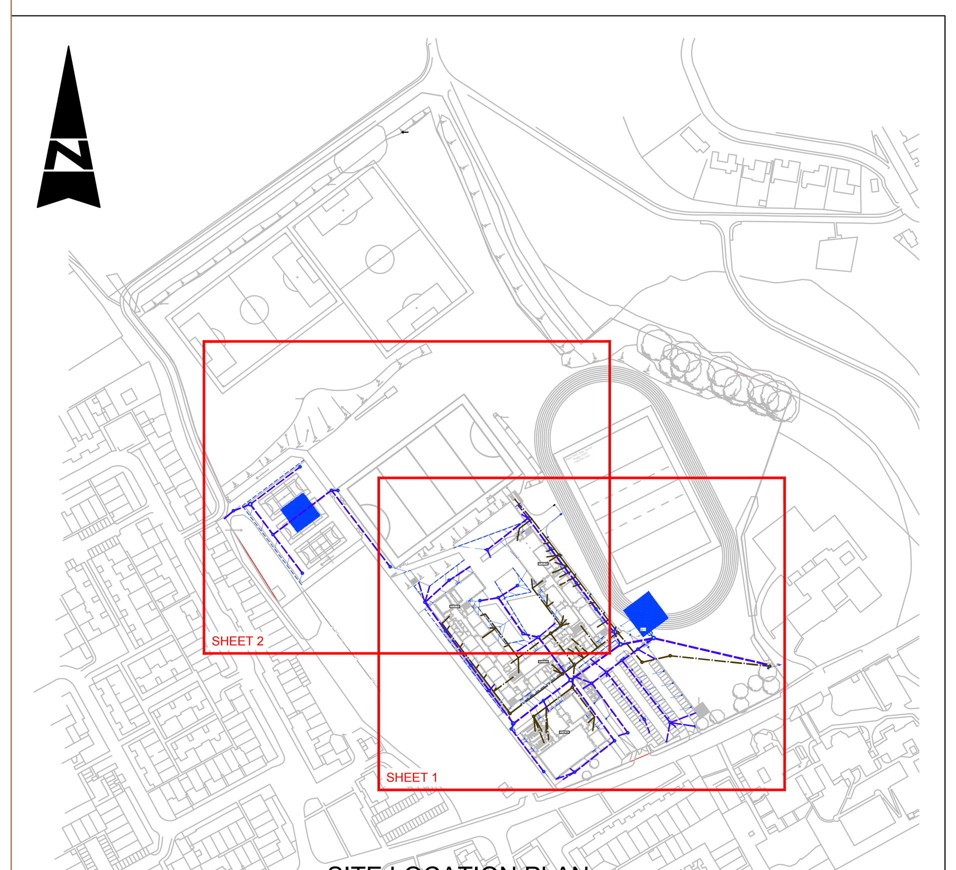

SITE LOCATION PLAN
SCALE: N.T.S

100mm at A0

SURFACE WATER MANHOLE SCHEDULE - ASTRO TURF/MUGA

Manhole Name	Cover Level (m)	MH Depth (m)	Manhole Connection	Manhole Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)
SA1	65.598	1.300	Open Manhole	1200	S1.000	64.298	225			
SA2	65.200	1.000	Open Manhole	1350	S2.000	64.200	375			
SA3	65.200	1.070	Open Manhole	1350	S2.001	64.130	150	S2.000	64.130	375
SA4	65.053	1.877	Open Manhole	1200	S1.001	63.176	300	S1.000	63.251	225
								S2.001	63.327	150
SA5	64.892	1.300	Open Manhole	1200	S3.000	63.592	225			
SA6	64.616	1.716	Open Manhole	1200	S1.002	62.900	300	S1.001	62.900	300
								S3.000	63.068	225
SA7	64.652	1.300	Open Manhole	1200	S4.000	63.352	150			
SA8	64.403	1.987	Open Manhole	1200	S1.003	62.416	300	S1.002	62.416	300
								S4.000	62.679	150
SA9	64.000	1.699	Open Manhole	1200	S1.004	62.301	300	S1.003	62.301	300
S	64.000	1.776	Open Manhole	0		OUTFALL		S1.004	62.224	300

NOTE: SW BRANCHWORK NOT INCLUDED WITHIN SCHEDULE. REFER TO PLAN LAYOUT FOR BRANCH LOCATIONS

SURFACE WATER MANHOLE SCHEDULE - MAIN SCHOOL BUILDING

Manhole Name	Cover Level (m)	MH Depth (m)	Manhole Connection	Manhole Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)
S1	67.587	1.087	Open Manhole	1200	S1.000	66.500	225			
S2	67.586	1.254	Open Manhole	1200	S1.001	66.332	300	S1.000	66.407	225
S3	67.636	1.405	Open Manhole	1200	S1.002	66.231	300	S1.001	66.231	300
S4	67.628	1.488	Open Manhole	1200	S1.003	66.140	300	S1.002	66.140	300
S5	67.623	1.549	Open Manhole	1200	S1.004	66.074	300	S1.003	66.074	300
S6	68.129	1.129	Open Manhole	1200	S2.000	67.000	150			
S7	68.052	1.981	Open Manhole	1200	S2.001	66.071	225	S2.000	66.146	150
S8	67.930	2.034	Open Manhole	1500	S1.005	65.896	375	S1.004	65.971	300
								S2.001	66.046	225
S9	67.956	2.125	Open Manhole	1350	S1.006	65.832	375	S1.005	65.832	375
S10	68.563	1.063	Open Manhole	1200	S3.000	67.500	225			
S11	68.338	1.162	Open Manhole	1200	S3.001	67.176	225	S3.000	67.176	225
S12	67.672	1.672	Open Manhole	1200	S4.000	66.000	225			
S13	67.459	1.587	Open Manhole	1200	S4.001	65.872	300	S4.000	65.947	225
S14	67.524	1.820	Open Manhole	1350	S4.002	65.704	375	S4.001	65.779	300
S15	67.549	1.879	Open Manhole	1350	S4.003	65.670	375	S4.002	65.670	375
S16	67.683	2.287	Open Manhole	1800	S1.007	65.396	525	S1.006	65.546	375
								S3.001	66.698	225
								S4.003	65.546	375
S17	67.490	1.490	Open Manhole	1200	S5.000	66.000	225			
S18	67.580	1.802	Open Manhole	1200	S5.001	65.778	300	S5.000	65.853	225
S19	67.674	1.977	Open Manhole	1200	S5.002	65.697	300	S5.001	65.697	300
S20	67.673	2.067	Open Manhole	1200	S5.003	65.606	300	S5.002	65.606	300
S21	67.672	2.136	Open Manhole	1200	S5.004	65.536	300	S5.003	65.536	300
S22	67.658	2.183	Open Manhole	1200	S5.005	65.475	300	S5.004	65.475	300
S23	67.556	2.247	Open Manhole	1800	S1.008	65.309	525	S1.007	65.309	525
								S5.005	65.436	300
S24	68.447	1.047	Open Manhole	1200	S6.000	67.400	225			
S25	67.732	1.432	Open Manhole	1200	S6.001	66.300	300	S6.000	66.373	225
S26	68.575	1.375	Open Manhole	1200	S7.000	67.200	225			
S27	67.662	1.432	Open Manhole	1200	S6.002	66.230	300	S6.001	66.230	300
								S7.000	66.306	225
S28	68.615	1.565	Open Manhole	1200	S8.000	67.050	225			
S29	67.616	1.465	Open Manhole	1200	S6.003	66.151	300	S6.002	66.151	300
								S8.000	66.226	225
S30	67.637	1.527	Open Manhole	1200	S6.004	66.110	300	S6.003	66.110	300
S31	67.909	3.009	Open Manhole	1800	S1.009	64.900	525	S1.008	64.900	525
								S6.004	66.069	300

NOTE: SW BRANCHWORK NOT INCLUDED WITHIN SCHEDULE. REFER TO PLAN LAYOUT FOR BRANCH LOCATIONS

NOTES:

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3. Do not sclae directly from drawing - if in doubt ask!

PRIVATE DRAINAGE NOTES:

1. DRAINAGE SYSTEMS TO COMPLY WITH THE FOLLOWING STANDARDS:
   - BS EN 752:2008
   - BUILDING REGULATIONS APPROVED DOCUMENT PART H, 2015 EDITION
2. ALL COMPONENTS USED IN DRAINAGE SYSTEMS TO COMPLY WITH THE FOLLOWING: BS EN 476:2011
3. ALL DRAINAGE SYSTEMS AND COMPONENTS TO BE CONSTRUCTED AND TESTED TO THE FULL SATISFACTION OF BOTH BUILDING REGULATIONS AND WARRANTY PROVIDER INSPECTORS
4. ALL DRAINAGE TO BE CONSTRUCTED AND TESTED IN ACCORDANCE WITH BS EN 1610:2015.
5. V.C. DENOTES VITRIFIED CLAY, VITRIFIED CLAY PIPES AND FITTINGS TO COMPLY WITH THE RELEVANT PROVISIONS OF BS EN295-1:2013,-2:2013,-3:2012 AND BS 65 RESPECTIVELY AND BE KITEMARKED. ALL PIPES SHALL BE EXTRA STRENGTH TO BS 65 OR EQUIVALENT BS EN295 PIPE CRUSHING STRENGTH.
6. LATERAL DRAIN CONNECTIONS (PIPES CONNECTING INTO ADOPTABLE SEWERS) TO BE VITRIFIED CLAY. WHERE COVER IS LESS THAN 1.2m TO GROUND LEVEL PIPE PROTECTION IS REQUIRED IN THE FORM OF A CONCRETE COVER SLAB.
7. PVC-U DENOTES UNPLASTISED POLYVINYL CHLORIDE . PVC-U PIPES AND FITTINGS TO COMPLY WITH THE RELEVANT PROVISIONS OF BS EN1401, BS EN13476-2 AND BS4660:1989/2000 RESPECTIVELY AND BE KITEMARKED.
8. PRECAST CONCRETE MANHOLES TO BE IN ACCORDANCE WITH BS EN 1917:2002 AND BS 5911-3:2010,-4:2002 AND TO BE KITEMARKED. PRECAST CONCRETE RINGS AND COVER SLABS TO CONCRETE PIPES TO BE JOINTED WITH CEMENT MORTAR UNLESS NOTED OTHERWISE.
9. INSITU AND PRECAST CONCRETE UNITS SHALL HAVE SULPHATE RESISTING PORTLAND CEMENT TO BS EN 197-1:2011.
10. POLYPROPYLENE INSPECTION CHAMBERS TO COMPLY WITH BS EN 13598-1:2010,-2:2016 AND BS 7158:2001 AND TO BE KITEMARKED.
11. MANHOLE COVERS AND FRAMES SHALL COMPLY WITH THE RELEVANT PROVISIONS OF BS EN 124-1 TO 6:2015. MANHOLE COVERS AND FRAMES TO BE OF A NON-ROCKING DESIGN WITH CUSHION INSERTS AND KITEMARKED. LOAD CLASS A15 COVERS TO BE USED IN AREAS INACCESSIBLE TO VEHICLES; LOAD CLASS B125 COVERS TO BE USED IN PRIVATE DRIVES; LOAD CLASS D400 COVERS TO BE USED IN PRIVATE ROADS. ALL COVERS TO BE BADGED "FW" OR "SW" AS APPROPRIATE. MANHOLE COVER SLABS AND ACCESS TO BE IN ACCORDANCE WITH CONCRETE PIPE ASSOCIATION TECHNICAL BULLETIN ISSUED SEPTEMBER 2001.
12. POLYPROPYLENE INSPECTION CHAMBER COVERS AND FRAMES SHALL COMPLY WITH THE RELEVANT PROVISIONS OF BS EN 124-1 TO 6:2015. COVERS AND FRAMES TO BE OF A NON-ROCKING DESIGN WITH CUSHION INSERTS AND KITEMARKED. LOAD CLASS A15 COVERS TO BE USED IN AREAS INACCESSIBLE TO VEHICLES; LOAD CLASS B125 COVERS TO BE USED IN PRIVATE DRIVES; LOAD CLASS D400 COVERS TO BE USED IN PRIVATE ROADS.
13. CLASS Z BEDDING DETAIL SHALL BE PROVIDED:
   - WHERE COVER TO PIPE BARREL IS;
     i) <1.2m IN VEHICULAR TRAFFICKED AREAS
     ii) <0.9m IN AREAS INACCESSIBLE TO VEHICLES.
   - AT ALL ROAD GULLY, YARD GULLY, RWP, SVP AND DRAINAGE CHANNEL BRANCHES.
   - AREAS OF DEEP ROOTING VEGETATION.
   - PIPE RUNS NEAR BUILDINGS IN ACCORDANCE WITH TYPICAL SECTIONS ON AWP DETAILS DRAWING.
   - WHERE TWO PIPES CROSS WITH A CLEAR GAP OF <300mm. CLASS Z SURROUND TO EXTEND A MINIMUM OF 1.0m FROM THE CENTRE OF THE CROSSING POINT & EXTENDED TO WITHIN 150mm OF THE NEAREST FLEXIBLE JOINT, WHERE REQUIRED.
14. NO MECHANICAL COMPACTION OF FILL MATERIAL WITHIN 300mm OF THE CROWN OF ANY PIPE.

HEALTH & SAFETY RISKS

IN ADDITION TO THE STANDARD HAZARDS AND RISKS NORMALLY ASSOCIATED WITH THE TYPE OF WORK DETAILED ON THIS DRAWING, PLEASE NOTE THE FOLLOWING RESIDUAL HEALTH AND SAFETY RISKS

CONSTRUCTION RISKS

CR 01 CONSTRUCTION IN AND AROUND EXISTING BURIED SERVICES - REFER TO SERVICES RECORDS.
CR 02 LIVE TRAFFIC WORK ON THE SITE
CR 03 LIVE SEWERAGE.

OPERATION & MAINTENANCE RISKS

MR 01 OPERATION AND MAINTENANCE TO BE THE RESPONSIBILITY OF THE SCHOOL AND MAINTAINED AS PART OF THEIR REGULAR ON SITE MAINTENANCE ROUTINE.
MR 02 ANCILLARY COMPONENTS TO BE MAINTAINED TO MANUFACTURERS GUIDELINES.

DEMOLITION RISKS

DR 01 DEMOLITION TO AVOID EXISTING BURIED SERVICES - REFER TO SERVICES RECORDS.
DR 02 DEMOLITION NEXT TO LIVE SEWERAGE. ALL SEWERS TO BE CONFIRMED REDUNDANT PRIOR TO DEMOLITION.

IT IS ASSUMED THAT ALL WORKS WILL BE CARRIED OUT BY A COMPETENT CONTRACTOR WORKING IN ACCORDANCE WITH THE REQUIREMENTS DEFINED IN THE CDM REGULATIONS.

JOB NO: 41632 - DRAINAGE - DRAWING REFERENCE TABLE

This Drawing to be Read in Conjunction with the Drawings Listed Below

Alan Wood & Partners (Civil)	Drawing Reference
Existing Surface Water Exceedance Flow Path	SFG-AWP-ZZ-XX-DR-C-3001
Proposed Surface Water Exceedance Flow Path	SFG-AWP-ZZ-XX-DR-C-3002
Existing Impermeable Areas	SFG-AWP-ZZ-XX-DR-C-3010
Proposed Impermeable Areas	SFG-AWP-ZZ-XX-DR-C-3011
Drainage Layouts - Sheets 1-2	SFG-AWP-ZZ-XX-DR-C-3300 to 3301
Manhole Schedule	SFG-AWP-ZZ-XX-DR-C-3320
Drainage Details - Sheets 1-3	SFG-AWP-ZZ-XX-DR-C-3700 to 3702
Drainage Details - Sheet 4	SFG-AWP-ZZ-XX-DR-C-3703
Cut and Fill - Sheets 1-2	SFG-AWP-ZZ-XX-DR-C-4000 to 4001
Site Build up Areas	SFG-AWP-ZZ-XX-DR-C-4400
External Works Details	SFG-AWP-ZZ-XX-DR-C-4700
Drawings by others	**Date Received**
Tower Surveys - Topographical Survey	20.12.2018
HLM Architects - Proposed Site Plan	23.01.2019

DRAINAGE KEY

- PROPOSED FW DRAIN 100Ø PIPE @ MIN. 1/40 U.N.O
- PROPOSED FW MANHOLE
- PROPOSED ADOPTABLE FW DEMARCATION CHAMBER
- FWP — PROPOSED FW POP-UP - BRANCH PIPEWORK 100Ø @ MIN. 1/40
- INTERCEPTOR
- PROPOSED SW ATTENUATION
- PROPOSED SW DRAIN - 150Ø PIPE @ MIN. 1/100 U.N.O
- PROPOSED SW MANHOLE
- PROPOSED ADOPTABLE SW DEMARCATION CHAMBER
- RWP — PROPOSED SW RAINWATER PIPE, C/W ACCESS PIPE & COVER FOR MAINTENANCE WHERE EXTERNAL. ALL PIPEWORK TO BE 100Ø
- RE — PROPOSED SW RODDING EYE
- CD — PROPOSED SW DRAINAGE CHANNEL - ACO M150D 0.0 C/W CLASS C250 COVERS WITH LOCKABLE GRATING
- TD — PROPOSED SW THRESHOLD DRAINAGE CHANNEL REQUIREMENT TBC BY ARCHITECT
- G — PROPOSED SW GULLY

* EXISTING SEWER BASED ON TOPOGRAPHICAL, GPR AND ON SITE CCTV SURVEY INFORMATION. ALL SEWERS TO BE LOCATED ON SITE PRIOR TO CONNECTION.

REFER TO ALL OTHER AWP DRAWINGS FOR DRAINAGE DETAILS AND SPECIFICATION.

REV	REASON FOR REVISION	DATE	BY	CHK
P07	SW MANHOLE SCHEDULES UPDATED TO SUIT LATEST MODEL	16.04.19	KR	TW
P06	AMENDED TO SUIT QA COMMENTS	02.04.19	KR	-
P05	UPDATED TO SUIT LATEST SITE PLAN AND LATEST DRAINAGE MODELLING	29.03.19	LV	TW
P04	UPDATED FOR PLANNING	14.02.19	LV	TW
P03	DRAWING NUMBER UPDATED	25.01.19	MJC	TW
P02	UPDATED TO SUIT LATEST SITE PLAN	24.01.19	MJC	TW
P01	FIRST ISSUE	17.01.19	GDV	TW

Caledonian

CLIENT:
CALEDONIAN MODULAR

PROJECT REF:
SIR FREDERICK GIBBERD SCHOOL, HARLOW ESSEX

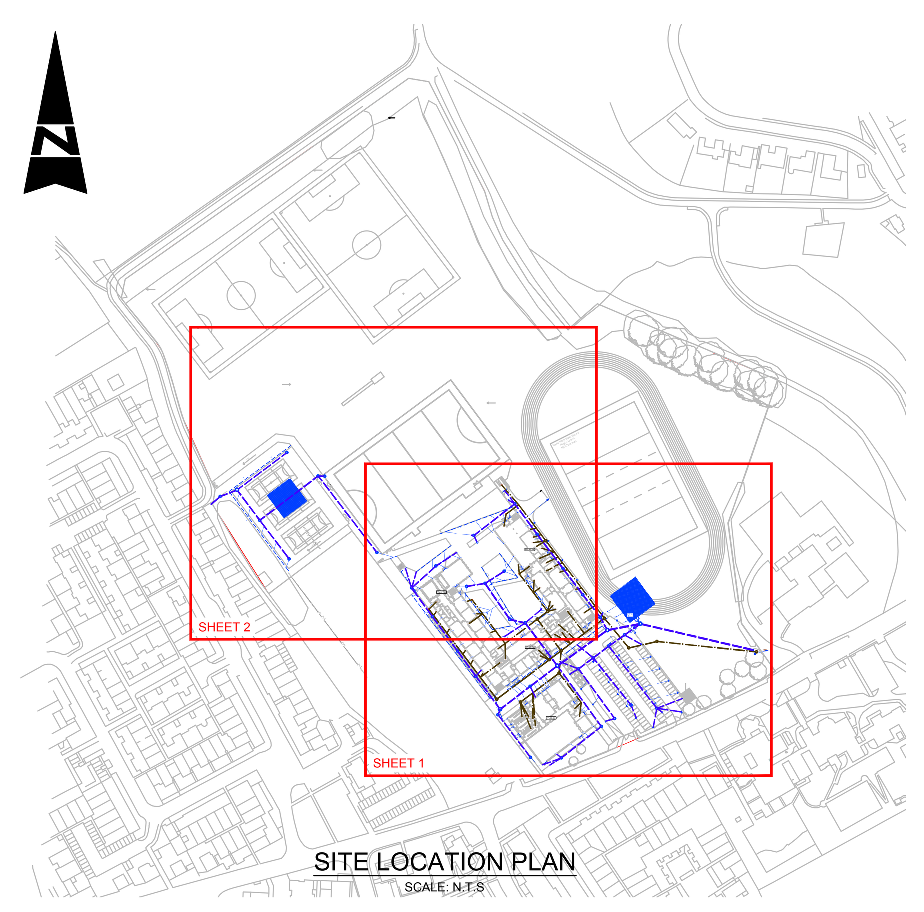
DESCRIPTION:
DRAINAGE LAYOUT - SHEET 1 OF 2

DOCUMENT REFERENCE No:

Ref	Orig	Zone	Level	Type	Role	Element / Chrono No.
FS0620	AWP	00	XX	DR	C	00-3300

SCALE @ A0: **1:250** REV: **P07**
CONTRACT NUMBER: **FS0620** DATE: **17.01.19**
INFORMATION STATUS: **WORK IN PROGRESS**

SUBCONTRACTOR COMPANY TRADE NAME: Alan Wood & Partners
SUBCONTRACTOR CONTRACT REF. No: **41632**



SURFACE WATER MANHOLE SCHEDULE - ASTRO TURF/MUGA

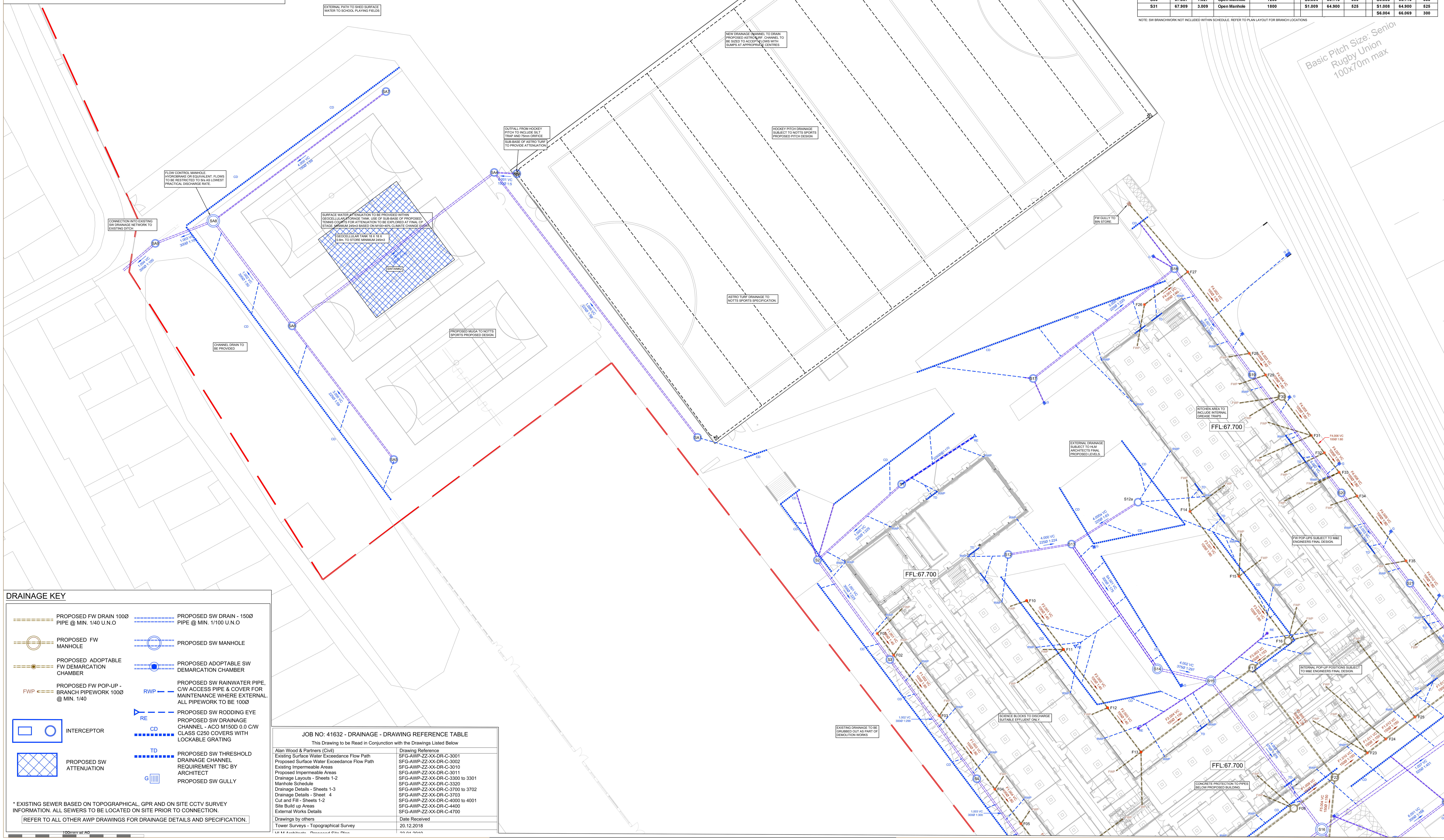
Manhole Name	Cover Level (m)	MH Depth (m)	Manhole Connection	Manhole Diam.,L*W (mm)		Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)		Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)
SA1	65.598	1.300	Open Manhole	1200		S1.000	64.298	225				
SA2	65.200	1.000	Open Manhole	1350		S2.000	64.200	375				
SA3	65.200	1.070	Open Manhole	1350		S2.001	64.130	150		S2.000	64.130	375
SA4	65.053	1.877	Open Manhole	1200		S1.001	63.176	300		S1.000	63.251	225
										S2.001	63.327	150
SA5	64.892	1.300	Open Manhole	1200		S3.000	63.592	225				
SA6	64.616	1.716	Open Manhole	1200		S1.002	62.900	300		S1.001	62.900	300
										S3.000	63.068	225
SA7	64.652	1.300	Open Manhole	1200		S4.000	63.352	150				
SA8	64.403	1.987	Open Manhole	1200		S1.003	62.416	300		S1.002	62.416	300
										S4.000	62.679	150
SA9	64.000	1.699	Open Manhole	1200		S1.004	62.301	300		S1.003	62.301	300
S	64.000	1.776	Open Manhole	0			OUTFALL			S1.004	62.224	300

NOTE: SW BRANCHWORK NOT INCLUDED WITHIN SCHEDULE. REFER TO PLAN LAYOUT FOR BRANCH LOCATIONS

SURFACE WATER MANHOLE SCHEDULE - MAIN SCHOOL BUILDING

Manhole Name	Cover Level (m)	MH Depth (m)	Manhole Connection	Manhole Diam.,L*W (mm)		Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)		Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)
S1	67.587	1.087	Open Manhole	1200		S1.000	66.500	225				
S2	67.586	1.254	Open Manhole	1200		S1.001	66.332	300		S1.000	66.407	225
S3	67.636	1.405	Open Manhole	1200		S1.002	66.231	300		S1.001	66.231	300
S4	67.628	1.488	Open Manhole	1200		S1.003	66.140	300		S1.002	66.140	300
S5	67.623	1.549	Open Manhole	1200		S1.004	66.074	300		S1.003	66.074	300
S6	68.129	1.129	Open Manhole	1200		S2.000	67.000	150				
S7	68.052	1.981	Open Manhole	1200		S2.001	66.071	225		S2.000	66.146	150
S8	67.930	2.034	Open Manhole	1500		S1.005	65.896	375		S1.004	65.971	300
										S2.001	66.046	225
S9	67.956	2.125	Open Manhole	1350		S1.006	65.832	375		S1.005	65.832	375
S10	68.563	1.063	Open Manhole	1200		S3.000	67.500	225				
S11	68.338	1.162	Open Manhole	1200		S3.001	67.176	225		S3.000	67.176	225
S12	67.672	1.672	Open Manhole	1200		S4.000	66.000	225				
S13	67.459	1.587	Open Manhole	1200		S4.001	65.872	300		S4.000	65.947	225
S14	67.524	1.820	Open Manhole	1350		S4.002	65.704	375		S4.001	65.779	300
S15	67.549	1.879	Open Manhole	1350		S4.003	65.670	375		S4.002	65.670	375
S16	67.683	2.287	Open Manhole	1500		S1.007	65.396	525		S1.006	65.546	375
										S3.001	66.698	225
										S4.003	65.546	375
S17	67.490	1.490	Open Manhole	1200		S5.000	66.000	225				
S18	67.580	1.802	Open Manhole	1200		S5.001	65.778	300		S5.000	65.853	225
S19	67.674	1.977	Open Manhole	1200		S5.002	65.697	300		S5.001	65.697	300
S20	67.673	2.067	Open Manhole	1200		S5.003	65.606	300		S5.002	65.606	300
S21	67.672	2.136	Open Manhole	1200		S5.004	65.536	300		S5.003	65.536	300
S22	67.658	2.183	Open Manhole	1200		S5.005	65.475	300		S5.004	65.475	300
S23	67.556	2.247	Open Manhole	1800		S1.008	65.319	525		S1.007	65.309	525
										S5.005	65.436	300
S24	68.447	1.047	Open Manhole	1200		S6.000	67.400	225				
S25	67.732	1.432	Open Manhole	1200		S6.001	66.300	300		S6.000	66.373	225
S26	68.575	1.375	Open Manhole	1200		S7.000	67.200	225				
S27	67.662	1.432	Open Manhole	1200		S6.002	66.230	300		S6.001	66.230	300
										S7.000	66.306	225
S28	68.615	1.565	Open Manhole	1200		S8.000	67.050	225				
S29	67.616	1.465	Open Manhole	1200		S6.003	66.151	300		S6.002	66.151	300
										S8.000	66.226	225
S30	67.637	1.527	Open Manhole	1200		S6.004	66.110	300		S6.003	66.110	300
S31	67.909	3.009	Open Manhole	1800		S1.009	64.900	525		S1.008	64.900	525
										S6.004	66.069	300

NOTE: SW BRANCHWORK NOT INCLUDED WITHIN SCHEDULE. REFER TO PLAN LAYOUT FOR BRANCH LOCATIONS



DRAINAGE KEY

PROPOSED FW DRAIN 100Ø PIPE @ MIN. 1/40 U.N.O

PROPOSED FW MANHOLE

PROPOSED ADOPTABLE FW DEMARCATION CHAMBER

FWP PROPOSED FW POP-UP - BRANCH PIPEWORK 100Ø @ MIN. 1/40

INTERCEPTOR

PROPOSED SW ATTENUATION

PROPOSED SW DRAIN - 150Ø PIPE @ MIN. 1/100 U.N.O

PROPOSED SW MANHOLE

PROPOSED ADOPTABLE SW DEMARCATION CHAMBER

RWP PROPOSED SW RAINWATER PIPE, C/W ACCESS PIPE & COVER FOR MAINTENANCE WHERE EXTERNAL. ALL PIPEWORK TO BE 100Ø

RE PROPOSED SW RODDING EYE

CD PROPOSED SW DRAINAGE CHANNEL - ACO M150D 0.0 C/W CLASS C250 COVERS WITH LOCKABLE GRATING

TD PROPOSED SW THRESHOLD DRAINAGE CHANNEL - REQUIREMENT TBC BY ARCHITECT

G PROPOSED SW GULLY

* EXISTING SEWER BASED ON TOPOGRAPHICAL, GPR AND ON SITE CCTV SURVEY INFORMATION. ALL SEWERS TO BE LOCATED ON SITE PRIOR TO CONNECTION.

REFER TO ALL OTHER AWP DRAWINGS FOR DRAINAGE DETAILS AND SPECIFICATION.

JOB NO: 41632 - DRAINAGE - DRAWING REFERENCE TABLE

This Drawing to be Read in Conjunction with the Drawings Listed Below

Alan Wood & Partners (Civil)	Drawing Reference
Existing Surface Water Exceedance Flow Path	SFG-AWP-ZZ-XX-DR-C-3001
Proposed Surface Water Exceedance Flow Path	SFG-AWP-ZZ-XX-DR-C-3002
Existing Impermeable Areas	SFG-AWP-ZZ-XX-DR-C-3010
Proposed Impermeable Areas	SFG-AWP-ZZ-XX-DR-C-3011
Drainage Layouts - Sheets 1-2	SFG-AWP-ZZ-XX-DR-C-3300 to 3301
Manhole Schedule	SFG-AWP-ZZ-XX-DR-C-3320
Drainage Details - Sheets 1-3	SFG-AWP-ZZ-XX-DR-C-3700 to 3702
Drainage Details - Sheet 4	SFG-AWP-ZZ-XX-DR-C-3703
Cut and Fill - Sheets 1-2	SFG-AWP-ZZ-XX-DR-C-4000 to 4001
Site Build up Areas	SFG-AWP-ZZ-XX-DR-C-4400
External Works Details	SFG-AWP-ZZ-XX-DR-C-4700
Drawings by others	Date Received
Tower Surveys - Topographical Survey	20.12.2018

NOTES:

1. This drawing has been prepared in accordance with the scope of CML's appointment with its clients and is subject to the terms and conditions of that appointment. CML accepts no liability for any use of this document other than by its client and only for the purposes for which it was prepared and provided.

2. This drawing is to be read in conjunction with all other relevant drawings and specifications for this project and apparent inconsistencies brought to the attention of the Project Design Manager.

3. Do not scale directly from drawing - if in doubt ask!

PRIVATE DRAINAGE NOTES:

1. DRAINAGE SYSTEMS TO COMPLY WITH THE FOLLOWING STANDARDS:
   - BS EN 752:2008
   - BUILDING REGULATIONS APPROVED DOCUMENT PART H, 2015 EDITION
2. ALL COMPONENTS USED IN DRAINAGE SYSTEMS TO COMPLY WITH THE FOLLOWING: BS EN 476:2011
3. ALL DRAINAGE SYSTEMS AND COMPONENTS TO BE CONSTRUCTED AND TESTED TO THE FULL SATISFACTION OF BOTH BUILDING REGULATIONS AND WARRANTY PROVIDER INSPECTORS
4. ALL DRAINAGE TO BE CONSTRUCTED AND TESTED IN ACCORDANCE WITH BS EN 1610:2015.
5. V.C. DENOTES VITRIFIED CLAY, VITRIFIED CLAY PIPES AND FITTINGS TO COMPLY WITH THE RELEVANT PROVISIONS OF BS EN295-1:2013,-2:2013,-3:2012 AND BS 65 RESPECTIVELY AND BE KITEMARKED. ALL PIPES SHALL BE EXTRA STRENGTH TO BS 65 OR EQUIVALENT BS EN295 PIPE CRUSHING STRENGTH.
6. LATERAL DRAIN CONNECTIONS (PIPES CONNECTING INTO ADOPTABLE SEWERS) TO BE VITRIFIED CLAY. WHERE COVER IS LESS THAN 1.2m TO GROUND LEVEL PIPE PROTECTION IS REQUIRED IN THE FORM OF A CONCRETE COVER SLAB.
7. PVC-U DENOTES UNPLASTISED POLYVINYL CHLORIDE . PVC-U PIPES AND FITTINGS TO COMPLY WITH THE RELEVANT PROVISIONS OF BS EN1401, BS EN13476-2 AND BS4660:1989/2000 RESPECTIVELY AND BE KITEMARKED.
8. PRECAST CONCRETE MANHOLES TO BE IN ACCORDANCE WITH BS EN 1917:2002 AND BS 5911-3:2010,-4:2002 AND TO BE KITEMARKED. PRECAST CONCRETE RINGS AND COVER SLABS TO CONCRETE PIPES TO BE JOINTED WITH CEMENT MORTAR UNLESS NOTED OTHERWISE.
9. INSITU AND PRECAST CONCRETE UNITS SHALL HAVE SULPHATE RESISTING PORTLAND CEMENT TO BS EN 197-1:2011.
10. POLYPROPYLENE INSPECTION CHAMBERS TO COMPLY WITH BS EN 13598-1:2010,-2:2016 AND BS 7158:2001 AND TO BE KITEMARKED.
11. MANHOLE COVERS AND FRAMES SHALL COMPLY WITH THE RELEVANT PROVISIONS OF BS EN 124-1 TO 6:2015. MANHOLE COVERS AND FRAMES TO BE OF A NON-ROCKING DESIGN WITH CUSHION INSERTS AND KITEMARKED. LOAD CLASS A15 COVERS TO BE USED IN AREAS INACCESSIBLE TO VEHICLES; LOAD CLASS B125 COVERS TO BE USED IN PRIVATE DRIVES; LOAD CLASS D400 COVERS TO BE USED IN PRIVATE ROADS. ALL COVERS TO BE BADGED "FW" OR "SW" AS APPROPRIATE. MANHOLE COVER SLABS AND ACCESS TO BE IN ACCORDANCE WITH CONCRETE PIPE ASSOCIATION TECHNICAL BULLETIN ISSUED SEPTEMBER 2001.
12. POLYPROPYLENE INSPECTION CHAMBER COVERS AND FRAMES SHALL COMPLY WITH THE RELEVANT PROVISIONS OF BS EN 124-1 TO 6:2015. COVERS AND FRAMES TO BE OF A NON-ROCKING DESIGN WITH CUSHION INSERTS AND KITEMARKED. LOAD CLASS A15 COVERS TO BE USED IN AREAS INACCESSIBLE TO VEHICLES; LOAD CLASS B125 COVERS TO BE USED IN PRIVATE DRIVES; LOAD CLASS D400 COVERS TO BE USED IN PRIVATE ROADS.
13. CLASS Z BEDDING DETAIL SHALL BE PROVIDED:
   - WHERE COVER TO PIPE BARREL IS;
     i) <1.2m IN VEHICULAR TRAFFICKED AREAS
     ii) <0.9m IN AREAS INACCESSIBLE TO VEHICLES.
   - AT ALL ROAD GULLY, YARD GULLY, RWP, SVP AND DRAINAGE CHANNEL BRANCHES.
   - AREAS OF DEEP ROOTING VEGETATION.
   - PIPE RUNS NEAR BUILDINGS IN ACCORDANCE WITH TYPICAL SECTIONS ON AWP DETAILS DRAWING.
   - WHERE TWO PIPES CROSS WITH A CLEAR GAP OF <300mm. CLASS Z SURROUND TO EXTEND A MINIMUM OF 1.0m FROM THE CENTRE OF THE CROSSING POINT & EXTENDED TO WITHIN 150mm OF THE NEAREST FLEXIBLE JOINT, WHERE REQUIRED.
14. NO MECHANICAL COMPACTION OF FILL MATERIAL WITHIN 300mm OF THE CROWN OF ANY PIPE.

HEALTH & SAFETY RISKS

IN ADDITION TO THE STANDARD HAZARDS AND RISKS NORMALLY ASSOCIATED WITH THE TYPE OF WORK DETAILED ON THIS DRAWING, PLEASE NOTE THE FOLLOWING RESIDUAL HEALTH AND SAFETY RISKS

CONSTRUCTION RISKS

CR 01 CONSTRUCTION IN AND AROUND EXISTING BURIED SERVICES - REFER TO SERVICES RECORDS.
CR 02 LIVE TRAFFIC WORK ON THE SITE
CR 03 LIVE SEWERAGE.

OPERATION & MAINTENANCE RISKS

MR 01 OPERATION AND MAINTENANCE TO BE THE RESPONSIBILITY OF THE SCHOOL AND MAINTAINED AS PART OF THEIR REGULAR ON SITE MAINTENANCE ROUTINE.
MR 02 ANCILLARY COMPONENTS TO BE MAINTAINED TO MANUFACTURERS GUIDELINES.

DEMOLITION RISKS

DR 01 DEMOLITION TO AVOID EXISTING BURIED SERVICES - REFER TO SERVICES RECORDS.
DR 02 DEMOLITION NEXT TO LIVE SEWERAGE. ALL SEWERS TO BE CONFIRMED REDUNDANT PRIOR TO DEMOLITION.

IT IS ASSUMED THAT ALL WORKS WILL BE CARRIED OUT BY A COMPETENT CONTRACTOR WORKING IN ACCORDANCE WITH THE REQUIREMENTS DEFINED IN THE CDM REGULATIONS.

REV	REASON FOR REVISION	DATE	BY	CHK
P06	SW MANHOLE SCHEDULES UPDATED TO SUIT LATEST MODEL	16.04.19	KR	TW
P05	AMENDED TO SUIT QA COMMENTS	02.04.19	KR	-
P04	UPDATED TO SUIT LATEST SITE PLAN AND LATEST DRAINAGE MODELLING	29.03.19	LV	TW
P03	UPDATED FOR PLANNING	14.02.19	LV	TW
P02	UPDATED TO SUIT LATEST SITE PLAN	24.01.19	MJC	TW
P01	FIRST ISSUE	17.01.19	GDV	TW

Caledonian

CLIENT: **CALEDONIAN MODULAR**

PROJECT REF: **SIR FREDERICK GIBBERD SCHOOL, HARLOW ESSEX**

DESCRIPTION: **DRAINAGE LAYOUT - SHEET 2 OF 2**

DOCUMENT REFERENCE No:

FS0620	AWP	00	XX	DR	C	00-3301
Ref	Orig	Zone	Level	Type	Role	Element Chrono No.

SCALE @ A0: **1:250** — REV: **P06**

CONTRACT NUMBER: **FS0620** — DATE: **17.01.19**

INFORMATION STATUS: **WORK IN PROGRESS**

SUBCONTRACTOR COMPANY TRADE NAME: Alan Wood & Partners

SUBCONTRACTOR CONTRACT REF. No: **41632**

FOUL MANHOLE SCHEDULE

MH NAME	MH CL (m)	MH DEPTH (m)	MH SIZE/TYPE (mm)	PIPE INVERTS (m)	MH DIAM, LxW (m)	COVER TYPE
F01	67.653	1.311	PPIC	F1.001 Inv. 67.000 F1 B1 Inv. 67.000	0.450	Standard
F02	67.653	2.297	PPIC	F1.001 Inv. 66.875 F1.002 Inv. 66.875 F2 B1 Inv. 66.875	0.450	Standard
F03	67.653	2.297	PPIC	F1.002 Inv. 66.700 F1.003 Inv. 66.700 F3 B1 Inv. 66.700	0.450	Standard
F04	67.653	2.297	PPIC	F1.003 Inv. 66.487 F1.004 Inv. 66.487 F4 B1 Inv. 66.487	0.450	Standard
F05	67.653	1.266	PPIC	F1.004 Inv. 66.387 F1.005 Inv. 66.387 F5 B1 Inv. 66.387	0.450	Standard
F06	67.653	1.397	PPIC	F1.005 Inv. 66.256 F1.006 Inv. 66.256 F6 B1 Inv. 66.301 F6 B2 Inv. 66.301	0.450	Standard
F07	67.676	1.639	Manhole Type B	F1.006 Inv. 66.037 F1.007 Inv. 66.037	1.200	D400
F08	67.689	1.919	PPIC	F1.007 Inv. 65.770 F1.008 Inv. 65.770	0.450	Standard
F09	67.789	2.589	Manhole Type B	F1.008 Inv. 65.200 F1.009 Inv. 65.200 F9 B1 Inv. 65.250 F9 B2 Inv. 65.250	1.200	D400
F10	67.633	0.804	PPIC	F2.001 Inv. 67.108 F10 B1 Inv. 66.829	0.450	Standard
F11	67.633	0.804	PPIC	F2.001 Inv. 66.829 F2.002 Inv. 66.829 F11 B1 Inv. 66.829 F11 B2 Inv. 66.829	0.450	Standard
F12	67.645	1.153	PPIC	F2.002 Inv. 66.492 F2.003 Inv. 66.492 F12 B1 Inv. 66.492	0.450	Standard
F13	67.665	1.400	PPIC	F2.003 Inv. 66.236 F2.004 Inv. 66.236 F13 B1 Inv. 66.236 F13 B2 Inv. 66.236	0.450	Standard
F14	67.642	1.314	PPIC	F3.001 Inv. 66.491 F14 B1 Inv. 66.491 F14 B2 Inv. 66.491	0.450	Standard
F15	67.656	1.353	PPIC	F3.001 Inv. 66.304 F3.002 Inv. 66.304 F15 B1 Inv. 66.304 F15 B2 Inv. 66.304	0.450	Standard
F16	67.667	1.551	Manhole Type B	F3.002 Inv. 66.117 F3.003 Inv. 66.117 F16 B1 Inv. 66.117 F16 B2 Inv. 66.117 F16 B3 Inv. 66.117	1.200	D400
F17	67.620	1.556	Manhole Type B	F2.004 Inv. 66.064 F2.005 Inv. 66.064 F3.003 Inv. 66.064	1.200	D400
F18	68.096	2.303	Manhole Type B	F5.001 Inv. 67.000 F18 B1 Inv. 67.000 F18 B2 Inv. 67.000 F18 B3 Inv. 67.000	1.200	D400
F19	68.138	1.263	PPIC	F5.001 Inv. 66.875 F5.002 Inv. 66.875 F19 B1 Inv. 66.875 F19 B2 Inv. 66.875	0.450	Standard
F20	68.185	1.313	PPIC	F6.000 Inv. 67.000 F20 B2 Inv. 67.000 F20 B1 Inv. 67.000	0.450	Standard

FOUL MANHOLE SCHEDULE

MH NAME	MH CL (m)	MH DEPTH (m)	MH SIZE/TYPE (mm)	PIPE INVERTS (m)	MH DIAM, LxW (m)	COVER TYPE
F21	67.966	2.790	Manhole Type B	F5.002 Inv. 66.260 F5.004 Inv. 65.176 F6.000 Inv. 66.260	1.200	D400
F22	67.590	2.509	Manhole Type B	F2.005 Inv. 65.081 F1.010 Inv. 65.081 F5.004 Inv. 65.081 F1.009 Inv. 65.081	1.200	D400
F23	67.590	2.559	PPIC	F1.010 Inv. 65.031 F1.011 Inv. 65.031 F23 B1 Inv. 65.081 F23 B2 Inv. 65.746	0.450	Standard
F24	67.590	2.587	PPIC	F1.011 Inv. 65.003 F1.012 Inv. 65.003 F24 B1 Inv. 65.053	0.450	Standard
F25	67.590	2.632	PPIC	F1.012 Inv. 64.958 F1.013 Inv. 64.958 F25 B1 Inv. 65.008	0.450	Standard
F26	67.625	1.312	PPIC	F4.001 Inv. 67.000 F26 B1 Inv. 67.000	0.450	Standard
F27	67.504	1.484	PPIC	F4.001 Inv. 66.750 F4.002 Inv. 66.750 F27 G1 Inv. 66.750	0.450	Standard
F28	67.641	2.293	PPIC	F4.002 Inv. 66.514 F4.003 Inv. 66.514 F28 B1 Inv. 66.514	0.450	Standard
F29	67.641	1.252	PPIC	F4.003 Inv. 66.389 F4.004 Inv. 66.389 F29 B1 Inv. 66.389	0.450	Standard
F30	67.640	1.376	Manhole Type B	F4.004 Inv. 66.264 F4.005 Inv. 66.264 F30 B1 Inv. 66.264 F30 B2 Inv. 66.264	1.200	D400
F31	67.640	1.489	PPIC	F4.005 Inv. 66.151 F4.006 Inv. 66.151 F31 B2 Inv. 66.151	0.450	Standard
F32	67.640	1.539	PPIC	F4.006 Inv. 66.101 F4.007 Inv. 66.101 F32 B1 Inv. 66.101	0.450	Standard
F33	67.640	1.596	PPIC	F4.007 Inv. 66.045 F4.008 Inv. 66.045 F33 F1 Inv. 66.045 F33 B2 Inv. 66.045	0.450	Standard
F34	67.640	1.664	PPIC	F4.008 Inv. 65.976 F4.009 Inv. 65.976 F34 B1 Inv. 65.976	0.450	Standard
F35	67.640	1.852	PPIC	F4.009 Inv. 65.788 F4.010 Inv. 65.788 F35 B1 Inv. 65.788	0.450	Standard
F36	67.640	2.027	PPIC	F4.010 Inv. 65.613 F4.011 Inv. 65.613 F36 B1 Inv. 65.613	0.450	Standard
F37	67.609	2.758	Manhole Type B	F1.013 Inv. 64.851 F1.014 Inv. 64.851 F4.011 Inv. 64.901	1.200	D400
F38	67.704	2.396	Manhole Type B	F1.014 Inv. 64.687 F1.015 Inv. 64.687	1.200	D400
F39	68.024	2.281	Manhole Type B	F1.015 Inv. 64.564 F1.016 Inv. 64.564	1.200	D400
F40	64.905	1.150	Manhole Type B	F1.016 Inv. 63.570	1.200	D400

100mm at A1

NOTES:

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PRIVATE DRAINAGE NOTES:

1. DRAINAGE SYSTEMS TO COMPLY WITH THE FOLLOWING STANDARDS:
   - BS EN 752:2008
   - BUILDING REGULATIONS APPROVED DOCUMENT PART H, 2015 EDITION
2. ALL COMPONENTS USED IN DRAINAGE SYSTEMS TO COMPLY WITH THE FOLLOWING: BS EN 476:2011
3. ALL DRAINAGE SYSTEMS AND COMPONENTS TO BE CONSTRUCTED AND TESTED TO THE FULL SATISFACTION OF BOTH BUILDING REGULATIONS AND WARRANTY PROVIDER INSPECTORS
4. ALL DRAINAGE TO BE CONSTRUCTED AND TESTED IN ACCORDANCE WITH BS EN 1610:2015.
5. V.C. DENOTES VITRIFIED CLAY, VITRIFIED CLAY PIPES AND FITTINGS TO COMPLY WITH THE RELEVANT PROVISIONS OF BS EN295-1:2013,-2:2013,-3:2012 AND BS 65 RESPECTIVELY AND BE KITEMARKED. ALL PIPES SHALL BE EXTRA STRENGTH TO BS 65 OR EQUIVALENT BS EN295 PIPE CRUSHING STRENGTH.
6. LATERAL DRAIN CONNECTIONS (PIPES CONNECTING INTO ADOPTABLE SEWERS) TO BE VITRIFIED CLAY. WHERE COVER IS LESS THAN 1.2m TO GROUND LEVEL PIPE PROTECTION IS REQUIRED IN THE FORM OF A CONCRETE COVER SLAB.
7. PVC-U DENOTES UNPLASTISED POLYVINYL CHLORIDE . PVC-U PIPES AND FITTINGS TO COMPLY WITH THE RELEVANT PROVISIONS OF BS EN1401, BS EN13476-2 AND BS4660:1989/2000 RESPECTIVELY AND BE KITEMARKED.
8. PRECAST CONCRETE MANHOLES TO BE IN ACCORDANCE WITH BS EN 1917:2002 AND BS 5911-3:2010,-4:2002 AND TO BE KITEMARKED. PRECAST CONCRETE RINGS AND COVER SLABS TO CONCRETE PIPES TO BE JOINTED WITH CEMENT MORTAR UNLESS NOTED OTHERWISE.
9. INSITU AND PRECAST CONCRETE UNITS SHALL HAVE SULPHATE RESISTING PORTLAND CEMENT TO BS EN 197-1:2011.
10. POLYPROPYLENE INSPECTION CHAMBERS TO COMPLY WITH BS EN 13598-1:2010,-2:2016 AND BS 7158:2001 AND TO BE KITEMARKED.
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13. CLASS Z BEDDING DETAIL SHALL BE PROVIDED:
   - WHERE COVER TO PIPE BARREL IS;
     i) <1.2m IN VEHICULAR TRAFFICKED AREAS
     ii) <0.9m IN AREAS INACCESSIBLE TO VEHICLES.
   - AT ALL ROAD GULLY, YARD GULLY, RWP, SVP AND DRAINAGE CHANNEL BRANCHES.
   - AREAS OF DEEP ROOTING VEGETATION.
   - PIPE RUNS NEAR BUILDINGS IN ACCORDANCE WITH TYPICAL SECTIONS ON AWP DETAILS DRAWING.
   - WHERE TWO PIPES CROSS WITH A CLEAR GAP OF <300mm. CLASS Z SURROUND TO EXTEND A MINIMUM OF 1.0m FROM THE CENTRE OF THE CROSSING POINT & EXTENDED TO WITHIN 150mm OF THE NEAREST FLEXIBLE JOINT, WHERE REQUIRED.
14. NO MECHANICAL COMPACTION OF FILL MATERIAL WITHIN 300mm OF THE CROWN OF ANY PIPE.

REV	REASON FOR REVISION	DATE	BY	CHK
P02	UPDATED TO SUIT LATEST DRAINAGE LAYOUT. SW SCHEDULES ADDED TO DRAINAGE LAYOUT PLANS	16.04.19	KR	TW
P01	FIRST ISSUE	29.03.19	LV	TW

Caledonian

CLIENT:

CALEDONIAN MODULAR

PROJECT REF:

SIR FREDERICK GIBBERD SCHOOL, HARLOW ESSEX

DESCRIPTION:

DRAINAGE LAYOUT - MANHOLE SCHEDULE

DOCUMENT REFERENCE No:

Ref	Orig	Zone	Level	Type	Role	Element Chrono No.
FS0620	AWP	00	XX	DR	C	00-3302

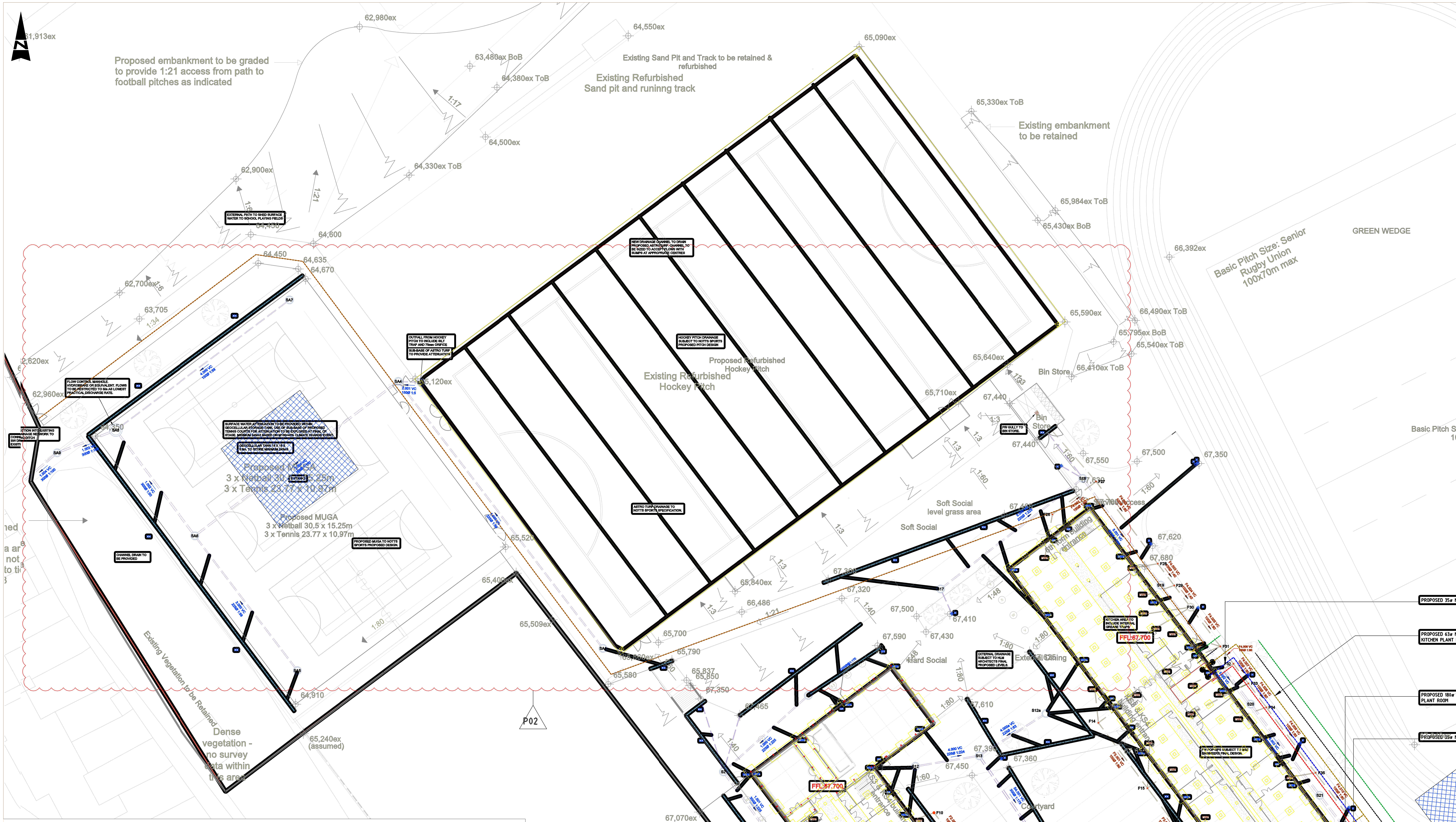
SCALE @ A0: **1:250** | REV: **P02**

CONTRACT NUMBER: **FS0620** | DATE: **29.03.19**

INFORMATION STATUS: **WORK IN PROGRESS**

SUBCONTRACTOR COMPANY TRADE NAME: Alan Wood & Partners

SUBCONTRACTOR CONTRACT REF. No: **41632**



SITE LOCATION PLAN
SCALE: N.T.S

DRAINAGE KEY

- PROPOSED FW DRAIN 100Ø PIPE @ MIN. 1/40 U.N.O
- PROPOSED FW MANHOLE
- PROPOSED ADOPTABLE FW DEMARCATION CHAMBER
- FWP — PROPOSED FW POP-UP - BRANCH PIPEWORK 100Ø @ MIN. 1/40
- INTERCEPTOR
- PROPOSED SW ATTENUATION
- PROPOSED SW DRAIN - 150Ø PIPE @ MIN. 1/100 U.N.O
- PROPOSED SW MANHOLE
- PROPOSED ADOPTABLE SW DEMARCATION CHAMBER
- RWP — PROPOSED SW RAINWATER PIPE, C/W ACCESS PIPE & COVER FOR MAINTENANCE WHERE EXTERNAL. ALL PIPEWORK TO BE 100Ø
- RE — PROPOSED SW RODDING EYE
- CD — PROPOSED SW DRAINAGE CHANNEL - ACO M150D 0.0 C/W CLASS C250 COVERS WITH LOCKABLE GRATING
- TD — PROPOSED SW THRESHOLD DRAINAGE CHANNEL REQUIREMENT TBC BY ARCHITECT
- G — PROPOSED SW GULLY

* EXISTING SEWER BASED ON TOPOGRAPHICAL, GPR AND ON SITE CCTV SURVEY INFORMATION. ALL SEWERS TO BE LOCATED ON SITE PRIOR TO CONNECTION.

REFER TO ALL OTHER AWP DRAWINGS FOR DRAINAGE DETAILS AND SPECIFICATION.

JOB NO: 41632 - DRAINAGE - DRAWING REFERENCE TABLE

This Drawing to be Read in Conjunction with the Drawings Listed Below

Alan Wood & Partners (Civil)	Drawing Reference
Existing Surface Water Exceedance Flow Path	SFG-AWP-ZZ-XX-DR-C-3001
Proposed Surface Water Exceedance Flow Path	SFG-AWP-ZZ-XX-DR-C-3002
Existing Impermeable Areas	SFG-AWP-ZZ-XX-DR-C-3010
Proposed Impermeable Areas	SFG-AWP-ZZ-XX-DR-C-3011
Drainage Layouts - Sheets 1-2	SFG-AWP-ZZ-XX-DR-C-3300 to 3301
Manhole Schedule	SFG-AWP-ZZ-XX-DR-C-3320
Drainage Details - Sheets 1-3	SFG-AWP-ZZ-XX-DR-C-3700 to 3702
Drainage Details - Sheet 4	SFG-AWP-ZZ-XX-DR-C-3703
Cut and Fill - Sheets 1-2	SFG-AWP-ZZ-XX-DR-C-4000 to 4001
Site Build up Areas	SFG-AWP-ZZ-XX-DR-C-4400
External Works Details	SFG-AWP-ZZ-XX-DR-C-4700
Drawings by others	**Date Received**
Tower Surveys - Topographical Survey	20.12.2018
HLM Architects - Proposed Site Plan	23.01.2019

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HEALTH & SAFETY RISKS

IN ADDITION TO THE STANDARD HAZARDS AND RISKS NORMALLY ASSOCIATED WITH THE TYPE OF WORK DETAILED ON THIS DRAWING, PLEASE NOTE THE FOLLOWING RESIDUAL HEALTH AND SAFETY RISKS

CONSTRUCTION RISKS

- CR 01 CONSTRUCTION IN AND AROUND EXISTING BURIED SERVICES - REFER TO SERVICES RECORDS.
- CR 02 LIVE TRAFFIC WORK ON THE SITE
- CR 03 LIVE SEWERAGE.

OPERATION & MAINTENANCE RISKS

- MR 01 OPERATION AND MAINTENANCE TO BE THE RESPONSIBILITY OF THE SCHOOL AND MAINTAINED AS PART OF THEIR REGULAR ON SITE MAINTENANCE ROUTINE.
- MR 02 ANCILLARY COMPONENTS TO BE MAINTAINED TO MANUFACTURERS GUIDELINES.

DEMOLITION RISKS

- DR 01 DEMOLITION TO AVOID EXISTING BURIED SERVICES - REFER TO SERVICES RECORDS.
- DR 02 DEMOLITION NEXT TO LIVE SEWERAGE. ALL SEWERS TO BE CONFIRMED REDUNDANT PRIOR TO DEMOLITION.

IT IS ASSUMED THAT ALL WORKS WILL BE CARRIED OUT BY A COMPETENT CONTRACTOR WORKING IN ACCORDANCE WITH THE REQUIREMENTS DEFINED IN THE CDM REGULATIONS.

LEGEND

SYMBOL	DESCRIPTION
	GAS MAIN
	COLD WATER MAINS
	PROPOSED BRITISH TELECOM & FIBRE DUCT ROUTE: 1No. DUCT REQUIRED FOR BT COPPER CONNECTION 1No. DUCT REQUIRED FOR BT FIBRE CONNECTION
	PROPOSED FIRE ALARM DUCT ROUTE TO CONNECT NEW BUILDING TO SPORTS HALL
	NEW LV SUBMAIN DUCT
	NEW INCOMING DNO ELECTRICAL SUPPLY. EXACT ROUTE TO BE CONFIRMED BY DNO
	NEW COMMS DUCT TO SERVE NEW BUILDING SPORTS HALL FROM NEW BUILDING
	PROPOSED ELV DUCT FOR EXTERNAL LIGHTING TO REAR OF SITE
	PROPOSED FIREMAIN
	GRAY DENOTES EXISTING
	DRAW PIT
G	GAS METER
M	WATER METER
H	FIRE HYDRANT

ALL M&E INFORMATION BASED ON ANDERSON GREEN PROPOSALS. REFER TO ANDERSON GREEN DRAWINGS FOR DETAILED INFORMATION

REV	REASON FOR REVISION	DATE	BY	CHK
P02	CP ISSUE	16.04.19	KR	TW
P01	FIRST ISSUE	25.01.19	MJC	TW

Caledonian

CLIENT: **CALEDONIAN MODULAR**

PROJECT REF: **SIR FREDERICK GIBBERD SCHOOL, HARLOW ESSEX**

DESCRIPTION: **COMBINED SERVICES - SHEET 1 OF 2**

DOCUMENT REFERENCE No:

Ref	Orig	Zone	Level	Type	Role	Element Chrono No.
FS0620	AWP	00	XX	DR	C	00-3400

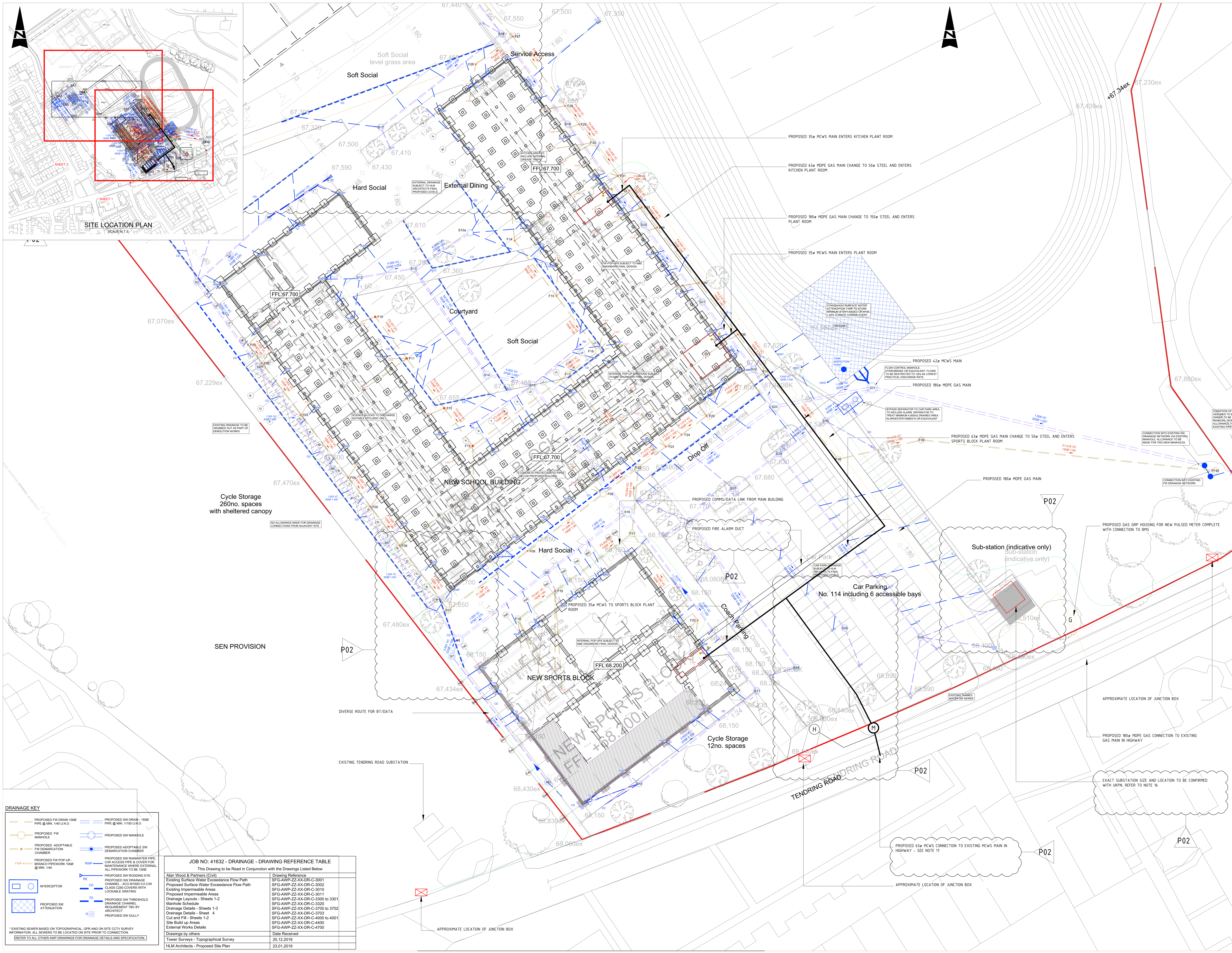
SCALE @ A0: **1:250** REV: **P02**

CONTRACT NUMBER: **FS0620** DATE: **17.01.19**

INFORMATION STATUS: **WORK IN PROGRESS**

SUBCONTRACTOR COMPANY TRADE NAME: Alan Wood & Partners

SUBCONTRACTOR CONTRACT REF. No: **41632**



NOTES:

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	NEW COMMS DUCT TO SERVE NEW BUILDING SPORTS HALL FROM NEW BUILDING
	PROPOSED ELV DUCT FOR EXTERNAL LIGHTING TO REAR OF SITE
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	GRAY DENOTES EXISTING
	DRAW PIT
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Drawings by others	**Date Received**
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HLM Architects - Proposed Site Plan	23.01.2019

REV	REASON FOR REVISION	DATE	BY	CHK
P03	CP ISSUE	16.04.19	KR	TW
P02	UPDATED TO SUIT LATEST SITE PLAN	24.01.19	MJC	TW
P01	FIRST ISSUE	17.01.19	GDV	TW

Caledonian

CLIENT:
CALEDONIAN MODULAR

PROJECT REF:
SIR FREDERICK GIBBERD SCHOOL, HARLOW ESSEX

DESCRIPTION:
DRAINAGE LAYOUT - SHEET 2 OF 2

DOCUMENT REFERENCE No:

Ref	Orig	Zone	Level	Type	Role	Element Chrono No.
FS0620	AWP	00	XX	DR	C	00-3301

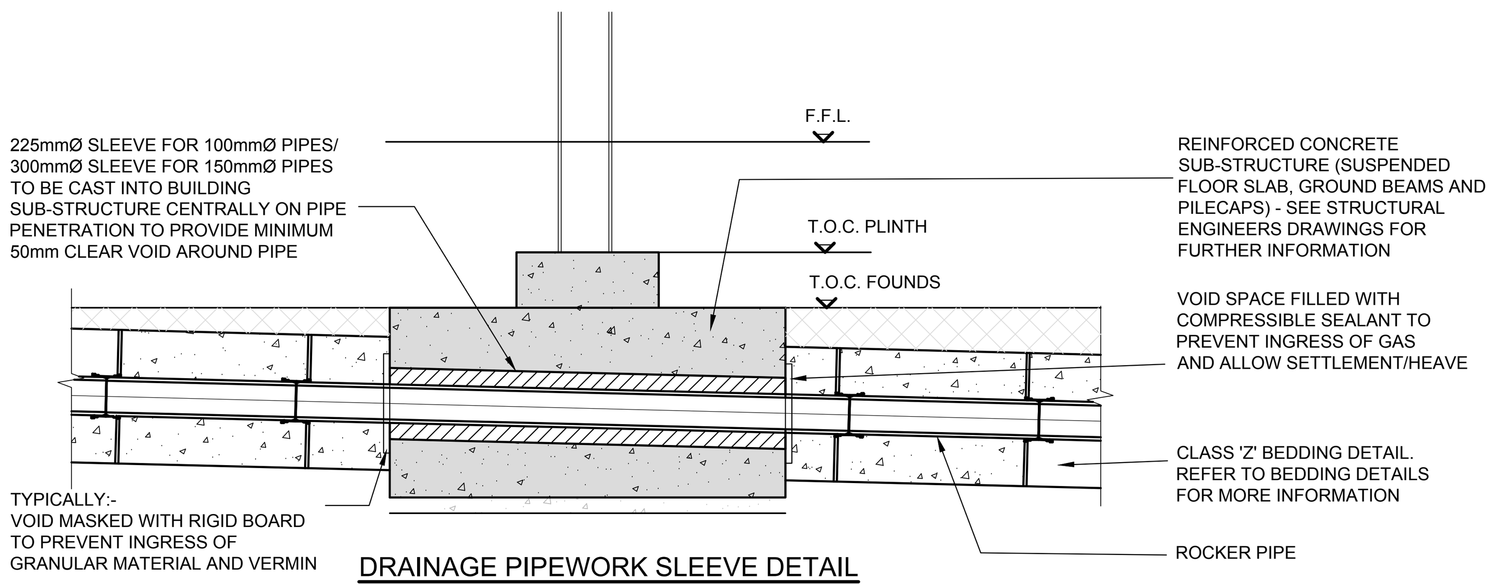
SCALE @ A0: **1:250** | REV: **P03**

CONTRACT NUMBER: **FS0620** | DATE: **17.01.19**

INFORMATION STATUS: **WORK IN PROGRESS**

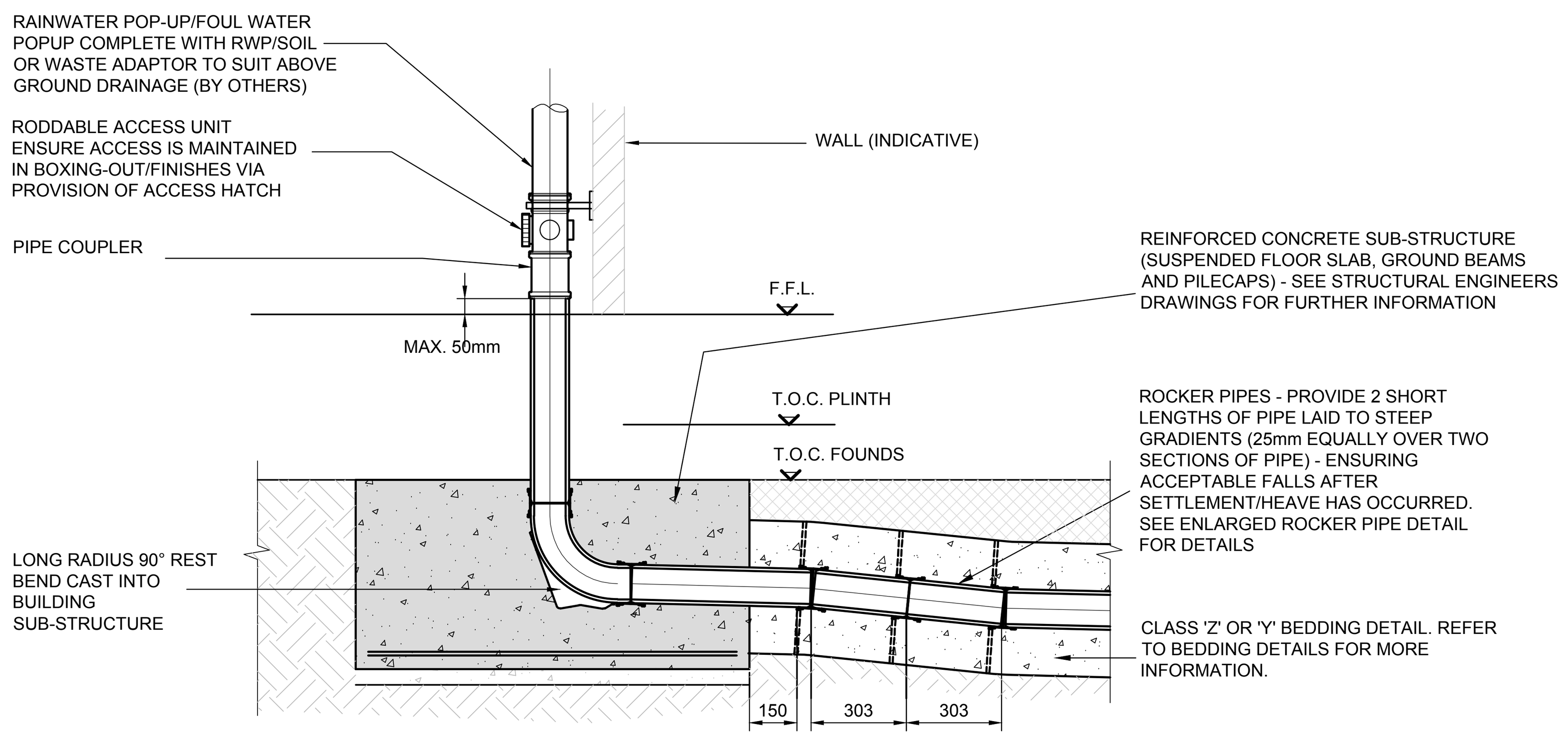
SUBCONTRACTOR COMPANY TRADE NAME: Alan Wood & Partners

SUBCONTRACTOR CONTRACT REF. No: **41632**



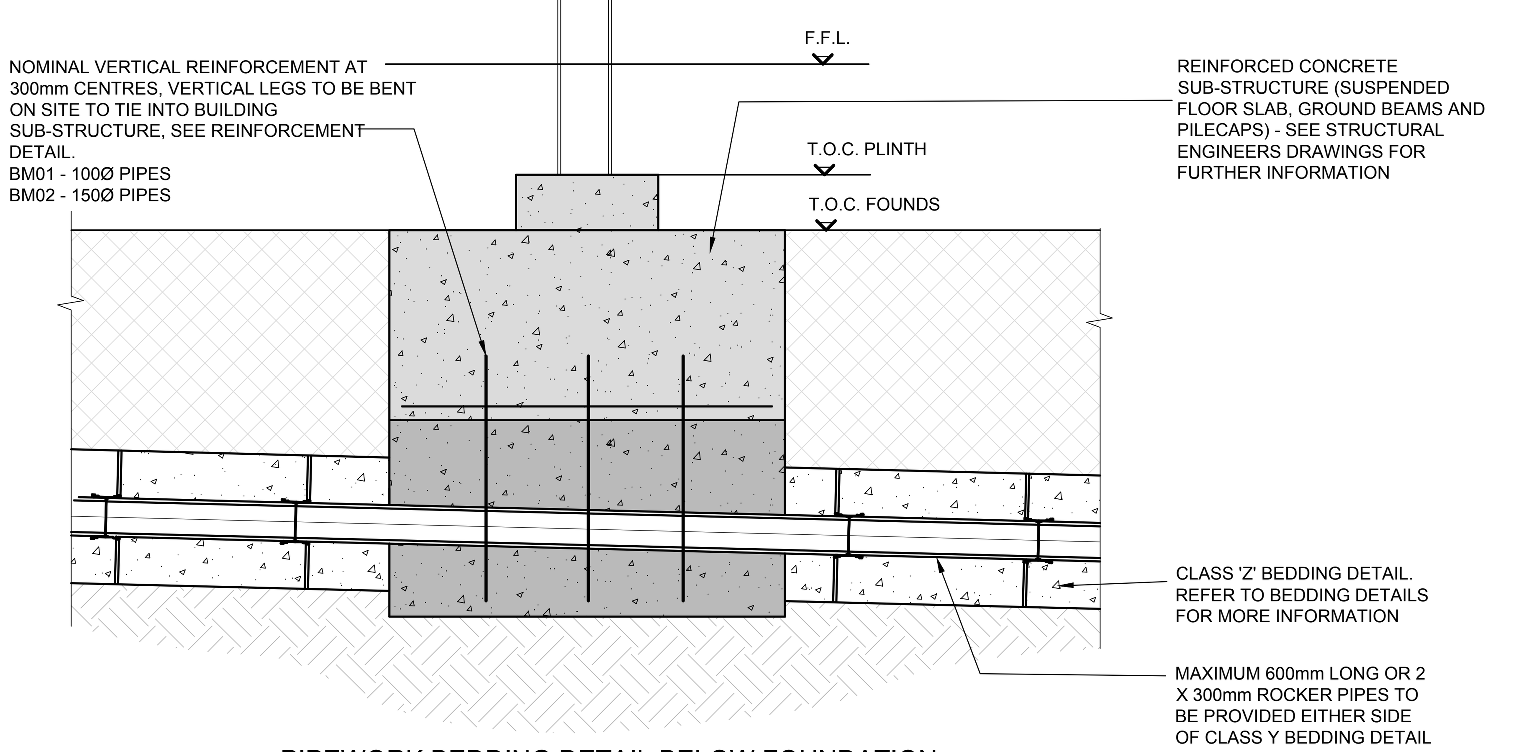
DRAINAGE PIPEWORK SLEEVE DETAIL
(ONLY WHERE PIPE SOFFIT >300mm FROM UNDERSIDE OF STRUCTURE, OTHERWISE CAST IN WITH CLASS Y BEDDING DETAIL)

WHERE PIPEWORK RUNS THROUGH BUILDING SUB-STRUCTURE

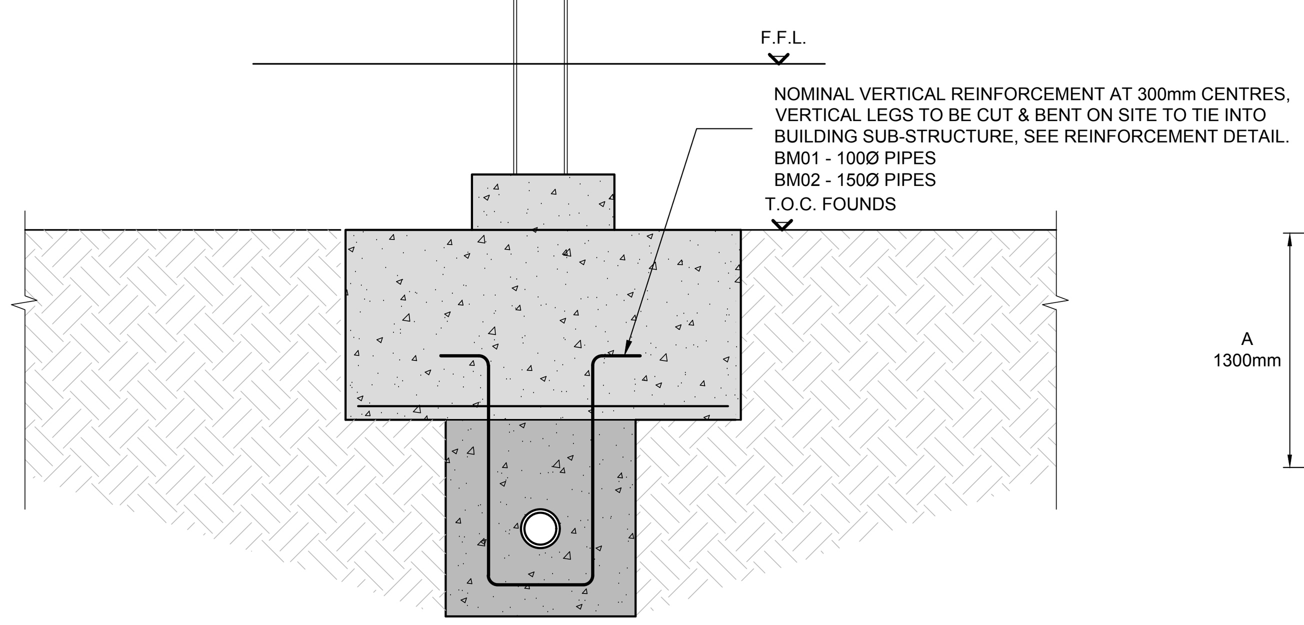


DRAINAGE STACK DETAIL 3 - REST BEND CAST INTO BUILDING SUB-STRUCTURE

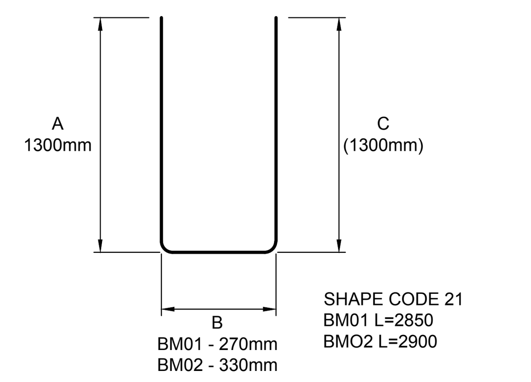
(ALLOWANCE FOR HEAVE/SETTLEMENT OF DOWNSTREAM PIPEWORK)



PIPEWORK BEDDING DETAIL BELOW FOUNDATION



PIPEWORK BEDDING DETAIL BELOW FOUNDATION
TYPICAL SECTION



REINFORCEMENT DETAIL
SCALE 1:20

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   - BUILDING REGULATIONS APPROVED DOCUMENT PART H, 2015 EDITION
2. ALL COMPONENTS USED IN DRAINAGE SYSTEMS TO COMPLY WITH THE FOLLOWING: BS EN 476:2011
3. ALL DRAINAGE SYSTEMS AND COMPONENTS TO BE CONSTRUCTED AND TESTED TO THE FULL SATISFACTION OF BOTH BUILDING REGULATIONS AND WARRANTY PROVIDER INSPECTORS
4. ALL DRAINAGE TO BE CONSTRUCTED AND TESTED IN ACCORDANCE WITH BS EN 1610:2015.
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6. LATERAL DRAIN CONNECTIONS (PIPES CONNECTING INTO ADOPTABLE SEWERS) TO BE VITRIFIED CLAY. WHERE COVER IS LESS THAN 1.2m TO GROUND LEVEL PIPE PROTECTION IS REQUIRED IN THE FORM OF A CONCRETE COVER SLAB.
7. PVC-U DENOTES UNPLASTISED POLYVINYL CHLORIDE . PVC-U PIPES AND FITTINGS TO COMPLY WITH THE RELEVANT PROVISIONS OF BS EN1401, BS EN13476-2 AND BS4660:1989/2000 RESPECTIVELY AND BE KITEMARKED.
8. PRECAST CONCRETE MANHOLES TO BE IN ACCORDANCE WITH BS EN 1917:2002 AND BS 5911-3:2010,-4:2002 AND TO BE KITEMARKED. PRECAST CONCRETE RINGS AND COVER SLABS TO CONCRETE PIPES TO BE JOINTED WITH CEMENT MORTAR UNLESS NOTED OTHERWISE.
9. INSITU AND PRECAST CONCRETE UNITS SHALL HAVE SULPHATE RESISTING PORTLAND CEMENT TO BS EN 197-1:2011.
10. POLYPROPYLENE INSPECTION CHAMBERS TO COMPLY WITH BS EN 13598-1:2010,-2:2016 AND BS 7158:2001 AND TO BE KITEMARKED.
11. MANHOLE COVERS AND FRAMES SHALL COMPLY WITH THE RELEVANT PROVISIONS OF BS EN 124-1 TO 6:2015. MANHOLE COVERS AND FRAMES TO BE OF A NON-ROCKING DESIGN WITH CUSHION INSERTS AND KITEMARKED. LOAD CLASS A15 COVERS TO BE USED IN AREAS INACCESSIBLE TO VEHICLES; LOAD CLASS B125 COVERS TO BE USED IN PRIVATE DRIVES; LOAD CLASS D400 COVERS TO BE USED IN PRIVATE ROADS. ALL COVERS TO BE BADGED "FW" OR "SW" AS APPROPRIATE. MANHOLE COVER SLABS AND ACCESS TO BE IN ACCORDANCE WITH CONCRETE PIPE ASSOCIATION TECHNICAL BULLETIN ISSUED SEPTEMBER 2001.
12. POLYPROPYLENE INSPECTION CHAMBER COVERS AND FRAMES SHALL COMPLY WITH THE RELEVANT PROVISIONS OF BS EN 124-1 TO 6:2015. COVERS AND FRAMES TO BE OF A NON-ROCKING DESIGN WITH CUSHION INSERTS AND KITEMARKED. LOAD CLASS A15 COVERS TO BE USED IN AREAS INACCESSIBLE TO VEHICLES; LOAD CLASS B125 COVERS TO BE USED IN PRIVATE DRIVES; LOAD CLASS D400 COVERS TO BE USED IN PRIVATE ROADS.
13. ROAD GULLY GRATES AND FRAMES SHALL COMPLY WITH THE RELEVANT PROVISIONS OF BS EN 124-1 TO 6:2015 AND BE OF A NON-ROCKING DESIGN WITH LEFT HANDED CAPTIVE HINGE ACCESS AND BE KITEMARKED. LOAD CLASS D400 GRATES TO BE USED IN PRIVATE ROADS. TYPE D400:450 GRATE AND FRAME. MINIMUM AREA OF WATERWAY TO BE 1010cm².
14. YARD GULLY GRATES AND FRAMES SHALL COMPLY WITH THE RELEVANT PROVISIONS OF BS EN 124-1 TO 6:2015 AND BE OF A NON-ROCKING DESIGN AND BE KITEMARKED. LOAD CLASS A15 GRATES TO BE USED IN AREAS INACCESSIBLE TO VEHICLES; LOAD CLASS B125 GRATES TO BE USED IN PRIVATE DRIVES. TYPE B125:450 GRATE AND FRAME. MINIMUM AREA OF WATERWAY TO BE 900cm².
15. DRAINAGE CHANNELS TO BE ACO M100D 0.0 MULTIDRAIN CHANNEL (O.S.A) FITTED WITH SLOTTED DUCTILE IRON GRATING. GRATES SHALL COMPLY WITH THE RELEVANT PROVISIONS OF BS EN 124-1 TO 6:2015 AND BE KITEMARKED. LOAD CLASS A15 GRATES TO BE USED IN AREAS INACCESSIBLE TO VEHICLES; LOAD CLASS B125 GRATES TO BE USED IN PRIVATE DRIVES; LOAD CLASS D400 GRATES TO BE USED IN PRIVATE ROADS. SUMP UNIT AND SILT BUCKET UNITS TO BE USED ON ALL GULLIES.
16. CLASS Z BEDDING DETAIL SHALL BE PROVIDED:
   - WHERE COVER TO PIPE BARREL IS;
     i) <1.2m IN VEHICULAR TRAFFICKED AREAS
     ii) <0.9m IN AREAS INACCESSIBLE TO VEHICLES.
   - AT ALL ROAD GULLY, YARD GULLY, RWP, SVP AND DRAINAGE CHANNEL BRANCHES.
   - AREAS OF DEEP ROOTING VEGETATION.
   - PIPE RUNS NEAR BUILDINGS IN ACCORDANCE WITH TYPICAL SECTIONS ON AWP DRAWING 37151/731.
   - WHERE TWO PIPES CROSS WITH A CLEAR GAP OF <300mm. CLASS Z SURROUND TO EXTEND A MINIMUM OF 1.0m FROM THE CENTRE OF THE CROSSING POINT & EXTENDED TO WITHIN 150mm OF THE NEAREST FLEXIBLE JOINT, WHERE REQUIRED.
17. NO MECHANICAL COMPACTION OF FILL MATERIAL WITHIN 300mm OF THE CROWN OF ANY PIPE.

THE VERSIONS OF BRITISH STANDARDS AND OTHER PUBLICATIONS LISTED ABOVE ARE CURRENT AT THE TIME OF THE DRAWING ISSUE. HOWEVER IF THESE HAVE BEEN REVISED OR UPDATED THEN THE NEWER VERSIONS SHOULD BE USED. ANY DISCREPANCIES SHOULD BE NOTIFIED TO AWP IMMEDIATELY.

NOTES:

1. This drawing has been prepared in accordance with the scope of CML's appointment with its clients and is subject to the terms and conditions of that appointment. CML accepts no liability for any use of this document other than by its client and only for the purposes for which it was prepared and provided.

2. This drawing is to be read in conjunction with all other relevant drawings and specifications for this project and apparent inconsistencies brought to the attention of the Project Design Manager.

3. Do not scale directly from drawing - if in doubt ask!

CONCRETE NOTES:

DESIGNATED CONCRETE:

3. ALL DESIGNATED CONCRETE TO CONFORM TO BS 8500-2
   - DESIGNATION - GEN 3
   - CEMENT TYPE - SRPC
   - MAXIMUM AGGREGATE SIZE - 20mm
   - CONSISTENCY CLASS - TO BE AGREED ON SITE
4. ALL EXPOSED EDGES TO HAVE 20x20mm CHAMFER.
1. IMMEDIATELY AFTER LAYING, CONCRETE SHALL BE PROTECTED FROM RAIN, RAPID TEMPERATURE CHANGE, FROST AND FROM DRYING OUT. ALSO MAINTAIN THE CONCRETE ABOVE 2° IN COLD WEATHER. THE METHODS USED SHALL BE IN ACCORDANCE WITH B.S. 5400, OR APPROVED BY THE ENGINEER.
6. ALL FORMWORK TO BE CLASS F.

JOB NO: 41632 - DRAINAGE - DRAWING REFERENCE TABLE This Drawing to be Read in Conjunction with the Drawings Listed Below	
Alan Wood & Partners (Civil)	Drawing Reference
Existing Surface Water Exceedance Flow Path	SFG-AWP-ZZ-XX-DR-C-3001
Proposed Surface Water Exceedance Flow Path	SFG-AWP-ZZ-XX-DR-C-3002
Existing Impermeable Areas	SFG-AWP-ZZ-XX-DR-C-3010
Proposed Impermeable Areas	SFG-AWP-ZZ-XX-DR-C-3011
Drainage Layouts - Sheets 1-2	SFG-AWP-ZZ-XX-DR-C-3300 to 3301
Manhole Schedule	SFG-AWP-ZZ-XX-DR-C-3320
Drainage Details - Sheets 1-3	SFG-AWP-ZZ-XX-DR-C-3700 to 3702
Drainage Details - Sheet 4	SFG-AWP-ZZ-XX-DR-C-3703
Cut and Fill - Sheets 1-2	SFG-AWP-ZZ-XX-DR-C-4000 to 4001
Site Build up Areas	SFG-AWP-ZZ-XX-DR-C-4400
External Works Details	SFG-AWP-ZZ-XX-DR-C-4700
Drawings by others	Date Received
Tower Surveys - Topographical Survey	20.12.2018
HLM Architects - Proposed Site Plan	23.01.2019

REV	REASON FOR REVISION	DATE	BY	CHK
P02	AMENDED TO SUIT QA COMMENTS	02.04.19	KR	-
P01	FIRST ISSUE	29.03.19	DD	TW

Caledonian

CLIENT:

CALEDONIAN MODULAR

PROJECT REF:

SIR FREDERICK GIBBERD SCHOOL, HARLOW ESSEX

DESCRIPTION:

DRAINAGE DETAILS - SHEET 4

DOCUMENT REFERENCE No:

Project No.	Orig	Volume	Level	Type	Role	Chrono No.
FS0620	AWP	00	XX	DR	C	00-3703

SCALE @ A1: **1:20 UNO** | REV: **P02**

CONTRACT NUMBER: **FS0620** | DATE: **29.03.19**

INFORMATION STATUS: **WORK IN PROGRESS**

SUBCONTRACTOR COMPANY TRADE NAME: Alan Wood & Partners

SUBCONTRACTOR CONTRACT REF. No: **41632**

Consulting Civil & Structural Engineers
Project Managers & Building Surveyors

Alan Wood & Partners

JOB NO: 41636

JOB TITLE: Sir Frederick Gibberd School

CLIENT: Caledonian Modular

DOCUMENT NAME: Surface Water Drainage Calculations

DOCUMENT REF: FS0620-AWP-00-XX-CA-C-00-1000

Alan Wood & Partners
341 Beverley Road
Hull
HU5 1LD

Telephone:

01482 442138

Email:
eng@alanwood.co.uk

Website:
www.alanwood.co.uk

Elements	Checked	Date
Main School Drawnet Model 2.0	TW	29/03/2018
ASTRO MUGA Drawnet Model 2.0	TW	29/03/2018

DOCUMENT REVISION	Checked	Date	Approved	Date	Description
P01	TW	29/03/2019	MC	29/03/2019	First Document Issue. Inclusion of Updated Individual Calculations
P02	TW	16/04/2019	MC	16/04/2019	Additional Model information added

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	1	PIMP (%)	100
M5-60 (mm)	20.000	Add Flow / Climate Change (%)	0
Ratio R	0.441	Minimum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	10.000
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	**Area (ha)**	**Time (mins)**	**Area (ha)**
0-4	0.620	4-8	0.743

Total Area Contributing (ha) = 1.363

Total Pipe Volume (m³) = 70.025

Network Design Table for Storm

PN	**Length (m)**	**Fall (m)**	**Slope (1:X)**	**I.Area (ha)**	**T.E. (mins)**	**Base Flow (l/s)**	**k (mm)**	**HYD SECT**	**DIA (mm)**	**Section Type**	**Auto Design**
S1.000	20.912	0.093	224.9	0.000	4.00	0.0	0.600	o	225	Pipe/Conduit	
S1.001	22.718	0.101	224.9	0.052	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.002	27.226	0.091	299.2	0.022	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.003	19.821	0.066	300.3	0.038	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.004	26.165	0.103	254.0	0.032	0.00	0.0	0.600	o	300	Pipe/Conduit	
S2.000	34.177	0.854	40.0	0.017	4.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	**Rain (mm/hr)**	**T.C. (mins)**	**US/IL (m)**	**Σ I.Area (ha)**	**Σ Base Flow (l/s)**	**Foul (l/s)**	**Add Flow (l/s)**	**Vel (m/s)**	**Cap (l/s)**	**Flow (l/s)**
S1.000	50.00	4.40	66.500	0.000	0.0	0.0	0.0	0.87	34.5	0.0
S1.001	50.00	4.76	66.332	0.052	0.0	0.0	0.0	1.04	73.8	7.1
S1.002	50.00	5.27	66.231	0.074	0.0	0.0	0.0	0.90	63.9	10.1
S1.003	50.00	5.63	66.140	0.113	0.0	0.0	0.0	0.90	63.8	15.3
S1.004	50.00	6.08	66.074	0.145	0.0	0.0	0.0	0.98	69.4	19.6
S2.000	50.00	4.36	67.000	0.017	0.0	0.0	0.0	1.60	28.2	2.4

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S2.001	3.718	0.025	148.7	0.035	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.005	24.145	0.064	375.0	0.028	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.006	21.790	0.286	76.2	0.105	0.00	0.0	0.600	o	375	Pipe/Conduit	
S3.000	32.449	0.324	100.2	0.045	4.00	0.0	0.600	o	225	Pipe/Conduit	
S3.001	47.828	0.478	100.1	0.051	0.00	0.0	0.600	o	225	Pipe/Conduit	
S4.000	11.848	0.053	223.6	0.099	4.00	0.0	0.600	o	225	Pipe/Conduit	
S4.001	27.954	0.093	300.6	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S4.002	10.113	0.034	297.5	0.095	0.00	0.0	0.600	o	375	Pipe/Conduit	
S4.003	34.233	0.124	276.1	0.113	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.007	39.205	0.087	450.6	0.062	0.00	0.0	0.600	o	525	Pipe/Conduit	
S5.000	33.011	0.147	224.6	0.071	4.00	0.0	0.600	o	225	Pipe/Conduit	
S5.001	24.253	0.081	299.4	0.046	0.00	0.0	0.600	o	300	Pipe/Conduit	
S5.002	27.330	0.091	300.3	0.030	0.00	0.0	0.600	o	300	Pipe/Conduit	
S5.003	20.952	0.070	299.3	0.033	0.00	0.0	0.600	o	300	Pipe/Conduit	
S5.004	18.308	0.061	300.0	0.023	0.00	0.0	0.600	o	300	Pipe/Conduit	
S5.005	9.314	0.039	238.8	0.013	0.00	0.0	0.600	o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S2.001	50.00	4.41	66.071	0.052	0.0	0.0	0.0	1.07	42.5	7.1
S1.005	50.00	6.51	65.896	0.225	0.0	0.0	0.0	0.93	102.7	30.5
S1.006	49.99	6.68	65.832	0.330	0.0	0.0	0.0	2.08	229.5	44.6
S3.000	50.00	4.41	67.500	0.045	0.0	0.0	0.0	1.31	51.9	6.1
S3.001	50.00	5.02	67.176	0.096	0.0	0.0	0.0	1.31	52.0	13.0
S4.000	50.00	4.23	66.000	0.099	0.0	0.0	0.0	0.87	34.6	13.4
S4.001	50.00	4.74	65.872	0.099	0.0	0.0	0.0	0.90	63.7	13.4
S4.002	50.00	4.90	65.704	0.194	0.0	0.0	0.0	1.05	115.5	26.3
S4.003	50.00	5.43	65.670	0.307	0.0	0.0	0.0	1.09	119.9	41.6
S1.007	47.75	7.31	65.396	0.795	0.0	0.0	0.0	1.05	227.0	102.8
S5.000	50.00	4.63	66.000	0.071	0.0	0.0	0.0	0.87	34.5	9.6
S5.001	50.00	5.08	65.778	0.117	0.0	0.0	0.0	0.90	63.9	15.9
S5.002	50.00	5.59	65.697	0.148	0.0	0.0	0.0	0.90	63.8	20.0
S5.003	50.00	5.97	65.606	0.181	0.0	0.0	0.0	0.90	63.9	24.5
S5.004	50.00	6.31	65.536	0.204	0.0	0.0	0.0	0.90	63.8	27.6
S5.005	50.00	6.46	65.475	0.217	0.0	0.0	0.0	1.01	71.6	29.4

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.008	21.516	0.419	51.4	0.027	0.00	0.0	0.600	o	525	Pipe/Conduit	🔒
S6.000	39.214	1.027	38.2	0.066	4.00	0.0	0.600	o	225	Pipe/Conduit	🔒
S6.001	11.747	0.070	167.8	0.035	0.00	0.0	0.600	o	300	Pipe/Conduit	🔒
S7.000	38.692	0.894	43.3	0.074	4.00	0.0	0.600	o	225	Pipe/Conduit	🔒
S6.002	12.442	0.079	157.5	0.033	0.00	0.0	0.600	o	300	Pipe/Conduit	🔓
S8.000	50.180	0.824	60.9	0.081	4.00	0.0	0.600	o	225	Pipe/Conduit	🔒
S6.003	12.369	0.041	300.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	🔓
S6.004	12.369	0.041	300.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	🔓
S1.009	73.739	0.357	206.6	0.035	0.00	0.0	0.600	o	525	Pipe/Conduit	🔓

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.008	47.36	7.42	65.319	1.040	0.0	0.0	0.0	3.13	677.5	133.3
S6.000	50.00	4.31	67.400	0.066	0.0	0.0	0.0	2.12	84.4	8.9
S6.001	50.00	4.47	66.300	0.101	0.0	0.0	0.0	1.21	85.6	13.7
S7.000	50.00	4.32	67.200	0.074	0.0	0.0	0.0	1.99	79.3	10.0
S6.002	50.00	4.64	66.230	0.207	0.0	0.0	0.0	1.25	88.4	28.1
S8.000	50.00	4.50	67.050	0.081	0.0	0.0	0.0	1.68	66.8	11.0
S6.003	50.00	4.86	66.151	0.289	0.0	0.0	0.0	0.90	63.8	39.1
S6.004	50.00	5.09	66.110	0.289	0.0	0.0	0.0	0.90	63.8	39.1
S1.009	44.88	8.21	64.900	1.363	0.0	0.0	0.0	1.55	336.6	165.7

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.009	S	68.100	64.543	0.000	0	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	0.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Storm Duration (mins)	30
Ratio R	0.441		

Online Controls for Storm

Hydro-Brake® Optimum Manhole: S31, DS/PN: S1.009, Volume (m^3): 12.7

Unit Reference	MD-SHE-0143-1200-2000-1200
Design Head (m)	2.000
Design Flow (l/s)	12.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	143
Invert Level (m)	64.900
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1500

Control Points	**Head (m)**	**Flow (l/s)**
Design Point (Calculated)	2.000	12.0
Flush-Flo™	0.582	12.0
Kick-Flo®	1.208	9.5
Mean Flow over Head Range	-	10.5

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)**
0.100	5.2	1.200	9.6	3.000	14.5	7.000	21.8
0.200	10.0	1.400	10.1	3.500	15.6	7.500	22.5
0.300	11.1	1.600	10.8	4.000	16.7	8.000	23.2
0.400	11.7	1.800	11.4	4.500	17.6	8.500	23.9
0.500	11.9	2.000	12.0	5.000	18.5	9.000	24.6
0.600	12.0	2.200	12.5	5.500	19.4	9.500	25.2
0.800	11.8	2.400	13.1	6.000	20.2		
1.000	11.1	2.600	13.6	6.500	21.0		

Storage Structures for Storm

Tank or Pond Manhole: S31, DS/PN: S1.009

Invert Level (m) 64.900

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	405.0	2.000	405.0	2.001	0.0

Volume Summary (Static)

Length Calculations based on True Length

Pipe Number	USMH Name	Manhole Volume (m³)	Pipe Volume (m³)	Storage Structure Volume (m³)	Total Volume (m³)
S1.000	S1	1.230	0.784	0.000	2.013
S1.001	S2	1.418	1.521	0.000	2.939
S1.002	S3	1.590	1.840	0.000	3.429
S1.003	S4	1.683	1.316	0.000	3.000
S1.004	S5	1.752	1.754	0.000	3.506
S2.000	S6	1.277	0.583	0.000	1.860
S2.001	S7	2.240	0.094	0.000	2.334
S1.005	S8	3.594	2.509	0.000	6.103
S1.006	S9	3.041	2.249	0.000	5.291
S3.000	S10	1.202	1.242	0.000	2.445
S3.001	S11	1.315	1.848	0.000	3.163
S4.000	S12	1.891	0.423	0.000	2.314
S4.001	S13	1.795	1.886	0.000	3.681
S4.002	S14	2.605	0.968	0.000	3.573
S4.003	S15	2.689	3.624	0.000	6.313
S1.007	S16	4.041	8.130	0.000	12.171
S5.000	S17	1.685	1.265	0.000	2.950
S5.001	S18	2.038	1.630	0.000	3.667
S5.002	S19	2.236	1.847	0.000	4.083
S5.003	S20	2.337	1.396	0.000	3.734
S5.004	S21	2.416	1.209	0.000	3.625
S5.005	S22	2.469	0.552	0.000	3.021
S1.008	S23	5.692	4.268	0.000	9.960
S6.000	S24	1.184	1.511	0.000	2.695
S6.001	S25	1.619	0.746	0.000	2.365
S7.000	S26	1.555	1.491	0.000	3.046
S6.002	S27	1.619	0.795	0.000	2.414
S8.000	S28	1.770	1.947	0.000	3.717
S6.003	S29	1.657	0.789	0.000	2.446
S6.004	S30	1.727	0.768	0.000	2.495
S1.009	S31	7.658	15.768	810.135	833.561
Total		71.024	66.754	810.135	947.913

2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 0.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Storage Structures 1
Number of Online Controls 1 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.441
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 20.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 2, 30, 100
Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	360 Winter	2	+0%	100/15 Summer				66.500
S1.001	S2	15 Winter	2	+0%	100/15 Summer				66.406
S1.002	S3	15 Winter	2	+0%	100/15 Summer				66.323
S1.003	S4	15 Winter	2	+0%	100/15 Summer				66.256
S1.004	S5	15 Winter	2	+0%	100/15 Summer				66.196
S2.000	S6	15 Winter	2	+0%					67.035
S2.001	S7	15 Winter	2	+0%	100/15 Summer				66.157
S1.005	S8	15 Winter	2	+0%	100/15 Summer				66.070
S1.006	S9	15 Winter	2	+0%	100/15 Summer				65.958
S3.000	S10	15 Winter	2	+0%	100/15 Summer				67.565
S3.001	S11	15 Winter	2	+0%	100/15 Summer				67.268
S4.000	S12	15 Winter	2	+0%	30/15 Summer				66.135
S4.001	S13	15 Summer	2	+0%	100/15 Summer				65.998
S4.002	S14	15 Winter	2	+0%	30/15 Winter				65.881
S4.003	S15	15 Winter	2	+0%	30/15 Summer				65.854
S1.007	S16	15 Winter	2	+0%	30/15 Summer				65.699
S5.000	S17	15 Winter	2	+0%	100/15 Summer				66.104
S5.001	S18	15 Winter	2	+0%	100/15 Summer				65.914
S5.002	S19	15 Winter	2	+0%	100/15 Summer				65.836

2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	-0.225	0.000	0.00		0.0	OK	
S1.001	S2	-0.226	0.000	0.14		8.2	OK	
S1.002	S3	-0.208	0.000	0.20		11.5	OK	
S1.003	S4	-0.184	0.000	0.31		17.1	OK	
S1.004	S5	-0.178	0.000	0.34		21.4	OK	
S2.000	S6	-0.115	0.000	0.13		3.5	OK	
S2.001	S7	-0.139	0.000	0.31		9.0	OK	
S1.005	S8	-0.201	0.000	0.44		33.2	OK	
S1.006	S9	-0.248	0.000	0.25		48.1	OK	
S3.000	S10	-0.160	0.000	0.18		8.9	OK	
S3.001	S11	-0.133	0.000	0.35		16.9	OK	
S4.000	S12	-0.090	0.000	0.67		19.7	OK	
S4.001	S13	-0.174	0.000	0.35		18.9	OK	
S4.002	S14	-0.198	0.000	0.40		34.1	OK	
S4.003	S15	-0.191	0.000	0.47		50.8	OK	
S1.007	S16	-0.222	0.000	0.62		121.5	OK	
S5.000	S17	-0.121	0.000	0.43		13.9	OK	
S5.001	S18	-0.164	0.000	0.42		20.9	OK	
S5.002	S19	-0.161	0.000	0.43		25.0	OK	

2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S5.003	S20	15 Winter	2	+0%	30/15 Winter				65.762
S5.004	S21	15 Winter	2	+0%	30/15 Summer				65.702
S5.005	S22	15 Winter	2	+0%	30/15 Winter				65.643
S1.008	S23	15 Winter	2	+0%	100/15 Summer				65.522
S6.000	S24	15 Winter	2	+0%	100/15 Summer				67.461
S6.001	S25	15 Winter	2	+0%	30/15 Summer				66.444
S7.000	S26	15 Winter	2	+0%	100/15 Summer				67.267
S6.002	S27	15 Winter	2	+0%	30/15 Summer				66.428
S8.000	S28	15 Winter	2	+0%	100/15 Summer				67.126
S6.003	S29	15 Winter	2	+0%	30/15 Summer				66.398
S6.004	S30	15 Winter	2	+0%	30/15 Summer				66.350
S1.009	S31	180 Winter	2	+0%	30/30 Summer				65.313

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S5.003	S20	-0.144	0.000	0.52		29.1	OK	
S5.004	S21	-0.134	0.000	0.58		31.8	OK	
S5.005	S22	-0.132	0.000	0.60		33.3	OK	
S1.008	S23	-0.322	0.000	0.32		157.9	OK	
S6.000	S24	-0.164	0.000	0.16		13.1	OK	
S6.001	S25	-0.156	0.000	0.30		18.3	OK	
S7.000	S26	-0.158	0.000	0.20		14.7	OK	
S6.002	S27	-0.102	0.000	0.52		36.5	OK	
S8.000	S28	-0.149	0.000	0.25		16.1	OK	
S6.003	S29	-0.053	0.000	1.00		51.8	OK	
S6.004	S30	-0.060	0.000	0.99		51.5	OK	
S1.009	S31	-0.112	0.000	0.04		11.7	OK	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 0.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Storage Structures 1
Number of Online Controls 1 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.441
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 20.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 2, 30, 100
Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	360 Winter	30	+0%	100/15 Summer				66.500
S1.001	S2	15 Winter	30	+0%	100/15 Summer				66.450
S1.002	S3	15 Winter	30	+0%	100/15 Summer				66.385
S1.003	S4	15 Winter	30	+0%	100/15 Summer				66.333
S1.004	S5	15 Winter	30	+0%	100/15 Summer				66.276
S2.000	S6	15 Winter	30	+0%					67.050
S2.001	S7	15 Winter	30	+0%	100/15 Summer				66.208
S1.005	S8	15 Winter	30	+0%	100/15 Summer				66.193
S1.006	S9	15 Winter	30	+0%	100/15 Summer				66.044
S3.000	S10	15 Winter	30	+0%	100/15 Summer				67.591
S3.001	S11	15 Winter	30	+0%	100/15 Summer				67.322
S4.000	S12	15 Winter	30	+0%	30/15 Summer				66.246
S4.001	S13	15 Winter	30	+0%	100/15 Summer				66.133
S4.002	S14	15 Winter	30	+0%	30/15 Winter				66.091
S4.003	S15	15 Winter	30	+0%	30/15 Summer				66.066
S1.007	S16	15 Winter	30	+0%	30/15 Summer				65.957
S5.000	S17	15 Winter	30	+0%	100/15 Summer				66.157
S5.001	S18	15 Winter	30	+0%	100/15 Summer				66.011
S5.002	S19	15 Winter	30	+0%	100/15 Summer				65.965

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	-0.225	0.000	0.00		0.0	OK	
S1.001	S2	-0.182	0.000	0.33		19.6	OK	
S1.002	S3	-0.146	0.000	0.46		26.6	OK	
S1.003	S4	-0.107	0.000	0.70		39.0	OK	
S1.004	S5	-0.098	0.000	0.77		48.0	OK	
S2.000	S6	-0.100	0.000	0.24		6.6	OK	
S2.001	S7	-0.088	0.000	0.69		19.7	OK	
S1.005	S8	-0.078	0.000	0.97		73.2	OK	
S1.006	S9	-0.163	0.000	0.53		104.1	OK	
S3.000	S10	-0.134	0.000	0.35		16.8	OK	
S3.001	S11	-0.079	0.000	0.74		35.4	OK	
S4.000	S12	0.021	0.000	1.27		37.5	SURCHARGED	
S4.001	S13	-0.039	0.000	0.63		34.1	OK	
S4.002	S14	0.012	0.000	0.75		64.3	SURCHARGED	
S4.003	S15	0.021	0.000	0.92		98.7	SURCHARGED	
S1.007	S16	0.037	0.000	1.28		252.3	SURCHARGED	
S5.000	S17	-0.068	0.000	0.81		26.3	OK	
S5.001	S18	-0.067	0.000	0.82		41.1	OK	
S5.002	S19	-0.032	0.000	0.83		47.6	OK	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S5.003	S20	15 Winter	30	+0%	30/15 Winter				65.910
S5.004	S21	15 Winter	30	+0%	30/15 Summer				65.850
S5.005	S22	15 Winter	30	+0%	30/15 Winter				65.781
S1.008	S23	240 Winter	30	+0%	100/15 Summer				65.766
S6.000	S24	15 Winter	30	+0%	100/15 Summer				67.486
S6.001	S25	15 Winter	30	+0%	30/15 Summer				66.792
S7.000	S26	15 Winter	30	+0%	100/15 Summer				67.295
S6.002	S27	15 Winter	30	+0%	30/15 Summer				66.761
S8.000	S28	15 Winter	30	+0%	100/15 Summer				67.160
S6.003	S29	15 Winter	30	+0%	30/15 Summer				66.675
S6.004	S30	15 Winter	30	+0%	30/15 Summer				66.513
S1.009	S31	240 Winter	30	+0%	30/30 Summer				65.764

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S5.003	S20	0.004	0.000	0.95		53.2	SURCHARGED	
S5.004	S21	0.014	0.000	1.06		58.1	SURCHARGED	
S5.005	S22	0.006	0.000	1.09		60.4	SURCHARGED	
S1.008	S23	-0.078	0.000	0.13		64.2	OK	
S6.000	S24	-0.139	0.000	0.31		24.9	OK	
S6.001	S25	0.192	0.000	0.57		34.9	SURCHARGED	
S7.000	S26	-0.130	0.000	0.37		27.8	OK	
S6.002	S27	0.231	0.000	1.02		71.9	SURCHARGED	
S8.000	S28	-0.115	0.000	0.48		30.5	OK	
S6.003	S29	0.224	0.000	1.95		100.9	SURCHARGED	
S6.004	S30	0.103	0.000	1.93		100.2	SURCHARGED	
S1.009	S31	0.339	0.000	0.04		12.0	SURCHARGED	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 0.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Storage Structures 1
Number of Online Controls 1 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.441
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 20.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 2, 30, 100
Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	15 Winter	100	+40%	100/15 Summer				66.972
S1.001	S2	15 Winter	100	+40%	100/15 Summer				66.983
S1.002	S3	15 Winter	100	+40%	100/15 Summer				66.953
S1.003	S4	15 Winter	100	+40%	100/15 Summer				66.912
S1.004	S5	15 Winter	100	+40%	100/15 Summer				66.847
S2.000	S6	15 Winter	100	+40%					67.069
S2.001	S7	15 Winter	100	+40%	100/15 Summer				66.739
S1.005	S8	15 Winter	100	+40%	100/15 Summer				66.717
S1.006	S9	360 Winter	100	+40%	100/15 Summer				66.626
S3.000	S10	15 Winter	100	+40%	100/15 Summer				67.757
S3.001	S11	15 Winter	100	+40%	100/15 Summer				67.644
S4.000	S12	15 Winter	100	+40%	30/15 Summer				67.143
S4.001	S13	15 Winter	100	+40%	100/15 Summer				66.888
S4.002	S14	15 Winter	100	+40%	30/15 Winter				66.790
S4.003	S15	15 Winter	100	+40%	30/15 Summer				66.709
S1.007	S16	360 Winter	100	+40%	30/15 Summer				66.624
S5.000	S17	15 Winter	100	+40%	100/15 Summer				67.050
S5.001	S18	15 Winter	100	+40%	100/15 Summer				66.854
S5.002	S19	15 Winter	100	+40%	100/15 Summer				66.725

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	0.247	0.000	0.11		3.3	SURCHARGED	
S1.001	S2	0.351	0.000	0.48		29.0	SURCHARGED	
S1.002	S3	0.422	0.000	0.67		38.8	SURCHARGED	
S1.003	S4	0.472	0.000	0.98		54.6	SURCHARGED	
S1.004	S5	0.473	0.000	1.12		69.9	SURCHARGED	
S2.000	S6	-0.081	0.000	0.44		11.9	OK	
S2.001	S7	0.443	0.000	1.05		30.2	SURCHARGED	
S1.005	S8	0.446	0.000	1.47		111.6	SURCHARGED	
S1.006	S9	0.420	0.000	0.14		27.0	SURCHARGED	
S3.000	S10	0.032	0.000	0.59		28.8	SURCHARGED	
S3.001	S11	0.243	0.000	1.22		58.8	SURCHARGED	
S4.000	S12	0.918	0.000	2.12		62.7	SURCHARGED	
S4.001	S13	0.716	0.000	1.13		60.6	SURCHARGED	
S4.002	S14	0.711	0.000	1.37		116.7	SURCHARGED	
S4.003	S15	0.664	0.000	1.72		185.2	SURCHARGED	
S1.007	S16	0.704	0.000	0.30		60.1	SURCHARGED	
S5.000	S17	0.825	0.000	1.27		41.2	SURCHARGED	
S5.001	S18	0.776	0.000	1.32		66.2	SURCHARGED	
S5.002	S19	0.728	0.000	1.38		79.2	SURCHARGED	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S5.003	S20	360 Winter	100	+40%	30/15 Winter				66.627
S5.004	S21	360 Winter	100	+40%	30/15 Summer				66.625
S5.005	S22	360 Winter	100	+40%	30/15 Winter				66.623
S1.008	S23	360 Winter	100	+40%	100/15 Summer				66.622
S6.000	S24	15 Winter	100	+40%	100/15 Summer				67.811
S6.001	S25	15 Winter	100	+40%	30/15 Summer				67.573
S7.000	S26	15 Winter	100	+40%	100/15 Summer				67.803
S6.002	S27	15 Winter	100	+40%	30/15 Summer				67.508
S8.000	S28	15 Winter	100	+40%	100/15 Summer				67.769
S6.003	S29	15 Winter	100	+40%	30/15 Summer				67.273
S6.004	S30	15 Winter	100	+40%	30/15 Summer				66.814
S1.009	S31	360 Winter	100	+40%	30/30 Summer				66.619

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S5.003	S20	0.721	0.000	0.24		13.4	SURCHARGED	
S5.004	S21	0.789	0.000	0.26		14.5	SURCHARGED	
S5.005	S22	0.848	0.000	0.27		15.0	SURCHARGED	
S1.008	S23	0.778	0.000	0.15		72.0	SURCHARGED	
S6.000	S24	0.186	0.000	0.53		42.4	SURCHARGED	
S6.001	S25	0.973	0.000	0.96		58.3	FLOOD RISK	
S7.000	S26	0.378	0.000	0.60		45.0	SURCHARGED	
S6.002	S27	0.978	0.000	1.71		120.7	FLOOD RISK	
S8.000	S28	0.494	0.000	0.78		50.0	SURCHARGED	
S6.003	S29	0.822	0.000	3.26		168.9	SURCHARGED	
S6.004	S30	0.405	0.000	3.26		168.9	SURCHARGED	
S1.009	S31	1.194	0.000	0.04		12.0	SURCHARGED	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	100	PIMP (%)	100
M5-60 (mm)	20.000	Add Flow / Climate Change (%)	0
Ratio R	0.440	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.696	4-8	0.245

Total Area Contributing (ha) = 0.941

Total Pipe Volume (m³) = 12.242

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	61.656	1.047	58.9	0.000	4.00	0.0	0.600		o	225	Pipe/Conduit	
S2.000	12.701	0.070	181.4	0.646	4.00	0.0		0.014	o	375	Pipe/Conduit	
S2.001	4.176	0.803	5.2	0.000	0.00	0.0	0.600		o	150	Pipe/Conduit	
S1.001	46.835	0.276	169.7	0.000	0.00	0.0	0.600		o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	50.00	4.60	64.298	0.000	0.0	0.0	0.0	1.71	67.9	0.0
S2.000	50.00	4.19	64.200	0.646	0.0	0.0	0.0	1.09	120.9	87.5
S2.001	50.00	4.02	64.130	0.000	5.0	0.0	0.0	4.45	78.6	5.0
S1.001	50.00	5.25	63.176	0.000	5.0	0.0	0.0	1.20	85.1	5.0

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S3.000	31.010	0.524	59.2	0.099	4.00	0.0	0.600		o	225	Pipe/Conduit	
S1.002	24.220	0.484	50.0	0.103	0.00	0.0		0.015	o	300	Pipe/Conduit	
S4.000	39.817	0.673	59.2	0.000	4.00	0.0	0.600		o	150	Pipe/Conduit	
S1.003	11.492	0.115	100.1	0.093	0.00	0.0	0.600		o	300	Pipe/Conduit	
S1.004	7.675	0.077	100.1	0.000	0.00	0.0	0.600		o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S3.000	50.00	4.30	63.592	0.099	0.0	0.0	0.0	1.70	67.7	13.4
S1.002	50.00	5.49	62.900	0.202	5.0	0.0	0.0	1.68	118.5	32.4
S4.000	50.00	4.51	63.352	0.000	0.0	0.0	0.0	1.31	23.2	0.0
S1.003	50.00	4.12	62.416	0.000	5.0	0.0	0.0	1.57	111.1	5.0
S1.004	50.00	4.20	62.301	0.000	5.0	0.0	0.0	1.57	111.1	5.0

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.004	S	64.000	62.224	0.000	0	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	0.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Storage Structures	2
Number of Online Controls	2	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Region	England and Wales
Return Period (years)	100	M5-60 (mm)	20.000

Synthetic Rainfall Details

Ratio R	0.440	Cv (Winter)	0.840
Profile Type	Summer	Storm Duration (mins)	30
Cv (Summer)	0.750		

Online Controls for Storm

Orifice Manhole: SA3, DS/PN: S2.001, Volume (m³): 2.8

Diameter (m) 0.075 Discharge Coefficient 0.600 Invert Level (m) 64.130

Hydro-Brake® Optimum Manhole: SA8, DS/PN: S1.003, Volume (m³): 4.6

Unit Reference	MD-SHE-0100-5000-1400-5000
Design Head (m)	1.400
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	100
Invert Level (m)	62.416
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.400	5.0
Flush-Flo™	0.416	5.0
Kick-Flo®	0.855	4.0
Mean Flow over Head Range	-	4.4

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)
0.100	3.3	1.200	4.7	3.000	7.1	7.000	10.7
0.200	4.6	1.400	5.0	3.500	7.7	7.500	11.0
0.300	4.9	1.600	5.3	4.000	8.2	8.000	11.4
0.400	5.0	1.800	5.6	4.500	8.6	8.500	11.7
0.500	5.0	2.000	5.9	5.000	9.1	9.000	12.0
0.600	4.9	2.200	6.2	5.500	9.5	9.500	12.3
0.800	4.3	2.400	6.4	6.000	9.9		
1.000	4.3	2.600	6.7	6.500	10.3		

Storage Structures for Storm

Porous Car Park Manhole: SA2, DS/PN: S2.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	60.0
Membrane Percolation (mm/hr)	1000	Length (m)	100.0
Max Percolation (l/s)	1666.7	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	64.200	Membrane Depth (mm)	300

Cellular Storage Manhole: SA8, DS/PN: S1.003

Invert Level (m)	62.900	Safety Factor	2.0
Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.95
Infiltration Coefficient Side (m/hr)	0.00000		

Depth (m)	**Area (m²)**	**Inf. Area (m²)**	**Depth (m)**	**Area (m²)**	**Inf. Area (m²)**
0.000	320.0	0.0	0.801	0.0	0.0
0.800	320.0	0.0			

Volume Summary (Static)

Length Calculations based on True Length

Pipe Number	**USMH Name**	**Manhole Volume (m^3)**	**Pipe Volume (m^3)**	**Storage Structure Volume (m^3)**	**Total Volume (m^3)**
S1.000	SA1	1.470	2.404	0.000	3.874
S2.000	SA2	1.431	1.254	1260.000	1262.685
S2.001	SA3	1.532	0.051	0.000	1.583
S1.001	SA4	2.123	3.226	0.000	5.348
S3.000	SA5	1.471	1.185	0.000	2.656
S1.002	SA6	1.940	1.627	0.000	3.567
S4.000	SA7	1.470	0.682	0.000	2.153
S1.003	SA8	2.247	0.727	243.301	246.276
S1.004	SA9	1.921	0.500	0.000	2.422
Total		15.606	11.657	1503.301	1530.564

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000   Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0   MADD Factor * 10m³/ha Storage 0.000
Hot Start Level (mm) 0   Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Storage Structures 2
Number of Online Controls 2 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR   Ratio R 0.440
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 20.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0   DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 30, 100
Climate Change (%) 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	SA1	360 Winter	30	+0%					64.298
S2.000	SA2	480 Winter	30	+0%					64.297
S2.001	SA3	600 Winter	30	+0%	30/120 Winter				64.330
S1.001	SA4	600 Summer	30	+0%	100/15 Summer				63.223
S3.000	SA5	15 Winter	30	+0%	100/15 Summer				63.716
S1.002	SA6	15 Winter	30	+0%	100/15 Summer				63.198
S4.000	SA7	360 Winter	30	+0%	100/360 Winter				63.352
S1.003	SA8	360 Winter	30	+0%	30/15 Summer				63.131
S1.004	SA9	30 Winter	30	+0%					62.354

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	SA1	-0.225	0.000	0.00		0.0	OK	
S2.000	SA2	-0.278	0.000	0.04		4.3	OK	
S2.001	SA3	0.050	0.000	0.07		4.2	SURCHARGED	
S1.001	SA4	-0.253	0.000	0.05		4.0	OK	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S3.000	SA5	-0.101	0.000	0.59		37.4	OK	
S1.002	SA6	-0.002	0.000	0.67		68.5	OK	
S4.000	SA7	-0.150	0.000	0.00		0.0	OK	
S1.003	SA8	0.415	0.000	0.06		5.0	SURCHARGED	
S1.004	SA9	-0.247	0.000	0.07		5.0	OK	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 0.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Storage Structures 2
Number of Online Controls 2 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.440
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 20.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 30, 100
Climate Change (%) 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S1.000	SA1	360 Winter	100	+40%				
S2.000	SA2	480 Winter	100	+40%				
S2.001	SA3	1440 Winter	100	+40%	30/120 Winter			
S1.001	SA4	15 Winter	100	+40%	100/15 Summer			
S3.000	SA5	15 Winter	100	+40%	100/15 Summer			
S1.002	SA6	15 Winter	100	+40%	100/15 Summer			
S4.000	SA7	1440 Winter	100	+40%	100/360 Winter			
S1.003	SA8	1440 Winter	100	+40%	30/15 Summer			
S1.004	SA9	8640 Summer	100	+40%				

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	SA1	64.298	-0.225	0.000	0.00		0.0	OK	
S2.000	SA2	64.399	-0.176	0.000	0.06		5.9	OK	
S2.001	SA3	64.577	0.297	0.000	0.11		5.9	SURCHARGED	
S1.001	SA4	63.725	0.249	0.000	0.14		10.6	SURCHARGED	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S3.000	SA5	64.266	0.449	0.000	0.99		62.6	SURCHARGED	
S1.002	SA6	63.726	0.526	0.000	1.17		119.5	SURCHARGED	
S4.000	SA7	63.678	0.176	0.000	0.00		0.0	SURCHARGED	
S1.003	SA8	63.678	0.962	0.000	0.06		5.0	SURCHARGED	
S1.004	SA9	62.354	-0.247	0.000	0.07		5.0	OK	