SOUTH SHIELDS & WESTOE SPORTS CLUB,

TEMPLE PARK, SOUTH SHIELDS

DRAINAGE STRATEGY

Report Reference	JCC17-051-C-03
Revision	01
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Document Control Sheet

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Document History

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1 BACKGROUND

1.1 BRIEF

James Christopher Consulting Ltd (JCC) has been commissioned by Tolent Living Ltd to assess the drainage requirements for a proposed South Shields and Westoe Sports Club development on the site of Temple Park, South Shields, NE34 8QN. This site specific FRA has been completed to support the planning application. The proposed site layout has been approved by South Tyneside Council (STC) through their pre planning application process subject to satisfactory planning approval.

As a new development, Sustainable Drainage Systems (SuDS), surface and foul water drainage must be considered. This report gives an overview of the methodology used, summarises the options investigated and the drainage proposals for the development.

1.2 OBJECTIVES

The Objectives of this note are as follows:

- To establish the existing drainage characteristics of the site.
- To assess the post development runoff from the site.
- To determine the suitability of SuDS to manage post development surface runoff.
- To assess the post development foul flows from the site.
- To determine a suitable discharge location for foul flows.

1.3 BACKGROUND INFORMATION

The proposed site is located in South Shields, South Tyneside (OS Grid Ref: NZ 37180 63525). The site is currently a public park. The site is bounded by Temple Park Centre and John Reid Road (A1300) to the North, King George Road A1018 to the East, Nevinson Avenue and residential properties to the South and Temple Memorial Park to the West.

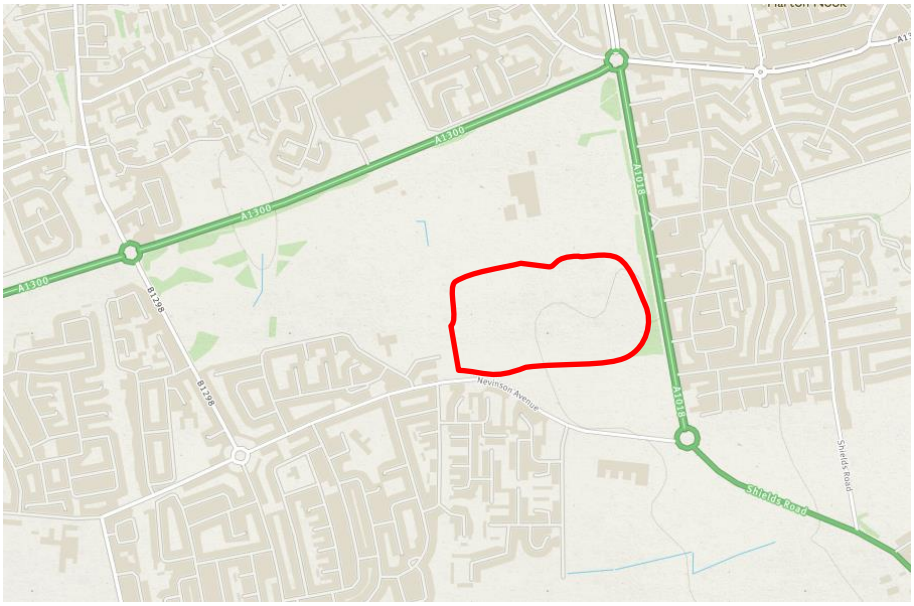

Figure 1.1 Ordnance Survey Map – Site Location

1.4 PROPOSED SITE DEVELOPMENT

The proposal is for the construction of a sports complex comprising of club house including changing room's, squash courts, toilets and a bar/function room as well as associated highway, boundary, hard and soft landscaping works as well as the construction of Rugby, Football and Tennis Courts.

2 SURFACE WATER DRAINAGE

2.1 SuDS Methodology

The following methodology was used to produce a SuDS strategy:

- Calculate pre-development/Greenfield runoff, using the method outlined in the Institute of Hydrology Report 124.
- Calculate the required post development attenuation/storage required for the critical storm with a return period of 30 years in line with the National Planning Policy Framework (NPPF).
- Test the sensitivity of the site by investigating the volume of runoff produced during storms with a return period of 100 year plus 40% allowance for climate change in line with the NPPF.

Surface water attenuation provided is to ensure that no road/property/overland flooding occurs for a 30 year return period storm. No property flooding should occur as a result of runoff from a 100 year (plus 40% allowance for climate change) return period storm.

The potential methods of discharge in order of preference are:

- Discharge via infiltration
- Discharge to watercourse
- Discharge to surface water sewer
- Discharge to combined sewer

A ground investigation has been carried out for the site; natural ground consisted of firm clay/silt with secondary constituents of sand and gravel. The cohesive deposits became stiffer with depth and in some exploratory hole locations graded into hard clay/weak mudstone (recovered as gravel) suggesting proximity to rock head. This suggests infiltration rates would be extremely low and not a suitable method of discharge.

The Ordnance Survey maps and EA maps show that the site is in within the catchment of the River Tyne, approximately 3.1km to the North West of the site and the North Sea approximately 3km to the North East of the Site. The site generally falls from South to North, with a change in level of approximately 2m; see Appendix A for existing site topography. The site is not thought to be positively drained and the grassed areas are understood to drain by evapotranspiration.

The site would have historically been within the catchment of the River Tyne and the North Sea. However, over time the urban development of South Shields has isolated the site from a watercourse. It is not possible to discharge surface water flows to a water course and is not likely to be an economic solution given that part of the site is currently positively drained to the NWL network.

The local sewerage plans for the site and surrounding area have been obtained, the public sewerage in the vicinity of the site consist of NWL sewers near the site within King George Road and Nevinson Avenue's. The site generally falls from South to North it is anticipated that it will be possible to discharge surface water flows to the surface water sewer within Nevinson Avenue and the Foul water flows to the combined sewer within the site.

Following a review of the options for surface water discharge, a Pre-Development Application Enquiry has been made to NWL to confirm an acceptable flow rate. NWL have confirmed that their network is currently at capacity and unable to accommodate the flows, see Appendix B. However, they accept that if more sustainable options are unfeasible then they would carry out modification works to their network to accommodate a restricted flow rate. Surface water flows will be restricted to a flow rate agreed with NWL and the Lead Local Flood Authority (LLFA) to ensure that there will be no additional flooding to the surrounding area due to the development.

To ensure the water quality entering the water network does not have a detrimental impact to the environment, the design will look to incorporate source control features in compliance with the SuDS guidelines to provide a suitable level of treatment. The level of treatment is required to be proportional to the level of risk. For the proposed site it is generally considered that for rooftop drainage requires one level of treatment and access roads require two levels of treatment.

2.2 PROPOSED DRAINAGE

It is proposed to provide a surface water drainage system serving roofs, roads, footpaths and all hard standing areas for the development. The area of the proposed new development is 4.0ha. The risk of surface water flooding of the site and the wider area will be mitigated by restricting the discharge flow rate and attenuating flows in exceedance.

The Greenfield runoff flow rate for the area has been calculated using the method outlined in Institute of Hydrology report 124 (calculations carried out using MicroDrainage). This method is only accurate for areas greater than 50ha. Therefore, the Greenfield runoff for 50ha has been calculated and factored down to provide a flow rate per ha.

The following design inputs were used based on information within MicroDrainage:

Return Period	=	100 year
Area	=	50 ha
SAAR	=	654
Soil Index	=	0.300
Region	=	3

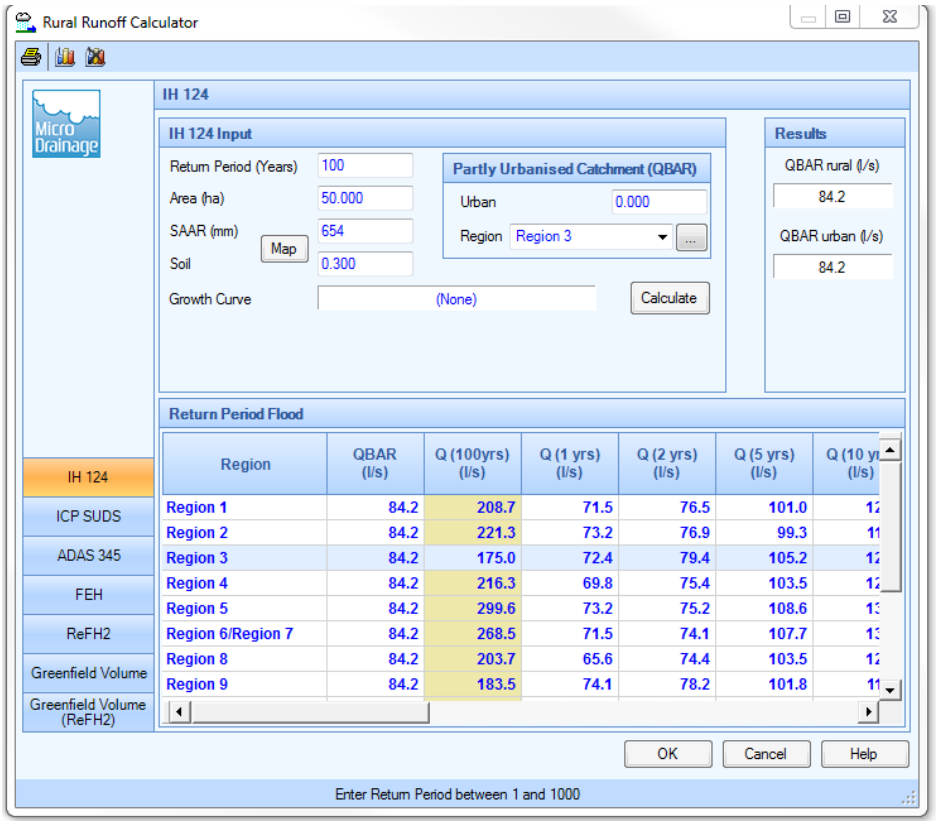

Figure 2.2 IH124 Greenfield Runoff Calculations in MicroDrainage

Based on a New Development Area of 0.277ha the following Greenfield run off rates for the following return period events have been calculated:

QBar	0.16 l/s
1 in 1 year	0.40 l/s
1 in 30 year	0.82 l/s
1 in 100 year	0.97 l/s

For a new development, the surface water discharge for a previously undeveloped site would normally be expected to be restricted to the QBar, Greenfield runoff rate. As the existing impermeable areas of the site discharge surface water at an unrestricted rate it is proposed to limit the discharge of surface water to the entire site to provide an improvement on the current arrangement.

It is proposed to split the surface water discharge between the NWL surface water sewer within Nevinson Avenue (NWL MH 0403) and the Existing Combined Sewer running within the site as per the NWL predevelopment enquiry. It is proposed to limit the surface water discharge to 5 l/s to MH 0403 and 12 l/s to the proposed new connection.

The existing combined NWL 225mm to 300mm DIA. sewer from MH 3401 to MH3701 runs within the proposed 1st Team Rugby pitch. We assume this section of sewer will be diverted to accommodate the proposed development; a potential diversion route has been highlighted on the Proposed External Drainage Arrangement (See Appendix C).

MicroDrainage has been used to estimate the surface water attenuation requirements for a 1 in 30 year return period event. It has been assumed that a surface water flows will be restricted to a rate of 10/s for the site.

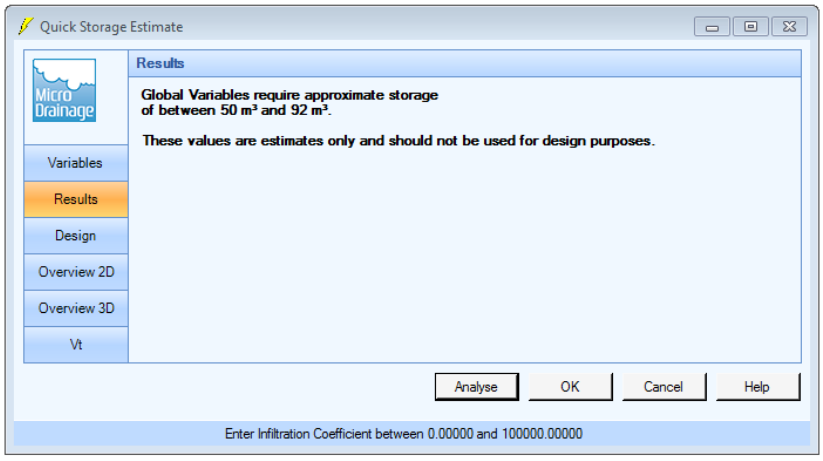

Figure 2.2.1 MicroDrainage attenuation estimate

MicroDrainage has been used to model the proposed surface water drainage and carry out a simulation for various return periods that for a 1 in 30 year return period event there is no exceedance of the network and for a 1 in 100 plus 40% for climate change surface water flows are directed away from buildings and retained on site. See Appendix C for proposed drainage layout and Appendix D for MicroDrainage calculations.

It is proposed to drain surface water from the road through permeable paving within parking areas to delay entry to the surface water network and remove contaminants collected from impermeable surfaces. The levels and falls across the site will be designed to direct surface water away from habitable areas and towards collection features.

During extreme storm events in excess of a 1 in 100 year return period event, exceedance flows will be retained within the kerbs of highways, filter drains to the edge of strategic roads and above areas of permeable paving. Once the peak of a storm subsides the flows will drain into the network and discharge at the restricted flow rate. This will ensure all properties are protected from flooding and that any exceedance flows are managed within the site boundary.

2.3 MAINTENANCE ISSUES

An application will be made to NWL for the adoption of all appropriate sewerage. Maintenance of the network will fall under their responsibility. Maintenance of SuDS features will be carried out in accordance with the Ciria C753 SuDS manual. (See Appendix E)

2.4 SAFETY ISSUES

Surface water pipework and manholes will be designed in accordance with Sewers for Adoption 7th Edition so as to ensure suitable access for maintenance and operation as required. SuDS features will be designed in accordance with the Ciria C753 SuDS manual.

2.5 SURFACE WATER DRAINAGE SUMMARY

Based on the investigation carried out to date, the surface water drainage strategy can be summarised as:

- Flows will be collected from rooftops, roads, footpaths and all hard standing areas and conveyed via gravity. All flows will be conveyed by the drainage network and will not infiltrate into the ground.
- Flows will be drained to a new surface water network which in turn will discharge to the existing NWL sewerage within Nevinson Avenue to the South of the site and to the existing Combined Sewer within the Site.
- Flows will pass through appropriate SuDS source control, including permeable paving and filer drains.
- A flow control device will restrict flows from the development to 10 l/s to the NWL network.
- Peak flows in excess of discharge rates during storms up to 1 in 30 years will be attenuated below ground within the network.
- Peak flows in excess of discharge rates during storms up to 1 in 100 years, plus 40% for climate change, will be attenuated on site to ensure there is no flooding of buildings or flooding off site. Flows will be attenuated within filter drains, within the kerb lines of roads and above areas of permeable paving.
- A diversion of the existing NWL combined sewer which runs within the Proposed 1st Team Pitch will be required to be diverted as directed by NWL.

3 FOUL WATER DRAINAGE

3.1 PROPOSED DRAINAGE

It is proposed to provide a foul water drainage system serving domestic foul water from appliances within dwellings on site. Foul flows will be discharged to the existing NWL combined sewer running within the site boundary

The layouts of the dwellings have been used to calculate the foul water flows using the following method:

- Peak flows calculated using "Discharge Units" method of calculation from BS EN 12056-2:2000
- Assumed to be system ii as described in BS EN 12056-2:2000 as this is worst case.
- Assumed frequency factor of 0.7 – frequent use.
- Total daily discharge calculated in accordance with British Water Code of Practice for Flows and Loads.

The following domestic foul flows for the site have been calculated:

Frequent Use (K) = 0.7

- 31No. Washbasins - 18.6 l/s
- 33No. WC - 82.5 l/s
- 2No. Kitchen Sink - 2.6 l/s
- 7No. Urinal - 5.6 l/s
- 2No. Dishwasher - 1.6 l/s
- 40No. Showers - 24 l/s

Total - 134.9 Discharge Units

Total discharge units for areas with frequent use = **134.9 DU**

0.7 x square root of 134.9 = **8.130 litres / second**

A pre-development application enquiry has been submitted to NWL and they have confirmed that foul water flows can be discharged at a rate of 8.13l/s to their network. As it is likely that NWL will carry out modifications to their network to accommodate surface water flows if is proposed that the calculated flows of 8.13 l/s be considered to allow and unrestricted foul water discharge. It is proposed to discharge the foul flows via gravity to the Existing Sewer within the site.

3.2 MAINTENANCE ISSUES

An application will be made to NWL for the adoption of all appropriate sewerage. Maintenance of the network will fall under their responsibility.

3.3 SAFETY ISSUES

Foul water pipework and manholes will be designed in accordance with Sewers for Adoption 7th Edition so as to ensure suitable access for maintenance and operation as required.

4 DESIGN STANDARDS

The following methodology was used to produce a SUDS strategy:

- BS EN 725 2008 – Drain and sewer systems outside buildings
- BS EN 12056-2 2000 – Gravity drainage systems inside buildings. Sanitary pipework, layout and calculation guide to the design, construction and maintenance of concrete block permeable pavements (Edition 6)
- SUDs Manual (CIRIA C753)
- Building Regulations Approved Document Part H 2000 (2002 with 2010 Amendments) Drainage and waste disposal
- PPG3 – Use and design of oil separators in surface water drainage systems
- National Building Specification
- Civil Engineering Specification for the Water Industry (7th Edition)
- Sewers for Adoption (7th Edition)
- BRE Digest 365

APPENDICIES

APPENDIX A

EXISTING TOPOGRAPHY

KEY

LINETYPES

VERGE	CONCRETE EDGE
FENCE - CHAIN LINK	FOOTPATH
FENCE - METAL	TRACK
FENCE - WOODEN	BUILDING
FENCE - POST & RAIL	TREE
HEDGE	GATE
WALL	SURVEY STATION
BARRIER	EAVES
CHANNEL LINE	

UTILITY KEY

LINETYPES

BT	POSSIBLE UTILITY LOCATED BY MIRA
CATV	COMBINED SEWER ROUTE
COMMS	FOUL WATER SEWER ROUTE
ELECTRIC	STORM WATER SEWER ROUTE
GAS	CHAMBER
UNKNOWN UTILITY	REINSTATEMENT SCAR
WATER	SURVEY BOUNDARY
POSSIBLE UTILITY LOCATED BY GPR	

ABBREVIATIONS

(AC)	ASSUMED CONNECTION	INT	INTERCEPTOR
A/G	ABOVE GROUND	KV	KILO VOLT
(AR)	ASSUMED ROUTE	LD	LOOP DETECTOR
ASB	ASBESTOS CEMENT	LH	LAMP HOLE
AV	AIR VALVE	LP	LAMP POST
BB	BELISHA BEACON	LV	LOW VOLTAGE
BD	BACK DROP	MK	MARKER
BL	BASE LEVEL	MH	MANHOLE
BO	BOLLARD	MT	METER
BOL	BOLLARD LIGHT	M/WELL	MONITORING WELL
BT	BRITISH TELECOM	O/H	OVERHEAD
CATV	CABLE TELEVISION	PE	POLYETHYLENE
CB	CONTROL BOX	PTG	PIPE TO GROUND
CI	CAST IRON	PVC	POLYVINYL CHLORIDE
CL	COVER LEVEL	TFR	TAKEN FROM RECORDS
CR	CABLE RISER	RE	RODDING EYE
CWS	COMBINED WATER SEWER	RED	REDUNDANT SERVICE
d	DEPTH OF SERVICE	RWP	RAIN WATER PIPE
DCH	DRAINAGE CHANNEL	SC	STOP COCK
DI	DUCTILE IRON	SI	SPUN IRON
DIS	DISUSED	SOF	SOFFIT
EOT	END OF TRACE	SP	SOIL PIPE
EP	ELECTRIC POLE	SWS	SURFACE WATER SEWER
ER	EARTH ROD	SV	STOP VALVE
FFP	FUEL TANK FILL POINT	TL	TRAFFIC LIGHT
FH	FIRE HYDRANT	TLC	TRAFFIC LIGHT COVER
FWS	FOUL WATER SEWER	TP	TELECOM POLE
GPR	GROUND PENETRATING RADAR	UTL	UNABLE TO LIFT
GR	GAS RISER	UTS	UNABLE TO SURVEY
GV	GAS VALVE	UTT	UNABLE TO TRACE
GY	GULLY	VC	VITRIFIED CLAY
HV	HIGH VOLTAGE	VP	VENT PIPE
IC	INSPECTION COVER	WL	WATER LEVEL
Id	INVERT DEPTH	WO	WASH OUT
IL	INVERT LEVEL	WR	WATER RISER

DISCLAIMER

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2. Ground Penetrating Radar (GPR) techniques have been used in the location of non metallic services (including fibre optic) wherever record information or surface scarring indicates the existence of a particular service. The interpretation of these results is not infallible and success will depend on a number of factors including soil type, ground water levels and surface conditions, hence trial excavations must be carried out in order to confirm identification, position and in particular depth of the service, where these are critical.
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4. Where cable routes cannot be individually selected for tracing, any one trace could be a single cable or a cluster of cables.
5. The locations of 'pot-ended' cables are often difficult to detect and although we will make all reasonable efforts to locate or transpose this information from records, we cannot guarantee that 'pot-ended' cables do not exist on this site.
6. Drainage information has been obtained without man entry into the chamber and SiteScan presume that sewers are straight between chambers.
7. Pipe / Duct sizes are shown from visual inspection or taken from record information. Pipe sizes are recorded in millimetres and depths in metres.
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11. The utility information has been compiled from non-intrusive survey techniques; it always remains possible that there are additional services within the survey boundary that we have not been able to detect. We recommend that care is taken on site and that all service records are used in conjunction with this survey.
12. The responsibility for avoiding damage to assets and services on site shall be that of the persons proposing to excavate within the surveyed area, who shall be liable to the asset owner and any third party who may be affected in any way for any loss or damage.

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A	INITIAL RELEASE	NP	NG

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PROJECT TITLE: TEMPLE PARK
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DRAWING TITLE: TOPOGRAPHICAL SURVEY

SCALE AT A0: 1:500 @ A0	DATE: 2.02.16	GRID/DATUM: OS
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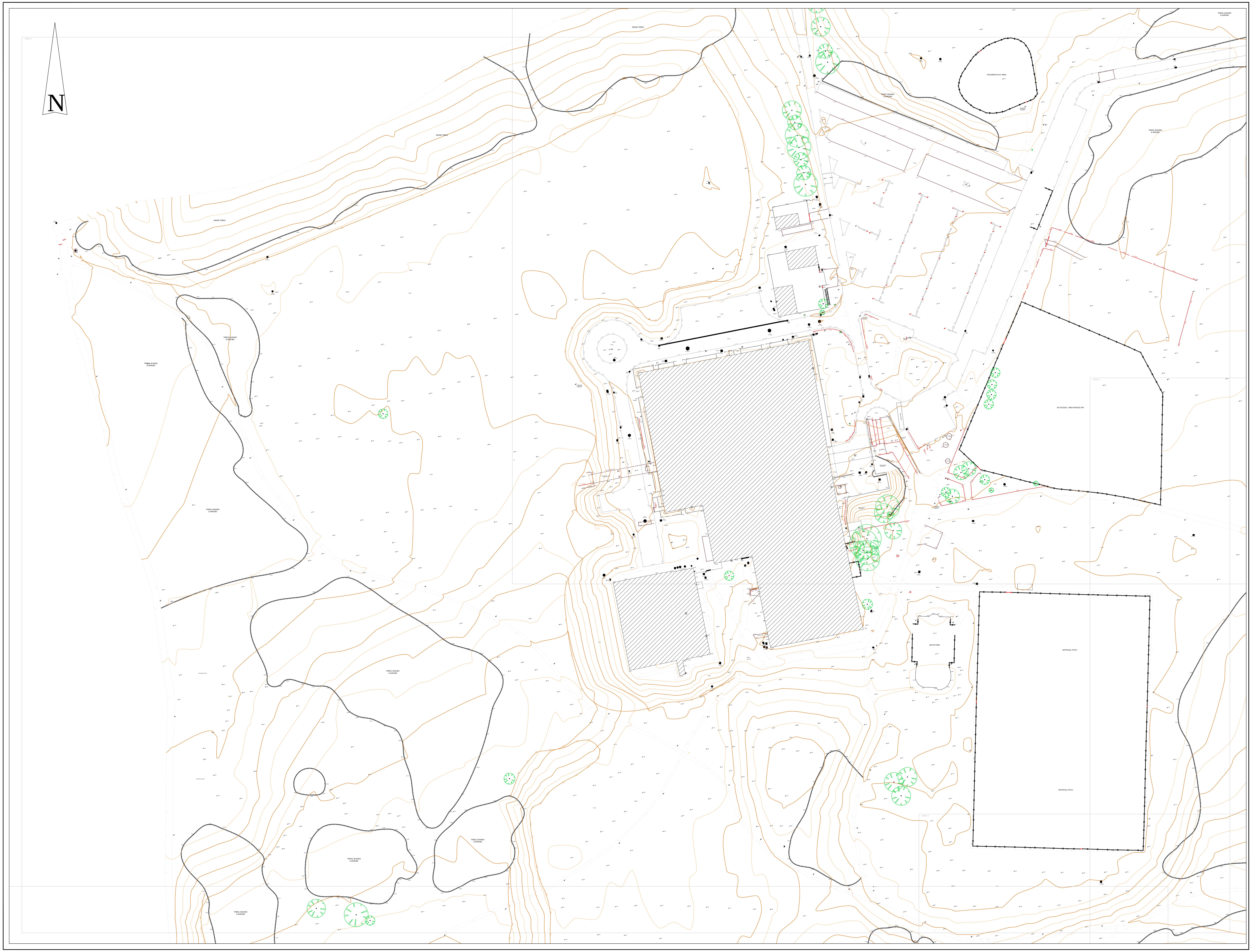
PROJECT No.: P16019	SHEET No.: 1/5	REV: A



KEY

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	HEDGE		GATE
	WALL	STN 1	SURVEY STATION
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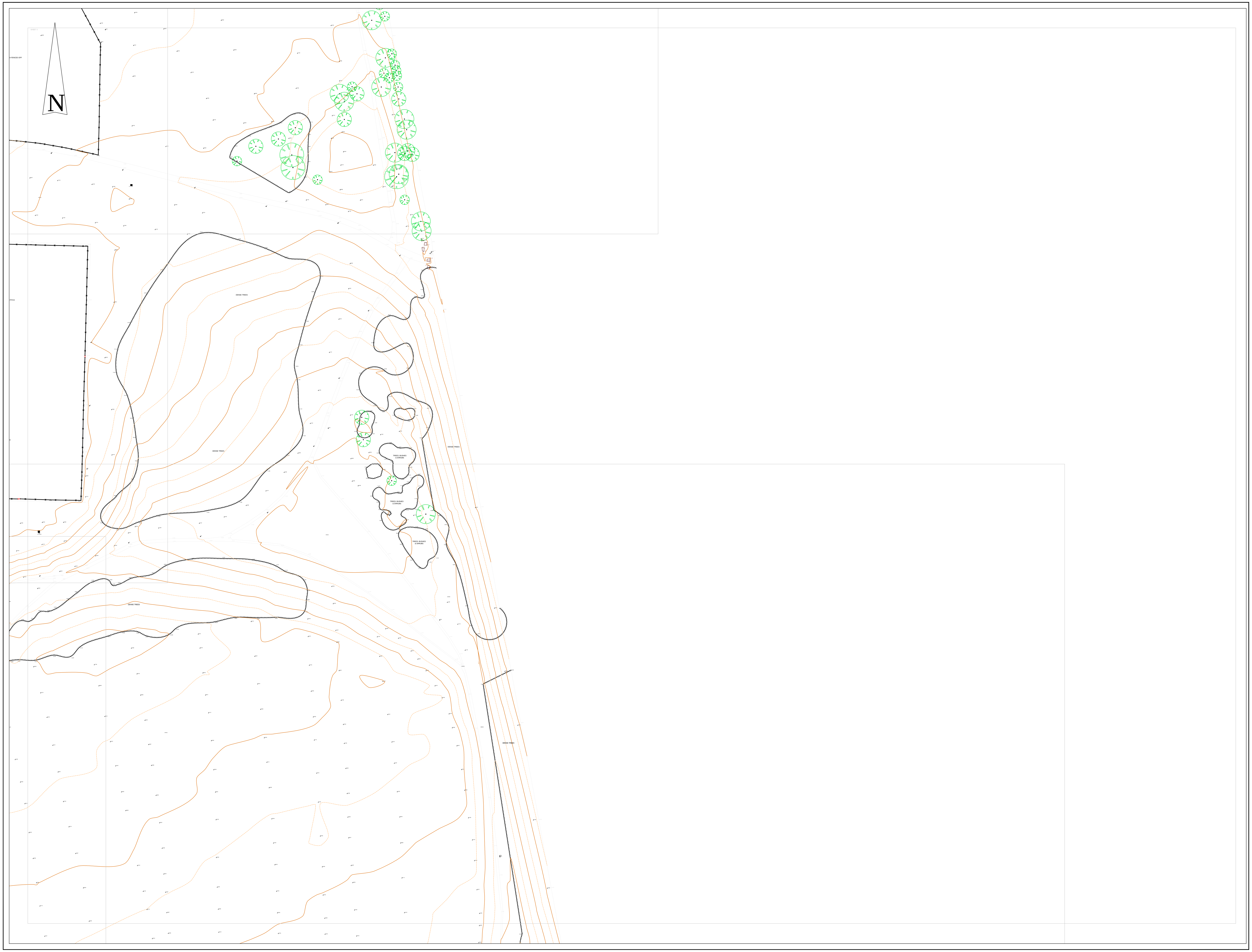

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CI	CAST IRON	PVC	POLYVINYL CHLORIDE
CL	COVER LEVEL	TFR	TAKEN FROM RECORDS
CR	CABLE RISER	RE	RODDING EYE
CWS	COMBINED WATER SEWER	RED	REDUNDANT SERVICE
d	DEPTH OF SERVICE	RWP	RAIN WATER PIPE
DCH	DRAINAGE CHANNEL	SC	STOP COCK
DI	DUCTILE IRON	SI	SPUN IRON
DIS	DISUSED	SOF	SOFFIT
EOT	END OF TRACE	SP	SOIL PIPE
EP	ELECTRIC POLE	SWS	SURFACE WATER SEWER
ER	EARTH ROD	SV	STOP VALVE
FFP	FUEL TANK FILL POINT	TL	TRAFFIC LIGHT
FH	FIRE HYDRANT	TLC	TRAFFIC LIGHT COVER
FWS	FOUL WATER SEWER	TP	TELECOM POLE
GPR	GROUND PENETRATING RADAR	UTL	UNABLE TO LIFT
GR	GAS RISER	UTS	UNABLE TO SURVEY
GV	GAS VALVE	UTT	UNABLE TO TRACE
GY	GULLY	VC	VITRIFIED CLAY
HV	HIGH VOLTAGE	VP	VENT PIPE
IC	INSPECTION COVER	WL	WATER LEVEL
Id	INVERT DEPTH	WO	WASH OUT
IL	INVERT LEVEL	WR	WATER RISER

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11. The utility information has been compiled from non-intrusive survey techniques; it always remains possible that there are additional services within the survey boundary that we have not been able to detect. We recommend that care is taken on site and that all service records are used in conjunction with this survey.
12. The responsibility for avoiding damage to assets and services on site shall be that of the persons proposing to excavate within the surveyed area, who shall be liable to the asset owner and any third party who may be affected in any way for any loss or damage.

ALWAYS EXERCISE CAUTION WHEN EXCAVATING.

NOTES

REV	AMENDMENT	DRAWN	CHECKED
A	INITIAL RELEASE	NP	NG

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SiteScan
Information to build on

CLIENT: HUSBAND & BROWN LTD

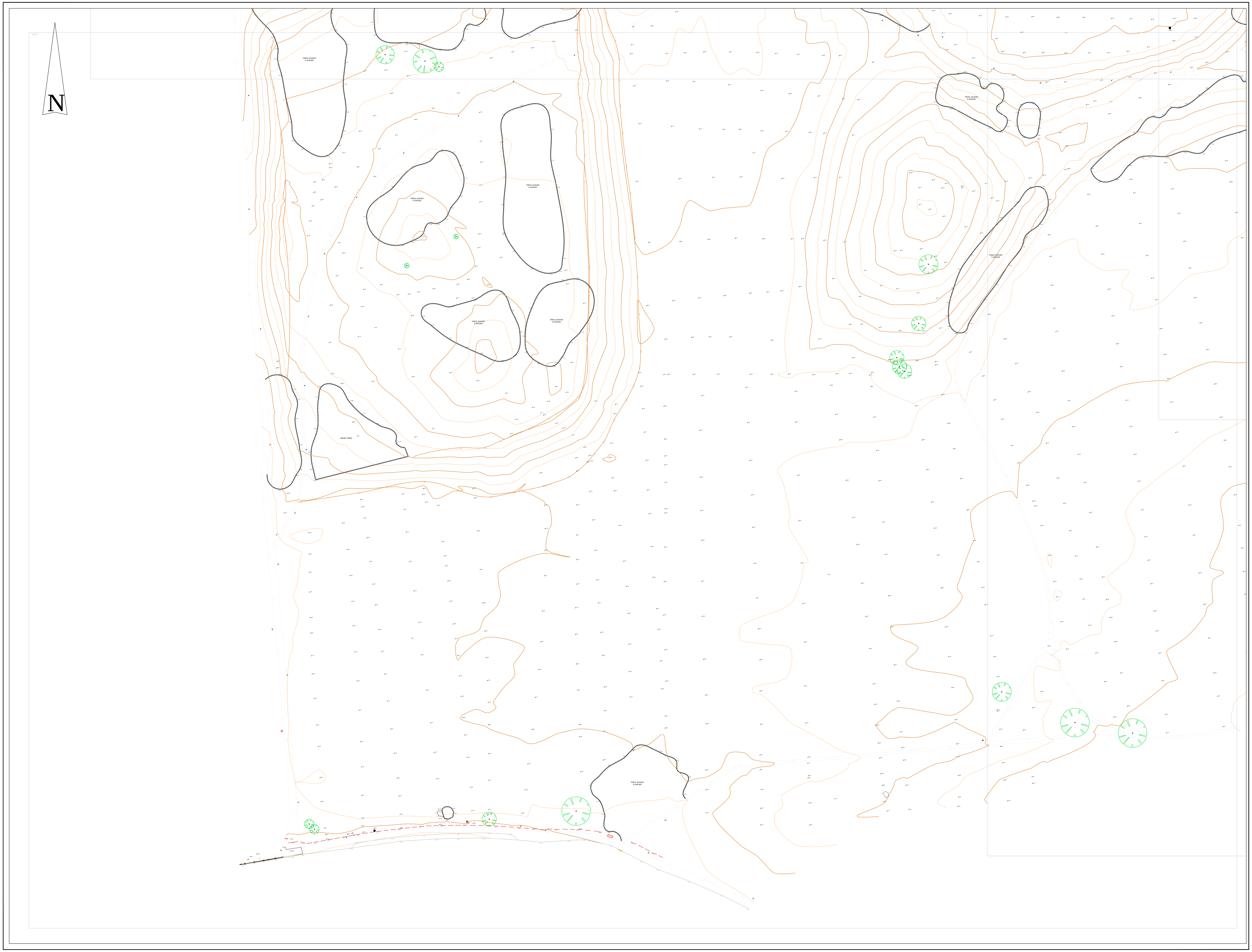
PROJECT TITLE: TEMPLE PARK
SOUTH SHIELDS
SOUTH TYNESIDE

DRAWING TITLE: TOPOGRAPHICAL SURVEY

SCALE AT A0	DATE	GRID/DATUM
1:500 @ A0	2.02.16	OS

SURVEYED BY	DRAWN BY	APPROVED
NP/NR	NP	NG

PROJECT No.	SHEET No.	REV
P16019	3/5	A



KEY

LINETYPES

VERGE	CONCRETE EDGE
FENCE - CHAIN LINK	FOOTPATH
FENCE - METAL	TRACK
FENCE - WOODEN	BUILDING
FENCE - POST & RAIL	TREE
HEDGE	GATE
WALL	SURVEY STATION
BARRIER	EAVES
CHANNEL LINE	

UTILITY KEY

LINETYPES

BT	POSSIBLE UTILITY LOCATED BY MIRA
CATV	COMBINED SEWER ROUTE
COMMS	FOUL WATER SEWER ROUTE
ELECTRIC	STORM WATER SEWER ROUTE
GAS	CHAMBER
UNKNOWN UTILITY	REINSTATEMENT SCAR
WATER	SURVEY BOUNDARY
POSSIBLE UTILITY LOCATED BY GPR	

ABBREVIATIONS

(AC)	ASSUMED CONNECTION	INT	INTERCEPTOR
A/G	ABOVE GROUND	KV	KILO VOLT
(AR)	ASSUMED ROUTE	LD	LOOP DETECTOR
ASB	ASBESTOS CEMENT	LH	LAMP HOLE
AV	AIR VALVE	LP	LAMP POST
BB	BELISHA BEACON	LV	LOW VOLTAGE
BD	BACK DROP	MK	MARKER
BL	BASE LEVEL	MH	MANHOLE
BO	BOLLARD	MT	METER
BOL	BOLLARD LIGHT	M/WELL	MONITORING WELL
BT	BRITISH TELECOM	O/H	OVERHEAD
CATV	CABLE TELEVISION	PE	POLYETHYLENE
CB	CONTROL BOX	PTG	PIPE TO GROUND
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A	INITIAL RELEASE	NP	NG

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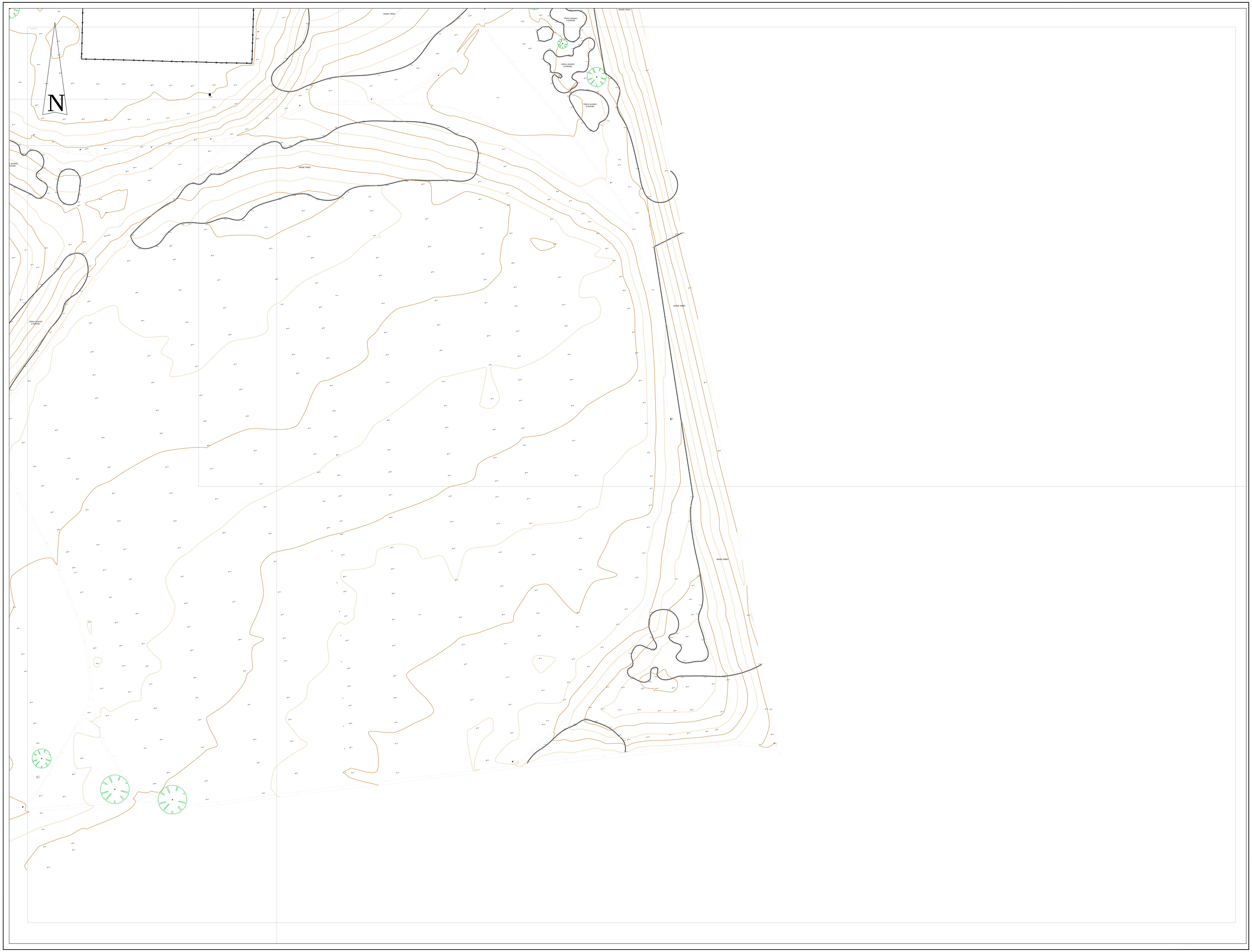
SOUTH SHIELDS
SOUTH TYNESIDE

DRAWING TITLE: TOPOGRAPHICAL SURVEY

SCALE AT A0	DATE	GRID/DATUM
1:500 @ A0	2.02.16	OS

SURVEYED BY	DRAWN BY	APPROVED
NP/NR	NP	NG

PROJECT No.	SHEET No.	REV
P16019	4/5	A



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CLIENT: HUSBAND & BROWN LTD

PROJECT TITLE: TEMPLE PARK
SOUTH SHIELDS
SOUTH TYNESIDE

DRAWING TITLE: TOPOGRAPHICAL SURVEY

SCALE AT A0: 1:500 @ A0	DATE: 2.02.16	GRID/DATUM: OS
SURVEYED BY: NP/NR	DRAWN BY: NP	APPROVED: NG
PROJECT No.: P16019	SHEET No.: 5/5	REV: A

APPENDIX B

NWL PREDEVELOPMENT ENQUIRY RESPONSE

Ext: 36646
Direct Line: 0191 419 66646
Email: developmentenquiries@nwl.co.uk
Our Ref: 17NO4BAA19
Your Ref:

24 August 2017

Tim Holland
James Christopher Consulting
4 McMillan Close
Saltwell Business Park
Gateshead
NE9 5BF

Dear Mr Holland,

Re: Pre-Development Enquiry – Nevison Avenue, South Shields

Further to the Pre-Development Enquiry received for the above site, we are now able to provide the following response.

We have based our response on the information in your application and accompanying correspondence. Therefore, should any of the information now be different, then you must ensure that you inform us of any changes as further Network Modelling may be required and our response may also change, leading to this response being invalid.

Northumbrian Water assesses the impact of the proposed development on our assets and assesses the capacity within our network's to accommodate and treat the anticipated flows arising from the development. We do not therefore offer comment on aspects of planning applications that are outside of our area of control.

Enclosed for your information is a scaled extract showing the approximate position of our water and wastewater networks and associated assets. Please note that the actual position of any of our assets shown on the plan must be established by taking trial holes in all cases.

An appropriate risk assessment and method statement (RAMS) must be provided to us prior to gaining approval for any trial hole investigations, at least 5 working days in advance of starting any work onsite.

Also enclosed is our extract showing locations within the approximate vicinity of this site that have, from our records, experienced flooding. This has been provided to demonstrate the known flood risks within the vicinity which have been considered as part of our assessment on this enquiry.

We have also carried out a review of your application and can confirm the following:

Sewerage and Sewerage Treatment

Northumbrian Water would ask that you separate the foul and surface water flows in accordance with Part H of the Building Regulations prior to the final connection to the public sewer.

All new connections to the public sewerage system must first be approved through the Section 106 of the Water Industry Act 1991 process prior to construction.

Should you decide to proceed with this development, a fully completed Sewer Connection application form will be required. These are available to download from the following link:

https://www.nwl.co.uk/developers/new-connections.aspx

- Foul Water Discharge

Based on the document you provided showing proposed number of discharge units in the new development, the foul flows from these units can discharge into manhole 3401.

- Surface Water Discharge

In applying for planning permission you will be required to demonstrate to the Local Planning Authority through your flood risk appraisal that you have considered the 3 alternative options for the management of surface water which are listed within Part H of the Building Regulations 2010:

(a) an adequate soakaway or some other adequate infiltration system; or, where that is not reasonably practicable,

(b) a watercourse; or, where that is not reasonably practicable,

(c) a sewer.

Your assessment of this will form an important part in considering our response to the planning consultation.

The modelling work undertaken as part of this application has identified that the existing network within the vicinity of the site is currently unable to accommodate any additional surface water flows as there is a risk of flooding predicted downstream. Could you please provide further details of the surface water flows from the development site, confirming if you are proposing to discharge any flows from the pitches into the public sewerage network.

- Protection of Existing Sewerage Assets

We wish to draw your attention to the existing sewer which passes through the site. This sewer could be diverted, protected or accommodated within your site layout with an appropriate easement. To discuss this in further detail, please contact:

Roger Perkins
0191 419 6621
roger.perkins@nwl.co.uk

- Sewage Treatment Capacity

The Sewage Treatment Works to which this development finally discharges to is able to accept the additional flows.

Please note that this response is valid for 1 year only and you should resubmit your proposals should this period lapse prior to your development beginning.

Should you require any further assistance or information, then please do not hesitate to contact me laura.king@nwl.co.uk or alternatively on 0191 419 6646, please quote our reference number above in any future correspondence.

Yours sincerely,

Laura King
Developer Services

APPENDIX C

PROPOSED DRAINAGE LAYOUT

DO NOT SCALE: Contractor to check all dimensions and report any omissions or errors

CRICKET FIELD DRAINAGE DESIGNED
BY SPECIALIST
PROPOSALS TO BE CONFIRMED

CRICKET FIELD DRAINAGE DESIGNED
BY SPECIALIST
PROPOSALS TO BE CONFIRMED

TENNIS COURT DRAINAGE DESIGNED
BY SPECIALIST
PROPOSALS TO BE CONFIRMED

RUGBY PITCH DRAINAGE DES
BY SPECIALIST
PROPOSALS TO BE CONFIR

NWL MH 3601
COVER LEVEL = 28.760
INVERT LEVEL = 25.632

2.002
150mm 1:153

2.002(1)
150mm 1:150

SW MH 8
COVER LEVEL = 28.526
INVERT LEVEL = 26.545
HYDRO-BRAKE OPTIMUM
1.8m DESIGN HEAD
12 l/s DISCHARGE RATE

FW MH 3
COVER LEVEL = 28.553
INVERT LEVEL = 26.465

GROUNDS KEEPERS HUT FFL 28.950

2.001
600mm 1:402

FW 1.001
150mm 1:50

225mm 1:100

SW MH 7
COVER LEVEL = 28.890
INVERT LEVEL = 27.540

3.000
600mm 1:100

SW MH 6
COVER LEVEL = 29.035
INVERT LEVEL = 26.690

FW MH 1
COVER LEVEL = 28.838
INVERT LEVEL = 27.485

FW 1.000
150mm 1:80

FW MH 2
COVER LEVEL = 28.877
INVERT LEVEL = 27.220

NWL MH 3501
COVER LEVEL = 29.090
INVERT LEVEL = 26.595

CLUB HOUSE
FFL 28.950

2.000
450mm 1:251

SW MH 5
COVER LEVEL = 28.895
INVERT LEVEL = 26.920

SW MH 1
COVER LEVEL = 28.102
INVERT LEVEL = 26.355

1.000
225mm 1:100

SW MH 2
COVER LEVEL = 27.969
INVERT LEVEL = 26.050

PERMEABLE GRAVEL OVER FLOW PARKING, REQUIREMENTS AND SPECIFICATION TO BE DETERMINED

1.001
225mm 1:150

SW MH 3
COVER LEVEL = 27.438
INVERT LEVEL = 25.635

1.002
225mm 1:52

SW MH 4
COVER LEVEL = 27.240
INVERT LEVEL = 25.460
HYDRO-BRAKE OPTIMUM
1.4m DESIGN HEAD
5 l/s DISCHARGE RATE

NWL MH 0403
COVER LEVEL = 26.512
INVERT LEVEL = 25.680

1.003
150mm 1:100

NWL SECTION 106 AGREEMENT TO BE COMPLETED BY THE CONTRACTOR AND AGREED TO ALLOW FOR UTILISING THE EXISTING NWL COMBINED SEWER

LEGEND

- LEGAL SITE BOUNDARY
- PROPOSED SURFACE WATER DRAINAGE
- PROPOSED FOUL DRAINAGE
- PROPOSED NWL DIVERSION
- NWL LINE TO BE ABANDONED AND DIVERTED
- SURFACE WATER PRE CAST CONCRETE MANHOLE CHAMBER 1.20M DIAMETER (<375 DIA PIPES) 1.50M DIAMETER (≥ 375 DIA PIPES)
- FOUL PRE CAST CONCRETE MANHOLE CHAMBER 1.20M DIAMETER (<375 DIA PIPES) 1.50M DIAMETER (≥ 375 DIA PIPES)
- EXISTING NWL COMBINED SEWER
- EXISTING NWL SURFACE WATER SEWER
- PROPOSED GRAVEL OVERFLOW CAR PARKING
- PROPOSED FILTER DRAIN

NOTES

1. PROPOSED GRAVITY CONNECTION TO EXISTING NWL COMBINED SEWER VIA NEW MANHOLE.
2. REFER TO ARCHITECTS DRAWINGS FOR CONFIRMATION OF LANDSCAPING ARRANGEMENTS.
3. ALL PITCH DRAINAGE TO BE DESIGNED BY OTHERS

DRAWING INFORMATION

4. SITE LOCATED AT NGR 437207,563555
5. EXISTING SITE INFORMATION BASED ON SITE SCAN TOPOGRAPHICAL SURVEY COMPLETED 02/02/16
6. PROPOSED SITE LAYOUT BASED ON QAD ARCHITECTS DRAWING 17-006 SK01 REVISION N SKETCH SITE LAYOUT.

Rev	Description	By	Chk	Date
C	Drawing Revised as per LLFA comments	AW	TH	05.01.18
B	Hard Surfacing Areas Revised	AW	TH	10.11.17
A	Issued for Planning	AW	TH	03.11.17

Drawing Status:
PLANNING
DRAWING ISSUED FOR PLANNING

James Christopher Consulting
Civil & Structural Engineers
Construction Consultants
Project Managers
4 McMillan Close
Saltwell Business Park
Gateshead
Tyne & Wear
NE9 5BF
Tel: (0191) 491 4684 Fax: (0191) 491 5168
Email: enquiries@jc-consulting.net
Website: www.jc-consulting.net

Client :
Tolent Living

Project:
South Shields & Westoe Sports Club
South Shields

Drawing Title:
Proposed External Drainage Arrangement
Sheet 1 of 2

Scale at A1	Drawn By	Date	Checked By	Date
1:500	AW	01.11.17	TH	01.11.17

Project No.	Drawing No.	Revision
JCC17-051	JCC17-051-110	C

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NWL SECTION 106 AGREEMENT TO BE COMPLETED BY THE CONTRACTOR AND AGREED TO ALLOW FOR UTILISING THE EXISTING NWL COMBINED SEWER

PR NWL 3
COVER LEVEL = 29.591
INVERT LEVEL = 24.879

300mm 1:100

300mm 1:91

NWL MH 3601
COVER LEVEL = 28.760
INVERT LEVEL = 25.632

TENNIS COURT DRAINAGE DESIGNED BY SPECIALIST PROPOSALS TO BE CONFIRMED

DIVERTED COMBINED SEWER PRIOR TO ANY UPSTREAM DRAINAGE WORKS EXISTING PIPE ROUTE AND LEVEL TO BE CONFIRMED AND MARKED OUT ON SITE. ANY DISCREPANCIES IN LEVEL TO BE REPORTED TO THE ENGINEER TO ALLOW FOR THE PROPOSED DRAINAGE UPSTREAM SYSTEM INVERT LEVELS TO BE VERIFIED AND CHECKED. DIVERSION ROUTE TO BE AGREED WITH NWL SECTION 106 AGREEMENT TO BE COMPLETED BY THE CONTRACTOR AND AGREED TO ALLOW FOR CONNECTION TO THE NWL COMBINED SEWER.

2.002
150mm 1:153

2.002(1)
150mm 1:150

SW MH 8
COVER LEVEL = 28.526
INVERT LEVEL = 26.545
HYDRO-BRAKE OPTIMUM
1.8m DESIGN HEAD
12 l/s DISCHARGE RATE

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COVER LEVEL = 28.553
INVERT LEVEL = 26.465

PR NWL 2
COVER LEVEL = 29.201
INVERT LEVEL = 25.918

GROUNDS KEEPERS HUT FFL 28.950

225mm 1:100

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COVER LEVEL = 28.890
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3.000
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COVER LEVEL = 29.090
INVERT LEVEL = 26.595

300mm 1:91

CLUB HOUSE FFL 28.950

2.000
450mm 1:251

225mm 1:100

RUGBY PITCH DRAINAGE DESIGNED BY SPECIALIST PROPOSALS TO BE CONFIRMED

SW MH 5
COVER LEVEL = 28.895
INVERT LEVEL = 26.920

SW MH 1
COVER LEVEL = 28.102
INVERT LEVEL = 26.355

PR NWL 1
COVER LEVEL = 29.740
INVERT LEVEL = 27.231

1.000
225mm 1:100

225mm 1:100

SW MH 2
COVER LEVEL = 27.969
INVERT LEVEL = 26.050

PERMEABLE GRAVEL OVER FLOW PARKING, REQUIREMENTS AND SPECIFICATION TO BE DETERMINED

NWL MH 3401
COVER LEVEL = 30.441
INVERT LEVEL = 27.651

LEGEND

- LEGAL SITE BOUNDARY
- PROPOSED SURFACE WATER DRAINAGE
- PROPOSED FOUL DRAINAGE
- PROPOSED NWL DIVERSION
- NWL LINE TO BE ABANDONED AND DIVERTED
- SURFACE WATER PRE CAST CONCRETE MANHOLE CHAMBER 1.20M DIAMETER (<375 DIA PIPES) 1.50M DIAMETER (≥ 375 DIA PIPES)
- FOUL PRE CAST CONCRETE MANHOLE CHAMBER 1.20M DIAMETER (<375 DIA PIPES) 1.50M DIAMETER (≥ 375 DIA PIPES)
- EXISTING NWL COMBINED SEWER
- EXISTING NWL SURFACE WATER SEWER
- PROPOSED GRAVEL OVERFLOW CAR PARKING
- PROPOSED FILTER DRAIN

NOTES

1. PROPOSED GRAVITY CONNECTION TO EXISTING NWL COMBINED SEWER VIA NEW MANHOLE.
2. REFER TO ARCHITECTS DRAWINGS FOR CONFIRMATION OF LANDSCAPING ARRANGEMENTS.
3. ALL PITCH DRAINAGE TO BE DESIGNED BY OTHERS

DRAWING INFORMATION

4. SITE LOCATED AT NGR 437207,563555
5. EXISTING SITE INFORMATION BASED ON SITE SCAN TOPOGRAPHICAL SURVEY COMPLETED 02/02/16
6. PROPOSED SITE LAYOUT BASED ON QAD ARCHITECTS DRAWING 17-006 SK01 REVISION N SKETCH SITE LAYOUT.

Rev	Description	By	Chk	Date
C	Drawing Revised as per LLFA comments	AW	TH	05.01.18
B	Hard Surfacing Areas Revised	AW	TH	10.11.17
A	Issued for Planning	AW	TH	03.11.17

Drawing Status:
PLANNING
DRAWING ISSUED FOR PLANNING

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Tolent Living

Project:
South Shields & Westoe Sports Club
South Shields

Drawing Title:
Proposed External Drainage Arrangement
Sheet 2 of 2

Scale at A1	Drawn By	Date	Checked By	Date
1:500	AW	01.11.17	TH	01.11.17
Project No.	Drawing No.			Revision
JCC17-051	JCC17-051-111			C

APPENDIX D

PROPOSED DRAINAGE CALCULATIONS

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)	17.600	Add Flow / Climate Change (%)	0
Ratio R	0.346	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
1.000	30.315	0.305	99.4	0.006	5.00	0.0	0.600	o	225	Pipe/Conduit	
1.001	62.826	0.415	151.4	0.014	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.002	26.631	0.175	152.2	0.034	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.003	36.058	0.360	100.2	0.020	0.00	0.0	0.600	o	150	Pipe/Conduit	
2.000	57.634	0.230	250.6	0.098	5.00	0.0	0.600	o	450	Pipe/Conduit	
3.000	36.433	0.365	99.8	0.140	5.00	0.0	0.600	o	600	Pipe/Conduit	
2.001	58.297	0.145	402.0	0.039	0.00	0.0	0.600	o	600	Pipe/Conduit	
2.002	94.189	0.625	150.7	0.000	0.00	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)
1.000	50.00	5.39	26.355	0.006	0.0	0.0	0.0	1.31	52.1	0.8
1.001	50.00	6.37	26.050	0.020	0.0	0.0	0.0	1.06	42.2	2.7
1.002	50.00	6.79	25.635	0.054	0.0	0.0	0.0	1.06	42.0	7.4
1.003	50.00	7.39	25.460	0.074	0.0	0.0	0.0	1.00	17.7	10.0
2.000	50.00	5.75	26.920	0.098	0.0	0.0	0.0	1.28	203.5	13.2
3.000	50.00	5.25	27.540	0.140	0.0	0.0	0.0	2.44	689.2	19.0
2.001	50.00	6.55	26.690	0.277	0.0	0.0	0.0	1.21	341.6	37.5
2.002	50.00	8.48	26.545	0.277	0.0	0.0	0.0	0.82	14.4«	37.5

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)
1.003		27.000	25.100	24.600	0	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)
2.002		28.760	25.920	25.920	0	0

Online Controls for Storm

Hydro-Brake® Optimum Manhole: SW MH 4, DS/PN: 1.003, Volume (m³): 3.0

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)	25.460
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		

Hydro-Brake® Optimum Manhole: SW MH 8, DS/PN: 2.002, Volume (m³): 19.6

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)	26.545
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Hydro-Brake® Optimum Manhole: SW MH 8, DS/PN: 2.002, Volume (m³): 19.6

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

Filter Drain Manhole: SW MH 3, DS/PN: 1.002

Infiltration Coefficient Base (m/hr)	0.00000	Pipe Diameter (m)	0.225
Infiltration Coefficient Side (m/hr)	0.00000	Pipe Depth above Invert (m)	0.300
Safety Factor	1.3	Number of Pipes	1
Porosity	0.30	Slope (1:X)	150.0
Invert Level (m)	26.135	Cap Volume Depth (m)	1.500
Trench Width (m)	0.5	Cap Infiltration Depth (m)	0.000
Trench Length (m)	130.0		

Porous Car Park Manhole: SW MH 5, DS/PN: 2.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	60.0
Membrane Percolation (mm/hr)	1000	Length (m)	10.0
Max Percolation (l/s)	166.7	Slope (1:X)	150.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	28.220	Membrane Depth (mm)	0

1 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	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	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	0.347
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	17.700	Cv (Winter)	0.840

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years)	1, 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.
1.000	SW MH 1	15 Winter	1	+0%	100/15 Summer			
1.001	SW MH 2	15 Winter	1	+0%	30/30 Winter			
1.002	SW MH 3	15 Winter	1	+0%	30/15 Summer			
1.003	SW MH 4	15 Winter	1	+0%	1/15 Summer			
2.000	SW MH 5	15 Winter	1	+0%	30/15 Winter			
3.000	SW MH 7	15 Winter	1	+0%	30/120 Summer			
2.001	SW MH 6	60 Winter	1	+0%	30/15 Winter			
2.002	SW MH 8	60 Winter	1	+0%	1/15 Summer	30/120 Summer		

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
1.000	SW MH 1	26.370	-0.210	0.000	0.01		0.7	OK	
1.001	SW MH 2	26.083	-0.192	0.000	0.05		2.0	OK	
1.002	SW MH 3	25.705	-0.155	0.000	0.13		5.2	OK	
1.003	SW MH 4	25.695	0.085	0.000	0.28		4.7	SURCHARGED	
2.000	SW MH 5	26.990	-0.380	0.000	0.04		8.0	OK	
3.000	SW MH 7	27.607	-0.533	0.000	0.03		16.3	OK	

1 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
2.001	SW MH 6	26.932	-0.358	0.000	0.05		15.3	OK	
2.002	SW MH 8	26.931	0.236	0.000	0.31		4.5	SURCHARGED	23

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	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	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	0.347
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	17.700	Cv (Winter)	0.840

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years)	1, 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.
1.000	SW MH 1	15 Winter	30	+0%	100/15 Summer			
1.001	SW MH 2	30 Winter	30	+0%	30/30 Winter			
1.002	SW MH 3	30 Winter	30	+0%	30/15 Summer			
1.003	SW MH 4	30 Winter	30	+0%	1/15 Summer			
2.000	SW MH 5	120 Winter	30	+0%	30/15 Winter			
3.000	SW MH 7	120 Winter	30	+0%	30/120 Summer			
2.001	SW MH 6	120 Winter	30	+0%	30/15 Winter			
2.002	SW MH 8	360 Winter	30	+0%	1/15 Summer	30/120 Summer		

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
1.000	SW MH 1	26.382	-0.198	0.000	0.03		1.7	OK	
1.001	SW MH 2	26.307	0.032	0.000	0.11		4.5	SURCHARGED	
1.002	SW MH 3	26.303	0.443	0.000	0.17		6.6	SURCHARGED	
1.003	SW MH 4	26.296	0.686	0.000	0.29		4.9	SURCHARGED	
2.000	SW MH 5	28.196	0.826	0.000	0.04		8.3	SURCHARGED	
3.000	SW MH 7	28.198	0.058	0.000	0.02		13.7	SURCHARGED	

30 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 (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
2.001	SW MH 6	28.201	0.911	0.000	0.05		15.7	SURCHARGED	
2.002	SW MH 8	28.526	1.831	1.113	0.36		5.1	FLOOD	23

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	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	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	0.347
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	17.700	Cv (Winter)	0.840

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years)	1, 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.
1.000	SW MH 1	60 Winter	100	+40%	100/15 Summer			
1.001	SW MH 2	60 Winter	100	+40%	30/30 Winter			
1.002	SW MH 3	60 Winter	100	+40%	30/15 Summer			
1.003	SW MH 4	60 Winter	100	+40%	1/15 Summer			
2.000	SW MH 5	180 Winter	100	+40%	30/15 Winter			
3.000	SW MH 7	30 Winter	100	+40%	30/120 Summer			
2.001	SW MH 6	120 Summer	100	+40%	30/15 Winter			
2.002	SW MH 8	180 Winter	100	+40%	1/15 Summer	30/120 Summer		

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
1.000	SW MH 1	26.851	0.271	0.000	0.03		1.5	SURCHARGED	
1.001	SW MH 2	26.846	0.571	0.000	0.09		3.7	SURCHARGED	
1.002	SW MH 3	26.846	0.986	0.000	0.18		6.9	SURCHARGED	
1.003	SW MH 4	26.918	1.308	0.000	0.29		5.0	SURCHARGED	
2.000	SW MH 5	28.535	1.165	0.000	0.05		8.9	FLOOD RISK	
3.000	SW MH 7	28.629	0.489	0.000	0.10		56.5	FLOOD RISK	

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
2.001	SW MH 6	28.537	1.247	0.000	0.07		22.8	SURCHARGED	
2.002	SW MH 8	28.532	1.837	6.664	0.41		5.9	FLOOD	23

APPENDIX E

DRAINAGE MAINTENANCE SCHEDULE

DRAINAGE MAINTENANCE SCHEDULE

Maintenance of all drainage features not adopted by Northumbrian Water Limited will be the responsibility of the land owner or site operator and will need to be carried out by a competent contractor. Drainage maintenance schedule covers, pipework, chambers, SUDs features and flow control device.

MAINTENANCE SCHEDULE	REQUIRED ACTION	TYPICAL FREQUENCY
Regular maintenance	Removal of blockages to surface collection features and removal of silt from catch pits.	Annually, after autumn leaf fall or based on as required based on site specific observations.
Monitoring	Initial inspection.	Monthly for three months after installation.
	Inspect attenuation crates and flow control device – if required take remedial action.	Six-monthly.
	Inspect all drainage features.	Annually.
Remedial Actions	Cleansing of drainage features via rodding of jetting.	As required.

As required by CDM 2015 designs have been produced to ensure that all maintenance risks have been identified, eliminated, reduced and/ or controlled where appropriate.

Any manufacturer specific maintenance requirements are to be included as part of the site health and safety file.