



K&C Construction Ltd

Ysgol Caerhun, Conway Road

Outline Drainage Strategy





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1 Introduction

1.1 Appointment

Opus International Consultants (UK) Ltd (OPUS) were commissioned by K&C Construction Ltd in April 2017, to undertake a Drainage Strategy Report in support of a Full Detailed Planning Application for the redevelopment of Dolgarrog Primary School into Ysgol Caerhun.

1.2 Existing Site

The proposed site is situated to the east of Conway Road (B5106), and is centred at NGR 276959, 367960 and a topographical survey of the site is provided within Appendix 4.1. The site covers an area adjacent to Conway Road which is currently occupied by school buildings and associated hardstanding. The northern, western and southern boundaries of the site are formed by undeveloped open fields and the eastern boundary is formed by Conway Road which is also the main point of access to the site.

The site area is 0.78ha, of which 0.462ha is currently hardstanding. The remainder comprises of landscaped areas.

A review of the topographical survey shows that the site generally falls in a south easterly direction, with the highest ground level being around 18.5mAOD at the north-western corner of the site and the lowest point being at 10mAOD near the south-eastern corner of the site.

Sewer records have been obtained from Dwr Cymru Welsh Water (DCWW) for this area. These show the presence of a public combined sewer running along the southern boundary of the site to a public pumping station. The sewer records are shown in Appendix 4.2.

A drainage survey has recently been provided by the Client. This survey has shown that both foul and surface water from the existing buildings (0.13ha) are currently drained via a combined sewer which communicates with the public combined sewer running along the southern boundary of the site. None of the hardstanding areas appear to be positively drained and the surface water run-off from these areas appear to follow the natural topography of the site, draining overland to the southern boundary and beyond. The drainage survey plan is provided in Appendix 4.3

1.3 Existing Flood Risk

In accordance with the Natural Resources Wales (NRW) online Maps (shown in Appendix 4.4), the site is located within Flood Zone A – Land having less than 1 in 1000 annual probability of river or sea flooding.

Due to the topography of the area, the risk of flooding from adjoining properties or roads is considered to be minimal, and therefore, the management of the surface water run-off generated by the post development site will be the principal flood risk associated with this scheme.

1.4 Proposed Development

The scheme consists of the demolition of the existing school buildings and the construction of a new school building, parking and associated hardstanding areas.

Based upon the latest development plans, the final impermeable area generated by the proposals will be approximately 0.402ha.

A copy of the latest proposed development plan is included in Appendix 4.5.

2 Drainage Proposals

2.1 Foul Drainage

The existing school has capacity for 90 pupils and the proposed school will be designed to cater for 120 pupils, therefore, the peak foul discharge will increase marginally following the redevelopment of the school.

It is proposed to drain foul water from the proposed development to the local foul sewer currently serving the site. The foul drainage system is proposed to be designed in accordance with all statutory requirements including Part H1 of Building Regulations 2010 (2015 Edition). It is proposed to re-use the existing connection to the public sewer under a Section 106 Agreement.

Initial discussions are underway with DCWW in respect to the foul discharge and a response is awaited.

2.2 Surface Water Drainage

It is acknowledged that the satisfactory collection, control and discharge of storm water is now a principal planning and design consideration.

Surface water drainage systems are required to consider quantity, quality, amenity and biodiversity whilst preventing any likelihood of flooding to the site or adjacent sites. Part H3 of the Building Regulations 2010 and surface water management guidance reviewed from Essex County Council recommend that surface water runoff shall discharge to one of the following, listed in order of priority:

- 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.

It is necessary to identify the most appropriate method of controlling and discharging surface water. The design should seek to improve the local run-off profile by using systems that can either attenuate run-off and reduce peak flow rates or positively impact on the existing flood profile.

2.2.1 Ground Infiltration Techniques

The following geotechnical desk study was reviewed as part of this assessment:

- Ground Investigation Report, Dolgarrog Primary School, SRL Strata Renewables Ltd, August 2016.

Summary of Ground Conditions:

Macadam surfacing	At each borehole, 100mm thick. Sub-base granular fill at BHO2 and BHO4 200mm and 300mm thick respectively.
Made Ground	Mixed Made Ground of brown sandy gravelly low cobble content Fill. Much slate gravel. Thickness in the range 900mm BHO1: Absent at BHO2 and BHO4. At BHO3 the Made Ground is clay fill of dark grey silty peaty organic CLAY with wood pieces and sparse angular gravel of slate.
Glacial Clay	Firm-stiff brown streaked grey fine-medium fine-coarse subangular and subrounded sandy gravelly CLAY. Gravel is some of slate. The clay is of Low Plasticity There are cobbles in the soils mass which would result in the termination of the Continuous Dynamic Sample and Continuous Dynamic Sounding. Where the Standard Penetration Test was completed to full penetration the N300 values were in the range 17-37. Where the Standard Penetration Test was incomplete the results are 55/30mm (BHO2) 50/300mm (BHO3) and 50/10mm (BHO4). The Standard Penetration Test N300 values are presented. No Groundwater was encountered during the sampling.

It is considered that the site to be poor with soakaway drainage, given the low permeable soils encountered and at this stage the option of using soakaways or infiltration drainage systems has been discounted.

2.2.2 Discharge to Watercourse

A review of the online Ordnance Survey Mapping data has indicated that the nearest open watercourse (Afon Porth-llwyd) is located approximately 250m to the south of the site. Due the distance and local land use, a connection to this watercourse for surface water drainage purposes will neither be cost effective nor feasible without crossing third party land. On this basis this option has been discounted.

2.2.3 Connection to Sewer

In the event that infiltration drainage systems are proved to be unsuitable for the discharge of surface water run-off from the proposed development, the surface water drainage system for the proposed development will have to discharge to a local sewer at a maximum agreed discharge rate.

2.2.3.1 Surface Water Sewer

There are no surface water sewers identified on DCWW public sewer records.

A review of Conway Road has shown that there are no road gullies on the road in close proximity of the site. The nearest road gullies are approx. 225m south, at the point the road crosses the Afon Porth-llwyd, and therefore, it is assumed that there is no Highway Drainage within the vicinity of the site that could be utilised as a point of discharge.

2.2.3.2 Combined Sewer

An existing Public Combined Sewer is situated along the southern boundary of the site to which the site currently drains surface water run-off from the school buildings. Given the close proximity of the combined sewer and that surface water flows from the site currently communicate with the combined sewer, we would advocate that a connection to the combined sewer is pursued.

Initial discussions are underway with DCWW in respect to the surface water flows re-communicating with the combined sewer and a response is awaited.

2.2.4 Allowable Discharge Rate

In the event that infiltration drainage systems are proved to be unsuitable for the discharge of surface water run-off from the proposed development, the surface water drainage system for the proposed development will have to discharge to the local sewers upon a maximum agreed discharge rate. The recent drainage survey has shown that rainwater from the site currently discharges directly into the foul sewer crossing the site without any attenuation.

2.2.4.1 Existing Greenfield Run-off Rate

The existing Greenfield run-off rates for the site have been calculated and are as follows and are attached within Appendix 4.6.

Existing Greenfield Discharge Rates	
Return Period	Existing Discharge Rate (l/s)
Q_{bar}	10.3
1 in 30 year	18.2
1 in 100 year	22.5

2.2.4.2 Existing Brownfield Run-off Rate

The allowable discharge rate, from the site may also be estimated by assuming the unrestricted run-off from the existing impermeable areas contributing flows to the public sewer.

Within Section 1.2, we have stated that 0.13 Ha of impermeable area currently contributes surface water flows to the public combined drainage system situated within along the southern boundary of the site.

Therefore, it is possible to estimate the run-off generated by the existing site area for events up to 1 in 100 year years by using the Lloyd-Davies method thus;

$$Q = 2.78.A.i.C_v.C_r \quad \text{Where} \quad A = \text{Area (ha)}$$

$$I = \text{Design rainfall intensity (mm/hr)}$$

$$C_v.C_r = \text{Run off \& routing coefficient} \sim 1.0$$

Allowing for a rainfall intensity of 50mm/hr (1 in 1 Year Storm) with a 30% betterment provided to determine the peak flow from the site and based upon an impermeable area of 0.13 ha, the peak flow generated would be:

$$Q = 2.78.A.i.C_v.C_r$$

$$Q = 2.78 \times 0.13 \times 50 \times 1$$

$$Q = 18.07 \text{ l/s}$$

Applying the 30% betterment requirement, the maximum allowable discharge from the site would be:

$$Q_{\max} = Q \times 0.7$$

$$Q_{\max} = 18.07 \times 0.7$$

$$Q_{\max} = \mathbf{12.65 \text{ l/s.}}$$

2.2.4.3 Proposed Discharge Rate

Based upon the above, we would advocate that the surface water discharge is limited to the existing Greenfield runoff Q_{bar} rate of 10.3l/s which achieves a 43% betterment on the existing brownfield discharge.

Initial discussions are underway with DCWW in respect to the surface water discharge and a response is awaited.

2.2.5 Scheme Proposals

As previously mentioned, the use of an infiltration system to discharge surface water flows from the development is unlikely to be viable, therefore, we would advocate a separate surface water drainage system, with an outfall to the existing public combined sewer situated along the southern boundary of the site, should be designed in accordance with all statutory standards. The maximum permissible discharge of surface water drainage from the development site to the public combined sewer will be in the order of 10.2 l/s subject to the approval of DCWW.

The attenuation required on-site to cater for storm up to and including the 1 in 100 year plus climate change event would be in the order of 190m³ based upon storage calculations using MicroDrainage.

It is acknowledged that as part of the detailed design anti-siltation catch-pits and measures will need to be incorporated upstream of the attenuation and flow control device.

Indicative proposals for the surface water drainage are shown on drawing V-R6393 enclosed within Appendix 4.7, with attenuation calculations provided in Appendix 4.8.

3 Recommendations & Conclusions

3.1 Recommendations

If percolation testing is required by DCWW to verify the on-site infiltration potential of the underlying ground to supplement the findings of the ground investigation report we would advocate they are undertaken in accordance with BRE365 guidance.

In the event that infiltration systems are agreed to be unsuitable with DCWW for the disposal of surface water run-off, then a restricted discharge of 10.2l/s via the existing connection to DCWW's public combined drainage system should be pursued and adequate on-site attenuation be provided. This discharge rate and easements should also be agreed with DCWW before the detail design is commenced.

3.2 Conclusions

The proposed site was not found to be at risk of fluvial flood risk and, subject to further surveys and discussions with DCWW, suitable points of connection were identified for the disposal of the foul effluent and surface water run-off generated from the proposed development.

The proposed development is not expected to be affected by general objections in respect to draining the site. There will also be suitable conditions imposed to ensure that the drainage proposals are designed and constructed in accordance with relevant statutory requirements, including Building Regulations 2010 and the requirements of the Local Authority.

4 Appendices

4.1 Topographical Survey

4.2 Sewer Record Plan

4.3 Existing Drainage Survey

4.4 NRW Flood Map

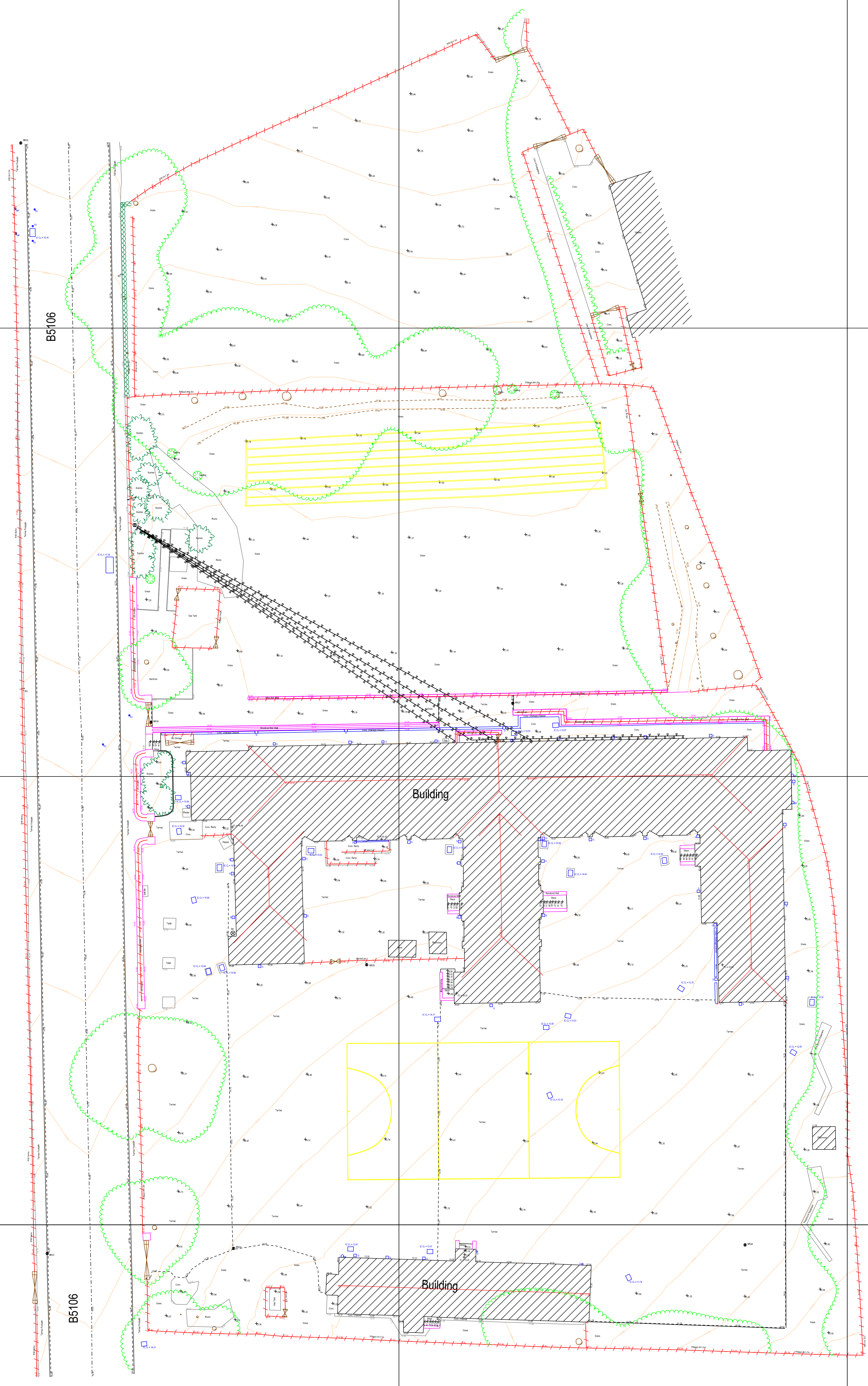
4.5 Proposed Development Plan

4.6 Greenfield Run-off Calculations

4.7 Indicative Drainage Layout

4.8 Typical Attenuation Volume

368100.000N
368050.000N
368000.000N
367950.000N
367900.000N



B5106

Building

Building

B5106

Point Features (Where Applicable)

- | | | |
|---------------------------------|------------------------|-------------------------|
| Water Meter | Electricity Pole | Gate |
| Gully | Telegraph Pole | Site |
| Fire Hydrant | Overhead Cable | Tree |
| Proping Eye | Down Main Anchor | Tree Stump |
| Earth Rod | Lamp Post | Tree Growth |
| Stop Valve | Letter Box | Undergrowth |
| Gas Valve | Spigot | Hedge |
| Air Valve | Seal | Permanent Ground Marker |
| Electricity Cabinet | Post | Non-Permanent Benchmark |
| Underground Service Marker Post | Road Sign | Spot Height |
| Telephone Cover | Post Box | Invert Level |
| Electric Cover | Reflective Hazard Post | Water Level |
| Inspection Cover (Circular) | Traffic Light | Water Level |
| Inspection Cover (Square) | Telephone Kiosk | |
| Inspection Cover (Rectangular) | Fence | |
| Inspection Cover (Triangular) | Safety Fence | |
| Pylon | Wall | |

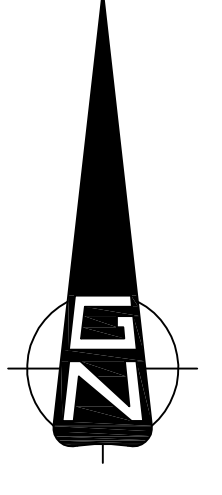
Additional Notes For Fencing

- | | |
|----------------|-----|
| Post and Wire | P/W |
| Post and Rail | P/R |
| Chainlink | C/L |
| Palisade | P/L |
| Close Boarded | C/B |
| Concrete Panel | C/P |
| Safety Fence | S/F |
-
- | | |
|-------------------------|------|
| Floor Level | FL |
| Damp Proof Course Level | DPC |
| SOFF Level | SOFF |
| Eaves Level | EL |
| Roof Level | RL |
| Threshold Level | THL |
| Sill Level | SL |

Notes

Station ID	Easting	Northing	Level	Type
NRG1	278910.77	367946.81	14.728	Road Nail
NRG2	278907.83	368070.85	19.890	Road Nail
NRG3	278931.58	367947.38	13.988	Road Nail
NRG4	278988.60	367947.76	11.286	Road Nail
NRG5	278946.40	367979.01	14.985	Road Nail
NRG6	278922.35	368006.05	16.711	Road Nail
NRG7	278962.69	368008.17	16.083	Road Nail

Local Scale Factor = 0.999789



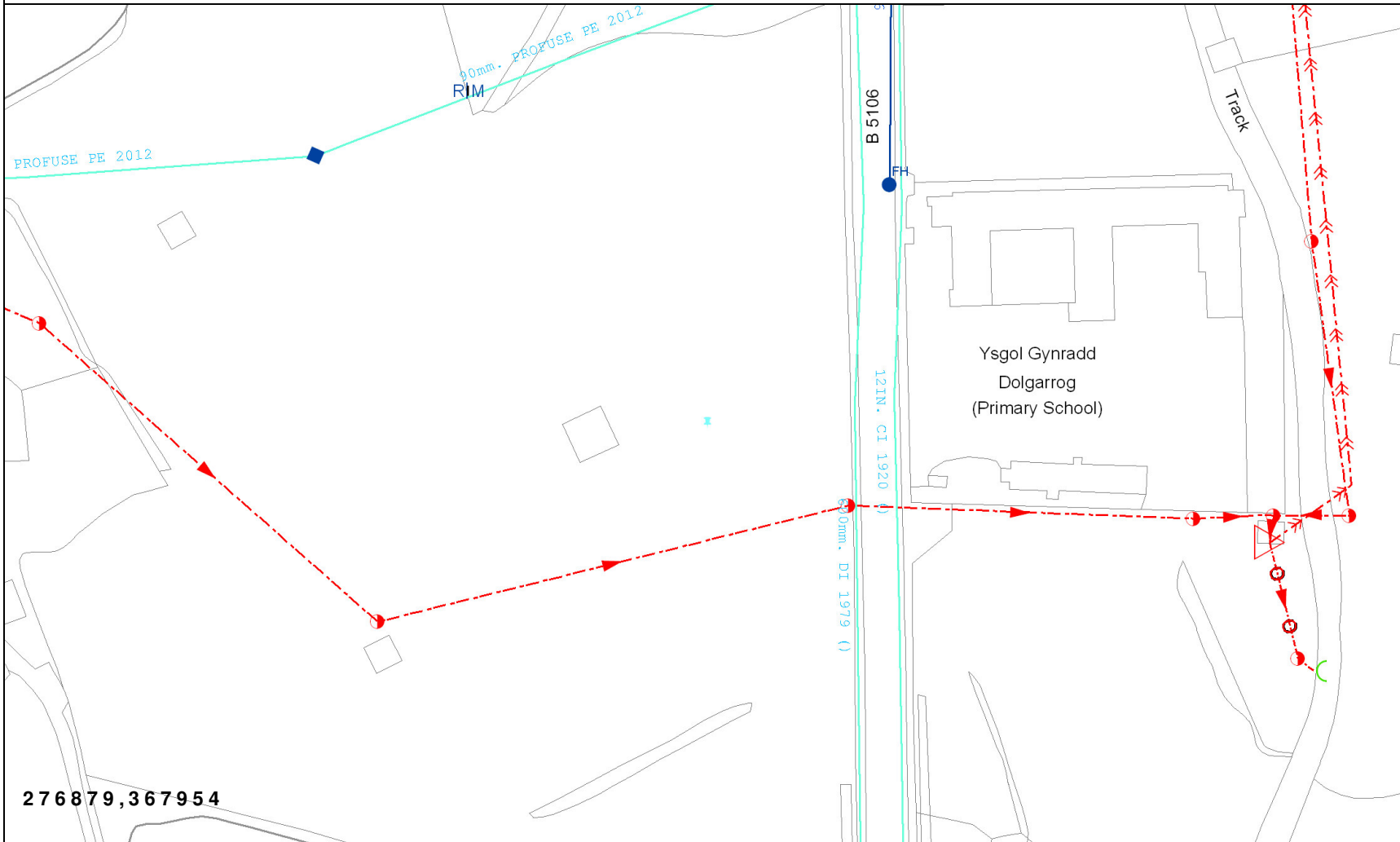
NRG NRG Engineering Services Ltd
 Castle View
 Station Road
 Llanfairfechan
 Conwy
 LL53 0AN
 Tel: 01248 681240
 email: nrg@nrgsurveys.co.uk
 www.nrgsurveys.co.uk

PROJECT		CLIENT	
Ysgol Gynradd Dolgarrog		Conwy County Borough Council	
TITLE			
Topographic Survey			
SCALE	DRAWN BY	CHECKED BY	APP'D
1:200@A0	DB LP	Newlyn	OSGB36
DATE	SHEET NO.	TITLE	DATE
1247/FP/01 : 01	DB LP	11/07/2016	

Caerhun Area School










Scale: 1:1250



LEGEND

Clean Water

-  Sluice Val
-  Air Val, SINGLE
-  Tap
-  Pressure Reducing Valve
-  Meter
-  BULK Meter
-  FH
-  Cap

-  Existing Main
-  NON COMPANY

Sewerage External

-  Foul
-  Surface Water
-  Combined
-  Rising Main
-  Private
-  Treatment Works
-  Pumping Station
-  Special Purpose
-  Unknown End
-  Change, Combined Overflow
-  Outfall, FOUL
-  Lamp Hole, Foul
-  Private Sewer Transfer
-  Lateral Drain
-  Inspection Chamber

276879,367954

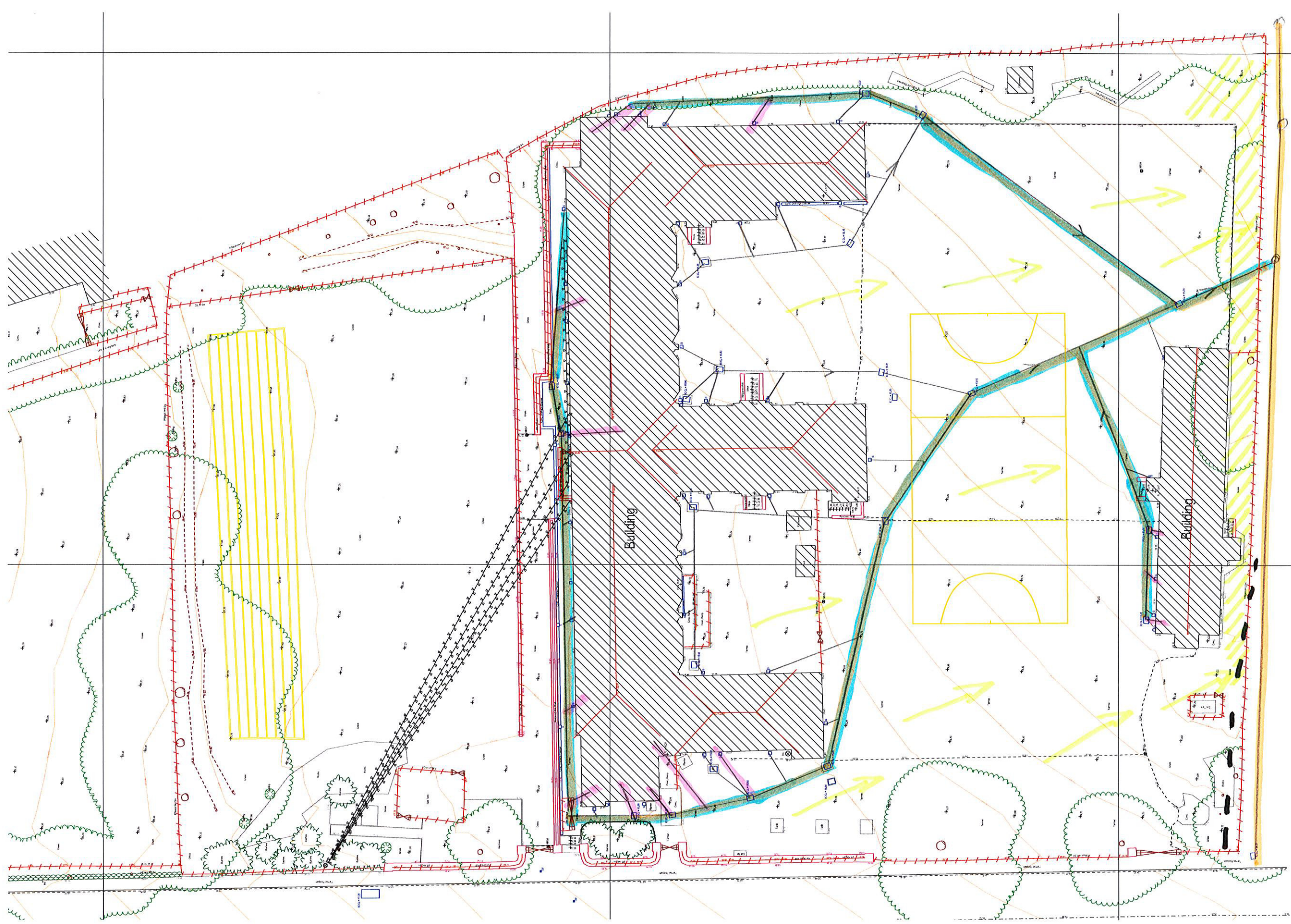
Dŵr Cymru Cyfyngedig ('the Company') gives this information as to the position of its underground apparatus by way of general guidance only and on the strict understanding that it is based on the best information available and no warranty as to its correctness is relied upon in the event of excavations or other works made in the vicinity of the Company's apparatus and any onus of locating the apparatus before carrying out any excavations rests entirely on you. The information which is supplied hereby by the Company, is done so in accordance with statutory requirements of sections 198 and 199 of the Water Industry Act 1991 based upon the best information available and in particular, but without prejudice to the generality of the foregoing, it should be noted that the records that are available to the Company may not disclose the existence of a drain sewer or disposal main laid before 1 September 1989, or if they do, the particulars thereof including their position underground may not be accurate. It must be understood that the furnishing of this information is entirely without prejudice to the provision of the New Roads and Street Works Act 1991 and the Company's right to be compensated for any damage to its apparatus.

EXACT LOCATION OF ALL APPARATUS TO BE DETERMINED ON SITE

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Whilst every reasonable effort has been taken to correctly record the pipe material of DCWW assets, there is a possibility that in some cases pipe material (other than Asbestos Cement or Pitch Fibre) may be found to be asbestos cement (AC) or Pitch Fibre (PF). It is therefore advisable that the possible presence of AC or PF pipes be anticipated and considered as part of any risk assessment prior to excavation.

DOLGARROG SCHOOL - DRAINAGE SURVEY UNDERTAKEN ON SITE ON 30/3/17 BETWEEN D WILKINSON (KTC) AND EMYR JONES (CARPENTER)











- COMBINED FOUL AND SURFACE WATER DRAINS
- SINKS AND WC'S FROM BUILDINGS
- SURFACE WATER GULLIES FROM ROOF
- ADOPTED WELSH WATER COMBINED SEWER
- DIRECTION OF SURFACE WATER FALLING ON TARMAC PLAYGROUND DISCHARGES TO PERIMETER GRASS
- ▨ PERIMETER GRASS WAS SOAKED WITH DISCHARGED WATER

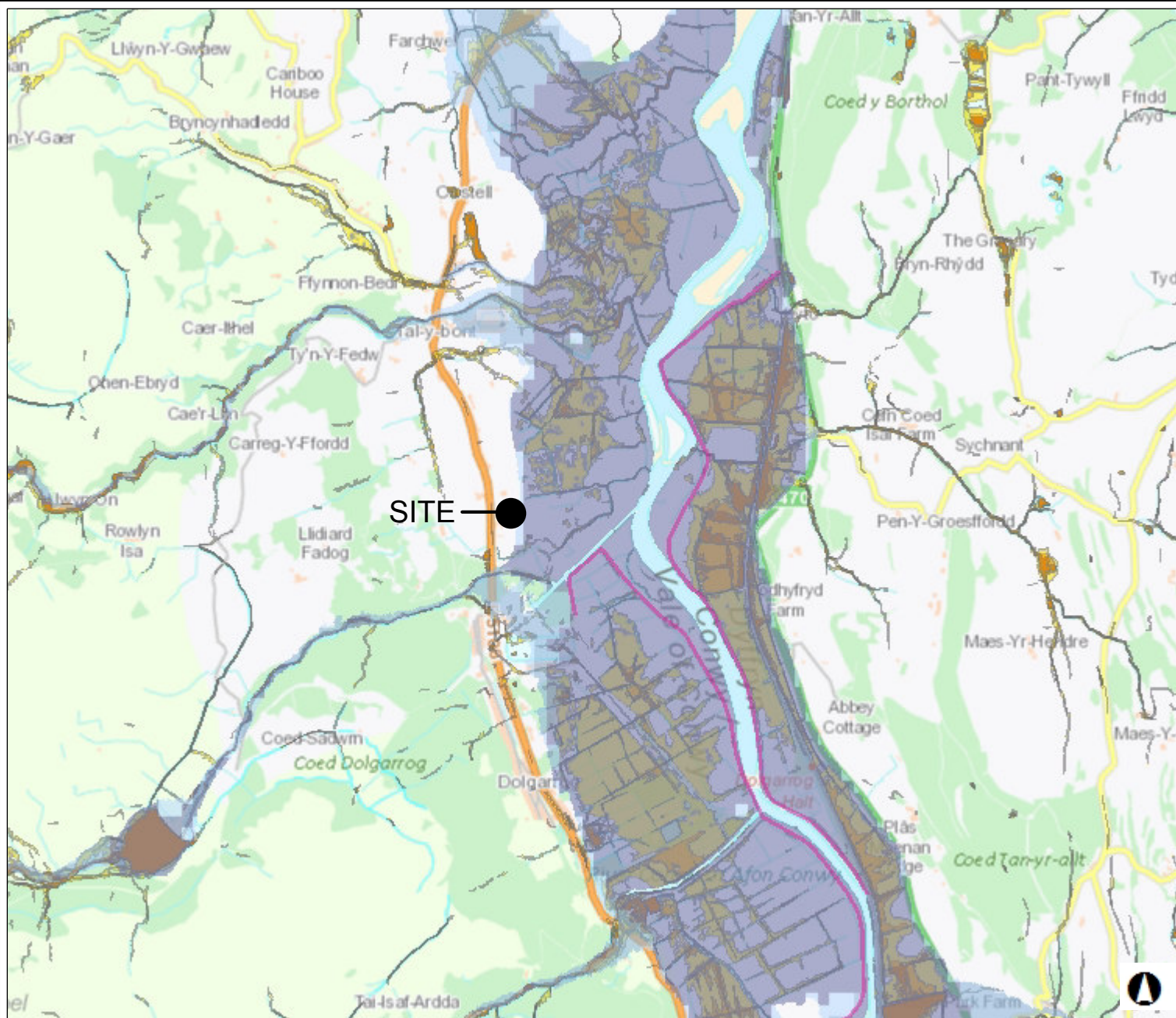
--- EMYR JONES CONFIRMED THIS AREA IS ALWAYS WET (EVEN IN SUMMER) AS IF AN UNDERGROUND SPRING RUNS ALONG THE BOUNDARY

Ys

Map Perygl Llifogydd / Flood Risk Map

Allwedd / Map Key

-  Flood Defences
- Risk of Flooding from Rivers & Sea
 -  High
 -  Medium
 -  Low
 -  Very Low
-  High Surface Water Flood Risk - Extent
-  Medium Surface Water Flood Risk - Extent
-  Low Surface Water Flood Risk - Extent

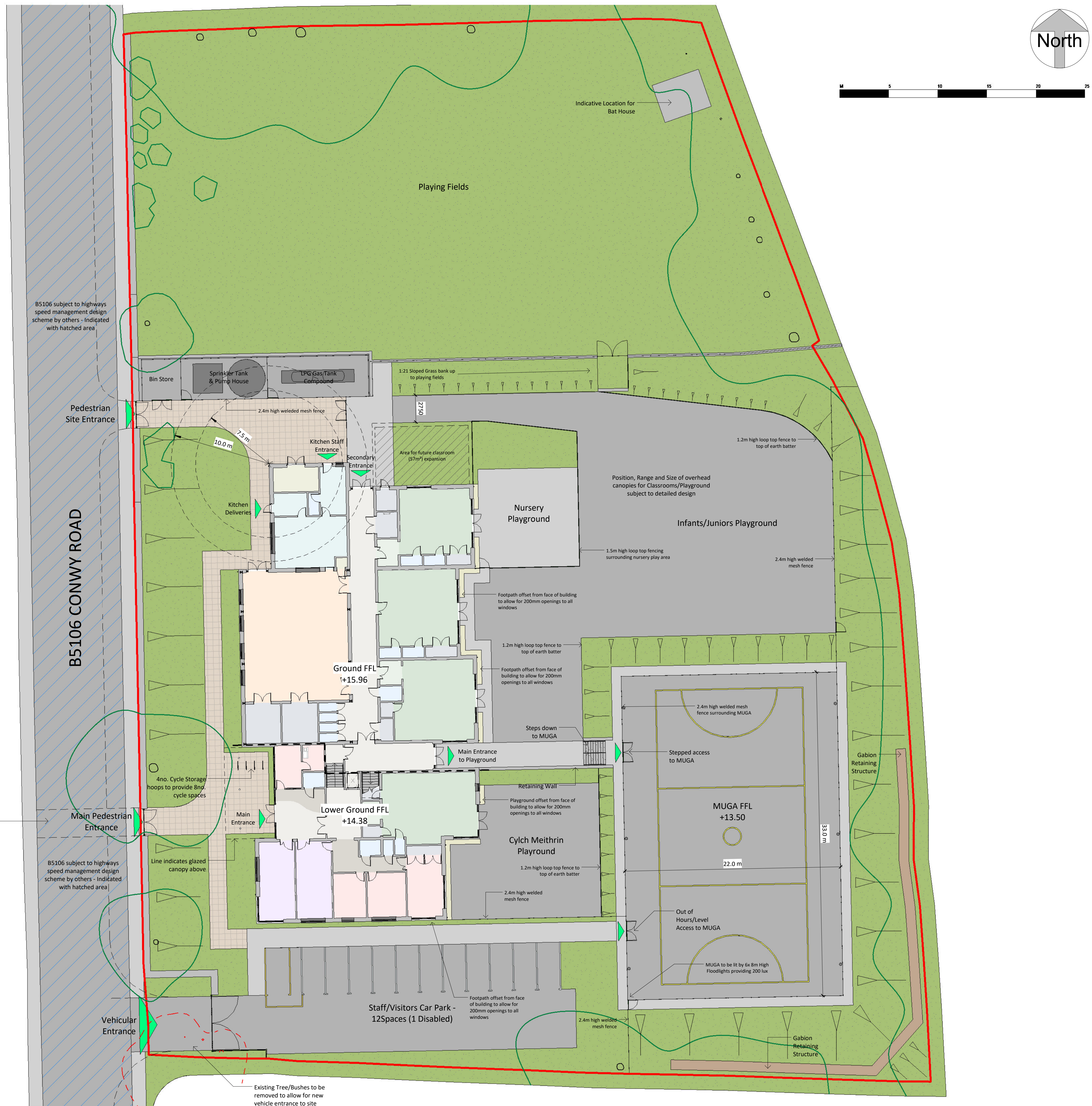


Graddfa / Scale 1: 25,000

Dyddiad / Date
11/04/2017



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- General Notes
1. Contractor to verify all dimensions and check level datums on site
 2. All of the designs are the sole property of TACP Architects Ltd and may not be used without their written agreement
 3. All prints, specifications and their copyright are the property of TACP Architects Ltd
 4. Do not scale off drawings
 5. All dimensions shall be checked on site before commencement of shop drawings, manufacture and all discrepancies must be reported to TACP Architects Ltd

Rev	Date	Description	By	Check
A	24-03-17	Issued for Final Approval	JH	MG

Consultants

Client
K&C Construction for Conwy County Council

Project Title
Ysgol Caerhun - Construction Phase

Drawing Title
Proposed Site Layout

Scale 1:200@A1 Date 08-03-17 Drawn by JH Checked by MG Office Wrexham

Job Number 16026 Drawing Number ST-01 Revision A

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FOR PRE-APPLICATION ONLY

Modulus House
Salterns Lane
Fareham PO16 0QS



Date 12/04/2017 16:14
File

Designed by rtgxt0
Checked by

XP Solutions Source Control 2015.2

ICP SUDS Mean Annual Flood

Input

Return Period (years) 1 Soil 0.500
Area (ha) 0.522 Urban 0.000
SAAR (mm) 2083 Region Number Region 9

Results 1/s

QBAR Rural 10.3
QBAR Urban 10.3

Q1 year 9.1

Q1 year 9.1
Q30 years 18.2
Q100 years 22.5



DRAINAGE NOTES:

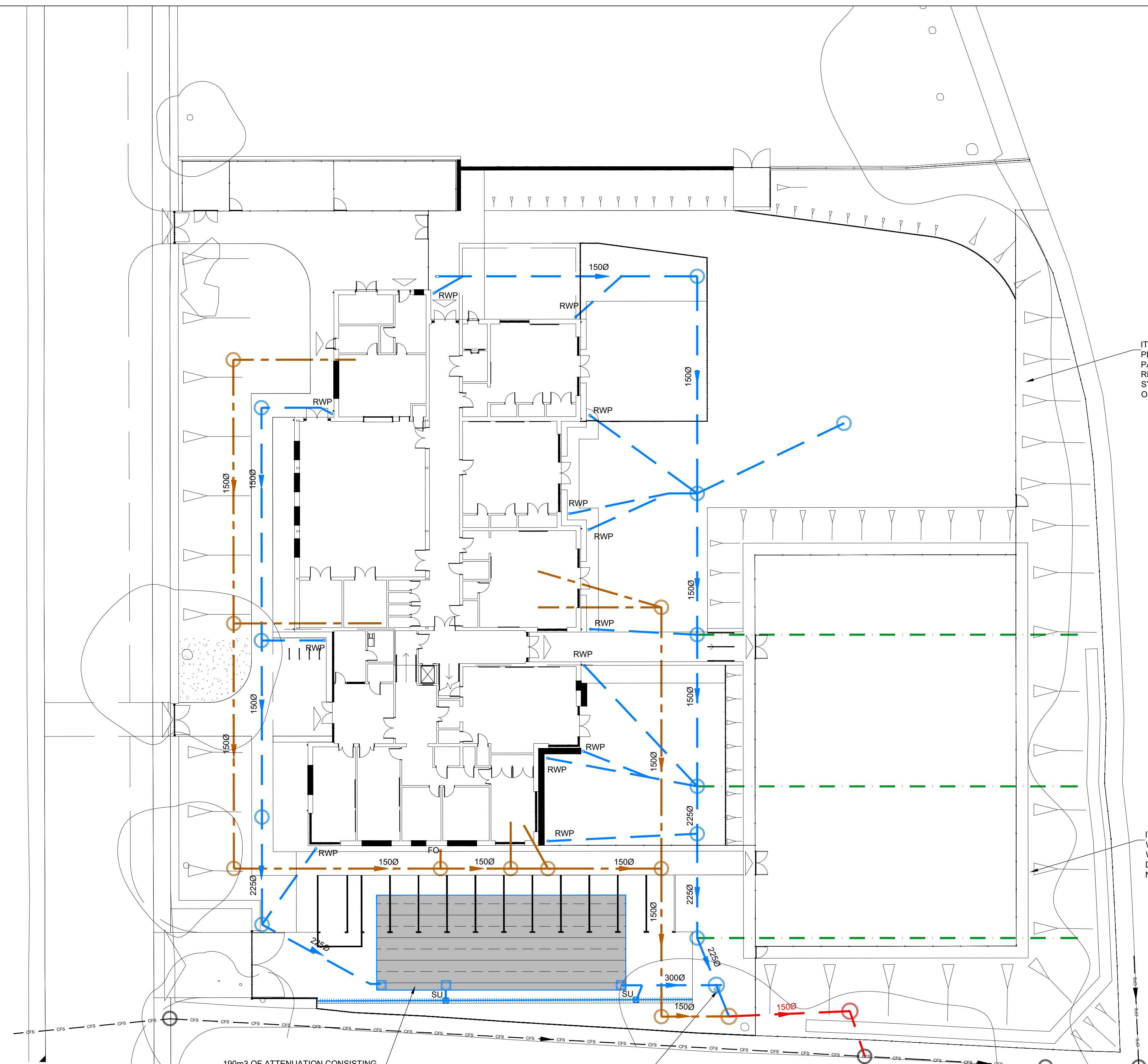
- ALL WORKS TO BE CONDUCTED IN STRICT ACCORDANCE WITH SPECIFICATION OF THE LOCAL AUTHORITY, BS8801 1985 & BSEN 752-1.
- ALL PIPE RUNS NEAR BUILDINGS TO COMPLY WITH THE BUILDING REGULATIONS 2002 PART H1. WHERE A PIPE IS WITHIN 1M OF A FOUNDATION THE TRENCH SHALL BE FILLED WITH CLASS GEN3 CONCRETE UP TO THE LOWEST LEVEL OF THE FOUNDATION. WHERE THE TRENCH IS FURTHER THAN 1M FROM THE FOUNDATION, THE TRENCH SHALL BE FILLED WITH CLASS GEN3 CONCRETE TO A LEVEL BELOW THE LOWEST LEVEL FOR THE FOUNDATION EQUAL TO THE DISTANCE FROM THE FOUNDATION LESS 150MM. IN BOTH CASES THE PIPE SHALL BE BEDDED AND SURROUNDED IN 150MM THICK CLASS GEN3 CONCRETE.
- WHERE PIPES, EXTERNAL TO THE STRUCTURES, HAVE A DEPTH TO SOFFIT FROM GROUND LEVEL OF LESS THAN 600MM THEY SHALL HAVE A CLASS GEN3 CONCRETE ENCASEMENT (150MM THICK).
- WHERE A PIPE, UNDER A CARRIAGEWAY, HAS A DEPTH OF COVER OF LESS THAN 1.2m THE PIPE SHALL BE LAID IN A CLASS 2 BEDDING.
- WHERE PIPES ARE BEDDED AND SURROUNDED IN CONCRETE, FLEXIBLE JOINTS SHOULD BE PROVIDED. COMPRESSIBLE BOARDS (FIBREBOARD OR POLYSTYRENE) SHALL BE PROVIDED AT A MAXIMUM OF 8M CENTRES (COINCIDING WITH PIPE JOINTS). THE BOARDS SHALL BE PRE-CUT TO PIPE DIAMETER AND TO A HEIGHT AND WIDTH EQUAL TO THE CONCRETE CROSS SECTION. A BOARD THICKNESS OF 18mm FOR PIPES UP TO 450MM NOMINAL DIAMETER AND 38mm FOR PIPES OVER 450MM NOMINAL DIAMETER.
- ALL PRIVATE BUILDING DRAINAGE SHALL BE CONSTRUCTED IN STRICT ACCORDANCE WITH BSEN.752-1.
- UNLESS OTHERWISE SPECIFIED, BUILDING DRAINAGE TO BE 100mm INTERNAL DIAMETER.
- MINIMUM GRADIENT FOR Ø100mm SURFACE DRAINAGE PIPES IS 1:60, AND Ø150mm IS 1:100.
- MINIMUM GRADIENTS FOR FOUL DRAINAGE PIPES:
 Ø100mm: 1:40 WHERE FLOW IS LESS THAN 1L/S, OR WHERE NO WCS ARE CONNECTED.
 Ø100mm: 1:78 WHERE FLOW IS 1L/S OR GREATER, OR WHERE AT LEAST 1NO. WCS IS CONNECTED.
 Ø150mm: 1:135 WHERE FLOW IS LESS THAN 5L/S, OR WHERE UP TO 5NO. WCS ARE CONNECTED.
 Ø150mm: 1:150 WHERE FLOW IS 5L/S OR GREATER, OR WHERE 5NO. OR MORE WCS ARE CONNECTED
- ALL GULLIES NOT CONNECTED TO INSPECTION CHAMBERS ARE TO BE RODDABLE.
- ALL GULLY CONNECTIONS OTHER THAN THOSE AT MANHOLES TO BE MADE VIA 'Y' JUNCTIONS.
- GULLIES COINCIDENT WITH PEDESTRIAN/DRIVE CROSSINGS TO HAVE PEDESTRIAN TYPE GULLY COVERS.
- ALL ROAD GULLY CONNECTIONS TO BE 150mm DIAMETER AND ANY GULLY CONNECTIONS SUBJECT TO TRAFFIC LOADING TO HAVE CLASS 2 BEDDING & SURROUND
- ALL STUB STACKS TO BE FITTED WITH AIR ADMITTANCE VALVES WHERE BRANCH DRAIN EXCEEDS 12m EXCEPT AT THE HEAD OF THE RUN. SOIL VENT PIPES LOCATED AT THE HEAD OF A RUN TO BE INSTALLED WITH ROOF TILE VENT.
- ALL CONNECTIONS TO BE MADE FROM SOFFIT TO SOFFIT UNLESS WERE NOTED OTHERWISE
- TRENCH TEMPORARY FORMWORK IS REQUIRED TO ALL EXCAVATIONS EXCEEDING 1.2m DEPTH TO PROVIDE ADEQUATE SUPPORT AND STABILITY AT ALL TIMES.
- SEWERS ARE TO BE CONSTRUCTED IN SINGLE SECTIONS BETWEEN MANHOLES ONLY. TRENCHES TO BE BACKFILLED PRIOR TO EXCAVATING THE SUCCEEDING SEWER RUN.
- ALL CONCRETE AND CONCRETE PRODUCTS TO BE IN ACCORDANCE WITH BRE 363 FOR SULPHATES.
- WHERE SEWER OR DRAINS ARE TO BE ABANDONED THEY SHALL BE REMOVED OR INFILLED BY GROUTING IN ACCORDANCE WITH THE CIVIL ENGINEER SPECIFICATION FOR THE WATER INDUSTRY 7TH EDITION, CLAUSE 5.23.
- EXTERNAL RAIN WATER PIPES TO HAVE ACCESS POINTS 1m ABOVE GROUND LEVEL. (REFER TO DETAIL WITHIN CONSTRUCTION DETAILS)

NEW CONNECTIONS TO PUBLIC SEWER

- IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO ENSURE THE SECTION 106 APPLICATION HAS BEEN APPROVED BY WELSH WATER AND 48HRS NOTICE HAS BEEN GIVEN PRIOR TO THE COMMENCEMENT OF WORKS.
- FLOWS MUST NOT BE DISCHARGED FROM SITE PRIOR TO WELSH WATER APPROVAL.
- IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO ENSURE THE RELEVANT STREETWORKS LICENCE IS APPROVED PRIOR TO THE COMMENCEMENT OF WORKS (WHERE APPLICABLE).

KEY

- CFS - EXISTING COMBINED FLOW SEWER
- PROPOSED FOUL SEWER
- PROPOSED COMBINED SEWER
- PROPOSED SW SEWER
- PROPOSED FILTER DRAIN
- PROPOSED ATTENUATION CRATES
- LINEAR DRAINAGE CHANNEL (SU - UNIVERSAL SUMP UNIT WITH AIR TRAP)
- FO - PROPOSED FOUL OUTLET
- IG - PROPOSED INTERNAL GULLY
- RWP - PROPOSED RAIN WATER DOWN PIPE
- RG - PROPOSED TRAPPED ROAD GULLY
- RE - RODDING EYE ACCESS POINT



IT HAS BEEN ASSUMED THAT THE SOFT PLAY AREA WILL BE A POROUS PAVEMENT SYSTEM WHICH WILL REQUIRE A LAND / FILTER DRAINAGE SYSTEM DUE TO THE CLAYEY NATURE OF THE SUBSTRATA

IT HAS BEEN ASSUMED THAT THE MUGA WILL BE A POROUS PAVEMENT SYSTEM WHICH WILL REQUIRE A LAND / FILTER DRAINAGE SYSTEM DUE TO THE CLAYEY NATURE OF THE SUBSTRATA

190m³ OF ATTENUATION CONSISTING OF AQUACELL CELLULAR BLOCKS - 8 UNITS x 21 UNITS X 3 UNIT (8m x 21m x 1.2m @ 95% VOID RATIO) TO CATER FOR THE CRITICAL 100 YEAR STORM EVENT + A 30% ALLOWANCE FOR CLIMATIC CHANGE

MANHOLE WITH FLOW CONTROL DEVICE TO LIMIT FORWARD FLOW TO 10.2 l/s @ 1.2m HEAD BASED ON RURAL Qbar CALCULATIONS

IT IS PROPOSED TO CONNECT THE FOUL AND SURFACE WATER DRAINAGE TO THE EXISTING ADJACENT COMBINED PUBLIC DRAINAGE SYSTEM. SUBJECT TO AGREEMENT WITH WELSH WATER

NOTE
 THE DRAINAGE STRATEGY AS DEPICTED IS SUBJECT TO APPROVAL WITH THE LOCAL STATUTORY UNDERTAKER AND SPECIFIC AGREEMENT WILL BE REQUIRED CONCERNING THE SURFACE WATER DISCHARGE RATE DEPICTED AND THE SUBSEQUENT ATTENUATION VOLUME.
 IT HAS ALSO BEEN ASSUMED AT THIS STAGE THAT THE SYSTEM CAN DRAIN BY GRAVITY AND AS SUCH THERE IS NO REQUIREMENT FOR PUMP STATIONS.

Revision	Amendment	Approved	Revision Date
A1	Updated to suit new layout	GT	24/04/2017



Drawn	Designed	Approved	Revision Date
RAH	RAH	LM	21/09/16

Project No. V-R6393.PP Scale 1:200

Project: PROPOSED YSGOL CAERHUN (FORMER YSGOL DOLGARROG)

Sheet: PRELIMINARY DRAINAGE PROPOSALS

Drawing No. SK Sheet No. 01 Revision A1

PRELIMINARY

Modulus House
Salterns Lane
Fareham PO16 0QS



Date 19-04-2017 16:18
File RH - INITIAL ATTEN.SRCX

Designed by rtjgr0
Checked by

XP Solutions Source Control 2015.2

Summary of Results for 100 year Return Period (+30%)

Half Drain Time : 163 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max E Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	12.478	0.478	0.0	10.1	10.1	76.3	O K
30 min Summer	12.665	0.665	0.0	10.1	10.1	106.1	O K
60 min Summer	12.852	0.852	0.0	10.1	10.1	135.9	O K
120 min Summer	12.990	0.990	0.0	10.1	10.1	158.0	O K
180 min Summer	13.030	1.030	0.0	10.2	10.2	164.4	O K
240 min Summer	13.038	1.038	0.0	10.3	10.3	165.6	O K
360 min Summer	13.024	1.024	0.0	10.2	10.2	163.5	O K
480 min Summer	12.996	0.996	0.0	10.1	10.1	159.0	O K
600 min Summer	12.962	0.962	0.0	10.1	10.1	153.5	O K
720 min Summer	12.924	0.924	0.0	10.1	10.1	147.4	O K
960 min Summer	12.843	0.843	0.0	10.1	10.1	134.5	O K
1440 min Summer	12.658	0.658	0.0	10.1	10.1	105.1	O K
2160 min Summer	12.403	0.403	0.0	10.1	10.1	64.3	O K
2880 min Summer	12.258	0.258	0.0	10.0	10.0	41.2	O K
4320 min Summer	12.154	0.154	0.0	9.1	9.1	24.6	O K
5760 min Summer	12.128	0.128	0.0	7.5	7.5	20.4	O K
7200 min Summer	12.113	0.113	0.0	6.4	6.4	18.1	O K
8640 min Summer	12.104	0.104	0.0	5.6	5.6	16.5	O K
10080 min Summer	12.097	0.097	0.0	5.0	5.0	15.4	O K
15 min Winter	12.541	0.541	0.0	10.1	10.1	86.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	93.473	0.0	84.0	21
30 min Summer	66.241	0.0	119.3	35
60 min Summer	44.962	0.0	162.3	64
120 min Summer	29.503	0.0	213.1	120
180 min Summer	22.662	0.0	245.5	150
240 min Summer	18.611	0.0	268.9	182
360 min Summer	14.043	0.0	304.3	250
480 min Summer	11.489	0.0	332.0	320
600 min Summer	9.820	0.0	354.7	390
720 min Summer	8.632	0.0	374.2	460
960 min Summer	7.032	0.0	406.4	598
1440 min Summer	5.252	0.0	455.3	866
2160 min Summer	3.910	0.0	508.6	1196
2880 min Summer	3.164	0.0	548.8	1532
4320 min Summer	2.347	0.0	610.6	2204
5760 min Summer	1.902	0.0	659.8	2936
7200 min Summer	1.616	0.0	700.8	3672
8640 min Summer	1.415	0.0	736.5	4400
10080 min Summer	1.266	0.0	768.4	5128
15 min Winter	93.473	0.0	94.2	21

Modulus House
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Summary of Results for 100 year Return Period (+30%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m ³)	Status
30 min Winter	12.753	0.753	0.0	10.1	10.1	120.3	O K
60 min Winter	12.967	0.967	0.0	10.1	10.1	154.4	O K
120 min Winter	13.139	1.139	0.0	10.7	10.7	181.8	O K
180 min Winter	13.183	1.183	0.0	10.9	10.9	188.9	O K
240 min Winter	13.189	1.189	0.0	10.9	10.9	189.8	O K
360 min Winter	13.163	1.163	0.0	10.8	10.8	185.7	O K
480 min Winter	13.114	1.114	0.0	10.6	10.6	177.8	O K
600 min Winter	13.054	1.054	0.0	10.3	10.3	168.3	O K
720 min Winter	12.991	0.991	0.0	10.1	10.1	158.2	O K
960 min Winter	12.860	0.860	0.0	10.1	10.1	137.2	O K
1440 min Winter	12.538	0.538	0.0	10.1	10.1	85.9	O K
2160 min Winter	12.236	0.236	0.0	10.0	10.0	37.6	O K
2880 min Winter	12.151	0.151	0.0	8.9	8.9	24.1	O K
4320 min Winter	12.117	0.117	0.0	6.7	6.7	18.7	O K
5760 min Winter	12.102	0.102	0.0	5.4	5.4	16.2	O K
7200 min Winter	12.092	0.092	0.0	4.6	4.6	14.6	O K
8640 min Winter	12.085	0.085	0.0	4.0	4.0	13.5	O K
10080 min Winter	12.079	0.079	0.0	3.6	3.6	12.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
30 min Winter	66.241	0.0	133.6	35
60 min Winter	44.962	0.0	181.8	62
120 min Winter	29.503	0.0	238.7	118
180 min Winter	22.662	0.0	275.0	168
240 min Winter	18.611	0.0	301.2	192
360 min Winter	14.043	0.0	340.9	270
480 min Winter	11.489	0.0	371.9	346
600 min Winter	9.820	0.0	397.3	422
720 min Winter	8.632	0.0	419.1	496
960 min Winter	7.032	0.0	455.2	644
1440 min Winter	5.252	0.0	510.0	898
2160 min Winter	3.910	0.0	569.7	1192
2880 min Winter	3.164	0.0	614.7	1476
4320 min Winter	2.347	0.0	683.9	2204
5760 min Winter	1.902	0.0	739.0	2920
7200 min Winter	1.616	0.0	784.9	3616
8640 min Winter	1.415	0.0	824.9	4320
10080 min Winter	1.266	0.0	860.7	5064

Opus International Consultants (UK) Ltd		Page 3
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Model Details

Storage is Online Cover Level (m) 13.500

Cellular Storage Structure

Invert Level (m) 12.000 Safety Factor 2.0
 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
 Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	168.0	0.0	1.201	0.0	0.0
1.200	168.0	0.0			

Hydro-Brake Optimum® Outflow Control

Unit Reference MD-SHE-0146-1010-1000-1010
 Design Head (m) 1.000
 Design Flow (l/s) 10.1
 Flush-Flo™ Calculated
 Objective Minimise upstream storage
 Diameter (mm) 146
 Invert Level (m) 12.000
 Minimum Outlet Pipe Diameter (mm) 225
 Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	10.1
Flush-Flo™	0.304	10.1
Kick-Flo®	0.674	8.4
Mean Flow over Head Range	-	8.6

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	5.3	1.200	11.0	3.000	17.0	7.000	25.5
0.200	9.8	1.400	11.8	3.500	18.3	7.500	26.3
0.300	10.1	1.600	12.6	4.000	19.5	8.000	27.2
0.400	9.9	1.800	13.3	4.500	20.6	8.500	28.0
0.500	9.7	2.000	14.0	5.000	21.7	9.000	28.8
0.600	9.2	2.200	14.6	5.500	22.7	9.500	29.5
0.800	9.1	2.400	15.3	6.000	23.7		
1.000	10.1	2.600	15.9	6.500	24.6		



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