

Report No: C0615	Date: December 2015
Project: Surface Water Drainage Strategy Report New Unit – ATT Engineering,	
Client: ATT Engineering	

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Signature:



Report status: **FINAL**

Approved for issue: **Graeme Tulip**
BEng(Hons), CEng, MICE

Signature:



Date: **10th Dec 2015**

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Issue History

Date	Revision	Revision Notes
10.12.2015	-	1 st Issue

INDEX

- 1.0 Introduction**
- 2.0 The Site**
- 3.0 Existing Drainage**
- 4.0 Future Site Drainage**
- 5.0 Summary**

Appendices

- A Topographic Survey**
- B DCWW Record Plan**
- C Public Sewer Record Map**
- D Soil Infiltration Test Report**
- E Proposed Development Layout**
- F Drainage Plan: Proposed Site**
- G Microdrainage Storage Calculations**

1.0 Introduction

1.1 Brief and Objectives

The drainage strategy report has been prepared to support a planning application for a new industrial unit at land located adjacent to Hunt's Bakery and the Tennant Canal, Neath Abbey Business Park, Neath (Planning ref. no. 2015/0631).

The main objectives of this Report are:

- To undertake an assessment of the drainage infrastructure available to the site
- To review drainage related consultation responses received to date
- To identify any constraints which will need to inform the design process
- To develop an appropriate strategy for surface water drainage disposal for the future site which addresses the issues raised during consultation and is in line with TAN15 and other relevant requirements and best practice.

1.2 Limitations

This drainage appraisal report is prepared for the purposes of supporting a planning application only and should not be used for any other purpose.

The information, views and conclusions drawn concerning the site are based, in part, on information supplied to CB3 Consult Ltd by other parties. CB3 Consult Ltd has proceeded in good faith on the assumption that this information is accurate. CB3 Consult Ltd accepts no liability for any inaccurate conclusions, assumptions or actions taken resulting from any inaccurate information supplied to CB3 Consult Ltd from others.

2.0 The Site

2.1 General Description

The site is a vacant area of land to the rear of an existing industrial unit adjacent to the Tennant canal, at the Neath Abbey Business Park, Neath. A site location plan is shown in Figure 1. An aerial photograph of the current site is shown in Figure 2. The site is relatively flat with no evidence of any positive drainage systems serving the existing site, with the exception of a land drain along the eastern boundary of the site indicated by Council records. A topographical survey of the site is included in Appendix A.

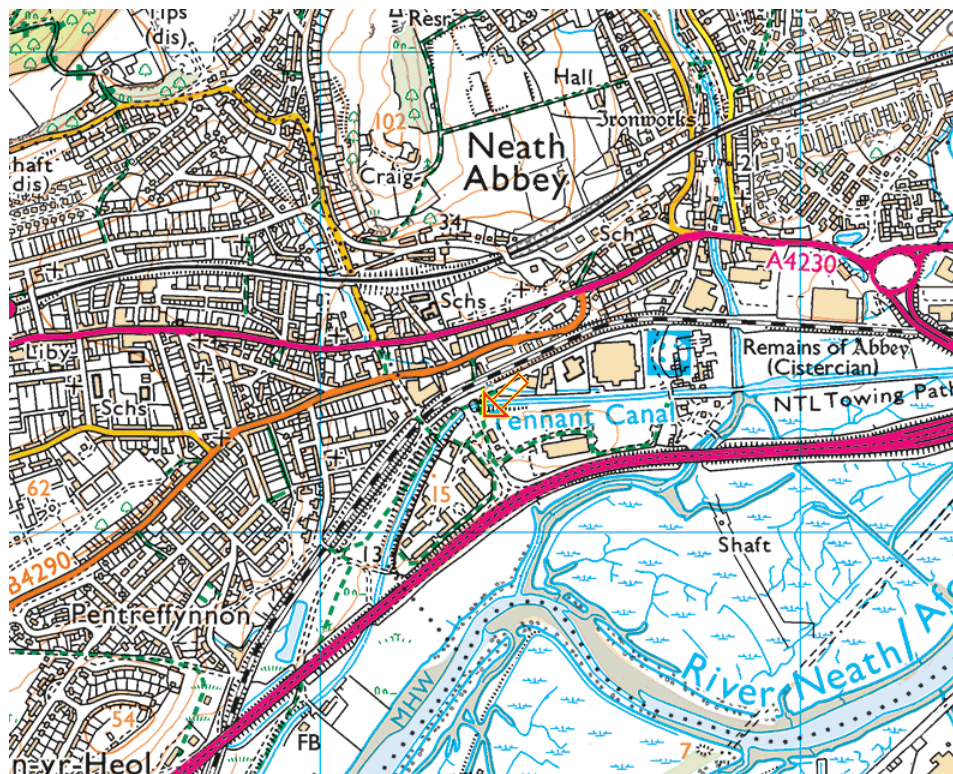


Figure 1: Site Location Plan

- 2.2 From 1876 up to the early 1940's the site was part of an open area and used as a passageway/track way to neighbouring industrial and commercial lands. To the south for the best part of this period resided Mines Royal Works (Copper Works) and to the north Main Colliery (on the northern side of the Tennant Canal). However, from the 1940's until the 1980's the neighbouring lands to the east were predominantly used as a 'tipping ground' for unknown waste, possibly domestic and a mix of locally derived colliery waste. The historical plans indicate that this tipping ground encroached into the eastern half of the site with ground features indication a levelling of the lands by the late 1980's just as Neath Abbey Business Park had been established and was in the midst of expansion with a new commercial unit constructed immediately south of the site. No building structures appear to have been built onsite in the past.

- 2.3 A topographical survey of the site undertaken in March 2015 is included in Appendix A. This shows that the site is generally flat, but does display sporadic mounded features and slightly hummocky nature indicating the possibility that these undulations in the ground profile could possibly be man-made.



Figure 2: Aerial View of Site

- 2.4 There site is generally an overgrown woodland, consisting of a mixture of trees, brambles and Japanese knotweed.
- 2.5 Site Hydrology and Hydrogeology
The closest water course is the Tennant Canal some 10-15m north of the site aligned east-west, with the River Clydach and River Neath to the south at respective distances of approximately 210m and 350m.
- 2.6 The Environment Agency website 'What's in your backyard?' shows the site to be underlain by both an Unproductive aquifer and a Secondary aquifer within the superficial deposits whilst the underlying bedrock has been identified as a Secondary A aquifer.

- 2.7 There are no Groundwater, Surface Water or Potable Water Abstraction Licenses within 2000m of the site. There are no Source Protection Zones within 500m of the site.
- 2.8 The Groundsure Report within the Desk Study states that the risk of flooding at the centre of the site is very low with the highest risk of flooding within 25m of the centre of the study site being low.

2.9 Flood Risk

According to the Welsh Government's TAN15 Development Advice Map, included as Figure 3, the Site is not located in an area of fluvial or tidal flooding.



Figure 3: Welsh Government TAN15 Development Advice Map

- 2.10 According to the Environment Agency's online surface water flooding maps, the risk of flooding from surface water at the site is considered to be very low. This is borne out by the sloping site topography.

3.0 Existing Drainage

- 3.1 There are no existing foul flows generated by this vacant brownfield site.
- 3.2 The sewerage undertaker (DCWW) public sewer record for the area indicates that there are no public sewers shown within the site curtilage. DCWW Sewer Record plan attached in Appendix B.
- 3.3 There is no evidence of an existing Surface Water system currently serving the site, and the existing topography suggests a naturally flat site with no predominant slope direction, although there are localised undulations due to tipping.
- 3.4 From local authority records (Appendix C), a surface water drainage system in the form of a 'french drain' is shown running along the site boundary adjacent to the unadopted highway bisecting the business park. There is one gully shown on this plan to the south west of the site, and it appears that the 'french drain' serves the highway drainage and heads in a southerly direction, outfall details are currently unknown. A site walkover revealed that there are other gully's serving the highway that are not included on this plan. This could suggest the possibility of the presence of an uncharted Surface Water drain in the road. The road adjacent to the site is unadopted and ownership of assets is currently uncertain.
- 3.5 A soil infiltration test report with associated plan is included in Appendix D. The tests carried out give unfavourable results for filtration. The results may be extrapolated to yield a positive (albeit low) permeability rate, or else further testing with a longer period, would be advised to obtain more accurate results.

4.0 Future Site Drainage

- 4.1 The architect's proposed development layout is included in Appendix D. The development comprises a single industrial unit with office space and associated parking facilities.

4.2 Consultation Comments to Date

Dwr Cymru Welsh Water

- No comments to date.

Natural Resources Wales –

- NRW have confirmed that the site is outside of the floodplain.

Neath Port Talbot County Borough Council

- No objection in principle subject to:
- Full drainage strategy required for the application site. This information should provide evidence of method of disposal of Surface Water when the site is completed. The strategy is to include calculations, pipe sizes, gradients, discharge points/locations, headwalls (if required), manholes etc. for assessment and approval.
- A means of temporarily disposing of ground and surface water during construction (can be conditioned as part of Construction Method Statement).
- Does the applicant wish to use a SUDS scheme to dispose of Surface Water.

4.3 Surface Water Drainage

The primary objective of any surface water drainage strategy is to mimic the drainage characteristics of the existing site as far as practicable in the future development.

The proposed surface water system and associated flows should discharge by one of the following mechanisms, shown below in order of preference;

- Infiltration / soakaways on site
- Discharge to the nearest watercourse or land drainage culvert
- Discharge to the nearest surface water sewer or highway drain

- 4.4 There is no evidence of existing positive drainage systems on site and as such given the relatively flat, vegetated and overgrown site conditions, rainfall will dissipate into the soft ground where it falls and also drain to the French drain along the eastern boundary of the site.

- 4.5 A 'Suds' (i.e. sustainable drainage) system should by design, reflect this existing regime as far as practicable in the proposed site drainage arrangements. In practice this means collection of roof and hard paved surface drainage and piping to an infiltration source(s) on site, or else connecting to an existing receiver at an agreed maximum flow-rate to reflect pre-development conditions.
- 4.6 Given the fact that two of three percolation tests did display a drop in water level over the limited 1-hour test window, it is considered that a shallow infiltration solution is the appropriate preferred strategy for surface water disposal at this site.
- 4.7 This will be implemented by the specification of porous surfacing products to all external areas, e.g. porous blockwork or other permeable surface treatments to footpaths / parking bays. All porous surfaces will be underlain by permeable sub-base material to allow infiltration at source into the underlying ground as per the existing arrangements.
- 4.8 Proposed drainage plan is included in Appendix F outlining the disposal strategy described above.
- 4.9 Roof downpipes from the residential block will discharge via below-ground pipework into the permeable sub-base underlying the external areas. Proprietary dispersal boxes wrapped in geotextile will ensure satisfactory distribution of flows.
- 4.10 The Microdrainage calculations provided in Appendix G demonstrate that 100-year design flows with a 30% climate change allowance are drained with an allowable overall sub-base thickness of 425mm. The soil infiltration rate assumed for the purposes of these calculations was 1.5×10^{-6} m/s, which we consider a realistic interpretation of the limited testing undertaken to date.
- 4.11 The next option 'Option 2' is disposal to the existing 'french drain' indicated on NPTCBC.records. A connection would be proposed to this 'french drain' at an attenuated rate.
- 4.12 In the event that Option 2 is not viable, a third option would be to navigate a discharge to the Tennant Canal at an attenuated rate.
- 4.13 Appendix F includes hydraulic sizing calculations and accompanying impermeable area plan for the preferred permeable surface/sub-base option.

5.0 Summary

- 5.1 Previous soakaway testing has provided inconclusive results. However given 2 of 3 test pits displayed a drop in water level over a 1hr time window, we consider that the shallow infiltration method of surface water disposal as presented in this report is appropriate at this site.
- 5.2 Should the proposed method of surface water disposal prove unviable, it is suggested that as an alternative, in the first instance, a connection with an attenuated rate be made to the existing 'french drain' currently serving the highway drainage. Should this also prove unviable, then a discharge to the nearby Tennant Canal be made, again at an attenuated rate.
- 5.3 Roof downpipes from the industrial unit will discharge via below-ground pipework into the permeable sub-base underlying the external areas.

Appendix A

Topographic Survey



Station coordinates			
Station	Easting	Northing	Level
1	273328.927	197236.102	10.923
2	273268.796	197276.664	11.354
3	273343.706	197155.863	9.476
4	273348.625	197296.635	11.740
5	273347.864	197234.925	13.280
6	273343.528	197244.202	11.826
GPS1	273322.467	197234.547	11.141

ABBREVIATIONS	
AV	Air valve
B	Bollard
BB	Bellina beacon
BH	Bore hole
BW	Site bench mark
BT	British Telecom
B/W	Barbed wire fence
CAM	Camera
CB	Cable box
CDP	Cable draw pit
CL	Cover level
Conc	Concrete
C/B	Corrugated fence
CP	Down pipe
DK	Drop kerb
EIC	Electric inspection cover
EL	Eaves level
EP	Electricity pole
ER	Earthing rod
FL	Floor level
PH	Fire hydrant
FP	Flag pole
G	Gully
G1.2	Tree girth (m)
GV	Gas valve
IC	Inspection cover
IL	Invert Level
I/R	Iron Rollings
JB	Junction box
KD	Kerb outlet
LB	Letter box
LP	Lamp post
Mkr	Utility marker
MP	Mile post
OSBM	Ordinance Survey bench mark
O/B	Open board fence
P	Post
PS	Rowing
P/R	Post/rail fence
P/W	Post/wire fence
RE	Reading eye
RW	Reinforcing wall
RS	Road Sign
SAP	Sapping
SC	Stop Cock
SE	Services entry point
SL	Step Level
SOF	Soffit level
SP	Sign Post
SV	Stop Valve
TAC	Tactile Paving
TH	Trial Hole
T.D.W	Top of Wall
TP	Telegraph Pole
TS	Traffic signal
TSC	Traffic signal cover
TV	Cable television
UTL	Unable To Lift
VP	Vent Pipe
WL	Water Level
WM	Water Meter
WS	Survey station
#	Pipe Diameter(m)
LINE TYPES	
Building	—
Kerbs, Walls	—
Fences	—
Iron rollings	—
Top of banks	-----
Bottom of banks	-----
Hedges	-----
Overhead Wires	—
Change of surface	—

Survey Details	
1.	OS grid & datum derived from GPS.
2.	North arrow indicates approximate North.
3.	Scale factor 1.00000000
4.	Contour interval 0.50m
5.	Individual trees not shown in woodland.

A	AC	05/02/15	Survey extended north to canal.
Rev.	By	Date	Description of update

Sheet Layout	
One Sheet Only	

Scale:	1:220 at A1	CLS Job No.	14-529
Drawing No.	14-501/250A1/1.1	Surveyor:	Adrian Catling
Date:	March 2015	Checked:	Adrian Catling

CLIENT	
ATT Engineering Ltd	

Land adjacent to Hunts Bakery
Neath Abbey Industrial Estate

Topographic Survey

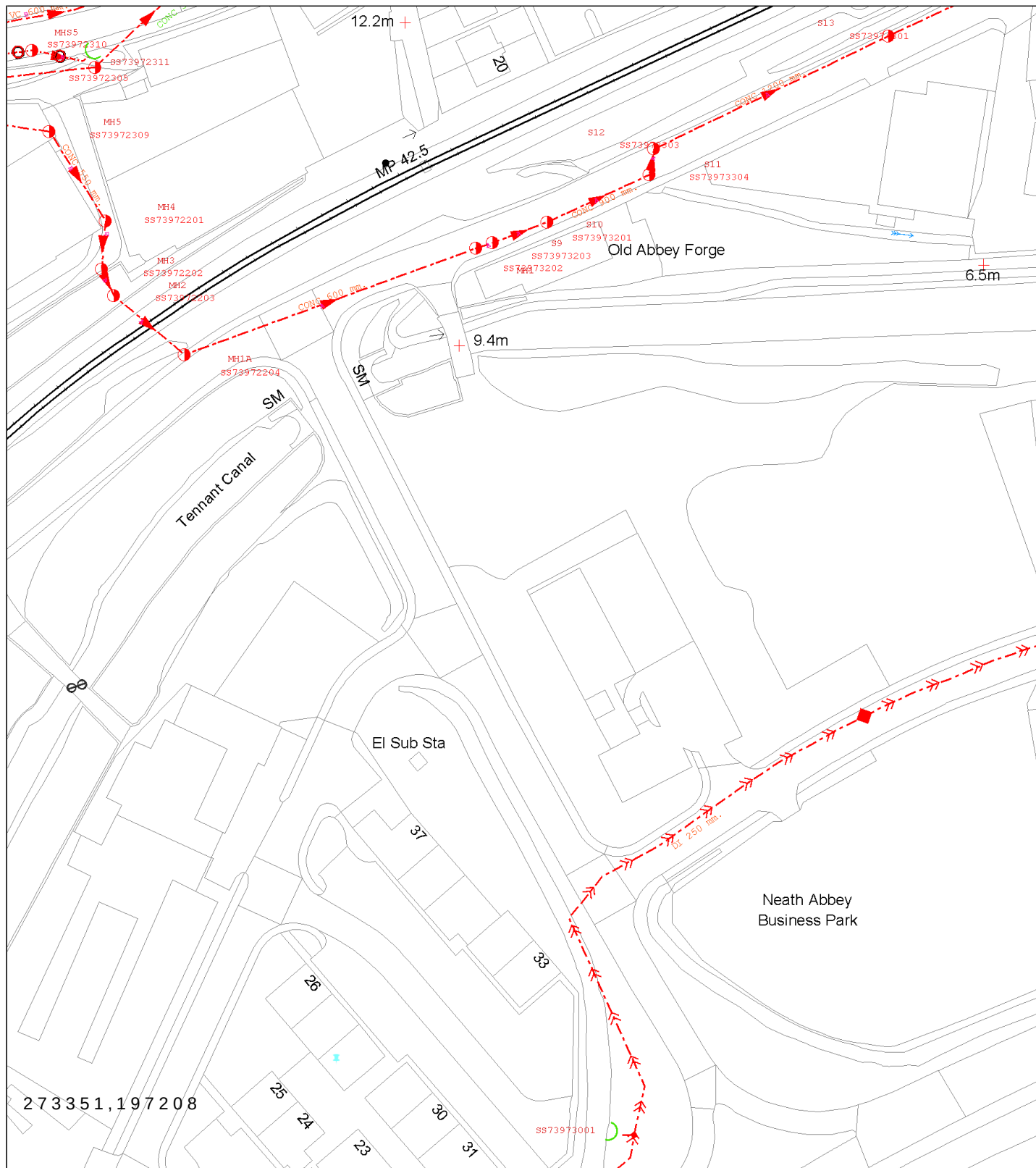


Catling's Land Surveys
A Passion for Mapping.

47 Heol Las, Ynysmeudwy, Porttardawe, Swansea, SA8 4PR
Tel / Mobile 07780 586323
email: adrian@catlingslandsurveys.co.uk

Appendix B

DCWW Record Plan



LEGEND



- | | | | |
|--|----------------------------|--|-------------------------|
| | Sluice Valve | | Gravity Sewer |
| | Air Valve SINGLE | | Rising Main |
| | Tap | | Outfall |
| | Pressure Reducing Valve | | Pumping Station |
| | Meter | | Lamphole |
| | Bulk Meter | | Combined Sewer Overflow |
| | Fire Hydrant | | Special Purpose Chamber |
| | Cap | | Treatment Works |
| | Non Dwr Cymru | | Private Sewer Transfer |
| | Existing Distribution Main | | Lateral Drain |
| | Inspection Chamber | | |
- NB: Sewer symbol colour indicates the sewer type.
 RED- Combined
 GREEN- Surface Water
 BROWN- Foul

Scale: 1:1250
17/11/2015

**EXACT
LOCATION OF
ALL APPARATUS
TO BE
DETERMINED ON
SITE**

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.

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 1999, 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.

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Appendix C

Public Sewer Record Map

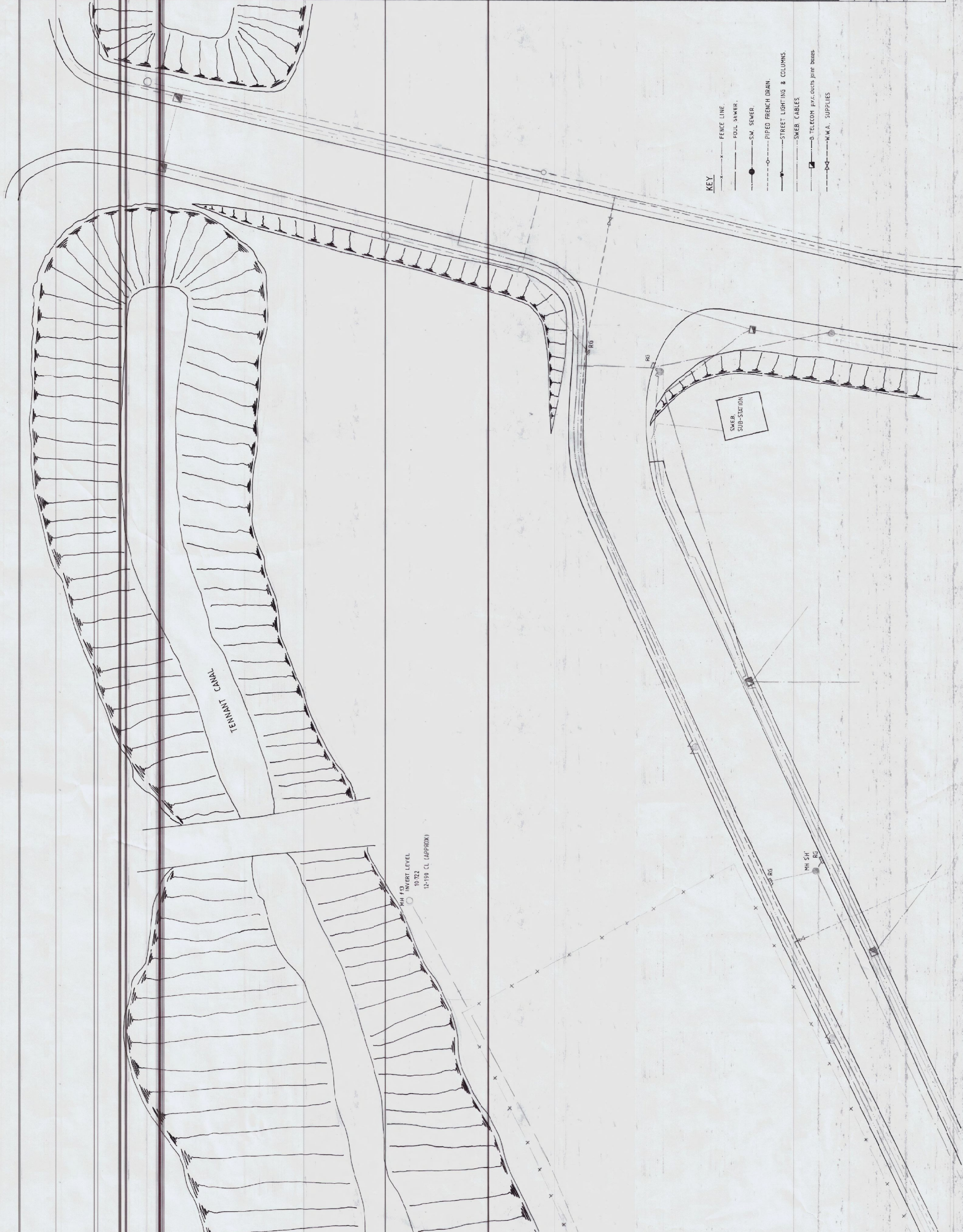
K.TAYLOR C.Eng., M.I.C.E., M.I.H.T.
DIRECTOR OF ENGINEERING AND OPERATIONS
NEATH BOROUGH COUNCIL
Cyngor Bwrdeisdref Castellnedd
Tregelles Court, Neath Abbey, West Glamorgan.
Telephone Neath 641127

NEATH ABBEY INDUSTRIAL ESTATE
PLAN OF EXISTING SERVICES.

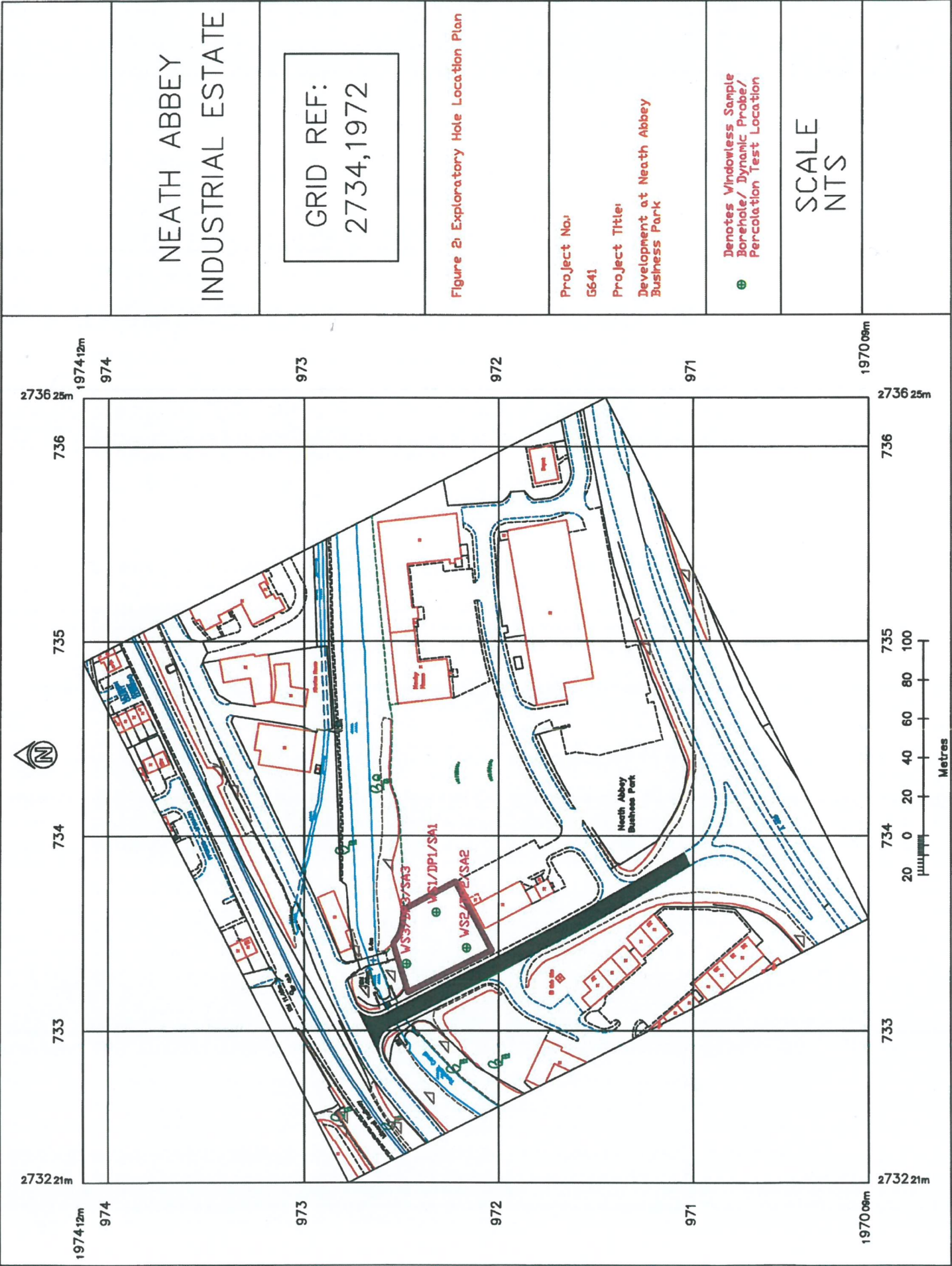
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Traced
Scale **1:200**
Date **19 July 1990**
Drawing No.
E 1029/12

The written dimensions, where shown, shall be preferred to the scale dimensions.

- KEY**
- x — FENCE LINE.
 - — — FOUL SEWER.
 - — — SW. SEWER.
 - — — PIPED FRENCH DRAIN.
 - — — STREET LIGHTING & COLUMNS.
 - — — SWEB. CABLES.
 - — — TELECOM PVC ducts joint boxes.
 - — — W.W.A. SUPPLIES.

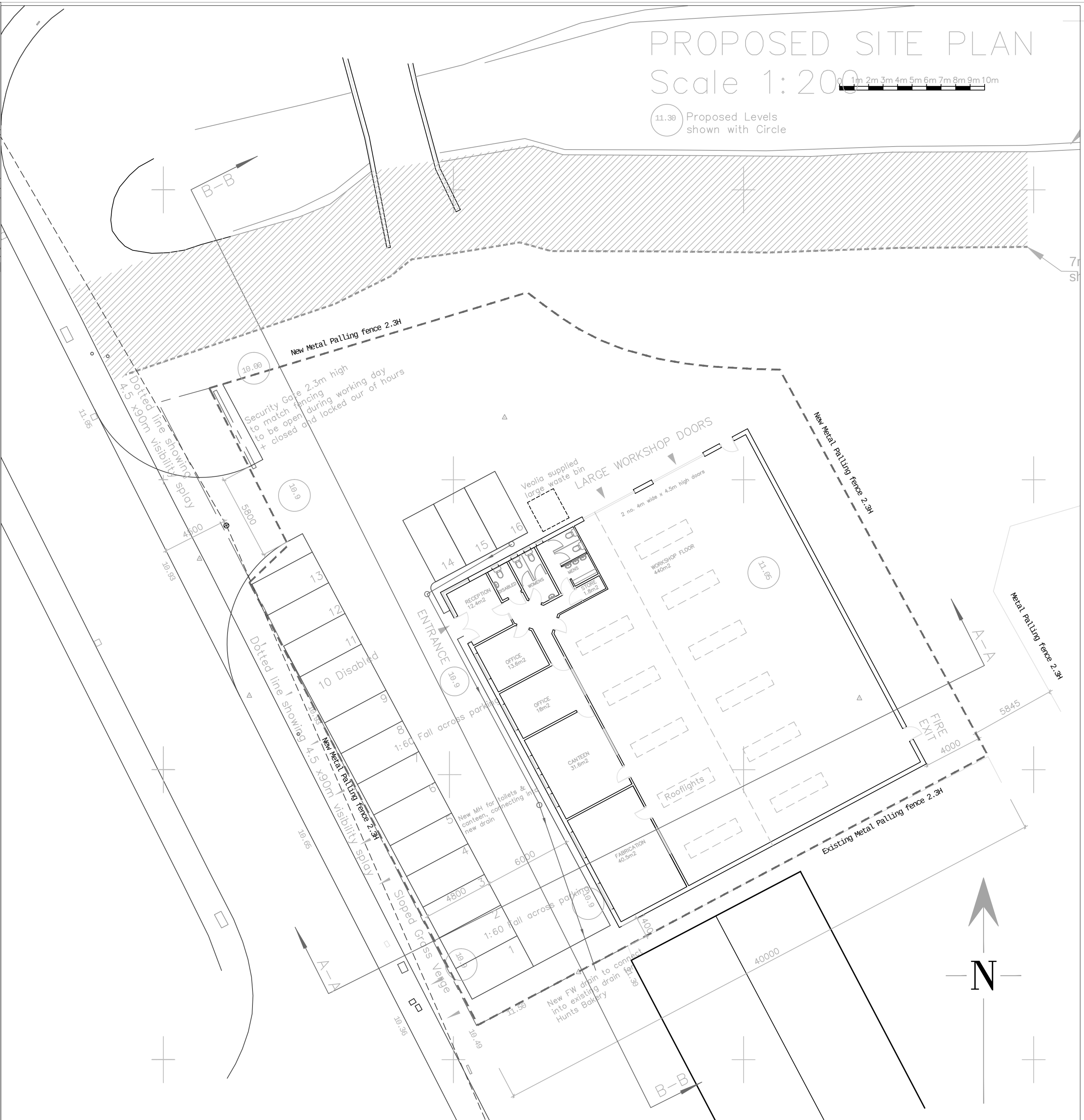
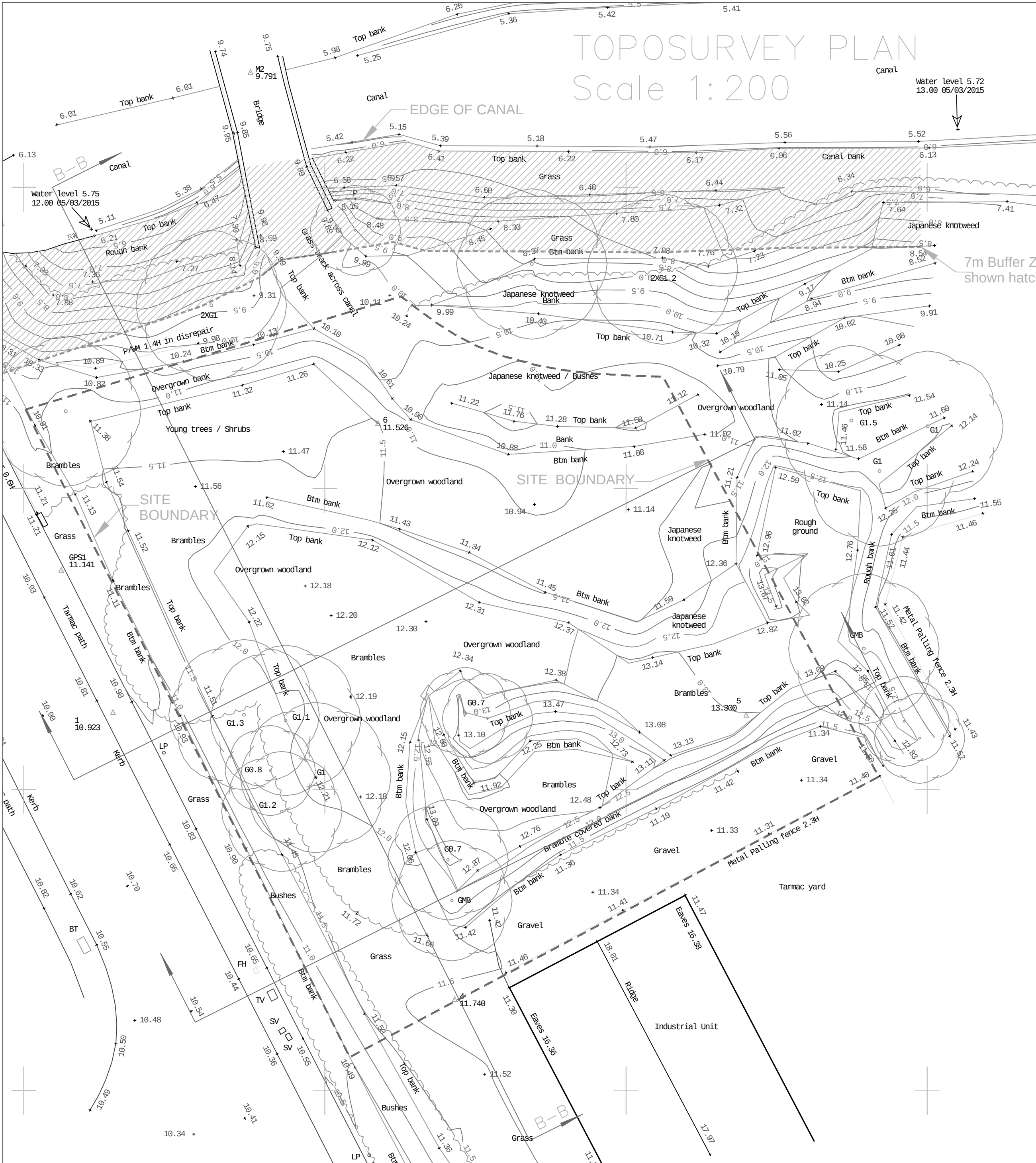


Appendix D
Soil Infiltration Test Report



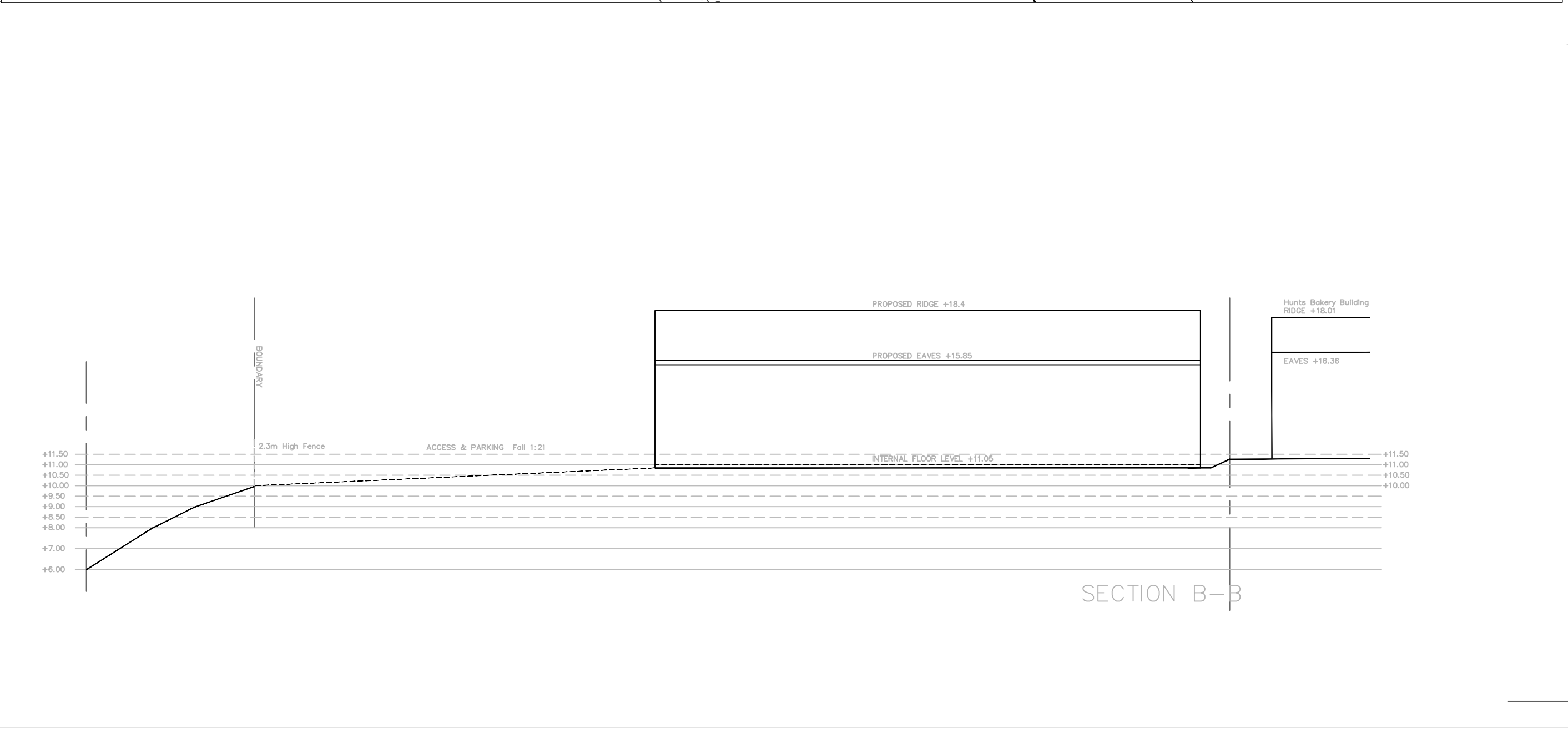
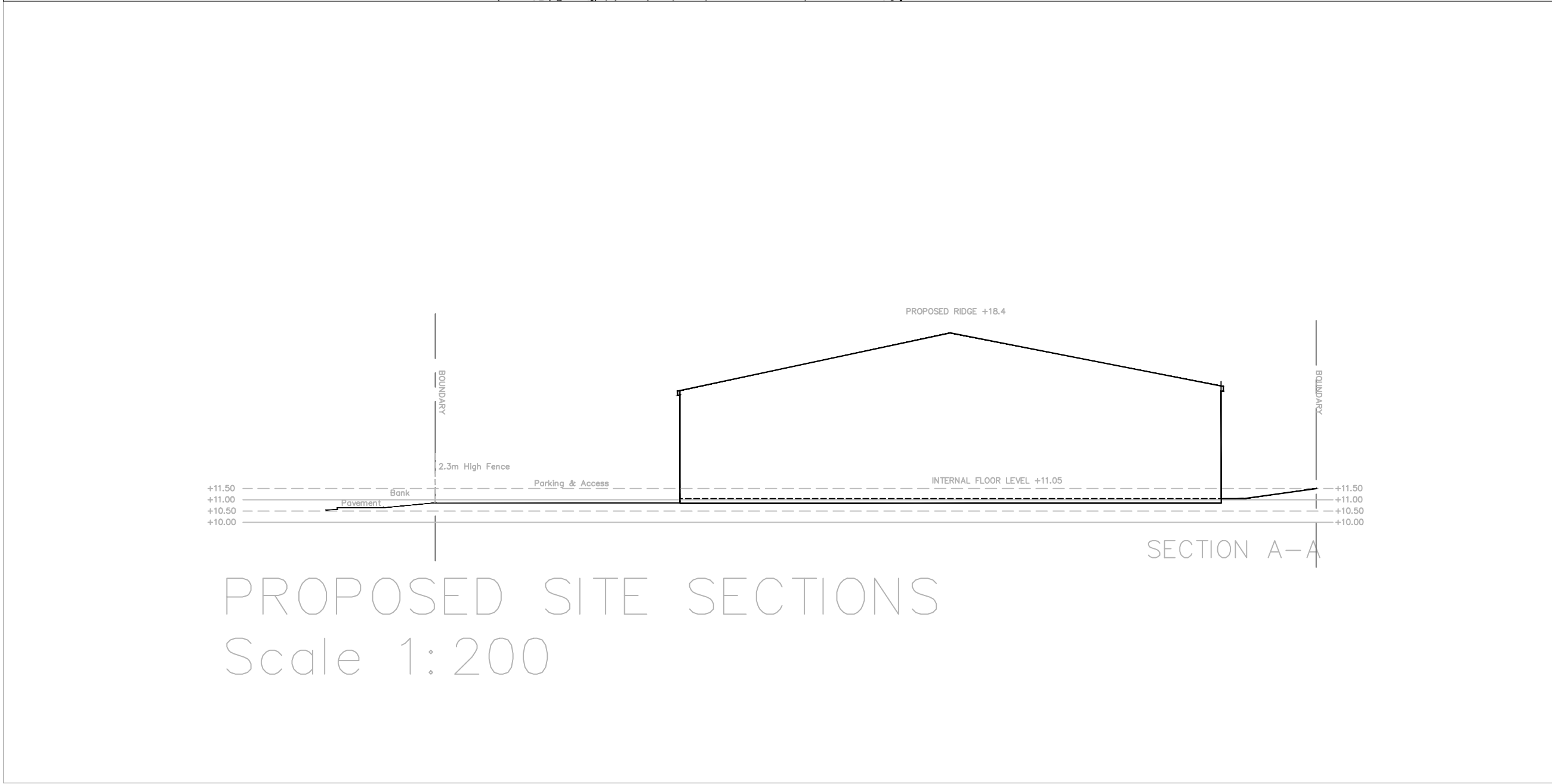
Appendix E

Proposed Development Layout



This Drawing is Copyright. ©
Note: All dimensions to be checked and set to be scaled from drawing.

AMENDMENTS:
Revision
Date
Rev A Revised Scheme 06.07.2015



ISSUE for
PLANNING
APPLICATION
06.07.2015

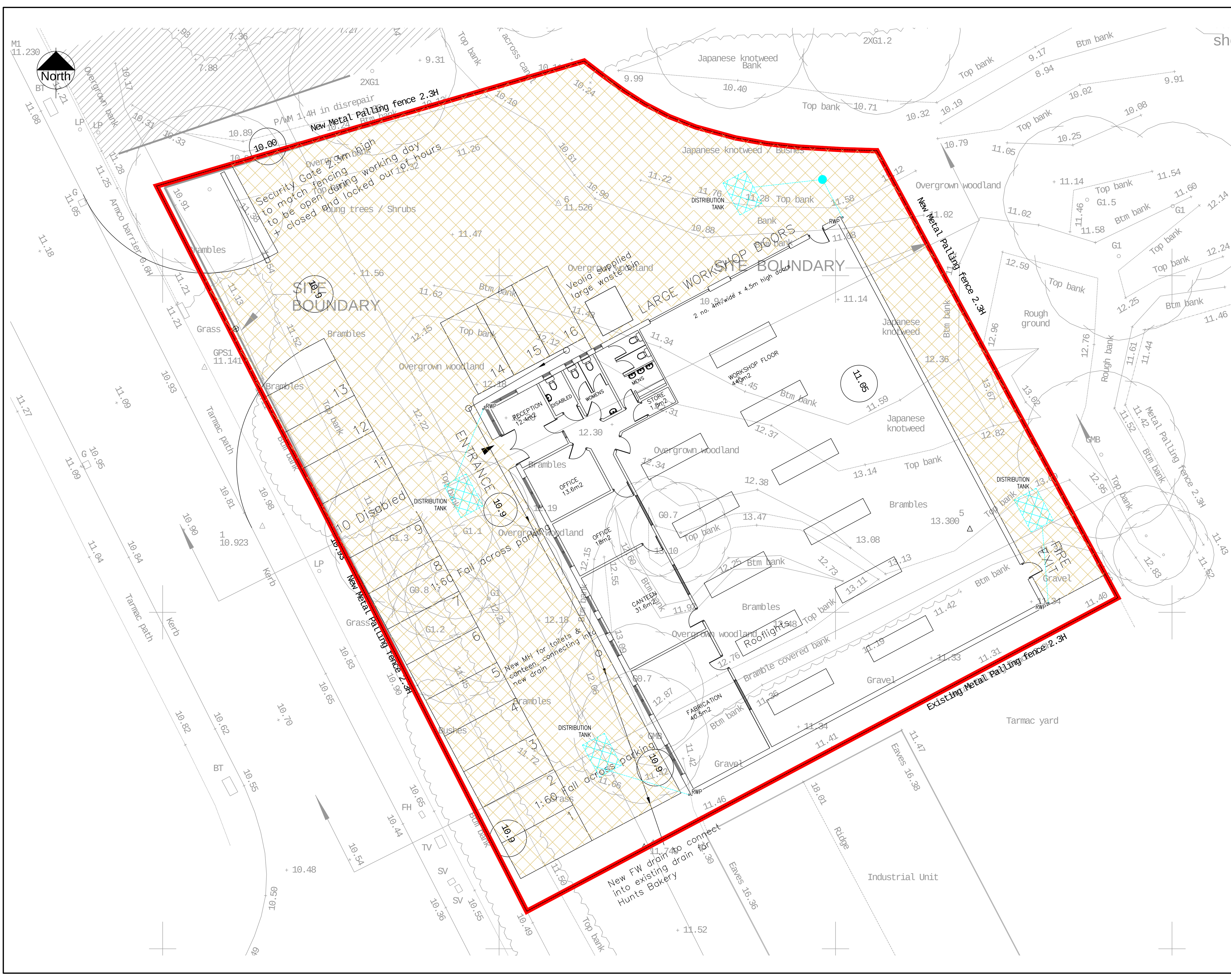
BBA
BUCKMASTEIRATCUP
Architects Ltd.

CLIENT:
ATT Engineering Ltd
PROJECT TITLE:
New LIGHT INDUSTRIAL UNIT
Neath Abbey Business Park

DRAWING TITLE:
SITE PLAN & SITE SECTIONS
SCALE: 1:100 & 1:200
DATE: 18.12.2014
at AT

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www.bbarch.co.uk
info@bbarch.co.uk BBA653.P.02 A

Appendix F
Drainage Plan: Proposed Site



NOTES

- DO NOT SCALE THIS DRAWING.
- CONTRACTOR TO CHECK ALL DIMENSIONS AND REPORT ALL ERRORS AND OMISSIONS TO THE ENGINEER.
- ANY DISCREPANCY TO BE REPORTED IMMEDIATELY TO THE ENGINEER.
- THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS, SUBCONTRACTORS AND SPECIALISTS DRAWINGS AND SPECIFICATIONS.

DRAINAGE NOTES

SURFACE WATER

- PROPOSED SURFACE WATER TO BE DISPOSED OF VIA PERMEABLE PAVING FILTRATION METHOD.
- SURFACE WATER SYSTEM DESIGNED TO CATER FOR 100YR + 30% CLIMATE CHANGE EVENT.
- INFILTRATION RATE TAKEN AS 1.5x10-6 m/hr.
- TOTAL CATCHMENT AREA = 1532.378m²
- TOTAL PERMEABLE PAVING AREA = 899m²

KEY

- PROPOSED SURFACE WATER DRAINAGE
- PROPOSED SW DISTRIBUTION TANK
- PROPOSED PERMEABLE PAVING

Rev.	Detail	By	Date

Revisions

Reinforcement schedules nos.

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Client

ATT ENGINEERING

Project

NEW UNIT – ATT ENGINEERING
NEATH ABBEY BUSINESS PARK

Drawing Title

DRAINAGE STRATEGY
OPTION 1

Project No.		Drawing No.	
C0615		C-001	
Scales		Date	
1:100		01.12.15	
Drawn		Revision	
PY		61	
Sheet Size		A1	

Appendix G

Microdrainage Storage Calculations

CB3 Consult Ltd				Page 1																																																																																																																																																																																																																													
7 St James Crescent Swansea Wales SA1 6DP		C0615 - New Unit ATT Eng. Surface Water Drainage Option 1																																																																																																																																																																																																																															
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XP Solutions		Source Control 2015.1																																																																																																																																																																																																																															
<u>Summary of Results for 100 year Return Period (+30%)</u> Half Drain Time : 1417 minutes. <table><thead><tr><th>Storm Event</th><th>Max Level (m)</th><th>Max Depth (m)</th><th>Max Infiltration (l/s)</th><th>Max Volume (m³)</th><th>Status</th></tr></thead><tbody><tr><td>15 min Summer</td><td>10.356</td><td>0.086</td><td>0.7</td><td>23.4</td><td>O K</td></tr><tr><td>30 min Summer</td><td>10.397</td><td>0.127</td><td>0.7</td><td>34.6</td><td>O K</td></tr><tr><td>60 min Summer</td><td>10.446</td><td>0.176</td><td>0.7</td><td>47.9</td><td>O K</td></tr><tr><td>120 min Summer</td><td>10.500</td><td>0.230</td><td>0.7</td><td>62.6</td><td>O K</td></tr><tr><td>180 min Summer</td><td>10.531</td><td>0.261</td><td>0.7</td><td>71.1</td><td>O K</td></tr><tr><td>240 min Summer</td><td>10.552</td><td>0.282</td><td>0.7</td><td>76.5</td><td>O K</td></tr><tr><td>360 min Summer</td><td>10.580</td><td>0.310</td><td>0.7</td><td>84.3</td><td>O K</td></tr><tr><td>480 min Summer</td><td>10.599</td><td>0.329</td><td>0.7</td><td>89.3</td><td>O K</td></tr><tr><td>600 min Summer</td><td>10.611</td><td>0.341</td><td>0.7</td><td>92.7</td><td>O K</td></tr><tr><td>720 min Summer</td><td>10.619</td><td>0.349</td><td>0.7</td><td>94.9</td><td>O K</td></tr><tr><td>960 min Summer</td><td>10.628</td><td>0.358</td><td>0.7</td><td>97.3</td><td>O K</td></tr><tr><td>1440 min Summer</td><td>10.631</td><td>0.361</td><td>0.7</td><td>98.3</td><td>O K</td></tr><tr><td>2160 min Summer</td><td>10.627</td><td>0.357</td><td>0.7</td><td>97.0</td><td>O K</td></tr><tr><td>2880 min Summer</td><td>10.617</td><td>0.347</td><td>0.7</td><td>94.3</td><td>O K</td></tr><tr><td>4320 min Summer</td><td>10.593</td><td>0.323</td><td>0.7</td><td>87.8</td><td>O K</td></tr><tr><td>5760 min Summer</td><td>10.568</td><td>0.298</td><td>0.7</td><td>80.9</td><td>O K</td></tr><tr><td>7200 min Summer</td><td>10.542</td><td>0.272</td><td>0.7</td><td>74.0</td><td>O K</td></tr><tr><td>8640 min Summer</td><td>10.518</td><td>0.248</td><td>0.7</td><td>67.3</td><td>O K</td></tr><tr><td>10080 min Summer</td><td>10.495</td><td>0.225</td><td>0.7</td><td>61.0</td><td>O K</td></tr><tr><td>15 min Winter</td><td>10.368</td><td>0.098</td><td>0.7</td><td>26.7</td><td>O K</td></tr><tr><td>30 min Winter</td><td>10.415</td><td>0.145</td><td>0.7</td><td>39.4</td><td>O K</td></tr></tbody></table> <table><thead><tr><th>Storm Event</th><th>Rain (mm/hr)</th><th>Flooded Volume (m³)</th><th>Time-Peak (mins)</th></tr></thead><tbody><tr><td>15 min Summer</td><td>98.769</td><td>0.0</td><td>19</td></tr><tr><td>30 min Summer</td><td>69.713</td><td>0.0</td><td>34</td></tr><tr><td>60 min Summer</td><td>47.182</td><td>0.0</td><td>64</td></tr><tr><td>120 min Summer</td><td>30.804</td><td>0.0</td><td>124</td></tr><tr><td>180 min Summer</td><td>23.556</td><td>0.0</td><td>182</td></tr><tr><td>240 min Summer</td><td>19.281</td><td>0.0</td><td>242</td></tr><tr><td>360 min Summer</td><td>14.554</td><td>0.0</td><td>362</td></tr><tr><td>480 min Summer</td><td>11.895</td><td>0.0</td><td>482</td></tr><tr><td>600 min Summer</td><td>10.159</td><td>0.0</td><td>602</td></tr><tr><td>720 min Summer</td><td>8.923</td><td>0.0</td><td>720</td></tr><tr><td>960 min Summer</td><td>7.262</td><td>0.0</td><td>960</td></tr><tr><td>1440 min Summer</td><td>5.416</td><td>0.0</td><td>1214</td></tr><tr><td>2160 min Summer</td><td>4.025</td><td>0.0</td><td>1600</td></tr><tr><td>2880 min Summer</td><td>3.254</td><td>0.0</td><td>1992</td></tr><tr><td>4320 min Summer</td><td>2.415</td><td>0.0</td><td>2812</td></tr><tr><td>5760 min Summer</td><td>1.956</td><td>0.0</td><td>3632</td></tr><tr><td>7200 min Summer</td><td>1.662</td><td>0.0</td><td>4464</td></tr><tr><td>8640 min Summer</td><td>1.455</td><td>0.0</td><td>5192</td></tr><tr><td>10080 min Summer</td><td>1.302</td><td>0.0</td><td>5960</td></tr><tr><td>15 min Winter</td><td>98.769</td><td>0.0</td><td>19</td></tr><tr><td>30 min 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7 St James Crescent Swansea Wales SA1 6DP		C0615 - New Unit ATT Eng. Surface Water Drainage Option 1			
Date 10/12/2015 14:31 File DRAINAGE STRATEGY -		Designed by paulyoung Checked by			
XP Solutions		Source Control 2015.1			
Summary of Results for 100 year Return Period (+30%)					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
60 min Winter	10.470	0.200		0.7 54.3	O K
120 min Winter	10.531	0.261		0.7 70.9	O K
180 min Winter	10.567	0.297		0.7 80.6	O K
240 min Winter	10.590	0.320		0.7 87.0	O K
360 min Winter	10.623	0.353		0.7 96.1	O K
480 min Winter	10.646	0.376		0.7 102.1	O K
600 min Winter	10.661	0.391		0.7 106.3	O K
720 min Winter	10.672	0.402		0.7 109.3	O K
960 min Winter	10.686	0.416		0.7 113.0	O K
1440 min Winter	10.693	0.423		0.7 114.9	O K
2160 min Winter	10.683	0.413		0.7 112.4	O K
2880 min Winter	10.669	0.399		0.7 108.5	O K
4320 min Winter	10.631	0.361		0.7 98.2	O K
5760 min Winter	10.590	0.320		0.7 87.0	O K
7200 min Winter	10.549	0.279		0.7 75.8	O K
8640 min Winter	10.510	0.240		0.7 65.2	O K
10080 min Winter	10.473	0.203		0.7 55.3	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)		
60 min Winter	47.182	0.0	62		
120 min Winter	30.804	0.0	122		
180 min Winter	23.556	0.0	180		
240 min Winter	19.281	0.0	240		
360 min Winter	14.554	0.0	356		
480 min Winter	11.895	0.0	472		
600 min Winter	10.159	0.0	588		
720 min Winter	8.923	0.0	702		
960 min Winter	7.262	0.0	926		
1440 min Winter	5.416	0.0	1358		
2160 min Winter	4.025	0.0	1708		
2880 min Winter	3.254	0.0	2164		
4320 min Winter	2.415	0.0	3072		
5760 min Winter	1.956	0.0	3976		
7200 min Winter	1.662	0.0	4824		
8640 min Winter	1.455	0.0	5616		
10080 min Winter	1.302	0.0	6352		
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<u>Model Details</u> Storage is Online Cover Level (m) 10.900 <u>Porous Car Park Structure</u> <table> <tr> <td>Infiltration Coefficient Base (m/hr)</td> <td>0.00540</td> <td>Width (m)</td> <td>30.1</td> </tr> <tr> <td>Membrane Percolation (mm/hr)</td> <td>1000</td> <td>Length (m)</td> <td>30.1</td> </tr> <tr> <td>Max Percolation (l/s)</td> <td>251.7</td> <td>Slope (1:X)</td> <td>0.0</td> </tr> <tr> <td>Safety Factor</td> <td>2.0</td> <td>Depression Storage (mm)</td> <td>5</td> </tr> <tr> <td>Porosity</td> <td>0.30</td> <td>Evaporation (mm/day)</td> <td>3</td> </tr> <tr> <td>Invert Level (m)</td> <td>10.270</td> <td>Cap Volume Depth (m)</td> <td>0.500</td> </tr> </table>			Infiltration Coefficient Base (m/hr)	0.00540	Width (m)	30.1	Membrane Percolation (mm/hr)	1000	Length (m)	30.1	Max Percolation (l/s)	251.7	Slope (1:X)	0.0	Safety Factor	2.0	Depression Storage (mm)	5	Porosity	0.30	Evaporation (mm/day)	3	Invert Level (m)	10.270	Cap Volume Depth (m)	0.500
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