

Flood Risk Assessment & SuDS Strategy

MIRA Lab Extension
Watling Street
Nuneaton

JMS Project Reference: CO23/O129/O2



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Revisions and Additional Material

Document History and Status

Revision	Date	Purpose/Status
B	17.08.2023	LLFA comments
A	03.07.2023	Client comments
-	29.06.2023	First Issue

Document Details

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Project Number	CO23/0129/02
Project Name	MIRA Lab Extension

Preamble

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1 Introduction

- 1.1 JMS Engineers has been appointed to prepare a Flood Risk Assessment (FRA) to support a planning application for an extension to an existing workshop at the MIRA Technology Park, which forms part of the larger MIRA vehicle testing facility near Nuneaton.
- 1.2 This assessment has been considered in accordance with local planning policies and guidance from Hinckley & Bosworth Borough Council and Leicestershire County Council.
- 1.3 The purpose of this assessment is to review the proposed development and consider the flood risks associated with the proposal. The risks of flooding and potential impact from alterations to the site drainage, and the surface water characteristics are considered within the scope of the parameters set out in the National Planning Policy Framework (NPPF).
- 1.4 This document has been produced in accordance with the Technical Guidance to the NPPF and the Flood Risk and Coastal Change Planning Policy Practice Guidance (PPG) and is based on the evidence provided by the Environment Agency (EA).
- 1.5 Consideration has been given to the ODPM document Preparing for Floods which is a “*guide intended for use by developers, local planning authorities and others involved in construction of new buildings, and renovation of existing building at risk of flooding. If adopted the principles set out within this guide should help reduce the stress and disruption of flooding and provide a more sustainable approach to flood risk*”.

2 Location & Existing Conditions

- 2.0.1 The application site is centred around Ordnance Survey (OS) grid reference 436346 295308. The current Technology Park site area is approximately 5.7ha. At present the site is occupied by a mixture of buildings and other areas of hardstanding such as car parks. The majority of the site is impermeable.
- 2.0.2 A topographical survey of the area to be built on has been undertaken, this can be found in **Appendix A**, along with an extract of a composite plan provided by the client.
- 2.0.3 The Technology Park sits immediately to the north of the A5, to the north of Nuneaton. The indicative location is shown as **Figure 1**, below.

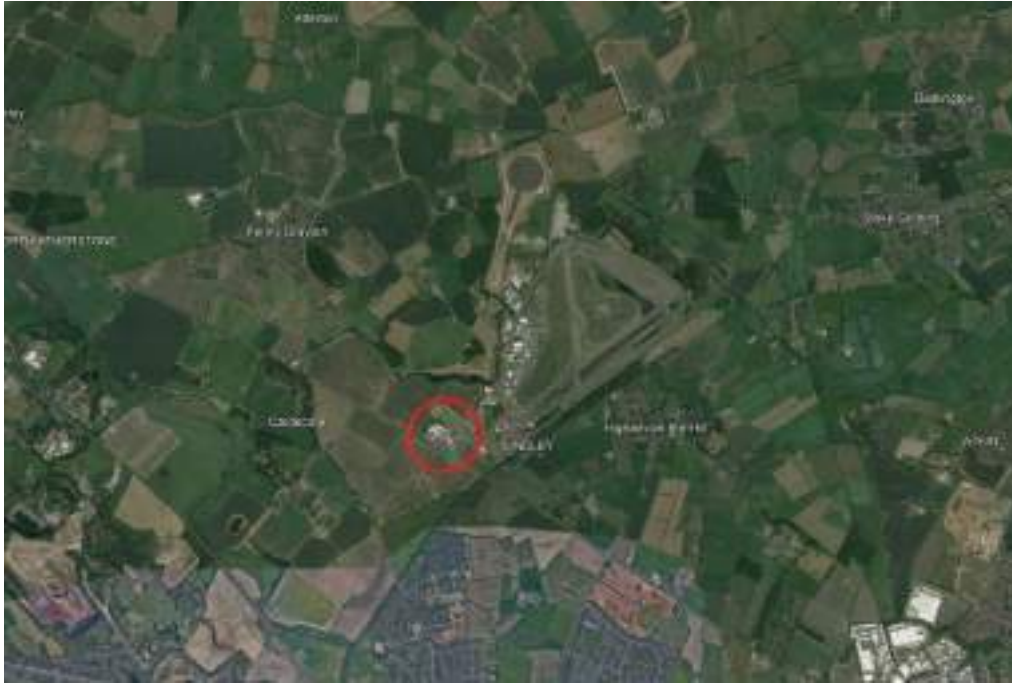


Figure 1 - Site location

- 2.0.4 Nearby British Geological Survey (BGS) borehole data indicate that the site is underlain by clay and sandstone. BGS records are contained in **Appendix B**.

2.1 Existing Sewer Assets

- 2.1.1 Severn Trent Water asset plans indicate that there are no surface water sewers in the vicinity of the site. A copy of the plan for the area is contained in **Appendix C**.

2.2 Site Proposals

- 2.2.1 It is proposed to extent one of the lab buildings to the west on to land that is currently a field. A plan showing the proposed extension within the wider site is contained in **Appendix D**.

2.3 Existing Drainage Regime

- 2.3.1 At present the Technology Park site drains to a ditch to the west of the site, by the A5, as shown on the extract contained in **Appendix A**.

3 Planning Policy Context

3.1 National Planning Policy

- 3.1.0 The National Planning Policy Framework (NPPF, 2021) includes government policy on development and in this case meeting the challenge of climate change and flood risk. The policy states; *“Plans should take a proactive approach to mitigating and adapting to climate change, taking into account the long-term implications for flood risk....”*
- 3.1.1 The location of new developments should consider climate change by planning to avoid increasing the vulnerability on development from the impacts of climate change. Where locations are considered vulnerable from the impacts of climate change, these risks should be managed and where possible mitigated to limit the risk.
- 3.1.2 Development in areas at risk of flooding should be made safe without increasing the flood risk elsewhere. Local Plans should be based on evidence, through a Sequential Test, in selecting the appropriate location for new development within the plan period and thus avoiding where possible flood risk to people and property.
- 3.1.3 Development priorities are based on the specific flood risk zones outlined within Table 1 of the technical guidance, as per **Table 1** below. For Flood Zone 1 – Low probability. Land assessed as having a less than 1 in 1,000-year annual probability of river and sea flooding (<0.1%) in any year.

Flood Zones	Definition
Zone 1 Low Probability	Land having a less than 1 in 1,000 annual probability of river or sea flooding. (Shown as ‘clear’ on the Flood Map – all land outside Zones 2 and 3)
Zone 2 Medium Probability	Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or Land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding. (Land shown in light blue on Flood Map)
Zone 3a High Probability	Land having a 1 in 100 or greater annual probability of river flooding; or Land having a 1 in 200 or greater annual probability of sea flooding (Land shown in dark blue on the Flood Map)
Zone 3b The Functional Floodplain	This zone comprises land where water must flow or be stored in times of flood. Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. (Not separately distinguished from Zone 3a on the Flood Map)

Table 1 - Flood Zone Definitions

- 3.1.4 The Environment Agency (EA) website confirms the site location to be within Flood Zone 1. In this case, there is no requirement to carry out a sequential or exception test.
- 3.1.5 Further guidance in NPPF classifies retail schemes to be a ‘less vulnerable’ land class use in terms of flood risk, as shown in **Table 2**, below.

Flood Risk Vulnerability Classification: Less Vulnerable	
Hospitals	
Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels	
Buildings used for dwelling houses, student halls of residence, drink establishments, nightclubs and hotels	
Non-residential uses for health services, nurseries and educational establishments, retail, offices, industry	
Landfill and sites used for waste management facilities for hazardous waste	
Sites used for holiday or short-let caravans and camping, subject to a specific warning and evacuation plan	

Table 2 - Flood Risk Vulnerability Classifications

- 3.1.6 NPPG Table 3 (para 67 ID 7-067-20140306) determines the appropriate uses by flood zone, in this case a less vulnerable use for retail is appropriate for a Zone 1 as summarised in PPS25, table D.1, shown below as **Table 3**.

Flood Zones		Flood Risk Vulnerability Classification			
	Essential Infrastructure	Highly Vulnerable	More Vulnerable	Less Vulnerable	Water Compatible
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	Exception Test Required	✓	✓	✓
Zone 3a	Exception Test Required	x	Exception Test Required	✓	✓
Zone 3b	Exception Test Required	x	x	x	✓

Table 3 - Flood Risk Vulnerability and Flood Zone Compatibility

- 3.1.7 The EA mapping indicates that the site is entirely located within Flood Zone 1 and therefore is located to meet the requirements of NPPF.

3.2 Local Planning Policy

- 3.2.0 Hinckley & Bosworth Site Allocations and Development Management Policies DPD (2016)

Policy DM7, Preventing Pollution and Flooding, states that development proposed must not create or exacerbate flooding, by being located away from areas of flood risk.

- 3.2.1 Hinckley & Bosworth Draft Local Plan, 2020-2039 (2021, not yet adopted)

Policy CCo2 states that flood risk from all sources should be avoided or managed.

Policy CCo3 states that SuDS should be utilised.

4 Flooding Assessment

4.1 Flood Risk

- 4.1.1 In the case of the proposed development; the site is located within Flood Zone 1 as indicated on the flood mapping shown as **Figure 2**, below.

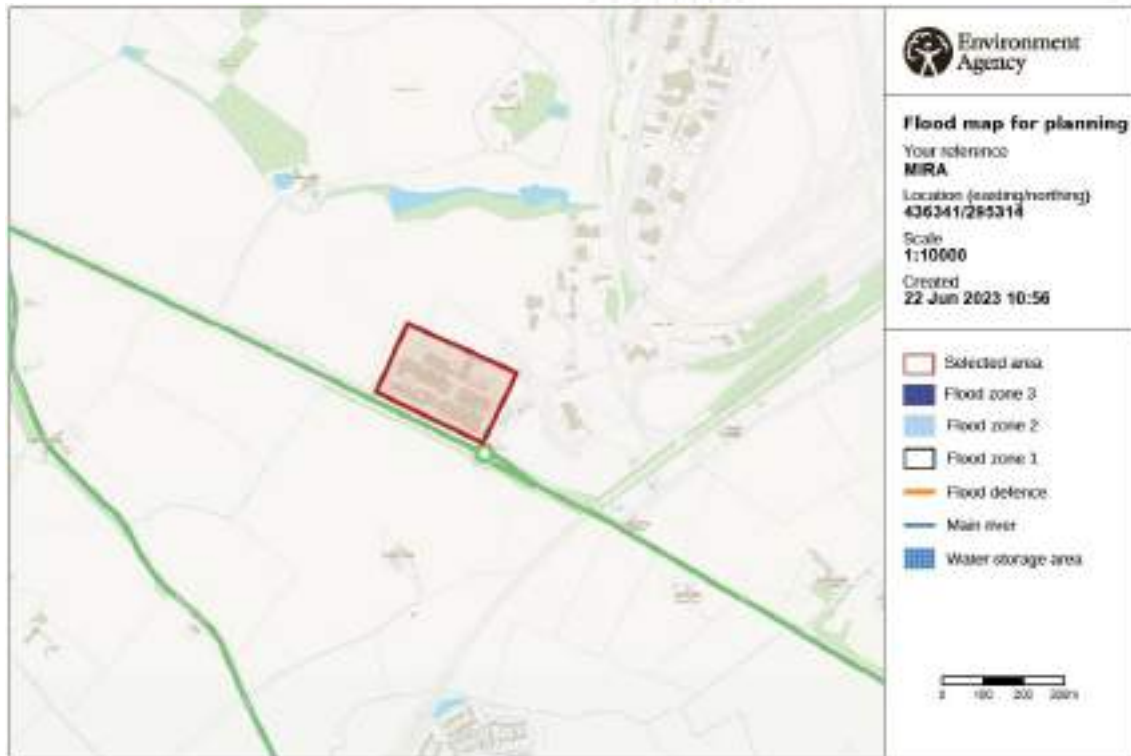


Figure 2 - EA Flood Zone Mapping

4.2 Flooding from Surface Water

- 4.2.1 Pluvial flooding refers to the flooding event as a result of extreme rainfall which cannot be absorbed within the ground, or the urban drainage system becoming overwhelmed. The mapping indicates a very low risk of surface water flooding for the majority of the site, with a high risk for some areas in the immediate vicinity of the watercourse that crosses the site, as per **Figure 3** below.



Figure 3 - Surface Water Flood Map

4.3 Flooding from Rivers or the Sea

- 4.3.1 Fluvial flooding is a result of the capacity of rivers being exceeded by the river flow. In general, rivers have a natural flood plain, which can sometimes be encroached upon by development.
- 4.3.2 Tidal flooding is a result from the sea where high tides and storm surges raise the level of tidal waters above the level of the shore or riverbanks. These can be sudden and severe. Due to the site's inland location, the site is not considered to be at risk of tidal flooding.
- 4.3.3 As shown on **figure 5**, below, the site is not predicted to be affected by flooding from rivers or the sea.



Figure 4 – River Flood Map

4.4 Infrastructure failure

4.4.1 Infrastructure failure: ‘Canals, reservoirs, industrial processes, burst water mains or failed pumping stations’. An extract of the flood risk from reservoirs map, which demonstrates that the site is not at risk of flooding from reservoirs or other artificial water bodies, is shown as **Figure 4**, below:



Figure 5 - Reservoir Flood Map

5 SuDS Considerations

- 5.0.1 Consideration of SuDS is a planning requirement for new developments. SuDS are designed to replicate the natural course of drainage as closely as possible with a view to reducing the impact of flooding, removing pollutants at source and combining water management with green space.
- 5.0.2 Developments should utilise SuDS where possible and ensure that surface water run-off is managed as close to its source as possible in line with the following hierarchy:
1. Into ground (infiltration).
 2. To a surface water body.
 3. To a surface water sewer.
 4. To a combined sewer.
- 5.0.3 Sustainable Drainage Systems should be included in the design in order to manage surface water flood risk. SuDS should be inspired by natural drainage processes and manage water as close to its source as possible whilst offering pollution control and landscape benefits.
- 5.0.4 The site currently discharges to a watercourse but does not appear to utilise SuDS.
- 5.0.5 As discussed in paragraph 2.0.4, the site is underlain by clay and is therefore considered unsuitable for infiltration.

5.1 SuDS Incorporation

- 5.1.1 The below table gives examples of various SuDS components that provide means of controlling surface water at source.

Component Type	Description	Collection Mechanism	Design Criteria						
			Water Quantity (Chapter 3)			Water Quality (Chapter 4)	Amenity (Chapter 5)	Biodiversity (Chapter 6)	Further Information (Chapter Ref)
			Peak Runoff Rate	Runoff Volumes					
				Small Events (Interceptions)	Large Events				
Rainwater Harvesting Systems	Systems that collect runoff from the roof of a building or other paved surface for use	P		●	●		●		11
Green roofs	Planted soil layers on the roof of buildings that slow and store runoff	S	○	●		●	●	●	12
Infiltration systems	Systems that collect and store runoff, allowing it to infiltrate into the ground	P	●	●	●	●	●	●	13
Proprietary treatment systems	Subsurface structures design to provide treatment to runoff	P				●			14
Filter strips	Grass strips that promote sedimentation and filtration as runoff is conveyed over the surface	L		●		●	○	○	15
Filter drains	Shallow stone-filled trenches that provide attenuation, conveyance and treatment of runoff	L	●	○		●	○	○	16
Swales	Shallow landscaped depressions that allow runoff to pond temporarily on the surface, before filtering through vegetation and underlying soils	L	●	●	●	●	●	●	17

Bioretention systems	Trees with soil-filled tree pits, tree planters or structural soils used to collect, store and treat runoff	P	●	●	●	●	●	●	18
Trees	Structural paving through which runoff can soak and subsequently be stored in the sub-base beneath, and/or allowed to infiltrate into the ground below	P	●	●		●	●	●	19
Pervious pavements	Structural paving through which runoff can soak and subsequently be stored in the sub-base beneath, and/or allowed to infiltrate into the ground below	S	●	●	●	●	○	○	20
Attenuation storage tanks	Large, below-ground voided spaces used to temporarily store runoff before infiltration-controlled release or use	P	●						21
Detention basins	Vegetated depressions that store and treat runoff	P	●	●		●	●	●	22
Ponds and wetlands	Permanent pools of water used to facilitate treatment of runoff – runoff can also be stored in an attenuation zone above the pool	P	●			●	●	●	23

P-Point L-Lateral S-Surface

● – likely valuable contribution to delivery of design criterion

○ – some potential contribution to delivery of design criterion, if specifically included in the design

Table 4 - CIRIA Table 7.1 SuDS Components

- 5.1.2 Is it proposed that surface water will be attenuated in a detention basin before being discharged to a ditch that crosses the site via a new headwall.
- 5.1.3 The design life of the development is likely to exceed the design life of any of the SuDS components listed above that are utilised on-site. During the routine inspections of any drainage components, it may become apparent that they have reached the end of their functional lifetime. In the interest of sustainability, repairs should be the first-choice solution where practicable. If this is not the case, then it will be necessary for the property owner to undertake complete replacement of the component in question.

6 Surface Water Strategy

6.0.1 The surface water strategy is based upon the SuDS implementation as outlined above:

A. Store rainwater for later use:

The user of the site may wish to utilise rainwater harvesting.

B. Use infiltration techniques, such as porous surfaces:

Upon review of the British Geological Survey Mapping data, the underlying ground conditions do not appear to support the use of infiltration techniques.

C. Attenuate rainwater in ponds or open water features for gradual release:

It is proposed that surface water will be attenuated in an online pond before discharging to a watercourse. A flow control has been proposed to restrict flows to 5.00l/s.

Microdrainage Calculations are contained in **Appendix E** and a Drainage Strategy plan is contained in **Appendix F**

D. Attenuate rainwater by storing in tanks or sealed water features for gradual release:

Not required. See above.

E. Direct rainwater direct to the watercourse:

It is proposed that the attenuated surface water be discharged to an existing ditch at a restricted rate of 5l/s.

F. Discharge rainwater to a surface water sewer/drain:

There are no surface water sewers in the vicinity.

6.1 Preliminary Surface Water Drainage Maintenance Schedule

6.1.1 This section of the report gives guidance on the maintenance of the drainage system and outlines who will be responsible for this. By necessity the available SuDS systems will control outfall flow, store and slow down rainwater.

6.1.2 Storage and Attenuation – Maintenance of the attenuation basin will be the responsibility of a Management Company, see **Table 5** below.

Maintenance Schedule	Required Action	Recommended Frequency
Regular Maintenance	Remove litter & debris	Monthly
	Cut grass-for spillways and access routes	Monthly (during growing season), or as required
	Cut grass-meadow grass in and around basin	Half yearly – Spring and Autumn
	Manage other vegetation and remove nuisance plants	Monthly (at start, then as required)

	Inspect inlets and outlets and overflows for blockages and clear if required	Monthly
	Inspect banksides, structures, pipework etc for evidence of physical damage	Monthly
	Inspect inlets and facility surface for silt accumulation. Establish appropriate silt removal frequencies	Monthly (for first year), then annually or as required
	Check any penstocks and other mechanical devices	Annually
	Tidy all dead growth before start of growing season	Annually
	Remove sediment from inlets, outlets and forebay	Annually / as required
	Manage wetland plants in outlet pool	Annually – as set out in CIRIA C753 Chapter 23.
Occasional Maintenance	Reseed areas of poor vegetation growth	As required
	Prune and trim any trees and remove cuttings	Every two years or as required
	Remove sediment from inlets, outlets, forebay and main basin when required	Every 5 years / as required
Remedial Actions	Repair erosion or other damage by reseeding or re-turfing	As required
	Realignment of rip-rap	As required
	Repair/Rehabilitation of inlets, outlets and overflows	As required
	Relevel uneven surfaces and reinstate design levels	As required

Table 5 - System storage operation and maintenance requirements (Detention Basin)

6.1.3 The rainwater from the roofs is collected via rainwater pipes and will be carried to the attenuation. The maintenance of the collection system is the responsibility of the property owner, see **Table 6** below.

Maintenance Schedule	Required Action	Recommended Frequency
Regular Maintenance	Inspection of silt trap chamber and removal of debris when necessary	Quarterly or as required following monitoring
Remedial actions	Check for blockages in manholes and pipes. Rodding and jetting of pipes to be carried out. CCTV survey can be carried out to inspect condition of pipework.	Quarterly or as required following monitoring
Monitoring	Inspect collection apparatus for debris and litter. Remove where necessary to prevent blockages in the system	Monthly or after periods of heavy rainfall

Table 6 - System storage operation and maintenance requirements (Rainwater Pipes and Chambers)

6.1.4 The design life of the development is likely to exceed the design life of each of the SuDS components listed above. During the routine inspections of any drainage components it may become apparent that they have reached the end of their functional lifetime. In the interest of sustainability, repairs should be the first-choice

solution where practicable. If this is not the case, then it will be necessary for the property owner to undertake complete replacement of the component in question.

6.2 Existing Watercourse

6.2.1 Culvert

The watercourse that currently borders the Technology Park and into which it is proposed to drain the extension partially sits within the footprint of the extension.

It is therefore proposed that the existing watercourse be culverted underneath the building. The flow rate of the existing channel has been calculated using Manning's equation:

$$Q = (1.49/n) * A * R^{2/3} * S^{1/2}$$

Where:

Q is the maximum flow rate (m³/s)

n is the Manning's roughness coefficient, assumed to be 0.04 for a grassy slope

A is the cross-sectional area of flow (m²)

R is the hydraulic radius (m, calculated as the area of flow / wetted perimeter)

S is the channel slope (expressed as a ratio)

A value for Q was calculated for three points along the section of the watercourse that is to be culverted, based on the site topographical survey. A plan showing the locations and cross sections for the three areas is contained in **Appendix G**.

The highest Q value was 7.8m³/s. Copies of the calculations are also contained in **Appendix G**. This is considered to be a robust calculation, as it assumes that the water is at the maximum possible level. Anecdotal evidence from the client suggests that the watercourse rarely has flowing water in it.

It is proposed to use a box culvert with a width of 2m and a height of 1m. Based on the Manning's equation, the culvert can accommodate a flow of 9.48m³/s. The proposed culvert is therefore sufficient to accommodate the maximum flow of the existing channel.

6.2.2 Catchment Plan

The LLFA requested a plan showing the extent of the catchment that serves the ditch and the estimated surface water runoff rate. A site visit was carried out on Wednesday 9th August in support of this.

A survey of the area was provided by the client. The survey and site visit confirmed that the ditch is not connected to any adjacent ditches. The survey also shows that there is an extensive network of surface water sewers within the site and that the catchment of the ditch therefore comprises the fields to the north and west.

A plan showing the approximate extent of the catchment is contained in **Appendix H**. The area is estimated as 6.77ha.

124 method. Based on an area of 6.77ha, the QBar runoff rate is 95.2l/s (0.0952m³/s). Calculations are contained in **Appendix E**. m³/s, or approximately 82 times the 1 in 100 year runoff rate, it is y issues with the existing ditch.

9.48m³/s, or 100 times the 1 in 100 year runoff rate.

fely accommodate the surface water outfall of the proposed

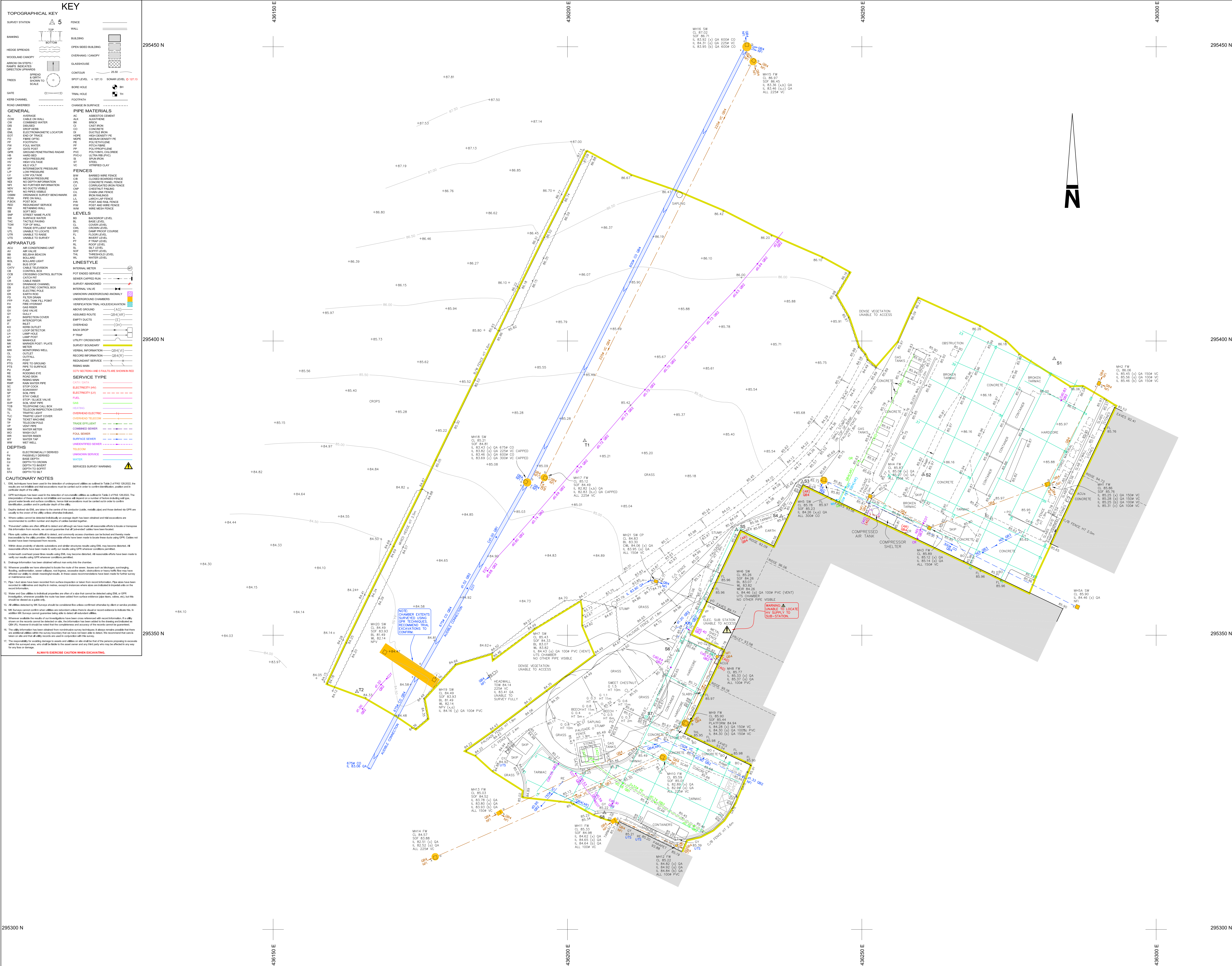
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7 Summary and Conclusions

- 7.1 JMS Engineers have been appointed to prepare a Flood Risk Assessment and SuDS strategy to assist with the planning application for the extension of an existing workshop at the MIRA vehicle testing centre.
- 7.2 A review of the Environment Agency's mapping illustrates that the site is situated within Flood Zone 1, with low risk from Pluvial flooding.
- 7.3 Nearby BGS borehole data indicate that the site is underlain by clay and mudstone, the site is therefore considered to be unsuitable for infiltration.
- 7.4 Following the SuDS hierarchy, it is proposed that surface water from the proposed extension be attenuated on-site before being discharged to a watercourse at a restricted rate. This represents betterment over the current situation, as the land that the extension will be built on is currently 100% impermeable.
- 7.5 As the proposed extension encroaches on an existing ditch, it is proposed that the ditch be culverted under the building. It has been demonstrated that the flow capacity of the culvert is in excess of the maximum theoretical capacity of the ditch.
- 7.6 The surface water runoff rate has been calculated for the ditch catchment. This has been shown to be approximately 1/80 of the capacity of the ditch.
- 7.7 In considering the details set out in this report we find the proposed development is compliant with national policy, and the development layout can be accommodated at this location without increasing the flood risk or impacting the water quality discharging from the site.

8 Appendices

Appendix A – Topographical Survey



- Notes:
- GRID LEVELS BASED ON ORDNANCE DATUM. DERIVED FROM THE NATIONAL GRID NETWORK. LOCAL SCALE FACTOR 0.999999 APPLIED.
 - TREE AND HEDGE SPECIES HAVE BEEN IDENTIFIED AS ACCURATELY AS POSSIBLE BUT SHOULD BE CHECKED IN CRITICAL AREAS.
 - THIS SURVEY SHOULD ALWAYS BE READ IN CONJUNCTION WITH THE DESKTOP UTILITY REPORT THAT WAS CARRIED OUT AS A PREREQUISITE TO THIS DETECTION SURVEY.
 - FOR ELEVATIONS SEE DRAWING 32306.DWG

Coordinate Table			
Station	Description	Easting	Northing
S1	Road Nail	436280.697	295396.900
S2	Road Nail	436280.436	295377.328
S3	Road Nail	436239.910	295376.007
S4	Road Nail	436238.305	295370.215
S5	Road Nail	436228.706	295367.949
S6	Road Nail	436218.747	295347.439
S7	Road Nail	436213.895	295335.879
S8	Road Nail	436206.279	295319.823
T1	Timber Peg	436202.932	295383.053
T2	Timber Peg	436164.239	295340.429

Equipment Information					
Equipment	Manufacturer	Model	Serial Number	MKS REF	Date of Calibration
EWL Tr Transmitter	SPX Radiodetection	TX-3	1017X-3-7489	RDS	07/12/2022
EWL Rt Receiver	SPX Radiodetection	RD3000	1018KPL-12845	RDS	07/12/2022
GPR	IDS Geoscan	Detector/Duo	SN004 & SN235	QPR16	02/03/2023

DETECTION SURVEY REPORT

GENERAL

This survey was carried out in accordance with PAS 128:2022 (Publicly Available Specification from BSI). After a preliminary consultation with the client it was agreed to carry out the detection survey using methodology M1 as per Table 2 of the PAS 128:2022. The survey boundary has been shown on the drawing; please see line/side section of the key for reference.

DESKTOP UTILITY REPORT

Prior to the survey commencing record information was gathered and compiled in a separate Desktop Utility Report. This report should be read in conjunction with the information contained in this utility detection survey. Record information was at the time of the survey the most recent available in accordance with the requirements of the PAS 128:2022. The record information is classed as historical and must be referenced with extreme caution. There is no guarantee of the completeness and accuracy of this information. For a full list of the providers searched, records reviewed and the dates the information was obtained, please refer to the attachments page of the desktop utility report.

DETECTION SURVEY

DRAINAGE

Drainage was checked with pipe locators and invert levels recorded. Wherever possible the chamber sizes have been recorded and positioned on the drawing. All connections from gullies, external drainage pipes and external air ducts have been drawn wherever possible into manholes and sewer runs by radio scans location and/or GPR. Where a saddle connection is present the position is assumed only until proven by GPR or above. In instances where other detection methods were unsuccessful connections between manholes have been assumed to be straight and labelled as CA. All drainage should be cross checked in critical areas by CCTV survey or verification survey type A. Recommended obtaining as-built records to enhance survey information and trial excavations to confirm position and depth in critical areas.

WATER

Unable to detect electricity cables within the survey area. Routes shown have been assumed. Recommended obtaining as-built records to enhance survey information and trial excavations to confirm position and depth in critical areas.

GAS

Gas pipes within the survey area are plastic and have been detected using GPR techniques as well as using EM. Techniques by tracing the duct using the sonic. In instances where it was not possible to detect pipes, the route has been assumed. Recommended obtaining as-built records to enhance survey information and trial excavations to confirm position and depth in critical areas.

ELECTRICITY

Unable to detect electricity cables within the survey area. Routes shown have been assumed. Recommended obtaining as-built records to enhance survey information and trial excavations to confirm position and depth in critical areas.

TELECOM

No telecom apparatus have been found within the survey area. For further information regarding BT apparatus please contact Openreach directly.

CATV

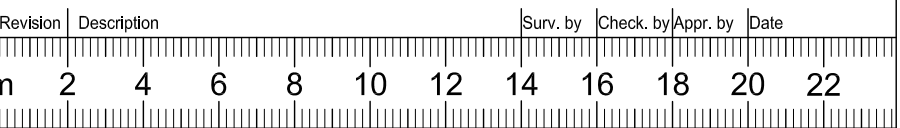
No CATV ducts have been found within the survey area. Recommended obtaining as-built records to enhance survey information and trial excavations in critical areas.

UNKNOWN

Some unknown targets identified on the drawing using GPR are classified as "non-linear targets". These are not consistent with what we expect to see when identifying a buried utility, and appear on the drawing as single targets without the line, no linking between depth readings. This does not mean they are not utilities, we are just unable to positively identify them as a utility. We would strongly recommend that further verification survey (PAS 128:2022 survey type A) are carried out to identify these targets in critical areas.

PAS 128:2022 Quality Level Guide		
Quality Level	Description	Accuracy
Q1 (CL-Q1)	A utility expected to exist but cannot be detected - (AR), (R), (V)	Unlimited
Q2 (CL-Q2)	Horizontal location only using one geophysical technique.	± 50mm Horizontal
Q3 (CL-Q3)	Horizontal location only using one geophysical technique.	± 50mm Horizontal
Q4 (CL-Q4)	Horizontal and vertical location only using one geophysical technique.	± 25mm or ± 40% of depth whichever is greater
Q5 (CL-Q5)	Horizontal and vertical location only using one geophysical technique.	± 15mm or ± 15% of depth whichever is greater
Q6 (CL-Q6)	Service verified by an open excavation, made an inspection chamber, or by the use of the point-to-point method or other	± 50mm Horizontal

Desktop Utility Records		
Utility Type	Provider Details	Date Acquired
Drainage	Sewer, Street Water	04/11/2022 (Historical)
Water	Sewer, Street Water	04/11/2022 (Historical)
Gas	Gasnet	04/11/2022 (Historical)
Electricity	National Grid Electricity Distribution	04/11/2022 (Historical)
Telecom	Openreach	05/12/2022 (Historical)
CATV	Virgin Media	04/11/2022 (Historical)
Telecom & Pylons	Unicom/Broadband	04/11/2022 (Historical)



Topographical and PAS 128:2022 Utility Survey



Horiba MIRA
Watling Street, Nuneaton
Warwickshire
CV10 0TU

Scale	Sheet Size	Sheet Number	Date
1:200	A0	1	March 2023

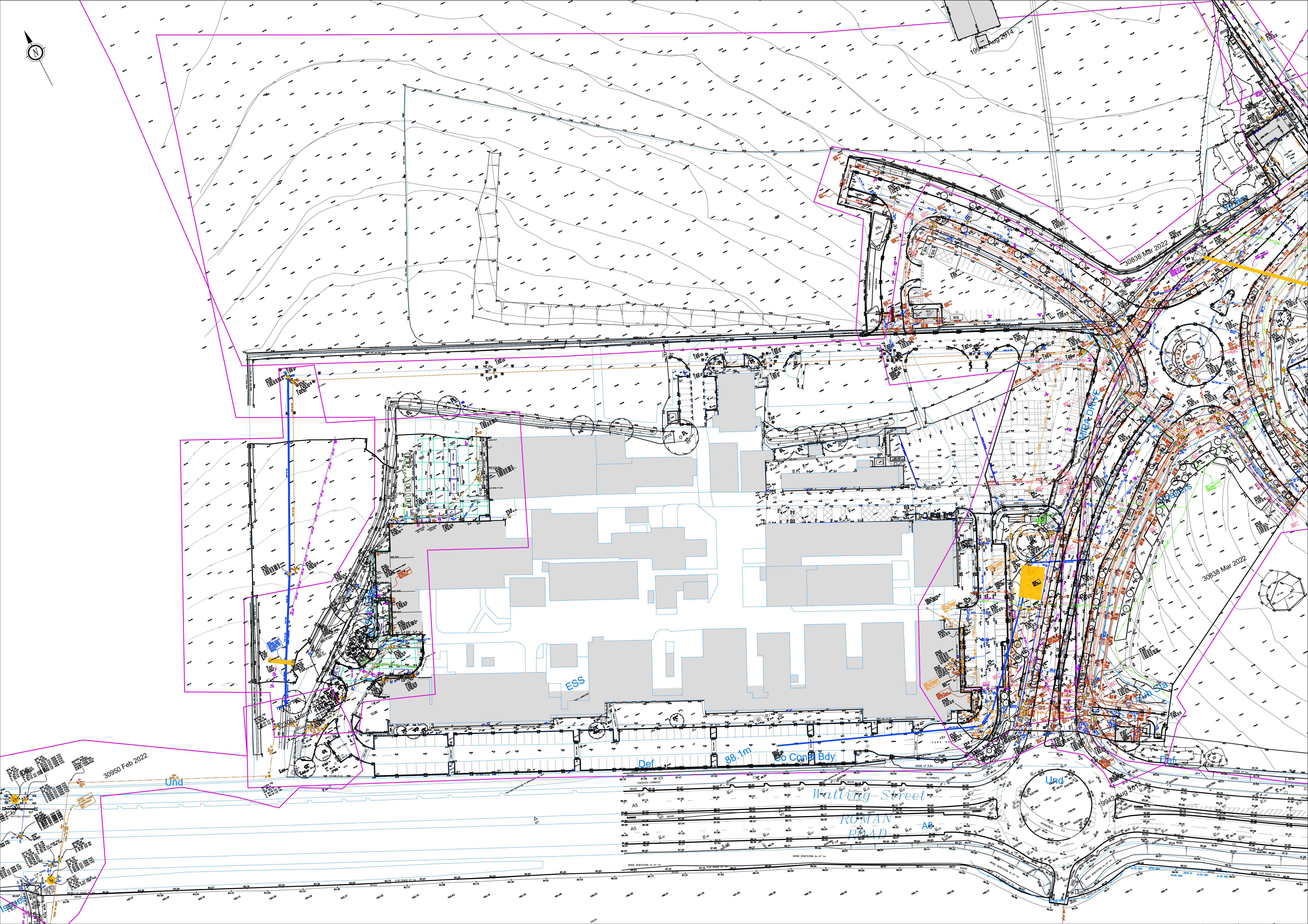
Project Number: 32306

Checked by: M/LKB

Approved by: TS/AH



Head Office: Milton Keynes t: 01908 965561 e: m@mk-surveys.co.uk



Appendix B – BGS Borehole Data

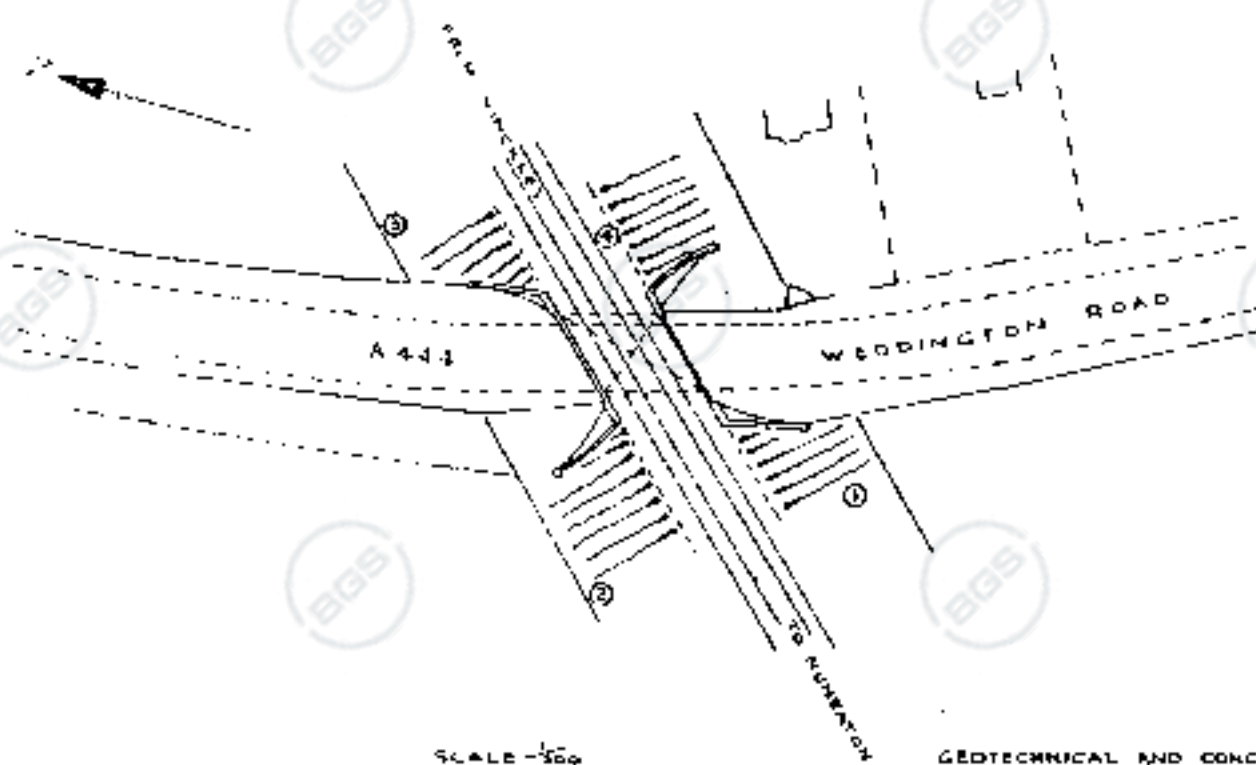


BOREHOLE RECORD SHEET

Job No. 1529 ~~3956/316~~ Date 3-2-91-1-1964; ...
 Location. 64 066 N 35 N. NEWTON 36088 94442
 Furnished and for LONDON MIDLAND REGION - BRITISH RAILWAYS BOARD.
 Gauge No. 3. Diameter 6 INCHES.
 Ground Line. 267 47 A.C.D. Scale 1/4 INCH TO 1 FOOT
 81.67

Depth (m)	W.C.	Q.S.D.	Legend	Depth	Thickness	Sample	Water Level
266.0				11.0			
267.0				11.0			
Brown, large sand and very sandy clay						11.0	
268.0				11.0		11.0	
269.0				11.0		11.0	
270.0				11.0		11.0	
271.0				11.0		11.0	
272.0				11.0		11.0	
273.0				11.0		11.0	
274.0				11.0		11.0	
275.0				11.0		11.0	
276.0				11.0		11.0	
277.0				11.0		11.0	
278.0				11.0		11.0	
279.0				11.0		11.0	
280.0				11.0		11.0	
281.0				11.0		11.0	
282.0				11.0		11.0	
283.0				11.0		11.0	
284.0				11.0		11.0	
285.0				11.0		11.0	
286.0				11.0		11.0	
287.0				11.0		11.0	
288.0				11.0		11.0	
289.0				11.0		11.0	
290.0				11.0		11.0	
291.0				11.0		11.0	
292.0				11.0		11.0	
293.0				11.0		11.0	
294.0				11.0		11.0	
295.0				11.0		11.0	
296.0				11.0		11.0	
297.0				11.0		11.0	
298.0				11.0		11.0	
299.0				11.0		11.0	
300.0				11.0		11.0	
301.0				11.0		11.0	
302.0				11.0		11.0	
303.0				11.0		11.0	
304.0				11.0		11.0	
305.0				11.0		11.0	
306.0				11.0		11.0	
307.0				11.0		11.0	
308.0				11.0		11.0	
309.0				11.0		11.0	
310.0				11.0		11.0	
311.0				11.0		11.0	
312.0				11.0		11.0	
313.0				11.0		11.0	
314.0				11.0		11.0	
315.0				11.0		11.0	
316.0				11.0		11.0	
317.0				11.0		11.0	
318.0				11.0		11.0	
319.0				11.0		11.0	
320.0				11.0		11.0	
321.0				11.0		11.0	
322.0				11.0		11.0	
323.0				11.0		11.0	
324.0				11.0		11.0	
325.0				11.0		11.0	
326.0				11.0		11.0	
327.0				11.0		11.0	
328.0				11.0		11.0	
329.0				11.0		11.0	
330.0				11.0		11.0	
331.0				11.0		11.0	
332.0				11.0		11.0	
333.0				11.0		11.0	
334.0				11.0		11.0	
335.0				11.0		11.0	
336.0				11.0		11.0	
337.0				11.0		11.0	
338.0				11.0		11.0	
339.0				11.0		11.0	
340.0				11.0		11.0	
341.0				11.0		11.0	
342.0				11.0		11.0	
343.0				11.0		11.0	
344.0				11.0		11.0	
345.0				11.0		11.0	
346.0				11.0		11.0	
347.0				11.0		11.0	
348.0				11.0		11.0	
349.0				11.0		11.0	
350.0				11.0		11.0	
351.0				11.0		11.0	
352.0				11.0		11.0	
353.0				11.0		11.0	
354.0				11.0		11.0	
355.0				11.0		11.0	
356.0				11.0		11.0	
357.0				11.0		11.0	
358.0				11.0		11.0	
359.0				11.0		11.0	
360.0				11.0		11.0	
361.0				11.0		11.0	
362.0				11.0		11.0	
363.0				11.0		11.0	
364.0				11.0		11.0	
365.0				11.0		11.0	
366.0				11.0		11.0	
367.0				11.0		11.0	
368.0				11.0		11.0	
369.0				11.0		11.0	
370.0				11.0		11.0	
371.0				11.0		11.0	
372.0				11.0		11.0	
373.0				11.0		11.0	
374.0				11.0		11.0	
375.0				11.0		11.0	
376.0				11.0		11.0	
377.0				11.0		11.0	
378.0				11.0		11.0	
379.0				11.0		11.0	
380.0				11.0		11.0	
381.0				11.0		11.0	
382.0				11.0		11.0	
383.0				11.0		11.0	
384.0				11.0		11.0	
385.0				11.0		11.0	
386.0				11.0		11.0	
387.0				11.0		11.0	
388.0				11.0		11.0	
389.0				11.0		11.0	
390.0				11.0		11.0	
391.0				11.0		11.0	
392.0				11.0		11.0	
393.0				11.0		11.0	
394.0				11.0		11.0	
395.0				11.0		11.0	
396.0				11.0		11.0	
397.0				11.0		11.0	
398.0				11.0		11.0	
399.0				11.0		11.0	
400.0				11.0		11.0	
401.0				11.0		11.0	
402.0				11.0		11.0	
403.0				11.0		11.0	
404.0				11.0		11.0	
405.0				11.0		11.0	
406.0				11.0		11.0	
407.0				11.0		11.0	
408.0				11.0		11.0	
409.0				11.0		11.0	
410.0				11.0		11.0	
411.0				11.0		11.0	
412.0				11.0		11.0	
413.0				11.0		11.0	
414.0				11.0		11.0	
415.0				11.0		11.0	
416.0				11.0		11.0	
417.0				11.0		11.0	
418.0				11.0		11.0	
419.0				11.0		11.0	
420.0				11.0		11.0	
421.0				11.0		11.0	
422.0				11.0		11.0	
423.0				11.0		11.0	
424.0				11.0		11.0	
425.0				11.0		11.0	
426.0				11.0		11.0	
427.0				11.0		11.0	
428.0				11.0		11.0	
429.0				11.0		11.0	
430.0				11.0		11.0	
431.0				11.0		11.0	
432.0				11.0		11.0	
433.0				11.0		11.0	
434.0				11.0		11.0	
435.0				11.0		11.0	
436.0				11.0		11.0	
437.0				11.0		11.0	
438.0				11.0		11.0	
439.0				11.0		11.0	
440.0				11.0		11.0	
441.0				11.0		11.0	
442.0				11.0		11.0	
443.0				11.0		11.0	
444.0				11.0		11.0	
445.0				11.0		11.0	
446.0				11.0		11.0	
447.0				11.0		11.0	
448.0				11.0		11.0	
449.0				11.0		11.0	
450.0				11.0		11.0	
451.0				11.0		11.0	
452.0				11.0		11.0	
453.0				11.0		11.0	
454.0				11.0		11.0	
455.0				11.0		11.0	
456.0				11.0		11.0	
457.0				11.0		11.0	
458.0				11.0		11.0	
459.0				11.0		11.0	
460.0				11.0			

DEPTH PLAN SHOWING BOREHOLE POSITIONS



SCALE - 1:500

GEOTECHNICAL AND CONCRETE SERVICES

REP No 1325 FEBRUARY 1964

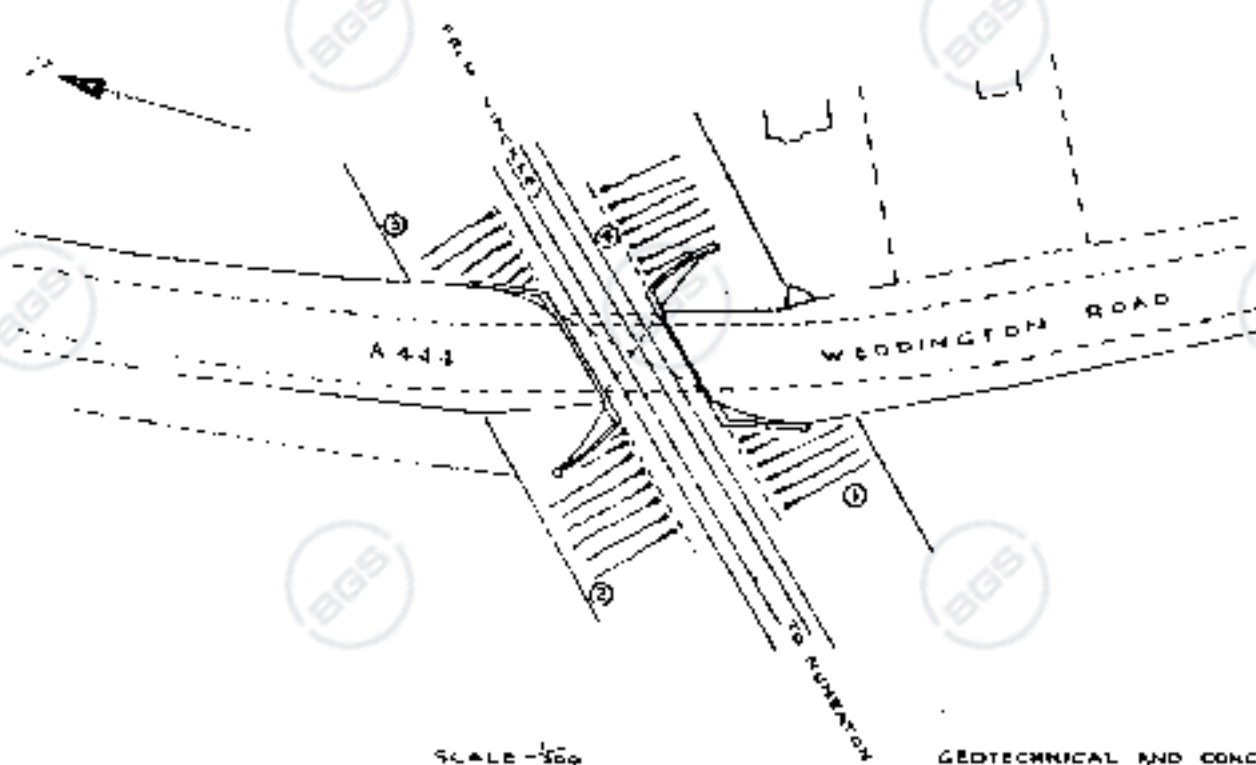
SPRINT 314-317

BOREHOLE RECORD SHEET

Job No. 524 SP 3936/317
 Date 1-2-64
 Location E.E. GORE RD 35, NUNEATON
 Client Mr. LONDON MIDLAND REGION - BRITISH RAILWAYS BOARD
 Drawing No. 41
 Drawing Scale 2 INCHES
 Goods Laid 283.75 400
 Notes 86.68
 Scale 1/4 INCH TO 1 FOOT

Description	M.C.	O.S.D.	Legend	Depth	Thickness	Sample	Water Levels
Hard - sand - shales	2857		X	0' 0"			
Under ground - clay, mudstone, shale and sandstone sections.	2862		X	1' 6"	7' 6"	N = 10 X 194-610 O 55b	
Thinly bedded sand containing nodules below 510			X	15' 0"		N = 40 blows for fine no further penetration X 170-710 O 45b	
			X			X 120-136 N = 19	
			X			O 15b X 150-166 N = 11	
	2872		X	16' 6"		Delta. → K 4 (3-2-44)	
			X		9' 6"	[113 252	Net water 200
	2887		X	21' 0"		[Live 250	
			X		(100)		
			X			O 30b	
	2917		X	31' 0"			
			X			End of Bore	

DEPTH PLAN SHOWING BOREHOLE POSITIONS



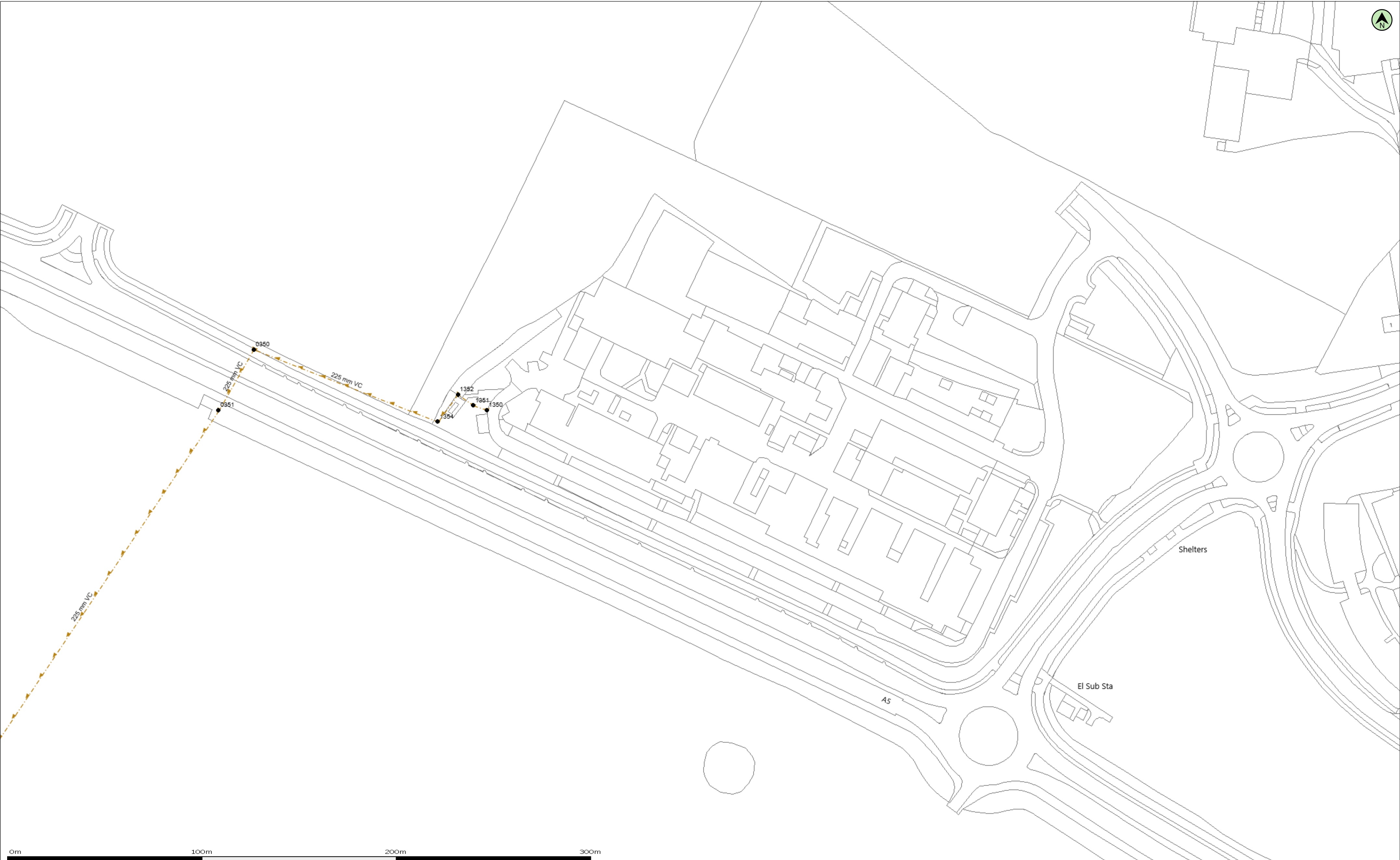
SCALE - 1:500

GEOTECHNICAL AND CONCRETE SERVICES

REP No 1325 FEBRUARY 1964

SPRINT 314-317





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Public Foul Gravity/Lateral Drain		Highway Drain		Manhole Foul	
Public Combined Gravity/Lateral Drain		Overflow Pipe		Manhole Surface	
Public Surface Water Gravity/Lateral Drain		Disposal Pipe		Abandoned Pipe	
Pressure Foul		Culverted Water Course		Chamber	
Pressure Combined		Pumping Station		Section 154 sewers are shown in green	
Pressure Surface Water		Fitting		Private sewers are shown in magenta	

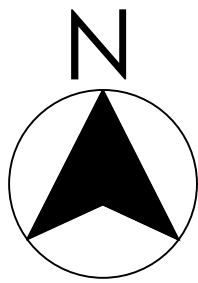
bparmar@jmsengineers.co.uk
CO23/0129/03



Appendix D – Proposed Site Plan

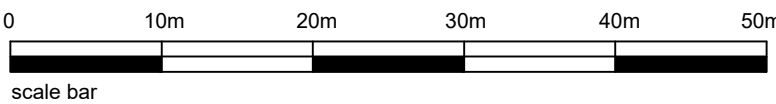


DO NOT SCALE



HORIBA-MIRA Boundary

Proposed extension



No		Note	
1. All dimensions in mm unless indicated.			

Rev	By	Date	Description	Chk'd



Walling Street
Nuneaton
Warwickshire
CV10 0TU
England
TEL +44 (0)24 7635 5000
FAX +44 (0)24 7635 8000

ESTATES MANAGEMENT

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Project:
**HORIBA-MIRA
SITE PLAN**

Drawing Title:
**PROPOSED
FACILITY EXTENSION**

Drawn	Chk'd	Appd	Status	Date
KC	MH	MH	Information	Jan 2023

Project No: 2023-001-FE Scale @ A1: 1:500

Drawing No: 2023-001-FE-SK-01 Rev:

Appendix E – Microdrainage Calculations



JMS (Midlands) Ltd		Page 1
Victoria Count	HORIBA MIRA	
Tennant St Nuneaton	Workshop Extension	
Warwickshire CV11 4LZ	CO23/O129/O2	
Date 05/06/2023	Designed by BP	
File	Checked by	
XP Solutions	Network 2018.1	

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)	2	PIMP (%)	100
M5-60 (mm)	19.700	Add Flow / Climate Change (%)	0
Ratio R	0.405	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

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	22.200	0.230	96.5	0.024	5.00	0.0	0.600	o	150	Pipe/Conduit	
1.001	24.800	0.250	99.2	0.024	0.00	0.0	0.600	o	150	Pipe/Conduit	
2.000	36.000	0.360	100.0	0.023	5.00	0.0	0.600	o	150	Pipe/Conduit	
1.002	13.000	0.090	144.4	0.024	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.003	3.100	0.080	38.8	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	5.36	84.400	0.024	0.0	0.0	0.0	1.02	18.1	3.2
1.001	50.00	5.77	84.170	0.048	0.0	0.0	0.0	1.01	17.8	6.5
2.000	50.00	5.60	84.660	0.023	0.0	0.0	0.0	1.00	17.8	3.1
1.002	50.00	6.03	83.920	0.095	0.0	0.0	0.0	0.83	14.7	12.9
1.003	50.00	6.06	83.830	0.095	0.0	0.0	0.0	1.62	28.7	12.9

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JMS (Midlands) Ltd		Page 2																																
Victoria Count	HORIBA MIRA																																	
Tennant St Nuneaton	Workshop Extension																																	
Warwickshire CV11 4LZ	CO23/0129/02																																	
Date 05/06/2023	Designed by BP																																	
File	Checked by																																	
XP Solutions		Network 2018.1																																
<u>Free Flowing Outfall Details for Storm</u> <table border="1"> <thead> <tr> <th>Outfall Pipe Number</th> <th>Outfall C. Level Name (m)</th> <th>I. Level (m)</th> <th>Min I. Level (m)</th> <th>D,L (mm)</th> <th>W (mm)</th> </tr> </thead> <tbody> <tr> <td>1.003</td> <td>85.000</td> <td>83.750</td> <td>0.000</td> <td>0</td> <td>0</td> </tr> </tbody> </table> <u>Simulation Criteria for Storm</u> Volumetric Runoff Coeff 0.750 Additional Flow - % of Total Flow 0.000 Areal Reduction Factor 1.000 MADD Factor * 10m³/ha Storage 2.000 Hot Start (mins) 0 Inlet Coefficient 0.800 Hot Start Level (mm) 0 Flow per Person per Day (l/per/day) 0.000 Manhole Headloss Coeff (Global) 0.500 Run Time (mins) 60 Foul Sewage per hectare (l/s) 0.000 Output Interval (mins) 1 Number of Input Hydrographs 0 Number of Storage Structures 1 Number of Online Controls 1 Number of Time/Area Diagrams 0 Number of Offline Controls 0 Number of Real Time Controls 0 <u>Synthetic Rainfall Details</u> <table border="1"> <thead> <tr> <th>Rainfall Model</th> <th>FSR</th> <th>Profile Type</th> <th>Summer</th> </tr> </thead> <tbody> <tr> <td>Return Period (years)</td> <td>2</td> <td>Cv (Summer)</td> <td>0.750</td> </tr> <tr> <td>Region</td> <td>England and Wales</td> <td>Cv (Winter)</td> <td>0.840</td> </tr> <tr> <td>M5-60 (mm)</td> <td>19.700</td> <td>Storm Duration (mins)</td> <td>30</td> </tr> <tr> <td>Ratio R</td> <td>0.405</td> <td></td> <td></td> </tr> </tbody> </table>			Outfall Pipe Number	Outfall C. Level Name (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)	1.003	85.000	83.750	0.000	0	0	Rainfall Model	FSR	Profile Type	Summer	Return Period (years)	2	Cv (Summer)	0.750	Region	England and Wales	Cv (Winter)	0.840	M5-60 (mm)	19.700	Storm Duration (mins)	30	Ratio R	0.405		
Outfall Pipe Number	Outfall C. Level Name (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)																													
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JMS (Midlands) Ltd		Page 3
Victoria Count	HORIBA MIRA	
Tennant St Nuneaton	Workshop Extension	
Warwickshire CV11 4LZ	CO23/0129/02	
Date 05/06/2023	Designed by BP	
File	Checked by	
XP Solutions	Network 2018.1	
<u>Online Controls for Storm</u> <u>Orifice Manhole: 5, DS/PN: 1.003, Volume (m³): 1.5</u> Diameter (m) 0.049 Discharge Coefficient 0.600 Invert Level (m) 83.830		
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JMS (Midlands) Ltd		Page 4								
Victoria Count	HORIBA MIRA									
Tennant St Nuneaton	Workshop Extension									
Warwickshire CV11 4LZ	CO23/0129/02									
Date 05/06/2023	Designed by BP									
File	Checked by									
XP Solutions	Network 2018.1									
<u>Storage Structures for Storm</u> <u>Tank or Pond Manhole: 4, DS/PN: 1.002</u> Invert Level (m) 83.920 <table><tr><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th></tr><tr><td>0.000</td><td>3.7</td><td>1.000</td><td>73.5</td></tr></table>			Depth (m)	Area (m²)	Depth (m)	Area (m²)	0.000	3.7	1.000	73.5
Depth (m)	Area (m²)	Depth (m)	Area (m²)							
0.000	3.7	1.000	73.5							
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JMS (Midlands) Ltd

Page 5

Victoria Count

Tennant St Nuneaton

Warwickshire CV11 4LZ

HORIBA MIRA

Workshop Extension

CO23/O129/O2

Date 05/06/2023

File

Designed by BP

Checked by

XP Solutions

Network 2018.1

Micro Drainage

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 Coefficient 0.800

Manhole Headloss Coeff (Global) 0.500

Flow per Person per Day (l/per/day) 0.000

Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0

Number of Storage Structures 1

Number of Online Controls 1

Number of Time/Area Diagrams 0

Number of Offline Controls 0

Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR

Ratio R 0.408

Region England and Wales

Cv (Summer) 0.750

M5-60 (mm) 19.800

Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0

Analysis Timestep 2.5

Second Increment (Extended)

DTS Status OFF

DVD Status OFF

Inertia Status OFF

Profile(s) Summer and Winter

Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440

Return Period(s) (years) 1, 30, 100

Climate Change (%) 0, 0, 40

US/MH

PN

Name

Storm

Return Period

Climate Change

First (X) Surge

First (Y) Flood

First (Z) Overflow

Overflow Act.

Water Level (m)

1.000

1

15 Winter

1

+0%

30/30 Winter

84.445

1.001

2

30 Winter

1

+0%

30/15 Summer

84.243

2.000

3

15 Winter

1

+0%

100/30 Winter

84.704

1.002

4

30 Winter

1

+0%

1/15 Summer

84.234

1.003

5

30 Winter

1

+0%

1/15 Summer

84.222

Surcharged Flooded

US/MH

PN

Name

Depth (m)

Volume (m³)

Flow / Cap.

Overflow (l/s)

Pipe Flow (l/s)

Status

Level Exceeded

1.000

1

-0.105

0.000

0.19

3.3

OK

1.001

2

-0.077

0.000

0.29

4.9

OK

2.000

3

-0.106

0.000

0.19

3.2

OK

1.002

4

0.164

0.000

0.24

3.2

SURCHARGED

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Victoria Count

Tennant St Nuneaton

Warwickshire CV11 4LZ

HORIBA MIRA

Workshop Extension

CO23/O129/O2

Date 05/06/2023

File

Designed by BP

Checked by

XP Solutions

Network 2018.1

Micro Drainage

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 Coefficient 0.800

Manhole Headloss Coeff (Global) 0.500

Flow per Person per Day (l/per/day) 0.000

Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0

Number of Storage Structures 1

Number of Online Controls 1

Number of Time/Area Diagrams 0

Number of Offline Controls 0

Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR

Ratio R 0.408

Region England and Wales

Cv (Summer) 0.750

M5-60 (mm) 19.800

Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0

Analysis Timestep 2.5

Second Increment (Extended)

DTS Status OFF

DVD Status OFF

Inertia Status OFF

Profile(s) Summer and Winter

Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440

Return Period(s) (years) 1, 30, 100

Climate Change (%) 0, 0, 40

US/MH

PN

Name

Storm

Return Period

Climate Change

First (X) Surge

First (Y) Flood

First (Z) Overflow

Overflow Act.

Water Level (m)

1.000

1

60 Winter

30

+0%

30/30 Winter

84.557

1.001

2

60 Winter

30

+0%

30/15 Summer

84.550

2.000

3

15 Winter

30

+0%

100/30 Winter

84.732

1.002

4

60 Winter

30

+0%

1/15 Summer

84.538

1.003

5

60 Winter

30

+0%

1/15 Summer

84.522

Surcharged

Flooded

Pipe

US/MH

PN

Name

Depth (m)

Volume (m³)

Flow / Cap.

Overflow (l/s)

Pipe Flow (l/s)

Status

Level Exceeded

1.000

1

0.007

0.000

0.24

4.1

SURCHARGED

1.001

2

0.230

0.000

0.41

7.0

SURCHARGED

2.000

3

-0.078

0.000

0.45

7.7

OK

1.002

4

0.468

0.000

0.31

4.2

SURCHARGED

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Victoria Count

Tennant St Nuneaton

Warwickshire CV11 4LZ

HORIBA MIRA

Workshop Extension

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Designed by BP

Checked by

XP Solutions

Network 2018.1

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 Coefficient 0.800

Manhole Headloss Coeff (Global) 0.500

Flow per Person per Day (l/per/day) 0.000

Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0

Number of Storage Structures 1

Number of Online Controls 1

Number of Time/Area Diagrams 0

Number of Offline Controls 0

Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR

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Cv (Summer) 0.750

M5-60 (mm) 19.800

Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0

Analysis Timestep 2.5

Second Increment (Extended)

DTS Status OFF

DVD Status OFF

Inertia Status OFF

Profile(s) Summer and Winter

Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 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) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	1	15 Winter	100	+40%	30/30 Winter				85.095
1.001	2	15 Winter	100	+40%	30/15 Summer				84.991
2.000	3	60 Winter	100	+40%	100/30 Winter				84.845
1.002	4	60 Winter	100	+40%	1/15 Summer				84.837
1.003	5	60 Winter	100	+40%	1/15 Summer				84.818

Surcharged Flooded

US/MH Name

Depth (m)

Volume (m³)

Flow / Cap.

Overflow (l/s)

Pipe Flow (l/s)

Status

Level Exceeded

1.000

1

0.545

0.000

0.68

11.7

SURCHARGED

1.001

2

0.671

0.000

1.29

21.9

SURCHARGED

2.000

3

0.035

0.000

0.43

7.4

SURCHARGED

1.002

4

0.767

0.000

0.37

5.0

FLOOD RISK

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Winter</td><td>84.556</td><td>0.656</td><td>5.0</td><td>12.3</td><td>0 K</td></tr><tr><td>480 min Winter</td><td>84.330</td><td>0.430</td><td>5.0</td><td>5.3</td><td>0 K</td></tr><tr><td>600 min Winter</td><td>84.139</td><td>0.239</td><td>4.9</td><td>1.9</td><td>0 K</td></tr><tr><td>720 min Winter</td><td>84.039</td><td>0.139</td><td>4.5</td><td>0.8</td><td>0 K</td></tr><tr><td>960 min Winter</td><td>84.002</td><td>0.102</td><td>3.7</td><td>0.6</td><td>0 K</td></tr><tr><td>1440 min Winter</td><td>83.979</td><td>0.079</td><td>2.6</td><td>0.4</td><td>0 K</td></tr><tr><td>2160 min Winter</td><td>83.964</td><td>0.064</td><td>1.9</td><td>0.3</td><td>0 K</td></tr><tr><td>2880 min Winter</td><td>83.956</td><td>0.056</td><td>1.5</td><td>0.3</td><td>0 K</td></tr><tr><td>4320 min Winter</td><td>83.946</td><td>0.046</td><td>1.1</td><td>0.2</td><td>0 K</td></tr><tr><td>5760 min Winter</td><td>83.941</td><td>0.041</td><td>0.9</td><td>0.2</td><td>0 K</td></tr><tr><td>7200 min 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Winter</td><td>11.424</td><td>0.0</td><td>72.2</td><td>288</td></tr><tr><td>600 min Winter</td><td>9.574</td><td>0.0</td><td>75.6</td><td>330</td></tr><tr><td>720 min Winter</td><td>8.283</td><td>0.0</td><td>78.5</td><td>376</td></tr><tr><td>960 min Winter</td><td>6.586</td><td>0.0</td><td>83.2</td><td>488</td></tr><tr><td>1440 min Winter</td><td>4.760</td><td>0.0</td><td>90.2</td><td>724</td></tr><tr><td>2160 min Winter</td><td>3.434</td><td>0.0</td><td>97.6</td><td>1104</td></tr><tr><td>2880 min Winter</td><td>2.722</td><td>0.0</td><td>103.2</td><td>1464</td></tr><tr><td>4320 min Winter</td><td>1.958</td><td>0.0</td><td>111.3</td><td>2172</td></tr><tr><td>5760 min Winter</td><td>1.549</td><td>0.0</td><td>117.4</td><td>2824</td></tr><tr><td>7200 min Winter</td><td>1.291</td><td>0.0</td><td>122.3</td><td>3592</td></tr></tbody></table>						Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status	10080 min Summer	83.938	0.038	0.8	0.2	0 K	15 min Winter	84.740	0.840	5.0	21.1	Flood Risk	30 min Winter	84.825	0.925	5.0	26.2	Flood Risk	60 min Winter	84.854	0.954	5.0	28.1	Flood Risk	120 min Winter	84.821	0.921	5.0	25.9	Flood Risk	180 min Winter	84.769	0.869	5.0	22.8	Flood Risk	240 min Winter	84.708	0.808	5.0	19.3	Flood Risk	360 min Winter	84.556	0.656	5.0	12.3	0 K	480 min Winter	84.330	0.430	5.0	5.3	0 K	600 min Winter	84.139	0.239	4.9	1.9	0 K	720 min Winter	84.039	0.139	4.5	0.8	0 K	960 min Winter	84.002	0.102	3.7	0.6	0 K	1440 min Winter	83.979	0.079	2.6	0.4	0 K	2160 min Winter	83.964	0.064	1.9	0.3	0 K	2880 min Winter	83.956	0.056	1.5	0.3	0 K	4320 min Winter	83.946	0.046	1.1	0.2	0 K	5760 min Winter	83.941	0.041	0.9	0.2	0 K	7200 min Winter	83.937	0.037	0.7	0.2	0 K	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	10080 min Summer	0.979	0.0	116.0	5096	15 min Winter	135.128	0.0	26.7	23	30 min Winter	88.754	0.0	35.0	35	60 min Winter	55.544	0.0	43.9	60	120 min Winter	33.591	0.0	53.0	96	180 min 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XP Solutions		Source Control 2018.1

Model Details

Storage is Online Cover Level (m) 84.900

Tank or Pond Structure

Invert Level (m) 83.900

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	4.0	1.000	73.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0105-5000-1000-5000
Design Head (m)	1.000
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	105
Invert Level (m)	83.900
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

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

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

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

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Victoria Count Tennant St Nuneaton Warwickshire CV11 4LZ	Lab Extension, MIRA CO23/0129/02																	
Date 26/04/2023 File SOURCE CONTROL.SRCX	Designed by BP Checked by																	
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Victoria Count Tennant St Nuneaton Warwickshire CV11 4LZ		
Date 17/08/2023 11:17 File	Designed by AndrewBurnley Checked by	
XP Solutions Source Control 2018.1		

IH 124 Mean Annual Flood

Input

Return Period (years)	2	Soil	0.450
Area (ha)	6.770	Urban	0.000
SAAR (mm)	700	Region Number	Region 4

Results l/s

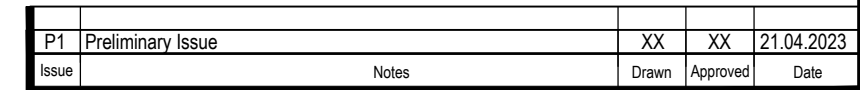
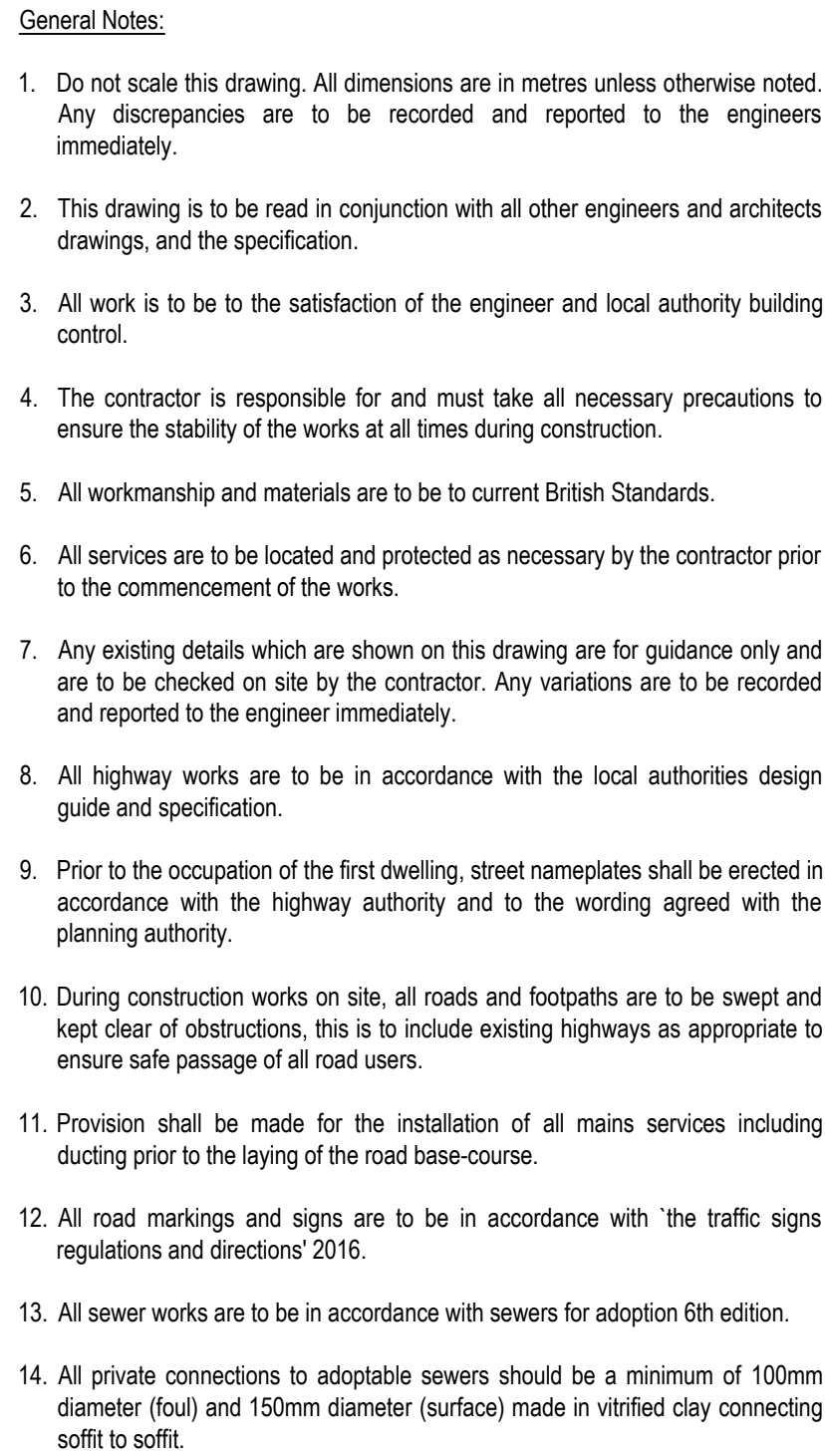
QBAR Rural	37.1
QBAR Urban	37.1
Q2 years	33.2
Q1 year	30.8
Q2 years	33.2
Q5 years	45.6
Q10 years	55.2
Q20 years	65.9
Q25 years	69.6
Q30 years	72.6
Q50 years	81.6
Q100 years	95.2
Q200 years	111.9
Q250 years	117.5
Q1000 years	154.2

Warning: It is unusual to use the IH124 method with an area < 50ha. The Interim Code of Practice recommends that the IH124 method is applied with 50ha and the resulting discharge is linearly interpolated for the required area. The ICP SUDS tab will do this automatically.

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Appendix F – Drainage Strategy

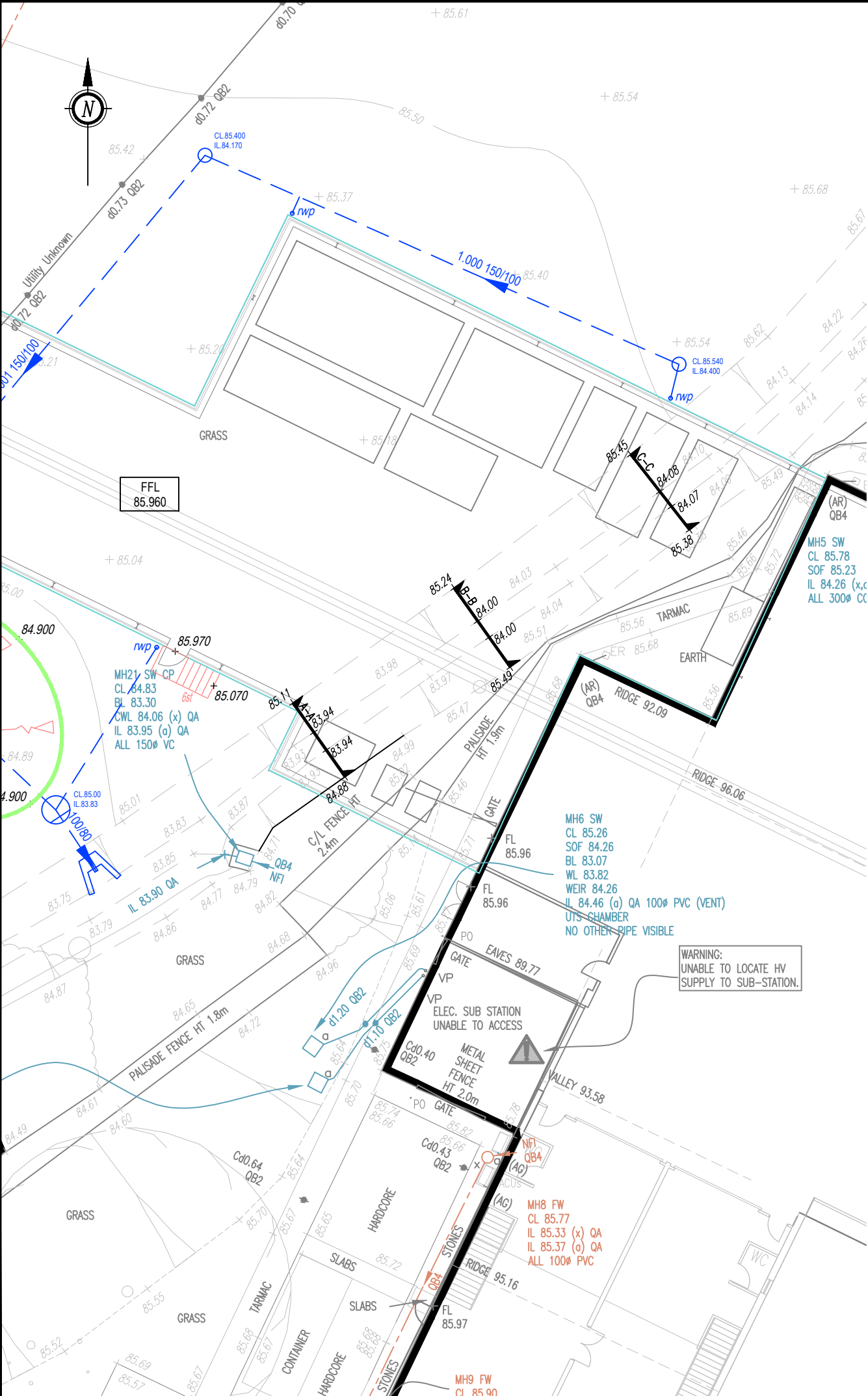




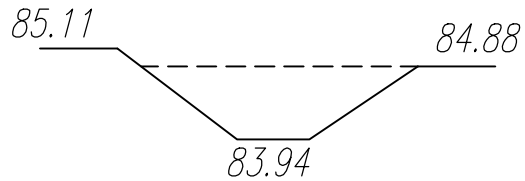
Original Sheet Size: A1

Appendix G – Watercourse & Culvert Flow Calculations

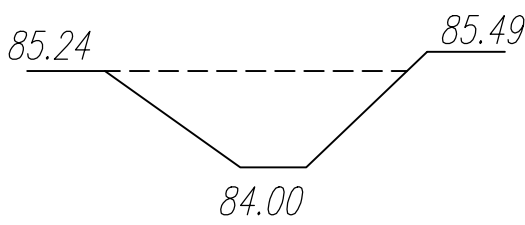




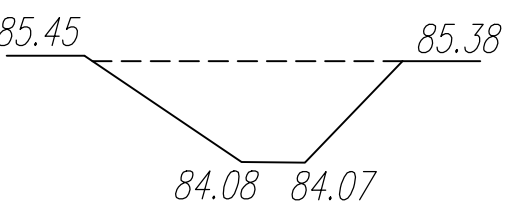
A-A



B-B



C-C



Issue		Notes		Drawn		Approved		Date	
									
Issuing Office: JMS Midlands (Nuneaton): Victoria Court, 25 Tennant Street Nuneaton, Warwickshire, United Kingdom, CV11 4LZ, Tel: 02476 350505									
Project: HORIBA MIRA Workshop Extension									
Drawing Title: Culverted Channel Sections									
Project No. CO23/0129/02				Drawing No. SK01				Issue P1	
SKETCH									

	Channel		
	A	B	C
Manning's coefficient, n	0.04	0.04	0.04
Area, A	2.1	2.9	3.1
Wetted perimeter, P	4.2	4.8	5
Hydraulic Radius, R	0.50	0.60	0.62
Channel Slope, S	0.01	0.01	0.01
Q	4.3	6.5	7.8

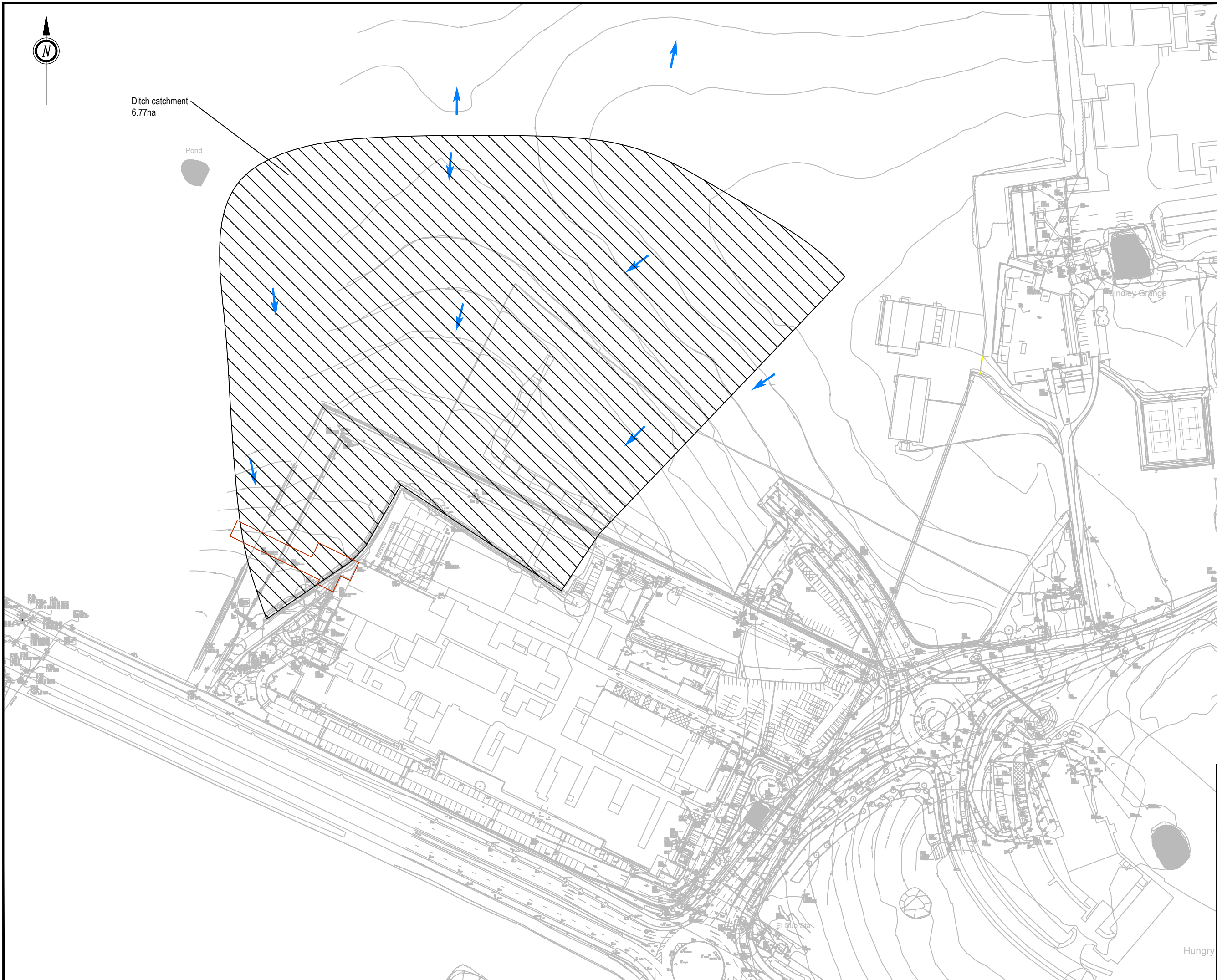
	Box culvert
Manning's coefficient, n	0.013
Width, b	2
Height, h	1
Area, A	2
Wetted perimeter, P	6
Hydraulic Radius, R	0.33
Channel Slope, S	0.01
Q	9.48





Ditch catchment
6.77ha

Pond



Not to Scale

P1 Preliminary Issue		AB AB 17.08.2023	
Issue	Notes	Drawn	Approved
			
Issuing Office: JMS Midlands (Nuneaton): Victoria Court, 25 Tennant Street Nuneaton, Warwickshire, United Kingdom, CV11 4LZ, Tel: 02476 350505			
Project: Horiba MIRA Workshop Extension Walling Street, Nuneaton, CV10 0TU			
Drawing Title: Ditch Catchment Plan			
Project No. CO23/0129/02	Drawing No. SK02	Issue P1	
SKETCH			



Issuing Office:
JMS Midlands (Nuneaton): Victoria Court, 25 Tennant Street
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Project:
Horiba MIRA Workshop Extension
Walling Street, Nuneaton, CV10 0TU

Drawing Title:
Ditch Catchment Plan

Project No. CO23/0129/02	Drawing No. SK02	Issue P1
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SKETCH

Original Sheet Size: A3