

# Technical design note

Project name	North star Academy		
Design note title	Internal Foundations check		
Document reference	23941-HYD-XX-XX-TN-GE-1002		
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Date	29 January 2024	Approved	✓

## 1. Introduction

### 1.1 Terms of reference

In November 2022, Hydrock was commissioned by ISG Limited (the Client) to undertake a review of the pad foundations at the site of the proposed Northstar Academy building. The site is located at Hallen Drive, Sea Mills, Bristol.

The site has remained partially completed since February 2022 after the previous main works Contractor entered administration. The majority of the substructure had been completed.

Hydrock understands that the site has been acquired by North Star Academy. The proposed development is a school for those with special educational needs. A proposed development layout (DKA, August 2020, Drawing FS0779-DKA-00-ZZ-DR-A-1201), is presented in Appendix A.

This Technical Note should be read in conjunction with Hydrock Ground Investigation Report, referenced 23941-HYD-XX-XX-RP-GE-1001, dated 9<sup>th</sup> September 2022.

The investigation works have been undertaken in accordance with Hydrock's proposal referenced (23941-NSA-HYD-XX-XX-GE-FQ-1001, August 2022) and the Client's instructions to proceed (Email via Tim Thompson on 3rd August 2022).

### 1.2 Objectives

These works and the previous works undertaken by Hydrock have been commissioned to investigate the previous completed foundation works and compare this with the original design.

The object of the investigation was therefore to confirm the depth of every pad foundation on the perimeter of the building and the internal foundations of the single storey structure. A requirement to confirm the concrete classification of the underlying soils is also needed.

### 1.3 Available information

The following documents, reports etc have been provided to Hydrock by ISG for use in the preparation of this report:

- » Ruddlesden Geotechnical, September 2018. Geotechnical Investigation and Contamination Assessment Report, North Star Academy, Hallen Drive, Bristol. Report Ref: AC/ JW/ SR/ 18379/ GICAR.

- » CJ Associates, January 2022. Factual and Interpretative Report, North Star Academy. Report Ref: 2070787.
- » Clegg Associates, February 2021. North Star Academy, Foundations Tree Influence Zones. Drawing Ref: 2019-101-FS0779-CAL-00-ZZ-DR-S-009-C01.
- » Clegg Associates, May 2021. North Star Academy, Foundation Layout. Drawing Ref: 2019-101-FS0779-CAL-01-FD-DR-S-0100.
- » Clegg Associates, November 2019. North Star Academy, Cut & Fill. Ref: 2019-101-NSA-CAL-00-XX-DR-C-360-P2
- » Hydrock Ground Investigation Report, referenced 23941-HYD-XX-XX-RP-GE-1001, dated 9<sup>th</sup> September 2022.

It is understood that the Client defined in Section 1.1 has obtained assignment of the above documents and Hydrock has assumed full reliance can be placed upon their contents. Should this not be the case, Hydrock should be informed at the earliest opportunity.

## 2. Ground investigation records and data

### 2.1 Site works

The fieldwork took place between 19 December 2022 and 16 February 2023. The ground investigation locations were positioned based on the construction grid shown in the Clagg Associates foundation drawings and are shown on the Exploratory Hole Location Plan (Hydrock Drawing 23941-HYD-XX-XX-DR-GE-1001-S2-P2) in Appendix A.

Cross sections through the inspection pits are presented on Hydrock Drawings 23941-HYD-XX-XX-DR-GE-1003 to 1012 in Appendix A.

The logs, including details of ground conditions, soil sampling, in situ testing and any installations, are also presented in Appendix B.

*Table 2-1: Summary of site works*

Activity	Method	No	Name	Depth	Rationale
<b>Foundation Inspections</b>	Mechanical Excavation	39	FPA1-13, FPB1 & 13, C1- & 13, D1-3 & 10-12, F-L 5-9	0.50 – 3.00	To investigate the profile of the ground conditions and depth of pad foundations. To collect samples for testing.
<b>Probes</b>	Dynamic Probe	4	DP01 – DP04	2.9 - 3.9	To gain a strength profile of the ground conditions through the Made Ground for the single storey footprint.
<b>Window Sample Boreholes</b>	Window Sample Rig	3	WS01 – WS03	2.5 –3.0	To investigate the profile of the ground conditions and collect samples for testing for the single storey.

### 2.2 Strata Encountered

The ground conditions encountered during the investigation comprised as follows:

Made Ground was encountered from surface typically comprising greyish brown slightly clayey angular to subangular fine to coarse gravel of limestone and brick fragments. Occasional fragments of breeze blocks, plastic strapping and timber were also encountered. Made Ground is likely to have been derived from the demolition of the former structure of the site which has been spread out across the site. Made Ground on the west of the site around the two-storey section of the building ranges in depth between 0.5-1.3m in depth but is deeper below the single storey structure ranging between 0.5 –2.4m thick (typically 1.3m thick). On the east of the site the Made Ground has been used raise the original ground level to provide a level platform for the development. In some locations the Made Ground has been described as a reworked natural material where it predominantly comprises of a reddish-brown gravelly clay but contains some element of anthropogenic material. It is considered that the Made Ground has not been placed in accordance with an earthwork specification.

The Made Ground is underlain by the Mercia Mudstone Group which is encountered as a firm to stiff reddish brown clay with occasional mudstone lithorelicts.

## 2.3 Geotechnical laboratory testing and data

The geotechnical tests undertaken by Hydrock are summarised in Table 2-2 and the test certificates are provided in Appendix C. Wherever possible, UKAS accredited procedures have been used.

Table 2-2: Summary of sample numbers for geotechnical tests

Test	Made Ground	Mercia Mudstone
Moisture content	-	13
Atterberg limits	-	13
BRE SD1 (reduced)	11	-

### 2.3.1 Moisture content

The natural moisture contents of the materials ranged between 15% and 24%, with an average value of 19%.

### 2.3.2 Plasticity

The volume change potential in terms of BRE Digest 298 with respect to building near trees have been determined from the results of plasticity index tests on samples of soil. These are summarised in Table 2-3.

Table 2-3: Volume change potential

GI	No. of tests	Plasticity Index			Modified Plasticity Index			Plasticity designation	Volume Change Potential
		Min.	Max	Av.	Min.	Max.	Av.		
Ruddlesden Geotechnical	6	12	21	16	8	20	13	Intermediate –Medium	Low – Medium
C J Associates	9	13	19	15	10	18	13	Low	Low
Hydrock GI	1		19	19		19	19	Medium	Low

Hydrock Supplementary GI	13	11	16	14	11	16	12	Low	Low
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### 2.3.3 Sulphate content

In accordance with BRE (Special Digest 1), the Design Sulphate (DS) classification and the Aggressive Chemical Environment for Concrete (ACEC) classification are presented in Table 2-4. The assessment summary sheet is presented in Appendix C.

Table 2-4: Aggressive chemical environment concrete classification

Stratum	No. tests	DS	ACEC
Made Ground	13	DS-2	AC-2

Hydrock drawing 23941-HYD-XX-XX-DR-GE-1013 shows the locations that samples were collected from the Made Ground and the concentration of water-soluble sulphate (2:1 extract). A simplistic approach based on the concentration of water soluble sulphate is shown on the drawing. Concentrations over 500mg/l a concrete class of DS-2 is required. The drawing shows that sulphate concentrations are elevated within the Made Ground across the whole of the site including the two storey and single storey sections of the building.

It is likely that the elevated sulphate concentrations are the results of the demolition of the former structures which are likely to have contained plaster (containing gypsum).

## 2.4 Obstructions

A number of obstructions were encountered during the investigation, preventing the base of the foundations to be identified. These are summarised in Table 2-5.

Table 2-5: Summary of obstructions encountered

Location	Depth (m bgl)	Obstruction Detail
FPA5	1.00	Concrete obstruction associated with adjacent drainage.
FPA6	0.50	Concrete obstruction.
FPA7	1.00	Concrete obstruction associated with adjacent drainage.

## 3. Geotechnical assessment

The intrusive ground investigation by Ruddlesden determined that all foundations were to be placed below any Made Ground within the firm to stiff silty natural clay at a minimum depth of 0.90m bgl, deepened within the influence of trees (and where Made Ground is prevalent).

The report advised that an allowable bearing capacity of 150kN/m<sup>2</sup> could be achieved within the firm to stiff natural clays and recommended that any pads would need to be founded with a minimum embedment depth of KLLmm into the Mercia Mudstone Formation.

A second ground investigation was undertaken by CJ Associated revised the volume change potential to low and recommended a minimum foundation depth of M.Lm and would provide an allowable bearing capacity of MN0kN/m<sup>2</sup>.

The existing foundations were inspected using a mechanical excavator to investigate the depth of the base of the pads and the founding stratum. For the purposes of this assessment the pads have

been labelled according to the grid layout as shown on the extract of the Foundation GA plan (FSLQQR-HYD-XX-FM-DR-S-MLLL, rev PLK) presented in Appendix A.

### 3.1 External foundations

To calculate the actual bottom of the foundation (BOF) depth of the external foundations within the assessment we have assumed that the top of foundation (TOF) level was achieved at NS.MLm AOD (QTLmm below Finished Floor Level) as per the foundation drawings provided by Clegg Associates.

The following table summarises the proposed founding depths vs. the actual founding depths, the founding stratum and whether the amount of embedment achieved.

Table 3-1: Summary of inspected external foundations

Location	Proposed Bottom of Foundation Depth (m) AOD	Actual Bottom of Foundation Depth (m) AOD	Formation level achieved (Y/ N)	Founding Stratum	Bearing 200mm into natural? (Y/ N)
A1	35.30	35.50	N	Mercia Mudstone	N
B1	35.30	35.60	N	Mercia Mudstone	N
C1	35.30	35.20	Y	Mercia Mudstone	Y
D1	35.00	35.24	N	Mercia Mudstone	N
D2	35.30	35.60	N	Mercia Mudstone	Y
A3	35.65	35.60	Y	Mercia Mudstone	Y
D3	35.65	35.63	Y	Mercia Mudstone	Y
A4	35.65	35.48	Y	Made Ground	N
A5	35.65	*Unknown (Concrete recorded to 35.10)	Y	** Mercia Mudstone Unknown	N/ A
D5	35.65	36.65	Y	Mercia Mudstone	Y
E5	35.65	35.65	Y	Mercia Mudstone	Y
F5***	35.65	35.65	Y	Made Ground	N
G5	35.05	35.58	N	Made Ground	N
H5	34.75	35.48	N	Made Ground	N
J5	34.75	35.57	N	Made Ground	N
K5	34.15	34.75	N	Made Ground	N
L5	34.15	35.27	N	Mercia Mudstone	N
A6	35.65	*Unknown (Concrete recorded to 35.10)	Y	**Mercia Mudstone Unknown	N/ A

F6	35.65	35.60	Y	Mercia Mudstone / Made Ground	N
J6	33.45	34.5	N	Made Ground	N
G6	34.75	35.67	N	Mercia Mudstone	N
H6	34.75	35.35	N	Mercia Mudstone	Y
A7	35.65	*Unknown (Concrete recorded to 35.10)	Y	**Mercia Mudstone Unknown*	N/ A
G7	34.75	35.19	N	Mercia Mudstone	N
F7	35.05	35.65	N	Mercia Mudstone	Y
K7	33.60	35.60	N	Made Ground	N
A8	35.65	35.05	Y	Mercia Mudstone	Y
D9	35.65	35.58	Y	Mercia Mudstone	Y
E9	35.65	35.57	Y	Mercia Mudstone	Y
G9	34.10	35.40	N	Made Ground	N
A9	35.65	35.40	Y	Mercia Mudstone	Y
F9	35.05	35.00	Y	Mercia Mudstone	Y
J9	33.30	34.16	N	Made Ground	N
A10***	35.65	35.57	Y	Mercia Mudstone	N
D10	35.65	35.70	N	Mercia Mudstone	Y
A11	35.40	35.50	N	Mercia Mudstone	Y
D11	34.65	34.57	Y	Mercia Mudstone	Y
A12	35.40	35.64	N	Mercia Mudstone	Y
C12	35.10	35.66	N	Mercia Mudstone	N
D12	34.60	35.66	N	Mercia Mudstone	N
A13	35.10	35.60	N	Mercia Mudstone	Y
B13	34.60	35.66	N	Mercia Mudstone	N
C13	34.60	35.20	N	Mercia Mudstone	N

\*Refused on Concrete at these depths

\*\*Currently assumed to be founded on top of Mercia Mudstone

\*\*\* Further assessment bearing capacity check undertaken on pad location. See Table 3-2.

Key:

	Founding depth and depth to embedment achieved
	Founding depth and depth to embedment not achieved
	Unknown –Requires further investigation

\*A concrete obstruction was encountered within A5, A6 and A7. This is thought to have been associated with the installed drainage. During the works a hydraulic breaker was not available to allow the progression of the excavation in order to confirm the founding strata. Therefore, While the required formation was achieved it has not been possible to confirm the founding material is suitable. It is likely that these foundations will be within the Mercia Mudstone material (natural) and may not require additional remediation, however for costing purposes it should be assumed that these locations required remediation.

The following pad locations were not investigated;

- » Pad locations A2 was not investigated due to the location of an underground electrical cable. It should be assumed that this location requires remediation.
- » Pad Location B2, C2 and B12 were located inside the existing structure. However, based on the surrounding investigated locations it should be assumed that these have not adequate and require remediation.
- » Pad locations D4 and D9.5 were obstructed by a drainage manhole and were not investigated.
- » Pad location K6 and J7 are pads which are shown on plans to be joined (J6-J7 and K6-K7) therefore the pad has only be investigated on one side but assumed to be the same across the foundation.
- » Pad Locations K9 and L6-9 were obstructed by a boundary fence and therefore these locations could not be investigated but based on the investigation of pad L5 it is likely that these pads will not have achieve the required depth and remediation is likely to be required. In addition, it would be recommended that foundations are piled to minimise potential differential settlement.
- » No access was possible for internal pits on grid lines B-C 3-10. However, these locations are outside tree influence. No remedial action proposed.

The pad foundation on grid line A10 has achieved the required bearing depth but the embedment of the foundation within the natural strata has not been achieved (minimum 200mm embedment). Where this occurs the bearing capacity of the pad may be reduced.

Pad foundation F5 is founded within the Made Ground but has achieved the required founding depth. Based on the dynamic probes the bearing capacity of the Made Ground has been assessed. The Made Ground is considered to provide adequate bearing capacity with minimal settlement <10mm.

*Table 3-2: Summary of bearing capacity for external pads that have not achieved the minimum embedment.*

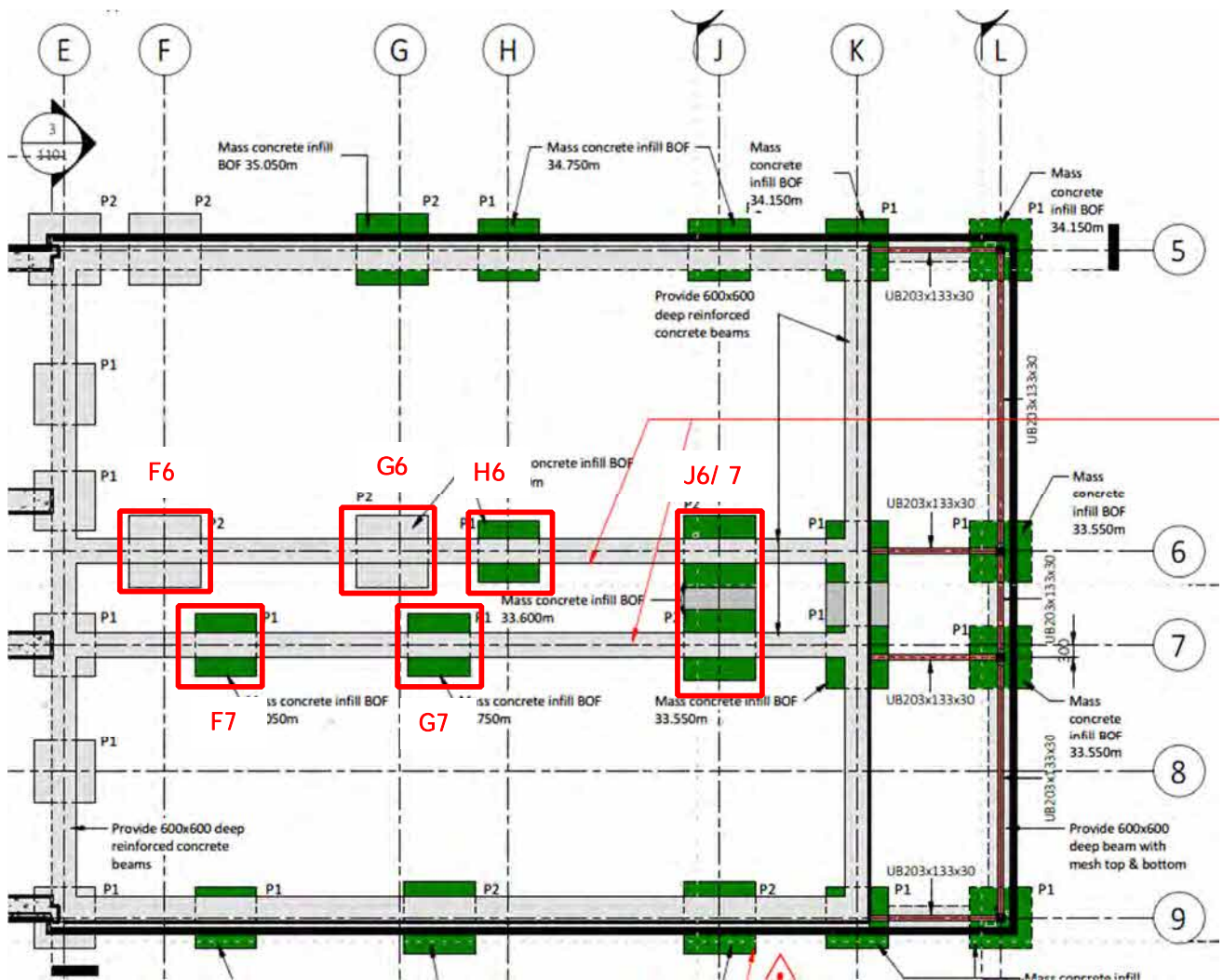
Pad	Proposed Loads kN (SLS)	Pad size (m)	Foundation pressure (kN m <sup>2</sup> )
AAB	MNT	M.TL x M.TL	ML Q
FC	NLL	M.QT x M.QT	RO

The foundation pressure is less than the 150kN/m<sup>2</sup> recommended in the ground investigation report and Hydrock assessment indicates that the pad foundation is adequate.

### 3.2 Internal foundations

As above, for the purposes of this assessment the internal pads have been labelled according to the grid layout as shown on the extract of the Foundation GA plan (FSLOQR-HYD-XX-FM-DR-S-MLLL, rev PLK) presented in Appendix A. Therefore, the pads have been labelled FS, GS, HS, JS, FQ GQ and JQ

Figure 3-1: Extract of foundation GA plan



For the internal foundations, the formation level was calculated using the structural slab level (SSL) at a level of NS.OTm AOD, and the corresponding top of the formation (TOF) being taken as NS.MLm AOD as before.

Where the foundations were influenced by trees the pads were to sit on mass concrete of varying depths. This information including the achieved formation levels and the stratum they were founded in is tabulated below.

Table 3-3: Internal Pad summary and achieved formation levels

Pad	Mass concrete mm	Anticipated bottom of formation (BOF) m AOD	Formation level achieved m AOD	Formation level achieved (Y/ N)	Stratum at achieved BOF	Bearing 200mm into natural? (Y/ N)
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FD	SXL	NT.ST	NT.SK	Y	MG: Grey Gravel	N
GD	RLL	NX.QT	NT.ST	N	Firm-stiff clay (MMG)	N
HD	RLL	NX.QT	NT.NS	N	Firm-stiff clay (MMG)	Y
JD	KKLL	NN.XT	NX.KL	N	MG: Former slab	N
FE	SLL	NT.L T	NT.ST	N	Firm clay (MMG)	Y
GE	SLL	NX.QT	NT.MR	N	Firm clay (MMG)	N)
JE	KKLL	NN.XT	NX.KL	N	MG: Former slab	N

**Key:**

	Founding depth and depth to embedment achieved
	Founding depth and depth to embedment not achieved

It should be noted that internal foundations below the two-storey building have not been investigated as part of our assessment. However, where these foundations are within the influence of trees it should be assumed that the foundations have not achieved the require depths and require remediation.

### 3.2.1 Bearing Capacity

Based on the various pad sizes and their proposed loadings the actual foundation pressures have been calculated for each pad and are shown in Table NK below.

Table 3-4: Summary of loads, pad size and foundation pressures

Pad	Proposed Loads kN (SLS)	Pad size (m)	Foundation pressure (kN m <sup>2</sup> )
FD	N ML	M.QT x M.QT	ML M
GD	NKL	M.QT x M.QT	MLX
HD	NLL	M.TL x M.TL	MN N
JD	NMT	M.QT x M.QT	MLN
FE	N TL	M.TL x M.TL	MT S
GE	XLL	M.TL x M.TL	MQO
JE	NRL	M.QT x M.QT	MK Q
KE	KLL	M.TL x M.TL	OR

The hand shear vanes undertaken within the firm, stiff and very stiff clays during the Hydrock investigation show a range of values of between TL and MXOkPa with an average value of RNkPa. The dynamic probe data show similar ranges and suggests an average shear strength value of ~QL kPa. These values therefore support an allowable bearing capacity of MTLkN/m<sup>2</sup>.

Of the seven internal pads, FQ and GQ slightly exceed the allowable bearing capacity quoted by the Ruddlesden report for the Mercia Mudstone. Therefore, Hydrock have undertaken a bearing capacity check of these foundations which has shown that foundation pressures of  $MTSkN/m^k$  and  $MOOkN/m^k$  for FQ and GQ respectively are acceptable within the achieved bearing stratum.

Pads GS, HS, FQ and GQ have been founded within the Mercia Mudstone Group, however GQ and GS did not achieve the minimum embedment as stated within the Ruddlesden report of at least  $KLLmm$ . In addition, none of these foundations with the exception of FS (in Made Ground) achieved their proposed bottom of formation (BOF) depth which was the minimum required in order to account for the removal of trees.

The remainder of the foundations (FS, JS, KQ and JQ) have been founded within either granular Made Ground (FS) or on a former concrete slab (JS and JQ). In addition, the inspection of FS pad indicates a plastic drainage pipe which underlies the base of the foundation. For JS and JQ the inspections appeared to indicate that the former concrete slab was in fact founded within natural materials of the firm to stiff clay.

### 3.2.2 Settlement

The intrusive dynamic probe data has been used to create stiffness profiles of the bearing soils. Following this exercise an assessment of the potential total settlement has been undertaken using Simple Elastic Theory applying a Boussinesq type distribution of stress increase to the ground from the expected range of loads. The results of this are summarised below

Table 3-5: Summary of loads, pad size, foundation pressures and calculated settlement

Pad	Proposed Loads kN (SLS)	Pad size (m)	Foundation pressure (kN m <sup>2</sup> )	Settlement (mm)
FD	NML	M.QT x M.QT	MLM	T.L
GD	NKL	M.QT x M.QT	MLX	T.L
HD	NLL	M.TL x M.TL	MNN	N.T
JD	NMT	M.QT x M.QT	MLN	K.T
FE	NTL	M.TL x M.TL	MTS	R.T
GE	XLL	M.TL x M.TL	MOO	Q.T
JE	NRL	M.QT x M.QT	MKQ	N.L
KE	KLL	M.TL x M.TL	OR	M.Q

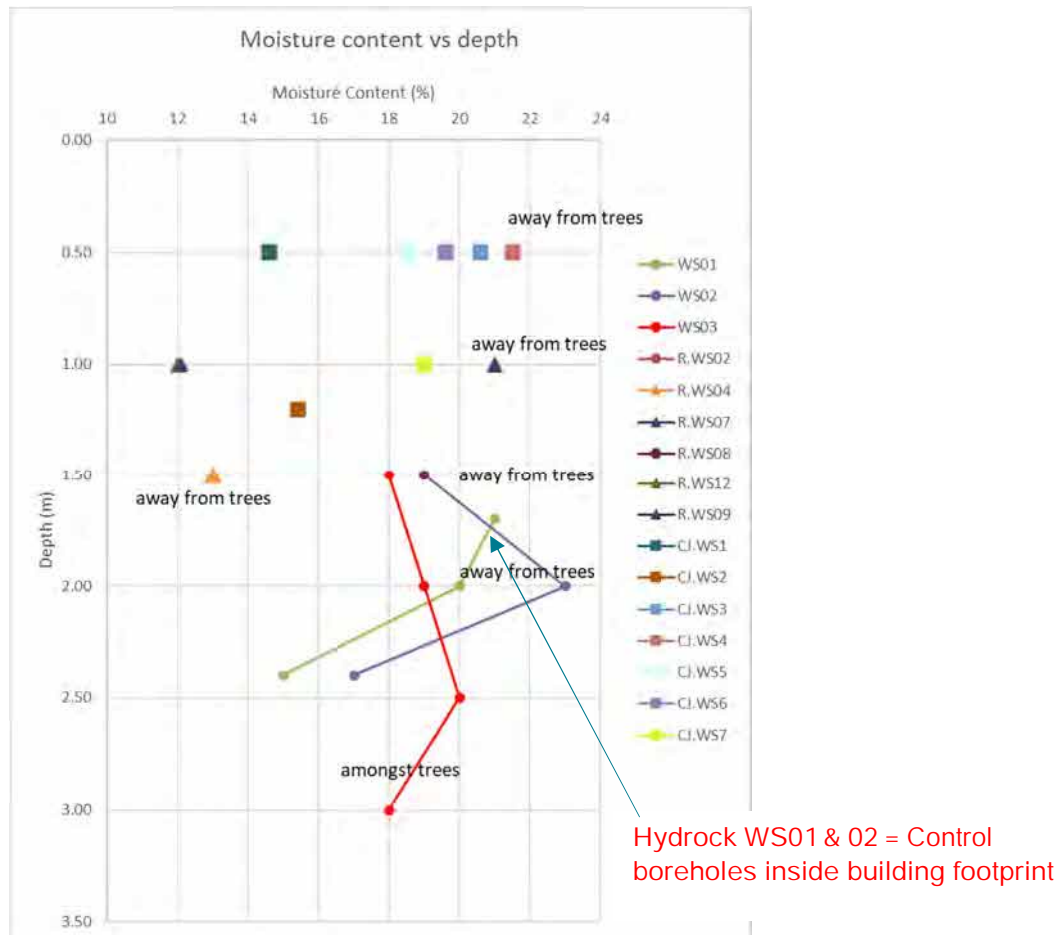
### 3.2.3 Heave / Shrinkage Potential

The samples tested have a modified plasticity index range of 6-20% with an average value of 11%. The results indicate that the clay beneath the site has predominantly a low volume change potential with one sample from the Ruddlesden report indicating medium volume change.

This investigation undertook two window samples (WS01 & WS02) within the footprint of the single storey building (both being outside the influence of trees) and a third window sample hole (WS03) outside the footprint within the influence of trees. The purpose being to gain information on any differences in the moisture content with depth between the areas sampled.

Previous shallow moisture content results were also taken into account. Any indication that there is a deficit of moisture from an equilibrium value would infer a clay layer could have the potential to heave and vice-versa; should there be a heightened moisture compared to the equilibrium, then a clay layer has the potential to shrink in the summer (and/or due to tree influence).

A graphical summary of the laboratory Natural Moisture Content test results against depth are plotted below.



The plot of natural moisture content against depth indicates that the two window samples within the footprint of the building contain higher moisture contents between founding depth and 2m than that of the Hydrock borehole situated within the influence of trees (WS03) located outside the building footprint.

With the exception of one (1.5m deep) sample of weathered Mercia Mudstone tested from the previous Ruddlesden borehole WS04, the moisture content of natural clay soils beneath the founding level within the building to 2m depth are similar to those previously sampled from shallow positions away from trees. Towards 2.5m depth under the building; the moisture content tends to a slightly drier value than that sampled from deep soils situated amongst trees. This would suggest that the moisture content of deeper material beneath the building is influenced more by its extremely heavily over-consolidated nature than seasonal effects i.e a moisture more representative of a non-shrinkable Mudstone Rock than a susceptible clay. The more weathered materials above rockhead appear to have been encapsulated below the building at a wet equilibrium and are unlikely to swell and would show little shrinkage from seasonal effects over time given the cover provided by the building. There could however be shrinkage from any tree root influence in the Spring & Summer months where foundations are not deep enough and within the influence of tree roots.

Pad A11 has been recorded as not achieving the required founding depth, however the current depth of the foundation is 100mm above the required depth. Therefore, an assessment has been undertaken to estimate the heave and settlement potential of this thickness of material. The moisture content of the material is likely to be wet of the equilibrium moisture content and the possible heave as a result of a 3% raise in moisture content would be 1mm however, if the material dries out as a result of tree influence a reduction of 8% moisture content, then the possible settlement would be in the range of 3.5-6.0mm. Therefore, a total range of settlement of 7mm is possible which is negligible but does not account for a differential settlement.

## 4. Geo-environmental Assessment

The Made Ground encountered during this investigation is considered to have been derived from the demolition of the former school building. Therefore, this material has not been screened for its risk to human health as part of the original investigation.

### 4.1 Human Health risk assessment

The recent Made Ground is a plausible contaminant source. The Made Ground comprised of demolition crush material and has been used below the building and the immediate vicinity. The majority of the Made Ground will be below hardstanding.

The potential receptors are considered to be the end site users, people (staff and students) attending the school.

Pathways to the end users are ingestion, skin contact, inhalation of dust and outdoor air.

#### 4.1.1 *Generic Assessment Criteria*

The soil screening values used are generic assessment criteria (GAC) (i.e. derived in accordance with EA CLEA guidance (KLLR) using the updated exposure model detailed in Defra SPMLML (KLMX), with the exception of published CXSLs. The term 'GAC' used in this report is inclusive of all generic soil screening values.

Based on the proposed development, generic assessment criteria (GAC) based on a default residential with homegrown produce for both the ELP and WLP and Public Open Space (Resi) for the ELP, CLEA land use scenarios have been adopted.

- » GAC are selected based on the following hierarchy:
- » Category 4 Screening Levels (C4SL), where available.
- » SoBRA Acute GAC for free cyanide, as acute dose toxicity is the primary risk driver.
- » Hydrock GAC.

#### 4.1.2 *Assessment Results*

A total of six samples of Made Ground have been screened. The individual results have been compared against the GAC for Human Health without home-grown produce (M% SOM) scenario which is considered to be a conservative representative for the site.

There was no concentration of substances at above the GAC with the exception of 1 exceedance from a sample collected from Trial Pit TP0106 at 0.5m bgl. This was a marginal exceedance of Dibenz(ah)anthracene at 0.40mg/kg compared to a GAC of 0.32mg/kg. This concentration is minimal and not considered to be a significant risk.

The Made Ground is not considered to pose a risk to human health and no further consideration is required. However, it should be noted that this material is not considered to be an appropriate growing medium and is therefore unlikely to be exposed at surface.

The laboratory testing results and screened chemical data are provided in Appendix C.

## 5. Conclusions and recommendations

### 5.1 External foundations

Of the 39 external foundations inspected A3,A8, A9, C1, D3 D10,D11 and F9 are the only pads which achieved both founding depth together with the required depth of embedment (200mm) into the correct founding stratum and have therefore been adequately constructed.

The assessment has therefore shown that 31 pads did not achieve either the founding depth or the depth of embedment (or both) and therefore the foundations are not considered wholly adequate.

Following further assessment presented above indicate that the pad foundations F6,A10 and A11 have also been considered to be acceptable. For the 3 remaining founding pads (A5, A6 and A7) the foundation stratum could not be proven as the inspection terminated upon a concrete obstruction associated with the adjacent drainage. At this time, it is assumed that they just sit upon the top of natural deposits without embedment. Although bearing is found to be adequate on this assumption for A5, A6 & A7, it would be prudent to assume that these foundations did not achieve their appropriate founding depth and may therefore be susceptible to tree influence were situated within root zones.

Hydrock drawing 23941-HYD-XX-XX-DR-GE-1001-S2-P4 provided in Appendix A provides a plan showing which pads are acceptable and which require further assessment.

### 5.2 Internal foundations

The investigation has proven that the bearing capacity of the soils is as stated within the Ruddlesden GI report and settlements due to the proposed loadings on the individual pads are within tolerable levels.

However, the investigation has confirmed that the soils exhibit the potential for tree influence in the form of shrinkage from this point at the start of Spring. None of the seven internal pads, achieved either the design founding depth or the depth of embedment (or both) and therefore the foundations are not considered adequate.

In addition to the above foundation pad F6, is constructed over a plastic drainage pipe which is unacceptable. Pads J6 and J7, are currently founded on a former concrete slab, which based on its depth is the remnant of the former school building which occupied the site. However, the extents of this slab are currently unknown. If it does not underlie the entirety of either of these pads there is the potential for differential settlement and therefore failure of these foundations. If the extents of the slab were proven it may be possible to calculate whether the former slab can act as the founding layer for the new pads and therefore these pads could remain in-situ subject to further investigation or remedial action.

### 5.3 Recommendations

#### 5.3.1 Elevated sulphates

Sulphate concentrations are elevated across the site and based on the testing results DS-2 and AC-2 concrete should be used where in contact with Made Ground. The existing concrete used on the scheme is design classification DS-1 and AC-1 based on the recommendations of the original ground investigations.

The elevated sulphate could potentially attack the buried concrete causing it to degrade. In time this may result in the exposure of the reinforcement. Under higher sulphate conditions the pad foundations could degrade resulting in a reduced bearing capacity or corrosion of reinforcement. A reduced life span is likely. The Made Ground in which the sulphates have been identified is typically

granular in nature and therefore permeable, having the ability to allow any water ingress to flow (and disperse sulphates).

The risk of sulphate attack is governed by the movement of water which mobilises the sulphate ions in solution. Groundwater was not recorded during the previous investigations and is therefore expected to be below the deepest investigation location 3.15m bgl. Some water seepage was noted from the Made Ground but this is anticipated to be perched groundwater. Even in unsaturated ground sulphate can migrate by diffusion provided there is sufficient water to coat particles of soil. It is considered unlikely that the groundwater below the site will mobilise sulphate in solution and the key risk is from percolating surface water through the unsaturated Made Ground.

An impermeable barrier could be installed around the exterior of the building in order to break the pathway by minimising the mobilisation of sulphates within any percolating water. A barrier would need to extend into the underlying natural material, cover over any shallow horizontal potential pathways and comprise a material with a permeability of less than  $10^{-7}$  m/s. This could be a root barrier membrane or bentonite grout mix. Details of the proposed impermeable barrier are provided in the Hydrock cut-off barrier specification ref. 23941-HYD-XX-XX-TN-GE-1004. This approach is subject to approval by building control.

### 5.3.2 Underpinning Foundations

Where foundations have been proven not to be adequate, further remedial works are required. It is recommended that inadequate pad and strip foundations are underpinned to achieve suitable founding depths or, where tree influence alone is the aggravating issue, protection by a root barrier system could be employed. Underpinning of pad and strip foundations would need to be undertaken in sequence to allow sufficient support to the existing structure. Replacement below each pad will be progressed in segments. Further details of the underpinning phasing is provided in Hydrock structures drawings (23941-HYD-XX-F1-SK-S-1400). Access to all sides of the pad is likely to be necessary during the underpinning and is likely to require the removal of the floor slab in sections. Alternatively, highlighted inadequate pads could be supported on mini-piles driven around their perimeter and connected by a dowelled ring beam.

A plan showing the pads which require hand dug underpinning is provided in Appendix A.

Underpinning should use a concrete with a design classification of DS-2 and AC-2.

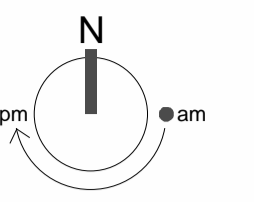
### 5.3.3 Root Barrier

As it is found that soils beneath internal parts of the building are currently at a wet equilibrium, where pads are not deep enough to combat the effects of tree influence alone, they could only be affected by future shrinkage. The introduction of a root barrier (impervious to root and water) at this moment before Spring could therefore inhibit this influence and be a consideration as an alternative to underpinning the single storey foundations. The barrier would need to be installed away from the building to avoid undermining the existing pad foundations and extend to a depth below the tree influence depths. A possible detail is provided in Hydrock sketch 23941-HYD-XX-XX-SK-GE-1001 provided in Appendix A. This approach would be subject to agreement by building control.

It may be possible to utilise this approach on the north and south of the two-storey building. Where foundation depth have achieved the minimal foundation depths for foundations outside the influence of trees (0.75m for low volume change). However, further testing would be necessary in order to confirm the moisture content profile but based on the existing information it is likely to be considered a viable option.

## *Appendix A Drawings*

Contractors must check all dimensions on site. Only figured dimensions are to be worked from. Discrepancies must be reported before proceeding. This drawing is copyright. ©



**PROPOSED SITE KEY**

- Vehicular Macadam
- Concrete finish
- Pedestrian Macadam
- Artificial pitch
- Grass
- Habitat
- Existing hard surface refurbished
- Macadam infill to existing hard surface
- Concrete steps with slip resistant finish and colour contrast nosings.
- Existing trees retained
- Proposed trees, as Landscape Architect's information.
- Bushes
- Root Protection Zone
- Extents of Site
- Assembly Point
- Electric charging point
- Entrance

Refer to Landscape Strategy for soft landscaping and planting proposals.  
Refer to External Works Setting Out drawings for further information on site requirements.

Issue	Date	Revision notes	Dr	CHK'd
P18	26.08.20	Updated CP's following planning changes.	JR	FC
P17	27.05.20	Updated CP's following planning changes.	JR	FC
P16	27.05.20	Bin store and canopy amended for Planning/CP issue.	JR	FC
P15	24.04.20	Issued for CP Stage.	BN	HY
P14	31.03.20	Updated in response to TA comments.	BN	HY
P13	05.03.20	Final CP Submission for information.	BN	HY
P12	04.02.20	Planning submission issued for comment.	BN	HY
P11	21.01.20	Issued for information.	CD	HY
P10	25.10.19	Gateway Submission	FB	AB
P09	23.10.19	Gateway Submission	FB	AB
P08	17.10.19	Issued for comment.	FB	FC
P07	11.10.19	Issued for comment.	FB	AB
P06	10.10.19	Issued for comment.	FB	AB
P05	01.10.19	Issued for comment.	ME2	AB
P04	24.09.19	Issued for comment.	ME2	AB
P03	17.09.19	Issued for comment.	ME2	AB
P02	10.09.19	Issued for comment.	ME2	AB
P01	09.09.19	First issue	ME2	AB

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Client  
**Midas Construction**

Project DKA Project No. | 279701  
**North Star Academy**

Drawing Title  
**Proposed Site Plan**

Project | Originator | Volume | Level | Type | Role | Number  
FS0779 - DKA - 00 - ZZ - DR - A - 1201  
Description Status | Revision  
Suitable for review and comment S3 P18

Scale  
1 : 250@A1 1:500@A1  
0 12.5m



Minibus  
Minibus  
Bin store  
Car Park  
Drop Off  
Staff cycle shelter  
Cycle access  
Vehicular access  
Pedestrian access  
Visitor cycle parking (below canopy)

35.780m  
35.500  
MUGA  
Pitch laid to nominal falls across length of pitch  
1:21  
1:21  
1:21 max.  
1:40  
Shed

Hard landscaping

Existing hard surface (refurbished)

Grass banking

Existing Hard Outdoor Play (refurbished)

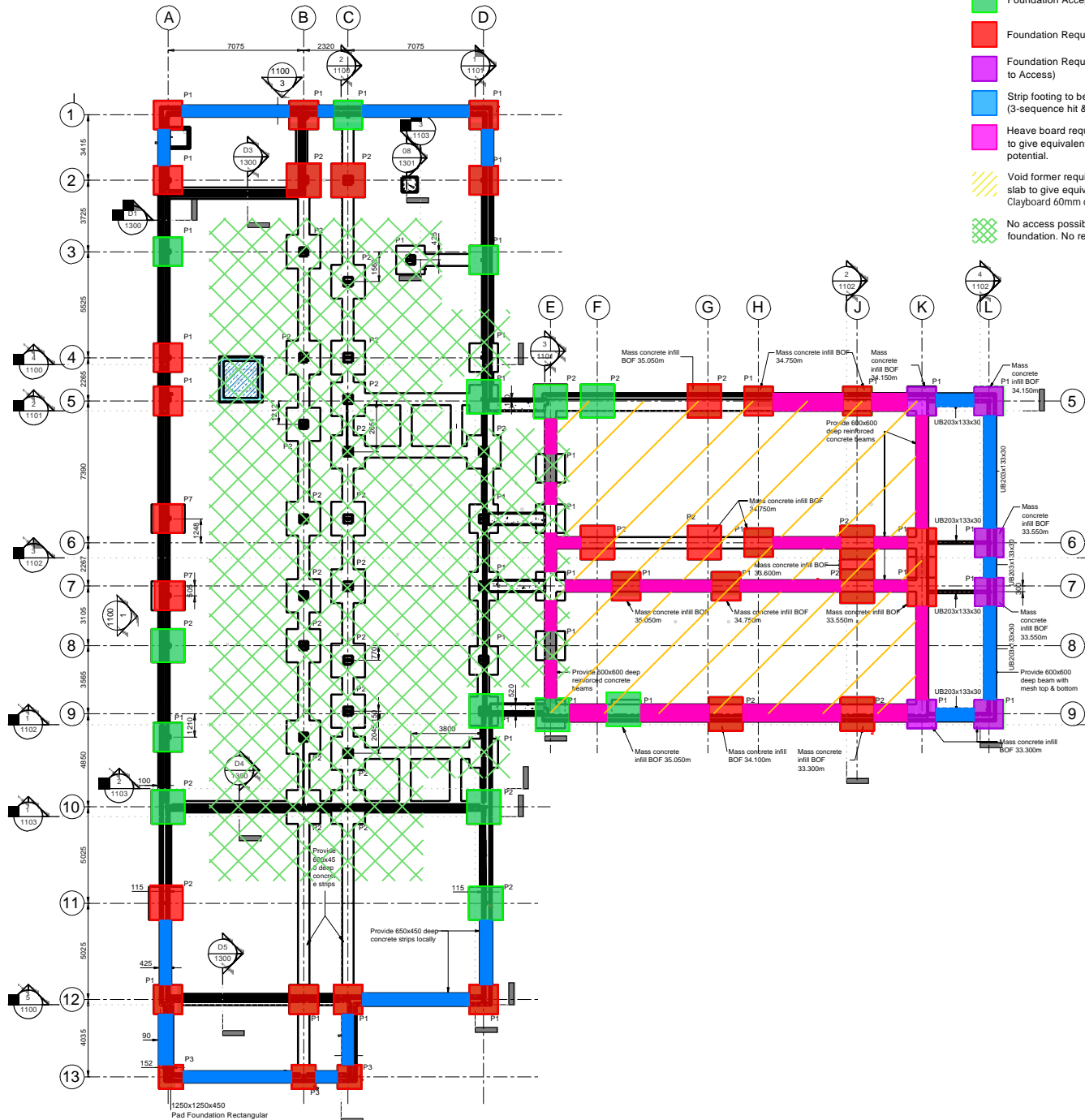
Existing access Maintenance only

Infill macadam in hatched area to square off court.

COMMUNITY DRIVE



OS NORTH



- Foundation Acceptable
- Foundation Requires Piled Underpinning
- Foundation Requires Hand Dug Underpinning (Due to Access)
- Strip footing to be underpinned (3-sequence hit & miss underpinning)
- Heave board required to underpin underside of ground beams to give equivalent 50mm void for low volume change potential.
- Void former required below suspended ground floor slab to give equivalent 50mm void. Dufalite Clayboard 60mm or similar.
- No access possible to determine founding depths of foundation. No remedial action proposed

KEY

NOTES

1. All dimensions are to be checked on site before the commencement of works. Any discrepancies are to be reported to the Architect & Engineer for verification. Figured dimensions only are to be taken from this drawing.
2. This drawing is to be read in conjunction with all relevant Engineers' and Service Engineers' drawings and specifications.
3. This drawing has been based on the following drawings and information:  
Clegg Associates, May 2021. Foundation Layout. Ref: FS0779-CAL-01-FD-DR-S-00100-C04.

P4	GROUND & STRIP FOOTING REMEDIAL REQ ADDED			
	LL	18/04/23	TH / RM	18/04/23
P3	THIRD ISSUE			
	TH	12/04/23	SC	12/04/23
P2	SECOND ISSUE			
	TH	27/03/23	SC	27/03/23
P1	FIRST ISSUE			
	TH	28/02/23	TH	28/03/23
REV.	REVISION NOTES/COMMENTS			
	DRAWN BY	DATE	CHECKED BY	APPROVED BY

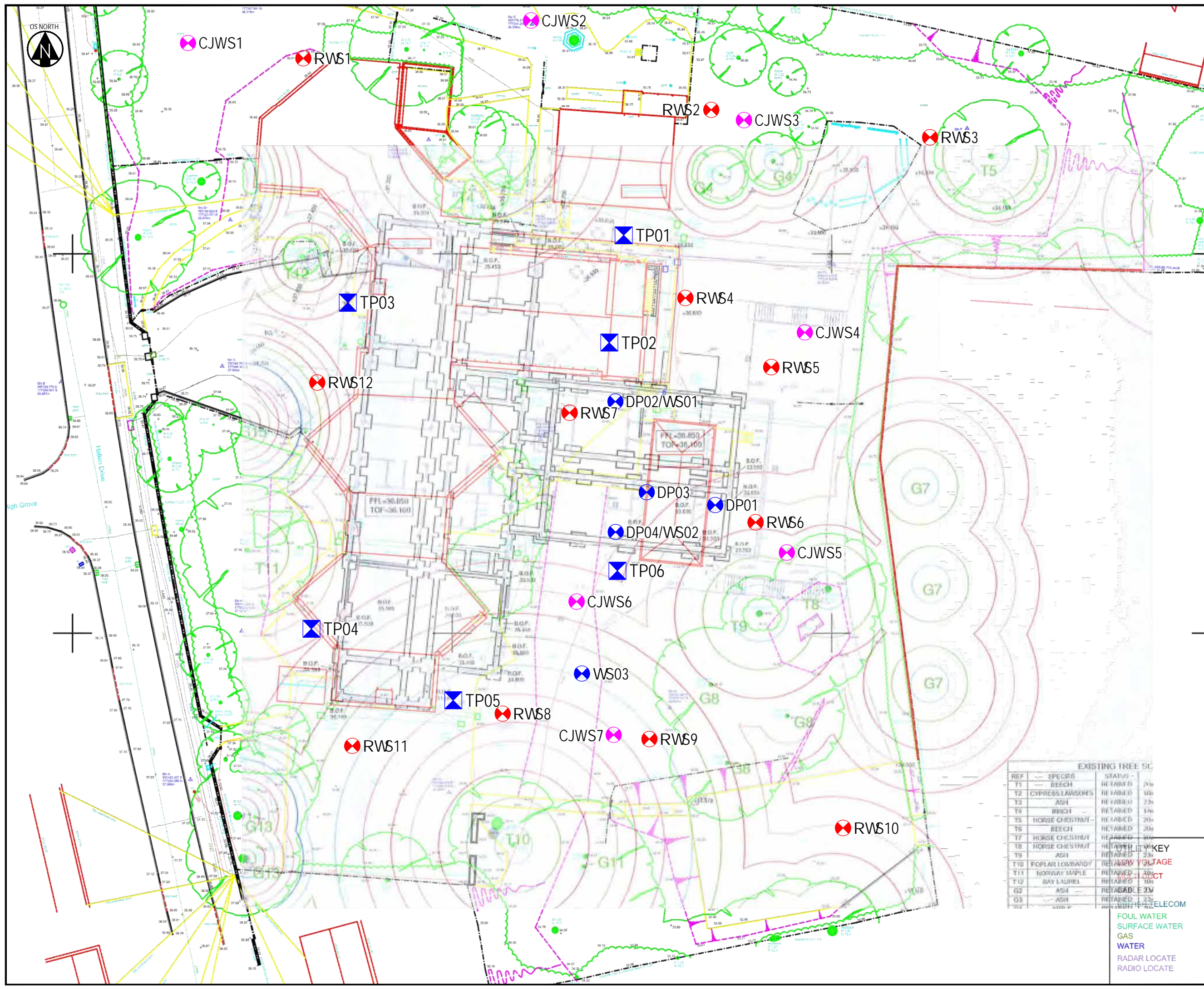
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CLIENT  
ISG LIMITED

PROJECT  
NORTH STAR ACADEMY

TITLE  
FOUNDATION LAYOUT

HYDROCK PROJECT NO. C-23941-C	SCALE @ A4 NTS
PURPOSE OF ISSUE SUITABLE FOR INFORMATION	STATUS S2
DRAWING NO. (PROJECT CODE-ORIGINATOR.ZONE.LEVEL.TYPE.ROLE.NUMBER) 23941-HY-XX-XX-DR-GE-1001	REVISION P4



**KEY**

- ▣ Hydrock Trial Pits
- ⊗ Hydrock Window sample / Dynamic Probe Hole
- ⊗ Ruddlestone Window sample
- ⊗ CJ Associates Window sample

**NOTES**

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SECOND ISSUE			
TH	24/04/23	TH	24/04/23
FIRST ISSUE			
KB	27/02/23	TH	27/02/23
REVISION NOTES/COMMENTS			
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			APPROVED BY
			DATE

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PROJECT  
NORTH STAR ACADEMY

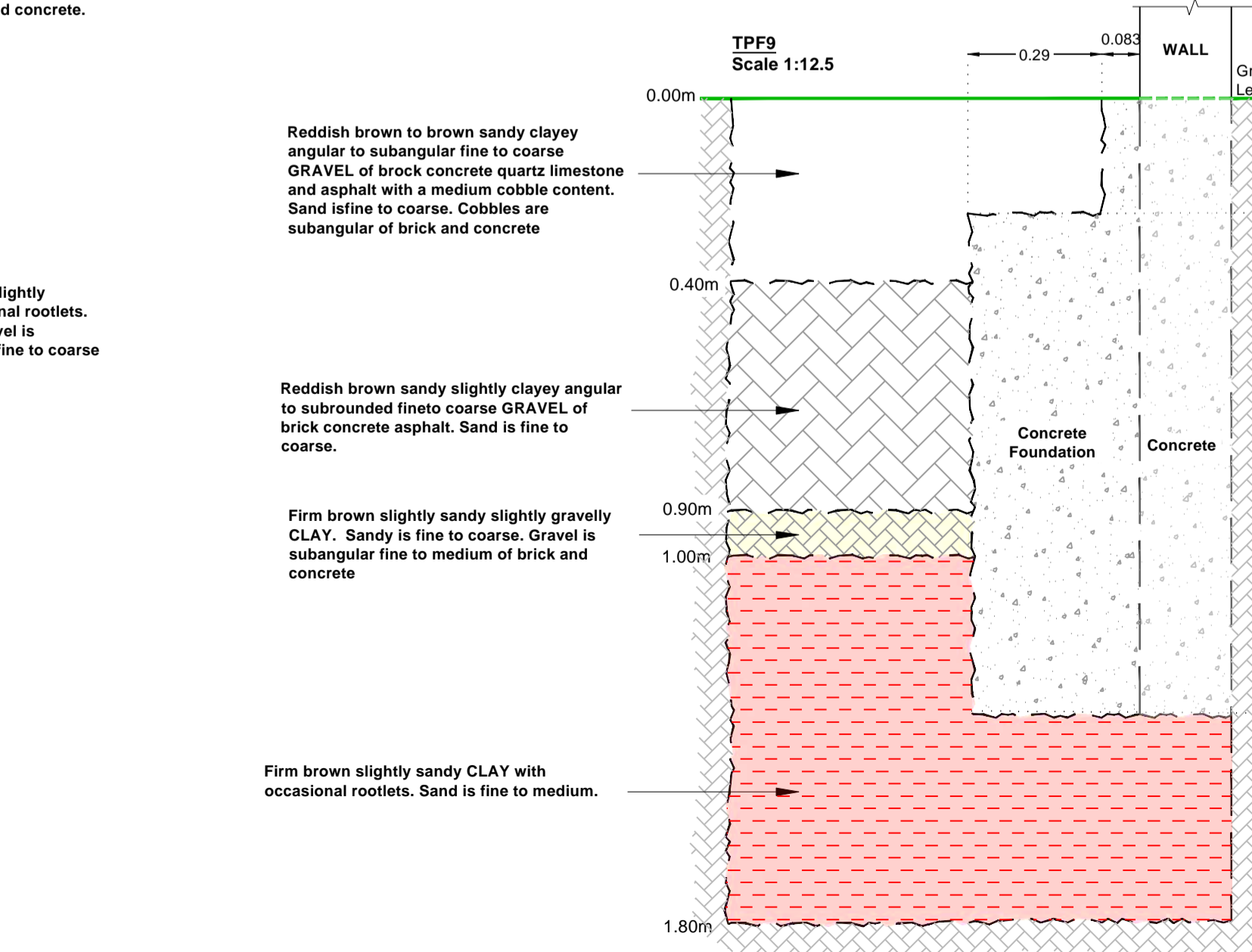
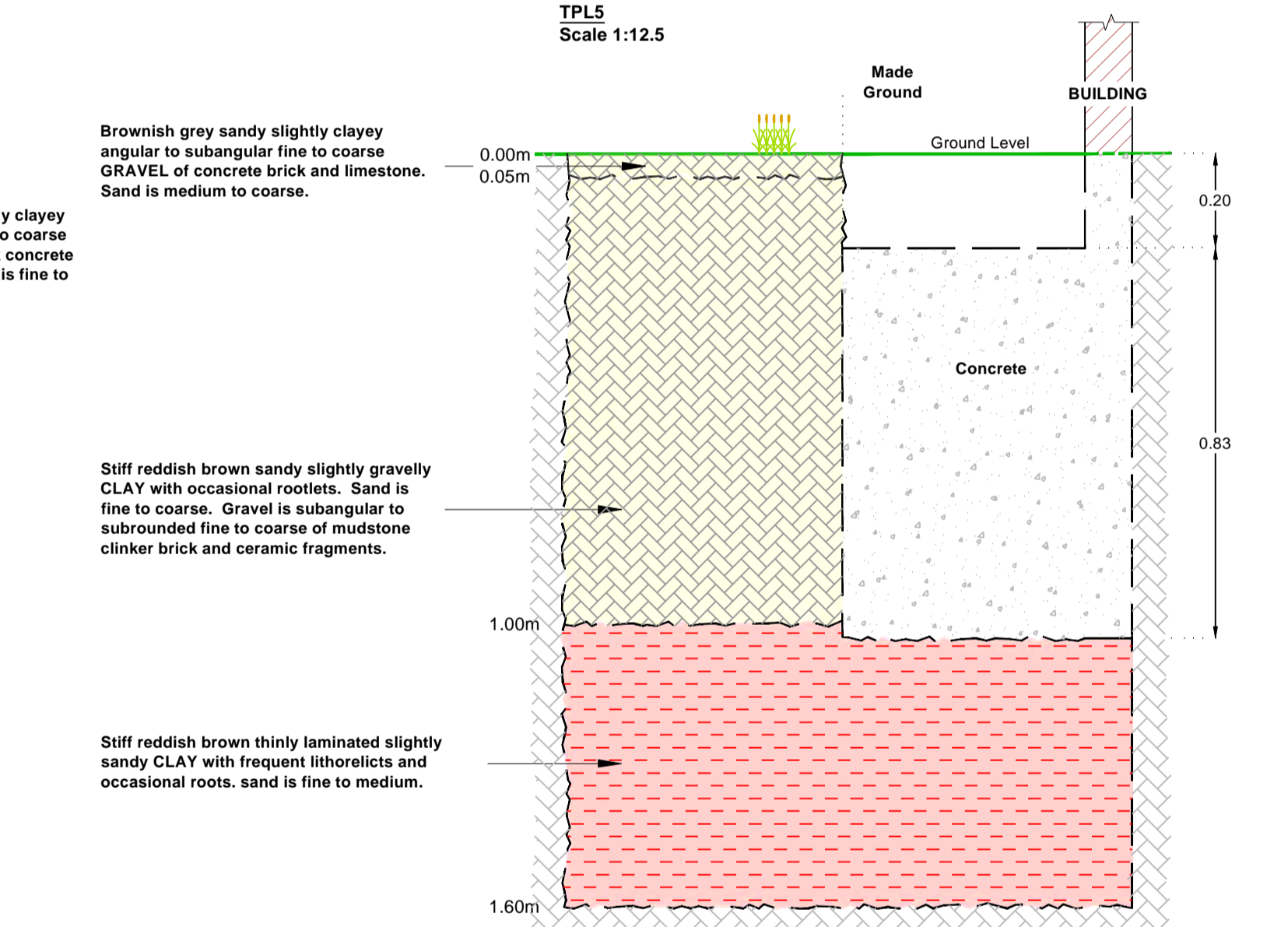
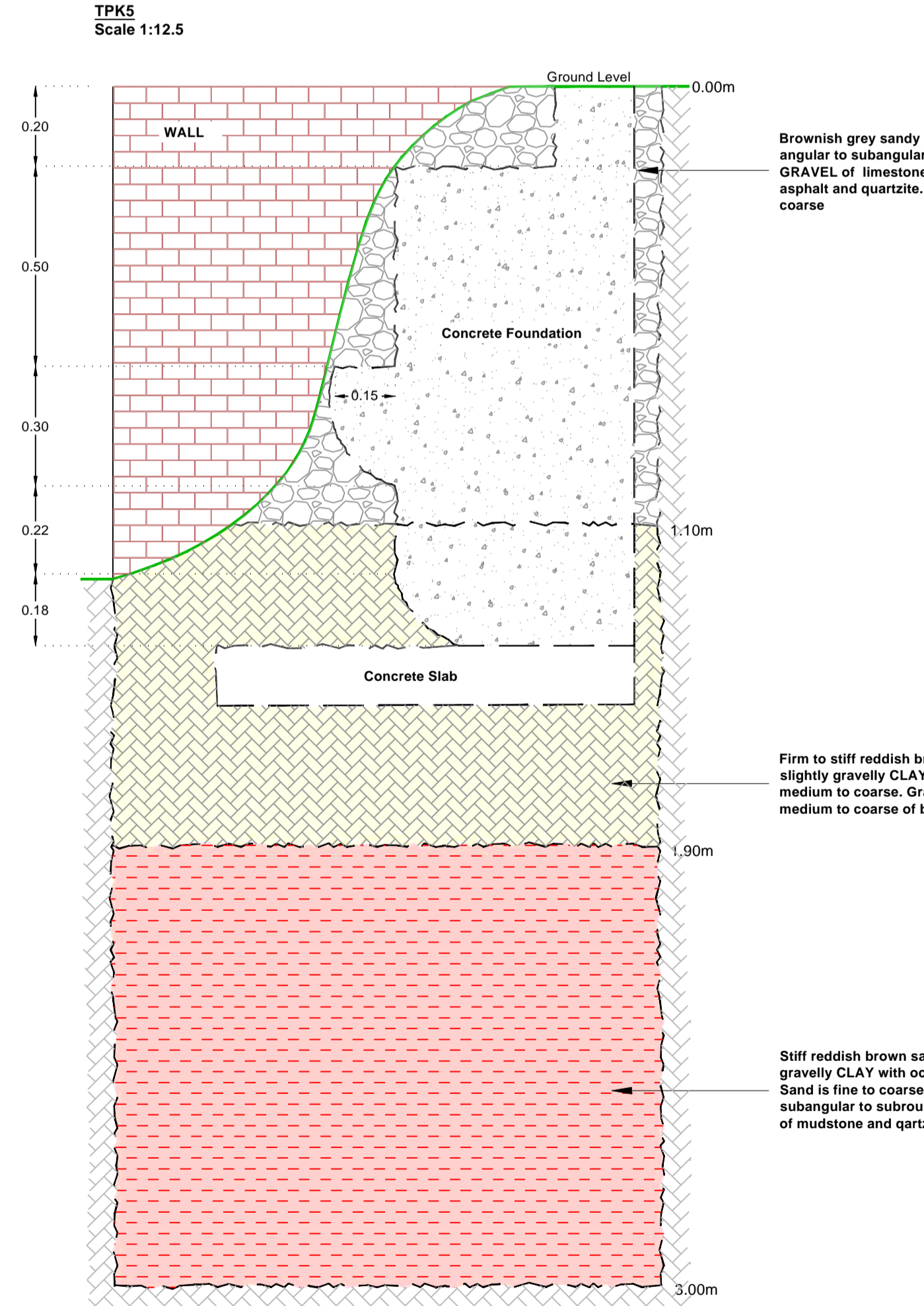
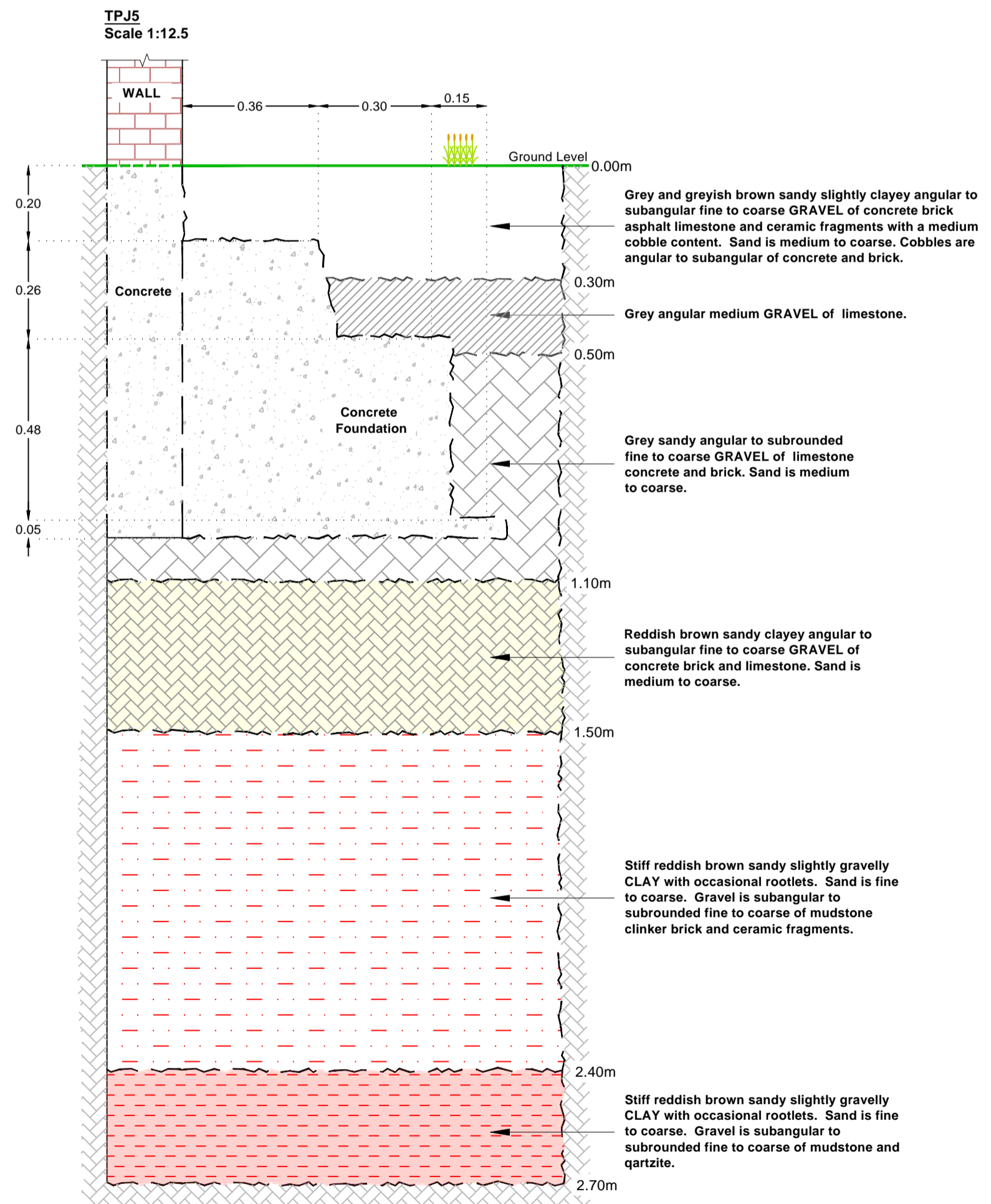
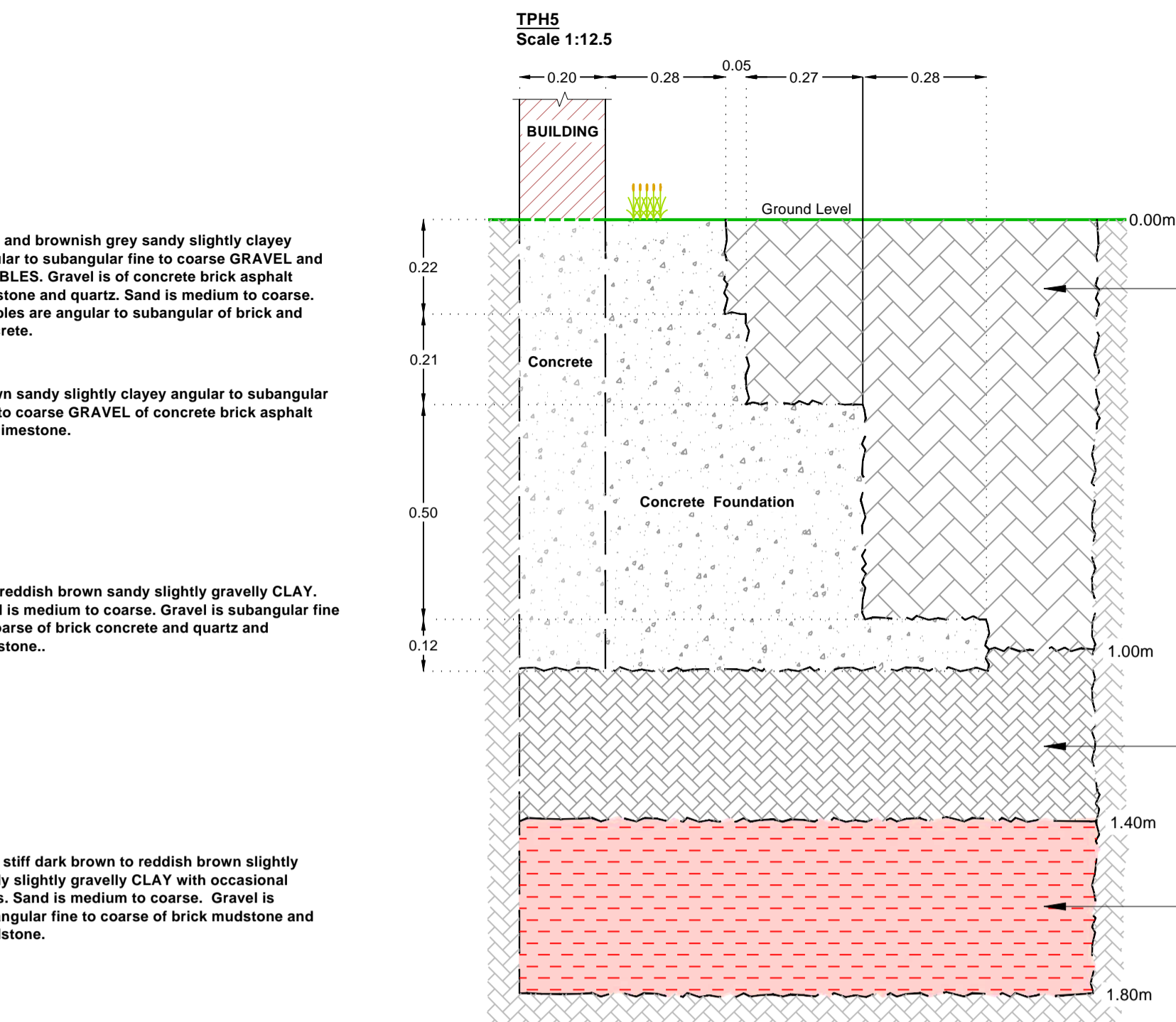
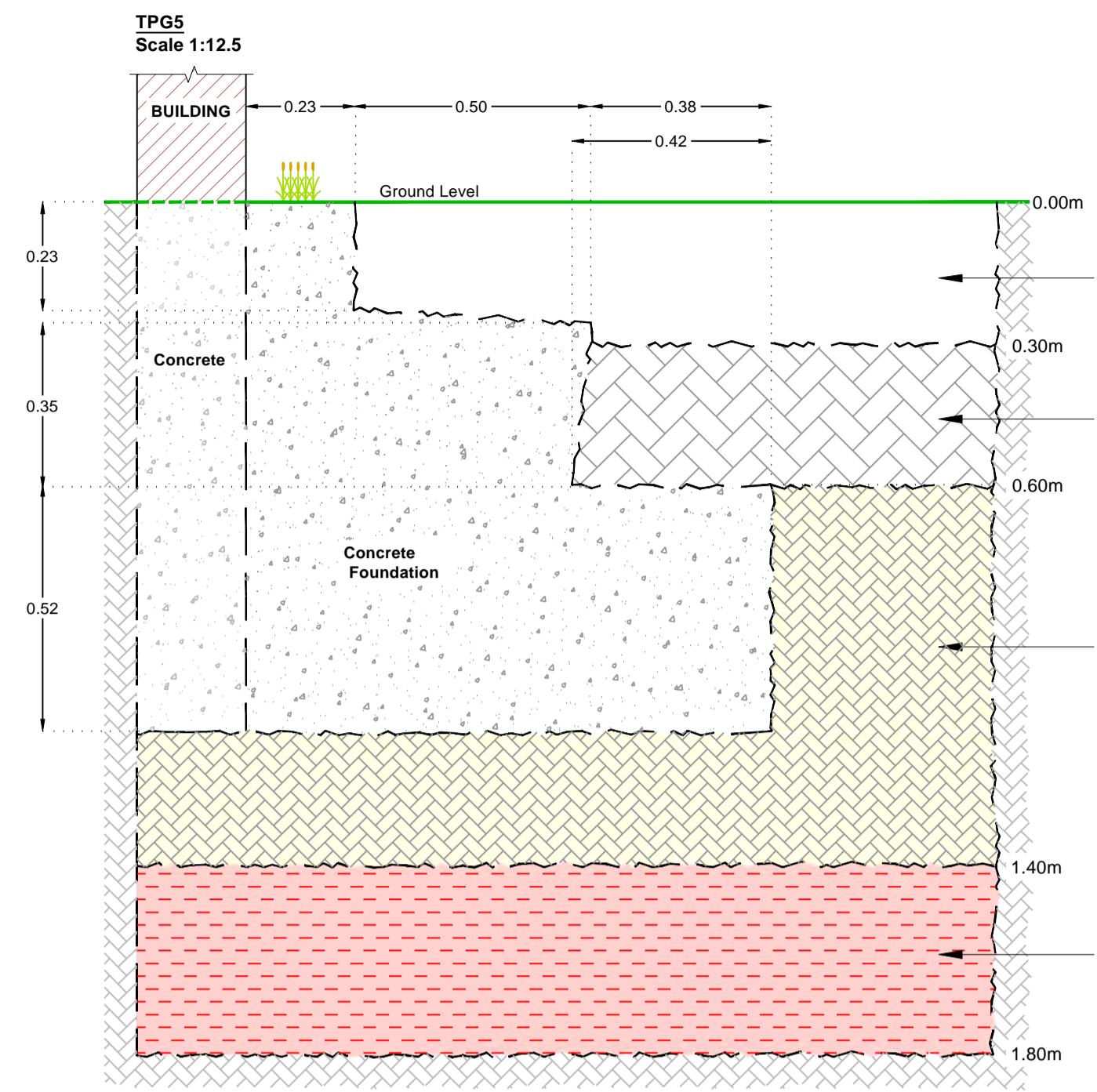
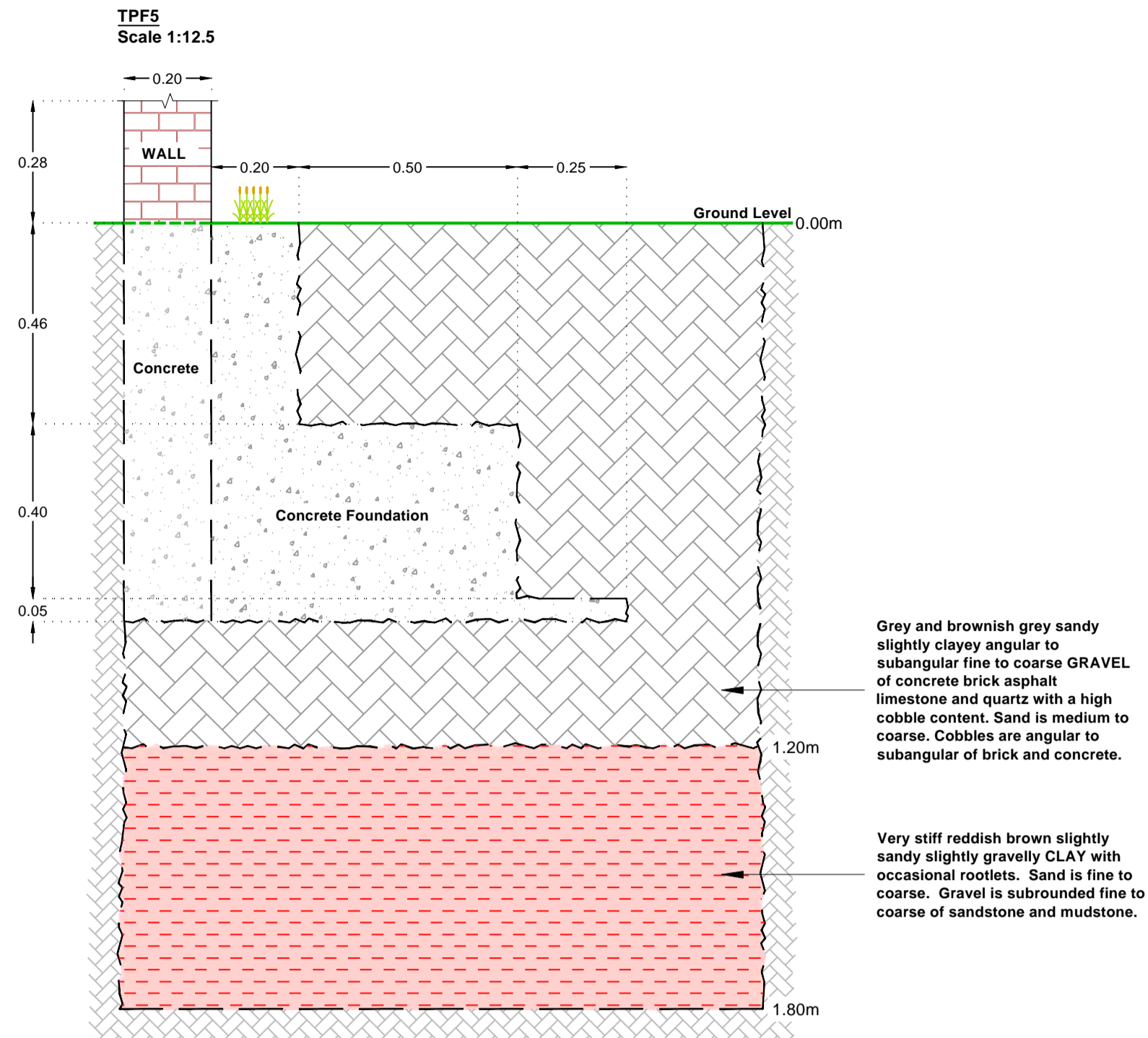
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HYDROCK PROJECT NO. C-23941-C	SCALE @ A3 N.T.S	STATUS S2
PURPOSE OF ISSUE SUITABLE FOR INFORMATION	REVISION P2	
DRAWING NO. (PROJECT CODE-ORIGINATOR-ZONE-LEVEL-TYPE-ROLE-NUMBER) 23941-HYD-XX-XX-DR-GE-1002		

**EXISTING TREE SCHEDULE**

REF	SPECIES	STATUS	COMMENTS
T1	BEECH	RETAINED	20%
T2	CYPRESS LAWSON'S	RETAINED	10%
T3	ASH	RETAINED	23%
T4	BEECH	RETAINED	14%
T5	HORSE CHESTNUT	RETAINED	20%
T6	BEECH	RETAINED	20%
T7	HORSE CHESTNUT	RETAINED	20%
T8	HORSE CHESTNUT	RETAINED	20%
T9	ASH	RETAINED	23%
T10	POPULAR LOMBARDY	RETAINED	23%
T11	NORWAY SPRUCE	RETAINED	40%
T12	RAY LAUREL	RETAINED	10%
G2	ASH	RETAINED	23%
G3	ASH	RETAINED	23%
G4	ASH	RETAINED	23%
G5	ASH	RETAINED	23%
G6	ASH	RETAINED	23%
G7	ASH	RETAINED	23%
G8	ASH	RETAINED	23%
G9	ASH	RETAINED	23%
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G100	ASH	RETAINED	23%

**FOUL WATER**  
**SURFACE WATER**  
**GAS**  
**WATER**  
**RADAR LOCATE**  
**RADIO LOCATE**



**KEY**

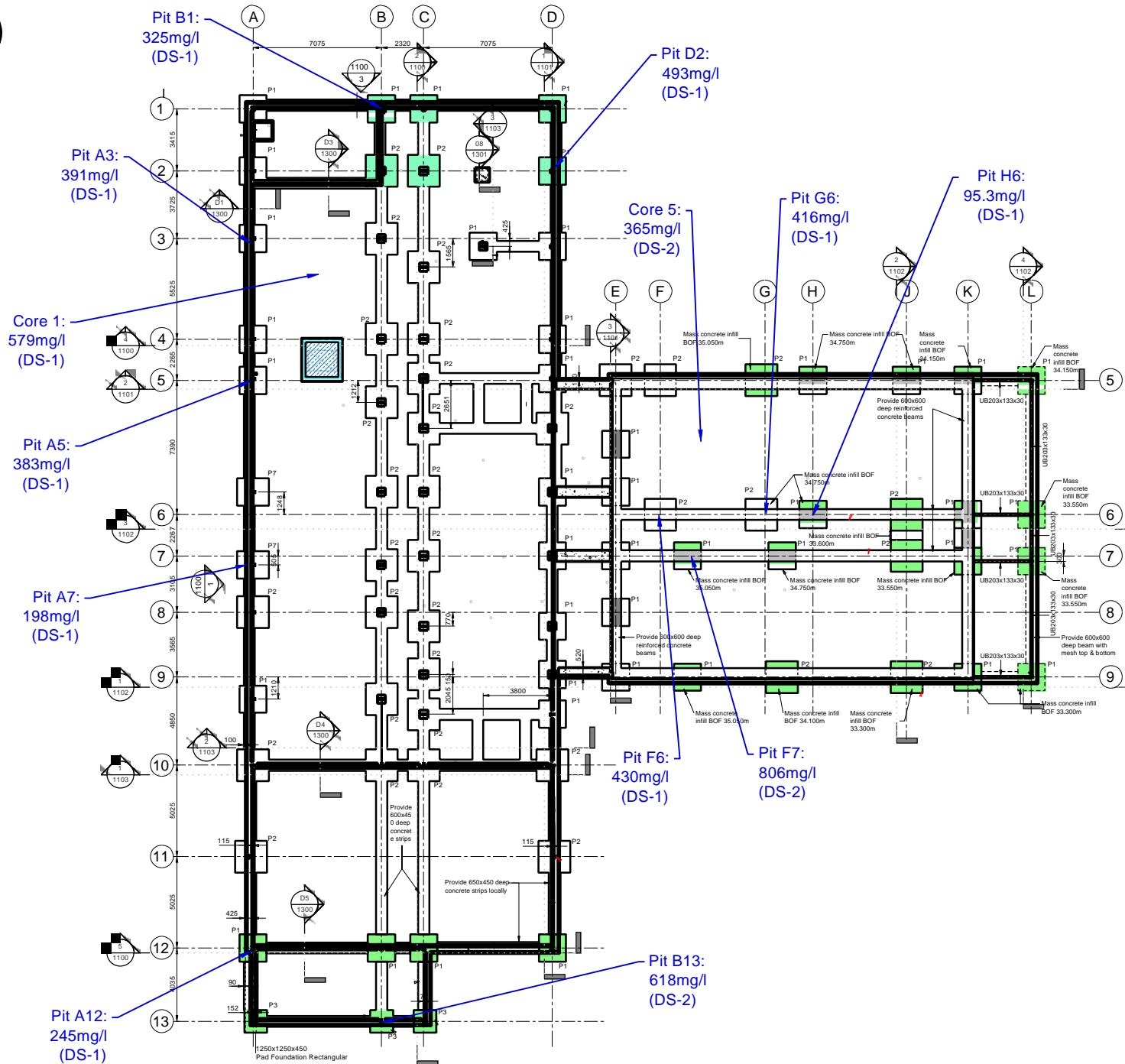
- Existing ground level
- Conjectural geological boundary
- Wall
- Building
- Concrete Foundation
- Made Ground Hardcore
- Made Ground
- Made Ground Reworked natural
- Reworked Mercia Mudstone
- Mercia Mudstone

**NOTES**

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P1	EP	31/01/23	TH	31/01/23	TH	31/01/23
REVISION NOTES/COMMENTS						
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<p>Over Court Barrs Over Lane Almondsbury, Bristol BS32 4DF TEL: 01454 619 533 FAX: 01454 614 125 E-Mail: bristol@hydrock.com or visit www.hydrock.com</p>						
CLIENT						
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PROJECT						
NORTH STAR ACADEMY						
TITLE						
FOUNDATION INSPECTIONS TPF5 , TPG5, TPH5, TPJ5, TPK5, TPL5 & TPF9						
HYDROCK PROJECT NO. C-23941-C				SCALE @ A1 1:12.5		
PURPOSE OF ISSUE SUITABLE FOR INFORMATION					STATUS S2	
DRAWING NO. (PROJECT CODE-ORIGINATOR-ZONE-LEVEL-TYPE-ROLE-NUMBER) 23941-HYD-XX-XX-DR-GE-1007					REVISION P1	

OS NORTH



KEY

NOTES

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3. This drawing has been based on the following drawings and information:  
Clegg Associates, May 2021. Foundation Layout. Ref: FS0779-CAL-01-FD-DR-S-00100-C04.

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TH	28/02/23	TH	28/03/23
SC		SC	28/03/22

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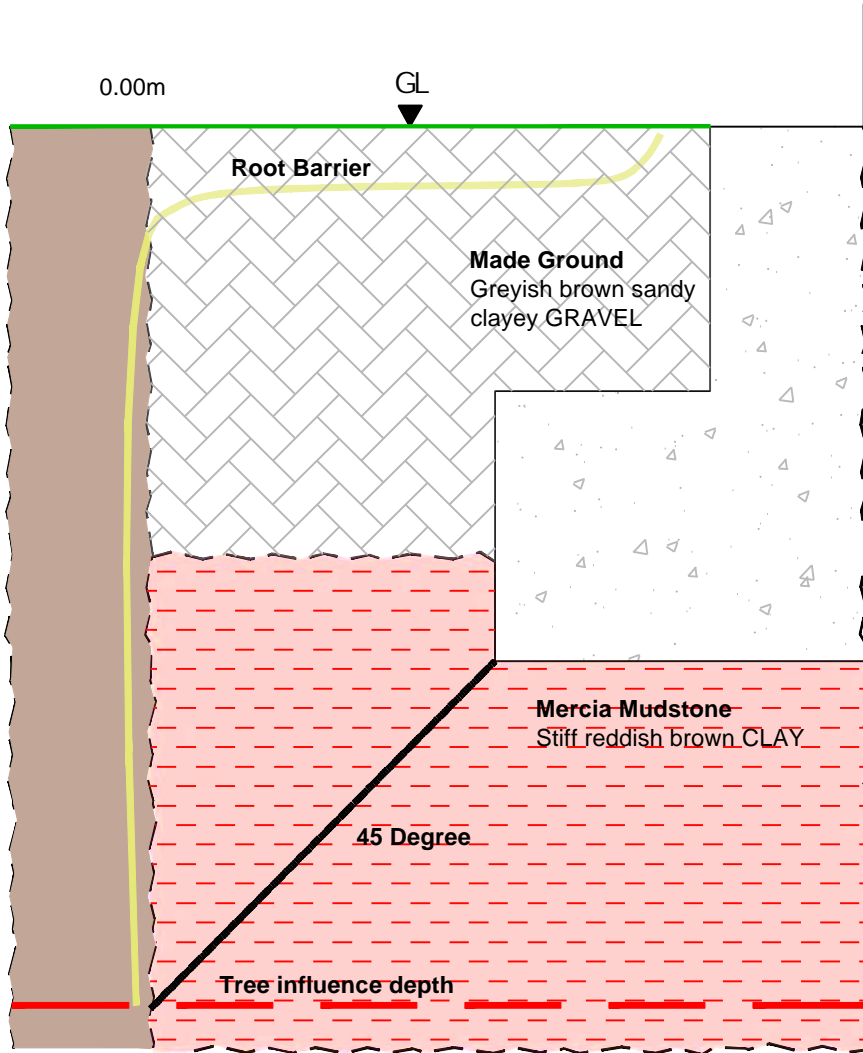
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PROJECT  
NORTH STAR ACADEMY

TITLE  
SULPHATE CONCENTRATION  
DISTRIBUTION (MADE GROUND)

HYDROCK PROJECT NO. C-23941-C	SCALE @ A4 NTS	PURPOSE OF ISSUE SUITABLE FOR INFORMATION	STATUS S2
DRAWING NO. (PROJECT CODE - ORIGINATOR.ZONE.LEVEL.TYPE.ROLE.NUMBER) 23941-HYD-XX-XX-DR-GE-1013		REVISION	P1

OS NORTH



KEY

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P1	FIRST ISSUE				
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TH	03/03/23				
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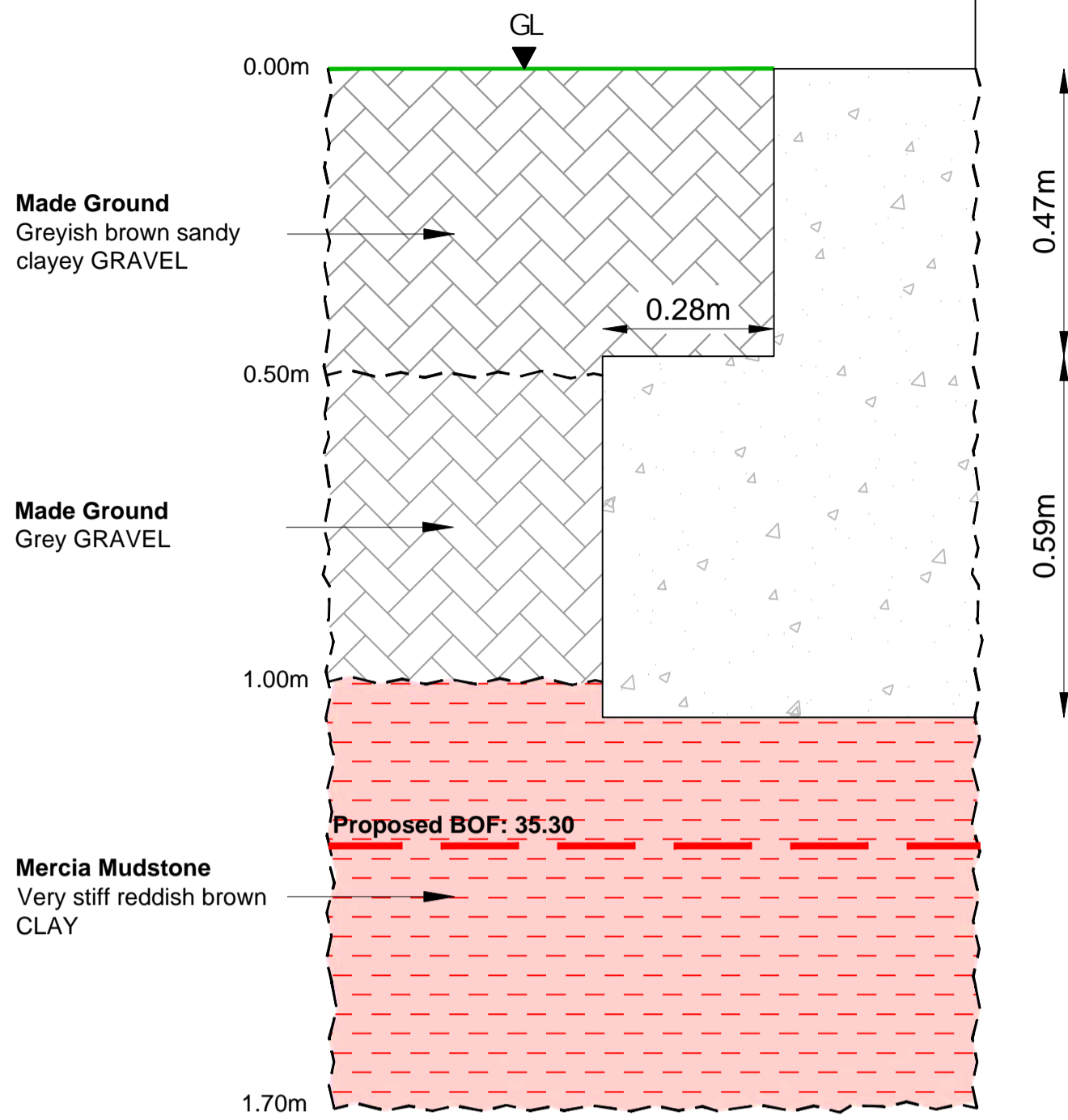
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EXAMPLE  
ROOT BARRIER DETAILS

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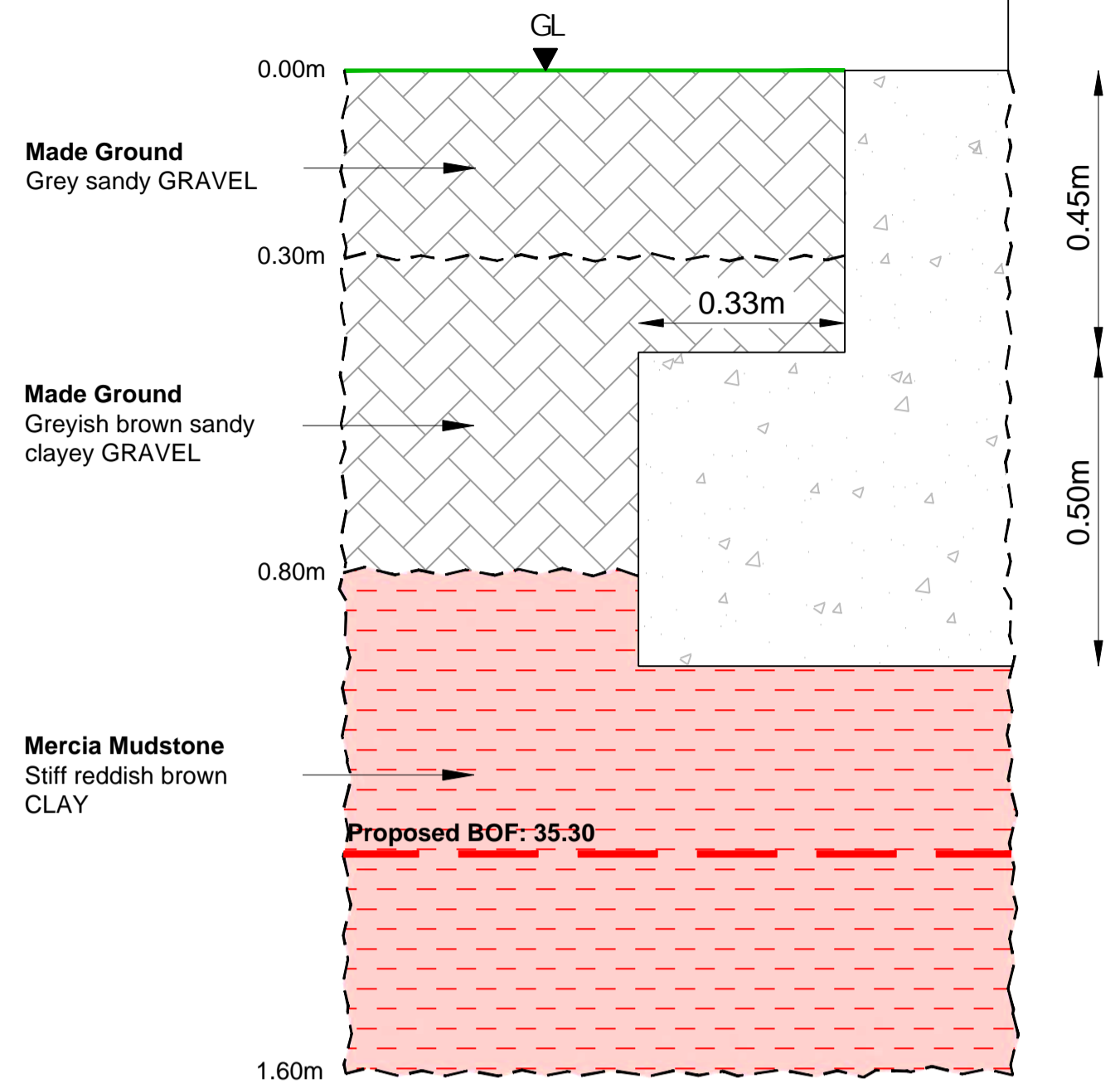
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DRAWING NO. (PROJECT - ORIGINATOR VOLUME LEVEL TYPE ROLE NUMBER) 23941-HYD-XX-XX-SK-GE-1001	REVISION P1
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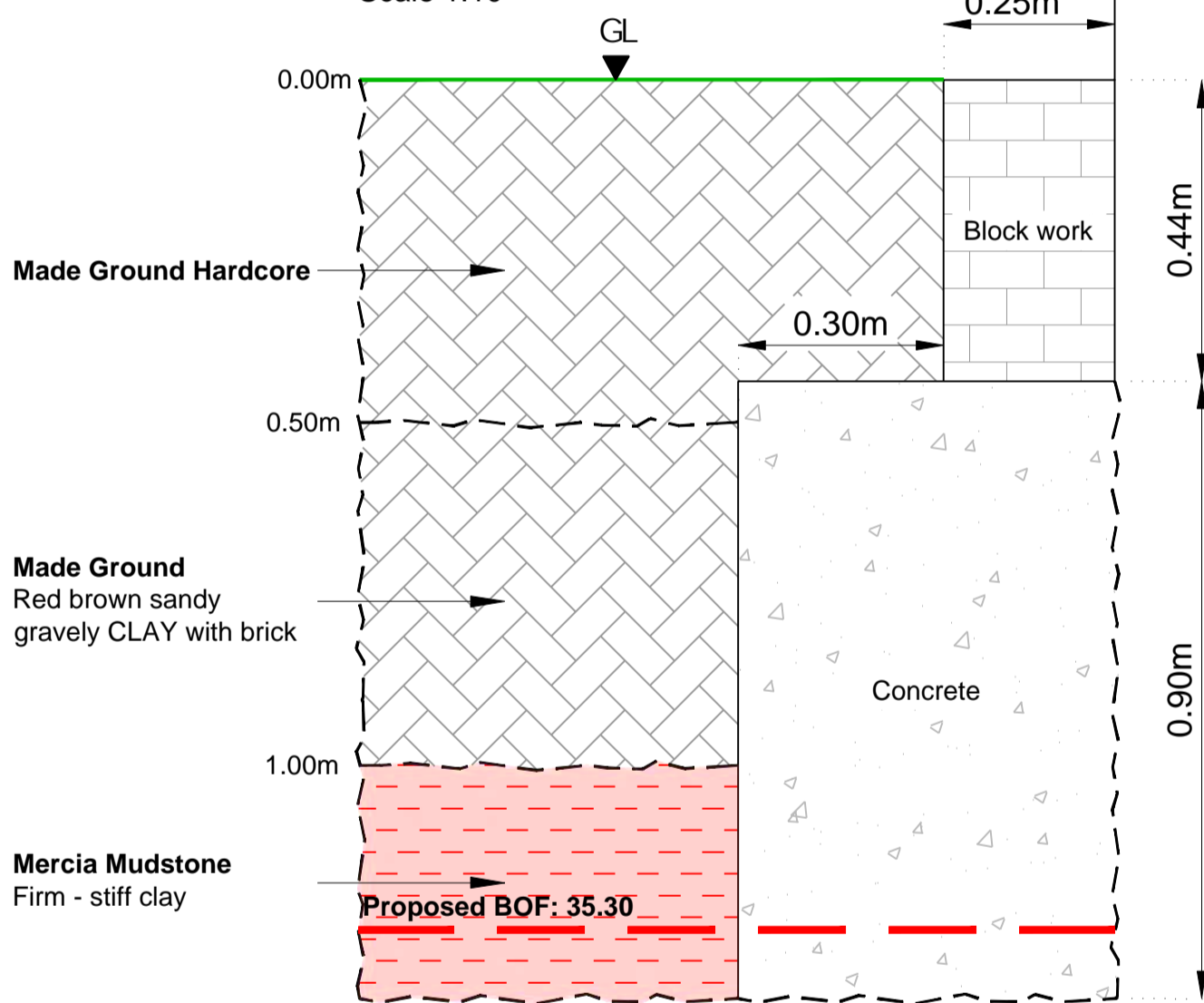
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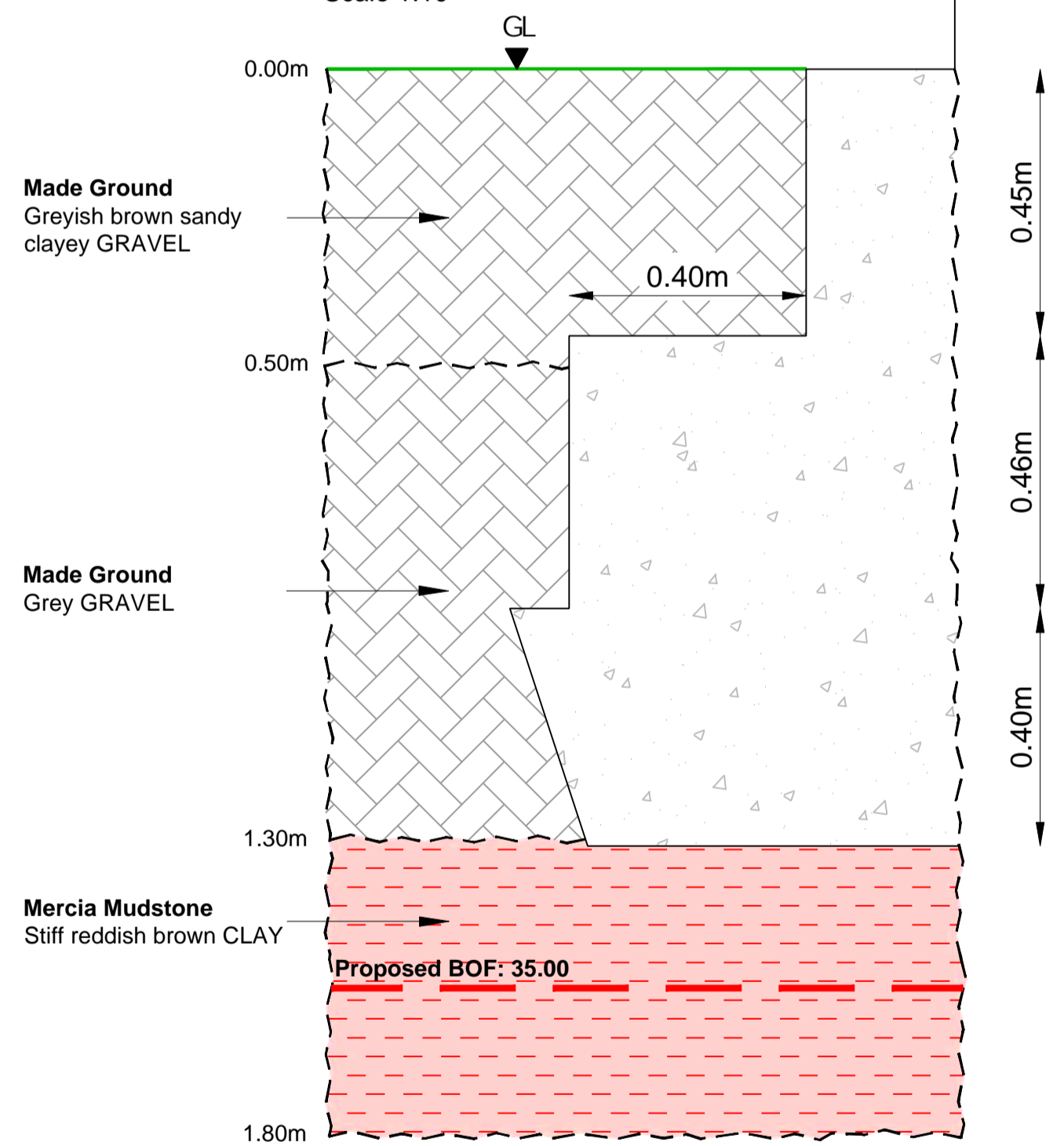
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Scale 1:10



**Foundation Inspection - TPC1**  
Scale 1:10



**Foundation Inspection - FPD1**  
Scale 1:10



**KEY**

- Existing ground level
- Conjectural geological boundary
- Made Ground
- Made Ground (Red brown Clay)
- Mercia mudstone

**NOTES**

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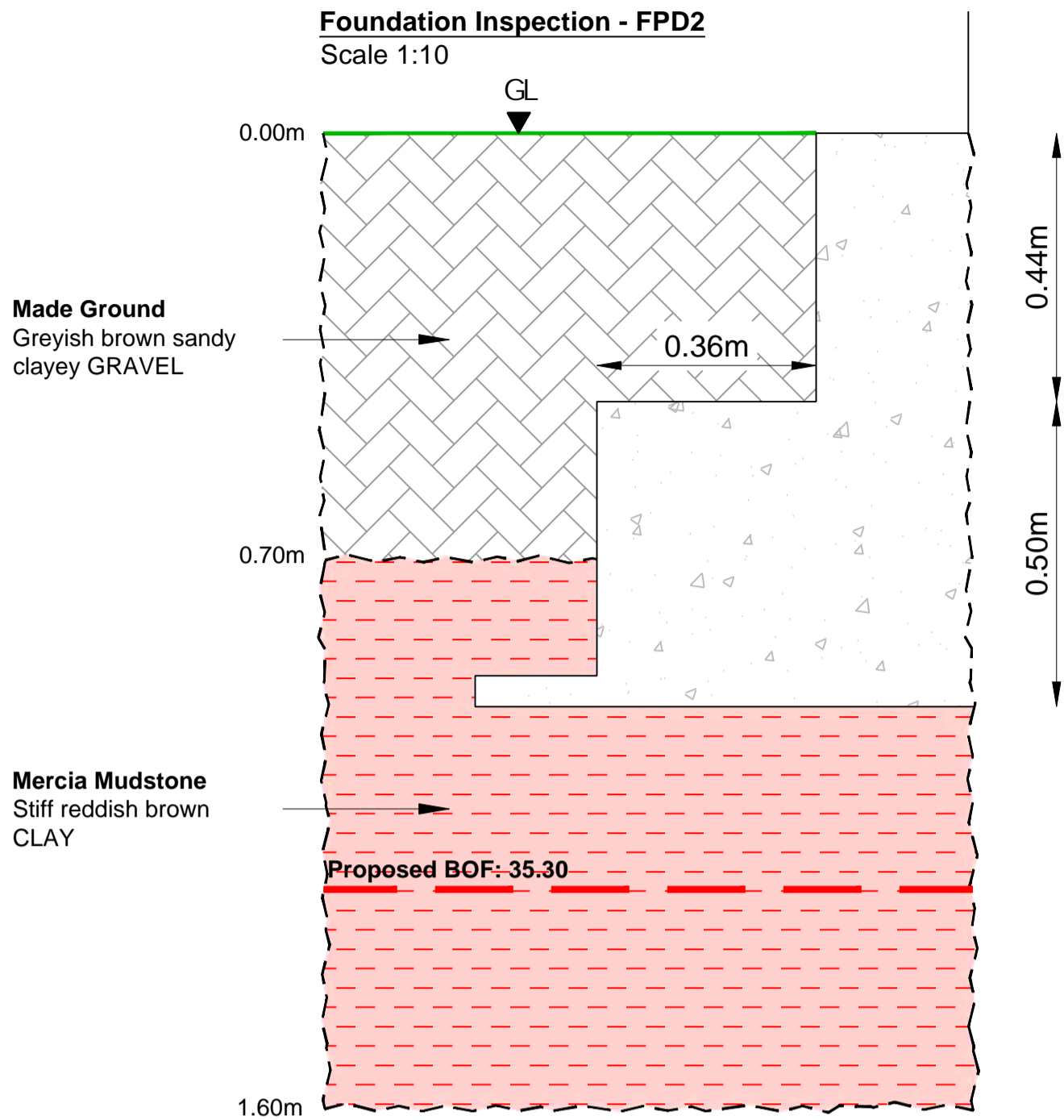
CLIENT  
**ISG LIMITED**

PROJECT  
**NORTH STAR ACADEMY**

TITLE <b>FOUNDATION INSPECTIONS FPA1, FPB1, FPC1, FPD1</b>	
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PURPOSE OF ISSUE <b>SUITABLE FOR INFORMATION</b>	STATUS <b>S2</b>
DRAWING NO. (PROJECT CODE-ORIGINATOR-ZONE-LEVEL-TYPE-ROLE-NUMBER) <b>23941-HYD-XX-XX-DR-GE-1003</b>	REVISION <b>P1</b>

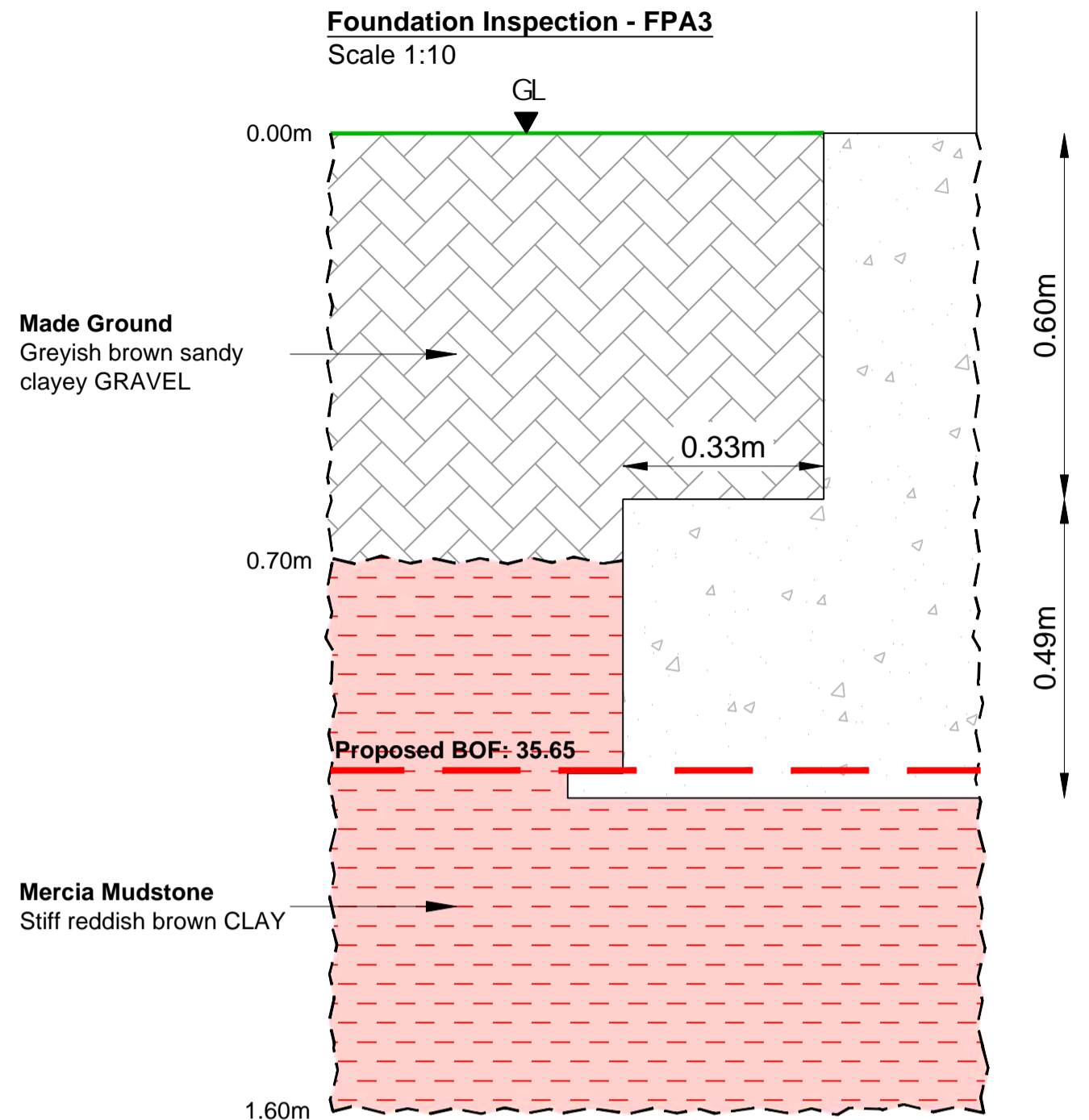
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Scale 1:10



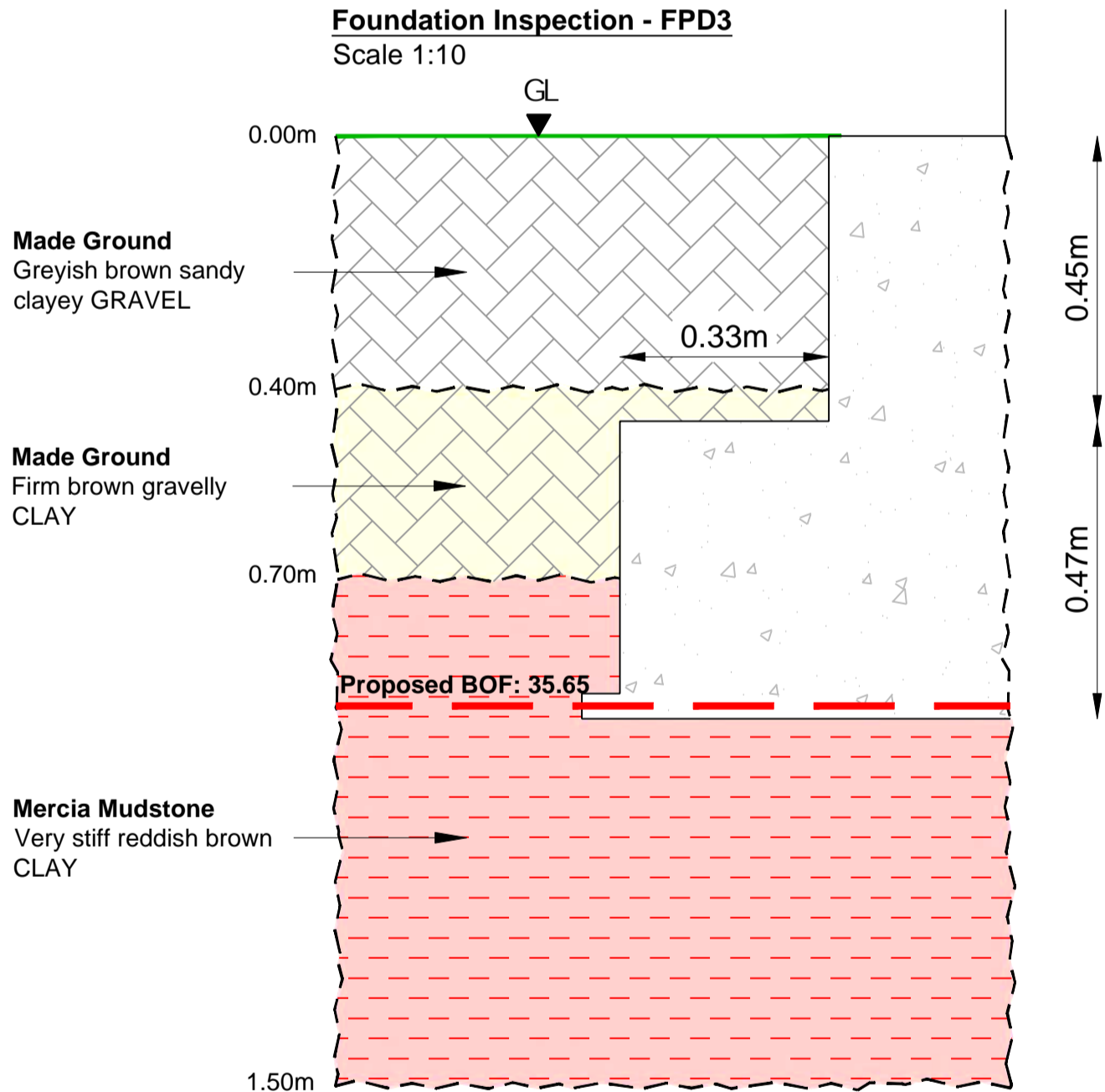
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Scale 1:10



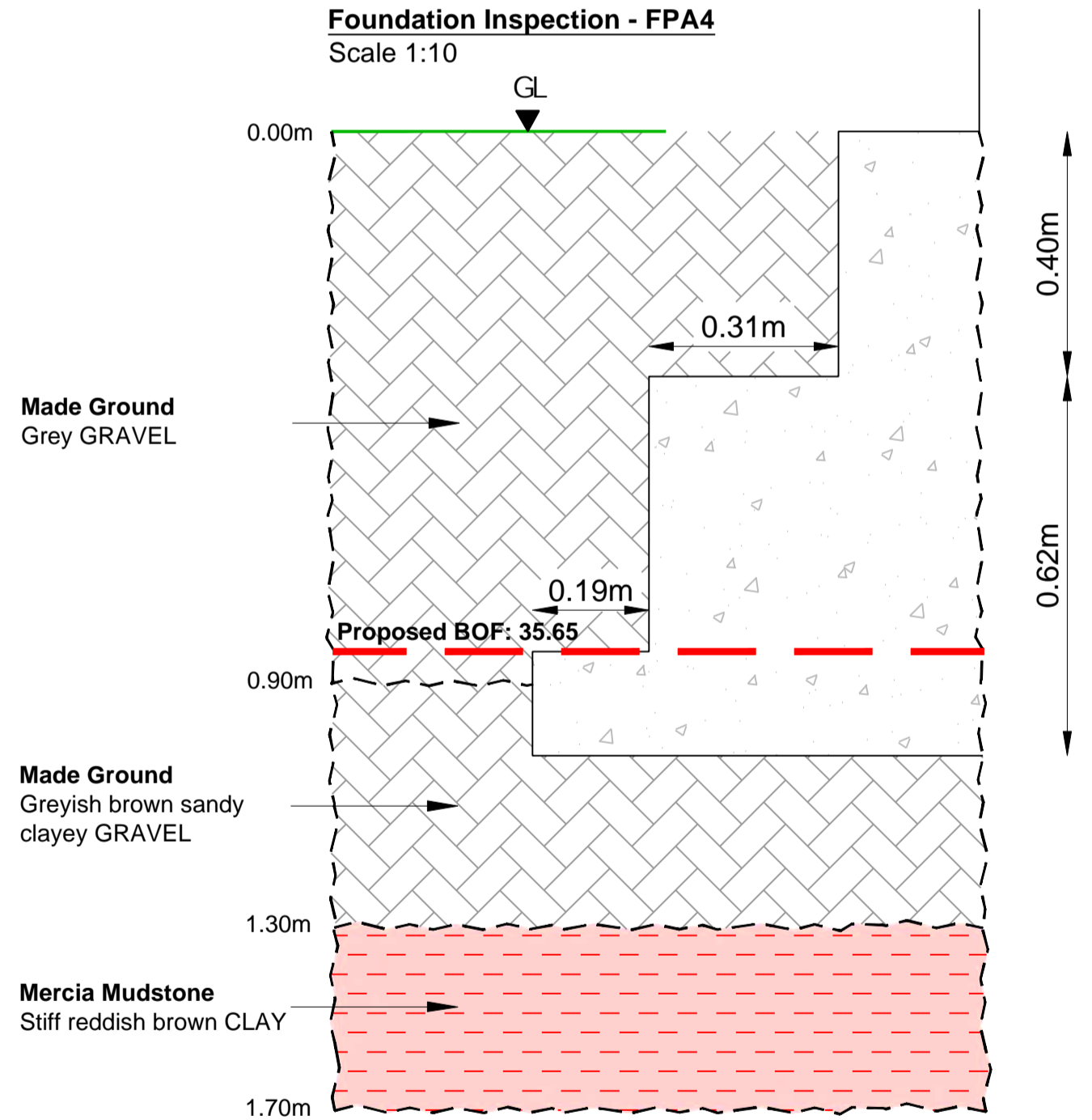
**Foundation Inspection - FPD3**

Scale 1:10



**Foundation Inspection - FPA4**

Scale 1:10



**KEY**

- Existing ground level
- Conjectural geological boundary
- Made Ground
- Made Ground (Red brown Clay)
- Mercia mudstone

**NOTES**

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2. This drawing is to be read in conjunction with all relevant Engineers' and Service Engineers' drawings and specifications.

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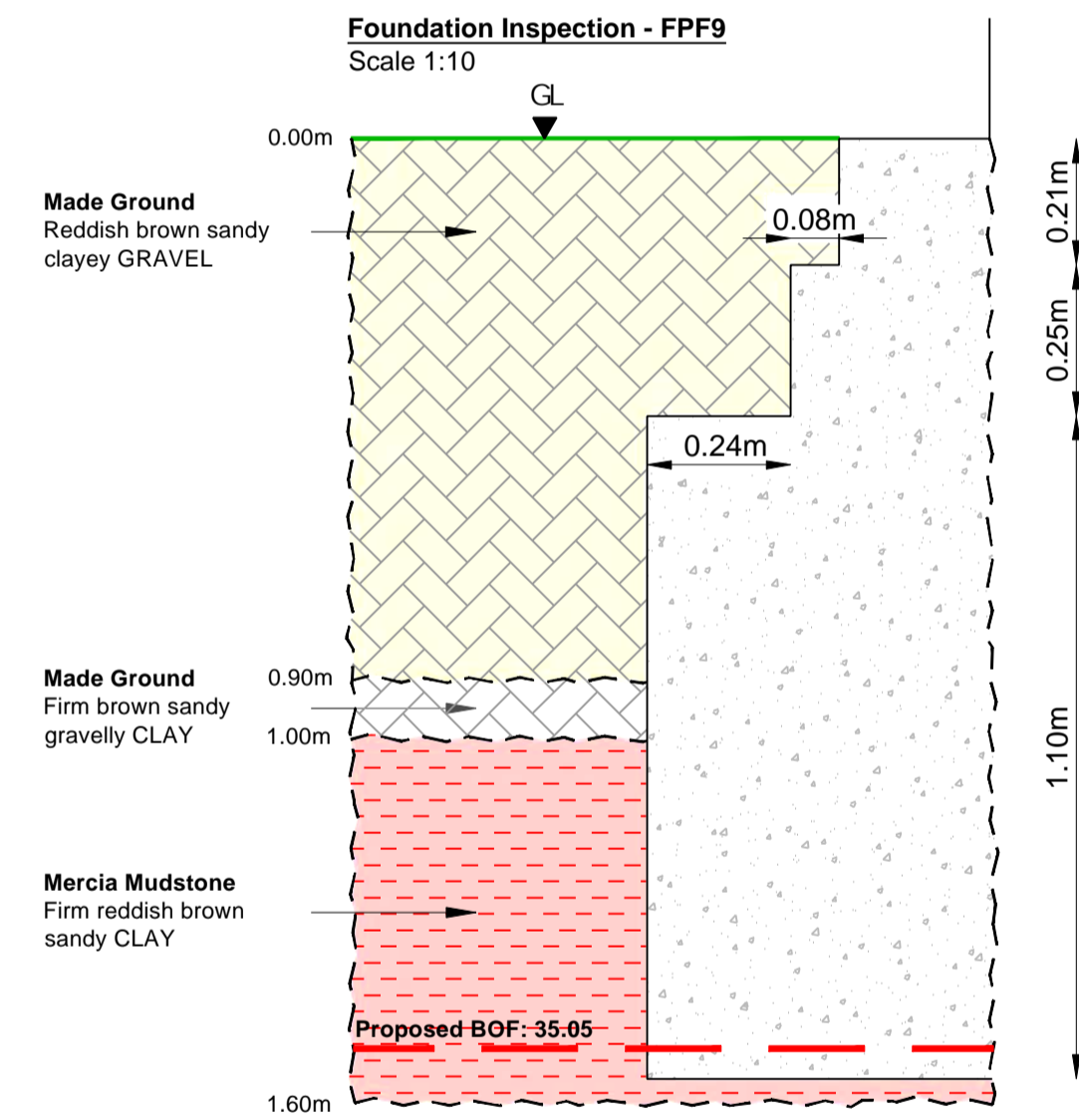
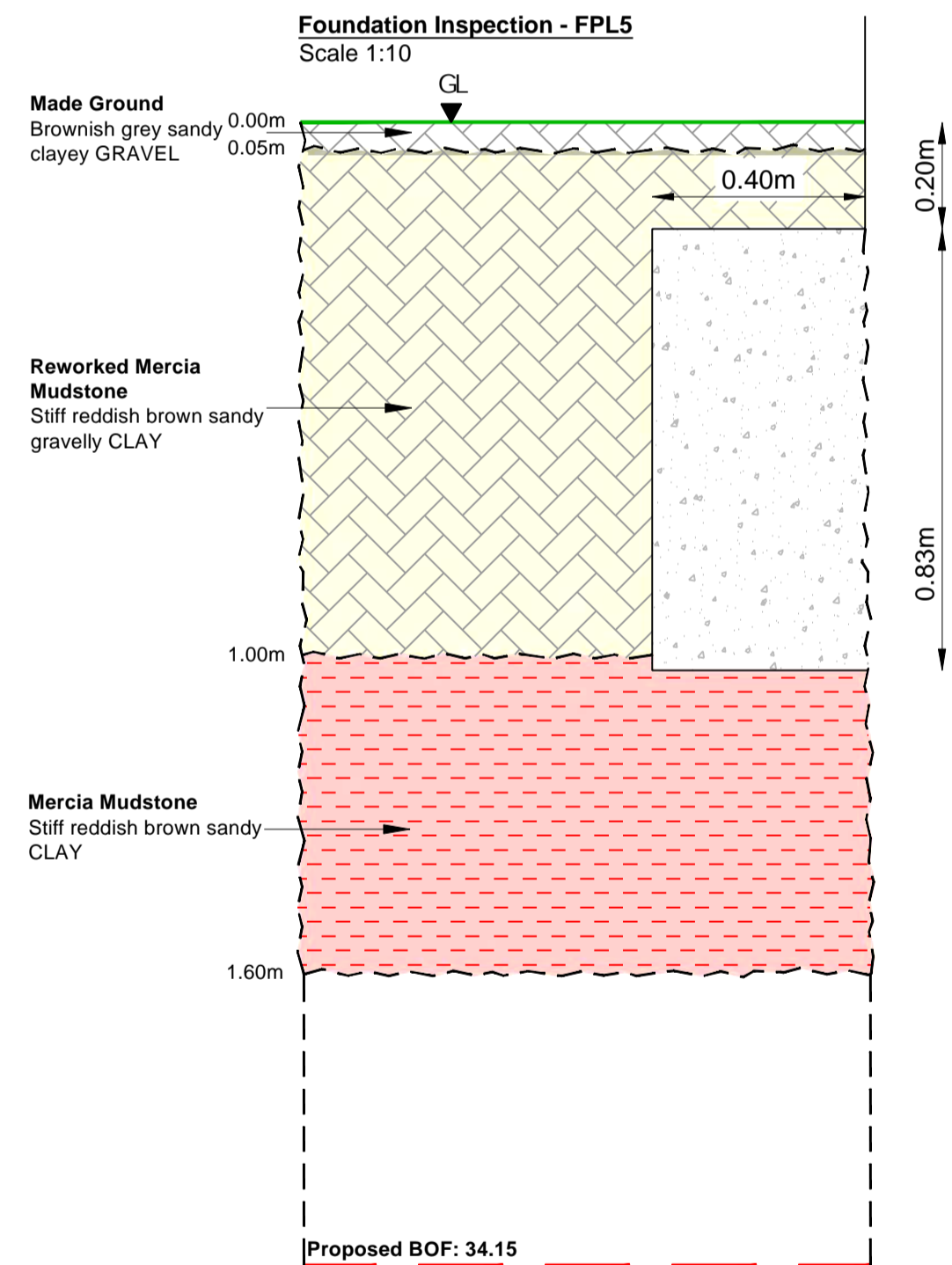
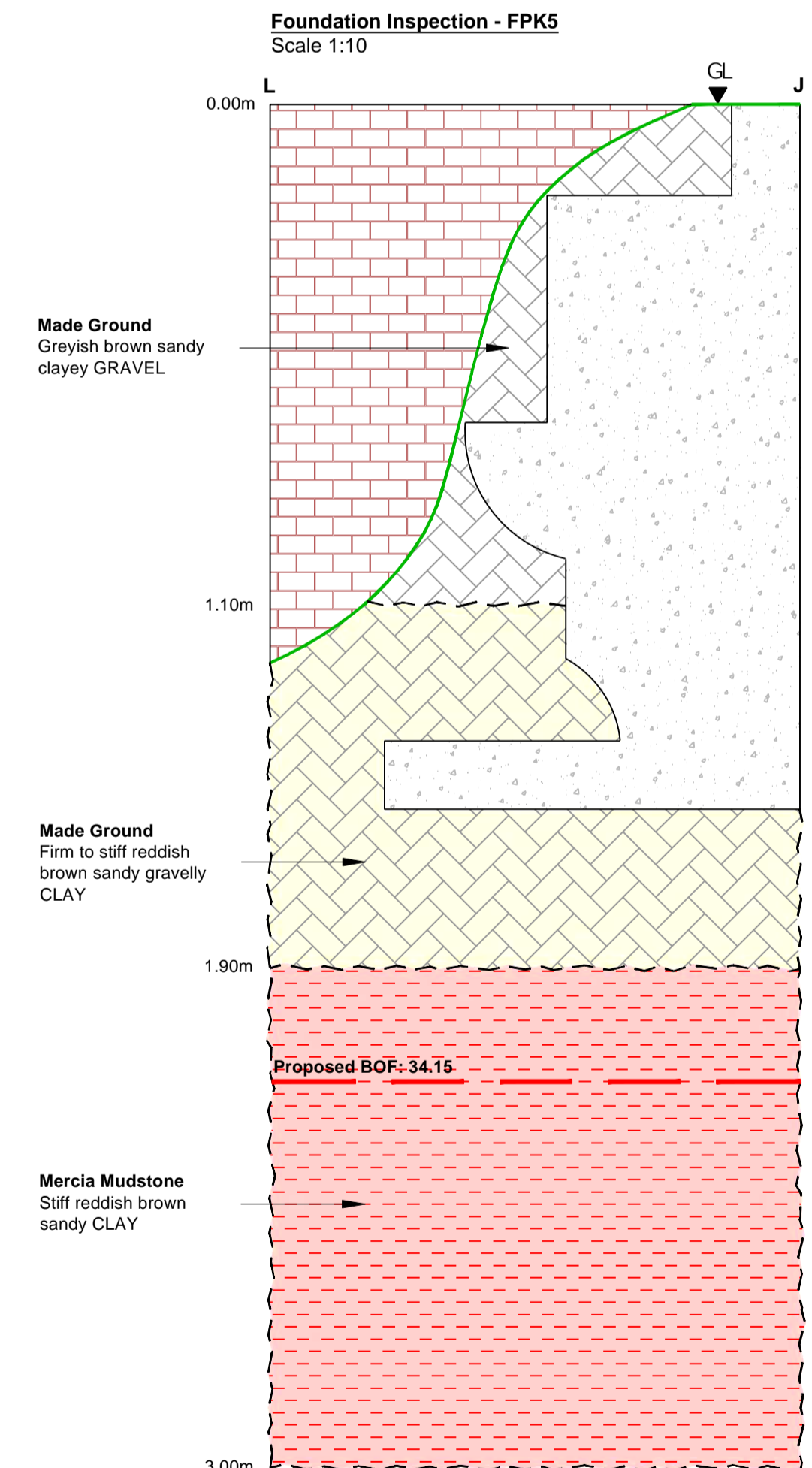
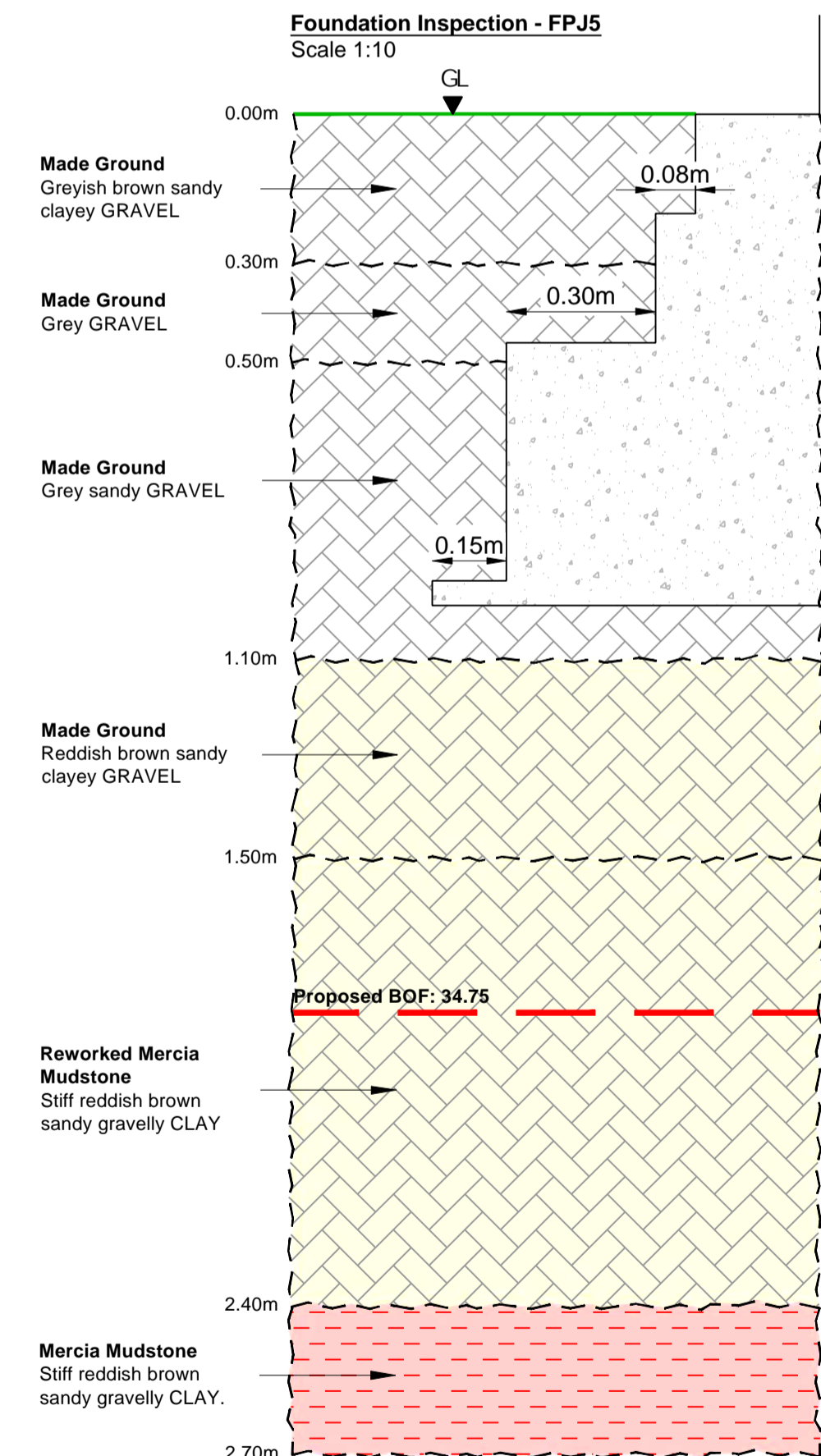
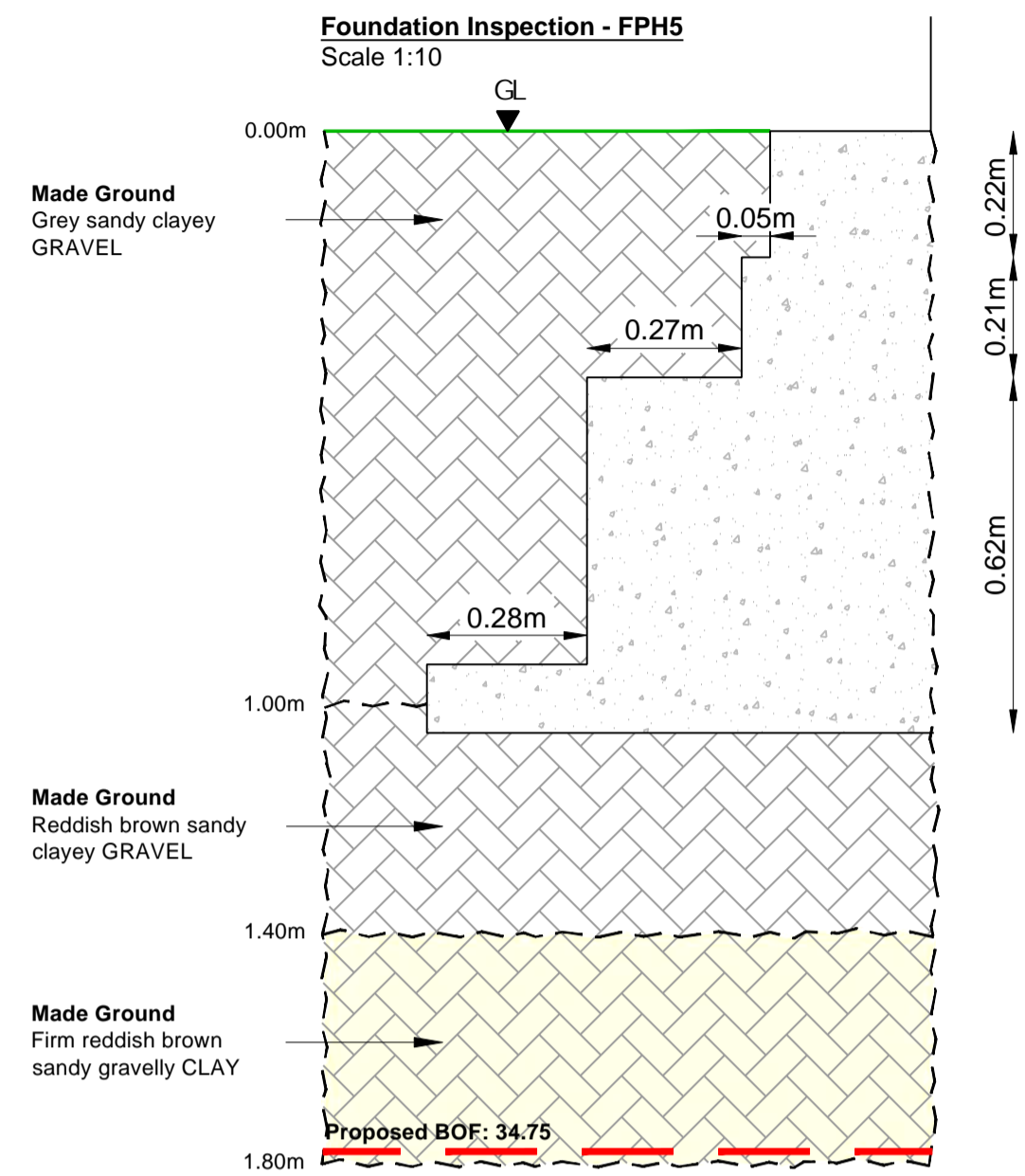
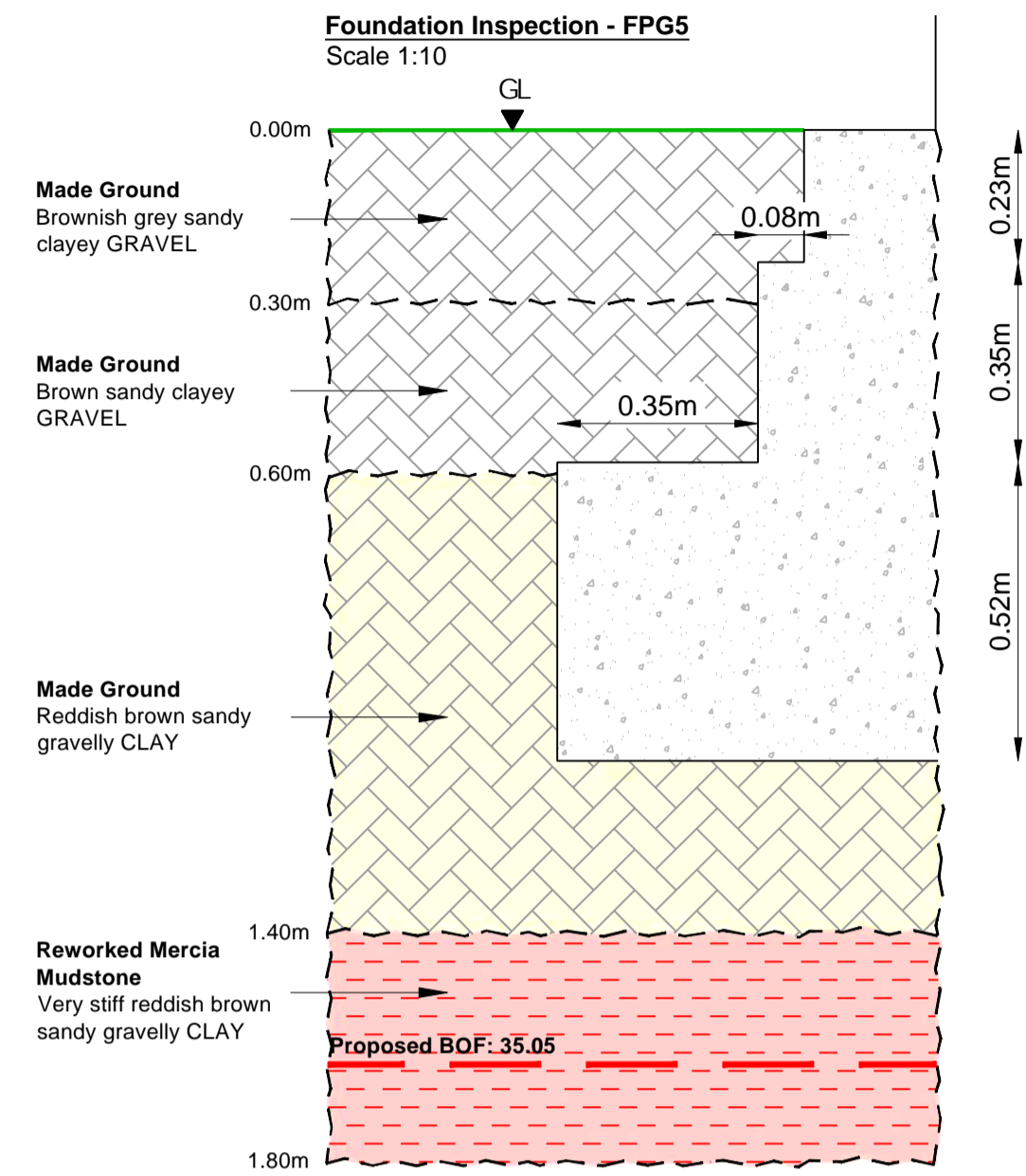
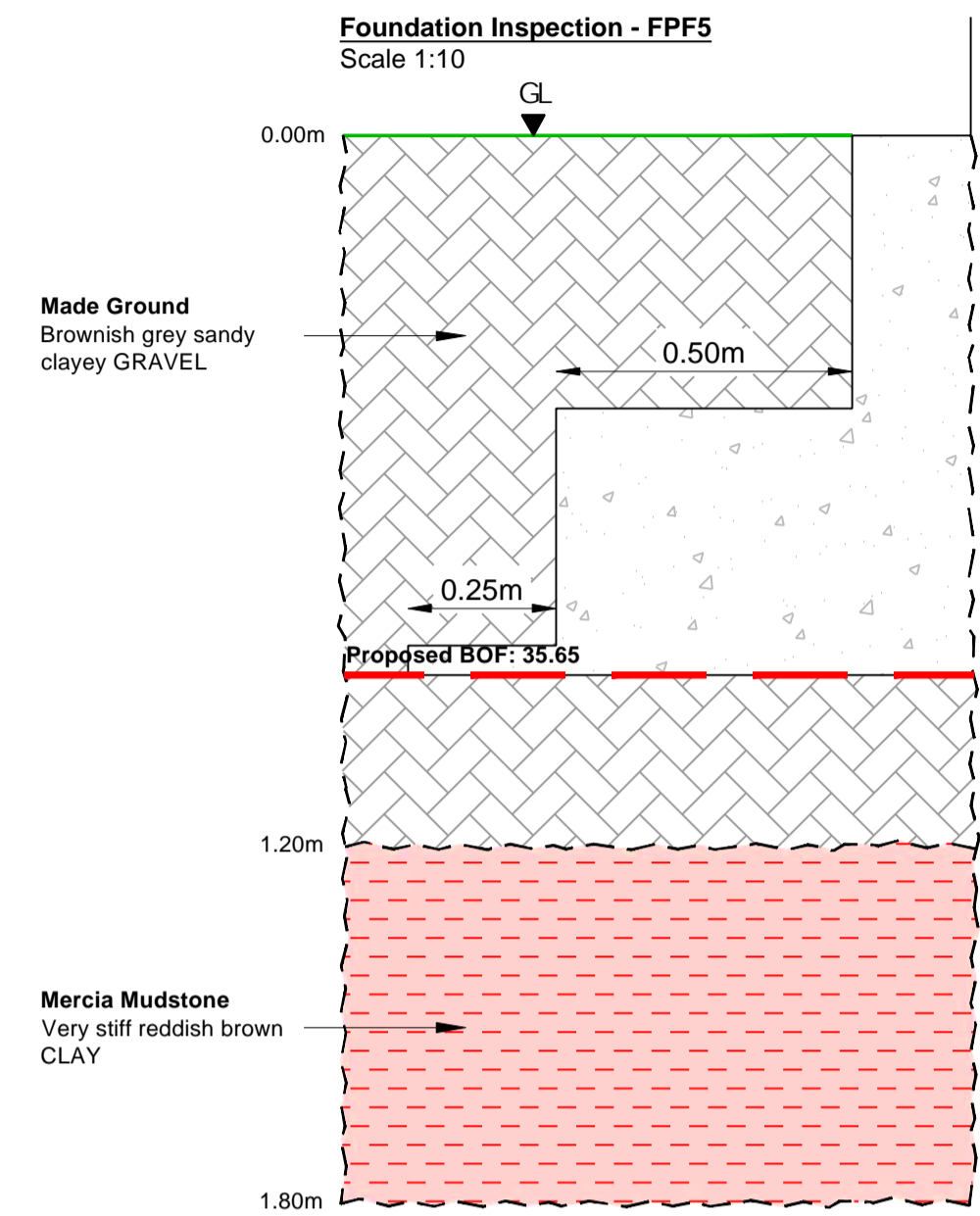
**CLIENT**

ISG LIMITED

**PROJECT**

NORTH STAR ACADEMY

<b>TITLE</b>	
FOUNDATION INSPECTION FPD2, FPA3, FPD3, FPA4	
HYDROCK PROJECT NO. C-23941-C	SCALE @ A2 1:10
PURPOSE OF ISSUE SUITABLE FOR INFORMATION	STATUS S2
DRAWING NO. (PROJECT CODE-ORIGINATOR-ZONE-LEVEL-TYPE-ROLE-NUMBER) 23941-HYD-XX-XX-DR-GE-1004	REVISION P1



**KEY**

- Existing ground level
- Conjectural geological boundary
- Made Ground
- Made Ground (Red brown Clay)
- Mercia mudstone

**NOTES**

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P1	FIRST ISSUE	EP	31/01/23	TH	31/01/23	TH	31/01/23
REV.	REVISION NOTES/COMMENTS	DRAWN BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE

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**ISG LIMITED**

PROJECT  
**NORTH STAR ACADEMY**

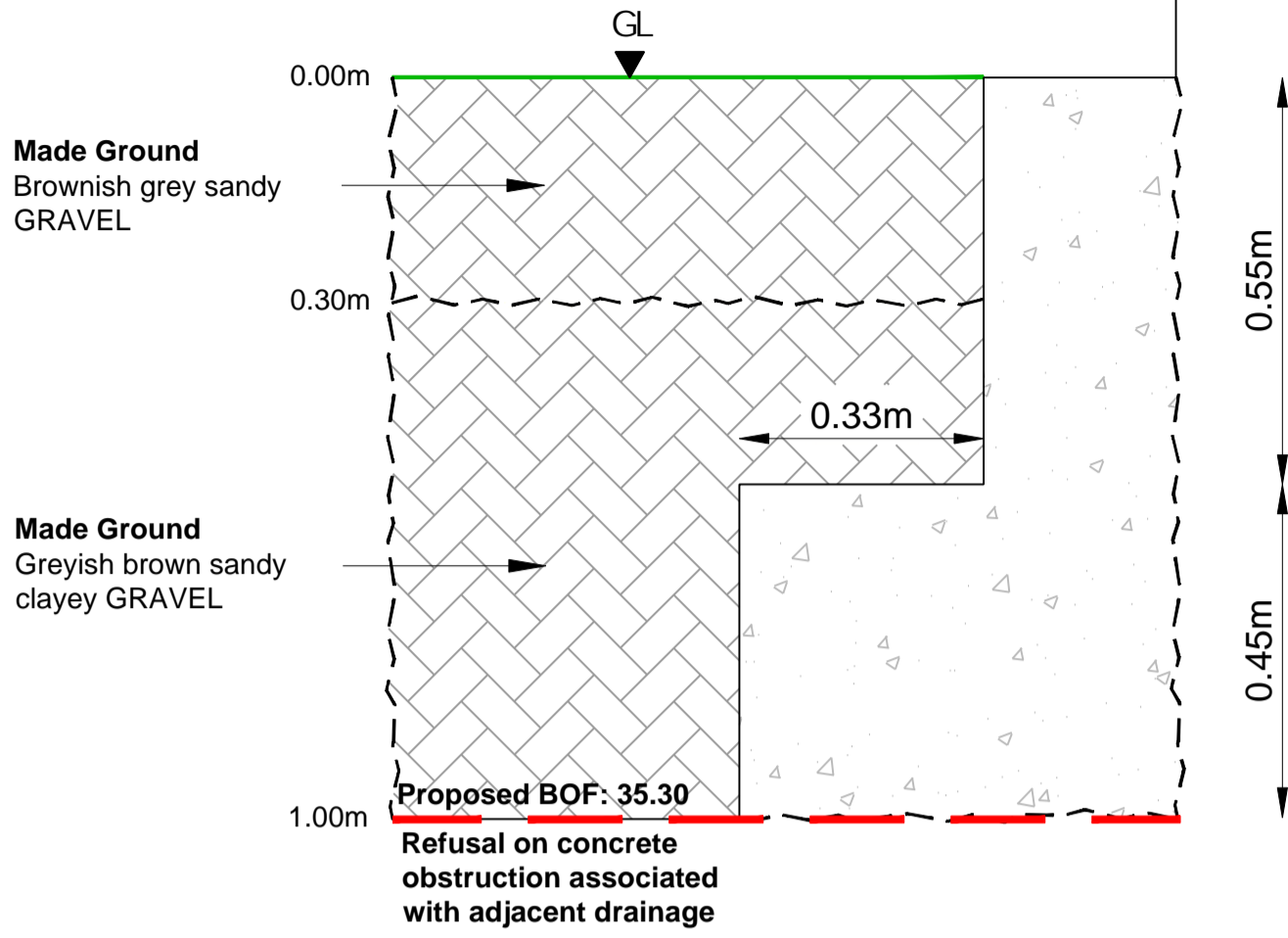
TITLE  
**FOUNDATION INSPECTIONS  
FPF5 ,FPG5, FPH5, FPJ5, FPK5, FPL5 & FPF9**

HYDROCK PROJECT NO. C-23941-C	SCALE @ A1 1:12.5	PURPOSE OF ISSUE SUITABLE FOR INFORMATION	STATUS S2
DRAWING NO. (PROJECT CODE-ORIGINATOR-ZONE-LEVEL-TYPE-ROLE-NUMBER) 23941-HYD-XX-XX-DR-GE-1006	REVISION P1		



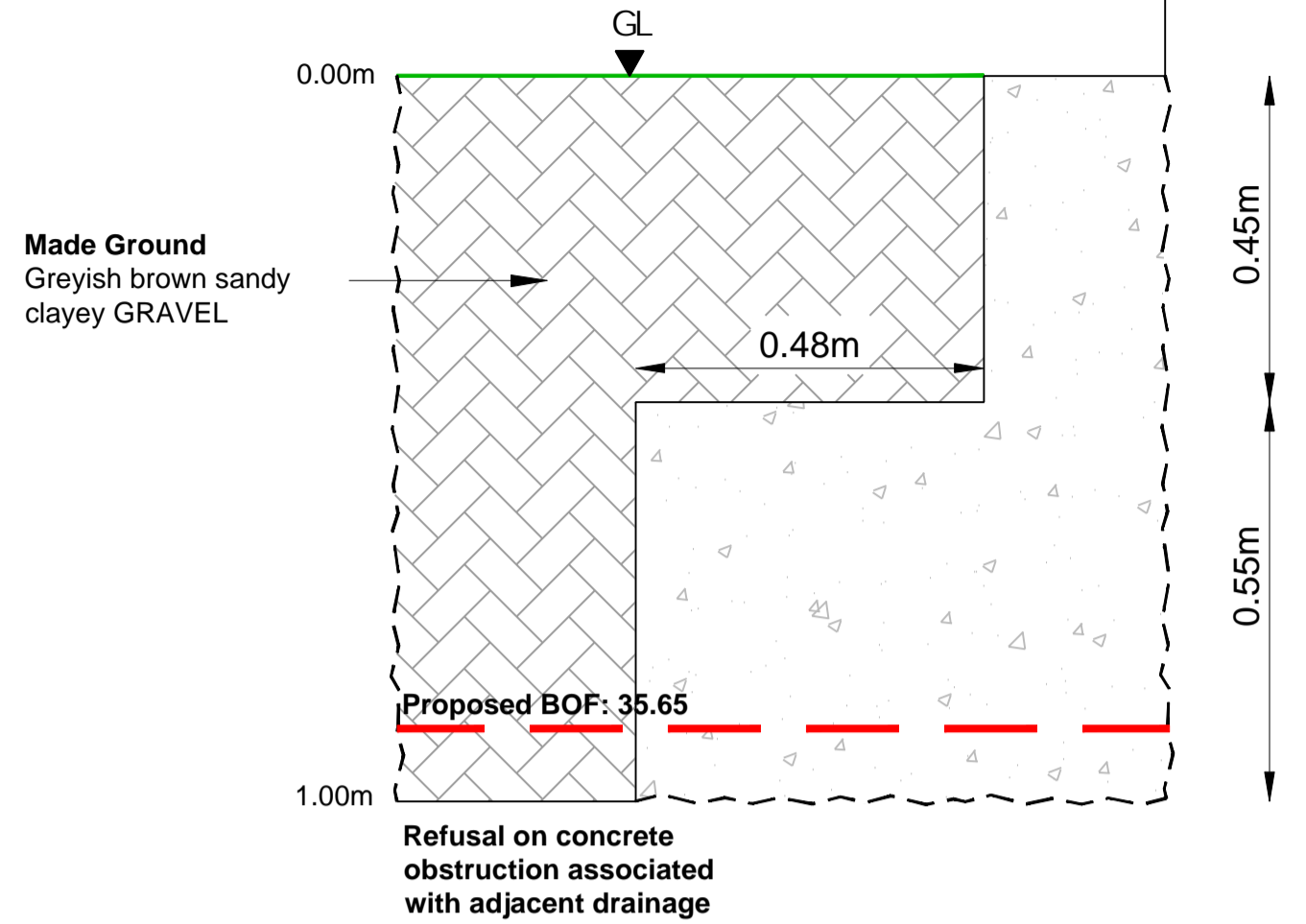
**Foundation Inspection - FPA5**

Scale 1:10



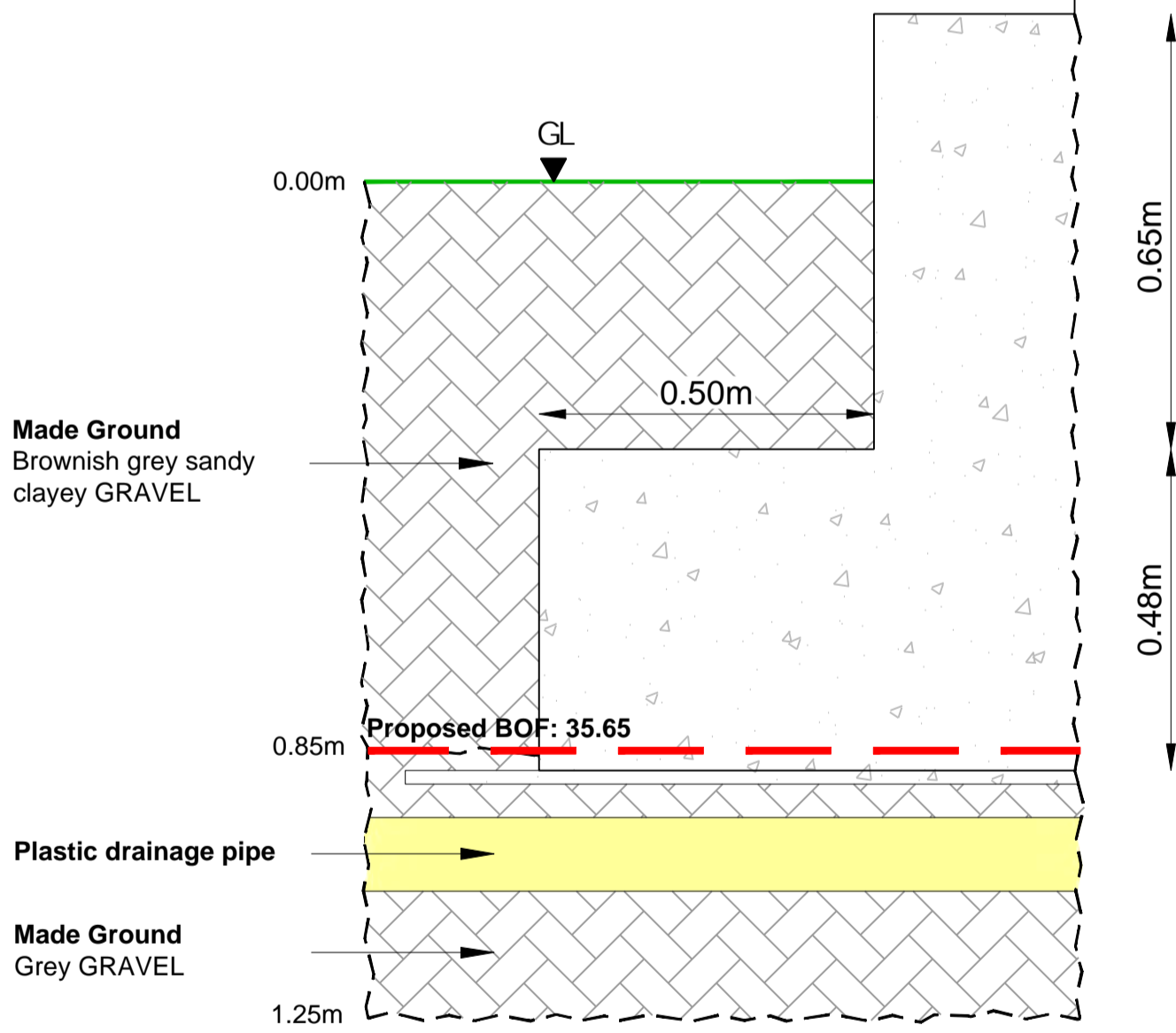
**Foundation Inspection - FPA6**

Scale 1:10



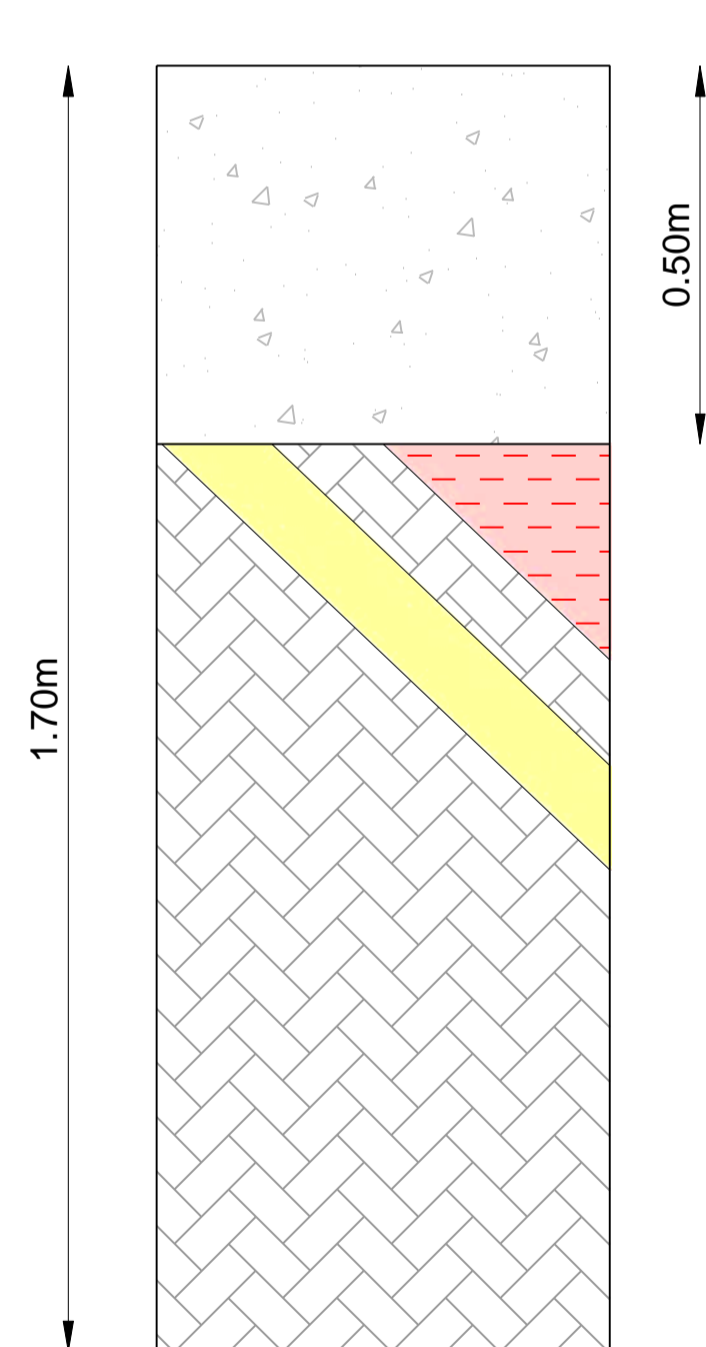
**Foundation Inspection - FPF6**

Scale 1:10



**Foundation Inspection - FPF6 Plan**

Scale 1:10



**KEY**

- Existing ground level
- Conjectural geological boundary
- Made Ground
- Made Ground (Red brown Clay)
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P1	FIRST ISSUE	20/12/22			
REV.	REVISION NOTES/COMMENTS				
DRAWN BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE

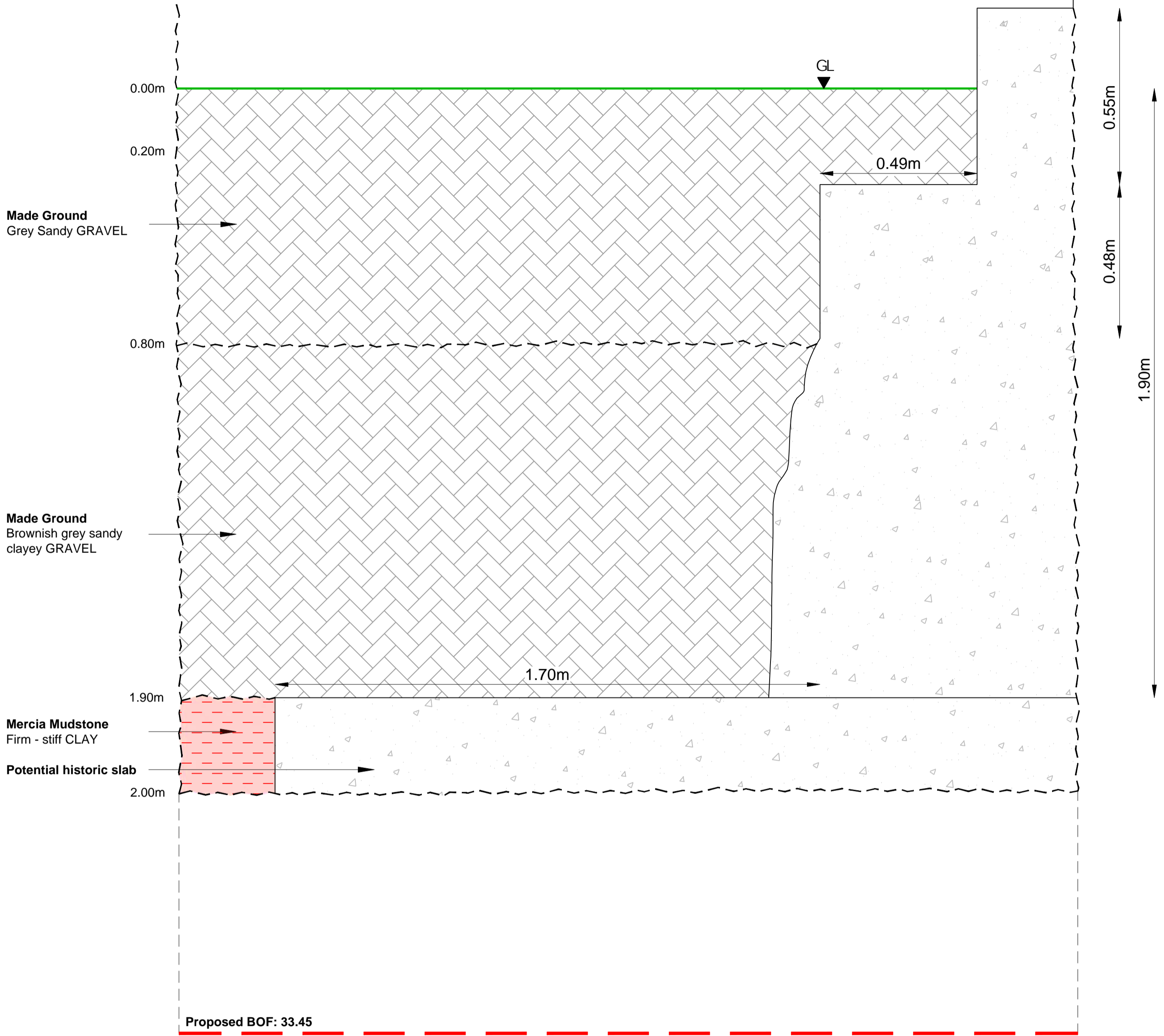
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NORTH STAR ACADEMY

<b>TITLE</b> FOUNDATION INSPECTION FPA5, FPA6, FPF6	
<b>HYDROCK PROJECT NO.</b> C-23941-C	<b>SCALE @ A2</b> 1:10
<b>PURPOSE OF ISSUE</b> SUITABLE FOR INFORMATION	<b>STATUS</b> S2
<b>DRAWING NO. (PROJECT CODE-ORIGINATOR-ZONE-LEVEL-TYPE-ROLE-NUMBER)</b> 23941-HYD-XX-XX-DR-GE-1006	<b>REVISION</b> P1

**Foundation Inspection - FPJ6**  
Scale 1:10



**KEY**

- Existing ground level
- Conjectural geological boundary
- Made Ground
- Made Ground (Red brown Clay)
- Mercia mudstone

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P1	FIRST ISSUE					
	KB	20/12/22				
REV.	REVISION NOTES/COMMENTS					
	DRAWN BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE

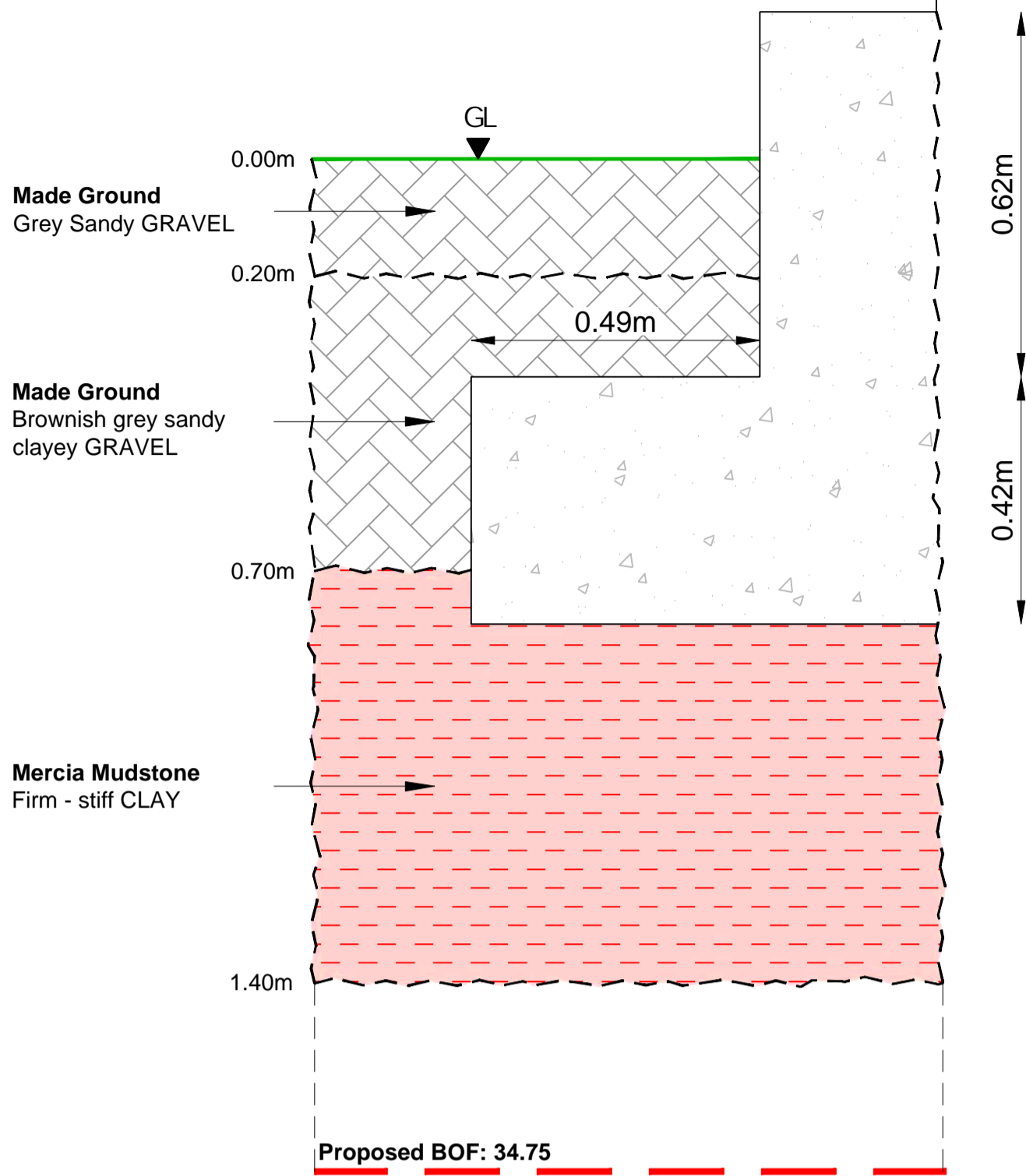
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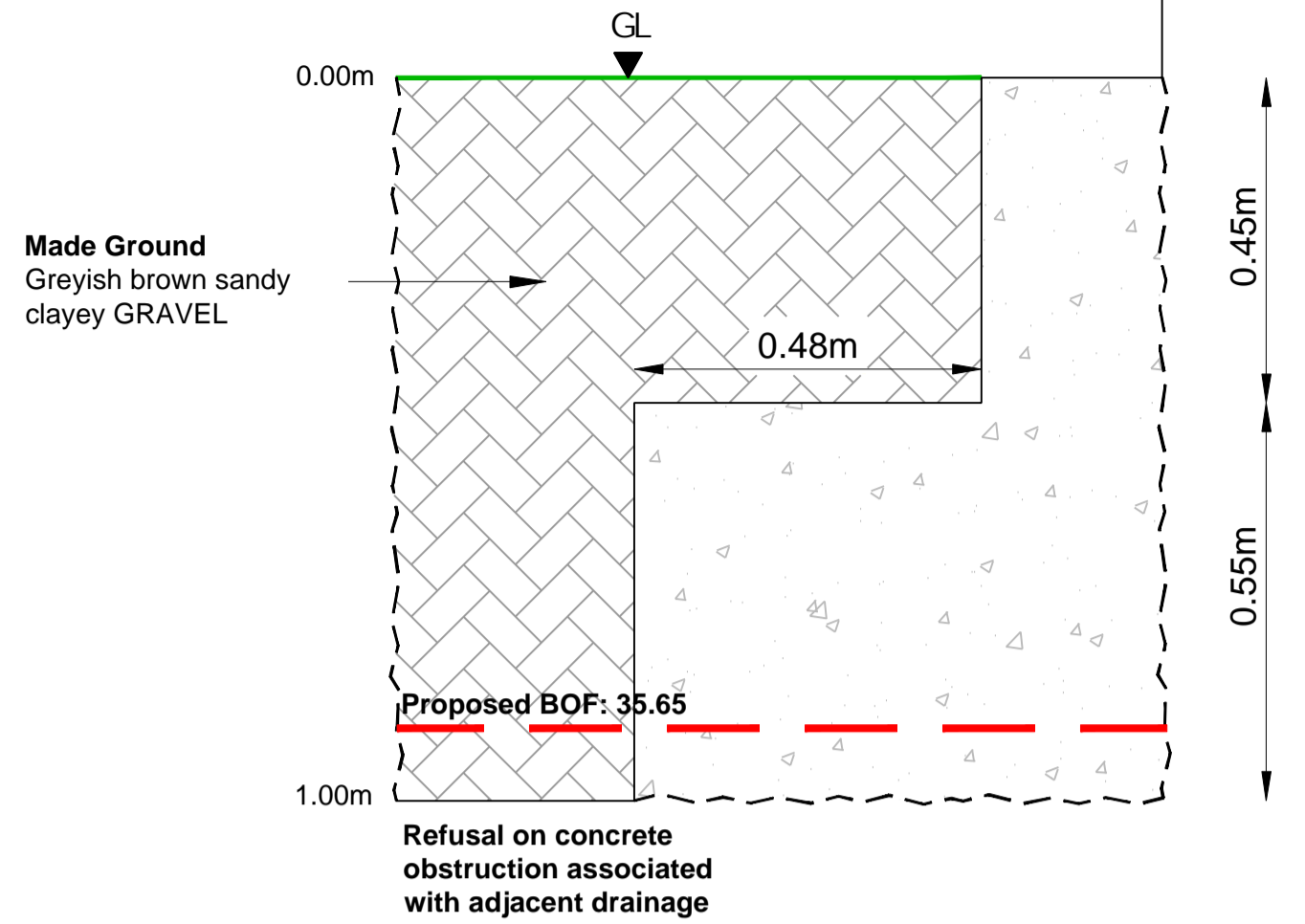
PROJECT  
**NORTH STAR ACADEMY**

TITLE <b>FOUNDATION INSPECTION FPJ6</b>	
HYDROCK PROJECT NO. <b>C-23941-C</b>	SCALE @ A2 <b>1:10</b>
PURPOSE OF ISSUE <b>SUITABLE FOR INFORMATION</b>	STATUS <b>S2</b>
DRAWING NO. (PROJECT CODE-ORIGINATOR-ZONE-LEVEL-TYPE-ROLE-NUMBER) <b>23941-HYD-XX-XX-DR-GE-1007</b>	REVISION <b>P1</b>

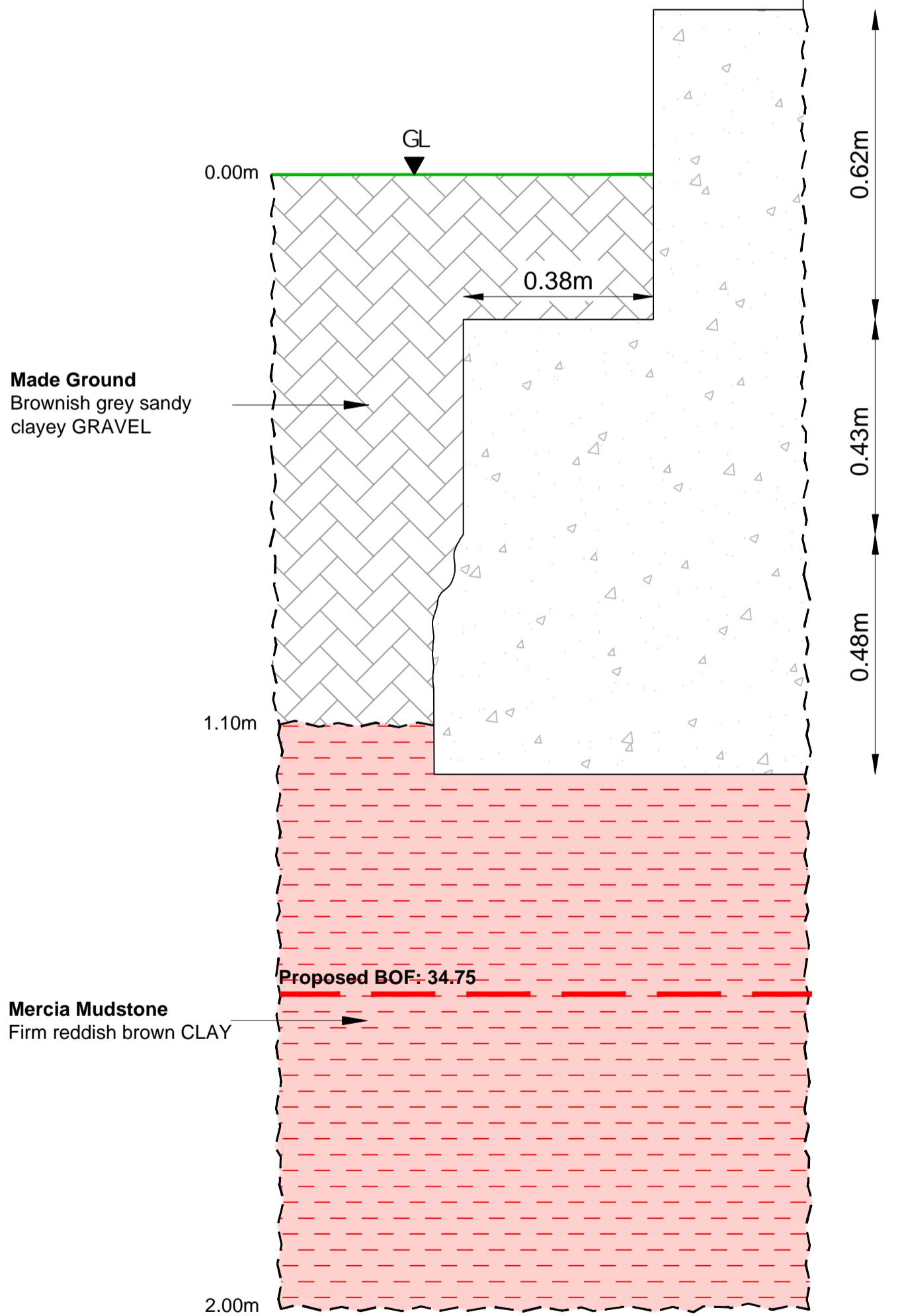
**Foundation Inspection - FPG6**  
Scale 1:10



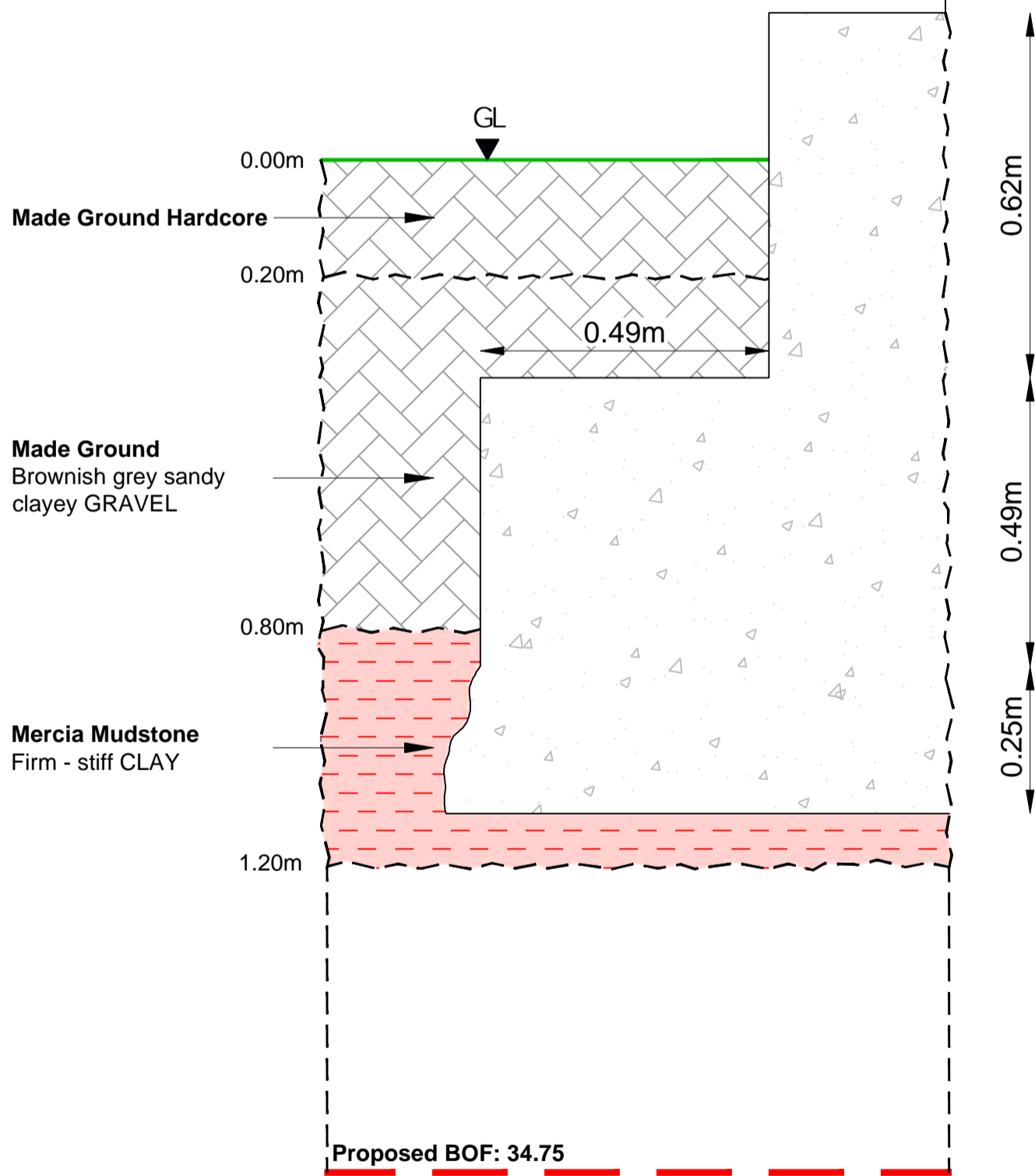
**Foundation Inspection - FPA7**  
Scale 1:10



**Foundation Inspection - FPG7**  
Scale 1:10



**Foundation Inspection - FPH6**  
Scale 1:10



**KEY**

- Existing ground level
- Conjectural geological boundary
- Made Ground
- Made Ground (Red brown Clay)
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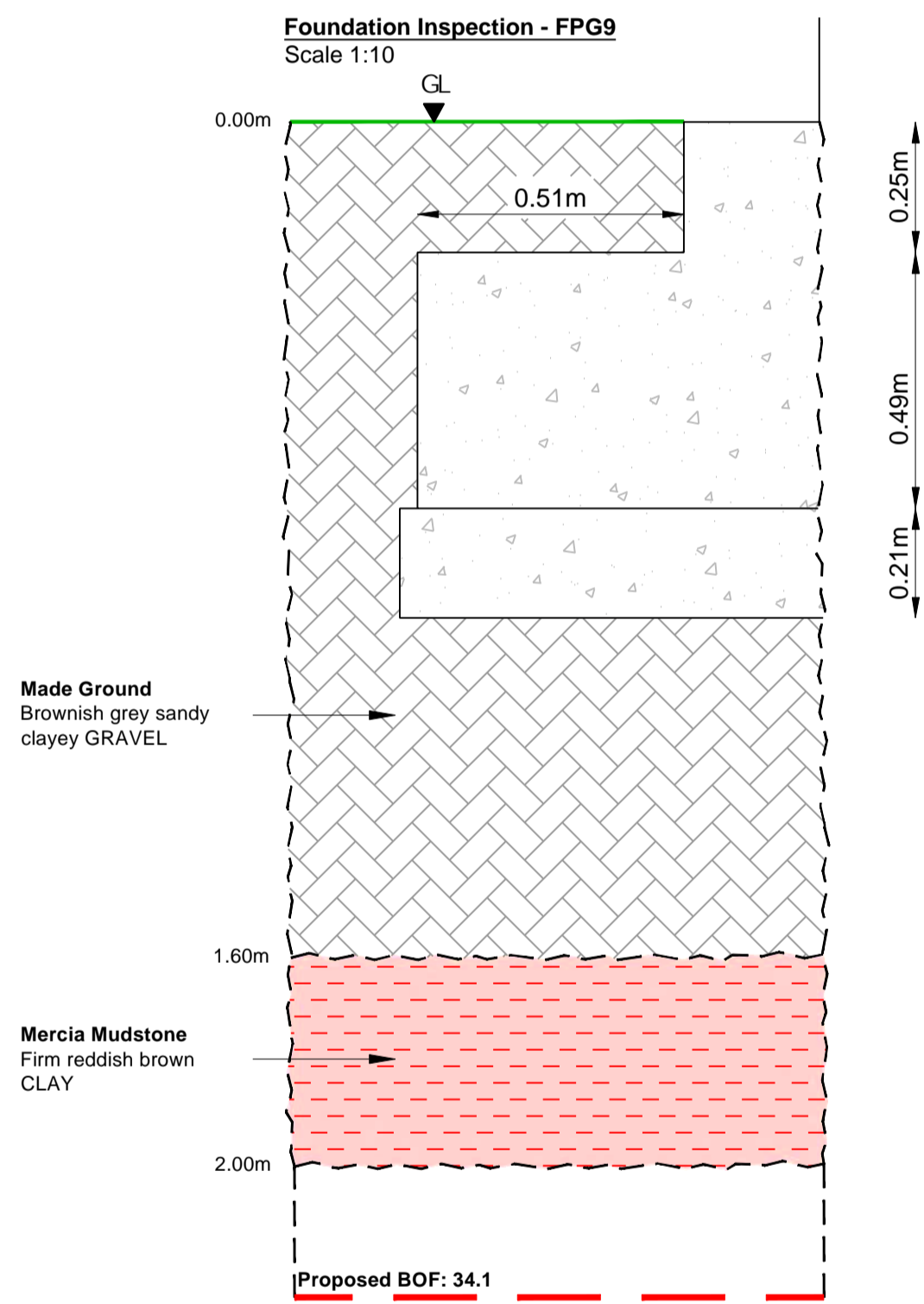
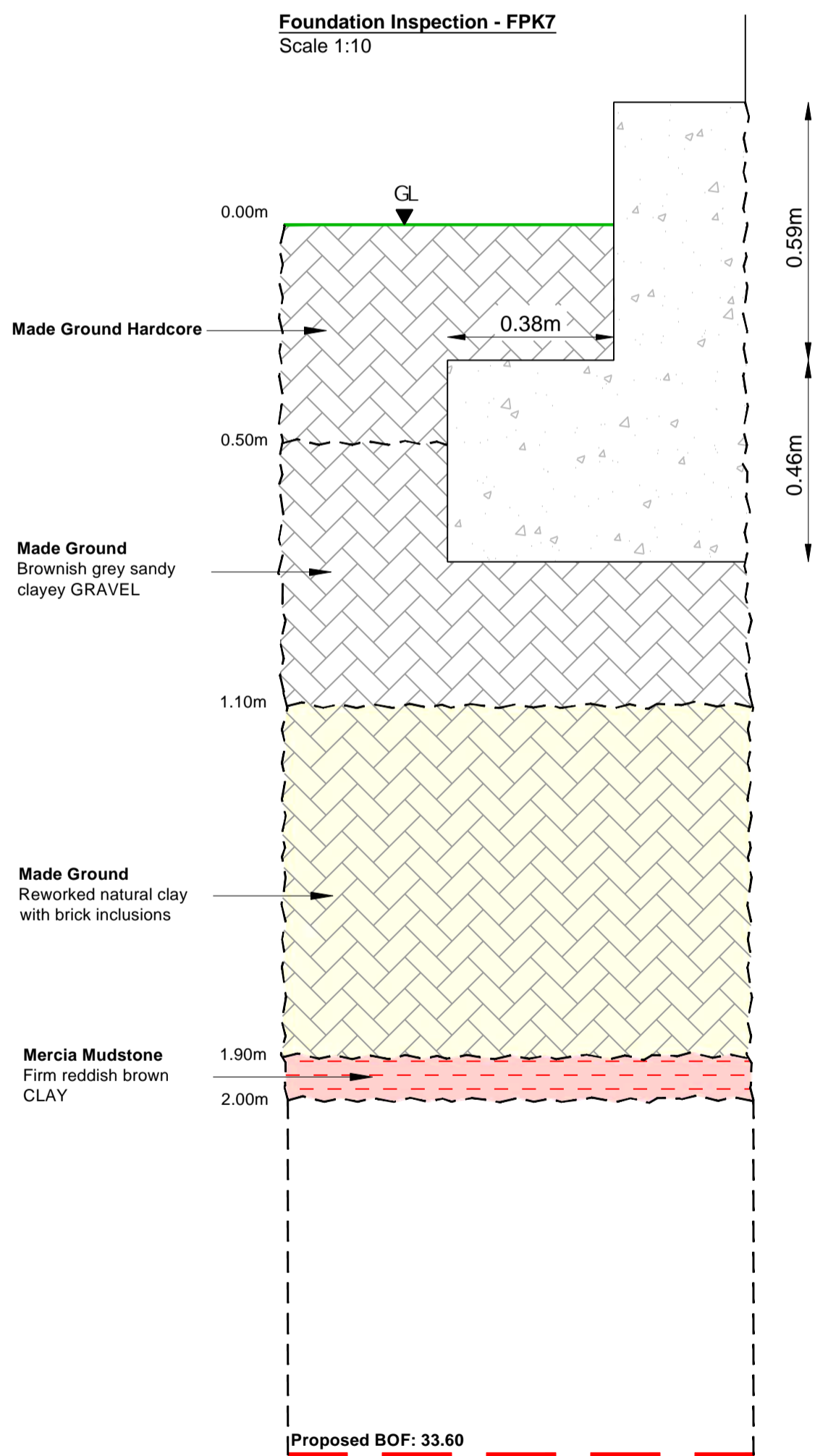
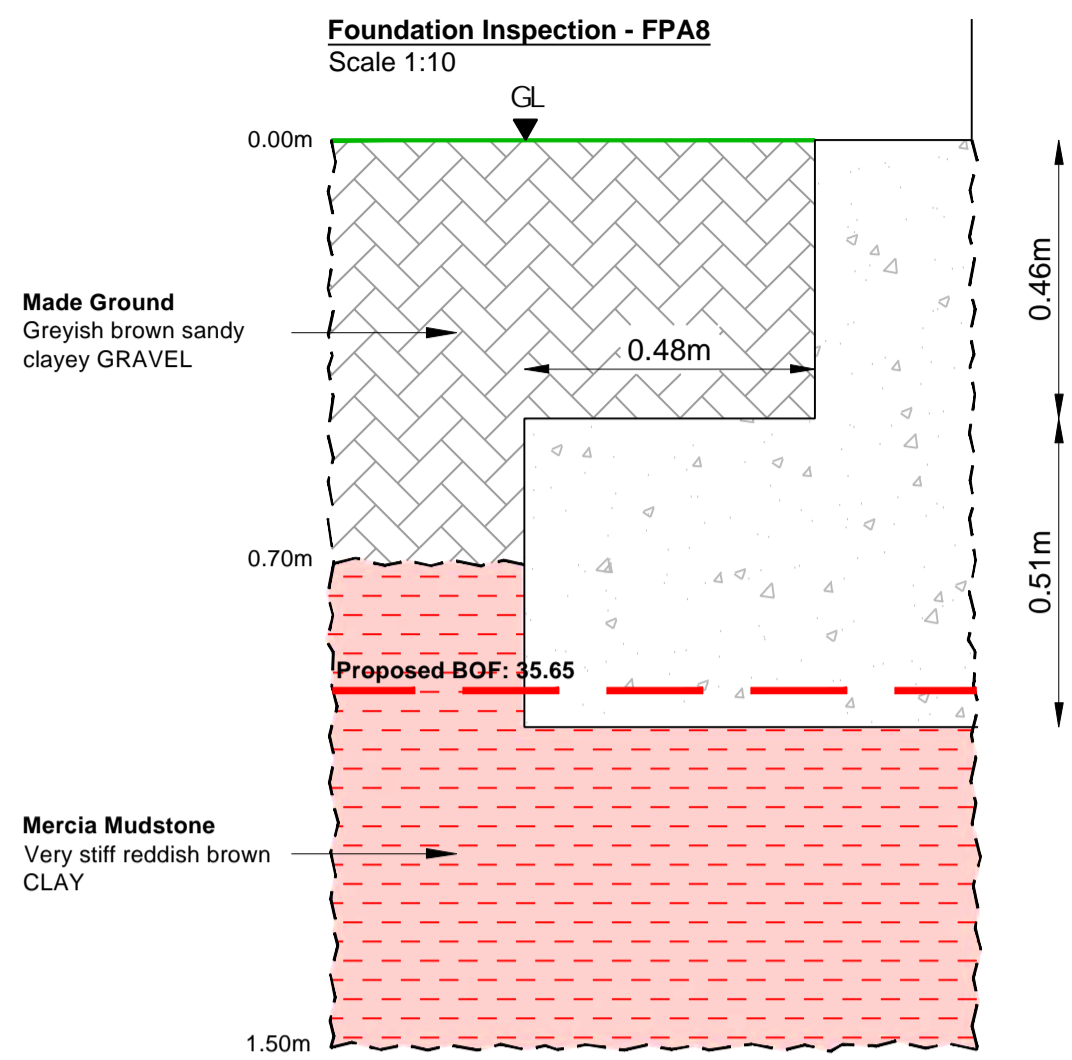
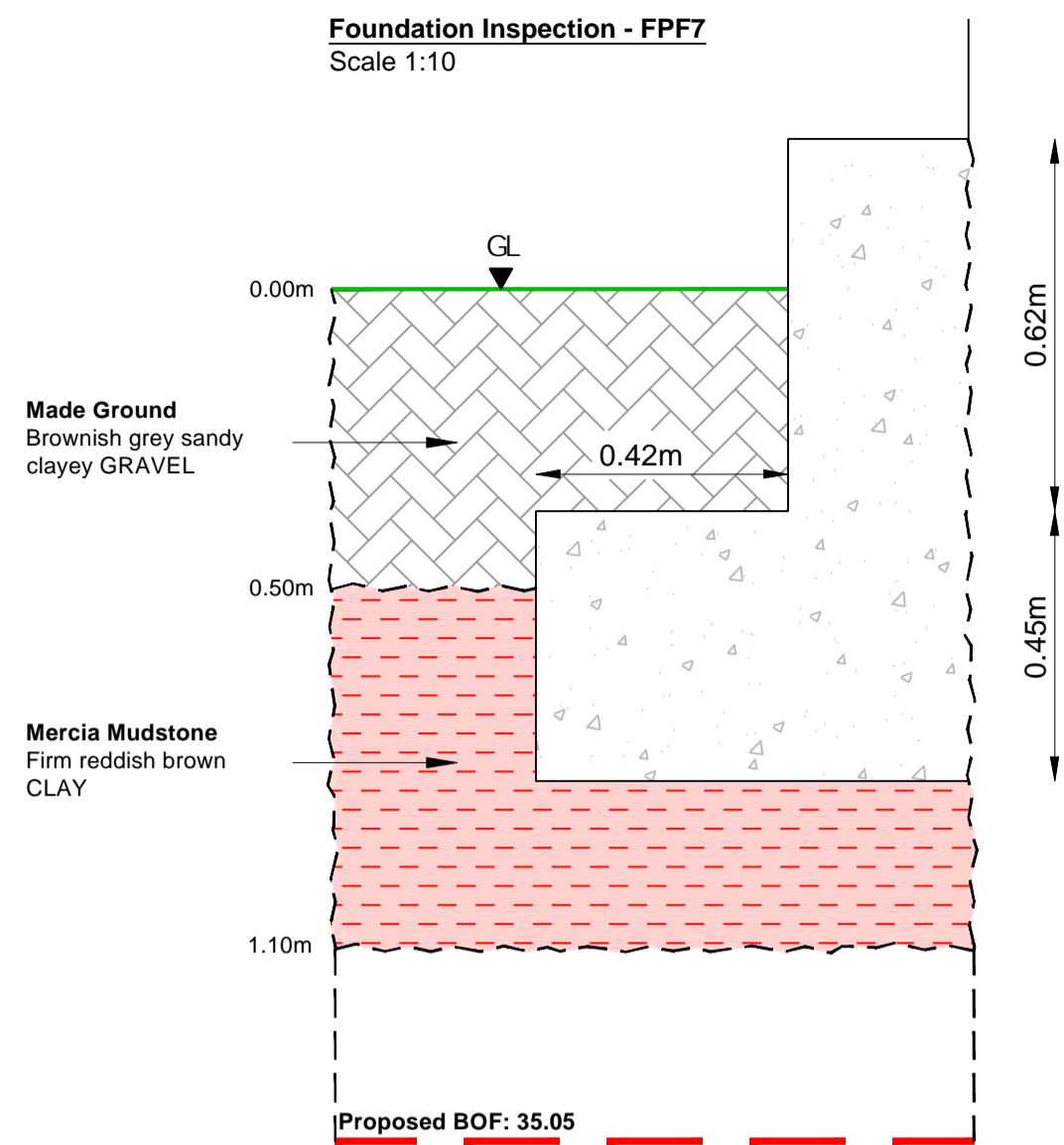
P1	FIRST ISSUE	07/02/23			
REV.	REVISION NOTES/COMMENTS	DATE	CHECKED BY	DATE	APPROVED BY
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**PROJECT**  
NORTH STAR ACADEMY

<b>TITLE</b> FOUNDATION INSPECTION FPG6, FPA7, FPH6, FPG7	
<b>HYDROCK PROJECT NO.</b> C-23941-C	<b>SCALE @ A2</b> 1:10
<b>PURPOSE OF ISSUE</b> SUITABLE FOR INFORMATION	<b>STATUS</b> S2
<b>DRAWING NO. (PROJECT CODE-ORIGINATOR-ZONE-LEVEL-TYPE-ROLE-NUMBER)</b> 23941-HYD-XX-XX-DR-GE-1008	<b>REVISION</b> P1



**KEY**

- Existing ground level
- Conjectural geological boundary
- Made Ground
- Made Ground (Red brown Clay)
- Mercia mudstone

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P1	FIRST ISSUE				
	KB	07/02/23			
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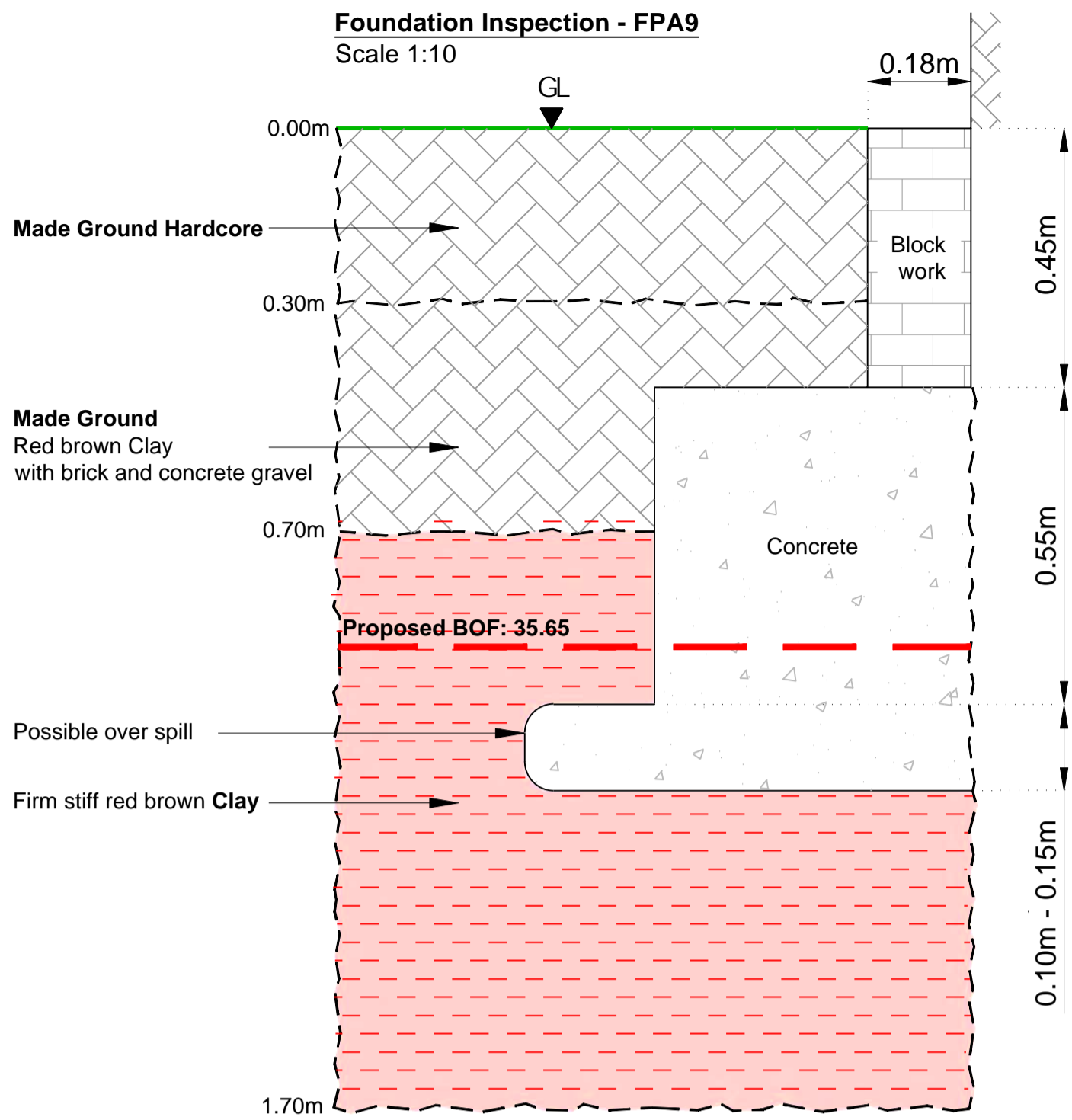
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PROJECT  
**NORTH STAR ACADEMY**

TITLE <b>FOUNDATION INSPECTION</b> FPF7, FPA8, FPK7, FPG9	
HYDROCK PROJECT NO. C-23941-C	SCALE @ A2 1:12.5
PURPOSE OF ISSUE SUITABLE FOR INFORMATION	STATUS S2
DRAWING NO. (PROJECT CODE-ORIGINATOR-ZONE-LEVEL-TYPE-ROLE-NUMBER) 23941-HYD-XX-XX-DR-GE-1009	REVISION P1

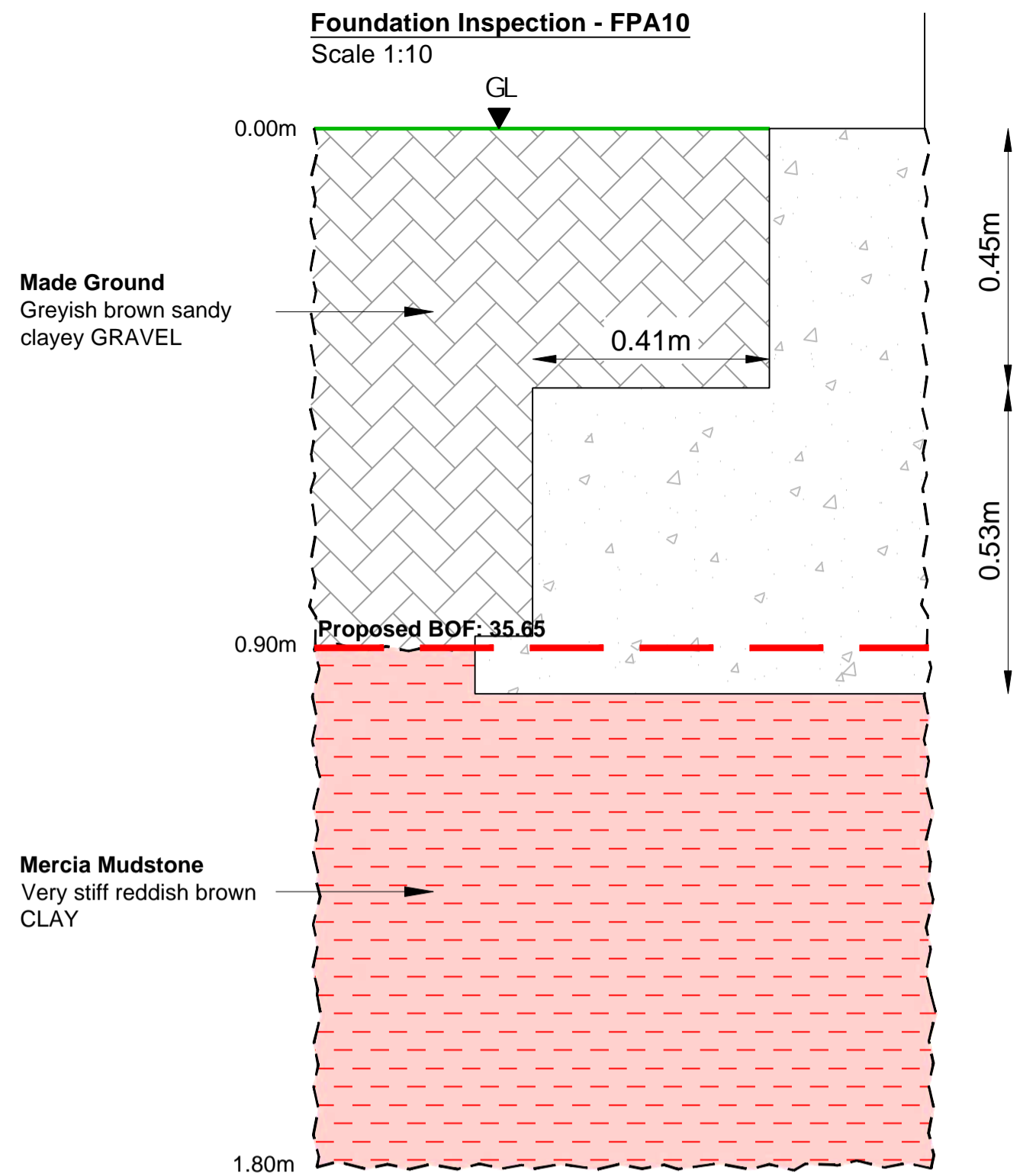
**Foundation Inspection - FPA9**

Scale 1:10



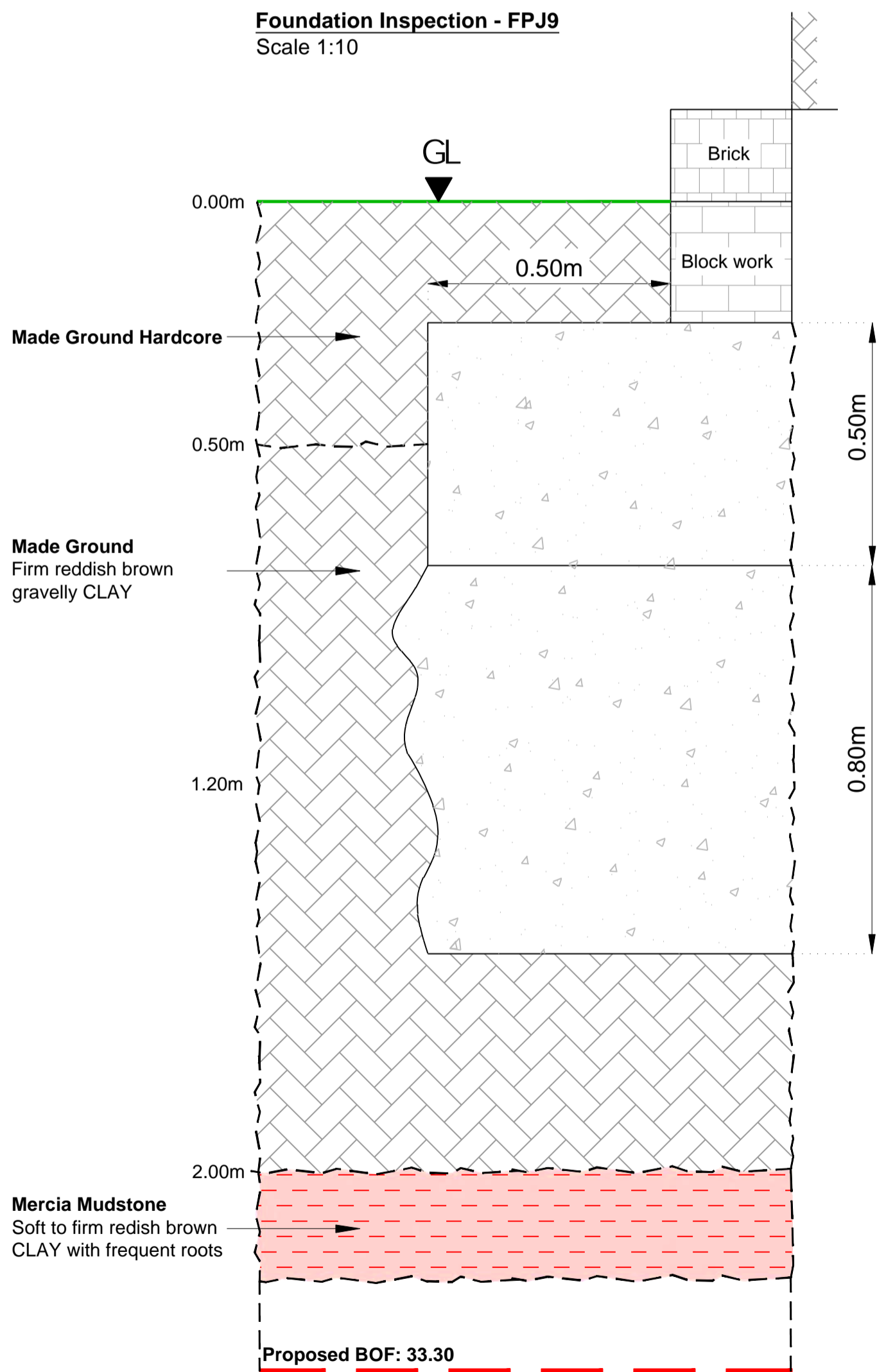
**Foundation Inspection - FPA10**

Scale 1:10



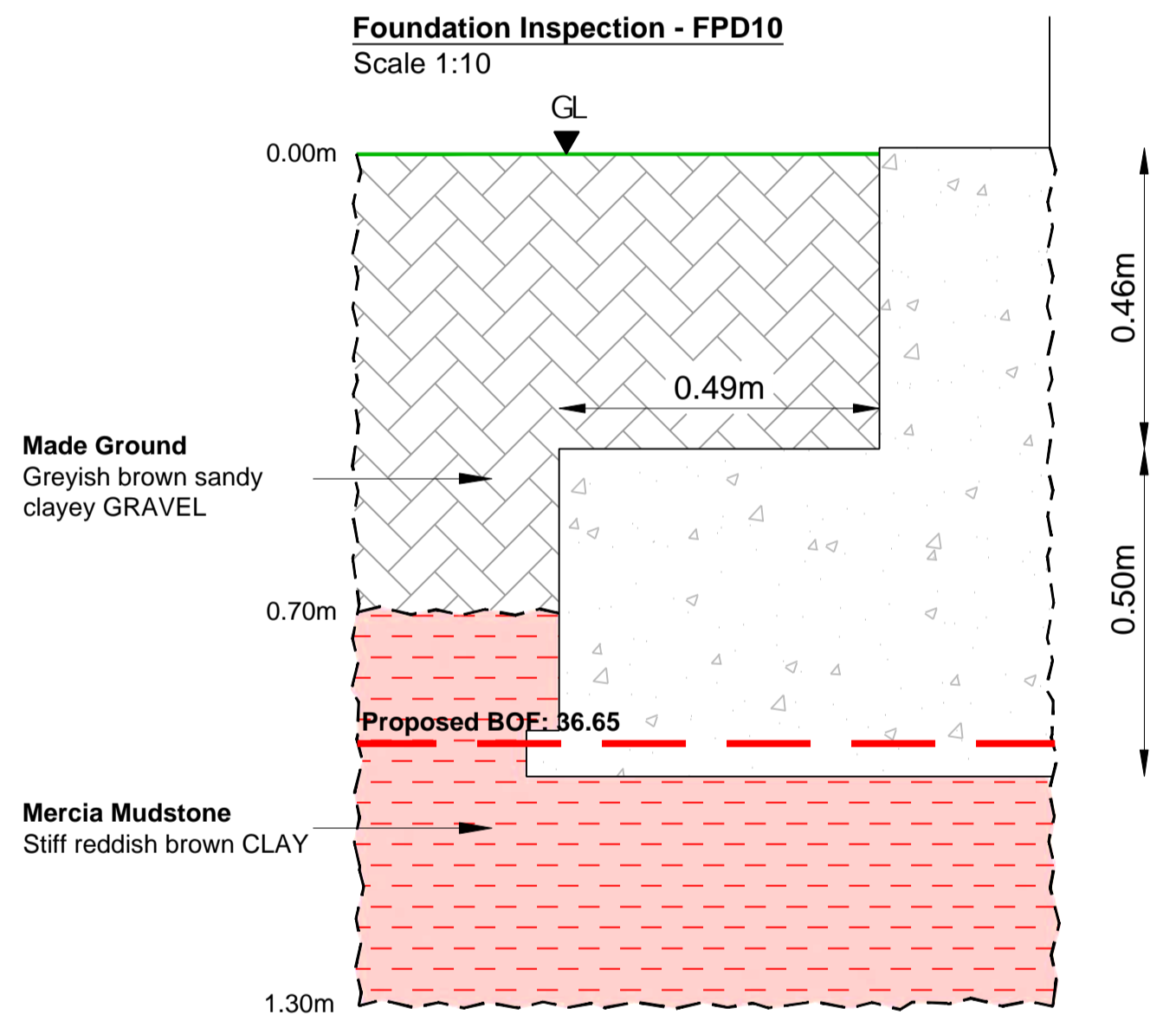
**Foundation Inspection - FPJ9**

Scale 1:10



**Foundation Inspection - FPD10**

Scale 1:10



**KEY**

- Existing ground level
- Conjectural geological boundary
- Made Ground
- Made Ground (Red brown Clay)
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P1		FIRST ISSUE			
XB		07/02/23			
REVISION NOTES/COMMENTS					
REV.	DRAWN BY	DATE	CHECKED BY	DATE	APPROVED BY

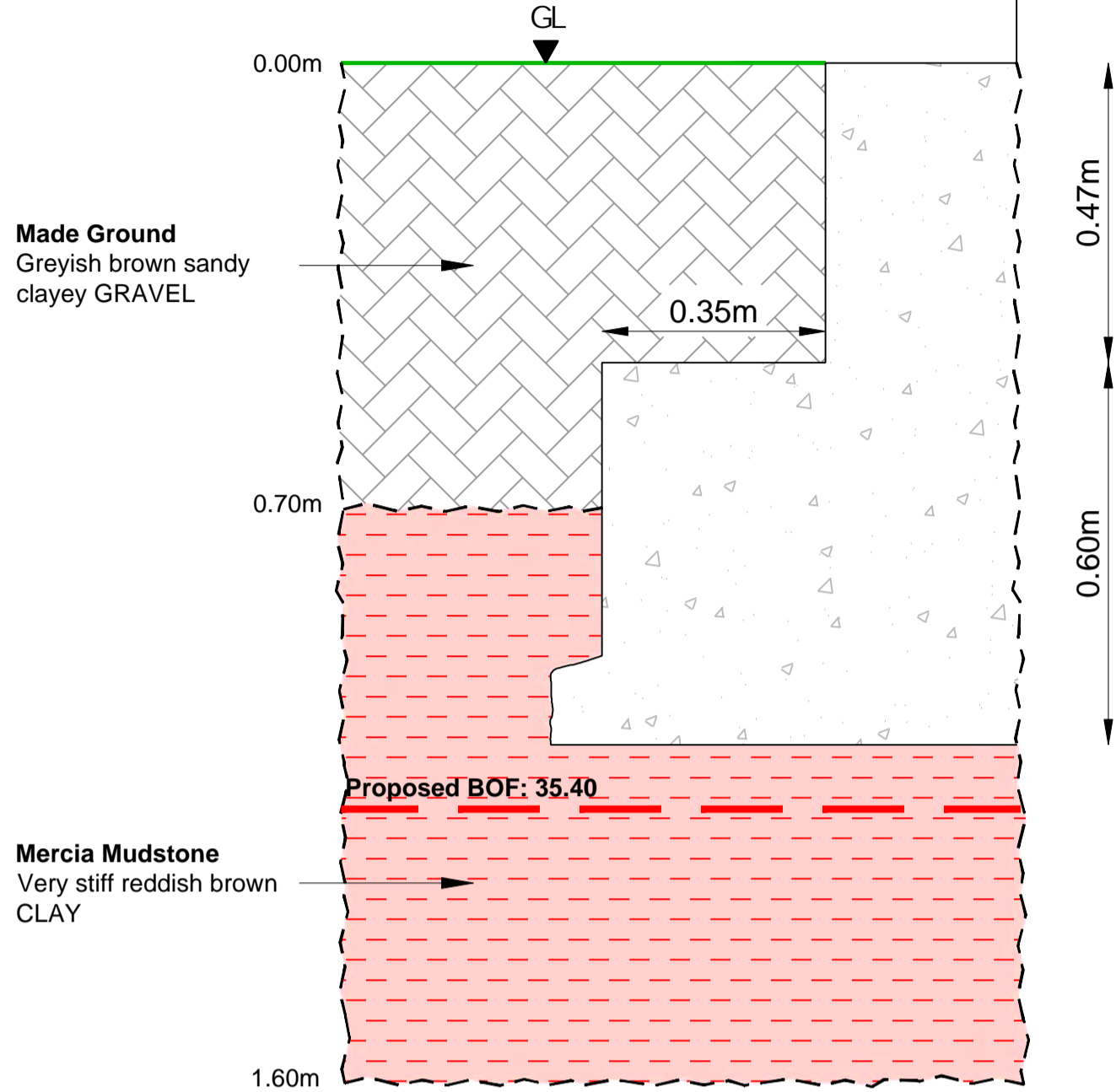
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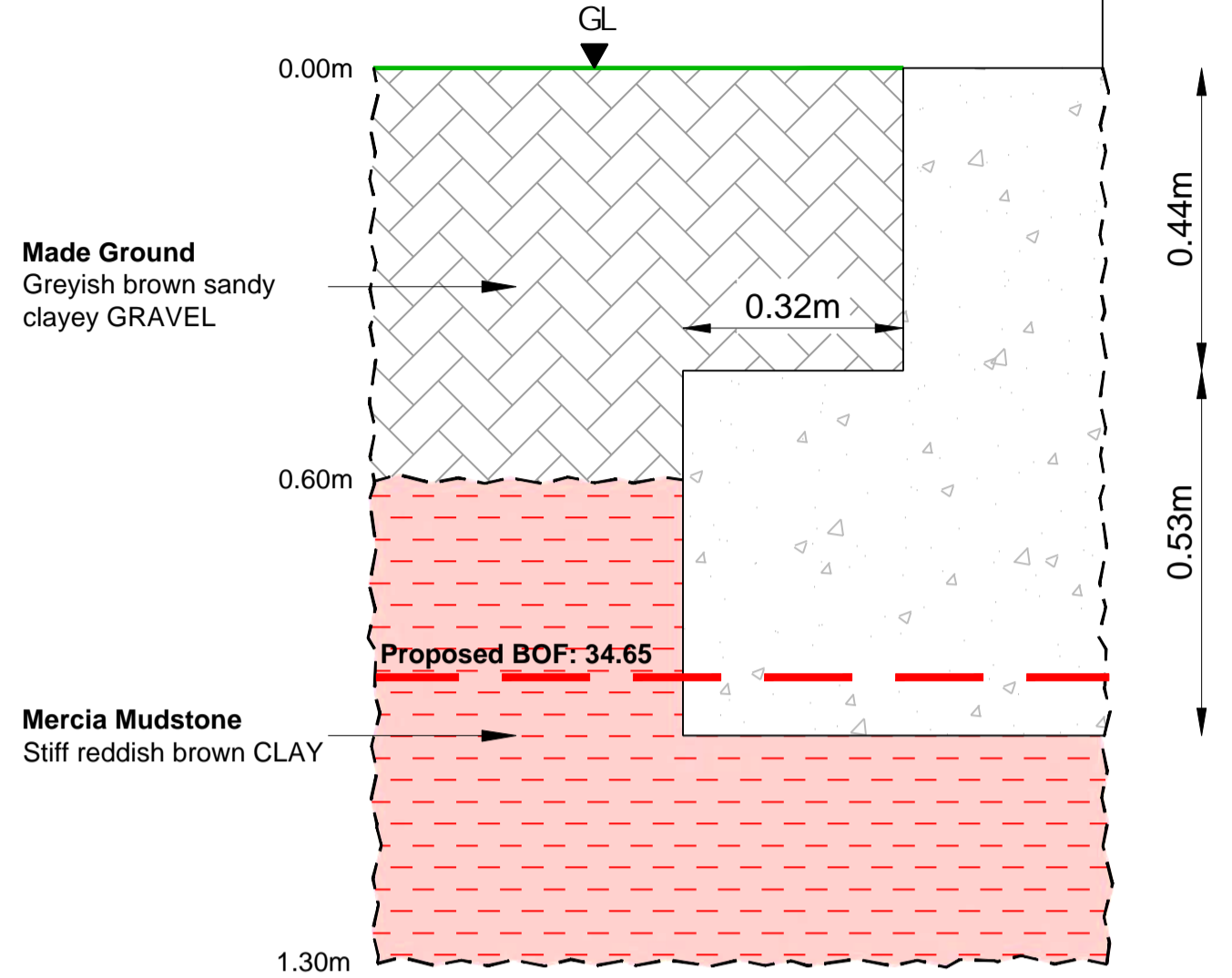
PROJECT  
**NORTH STAR ACADEMY**

TITLE <b>FOUNDATION INSPECTION FPA9, FPA10, FPJ9, FPD10</b>	
HYDROCK PROJECT NO. C-23941-C	SCALE @ A2 1:10
PURPOSE OF ISSUE SUITABLE FOR INFORMATION	STATUS S2
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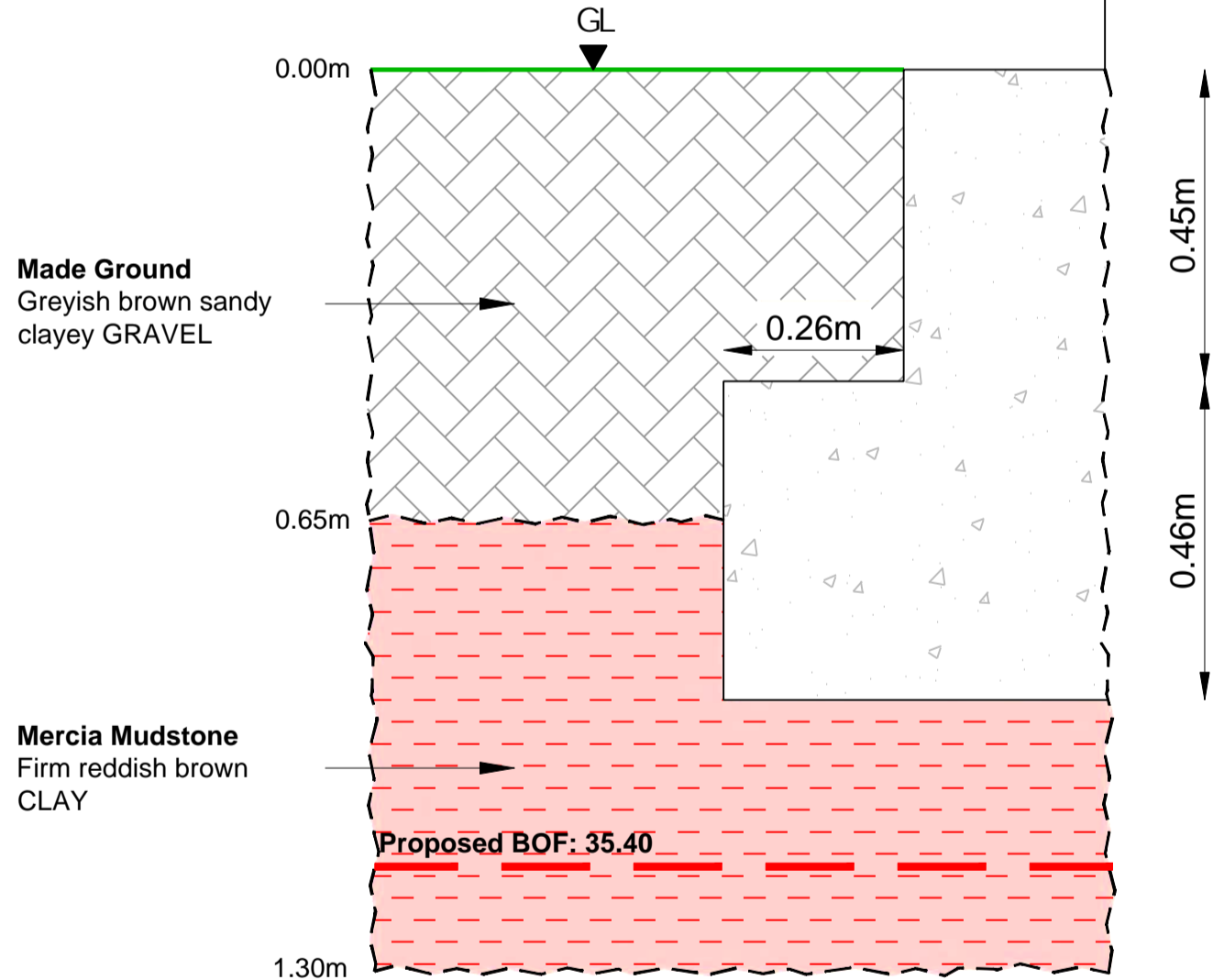
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Scale 1:10



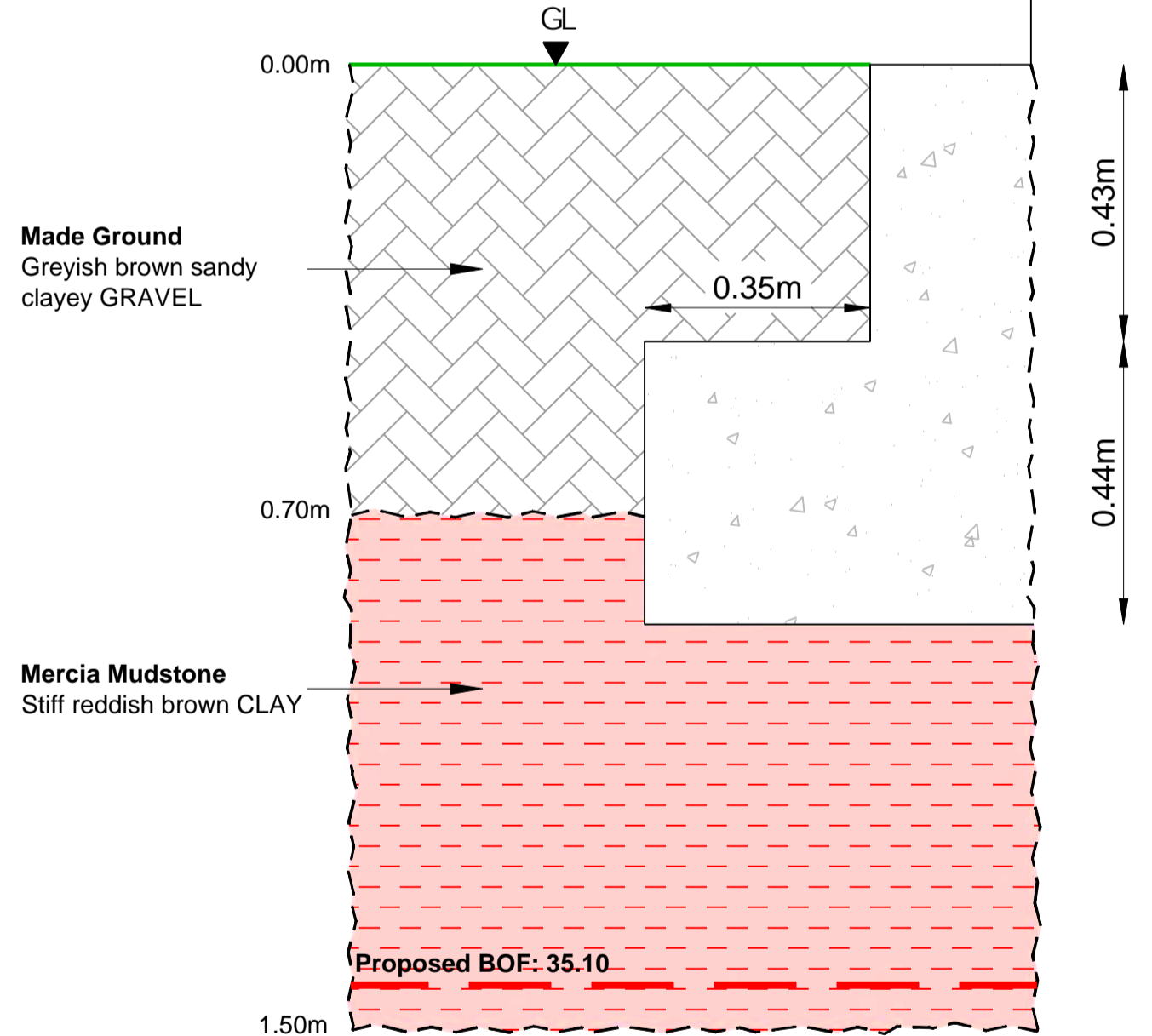
**Foundation Inspection - FPD11**  
Scale 1:10



**Foundation Inspection - FPA12**  
Scale 1:10



**Foundation Inspection - FPC12**  
Scale 1:10



**KEY**

- Existing ground level
- Conjectural geological boundary
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- Made Ground (Red brown Clay)
- Mercia mudstone

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P1	FIRST ISSUE						
	REVISION NOTES/COMMENTS	07/02/23					
REV.	DRAWN BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE	

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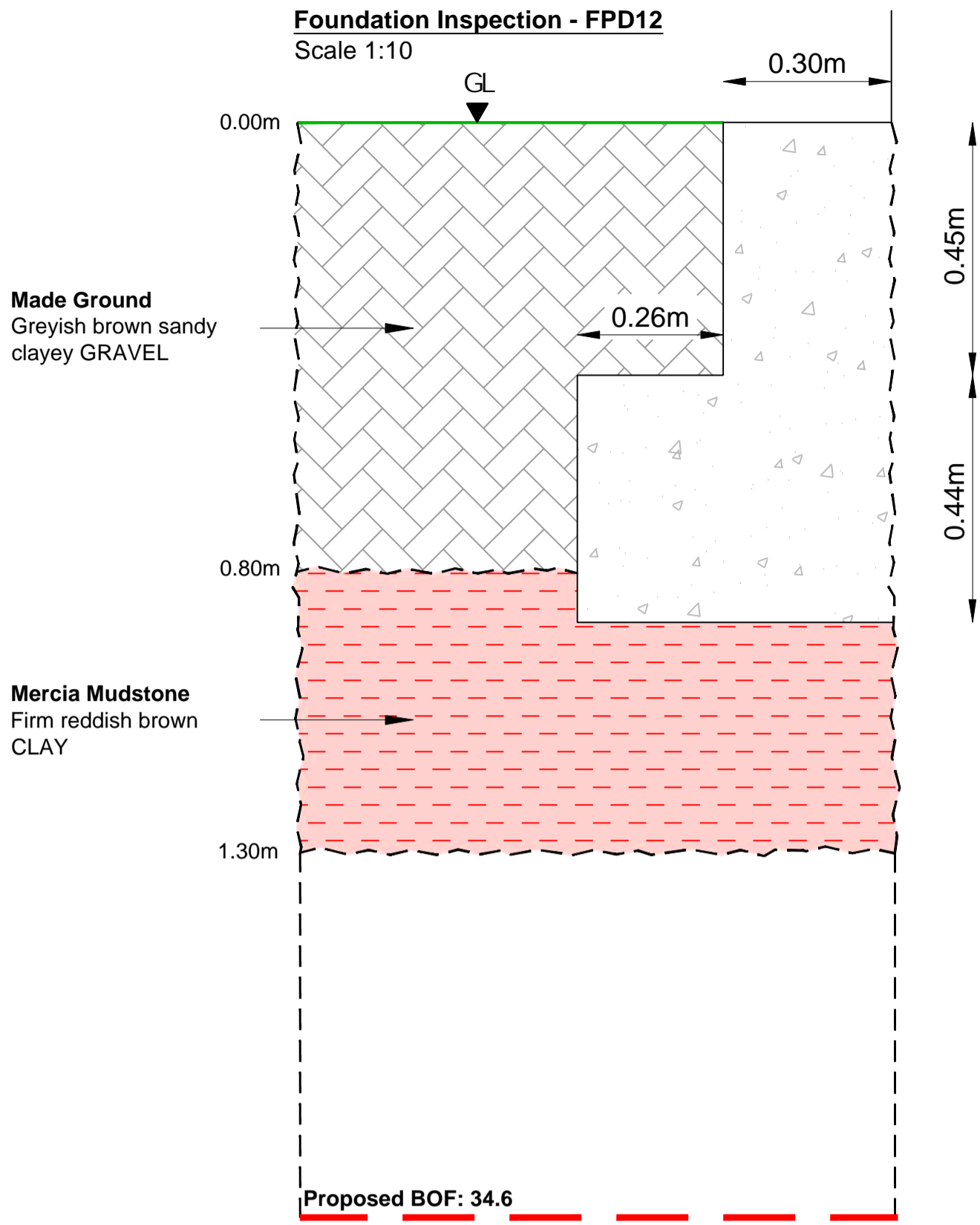
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PROJECT

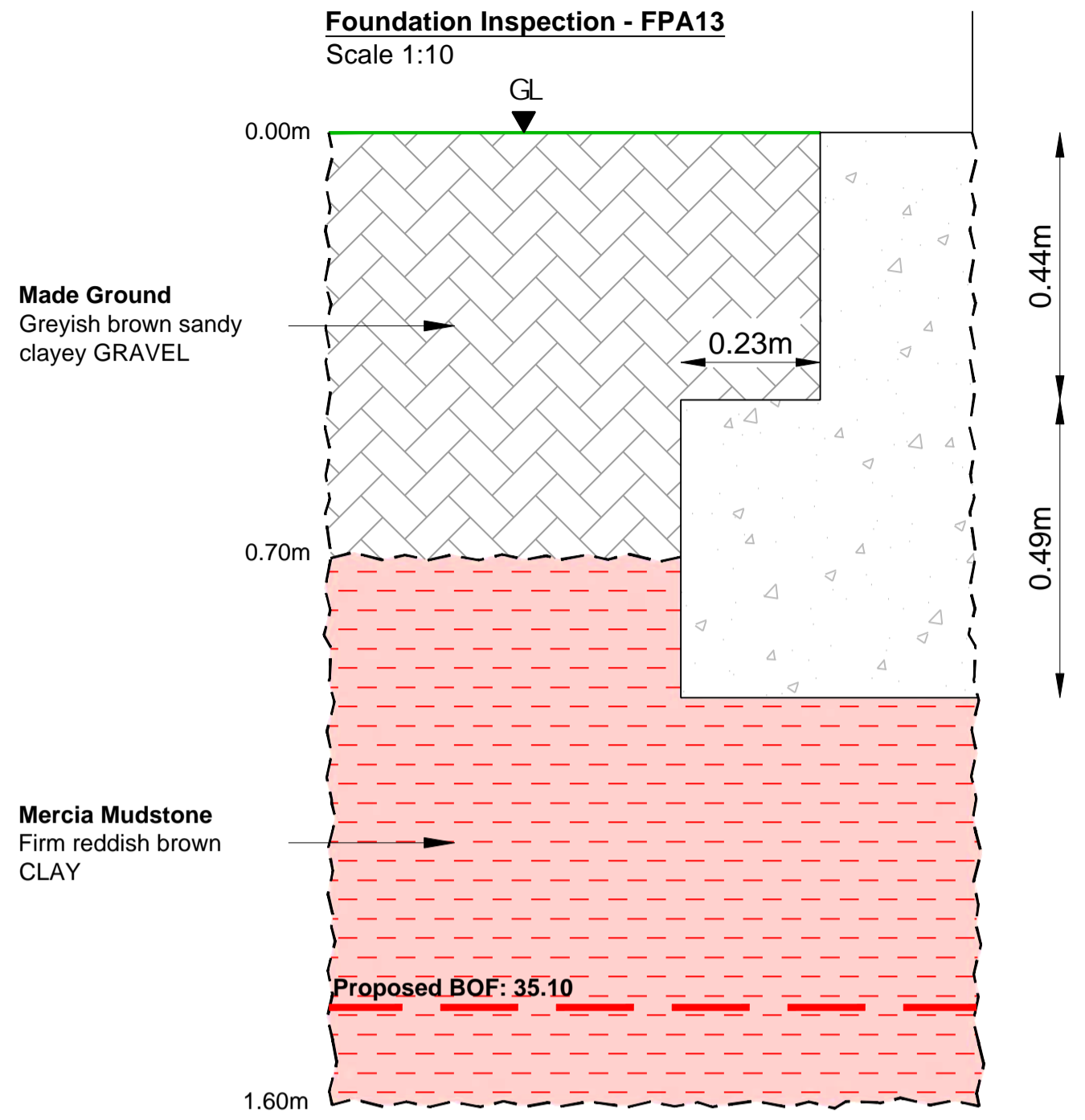
**NORTH STAR ACADEMY**

<b>TITLE</b>	
<b>FOUNDATION INSPECTION</b>	
FPA11, FPD11, FPA12, FPC12	
HYDROCK PROJECT NO. C-23941-C	SCALE @ A2 1:10
PURPOSE OF ISSUE SUITABLE FOR INFORMATION	STATUS S2
DRAWING NO. (PROJECT CODE-ORIGINATOR-ZONE-LEVEL-TYPE-ROLE-NUMBER) 23941-HYD-XX-XX-DR-GE-1011	REVISION P1

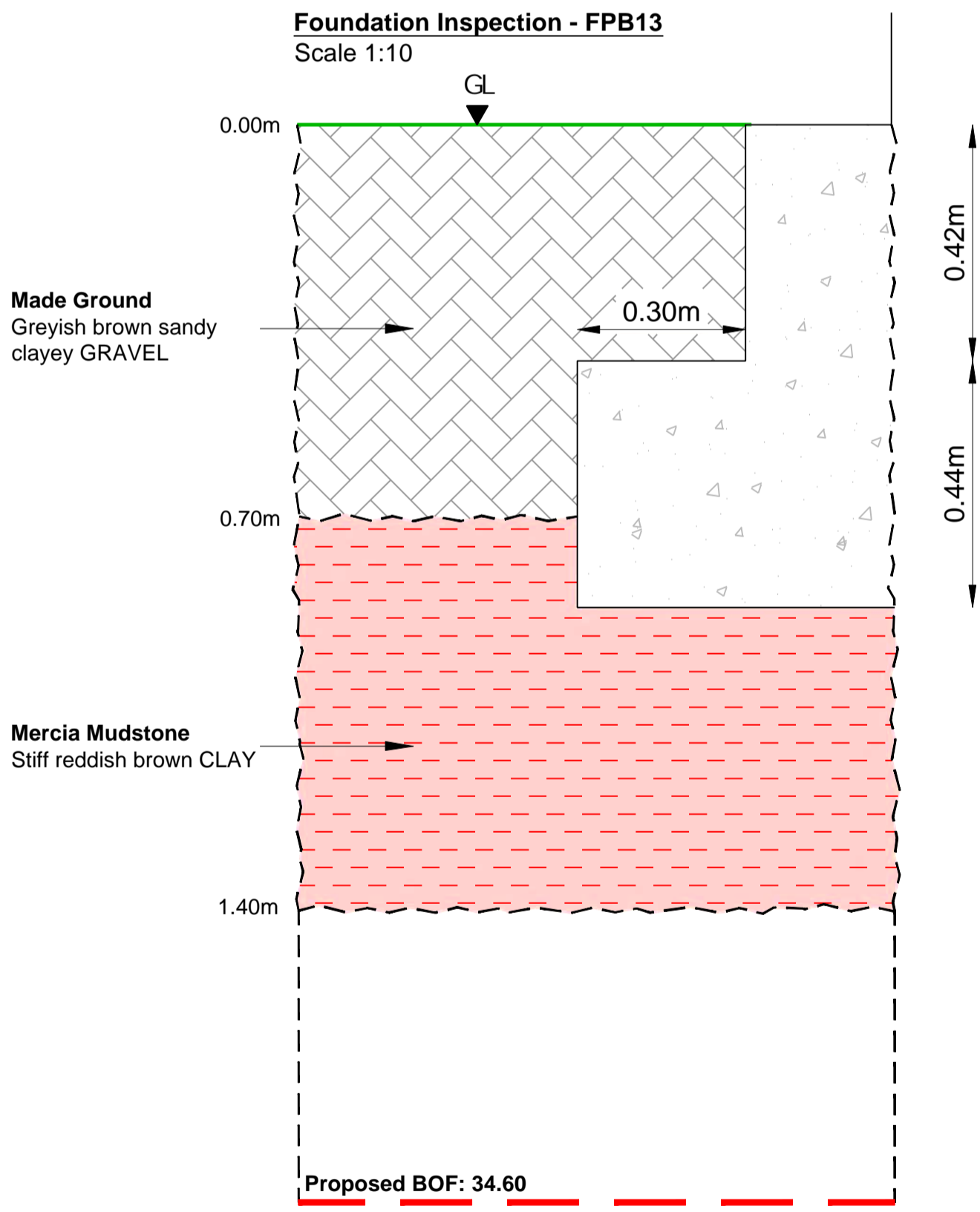
**Foundation Inspection - FPD12**  
Scale 1:10



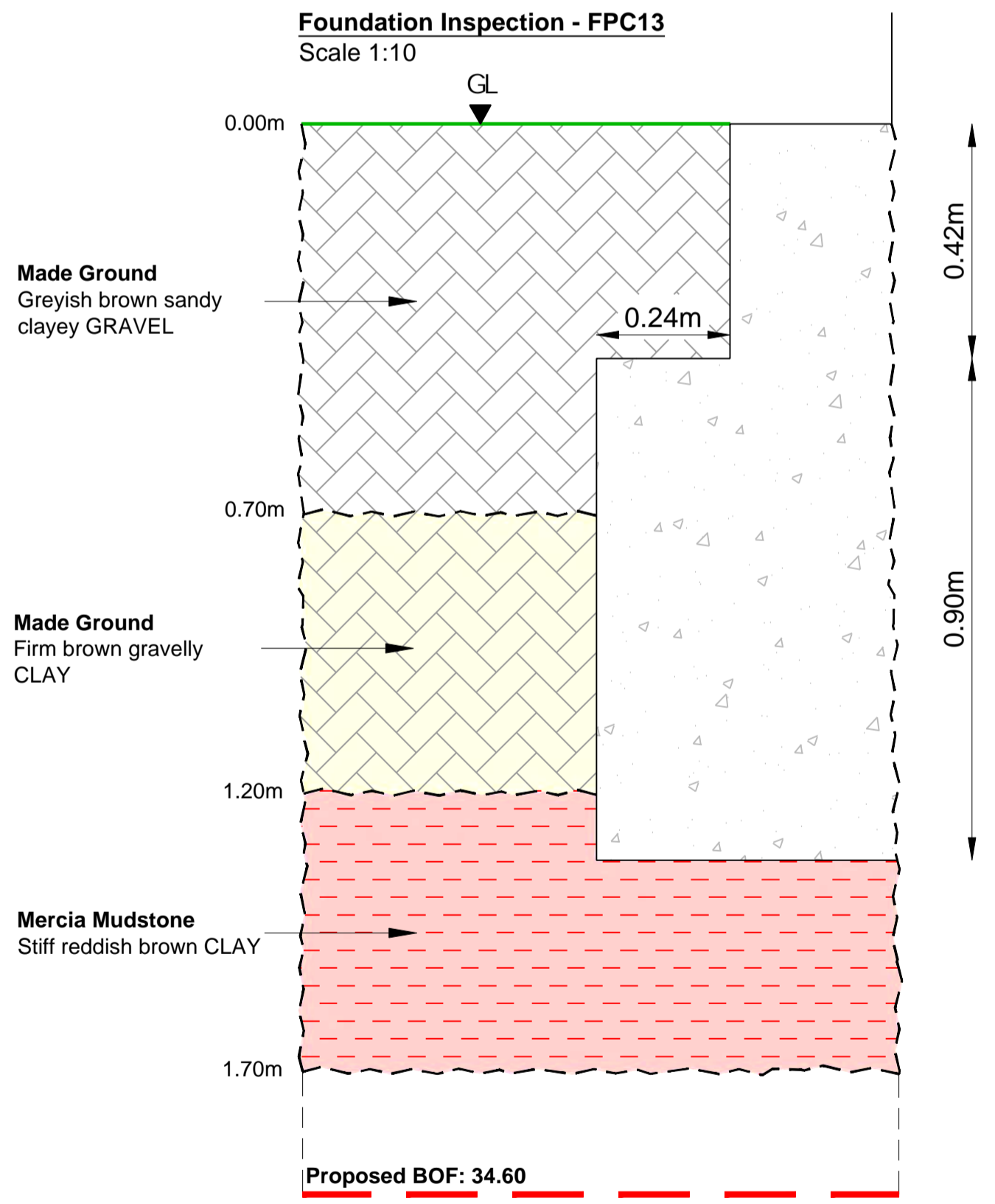
**Foundation Inspection - FPA13**  
Scale 1:10



**Foundation Inspection - FPB13**  
Scale 1:10



**Foundation Inspection - FPC13**  
Scale 1:10



**KEY**

- Existing ground level
- Conjectural geological boundary
- Made Ground
- Made Ground (Red brown Clay)
- Mercia mudstone

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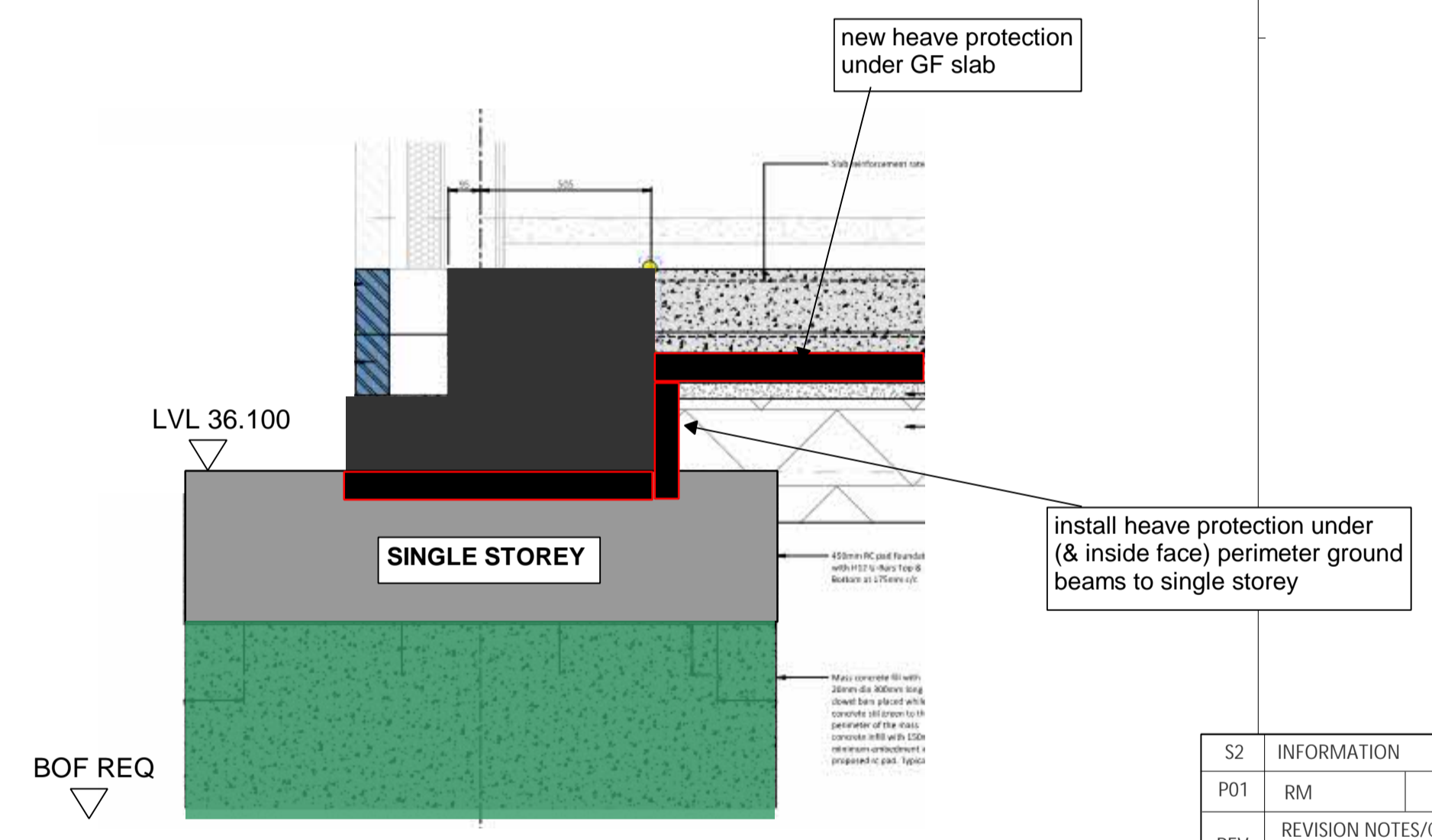
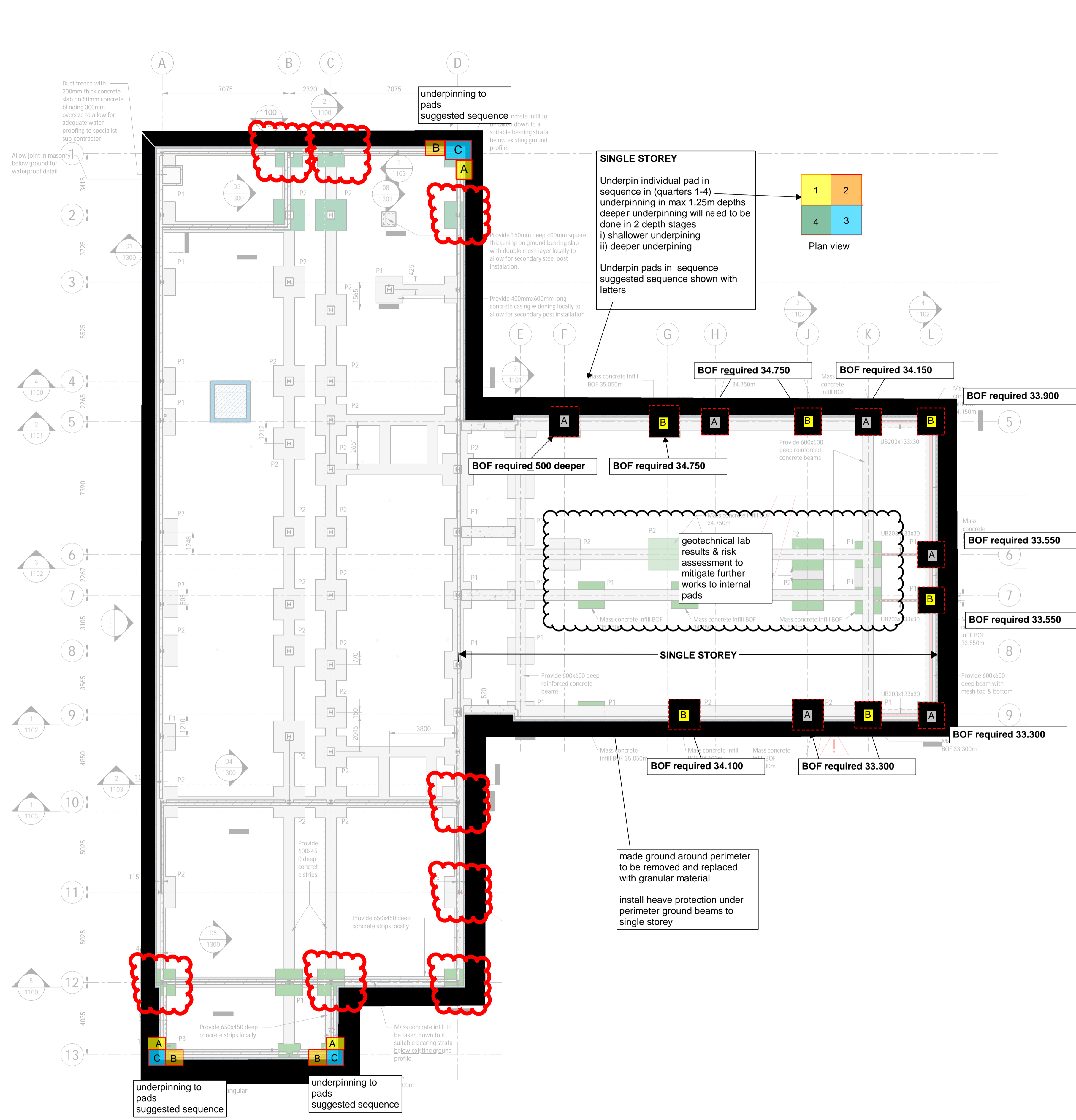
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ISG LIMITED

**PROJECT**  
NORTH STAR ACADEMY

<b>TITLE</b> FOUNDATION INSPECTION FPD12, FPA13, FPB13, FPC13	
<b>HYDROCK PROJECT NO.</b> C-23941-C	<b>SCALE @ A2</b> 1:10
<b>PURPOSE OF ISSUE</b> SUITABLE FOR INFORMATION	<b>STATUS</b> S2
<b>DRAWING NO. (PROJECT CODE-ORIGINATOR-ZONE-LEVEL-TYPE-ROLE-NUMBER)</b> 23941-HYD-XX-XX-DR-GE-1012	<b>REVISION</b> P1

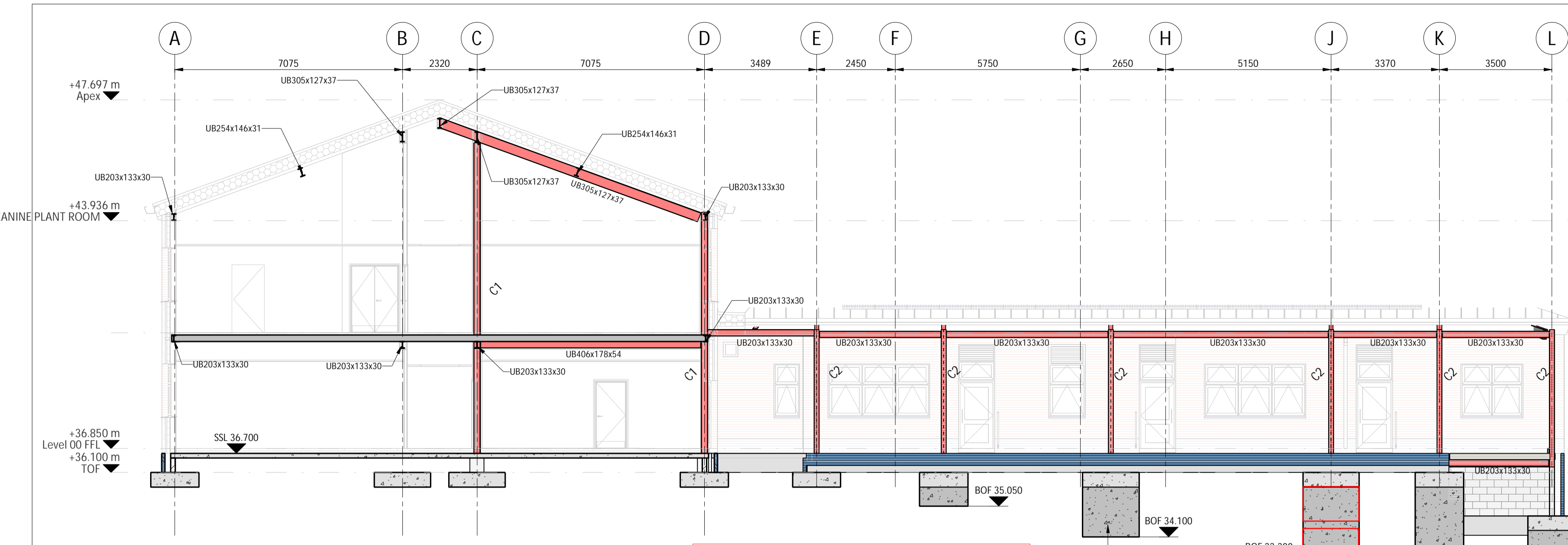


1 Foundations GA  
1: 125

S2	INFORMATION				
P01	RM	--	--	--	--
REV	REVISION NOTES/COMMENTS				
	DRAWN BY	DATE	CHECKED BY	DATE	APPROVED BY DATE
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CLIENT	ISG				
PROJECT	North Star Academy				
TITLE	FOUNDATION REMEDIATION SCHEME UNDERPINNING				
HYDROCK PROJECT NO.	C-23941		SCALE	@ A3	
STATUS DESCRIPTION				STATUS	
SUITABLE FOR INFORMATION				S2	
DRAWING NO.				REVISION	
26941-HYD-XX-F1-SK-S-1400				P01	

MA23000-23999/23941 - Northstar Academy01\_WFPA03\_Model\_3d13123941-HYD-XX-F1-SK-S-0001.rvt

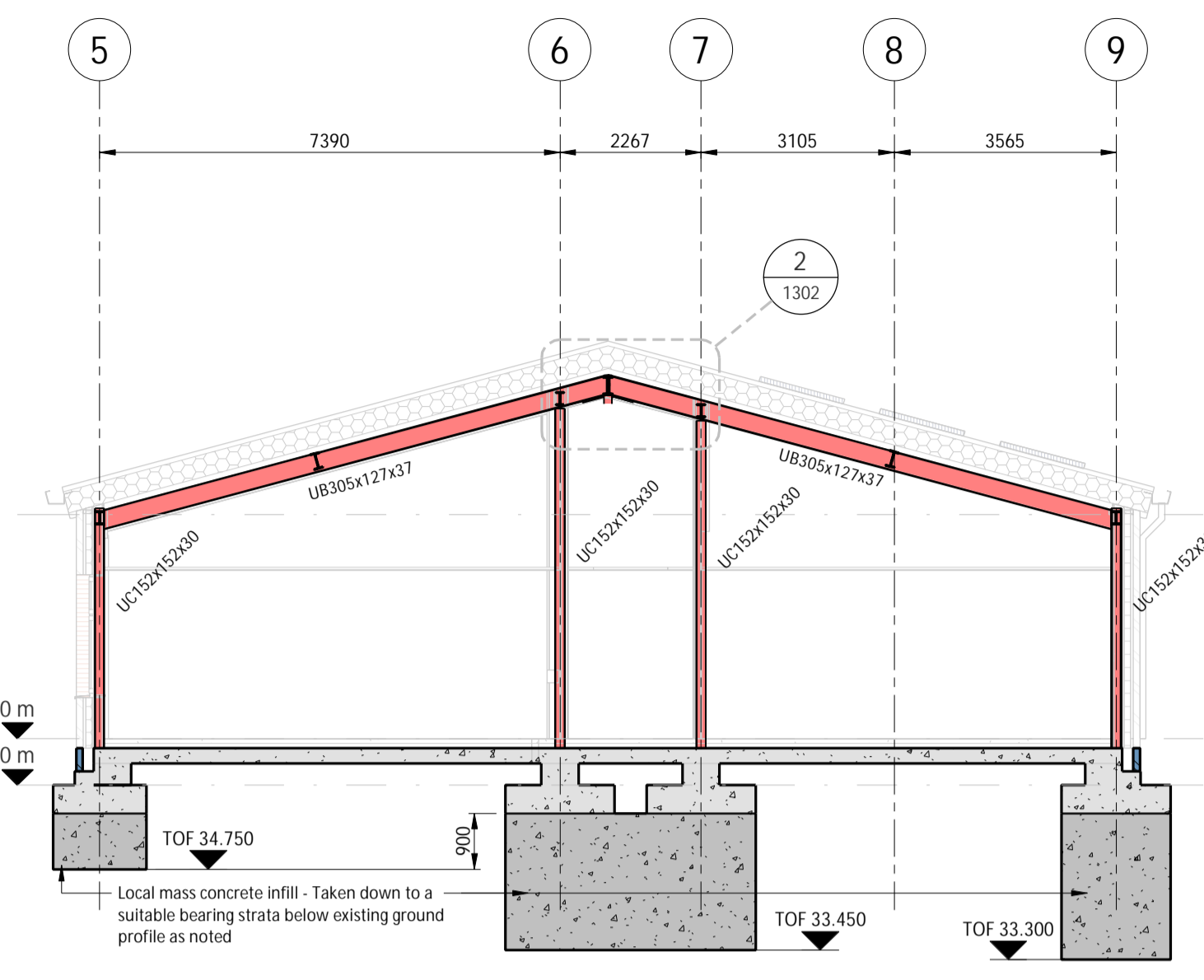




1 G9 - Section on Grid "9"  
1 : 100

! Foundation depths to be verified on site with further investigations.  
Investigation 1 - Perimeter foundations to Grids A-D.  
Investigation 2 - All foundations Grids F-L (Internal pads once GF slab removed)

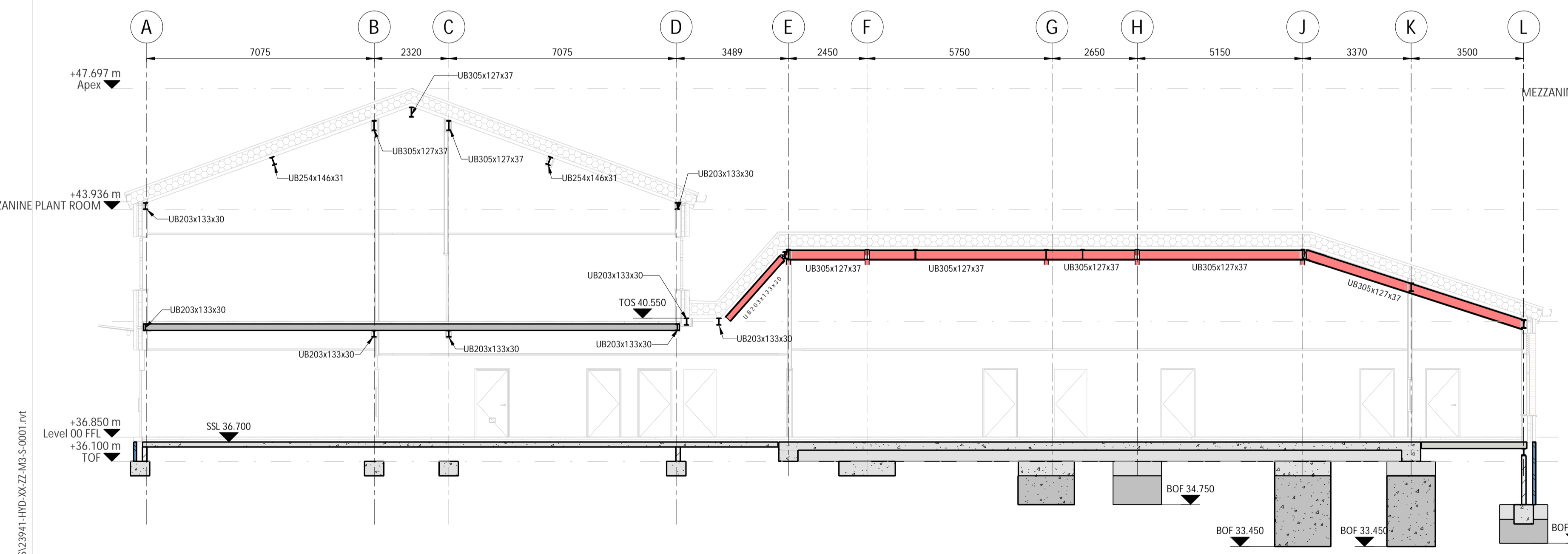
! As built pad grid J/9 not pad not constructed to depth shown, pad to be underpinned to depth detailed (33.300)  
Local mass concrete infill - Taken down to a suitable bearing strata below existing ground profile as noted



2 GJ - Section on Grid "J"  
1 : 100

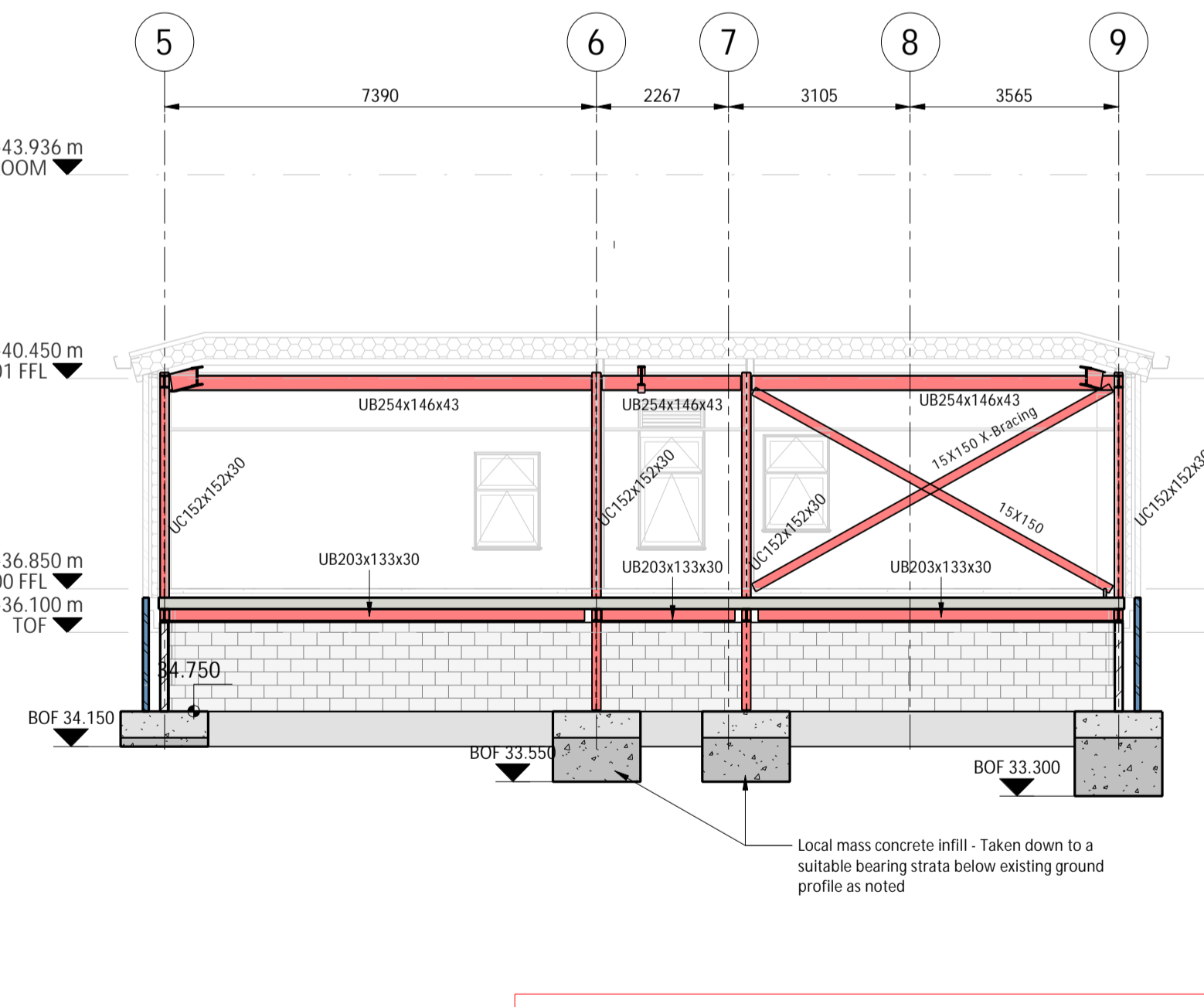
! Foundation depths to be verified on site with further investigations.  
Investigation 1 - Perimeter foundations to Grids A-D.  
Investigation 2 - All foundations Grids F-L (Internal pads once GF slab removed)

! Below ground steel (grid K-L) currently unprotected.  
Below ground floor steelwork to be painted with 2 coats of RIW LAC. Steelwork to be cleaned and prepared to receive paint in accordance with manufacturers guidelines.  
Interfaces with concrete slabs/foundations to be sealed with bituminous sealant and painted  
Allow for removal of existing perimeter block work walls to gain access



3 G6 - Section on Grid "6"  
1 : 100

! Foundation depths to be verified on site with further investigations.  
Investigation 1 - Perimeter foundations to Grids A-D.  
Investigation 2 - All foundations Grids F-L (Internal pads once GF slab removed)



4 GL - Section on Grid "L"  
1 : 100

! Below ground steel (grid K-L) currently unprotected.  
Below ground floor steelwork to be painted with 2 coats of RIW LAC. Steelwork to be cleaned and prepared to receive paint in accordance with manufacturers guidelines.  
Interfaces with concrete slabs/foundations to be sealed with bituminous sealant and painted  
Allow for removal of existing perimeter block work walls to gain access

KEY PLAN

NOTES

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The building structure has already been constructed this includes the steel frame, foundations, ground floor slab, first floor slab and roof deck. SFS completed except for Hall.

Blockwork walls to Hall to be removed (Grids 10-13) and replaced by SFS (CFD Item).

Grids K-L ground floor & below Steelwork to be painted to RIW LAC as not protected as per original specification requirement.

Cavity exposed faces to Perimeter columns required to be painted with RIW LAC (2 coats)

Cold rolled joist to mezzanine plant space to be installed (CDP Item)

Lift pit to be internally tanked. CDP Item

New items by Hydrock:

- Replacement ground floor slab & internal ground beams to single storey (Grids E-K) due to inadequate original design.
- Heave board under slab this zone.

New roller shutter secondary steelwork (GF 2 locations)

Sizing of additional roof steelwork to accommodate new roof penetrations

Underpinning of existing foundation J/9 required due to foundation not installed to suitable depth (further investigation required to determine if further remedial work to other foundations required)

New/uncompleted requirements based on constructed structure noted in red

REVISIONS

NO	DATE	DESCRIPTION

NO	DATE	ISSUED FOR	BY	CHECKED BY	DATE	APPROVED BY	DATE
P02	21.10.2022	ISSUED FOR TENDER	RM	RM	21.10.2022	RM	21.10.2022
D2	03.10.2022	ISSUED FOR TENDER	RM	RM	03.10.2022	RM	03.10.2022

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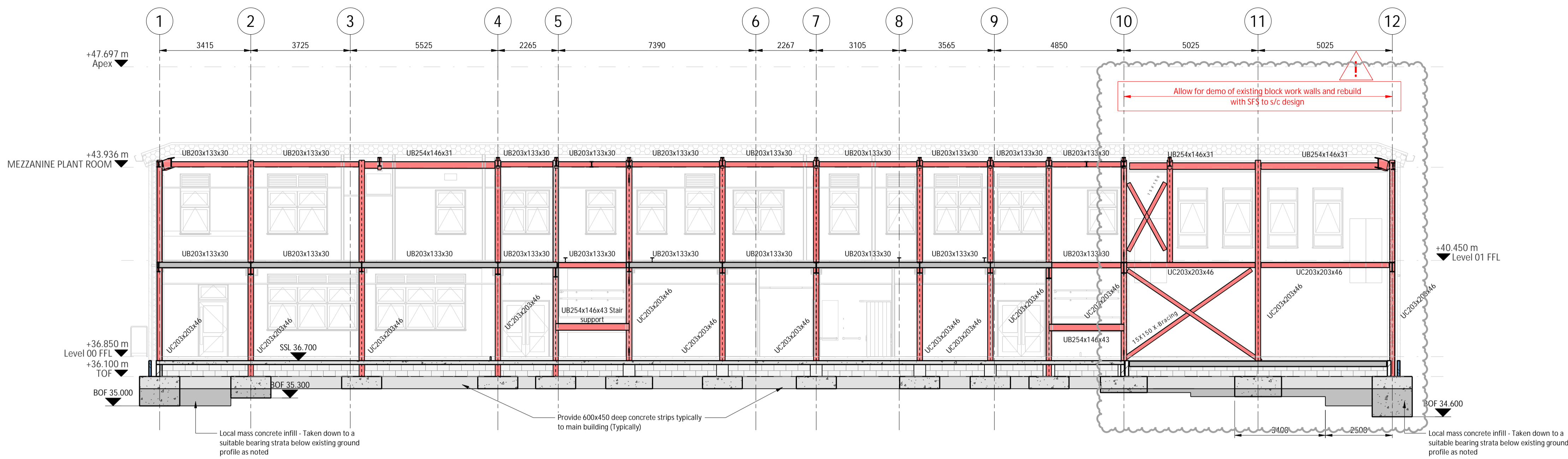
CLIENT  
ISG

PROJECT  
North Star Academy Coombe  
Dingle-Bristol

TITLE  
Sections/Elevations Sheet 3

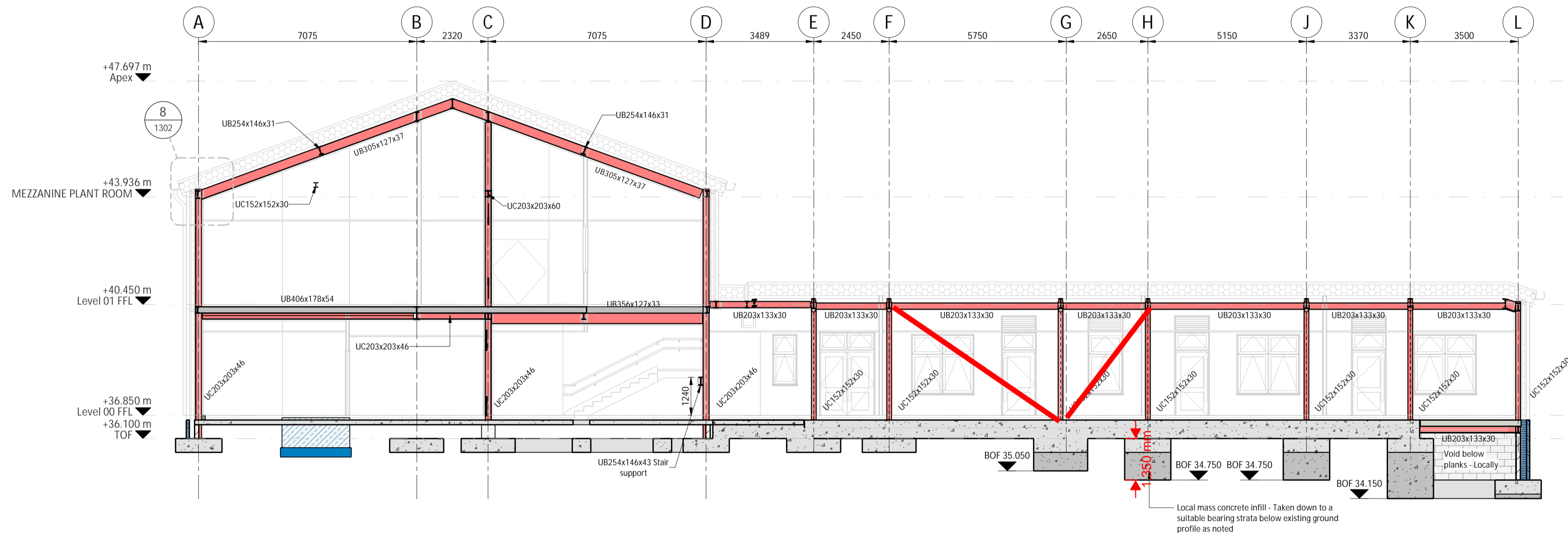
HYDROCK PROJECT NO. C-23941	SCALE @ A1 1 : 100
STATUS DESCRIPTION SUITABLE FOR TENDER	STATUS D2
DRAWING NO. FS0779-HYD-XX-ZZ-DR-S-1102	REVISION P02

MA23000-23999/23941 - Northstar Academy01\_WIP/MA3\_Model\_3d/13/23941-HYD-XX-ZZ-M3-S-0001.rvt



1 GD - Section on Grid D  
1 : 100

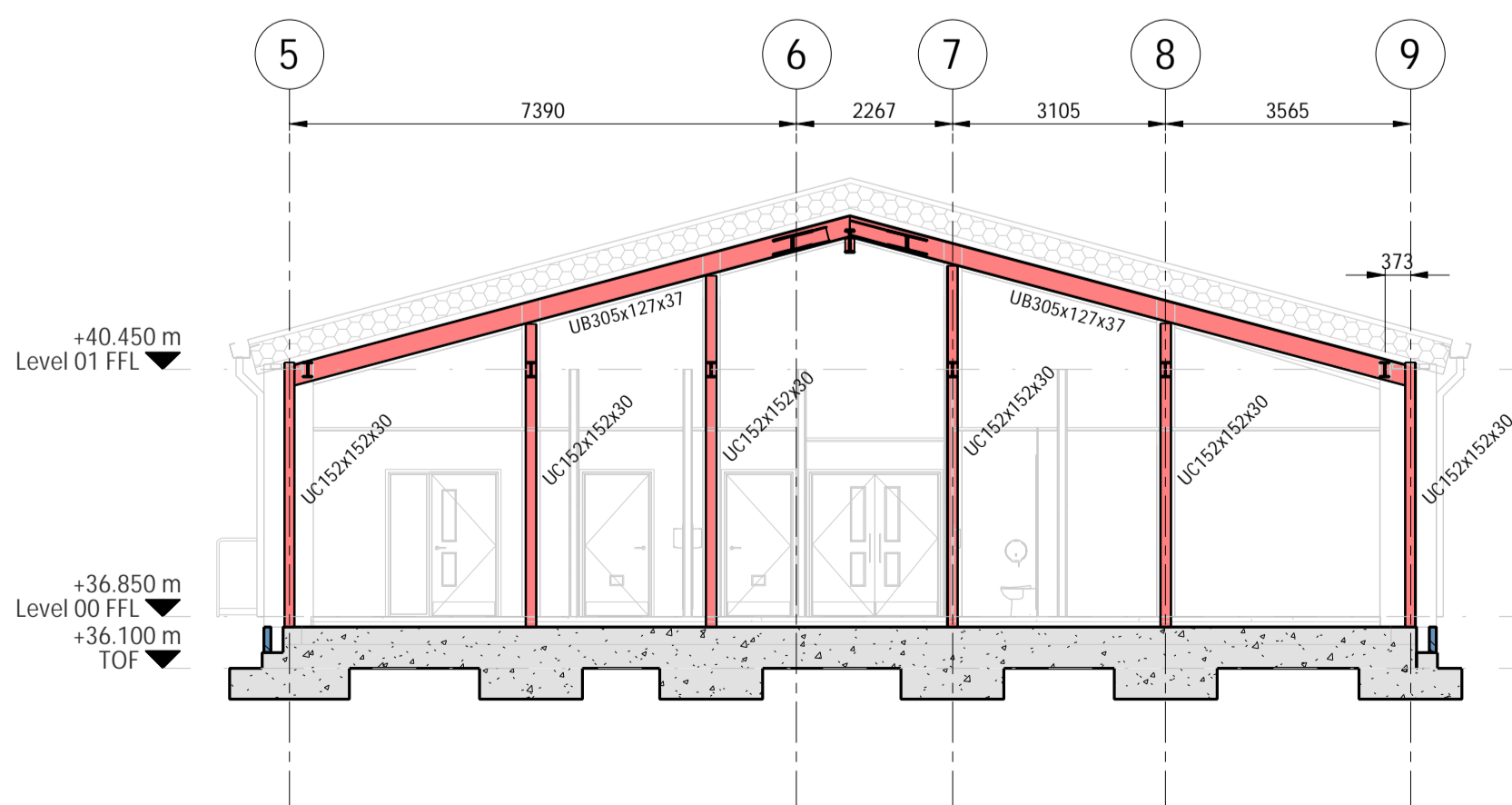
! Foundation depths to be verified on site with further investigations.  
Investigation 1 - Perimeter foundations to Grids A-D.  
Investigation 2 - All foundations Grids F-L (internal pads once GF slab removed)



2 G5 - Section on Grid "5"  
1 : 100

! Below ground steel (grid K-L) currently unprotected. Below ground floor steelwork to be painted with 2 coats of RIW LAC. Steelwork to be cleaned and prepared to receive paint in accordance with manufacturers guidelines. Interfaces with concrete slabs/foundations to be sealed with bituminous sealant and painted. Allow for removal of existing perimeter block work walls to gain access

! Foundation depths to be verified on site with further investigations.  
Investigation 1 - Perimeter foundations to Grids A-D.  
Investigation 2 - All foundations Grids F-L (internal pads once GF slab removed)



3 Section on Grid E  
1 : 100

NOTES

- All dimensions are to be checked on site before the commencement of works. Any discrepancies are to be reported to the Architect & Engineer for verification. Figured dimensions only are to be taken from this drawing.
  - This drawing is to be read in conjunction with all relevant engineers' and service engineers' drawings and specifications. This drawing is copyright.
- The building structure has already been constructed this includes the steel frame, foundations, ground floor slab, first floor slab and roof deck. SFS completed except for Hall.
  - Blockwork walls to Hall to be removed (grids 10-13) and replaced by SFS (CFD Item).
  - Grids K-L ground floor & below Steelwork to be painted to RIW LAC as not protected as per original specification requirement.
  - Cavity exposed faces to Perimeter columns required to be painted with RIW LAC (2 coats)
  - Cold rolled joist to mezzanine plant space to be installed (CDP Item)
  - Lift pit to be internally tanked. CDP Item
  - New items by Hydrock:
    - Replacement ground floor slab & internal ground beams to single storey (grids E-K) due to inadequate original design.
    - Heave board under slab this zone.
  - New roller shutter secondary steelwork (GF 2 locations)
  - Sizing of additional roof steelwork to accommodate new roof penetrations
  - Underpinning of existing foundation J/9 required due to foundation not installed to suitable depth (further investigation required to determine if further remedial work to other foundations required)

New/uncompleted requirements based on constructed structure noted in red

REVISIONS

P02	ISSUED FOR TENDER					
D2	ZP	21.10.2022	RM	21.10.2022	RM	21.10.2022
P01	ISSUED FOR TENDER					
D2	ZP	03.10.2022	RM	03.10.2022	RM	03.10.2022
REV	REVISION NOTES/COMMENTS					
STA.	DRAWN BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE

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CLIENT  
ISG

PROJECT  
North Star Academy Coombe  
Dingle-Bristol

TITLE  
Sections/Elevations Sheet 2

HYDROCK PROJECT NO. C-23941	SCALE @ A1 1 : 100
STATUS DESCRIPTION SUITABLE FOR TENDER	STATUS D2
DRAWING NO. FS0779-HYD-XX-ZZ-DR-S-1101	REVISION P02

## *Appendix B      Exploratory Holes Logs*

Sample Run Info			Testing			Water-Strikes	Stratum Description	Depth m	Thickness m	Level m OD	Legend
Sample Run	Run Ø	Recovery	Depth (m)	Type	Results						
0.50 - 1.00	85mm	90%					Grey and brownish grey sandy slightly clayey angular to subangular fine to coarse GRAVEL and COBBLES. Gravel is of concrete brick asphalt limestone and quartz. Sand is medium to coarse. Cobbles are angular to subangular of brick and concrete.	0.30	(0.30)		
							(MADE GROUND) Brown sandy slightly clayey angular to subangular fine to coarse GRAVEL of concrete brick asphalt and limestone.	0.60	(0.30)		
1.00 - 2.00	75mm	100%					Stiff reddish brown sandy slightly gravelly CLAY. Sand is medium to coarse. Gravel is subangular fine to coarse of brick concrete and quartz and mudstone. (MADE GROUND)	1	(1.00)		
2.00 - 2.50	65mm	100%					Very stiff reddish brown slightly sandy slightly gravelly CLAY. Sand is medium to coarse. Gravel is subangular fine to coarse of mudstone and sandstone. (MERCIA MUDSTONE)	1.60	(0.90)		
							..... End of Borehole at 2.50m	2.50			
								3			
								4			
								5			
								6			

Sample Run Info			Testing			Water-Strikes	Stratum Description	Depth m agl	Thickness (m)	Level m OD	Legend
Sample Run	Run Ø	Recovery	Depth (m)	Type	Results						
0.50 - 1.00	85mm	90%					Greyish brown sandy slightly clayey angular to subangular fine to coarse GRAVEL of limestone. Sand is fine to coarse. (MADE GROUND)	(1.50)			
1.00 - 2.00	75mm	80%						1			
								1.50			
2.00 - 2.50	65mm	80%					Stiff becoming very stiff reddish brown CLAY. (MERCIA MUDSTONE)	2	(1.00)		
								2.50			
							End of Borehole at 2.50m				
								3			
								4			
								5			
								6			

Sample Run Info			Testing			Water-Strikes	Stratum Description	Depth m agl	Thickness (m)	Level m OD	Legend
Sample Run	Run Ø	Recovery	Depth (m)	Type	Results						
0.50 - 1.00	85mm	80%					Greyish brown sandy slightly clayey angular to subangular fine to coarse GRAVEL of limestone and brick. Sand is fine to coarse. (MADE GROUND)		(1.20)		
1.00 - 2.00	75mm	100%						1			
								1.20			
2.00 - 3.00	65mm	90%					Stiff becoming very stiff reddish brown slightly sandy CLAY. Sand is fine to coarse. (MERCIA MUDSTONE)	2	(1.80)		
								3			
							End of Borehole at 3.00m	3.00			
								4			
								5			
								6			

## *Appendix C      Laboratory Test Results*



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## **Analytical Report Number : 22-81009**

<b>Project / Site name:</b>	North Star Academy	<b>Samples received on:</b>	26/08/2022
<b>Your job number:</b>	13941	<b>Samples instructed on/ Analysis started on:</b>	31/08/2022
<b>Your order number:</b>	PO19397	<b>Analysis completed by:</b>	08/09/2022
<b>Report Issue Number:</b>	1	<b>Report issued on:</b>	08/09/2022
<b>Samples Analysed:</b>	2 soil samples		

**Signed:** 

Adam Fenwick  
Technical Reviewer  
**For & on behalf of i2 Analytical Ltd.**

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement uncertainty can be provided on request.



Analytical Report Number: 22-81009  
 Project / Site name: North Star Academy  
 Your Order No: PO19397

Lab Sample Number				2406642	2406643
Sample Reference				CORE-1	CORE-5
Sample Number				None Supplied	None Supplied
Depth (m)				0.25-0.50	0.50-0.90
Date Sampled				Deviating	Deviating
Time Taken				None Supplied	None Supplied
Analytical Parameter (Soil Analysis)					
Stone Content	%	0.1	NONE	69	42
Moisture Content	%	0.01	NONE	5.1	5.8
Total mass of sample received	kg	0.001	NONE	0.6	0.6

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	9.9	11.2
Total Sulphate as SO4	mg/kg	50	MCERTS	4300	5200
Total Sulphate as SO4	%	0.005	MCERTS	0.431	0.52
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.58	0.36
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	579	365
Water Soluble Chloride (2:1)	mg/kg	1	MCERTS	810	210
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	MCERTS	410	110
Total Sulphur	mg/kg	50	MCERTS	3000	2300
Total Sulphur	%	0.005	MCERTS	0.295	0.229
Ammoniacal Nitrogen as NH4	mg/kg	0.5	MCERTS	3.9	2
Ammonium as NH4 (10:1 leachate equivalent)	mg/l	0.05	MCERTS	0.39	0.2
Water Soluble Nitrate (2:1) as NO3	mg/kg	2	NONE	5.5	4.1
Water Soluble Nitrate (2:1) as NO3 (leachate equivalent)	mg/l	5	NONE	< 5.0	< 5.0

Heavy Metals / Metalloids

Magnesium (water soluble)	mg/kg	5	NONE	< 5.0	< 5.0
Magnesium (leachate equivalent)	mg/l	2.5	NONE	< 2.5	< 2.5

U/S = Unsuitable Sample I/S = Insufficient Sample



Analytical Report Number : 22-81009  
 Project / Site name: North Star Academy

\* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
2406642	CORE-1	None Supplied	0.25-0.50	Brown clay and sand with stones.
2406643	CORE-5	None Supplied	0.50-0.90	Brown loam and clay with gravel and vegetation.

Analytical Report Number : 22-81009  
 Project / Site name: North Star Academy

Water matrix abbreviations:

Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS
Chloride, water soluble, in soil	Determination of Chloride colorimetrically by discrete analyser.	In house method.	L082-PL	D	MCERTS
Magnesium, water soluble, in soil	Determination of water soluble magnesium by extraction with water followed by ICP-OES.	In-house method based on TRL 447	L038-PL	D	NONE
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Nitrate, water soluble, in soil	Determination of nitrate by reaction with sodium salicylate and colorimetry.	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08, 2:1 extraction.	L078-PL	D	NONE
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
Total sulphate (as SO4 in soil)	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Total Sulphur in soil	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
Ammonium as NH4 in soil	Determination of Ammonium/Ammonia/ Ammoniacal Nitrogen by the colorimetric salicylate/nitroprusside method, 10:1 water extraction.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	MCERTS
Total Sulphate in soil as %	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
Total Sulphur in soil as %	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
Water Soluble Nitrate (leachate equivalent)	Determination of nitrate by reaction with sodium salicylate and colorimetry.	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08, 2:1 extraction.	L078-PL	D	NONE
Sulphate, water soluble, in soil	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.

For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.

Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

## Sample Deviation Report



Analytical Report Number : 22-81009  
Project / Site name: North Star Academy

This deviation report indicates the sample and test deviations that apply to the samples submitted for analysis. Please note that the associated result(s) may be unreliable and should be interpreted with care.

Sample ID	Other ID	Sample Type	Lab Sample Number	Sample Deviation	Test Name	Test Ref	Test Deviation
CORE-1	None Supplied	S	2406642	a	None Supplied	None Supplied	None Supplied
CORE-5	None Supplied	S	2406643	a	None Supplied	None Supplied	None Supplied



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## **Analytical Report Number : 23-11013**

<b>Project / Site name:</b>	North Star Academy	<b>Samples received on:</b>	10/01/2023
<b>Your job number:</b>	23941	<b>Samples instructed on/ Analysis started on:</b>	10/01/2023
<b>Your order number:</b>	PO23349	<b>Analysis completed by:</b>	16/01/2023
<b>Report Issue Number:</b>	1	<b>Report issued on:</b>	17/01/2023
<b>Samples Analysed:</b>	4 soil samples		

**Signed:** 

Izabela Wójcik  
Reporting Specialist  
**For & on behalf of i2 Analytical Ltd.**

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement uncertainty can be provided on request.

Analytical Report Number: 23-11013  
Project / Site name: North Star Academy

Lab Sample Number	2549758			2549759			2549760			2549761		
Sample Reference	FP01			FP02			FP03			FP05		
Sample Number	FPF6			FPG6			FPH6			FPF7		
Depth (m)	0.50			0.40			0.50			0.40		
Date Sampled	19/12/2022			19/12/2022			19/12/2022			19/12/2022		
Time Taken	None Supplied			None Supplied			None Supplied			None Supplied		
Analytical Parameter (Soil Analysis)												
Stone Content	%	0.1	NONE	52	< 0.1	60	32					
Moisture Content	%	0.01	NONE	7	16	5.6	11					
Total mass of sample received	kg	0.001	NONE	0.5	0.5	0.5	0.5					

#### General Inorganics

Parameter	Units	Limit	MCERTS	2549758	2549759	2549760	2549761
pH - Automated	pH Units	N/A	MCERTS	11.1	10.8	11.4	10.7
Total Sulphate as SO <sub>4</sub>	mg/kg	50	MCERTS	4600	3900	4300	7100
Total Sulphate as SO <sub>4</sub>	%	0.005	MCERTS	0.464	0.385	0.43	0.707
Water Soluble SO <sub>4</sub> 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.43	0.42	0.095	0.81
Water Soluble SO <sub>4</sub> 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	430	416	95.3	806
Water Soluble Chloride (2:1)	mg/kg	1	MCERTS	53	86	96	46
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	MCERTS	27	43	48	23
Total Sulphur	mg/kg	50	MCERTS	1800	1500	1800	2600
Total Sulphur	%	0.005	MCERTS	0.183	0.149	0.18	0.262
Ammoniacal Nitrogen as NH <sub>4</sub>	mg/kg	0.5	MCERTS	< 0.5	0.9	< 0.5	1.6
Ammonium as NH <sub>4</sub> (10:1 leachate equivalent)	mg/l	0.05	MCERTS	< 0.05	0.09	< 0.05	0.16
Water Soluble Nitrate (2:1) as NO <sub>3</sub>	mg/kg	2	NONE	11	13	25	4.7
Water Soluble Nitrate (2:1) as NO <sub>3</sub> (leachate equivalent)	mg/l	5	NONE	5.3	6.3	12	< 5.0

#### Heavy Metals / Metalloids

Parameter	Units	Limit	MCERTS	2549758	2549759	2549760	2549761
Magnesium (water soluble)	mg/kg	5	NONE	< 5.0	< 5.0	< 5.0	< 5.0
Magnesium (leachate equivalent)	mg/l	2.5	NONE	< 2.5	< 2.5	< 2.5	< 2.5

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

Analytical Report Number : 23-11013  
Project / Site name: North Star Academy

\* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
2549758	FP01	FPF6	0.5	Brown clay and sand with brick and stones.
2549759	FP02	FPG6	0.4	Brown clay and sand with gravel.
2549760	FP03	FPH6	0.5	Brown gravelly sand with stones.
2549761	FP05	FPF7	0.4	Brown gravelly sand with stones.

Analytical Report Number : 23-11013  
 Project / Site name: North Star Academy

Water matrix abbreviations:

Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS
Chloride, water soluble, in soil	Determination of Chloride colorimetrically by discrete analyser.	In house method.	L082-PL	D	MCERTS
Magnesium, water soluble, in soil	Determination of water soluble magnesium by extraction with water followed by ICP-OES.	In-house method based on TRL 447	L038-PL	D	NONE
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Nitrate, water soluble, in soil	Determination of nitrate by reaction with sodium salicylate and colorimetry.	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08, 2:1 extraction.	L078-PL	D	NONE
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
Total sulphate (as SO4 in soil)	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Total Sulphur in soil	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
Ammonium as NH4 in soil	Determination of Ammonium/Ammonia/ Ammoniacal Nitrogen by the colorimetric salicylate/nitroprusside method, 10:1 water extraction.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	MCERTS
Total Sulphate in soil as %	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
Total Sulphur in soil as %	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
Water Soluble Nitrate (leachate equivalent)	Determination of nitrate by reaction with sodium salicylate and colorimetry.	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08, 2:1 extraction.	L078-PL	D	NONE
Sulphate, water soluble, in soil	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS

For method numbers ending in 'UK or A' analysis have been carried out in our laboratory in the United Kingdom (WATFORD).

For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).

For method numbers ending in 'PL or B' analysis have been carried out in our laboratory in Poland.

Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC

Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.





# TEST CERTIFICATE

DETERMINATION OF LIQUID AND PLASTIC LIMITS  
Tested in Accordance with: BS 1377-2:1990: Clause 4.4 and 5

i2 Analytical Ltd  
Unit 8 Harrowden Road  
Brackmills Industrial Estate  
Northampton NN4 7EB



Environmental Science

4041

Client: Hydrock Consultants Ltd  
Client Address: Over Court Barns, Over Lane,  
Bristol, BS32 4DF

Client Reference: 23941  
Job Number: 23-12069  
Date Sampled: 10/01/2023  
Date Received: 17/01/2023  
Date Tested: 23/01/2023  
Sampled By: Not Given

Contact: Kieran Bayley  
Site Address: North Star Academy

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

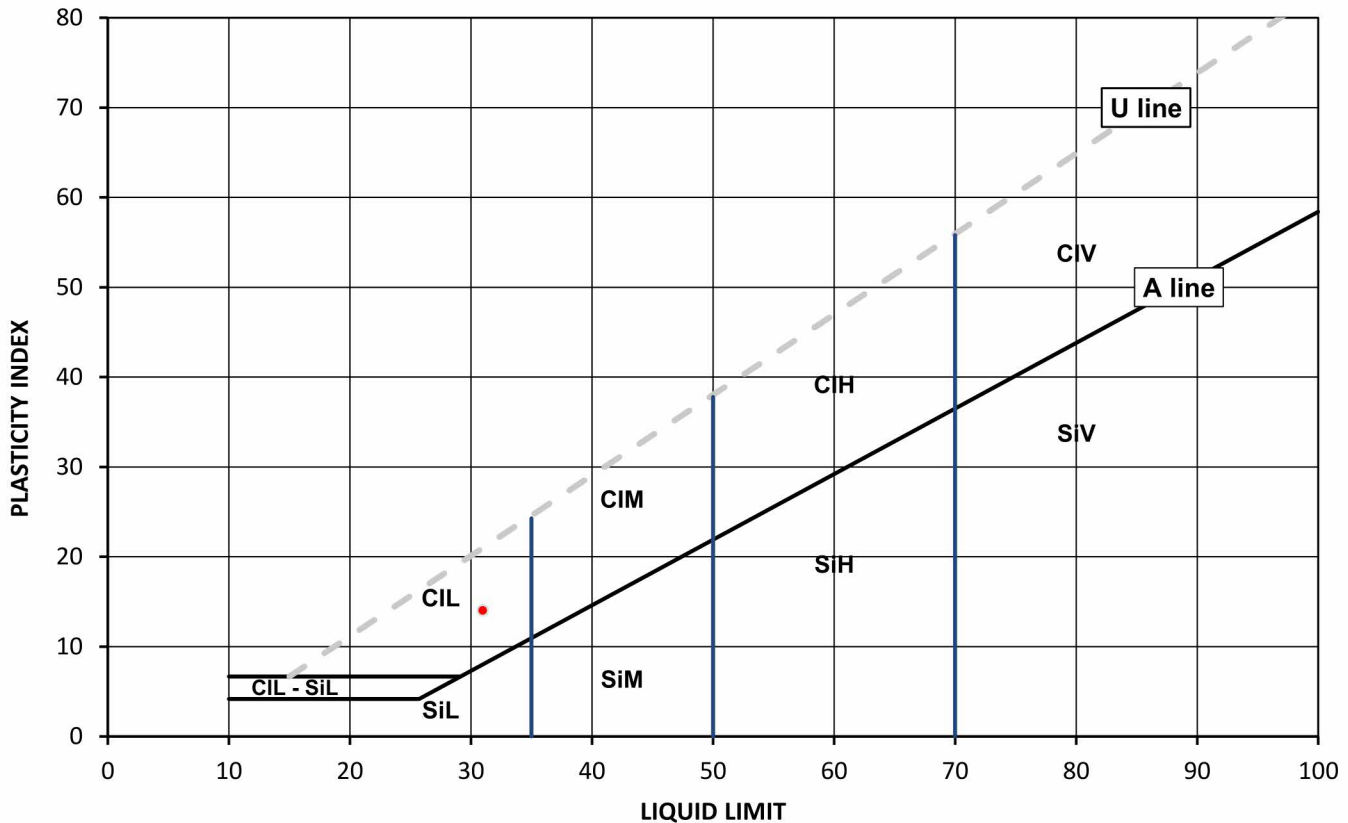
### Test Results:

Laboratory Reference: 2555748  
Hole No.: FPK7  
Sample Reference: Not Given  
Sample Description: Brown slightly gravelly very sandy CLAY

Depth Top [m]: 2.00  
Depth Base [m]: Not Given  
Sample Type: D

Sample Preparation: Tested after >425um removed by hand

As Received Water Content [ W ] %	Liquid Limit [ WL ] %	Plastic Limit [ Wp ] %	Plasticity Index [ Ip ] %	% Passing 425µm BS Test Sieve
18	31	17	14	89



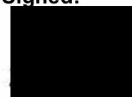
Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

	Plasticity	Liquid Limit
Cl	Clay	below 35
Si	Silt	35 to 50
	L	Low
	M	Medium
	H	High
	V	Very high
	O	Organic
		append to classification for organic material ( eg CIHO )

Note: Water Content by BS 1377-2: 1990: Clause 3.2

Remarks:

Signed:



Monika Siewior  
Reporting Specialist  
for and on behalf of i2 Analytical Ltd

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# TEST CERTIFICATE

DETERMINATION OF LIQUID AND PLASTIC LIMITS  
Tested in Accordance with: BS 1377-2:1990: Clause 4.4 and 5

i2 Analytical Ltd  
Unit 8 Harrowden Road  
Brackmills Industrial Estate  
Northampton NN4 7EB



Environmental Science

4041

Client: Hydrock Consultants Ltd  
Client Address: Over Court Barns, Over Lane,  
Bristol, BS32 4DF

Client Reference: 23941  
Job Number: 23-12069  
Date Sampled: 10/01/2023  
Date Received: 17/01/2023  
Date Tested: 23/01/2023  
Sampled By: Not Given

Contact: Kieran Bayley  
Site Address: North Star Academy

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

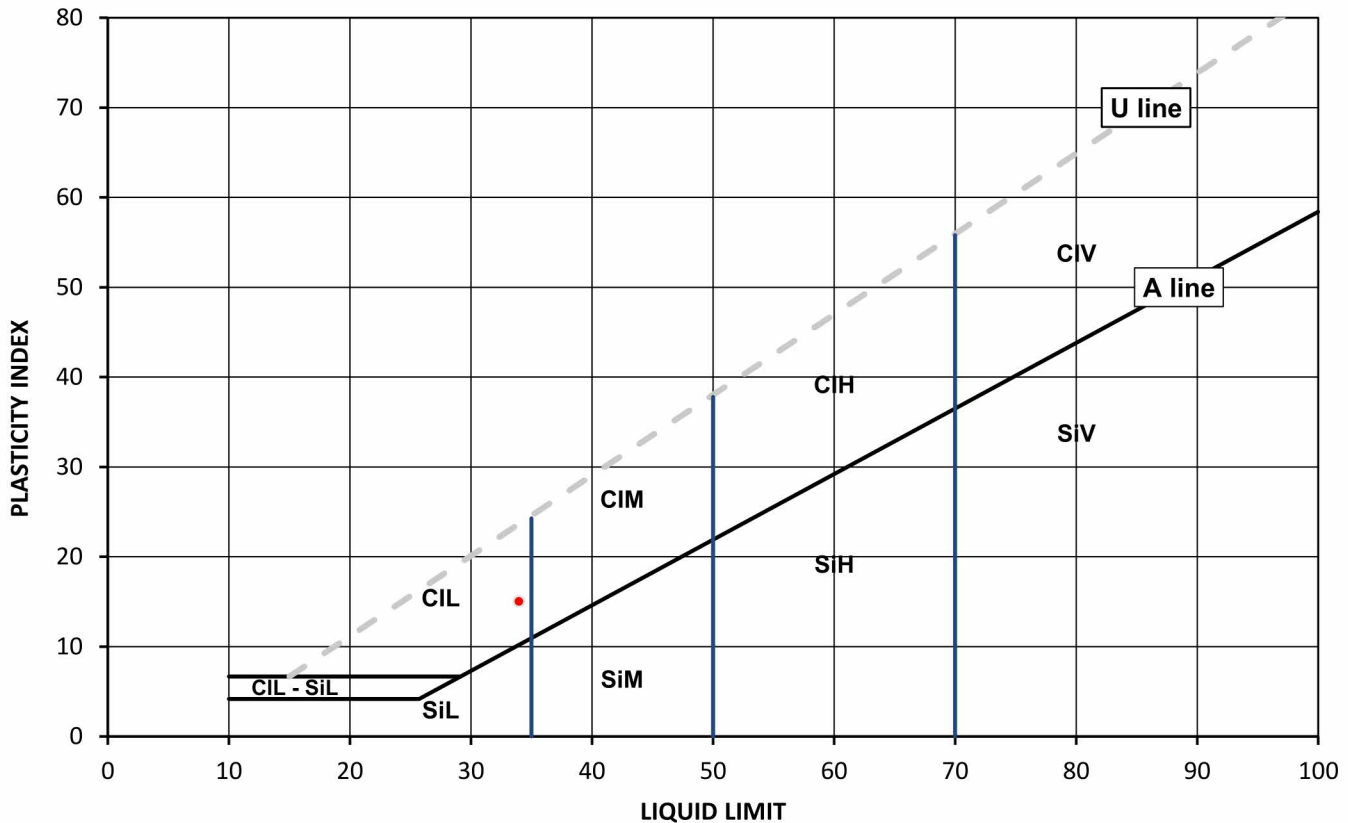
## Test Results:

Laboratory Reference: 2555749  
Hole No.: FPG9  
Sample Reference: Not Given  
Sample Description: Orangish brown slightly gravelly very sandy CLAY

Depth Top [m]: 1.80  
Depth Base [m]: Not Given  
Sample Type: D

Sample Preparation: Tested after >425um removed by hand

As Received Water Content [ W ] %	Liquid Limit [ WL ] %	Plastic Limit [ Wp ] %	Plasticity Index [ Ip ] %	% Passing 425µm BS Test Sieve
24	34	19	15	99



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

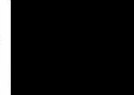
	Plasticity	Liquid Limit
Cl	Clay	below 35
Si	Silt	35 to 50
	L	Low
	M	Medium
	H	High
	V	Very high
	O	Organic
		append to classification for organic material ( eg CIHO )

Note: Water Content by BS 1377-2: 1990: Clause 3.2

Remarks:

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DETERMINATION OF LIQUID AND PLASTIC LIMITS  
Tested in Accordance with: BS 1377-2:1990: Clause 4.4 and 5

i2 Analytical Ltd  
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Sampled By: Not Given

Contact: Kieran Bayley  
Site Address: North Star Academy

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

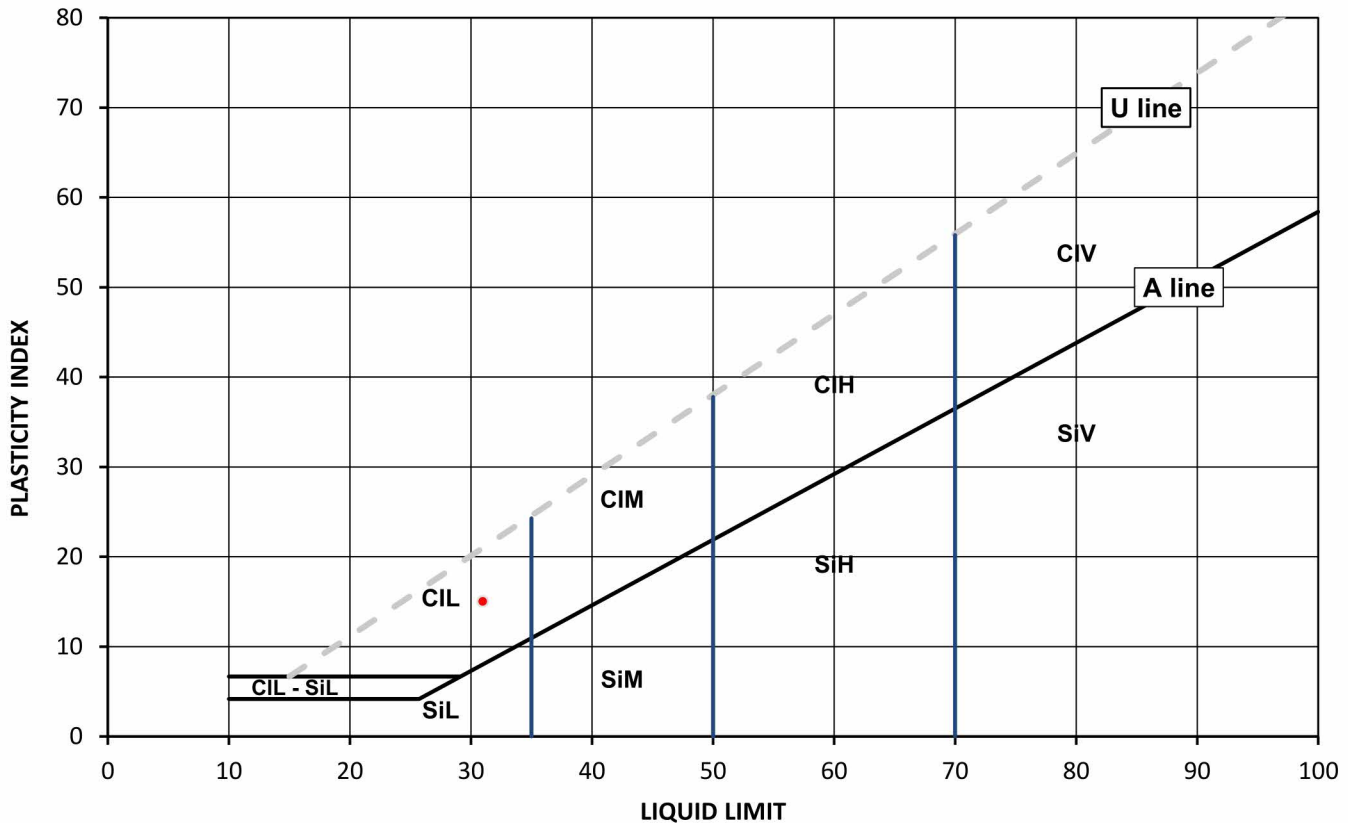
## Test Results:

Laboratory Reference: 2555750  
Hole No.: FP01  
Sample Reference: FPF6  
Sample Description: Orangish brown slightly gravelly very sandy CLAY

Depth Top [m]: 2.00  
Depth Base [m]: Not Given  
Sample Type: D

Sample Preparation: Tested after >425um removed by hand

As Received Water Content [ W ] %	Liquid Limit [ WL ] %	Plastic Limit [ Wp ] %	Plasticity Index [ Ip ] %	% Passing 425µm BS Test Sieve
18	31	16	15	99



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

	Plasticity	Liquid Limit
Cl	Clay	below 35
Si	Silt	35 to 50
	L	Low
	M	Medium
	H	High
	V	Very high
	O	Organic
		append to classification for organic material ( eg CIHO )

Note: Water Content by BS 1377-2: 1990: Clause 3.2

Remarks:

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Contact: Kieran Bayley  
Site Address: North Star Academy

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

# SUMMARY REPORT

## SUMMARY OF CLASSIFICATION TEST RESULTS

Tested in Accordance with:

Water Content by BS 1377-2:1990: Clause 3.2; Atterberg by BS 1377-2: 1990: Clause 4.3 (4 Point Test), Clause 4.4 (1 Point Test) and 5; PD by BS 1377-2: 1990: Clause 8.2

i2 Analytical Ltd  
Unit 8 Harrowden Road  
Brackmills Industrial Estate  
Northampton NN4 7EB



Environmental Science

Client Reference: 23941  
Job Number: 23-12069  
Date Sampled: 10/01/2023  
Date Received: 17/01/2023  
Date Tested: 23/01/2023  
Sampled By: Not Given

### Test results

Laboratory Reference	Hole No.	Sample				Description	Remarks	Water Content BS 1377-2 [ W ] %	Water Content BS EN ISO 17892-1 [ W ] %	Atterberg				Density			Total Porosity# %		
		Reference	Depth Top m	Depth Base m	Type					% Passing 425um	WL %	Wp %	Ip %	bulk Mg/m3	dry Mg/m3	PD Mg/m3			
2555748	FPK7	Not Given	2.00	Not Given	D	Brown slightly gravelly very sandy CLAY	Atterberg 1 Point	18		89	31	17	14						
2555749	FPG9	Not Given	1.80	Not Given	D	Orangish brown slightly gravelly very sandy CLAY	Atterberg 1 Point	24		99	34	19	15						
2555750	FP01	FPF6	2.00	Not Given	D	Orangish brown slightly gravelly very sandy CLAY	Atterberg 1 Point	18		99	31	16	15						

Note: # Non accredited; NP - Non plastic

Comments:

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Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

# SUMMARY REPORT

## DETERMINATION OF WATER CONTENT

Tested in Accordance with: BS 1377-2: 1990: Clause 3.2

i2 Analytical Ltd  
Unit 8 Harrowden Road  
Brackmills Industrial Estate  
Northampton NN4 7EB



Environmental Science

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Date Sampled: 10/01/2023  
Date Received: 17/01/2023  
Date Tested: 23/01/2023  
Sampled By: Not Given

### Test results

Laboratory Reference	Hole No.	Sample				Description	Remarks	WC %	Sample preparation / Oven temperature at the time of testing			
		Reference	Depth Top m	Depth Base m	Type							
2555748	FPK7	Not Given	2.00	Not Given	D	Brown slightly gravelly very sandy CLAY		18	Sample was quartered, oven dried at 106 °C			
2555749	FPG9	Not Given	1.80	Not Given	D	Orangish brown slightly gravelly very sandy CLAY		24	Sample was quartered, oven dried at 106 °C			
2555750	FP01	FPF6	2.00	Not Given	D	Orangish brown slightly gravelly very sandy CLAY		18	Sample was quartered, oven dried at 106 °C			

Comments:

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# TEST CERTIFICATE

DETERMINATION OF LIQUID AND PLASTIC LIMITS  
Tested in Accordance with: BS 1377-2:1990: Clause 4.3 and 5

i2 Analytical Ltd  
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Brackmills Industrial Estate  
Northampton NN4 7EB



Environmental Science

4041

Client: Hydrock Consultants Ltd  
Client Address: Over Court Barns, Over Lane,  
Bristol, BS32 4DF

Client Reference: C-23941-C  
Job Number: 23-16494-1  
Date Sampled: 01/02/2023  
Date Received: 06/02/2023  
Date Tested: 13/02/2023  
Sampled By: Not Given

Contact: Kieran Bayley  
Site Address: North Star Academy

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

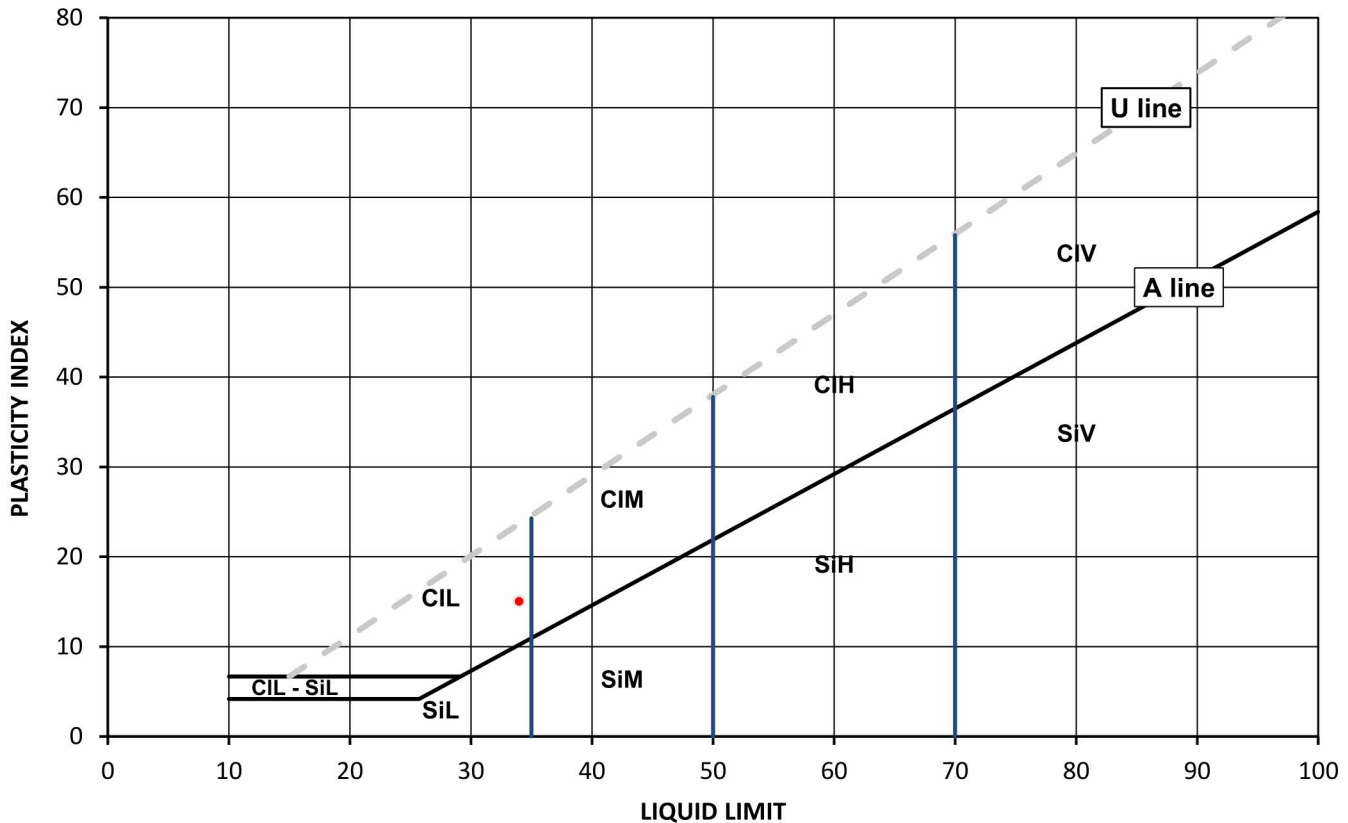
### Test Results:

Laboratory Reference: 2578652  
Hole No.: WS01  
Sample Reference: Not Given  
Sample Description: Orangish brown very sandy CLAY

Depth Top [m]: 1.70  
Depth Base [m]: Not Given  
Sample Type: D

Sample Preparation: Tested in natural condition

As Received Water Content [ W ] %	Liquid Limit [ WL ] %	Plastic Limit [ Wp ] %	Plasticity Index [ Ip ] %	% Passing 425µm BS Test Sieve
21	34	19	15	100



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

Cl	Clay	Plasticity	Liquid Limit
Si	Silt	L	Low
		M	Medium
		H	High
		V	Very high
		O	Organic
			below 35
			35 to 50
			50 to 70
			exceeding 70
			append to classification for organic material ( eg CIHO )

Note: Water Content by BS 1377-2: 1990: Clause 3.2

Remarks:

Signed:

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Reporting Specialist  
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# TEST CERTIFICATE

DETERMINATION OF LIQUID AND PLASTIC LIMITS  
Tested in Accordance with: BS 1377-2:1990: Clause 4.3 and 5

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Environmental Science

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Client Reference: C-23941-C  
Job Number: 23-16494-1  
Date Sampled: 01/02/2023  
Date Received: 06/02/2023  
Date Tested: 13/02/2023  
Sampled By: Not Given

Contact: Kieran Bayley  
Site Address: North Star Academy

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

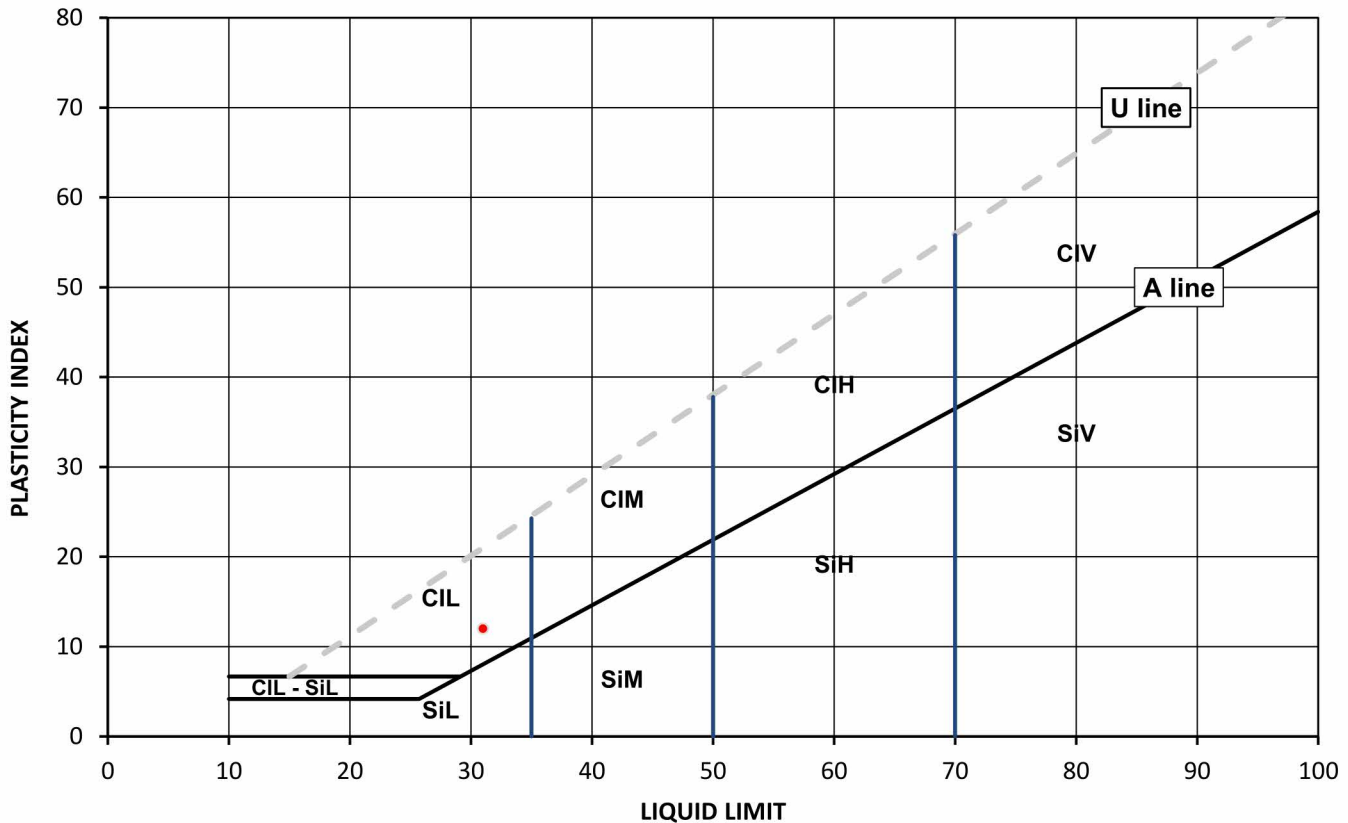
### Test Results:

Laboratory Reference: 2578653  
Hole No.: WS01  
Sample Reference: Not Given  
Sample Description: Orangish brown slightly gravelly very sandy CLAY

Depth Top [m]: 2.00  
Depth Base [m]: Not Given  
Sample Type: D

Sample Preparation: Tested after >425um removed by hand

As Received Water Content [ W ] %	Liquid Limit [ WL ] %	Plastic Limit [ Wp ] %	Plasticity Index [ Ip ] %	% Passing 425µm BS Test Sieve
20	31	19	12	98



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

	Plasticity	Liquid Limit
Cl	Clay	below 35
Si	Silt	35 to 50
	L	Low
	M	Medium
	H	High
	V	Very high
	O	Organic
		append to classification for organic material ( eg CIHO )

Note: Water Content by BS 1377-2: 1990: Clause 3.2

Remarks:

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Date Sampled: 01/02/2023  
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Date Tested: 13/02/2023  
Sampled By: Not Given

Contact: Kieran Bayley  
Site Address: North Star Academy

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

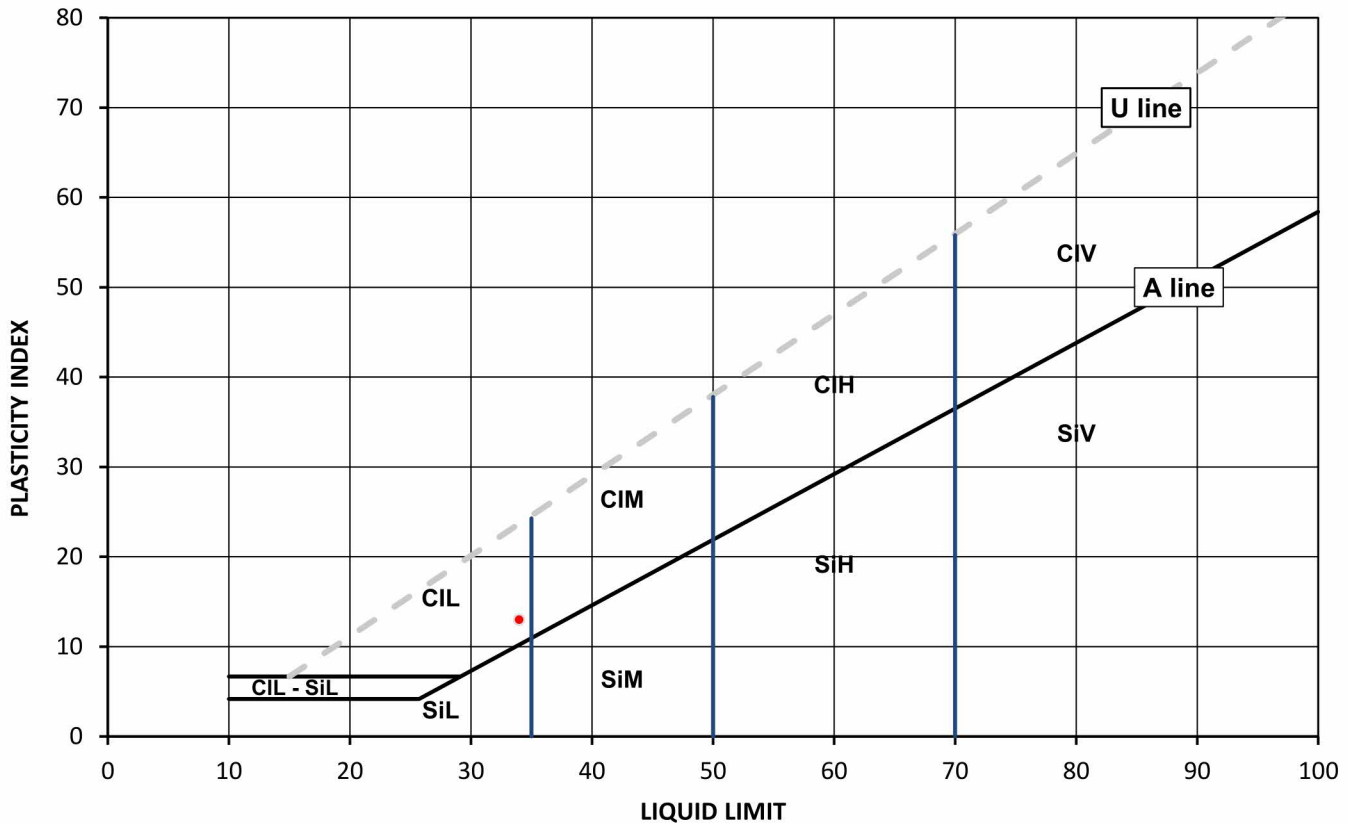
### Test Results:

Laboratory Reference: 2578654  
Hole No.: WS01  
Sample Reference: Not Given  
Sample Description: Orangish brown gravelly very sandy CLAY

Depth Top [m]: 2.40  
Depth Base [m]: Not Given  
Sample Type: D

Sample Preparation: Tested after washing to remove >425um

As Received Water Content [ W ] %	Liquid Limit [ WL ] %	Plastic Limit [ Wp ] %	Plasticity Index [ Ip ] %	% Passing 425µm BS Test Sieve
15	34	21	13	45



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

Cl	Clay	Plasticity	L	Low	Liquid Limit	below 35
Si	Silt		M	Medium		35 to 50
			H	High		50 to 70
			V	Very high		exceeding 70
			O	Organic		append to classification for organic material ( eg CIHO )

Note: Water Content by BS 1377-2: 1990: Clause 3.2

Remarks:

Signed:



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Date Received: 06/02/2023  
Date Tested: 13/02/2023  
Sampled By: Not Given

Contact: Kieran Bayley  
Site Address: North Star Academy

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

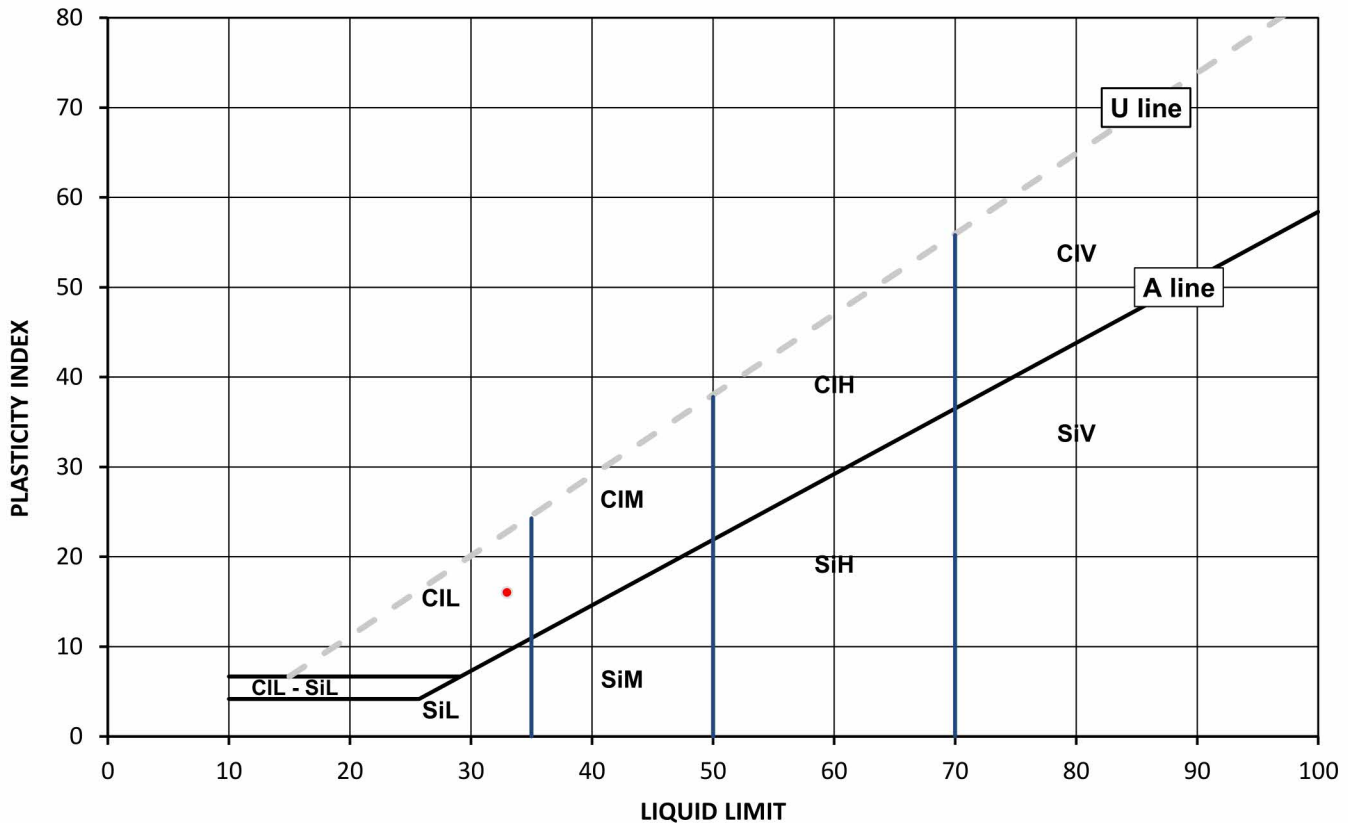
### Test Results:

Laboratory Reference: 2578655  
Hole No.: WS02  
Sample Reference: Not Given  
Sample Description: Brown slightly gravelly very sandy CLAY

Depth Top [m]: 1.50  
Depth Base [m]: Not Given  
Sample Type: D

Sample Preparation: Tested after >425um removed by hand

As Received Water Content [ W ] %	Liquid Limit [ WL ] %	Plastic Limit [ Wp ] %	Plasticity Index [ Ip ] %	% Passing 425µm BS Test Sieve
19	33	17	16	97



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

	Plasticity	Liquid Limit
Cl	Clay	below 35
Si	Silt	35 to 50
	L	Low
	M	Medium
	H	High
	V	Very high
	O	Organic
		append to classification for organic material ( eg CIHO )

Note: Water Content by BS 1377-2: 1990: Clause 3.2

Remarks:

Signed:



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Sampled By: Not Given

Contact: Kieran Bayley  
Site Address: North Star Academy

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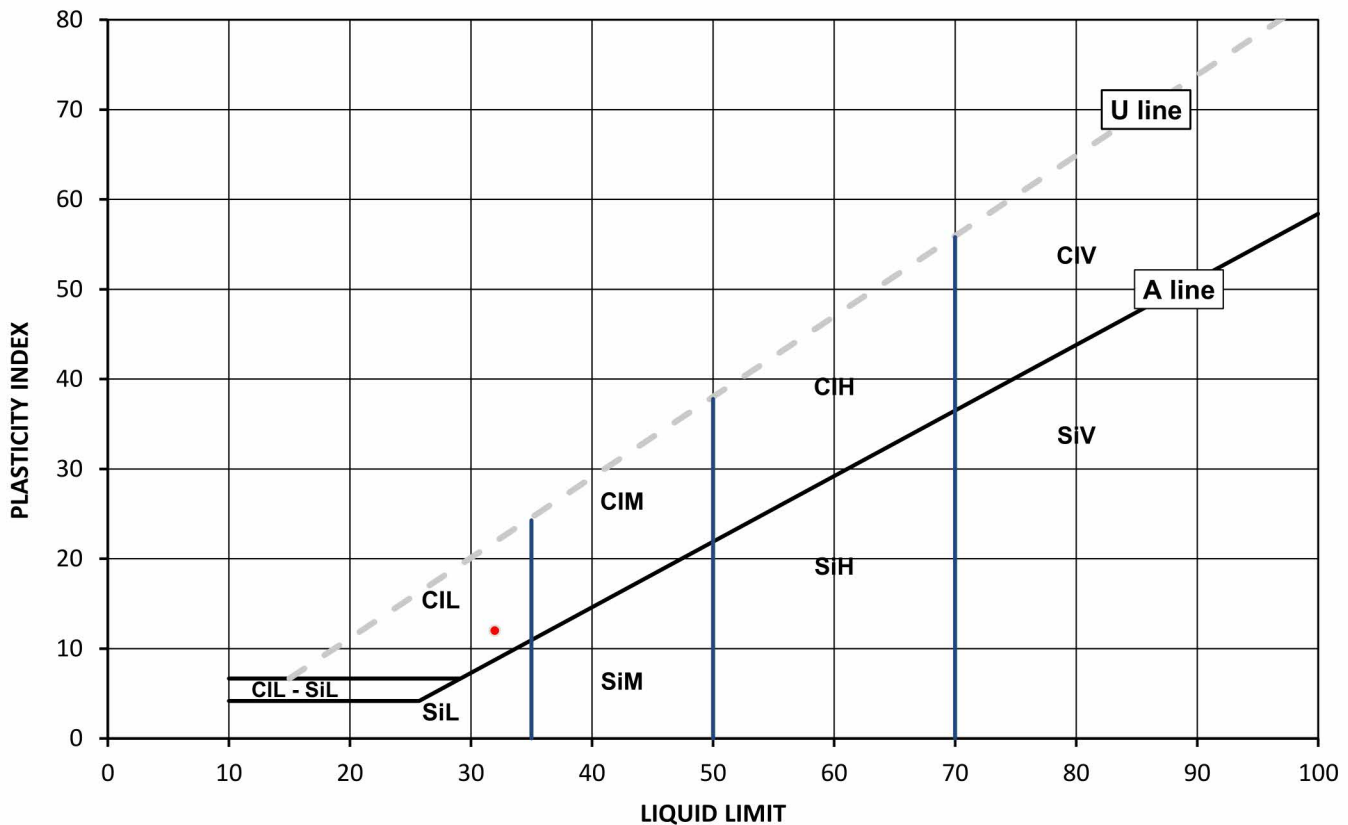
### Test Results:

Laboratory Reference: 2578656  
Hole No.: WS02  
Sample Reference: Not Given  
Sample Description: Brown very sandy CLAY

Depth Top [m]: 2.00  
Depth Base [m]: Not Given  
Sample Type: D

Sample Preparation: Tested in natural condition

As Received Water Content [ W ] %	Liquid Limit [ WL ] %	Plastic Limit [ Wp ] %	Plasticity Index [ Ip ] %	% Passing 425µm BS Test Sieve
23	32	20	12	100



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

	Plasticity	Liquid Limit
Cl	Clay	below 35
Si	Silt	35 to 50
	L	Low
	M	Medium
	H	High
	V	Very high
	O	Organic
		append to classification for organic material ( eg CIHO )

Note: Water Content by BS 1377-2: 1990: Clause 3.2

Remarks:

Signed: [Redacted]

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Reporting Specialist  
for and on behalf of i2 Analytical Ltd

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Tested in Accordance with: BS 1377-2:1990: Clause 4.3 and 5

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Date Sampled: 01/02/2023  
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Date Tested: 13/02/2023  
Sampled By: Not Given

Contact: Kieran Bayley  
Site Address: North Star Academy

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

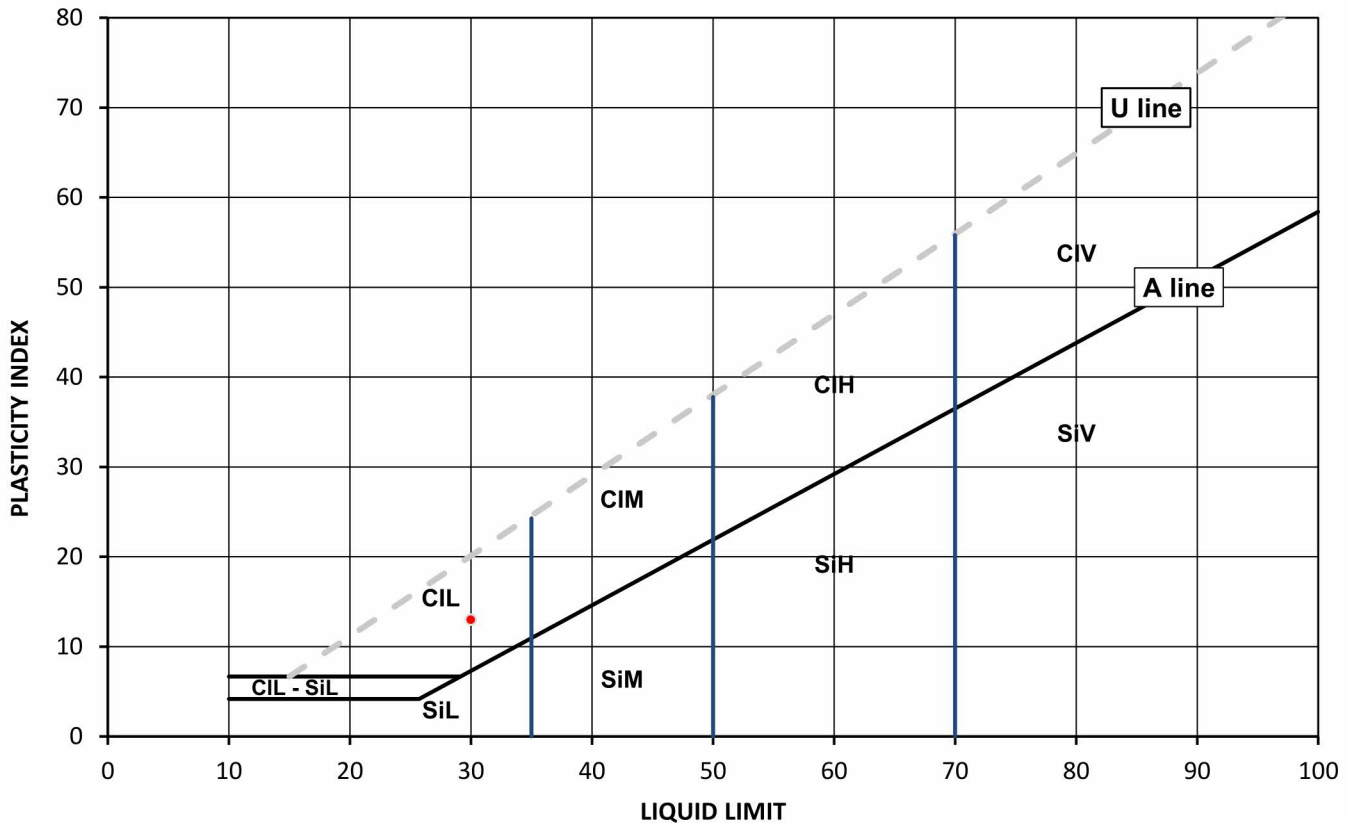
## Test Results:

Laboratory Reference: 2578657  
Hole No.: WS02  
Sample Reference: Not Given  
Sample Description: Brown slightly gravelly very sandy CLAY with fragments of gypsum crystals

Depth Top [m]: 2.40  
Depth Base [m]: Not Given  
Sample Type: D

Sample Preparation: Tested after >425um removed by hand

As Received Water Content [ W ] %	Liquid Limit [ WL ] %	Plastic Limit [ Wp ] %	Plasticity Index [ Ip ] %	% Passing 425µm BS Test Sieve
17	30	17	13	99



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

	Plasticity	Liquid Limit
Cl	Clay	below 35
Si	Silt	35 to 50
	L	Low
	M	Medium
	H	High
	V	Very high
	O	Organic
		append to classification for organic material ( eg CIHO )

Note: Water Content by BS 1377-2: 1990: Clause 3.2

Remarks:

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Client: Hydrock Consultants Ltd  
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Client Reference: C-23941-C  
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Date Sampled: 01/02/2023  
Date Received: 06/02/2023  
Date Tested: 13/02/2023  
Sampled By: Not Given

Contact: Kieran Bayley  
Site Address: North Star Academy

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

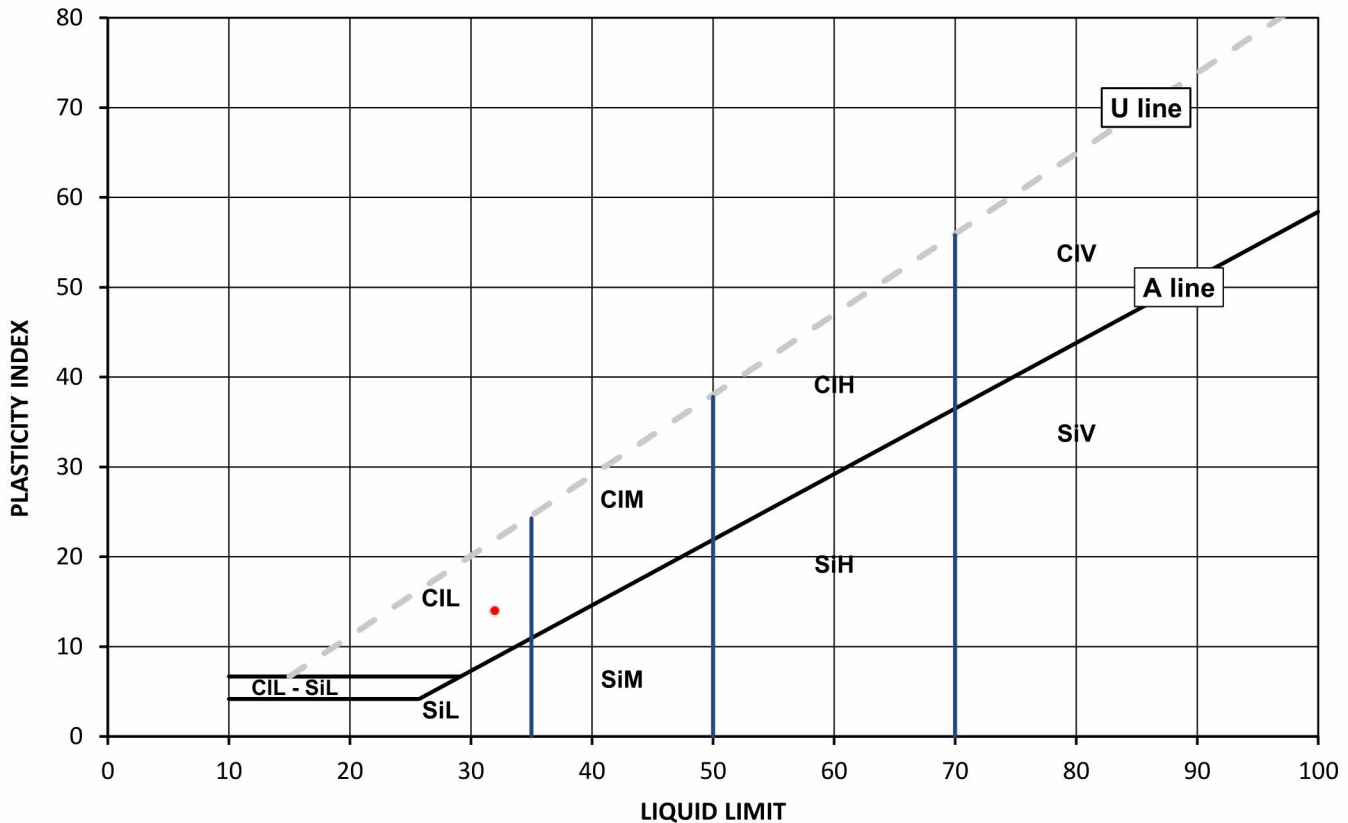
## Test Results:

Laboratory Reference: 2578658  
Hole No.: WS03  
Sample Reference: Not Given  
Sample Description: Brown very sandy CLAY

Depth Top [m]: 1.50  
Depth Base [m]: Not Given  
Sample Type: D

Sample Preparation: Tested in natural condition

As Received Water Content [ W ] %	Liquid Limit [ WL ] %	Plastic Limit [ Wp ] %	Plasticity Index [ Ip ] %	% Passing 425µm BS Test Sieve
18	32	18	14	100



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

Cl	Clay	Plasticity	Liquid Limit
Si	Silt	L	Low
		M	Medium
		H	High
		V	Very high
		O	Organic
			below 35
			35 to 50
			50 to 70
			exceeding 70
			append to classification for organic material ( eg CIHO )

Note: Water Content by BS 1377-2: 1990: Clause 3.2

Remarks:

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DETERMINATION OF LIQUID AND PLASTIC LIMITS  
Tested in Accordance with: BS 1377-2:1990: Clause 4.3 and 5

i2 Analytical Ltd  
Unit 8 Harrowden Road  
Brackmills Industrial Estate  
Northampton NN4 7EB



Environmental Science

4041

Client: Hydrock Consultants Ltd  
Client Address: Over Court Barns, Over Lane,  
Bristol, BS32 4DF

Client Reference: C-23941-C  
Job Number: 23-16494-1  
Date Sampled: 01/02/2023  
Date Received: 06/02/2023  
Date Tested: 13/02/2023  
Sampled By: Not Given

Contact: Kieran Bayley  
Site Address: North Star Academy

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

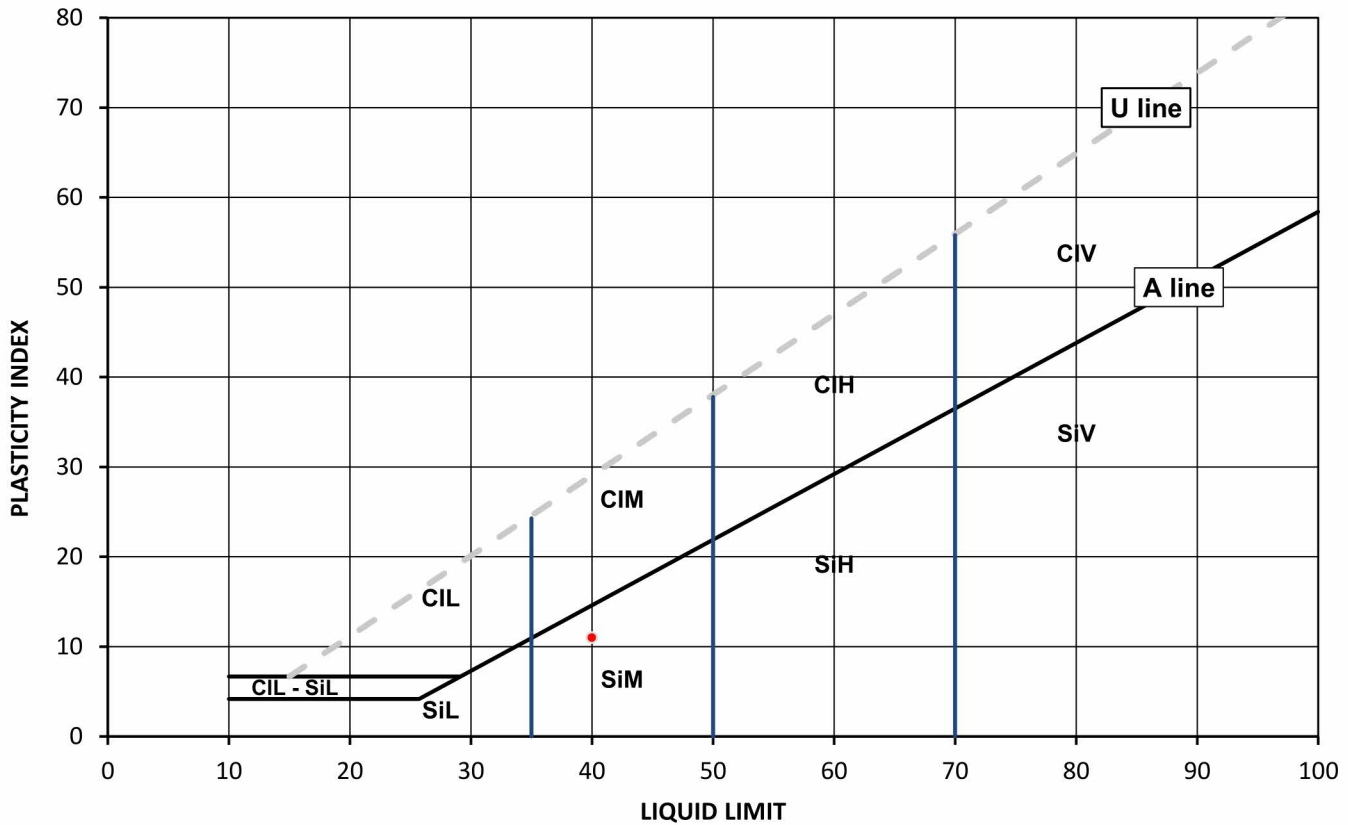
### Test Results:

Laboratory Reference: 2578659  
Hole No.: WS03  
Sample Reference: Not Given  
Sample Description: Brown slightly gravelly sandy CLAY

Depth Top [m]: 2.00  
Depth Base [m]: Not Given  
Sample Type: D

Sample Preparation: Tested after >425um removed by hand

As Received Water Content [ W ] %	Liquid Limit [ WL ] %	Plastic Limit [ Wp ] %	Plasticity Index [ Ip ] %	% Passing 425µm BS Test Sieve
19	40	29	11	99



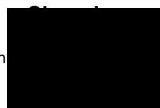
Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

Cl	Clay	Plasticity	L	Low	Liquid Limit	below 35
Si	Silt		M	Medium		35 to 50
			H	High		50 to 70
			V	Very high		exceeding 70
			O	Organic		append to classification for organic material ( eg CIHO )

Note: Water Content by BS 1377-2: 1990: Clause 3.2

Remarks:

Opinions and interpretations expressed herein are outside of the scope of the UKAS Accreditation. The report may not be reproduced other than in full without the prior written approval of the issuing laboratory. The results included within the report relate only to the sample(s) submitted for testing.



Monika Siewior  
Reporting Specialist  
for and on behalf of i2 Analytical Ltd



# TEST CERTIFICATE

DETERMINATION OF LIQUID AND PLASTIC LIMITS  
Tested in Accordance with: BS 1377-2:1990: Clause 4.3 and 5

i2 Analytical Ltd  
Unit 8 Harrowden Road  
Brackmills Industrial Estate  
Northampton NN4 7EB



Environmental Science

4041

Client: Hydrock Consultants Ltd  
Client Address: Over Court Barns, Over Lane,  
Bristol, BS32 4DF

Client Reference: C-23941-C  
Job Number: 23-16494-1  
Date Sampled: 01/02/2023  
Date Received: 06/02/2023  
Date Tested: 13/02/2023  
Sampled By: Not Given

Contact: Kieran Bayley  
Site Address: North Star Academy

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

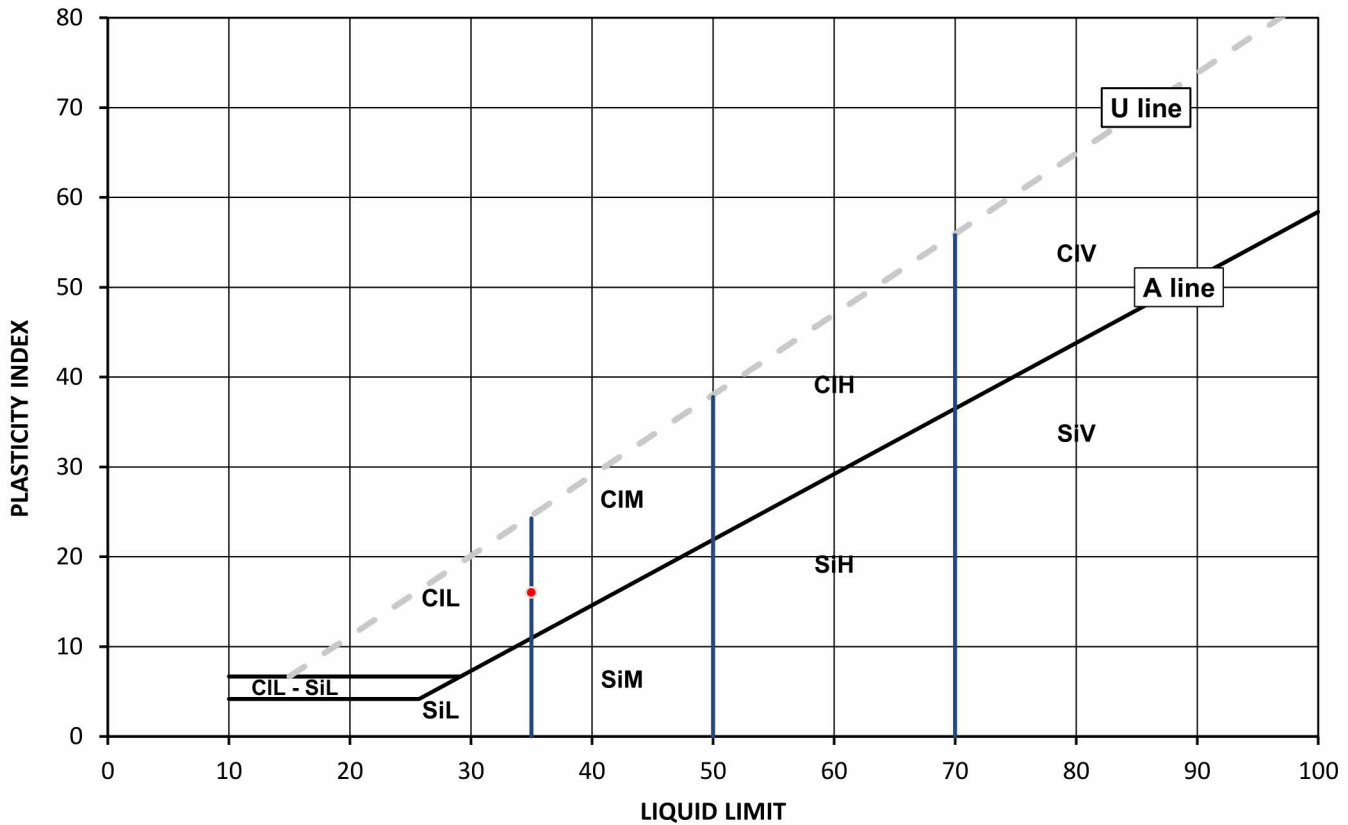
## Test Results:

Laboratory Reference: 2578660  
Hole No.: WS03  
Sample Reference: Not Given  
Sample Description: Brown sandy CLAY

Depth Top [m]: 2.50  
Depth Base [m]: Not Given  
Sample Type: D

Sample Preparation: Tested in natural condition

As Received Water Content [ W ] %	Liquid Limit [ WL ] %	Plastic Limit [ Wp ] %	Plasticity Index [ Ip ] %	% Passing 425µm BS Test Sieve
20	35	19	16	100



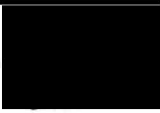
Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

Cl	Clay	Plasticity	Liquid Limit
Si	Silt	L	Low
		M	Medium
		H	High
		V	Very high
		O	Organic
			append to classification for organic material ( eg CIHO )

Note: Water Content by BS 1377-2: 1990: Clause 3.2

Remarks:

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Monika Siewior  
Reporting Specialist  
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# TEST CERTIFICATE

DETERMINATION OF LIQUID AND PLASTIC LIMITS  
Tested in Accordance with: BS 1377-2:1990: Clause 4.3 and 5

i2 Analytical Ltd  
Unit 8 Harrowden Road  
Brackmills Industrial Estate  
Northampton NN4 7EB



Environmental Science

4041

Client: Hydrock Consultants Ltd  
Client Address: Over Court Barns, Over Lane,  
Bristol, BS32 4DF

Client Reference: C-23941-C  
Job Number: 23-16494-1  
Date Sampled: 01/02/2023  
Date Received: 06/02/2023  
Date Tested: 13/02/2023  
Sampled By: Not Given

Contact: Kieran Bayley  
Site Address: North Star Academy

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

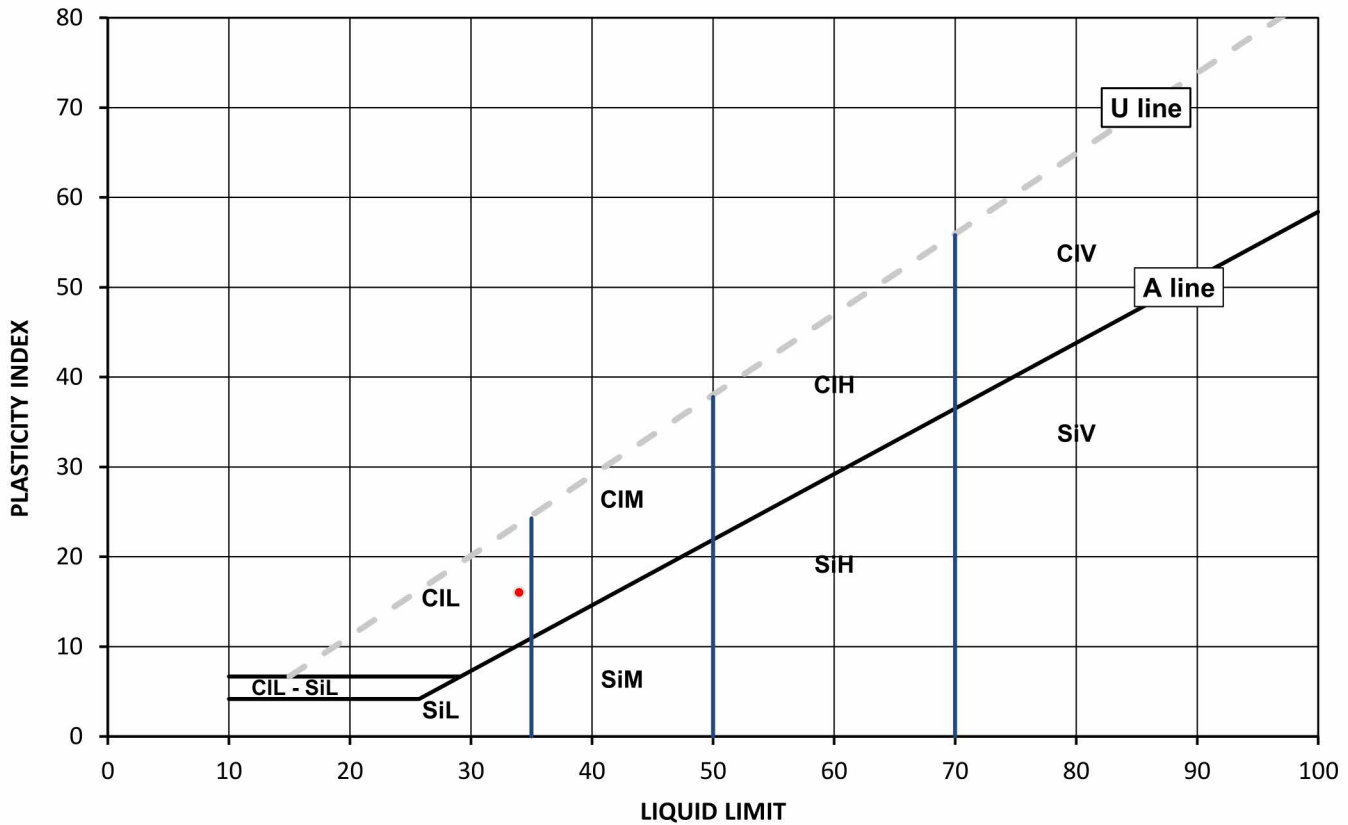
### Test Results:

Laboratory Reference: 2578661  
Hole No.: WS03  
Sample Reference: Not Given  
Sample Description: Brown very sandy CLAY with fragments of gypsum crystals

Depth Top [m]: 3.00  
Depth Base [m]: Not Given  
Sample Type: D

Sample Preparation: Tested in natural condition

As Received Water Content [ W ] %	Liquid Limit [ WL ] %	Plastic Limit [ Wp ] %	Plasticity Index [ Ip ] %	% Passing 425µm BS Test Sieve
18	34	18	16	100



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

Cl	Clay	Plasticity	Liquid Limit
Si	Silt	L	Low
		M	Medium
		H	High
		V	Very high
		O	Organic
			append to classification for organic material ( eg CIHO )
			below 35
			35 to 50
			50 to 70
			exceeding 70

Note: Water Content by BS 1377-2: 1990: Clause 3.2

Remarks:

Signed:



Monika Siewior  
Reporting Specialist  
for and on behalf of i2 Analytical Ltd

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4041

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 Client Address: Over Court Barns, Over Lane,  
 Bristol, BS32 4DF

Contact: Kieran Bayley  
 Site Address: North Star Academy

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

**SUMMARY REPORT****SUMMARY OF CLASSIFICATION TEST RESULTS**

Tested in Accordance with:

Water Content by BS 1377-2:1990: Clause 3.2 Atterberg by BS 1377-2: 1990:  
 Clause 4.3 (4 Point Test), Clause 4.4 (1 Point Test) and 5

i2 Analytical Ltd  
 Unit 8 Harrowden Road  
 Brackmills Industrial Estate  
 Northampton NN4 7EB



Environmental Science

Client Reference: C-23941-C  
 Job Number: 23-16494-1  
 Date Sampled: 01/02/2023  
 Date Received: 06/02/2023  
 Date Tested: 13/02/2023  
 Sampled By: Not Given

**Test results**

Laboratory Reference	Hole No.	Sample				Description	Remarks	Water Content BS 1377-2 [ W ] %	Water Content BS EN ISO 17892-2 [ W ] %	Atterberg				Density			Total Porosity# %		
		Reference	Depth Top m	Depth Base m	Type					% Passing 425um	WL %	Wp %	Ip %	bulk Mg/m3	dry Mg/m3	PD Mg/m3			
2578652	WS01	Not Given	1.70	Not Given	D	Orangish brown very sandy CLAY	Atterberg 4 Point	21		100	34	19	15						
2578653	WS01	Not Given	2.00	Not Given	D	Orangish brown slightly gravelly very sandy CLAY	Atterberg 4 Point	20		98	31	19	12						
2578654	WS01	Not Given	2.40	Not Given	D	Orangish brown gravelly very sandy CLAY	Atterberg 4 Point	15		45	34	21	13						
2578655	WS02	Not Given	1.50	Not Given	D	Brown slightly gravelly very sandy CLAY	Atterberg 4 Point	19		97	33	17	16						
2578656	WS02	Not Given	2.00	Not Given	D	Brown very sandy CLAY	Atterberg 4 Point	23		100	32	20	12						
2578657	WS02	Not Given	2.40	Not Given	D	Brown slightly gravelly very sandy CLAY with fragments of gypsum crystals	Atterberg 4 Point	17		99	30	17	13						
2578658	WS03	Not Given	1.50	Not Given	D	Brown very sandy CLAY	Atterberg 4 Point	18		100	32	18	14						
2578659	WS03	Not Given	2.00	Not Given	D	Brown slightly gravelly sandy CLAY	Atterberg 4 Point	19		99	40	29	11						
2578660	WS03	Not Given	2.50	Not Given	D	Brown sandy CLAY	Atterberg 4 Point	20		100	35	19	16						
2578661	WS03	Not Given	3.00	Not Given	D	Brown very sandy CLAY with fragments of gypsum crystals	Atterberg 4 Point	18		100	34	18	16						

Note: # Non accredited; NP - Non plastic

Comments:

Signed:



Monika Siewior  
 Reporting Specialist  
 for and on behalf of i2 Analytical Ltd

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4041

Client: Hydrock Consultants Ltd  
 Client Address: Over Court Barns, Over Lane,  
 Bristol, BS32 4DF

Contact: Kieran Bayley  
 Site Address: North Star Academy

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

## SUMMARY REPORT

### DETERMINATION OF WATER CONTENT

Tested in Accordance with: BS 1377-2: 1990: Clause 3.2

i2 Analytical Ltd  
 Unit 8 Harrowden Road  
 Brackmills Industrial Estate  
 Northampton NN4 7EB



Environmental Science

Client Reference: C-23941-C  
 Job Number: 23-16494-1  
 Date Sampled: 01/02/2023  
 Date Received: 06/02/2023  
 Date Tested: 13/02/2023  
 Sampled By: Not Given

#### Test results

Laboratory Reference	Hole No.	Sample				Description	Remarks	WC %	Sample preparation / Oven temperature at the time of testing			
		Reference	Depth Top m	Depth Base m	Type							
2578652	WS01	Not Given	1.70	Not Given	D	Orangish brown very sandy CLAY		21	Sample was quartered, oven dried at 108.7 °C			
2578653	WS01	Not Given	2.00	Not Given	D	Orangish brown slightly gravelly very sandy CLAY		20	Sample was quartered, oven dried at 108.7 °C			
2578654	WS01	Not Given	2.40	Not Given	D	Orangish brown gravelly very sandy CLAY		15	Sample was quartered, oven dried at 108.7 °C			
2578655	WS02	Not Given	1.50	Not Given	D	Brown slightly gravelly very sandy CLAY		19	Sample was quartered, oven dried at 108.7 °C			
2578656	WS02	Not Given	2.00	Not Given	D	Brown very sandy CLAY		23	Sample was quartered, oven dried at 108.7 °C			
2578657	WS02	Not Given	2.40	Not Given	D	Brown slightly gravelly very sandy CLAY with fragments of gypsum crystals		17	Sample was quartered, oven dried at 60.0 °C			
2578658	WS03	Not Given	1.50	Not Given	D	Brown very sandy CLAY		18	Sample was quartered, oven dried at 108.7 °C			
2578659	WS03	Not Given	2.00	Not Given	D	Brown slightly gravelly sandy CLAY		19	Sample was quartered, oven dried at 108.7 °C			
2578660	WS03	Not Given	2.50	Not Given	D	Brown sandy CLAY		20	Sample was quartered, oven dried at 108.7 °C			
2578661	WS03	Not Given	3.00	Not Given	D	Brown very sandy CLAY with fragments of gypsum crystals		18	Sample was quartered, oven dried at 60.0 °C			

Comments:

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Signed:



Monika Siewior  
 Reporting Specialist  
 for and on behalf of i2 Analytical Ltd



**Kieran Bayley**  
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## **Analytical Report Number : 23-18575**

<b>Project / Site name:</b>	North Star Academy	<b>Samples received on:</b>	17/02/2023
<b>Your job number:</b>	23941	<b>Samples instructed on/ Analysis started on:</b>	20/02/2023
<b>Your order number:</b>	PO24354	<b>Analysis completed by:</b>	24/02/2023
<b>Report Issue Number:</b>	1	<b>Report issued on:</b>	27/02/2023
<b>Samples Analysed:</b>	7 soil samples		

**Signed:** 

Dominika Warjan  
Junior Reporting Specialist  
**For & on behalf of i2 Analytical Ltd.**

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41-711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement uncertainty can be provided on request.

Analytical Report Number: 23-18575  
Project / Site name: North Star Academy

Lab Sample Number				2591548	2591549	2591550	2591551	2591552
Sample Reference				FPA3	FPA5	FPA7	FPA12	FPB1
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.40	0.60	0.50	0.40	0.50
Date Sampled				16/02/2023	16/02/2023	16/02/2023	16/02/2023	16/02/2023
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)								
Stone Content	%	0.1	NONE	44	< 0.1	63	45	49
Moisture Content	%	0.01	NONE	7.8	12	8.5	9.2	5.7
Total mass of sample received	kg	0.001	NONE	0.6	0.6	0.6	0.6	0.6

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	11.1	10.9	11	11.1	10
Total Sulphate as SO4	mg/kg	50	MCERTS	7000	4600	3100	5800	2700
Total Sulphate as SO4	%	0.005	MCERTS	0.701	0.455	0.308	0.584	0.272
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.39	0.38	0.2	0.24	0.32
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	391	383	198	245	325
Water Soluble Chloride (2:1)	mg/kg	1	MCERTS	240	130	78	14	41
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	MCERTS	120	65	39	7	20
Total Sulphur	mg/kg	50	MCERTS	3000	1900	1400	2800	1700
Total Sulphur	%	0.005	MCERTS	0.304	0.193	0.138	0.283	0.173
Ammoniacal Nitrogen as NH4	mg/kg	0.5	MCERTS	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Ammonium as NH4 (10:1 leachate equivalent)	mg/l	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Water Soluble Nitrate (2:1) as NO3	mg/kg	2	NONE	2.8	2.1	2.4	6.8	27
Water Soluble Nitrate (2:1) as NO3 (leachate equivalent)	mg/l	5	NONE	< 5.0	< 5.0	< 5.0	< 5.0	13

Heavy Metals / Metalloids

Magnesium (water soluble)	mg/kg	5	NONE	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Magnesium (leachate equivalent)	mg/l	2.5	NONE	< 2.5	< 2.5	< 2.5	< 2.5	< 2.5

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

Analytical Report Number: 23-18575  
Project / Site name: North Star Academy

Lab Sample Number				2591553	2591554
Sample Reference				FPB13	FPB2
Sample Number				None Supplied	None Supplied
Depth (m)				0.50	0.50
Date Sampled				16/02/2023	16/02/2023
Time Taken				None Supplied	None Supplied
Analytical Parameter (Soil Analysis)					
Stone Content	%	0.1	NONE	< 0.1	59
Moisture Content	%	0.01	NONE	15	7.2
Total mass of sample received	kg	0.001	NONE	0.6	0.6

#### General Inorganics

pH - Automated	pH Units	N/A	MCERTS	10	10.6
Total Sulphate as SO4	mg/kg	50	MCERTS	4500	4600
Total Sulphate as SO4	%	0.005	MCERTS	0.447	0.461
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.62	0.49
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	618	493
Water Soluble Chloride (2:1)	mg/kg	1	MCERTS	260	970
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	MCERTS	130	490
Total Sulphur	mg/kg	50	MCERTS	1700	2000
Total Sulphur	%	0.005	MCERTS	0.17	0.2
Ammoniacal Nitrogen as NH4	mg/kg	0.5	MCERTS	< 0.5	1.7
Ammonium as NH4 (10:1 leachate equivalent)	mg/l	0.05	MCERTS	< 0.05	0.17
Water Soluble Nitrate (2:1) as NO3	mg/kg	2	NONE	4.9	3.2
Water Soluble Nitrate (2:1) as NO3 (leachate equivalent)	mg/l	5	NONE	< 5.0	< 5.0

#### Heavy Metals / Metalloids

Magnesium (water soluble)	mg/kg	5	NONE	< 5.0	< 5.0
Magnesium (leachate equivalent)	mg/l	2.5	NONE	< 2.5	< 2.5

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected



Analytical Report Number : 23-18575  
 Project / Site name: North Star Academy

\* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
2591548	FPA3	None Supplied	0.4	Brown loam and sand with gravel and brick.
2591549	FPA5	None Supplied	0.6	Brown gravelly clay.
2591550	FPA7	None Supplied	0.5	Brown clay and sand with gravel and brick.
2591551	FPA12	None Supplied	0.4	Brown loam and sand with brick and stones.
2591552	FPB1	None Supplied	0.5	Brown clay and sand with gravel and stones.
2591553	FPB13	None Supplied	0.5	Brown clay and sand with gravel.
2591554	FPB2	None Supplied	0.5	Brown loam and sand with gravel and brick.

Analytical Report Number : 23-18575  
 Project / Site name: North Star Academy

Water matrix abbreviations:

Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS
Chloride, water soluble, in soil	Determination of Chloride colorimetrically by discrete analyser.	In house method.	L082-PL	D	MCERTS
Magnesium, water soluble, in soil	Determination of water soluble magnesium by extraction with water followed by ICP-OES.	In-house method based on TRL 447	L038-PL	D	NONE
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Nitrate, water soluble, in soil	Determination of nitrate by reaction with sodium salicylate and colorimetry.	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08, 2:1 extraction.	L078-PL	D	NONE
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
Total sulphate (as SO4 in soil)	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Total Sulphur in soil	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
Ammonium as NH4 in soil	Determination of Ammonium/Ammonia/ Ammoniacal Nitrogen by the colorimetric salicylate/nitroprusside method, 10:1 water extraction.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	MCERTS
Total Sulphate in soil as %	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
Total Sulphur in soil as %	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
Water Soluble Nitrate (leachate equivalent)	Determination of nitrate by reaction with sodium salicylate and colorimetry.	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08, 2:1 extraction.	L078-PL	D	NONE
Sulphate, water soluble, in soil	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS

For method numbers ending in 'UK or A' analysis have been carried out in our laboratory in the United Kingdom (WATFORD).

For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).

For method numbers ending in 'PL or B' analysis have been carried out in our laboratory in Poland.

Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC

Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.



**Kieran Bayley**  
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## **Analytical Report Number : 23-27743**

<b>Project / Site name:</b>	North Star Academy	<b>Samples received on:</b>	06/04/2023
<b>Your job number:</b>	23941	<b>Samples instructed on/ Analysis started on:</b>	12/04/2023
<b>Your order number:</b>	PO25444	<b>Analysis completed by:</b>	18/04/2023
<b>Report Issue Number:</b>	1	<b>Report issued on:</b>	18/04/2023
<b>Samples Analysed:</b>	6 soil samples		

**Signed** 

Anna Goc  
Junior Reporting Specialist  
**For & on behalf of i2 Analytical Ltd.**

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41-711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement uncertainty can be provided on request.

Analytical Report Number: 23-27743  
Project / Site name: North Star Academy

Lab Sample Number			2644589	2644590	2644591	2644592	2644593	
Sample Reference			TP106	TP105	TP104	TP103	TP101	
Sample Number			None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	
Depth (m)			0.50	0.40	0.30	0.40	0.20	
Date Sampled			04/04/2023	04/04/2023	04/04/2023	04/04/2023	04/04/2023	
Time Taken			None Supplied	None Supplied	None Supplied	None Supplied	None Supplied	
Analytical Parameter (Soil Analysis)								
Stone Content	%	0.1	NONE	< 0.1	< 0.1	28	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	9	7.9	9.5	6.2	14
Total mass of sample received	kg	0.001	NONE	1.3	1.4	1.3	1.4	1.4

Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected	Not-detected	Not-detected
Asbestos Analyst ID	N/A	N/A	N/A	MLO	MLO	MLO	MLO	MLO

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	10.8	11.6	11.2	11.5	8.5
Free Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Sulphate as SO4	mg/kg	50	MCERTS	-	-	-	-	730
Total Sulphate as SO4	%	0.005	MCERTS	-	-	-	-	0.073
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.96	0.23	0.5	0.31	0.24
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	-	-	-	-	244
Water Soluble Chloride (2:1)	mg/kg	1	MCERTS	-	-	-	-	10
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	MCERTS	-	-	-	-	5.1
Total Sulphur	mg/kg	50	MCERTS	-	-	-	-	320
Total Sulphur	%	0.005	MCERTS	-	-	-	-	0.032
Ammoniacal Nitrogen as NH4	mg/kg	0.5	MCERTS	-	-	-	-	< 0.5
Ammonium as NH4 (10:1 leachate equivalent)	mg/l	0.05	MCERTS	-	-	-	-	< 0.05
Fraction Organic Carbon (FOC) Automated	N/A	0.001	MCERTS	0.01	0.009	0.0067	0.0035	0.0042
Water Soluble Nitrate (2:1) as NO3	mg/kg	2	NONE	-	-	-	-	2.4
Water Soluble Nitrate (2:1) as NO3 (leachate equivalent)	mg/l	5	NONE	-	-	-	-	< 5.0

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	0.1	0.09	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	0.23	0.08	< 0.05	< 0.05	< 0.05
Fluorene	mg/kg	0.05	MCERTS	0.28	0.11	< 0.05	< 0.05	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	3.2	1.1	0.85	0.35	0.08
Anthracene	mg/kg	0.05	MCERTS	0.9	0.37	0.35	0.14	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	5.9	2.7	3.3	1.1	0.2
Pyrene	mg/kg	0.05	MCERTS	4.8	3	3.8	1.2	0.21
Benzo(a)anthracene	mg/kg	0.05	MCERTS	2.5	1.5	1.9	0.56	0.12
Chrysene	mg/kg	0.05	MCERTS	2.3	1.3	1.7	0.52	0.14
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	2.8	1.8	2.3	0.63	0.21
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	1.1	0.58	0.89	0.24	0.06
Benzo(a)pyrene	mg/kg	0.05	MCERTS	2.1	1.6	2	0.52	0.18
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	1.3	0.79	1	0.3	0.12
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	0.4	0.19	0.25	< 0.05	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	1.4	0.87	1.2	0.37	0.13

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	29.1	16	19.4	5.91	1.45



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Lab Sample Number			2644589	2644590	2644591	2644592	2644593
Sample Reference			TP106	TP105	TP104	TP103	TP101
Sample Number			None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)			0.50	0.40	0.30	0.40	0.20
Date Sampled			04/04/2023	04/04/2023	04/04/2023	04/04/2023	04/04/2023
Time Taken			None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)							

**Heavy Metals / Metalloids**

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	15	13	16	14	36
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	0.55	0.54	0.63	0.55	1.1
Boron (water soluble)	mg/kg	0.2	MCERTS	1.7	1	1.4	0.7	0.4
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	0.7	0.6	0.7	0.9	< 0.2
Chromium (hexavalent)	mg/kg	1.8	MCERTS	< 1.8	< 1.8	< 1.8	< 1.8	< 1.8
Chromium (III)	mg/kg	1	NONE	14	14	15	11	22
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	14	14	16	11	22
Copper (aqua regia extractable)	mg/kg	1	MCERTS	12	14	9.3	12	21
Lead (aqua regia extractable)	mg/kg	1	MCERTS	38	24	24	42	41
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	13	14	12	8.8	25
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	23	22	24	20	30
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	83	60	63	87	130
Magnesium (water soluble)	mg/kg	5	NONE	-	-	-	-	18
Magnesium (leachate equivalent)	mg/l	2.5	NONE	-	-	-	-	9.2

**Monoaromatics & Oxygenates**

Benzene	µg/kg	5	MCERTS	-	-	< 5.0	-	-
Toluene	µg/kg	5	MCERTS	-	-	< 5.0	-	-
Ethylbenzene	µg/kg	5	MCERTS	-	-	< 5.0	-	-
p & m-xylene	µg/kg	5	MCERTS	-	-	< 5.0	-	-
o-xylene	µg/kg	5	MCERTS	-	-	< 5.0	-	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	5	NONE	-	-	< 5.0	-	-

**Petroleum Hydrocarbons**

TPH-CWG - Aliphatic >EC5 - EC6 HS_1D_AL	mg/kg	0.001	NONE	-	-	< 0.001	-	-
TPH-CWG - Aliphatic >EC6 - EC8 HS_1D_AL	mg/kg	0.001	NONE	-	-	< 0.001	-	-
TPH-CWG - Aliphatic >EC8 - EC10 HS_1D_AL	mg/kg	0.001	NONE	-	-	< 0.001	-	-
TPH-CWG - Aliphatic >EC10 - EC12 EH_CU_1D_AL	mg/kg	1	MCERTS	-	-	< 1.0	-	-
TPH-CWG - Aliphatic >EC12 - EC16 EH_CU_1D_AL	mg/kg	2	MCERTS	-	-	4.8	-	-
TPH-CWG - Aliphatic >EC16 - EC21 EH_CU_1D_AL	mg/kg	8	MCERTS	-	-	15	-	-
TPH-CWG - Aliphatic >EC21 - EC35 EH_CU_1D_AL	mg/kg	8	MCERTS	-	-	110	-	-
TPH-CWG - Aliphatic >EC16 - EC35 EH_CU_1D_AL	mg/kg	10	MCERTS	-	-	130	-	-
TPH-CWG - Aliphatic > EC35 - EC44 EH_CU_1D_AL	mg/kg	8.4	NONE	-	-	91	-	-
TPH-CWG - Aliphatic (EC5 - EC35) EH_CU+HS_1D_AL	mg/kg	10	NONE	-	-	130	-	-
TPH-CWG - Aliphatic (EC5 - EC44) EH_CU+HS_1D_AL	mg/kg	10	NONE	-	-	220	-	-
TPH-CWG - Aromatic >EC5 - EC7 HS_1D_AR	mg/kg	0.001	NONE	-	-	< 0.001	-	-
TPH-CWG - Aromatic >EC7 - EC8 HS_1D_AR	mg/kg	0.001	NONE	-	-	< 0.001	-	-
TPH-CWG - Aromatic >EC8 - EC10 HS_1D_AR	mg/kg	0.001	NONE	-	-	< 0.001	-	-
TPH-CWG - Aromatic >EC10 - EC12 EH_CU_1D_AR	mg/kg	1	MCERTS	-	-	< 1.0	-	-
TPH-CWG - Aromatic >EC12 - EC16 EH_CU_1D_AR	mg/kg	2	MCERTS	-	-	2.7	-	-
TPH-CWG - Aromatic >EC16 - EC21 EH_CU_1D_AR	mg/kg	10	MCERTS	-	-	21	-	-
TPH-CWG - Aromatic >EC21 - EC35 EH_CU_1D_AR	mg/kg	10	MCERTS	-	-	140	-	-
TPH-CWG - Aromatic > EC35 - EC44 EH_CU_1D_AR	mg/kg	8.4	NONE	-	-	120	-	-
TPH-CWG - Aromatic (EC5 - EC35) EH_CU+HS_1D_AR	mg/kg	10	NONE	-	-	160	-	-
TPH-CWG - Aromatic (EC5 - EC44) EH_CU+HS_1D_AR	mg/kg	10	NONE	-	-	280	-	-
TPH Total C5 - C44 EH_CU+HS_1D_TOTAL	mg/kg	10	NONE	-	-	500	-	-



Analytical Report Number: 23-27743  
 Project / Site name: North Star Academy

Lab Sample Number	2644589	2644590	2644591	2644592	2644593
Sample Reference	TP106	TP105	TP104	TP103	TP101
Sample Number	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)	0.50	0.40	0.30	0.40	0.20
Date Sampled	04/04/2023	04/04/2023	04/04/2023	04/04/2023	04/04/2023
Time Taken	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)					

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

Analytical Report Number: 23-27743  
Project / Site name: North Star Academy

Lab Sample Number	2644594			
Sample Reference	TP102			
Sample Number	None Supplied			
Depth (m)	0.50			
Date Sampled	04/04/2023			
Time Taken	None Supplied			
Analytical Parameter (Soil Analysis)				
Stone Content	%	0.1	NONE	< 0.1
Moisture Content	%	0.01	NONE	9.6
Total mass of sample received	kg	0.001	NONE	1.3

Asbestos in Soil	Type	N/A	ISO 17025	Not-detected
Asbestos Analyst ID	N/A	N/A	N/A	MLO

#### General Inorganics

pH - Automated	pH Units	N/A	MCERTS	10.7
Free Cyanide	mg/kg	1	MCERTS	< 1.0
Total Sulphate as SO <sub>4</sub>	mg/kg	50	MCERTS	-
Total Sulphate as SO <sub>4</sub>	%	0.005	MCERTS	-
Water Soluble SO <sub>4</sub> 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	1.7
Water Soluble SO <sub>4</sub> 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	-
Water Soluble Chloride (2:1)	mg/kg	1	MCERTS	-
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	MCERTS	-
Total Sulphur	mg/kg	50	MCERTS	-
Total Sulphur	%	0.005	MCERTS	-
Ammoniacal Nitrogen as NH <sub>4</sub>	mg/kg	0.5	MCERTS	-
Ammonium as NH <sub>4</sub> (10:1 leachate equivalent)	mg/l	0.05	MCERTS	-
Fraction Organic Carbon (FOC) Automated	N/A	0.001	MCERTS	0.0064
Water Soluble Nitrate (2:1) as NO <sub>3</sub>	mg/kg	2	NONE	-
Water Soluble Nitrate (2:1) as NO <sub>3</sub> (leachate equivalent)	mg/l	5	NONE	-

#### Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0
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#### Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	0.13
Fluorene	mg/kg	0.05	MCERTS	0.12
Phenanthrene	mg/kg	0.05	MCERTS	1.9
Anthracene	mg/kg	0.05	MCERTS	0.61
Fluoranthene	mg/kg	0.05	MCERTS	4
Pyrene	mg/kg	0.05	MCERTS	3.8
Benzo(a)anthracene	mg/kg	0.05	MCERTS	1.6
Chrysene	mg/kg	0.05	MCERTS	1.4
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	1.7
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	0.54
Benzo(a)pyrene	mg/kg	0.05	MCERTS	1.4
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	0.72
Dibenzo(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	0.88

#### Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	18.8
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Analytical Report Number: 23-27743  
Project / Site name: North Star Academy

Lab Sample Number	2644594
Sample Reference	TP102
Sample Number	None Supplied
Depth (m)	0.50
Date Sampled	04/04/2023
Time Taken	None Supplied

Analytical Parameter (Soil Analysis)				
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Heavy Metals / Metalloids				
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	17
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	0.61
Boron (water soluble)	mg/kg	0.2	MCERTS	1.3
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	1
Chromium (hexavalent)	mg/kg	1.8	MCERTS	< 1.8
Chromium (III)	mg/kg	1	NONE	15
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	15
Copper (aqua regia extractable)	mg/kg	1	MCERTS	14
Lead (aqua regia extractable)	mg/kg	1	MCERTS	38
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	14
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	23
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	84

Magnesium (water soluble)	mg/kg	5	NONE	-
Magnesium (leachate equivalent)	mg/l	2.5	NONE	-

#### Monoaromatics & Oxygenates

Benzene	µg/kg	5	MCERTS	-
Toluene	µg/kg	5	MCERTS	-
Ethylbenzene	µg/kg	5	MCERTS	-
p & m-xylene	µg/kg	5	MCERTS	-
o-xylene	µg/kg	5	MCERTS	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	5	NONE	-

#### Petroleum Hydrocarbons

TPH-CWG - Aliphatic >EC5 - EC6 HS_1D_AL	mg/kg	0.001	NONE	-
TPH-CWG - Aliphatic >EC6 - EC8 HS_1D_AL	mg/kg	0.001	NONE	-
TPH-CWG - Aliphatic >EC8 - EC10 HS_1D_AL	mg/kg	0.001	NONE	-
TPH-CWG - Aliphatic >EC10 - EC12 EH_CU_1D_AL	mg/kg	1	MCERTS	-
TPH-CWG - Aliphatic >EC12 - EC16 EH_CU_1D_AL	mg/kg	2	MCERTS	-
TPH-CWG - Aliphatic >EC16 - EC21 EH_CU_1D_AL	mg/kg	8	MCERTS	-
TPH-CWG - Aliphatic >EC21 - EC35 EH_CU_1D_AL	mg/kg	8	MCERTS	-
TPH-CWG - Aliphatic >EC16 - EC35 EH_CU_1D_AL	mg/kg	10	MCERTS	-
TPH-CWG - Aliphatic > EC35 - EC44 EH_CU_1D_AL	mg/kg	8.4	NONE	-
TPH-CWG - Aliphatic (EC5 - EC35) EH_CU+HS_1D_AL	mg/kg	10	NONE	-
TPH-CWG - Aliphatic (EC5 - EC44) EH_CU+HS_1D_AL	mg/kg	10	NONE	-

TPH-CWG - Aromatic >EC5 - EC7 HS_1D_AR	mg/kg	0.001	NONE	-
TPH-CWG - Aromatic >EC7 - EC8 HS_1D_AR	mg/kg	0.001	NONE	-
TPH-CWG - Aromatic >EC8 - EC10 HS_1D_AR	mg/kg	0.001	NONE	-
TPH-CWG - Aromatic >EC10 - EC12 EH_CU_1D_AR	mg/kg	1	MCERTS	-
TPH-CWG - Aromatic >EC12 - EC16 EH_CU_1D_AR	mg/kg	2	MCERTS	-
TPH-CWG - Aromatic >EC16 - EC21 EH_CU_1D_AR	mg/kg	10	MCERTS	-
TPH-CWG - Aromatic >EC21 - EC35 EH_CU_1D_AR	mg/kg	10	MCERTS	-
TPH-CWG - Aromatic > EC35 - EC44 EH_CU_1D_AR	mg/kg	8.4	NONE	-
TPH-CWG - Aromatic (EC5 - EC35) EH_CU+HS_1D_AR	mg/kg	10	NONE	-
TPH-CWG - Aromatic (EC5 - EC44) EH_CU+HS_1D_AR	mg/kg	10	NONE	-

TPH Total C5 - C44 EH_CU+HS_1D_TOTAL	mg/kg	10	NONE	-
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Analytical Report Number: 23-27743  
 Project / Site name: North Star Academy

Lab Sample Number	2644594		
Sample Reference	TP102		
Sample Number	None Supplied		
Depth (m)	0.50		
Date Sampled	04/04/2023		
Time Taken	None Supplied		
Analytical Parameter (Soil Analysis)			
U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected			

Analytical Report Number : 23-27743  
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\* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
2644589	TP106	None Supplied	0.5	Brown loam and sand with rubble and brick.
2644590	TP105	None Supplied	0.4	Brown loam and sand with rubble and brick.
2644591	TP104	None Supplied	0.3	Brown loam and sand with gravel and stones.
2644592	TP103	None Supplied	0.4	Brown loam and sand with rubble and vegetation.
2644593	TP101	None Supplied	0.2	Brown loam and clay with gravel and vegetation.
2644594	TP102	None Supplied	0.5	Brown loam and sand with rubble and brick.

Analytical Report Number : 23-27743  
Project / Site name: North Star Academy

Water matrix abbreviations:

Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS
Asbestos identification in soil	Asbestos identification with the use of polarised light microscopy in conjunction with dispersion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES.	In-house method based on Second Site Properties version 3	L038-PL	D	MCERTS
Chloride, water soluble, in soil	Determination of Chloride colorimetrically by discrete analyser.	In house method.	L082-PL	D	MCERTS
Free cyanide in soil	Determination of free cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Magnesium, water soluble, in soil	Determination of water soluble magnesium by extraction with water followed by ICP-OES.	In-house method based on TRL 447	L038-PL	D	NONE
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
Nitrate, water soluble, in soil	Determination of nitrate by reaction with sodium salicylate and colorimetry.	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08, 2:1 extraction.	L078-PL	D	NONE
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
Total sulphate (as SO4 in soil)	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Total Sulphur in soil	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
BTEX and MTBE in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS. Individual components MCERTS accredited	In-house method based on USEPA8260	L073B-PL	W	MCERTS
Ammonium as NH4 in soil	Determination of Ammonium/Ammonia/ Ammoniacal Nitrogen by the colorimetric salicylate/nitroprusside method, 10:1 water extraction.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	MCERTS

Analytical Report Number : 23-27743  
Project / Site name: North Star Academy

Water matrix abbreviations:

Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
TPH Chromatogram in Soil	TPH Chromatogram in Soil.	In-house method	L064-PL	D	NONE
Cr (III) in soil	In-house method by calculation from total Cr and Cr VI.	In-house method by calculation	L080-PL	W	NONE
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L088/76-PL	W	MCERTS
TPH in (Soil)	Determination of TPH bands by HS-GC-MS/GC-FID	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	D	MCERTS
Fraction Organic Carbon FOC Automated	Determination of fraction of organic carbon in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method	L009	D	MCERTS
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in NaOH and addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	MCERTS
Total Sulphate in soil as %	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
Total Sulphur in soil as %	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
Water Soluble Nitrate (leachate equivalent)	Determination of nitrate by reaction with sodium salicylate and colorimetry.	In-house method based on Examination of Water and Wastewater & Polish Standard Method PN-82/C-04579.08, 2:1 extraction.	L078-PL	D	NONE
Sulphate, water soluble, in soil	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS

For method numbers ending in 'UK or A' analysis have been carried out in our laboratory in the United Kingdom (WATFORD).

For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).

For method numbers ending in 'PL or B' analysis have been carried out in our laboratory in Poland.

Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30°C.

Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

## Information in Support of Analytical Results

### List of HWOL Acronyms and Operators

Acronym	Descriptions
HS	Headspace Analysis
MS	Mass spectrometry
FID	Flame Ionisation Detector
GC	Gas Chromatography
EH	Extractable Hydrocarbons (i.e. everything extracted by the solvent(s))
CU	Clean-up - e.g. by Florisil®, silica gel
1D	GC - Single coil/column gas chromatography
2D	GC-GC - Double coil/column gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics
AR	Aromatics

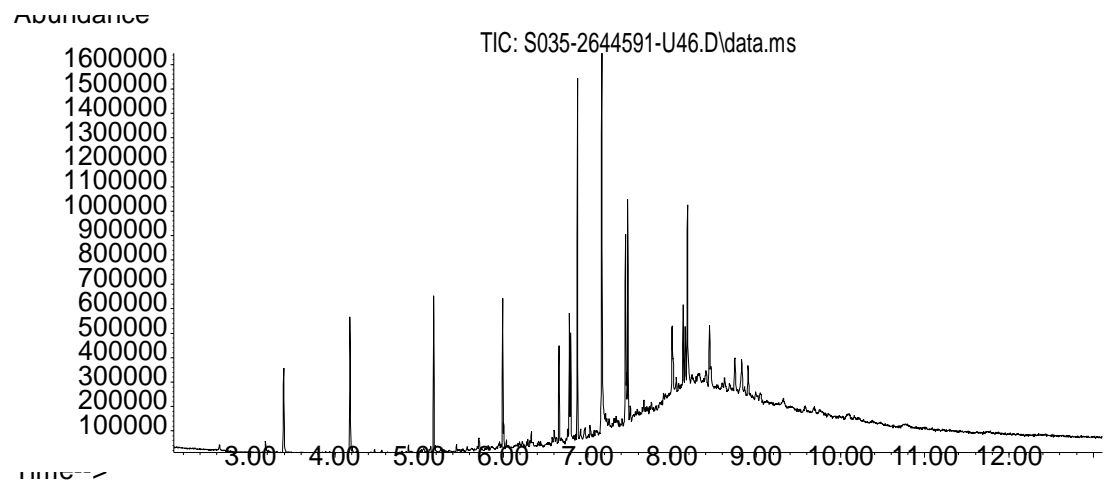




Analytical Report Number : 23-27743  
 Project / Site name: North Star Academy

Water matrix abbreviations:  
 Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
#1	EH_2D_Total but with humics mathematically subtracted				
#2	EH_2D_Total but with fatty acids mathematically subtracted				
_	Operator - understore to separate acronyms (exception for +)				
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total				



## Sample Deviation Report



Analytical Report Number : 23-27743

Project / Site name: North Star Academy

This deviation report indicates the sample and test deviations that apply to the samples submitted for analysis. Please note that the associated result(s) may be unreliable and should be interpreted with care.

Key: a - No sampling date b - Incorrect container c - Holding time d - Headspace e - Temperature

Sample ID	Other ID	Sample Type	Lab Sample Number	Sample Deviation	Test Name	Test Ref	Test Deviation
TP101	None Supplied	S	2644593	c	Free cyanide in soil	L080-PL	c
TP102	None Supplied	S	2644594	c	Free cyanide in soil	L080-PL	c
TP103	None Supplied	S	2644592	c	Free cyanide in soil	L080-PL	c
TP104	None Supplied	S	2644591	c	Free cyanide in soil	L080-PL	c
TP105	None Supplied	S	2644590	c	Free cyanide in soil	L080-PL	c
TP106	None Supplied	S	2644589	c	Free cyanide in soil	L080-PL	c

Client <b>ISG Ltd</b>	Location or material to which this assessment applies <b>Made Ground</b>
Project <b>North Star Academy</b>	
Job number <b>23941</b>	

## Concrete in aggressive ground After BRE Special Digest 1, 2005

### Soil data

	(Adjusted) water soluble sulfate (mg/l)	Total potential sulfate (%)	Water soluble magnesium (mg/l)
Number of tests	13	13	0
No. tests in 20% data set	3	3	
No. tests with suspected pyrite		1	
Maximum value	1136.35	0.9	
Mean of highest two values	971	1	
Mean of highest 20%	900	1	
<b>Characteristic Value</b>	<b>900</b>	<b>0.9</b>	

	[no pyrite]	[pyrite suspected]
DS Class	DS-2	DS-3

If pyrite suspected, DS Class limited to DS-3

Is pyrite assumed to be present **No** Adopted DS Class = DS-2

### Water data

	(Adjusted) soluble sulfate (mg/l)	Soluble magnesium (mg/l)
<b>Characteristic Value (Maximum Level)</b>	0	0
<b>DS Class</b>		

### pH data

	Soil	Water
Number of tests	13	0
No. tests in 20% data set	3	
Lowest pH	9.9	
Mean of lowest 20%	10.0	
<b>Characteristic value</b>	<b>10.0</b>	

**Design value** 10.0

Number of soil pH results less than 5.5 0

**DS Class design value**

**ACEC Class design value**

Based on higher of soil and water data

DS-2

Natural ground

Mobile groundwater

AC-2

Assessment of Chemicals of Potential Concern to Human Health

Risk parameter: Default - Human Health - residential without home-grown produce (1%SOM)															Date					
Client: ISG															04/04/2023					
Site: North Star															04/04/2023					
Job no.: 23941															04/04/2023					
Lab. report no(s): 23-27743															04/04/2023					
Data Filters															04/04/2023					
Zone: All															04/04/2023					
Strata: All															04/04/2023					
Depth Min (m bgl): 0.2															04/04/2023					
Depth Max (m bgl): 0.5															04/04/2023					
Dataset mean SOM%: 1.14															04/04/2023					
Scenario SOM%: 1															04/04/2023					
All values in mg/kg unless otherwise stated															04/04/2023					
CAS No / P Code	Chemical of Potential Concern	Units	LoD	No. Samples	Min. Value	Max. Value	Mean	Median	Standard Deviation	No. Samples >= GAC & > LoD	Soil Saturation Limit @1% SOM	GAC	GAC Source	Strata	MG	MG	MG	MG	MG	MG
-	<b>Asbestos</b>																			
P1020	Asbestos Identified	text	Y/N	6	-	-	-	-	No. of detects:	0	-	-	-		N	N	N	N	N	N
P1889	Asbestos Screen Name	text		0	-	-	-	-	-	-	-	-	-							
P1885	Asbestos Quant. (Stage 2)	%	0.001	0					No. > LOD:		-	-	-							
P1935	Asbestos Quant. Total	%	0.001	0					No. > LOD:		-	-	-							
P1826	Asbestos Quant. (Stage 3)	%	0.001	0					No. > LOD:		-	-	-							
-	Asbestos Quant. Total (Stages 2+3)	%	0.001	0					No. > LOD:		-	-	-							
P1880	Asbestos Containing Material Type: Detected (ACM)	text		0	-	-	-	-	-	-	-	-	-							
0	<b>Hydrock Default Suite - FOC / SOM / pH</b>																			
P1085	FOC (dimensionless)	[]	0.001	6	0.004	0.010	0.007	0.007	0.00		-	-	-		0.01	0.009	0.0067	0.0035	0.0042	0.0064
-	SOM (calculated)	%	0.1724	6	0.60	1.72	1.14	1.13	0.44		-	-	-		1.724	1.5516	1.15508	0.6034	0.72408	1.10336
P1334	pH (su)	pH Units	0.1	6	8.50	11.60	10.72	11.00	1.14		-	-	-		10.8	11.6	11.2	11.5	8.5	10.7
-	<b>Hydrock Default Suite - Metals &amp; PAH</b>																			
7440-38-2	Arsenic	mg/ kg	1	6	13.00	36.00	18.50	15.50	8.69	0	NR	40	C4SL - CL-AIRE 2014		15	13	16	14	36	17
7440-41-7	Beryllium	mg/ kg	0.06	6	0.54	1.10	0.66	0.58	0.22	0	NR	1.7	Hydrock Derived		0.55	0.54	0.63	0.55	1.1	0.61
7440-42-8	Boron	mg/ kg	0.2	6	0.40	1.70	1.08	1.15	0.48	0	NR	11000	Hydrock Derived		1.7	1	1.4	0.7	0.4	1.3
7440-43-9	Cadmium	mg/ kg	0.2	6	0.20	1.00	0.68	0.70	0.28	0	NR	150	C4SL - CL-AIRE 2014		0.7	0.6	0.7	0.9	<0.2	1
16065-83-1	Chromium (III)	mg/kg	1	6	11.00	22.00	15.17	14.50	3.66	0	NR	890	Hydrock Derived		14	14	15	11	22	15
18540-29-9	Chromium (VI)	mg/kg	1.8	6	1.80	1.80	1.80	1.80	0.00	0	NR	21	C4SL - CL-AIRE 2014		<1.8	<1.8	<1.8	<1.8	<1.8	<1.8
7440-47-3	Chromium (Total)	mg/kg	1	6	11.00	22.00	15.33	14.50	3.67						14	14	16	11	22	15
7440-50-8	Copper	mg/ kg	1	6	9.30	21.00	13.72	13.00	3.97	0	NR	7100	Hydrock Derived		12	14	9.3	12	21	14
7439-92-1	Lead	mg/ kg	1	6	24.00	42.00	34.50	38.00	8.29	0	NR	310	C4SL - CL-AIRE 2014		38	24	24	42	41	38
7439-97-6	Mercury, inorganic	mg/kg	0.3	6	0.30	0.30	0.30	0.30	0.00	0	NR	56	Hydrock Derived		<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
7440-02-0	Nickel	mg/ kg	1	6	8.80	25.00	14.47	13.50	5.51	0	NR	180	Hydrock Derived		13	14	12	8.8	25	14
7782-49-2	Selenium	mg/ kg	1	6	1.00	1.00	1.00	1.00	0.00	0	NR	430	Hydrock Derived		<1	<1	<1	<1	<1	<1
7440-62-2	Vanadium	mg/ kg	1	6	20.00	30.00	23.67	23.00	3.39	0	NR	1200	Hydrock Derived		23	22	24	20	30	23
7440-66-6	Zinc	mg/ kg	1	6	60.00	130.00	84.50	83.50	25.07	0	NR	40000	Hydrock Derived		83	60	63	87	130	84
P1095	Cyanide (free)	mg/kg	1	6	1.00	1.00	1.00	1.00	0.00	0	NR	24	Acute Risk - SoBRA 2020		<1	<1	<1	<1	<1	<1
P1186	Total Phenols (Monohydric)	mg/kg	1	6	1.00	1.00	1.00	1.00	0.00	0	24237	440	Hydrock Derived		<1	<1	<1	<1	<1	<1
83-32-9	Acenaphthene	mg/ kg	0.05	6	0.05	0.23	0.10	0.07	0.07	0	57	6600	Hydrock Derived		0.23	0.08	<0.05	<0.05	<0.05	0.13
208-96-8	Acenaphthylene	mg/ kg	0.05	6	0.05	0.10	0.07	0.05	0.02	0	86	6600	Hydrock Derived		0.1	0.09	<0.05	<0.05	<0.05	<0.05
120-12-7	Anthracene	mg/ kg	0.05	6	0.05	0.90	0.40	0.36	0.31	0	1.17	37000	Hydrock Derived		0.9	0.37	0.35	0.14	<0.05	0.61
56-55-3	Benz(a)anthracene	mg/ kg	0.05	6	0.12	2.50	1.36	1.55	0.88	0	1.71	15	Hydrock Derived		2.5	1.5	1.9	0.56	0.12	1.6
50-32-8	Benzo(a)pyrene	mg/ kg	0.05	6	0.18	2.10	1.30	1.50	0.79	0	0.91	5.3	C4SL - CL-AIRE 2014		2.1	1.6	2	0.52	0.18	1.4
205-99-2	Benzo(b)fluoranthene	mg/ kg	0.05	6	0.21	2.80	1.57	1.75	0.98	0	1.22	4.1	Hydrock Derived		2.8	1.8	2.3	0.63	0.21	1.7
191-24-2	Benzo(ghi)perylene	mg/ kg	0.05	6	0.13	1.40	0.81	0.88	0.48	0	0.02	360	Hydrock Derived		1.4	0.87	1.2	0.37	0.13	0.88
207-08-9	Benzo(k)fluoranthene	mg/ kg	0.05	6	0.06	1.10	0.57	0.56	0.39	0	0.69	110	Hydrock Derived		1.1	0.58	0.89	0.24	0.06	0.54
218-01-9	Chrysene	mg/ kg	0.05	6	0.14	2.30	1.23	1.35	0.79	0	0.44	32	Hydrock Derived		2.3	1.3	1.7	0.52	0.14	1.4
53-70-3	Dibenz(ah)anthracene	mg/ kg	0.05	6	0.05	0.40	0.17	0.12	0.14	1	0.004	0.32	Hydrock Derived		0.4	0.19	0.25	<0.05	<0.05	<0.05
206-44-0	Fluoranthene	mg/ kg	0.05	6	0.20	5.90	2.87	3.00	2.05	0	19	1600	Hydrock Derived		5.9	2.7	3.3	1.1	0.2	4
86-73-7	Fluorene	mg/ kg	0.05	6	0.05	0.28	0.11	0.08	0.09	0	31	4700	Hydrock Derived		0.28	0.11	<0.05	<0.05	<0.05	0.12
193-39-5	Indeno(123cd)pyrene	mg/ kg	0.05	6	0.12	1.30	0.71	0.76	0.44	0	0.06	46	Hydrock Derived		1.3	0.79	1	0.3	0.12	0.72
91-20-3	Naphthalene	mg/ kg	0.05	6	0.05	0.05	0.05	0.05	0.00	0	76	23	Hydrock Derived		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
85-01-8	Phenanthrene	mg/ kg	0.05	6	0.08	3.20	1.25	0.98	1.15	0	36	1500	Hydrock Derived		3.2	1.1	0.85	0.35	0.08	1.9
129-00-0	Pyrene	mg/ kg	0.05	6	0.21	4.80	2.80	3.40	1.75	0	2.2	3800	Hydrock Derived		4.8	3	3.8	1.2	0.21	3.8
P1310	PAH 16 Total	mg/kg	0.8	6	1.45	29.10	15.11	17.40	10.00						29.1	16	19.4	5.91	1.45	18.8
0	<b>TPH fractions</b>																			
P1407	TPH all EC05-EC06	mg/kg	0.001	1	0.00	0.00	0.00	0.00	-	0	304	42	Hydrock Derived				<0.001			
P1408	TPH all >EC06-EC08	mg/kg	0.001	1	0.00	0.00	0.00	0.00	-	0	144	100	Hydrock Derived				<0.001			
P1409	TPH all >EC08-EC10	mg/kg	0.001	1	0.00	0.00	0.00	0.00	-	0	78	27	Hydrock Derived				<0.001			
P1410	TPH all >EC10-EC12	mg/kg	1	1	1.00	1.00	1.00	1.00	-	0	48	130	Hydrock Derived				<1			
P1411	TPH all >EC12-EC16	mg/kg	2	1	4.80	4.80	4.80	4.80	-	0	24	1100	Hydrock Derived				4.8			
P1412	TPH all >EC16-EC21	mg/kg	8	1	15.00	15.00	15.00	15.00	-								15			

Assessment of Chemicals of Potential Concern to Human Health

Risk parameter: Default - Human Health - residential without home-grown produce (1%SOM)															04/04/23 04/04/23 04/04/23 04/04/23 04/04/23 04/04/23							
Client: ISG		Data Filters																				
Site: North Star		Zone All																				
Job no.: 23941		Strata All																				
Lab. report no(s): 23-27743		Depth Min (m bgl) 0.2																				
		Depth Max (m bgl) 0.5																				
Dataset mean SOM% 1.14																						
Scenario SOM% 1																						
All values in mg/kg unless otherwise stated																						
CAS No / P Code	Chemical of Potential Concern	Units	LoD	No. Samples	Min. Value	Max. Value	Mean	Median	Standard Deviation	No. Samples >= GAC & > LoD	Soil Saturation Limit @1% SOM	GAC	GAC Source	Strata	Date	04/04/2023	04/04/2023	04/04/2023	04/04/2023	04/04/2023	04/04/2023	
P1413	TPH ali >EC21-EC35	mg/kg	8	1	110.00	110.00	110.00	110.00	-			-										
P1938	TPH ali >EC16-EC35	mg/kg	10	1	130.00	130.00	130.00	130.00	-	0	8	65000	Hydrock Derived									
P1415	TPH ali >EC35-EC44	mg/kg	8.4	1	91.00	91.00	91.00	91.00	-	0	8	65000	Hydrock Derived									
P1418	TPH ali >EC5-EC35	mg/kg	10	1	130.00	130.00	130.00	130.00	-			-										
P1420	TPH ali >EC5-EC44	mg/kg	10	1	220.00	220.00	220.00	220.00	-			-										
P1441	TPH aro EC05-EC07	mg/kg	0.001	1	0.00	0.00	0.00	0.00	-	0	1218	370	Hydrock Derived									
P1355	TPH aro >EC07-EC08	mg/kg	0.001	1	0.00	0.00	0.00	0.00	-	0	869	860	Hydrock Derived									
P1356	TPH aro >EC08-EC10	mg/kg	0.001	1	0.00	0.00	0.00	0.00	-	0	613	47	Hydrock Derived									
P1357	TPH aro >EC10-EC12	mg/kg	1	1	1.00	1.00	1.00	1.00	-	0	364	250	Hydrock Derived									
P1358	TPH aro >EC12-EC16	mg/kg	2	1	2.70	2.70	2.70	2.70	-	0	169	1800	Hydrock Derived									
P1359	TPH aro >EC16-EC21	mg/kg	10	1	21.00	21.00	21.00	21.00	-	0	54	1900	Hydrock Derived									
P1360	TPH aro >EC21-EC35	mg/kg	10	1	140.00	140.00	140.00	140.00	-	0	5	1900	Hydrock Derived									
P1362	TPH aro >EC35-EC44	mg/kg	8.4	1	120.00	120.00	120.00	120.00	-	0	5	1900	Hydrock Derived									
P1365	TPH aro >EC5-EC35	mg/kg	10	1	160.00	160.00	160.00	160.00	-			-										
P1941	TPH aro >EC5-EC44	mg/kg	10	1	280.00	280.00	280.00	280.00	-			-										
P1373	Total TPH >EC5-EC44	mg/kg	10	1	500.00	500.00	500.00	500.00	-			-										