

Technical Note

To: Manchester City Council (Planning)

From: Jake Busby (Curtins)

Subject: Ground Conditions

Reference: 20200-CUR-INZ-XX-GN-C-00003

Date: 11th October 2022

This technical note has been prepared in support of an application for planning permission for additional carparking on land within the North Manchester General Hospital (NMGH) campus (hereafter referred to as the TCP05).

The package of works proposed within the planning application comprises:

- Phase 1 and 2 construction of a new temporary carpark;
- Installation of required drainage and other associated infrastructure.

Further details of the works and the proposed surface water drainage strategy is detailed below:

TCP05

Referring to the Phase 1 Preliminary Risk Assessment Summary (December 2021) the report indicated that the site was historically occupied by fields; and by 1894 mapping was shown to be a part of the wider Prestwich Union House site now the infectious disease building and is occupied in the south by tennis courts in 1954 which are replaced with the current car park by 2000.

Considering the tennis courts constructed on site by 1954 and replaced by a car park in 2000, Made Ground is anticipated across the site. BGS data indicates Glaciofluvial Sheet Deposits (sands and gravels) across the site.

Superficial deposits are underlain by the Chester Formation (sandstone). The superficial deposits are recorded as Secondary Undifferentiated Aquifer corresponding to the Glacial Till deposit. The Chester Formation is designated as a Principal Aquifer. There are no groundwater abstraction points within 500m and the site is not located within a Source Protection Zone (SPZ).

The nearest surface water feature is the River Irk 189m east of the site flowing southwards.

A Preliminary Conceptual Site Model considered that the site presents a Moderate/Low risk to site end users from potentially contaminated shallow soils. The risk to groundwater and surface water receptors was considered to be Moderate/Low and Very Low respectively.

Due to the site's proposed end use as a surface car park, with no structures or buildings proposed, the risk to site end users from ground gases was considered to be Low.

In March 2021 intrusive investigations were undertaken within the estate. This investigation was to assess the ground conditions and to aid contamination assessment in the area of the proposed Temporary Car Parks, to be used during the wider redevelopment of NMGH in the coming years.

Within TCP05 5no Window Sample boreholes (WS101 to WS102 and WS401 to WS403) to a maximum 5.45m bgl and 3no California Bearing Ratio (CBR) Tests (CBR401 to CBR403) at 0.40m and 0.75m bgl were completed.

The exploratory hole logs and an exploratory hole plans, (ref. 20200-CUR-XX-EX-DR-G-0001 to 0003) are appended here for reference.

Three Made Ground soil samples were obtained from the window sample boreholes to allow for chemical and testing to be undertaken, with the testing suite detailed in Table 1.0:

Table 1.0 – Environmental testing suite (Soils)

Suite Ref.	Analyte	LOD
Soils Suite A	Asbestos Screen, pH and Soil Organic Matter (SOM)	-
	Arsenic, Chromium, Chromium VI, Copper, Lead, Selenium, Zinc, Nickel	1 - 5 mg/kg
	Boron (water soluble)	1 mg/kg
	Cadmium	0.5 mg/kg
	Mercury	0.1 mg/kg
	Cyanide (total)	1 mg/kg
	Sulphate (water sol 2:1)	0.01 mg/kg
	Phenols (screen)	0.2 mg/kg
	PAHs (USEPA 16)	0.01 – 0.08 mg/kg
	TPH (Aro/Alc Split)	0.01 to 0.1 mg/kg

Table 2.0B – Summary of encountered ground conditions TCP05 & Service Diversion:

Stratum	Depth to Top of Strata (m bgl)	Thickness (m)		Description
		Min	Max	
TOPSOIL WS403 A-D, CBR402 and CBR 403	0.00	0.07	0.10	Grass over brown silty clay topsoil with frequent rootlets. Rare angular to subangular fine to coarse gravel including brick and coal.
ASPHALT WS101, WS102, WS401, WS402 and CBR401	0.00	0.07	0.12	Asphalt underlain by sub base comprising light brown sandy angular to subrounded fine to medium gravel of limestone and brick.
MADE GROUND ¹ All locations except CBR402 & CBR403	0.20 – 0.40	0.15	>2.00	Light brown to dark brown sandy angular to subrounded fine to coarse gravel including brick concrete and metal with various ash and cobble content.
GLACIOFLUVIAL SHEET DEPOSITS (sands and gravels) WS401 – WS403 and WS101	0.48 – 0.80	0.20	0.40	Medium dense light brown to dark brown fine to coarse SAND.

Stratum	Depth to Top of Strata (m bgl)	Thickness (m)		Description
		Min	Max	
GLACIAL TILL ² (clay) WS501 – WS503 and CBR501	0.08 – 1.70	1.1	>3.8	Firm to Stiff light brown, orange brown sandy slightly gravelly CLAY.
GLACIOFLUVIAL SHEET DEPOSITS ³ (sands and gravels) WS401 – WS403, WS101 and CBR401-403	2.8 – 3	0.20	>1.22	WS502 only - Loose light brown clayey fine to medium SAND. Medium dense grey/brown fine to medium clayey SAND, or medium to coarse with rare bands of fine gravel of coal

1 - Base of strata not encountered in WS102.

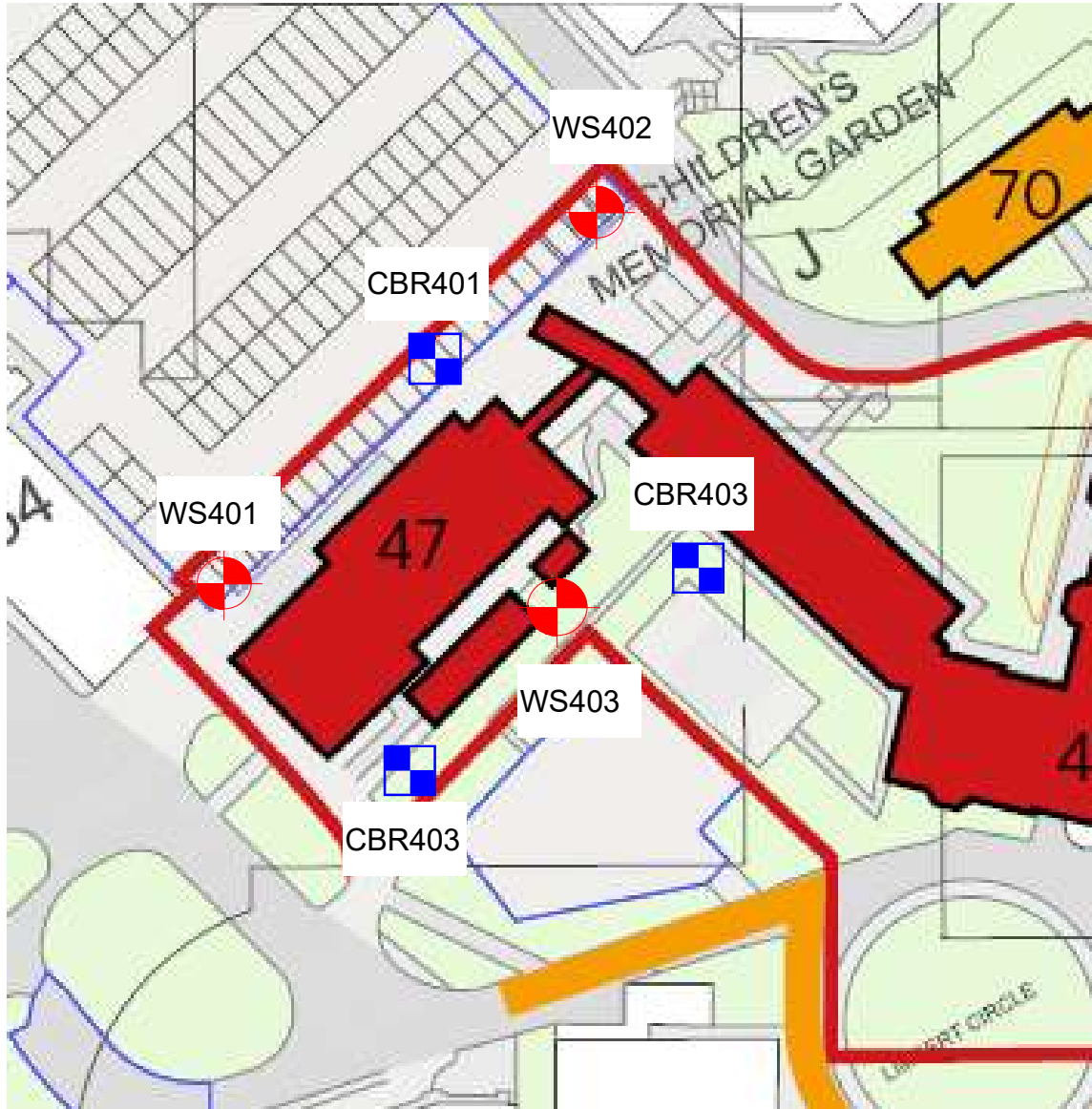
2 - Base of strata not encountered in CBR401-403.

3 - Base of strata not encountered in WS101 & WS402.

Consequently, the risk to site end users and construction workers from shallow site soils is therefore considered to be **Low**. Construction workers are to be provided with appropriate PPE and sanitary facilities with reference to the enclosed environmental testing results.

Due to the site's proposed end use as a surface car park, with no structures or buildings proposed, the risk to site end users from ground gases was considered to be **Low**. If the proposed development were to change and include buildings, a detailed ground gas risk assessment would be required.

It is considered that a Remediation Statement will not be required for this site.



-  WINDOW SAMPLE BOREHOLE LOCATION UP TO 5M
 CBR TEST

Rev:	Description:	Date:	By:	Chkd:
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Status:

INFORMATION

Project:

NORTH MANCHESTER GENERAL HOSPITAL

EXPLORATORY HOLE LOCATION PLAN TCP05

Scale: NTS	Size: A3	First Issue: 30/04/2021	Drawn: PN	Checked: RA
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Drg No: 20200-CUR-XX-EX-DR-G-0001	Rev:
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Borehole Log

Borehole No.

WS401

Sheet 1 of 1

Project Name: North Manchester General Hospital - TCP05

Project No.
076686

Co-ords: -

Hole Type
WS

Location: Manchester

Level:

Scale
1:50

Client: Pennine Acute Trust

Dates: 08/03/2021 - 08/03/2021

Logged By
PN

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.10	ES		0.10			ASPHALT	
		0.20			0.20			MADE GROUND: Light brown/grey sandy angular to subrounded fine to medium gravel of aggregate, limestone and brick. Sand is medium to coarse.	
		0.48			0.48			MADE GROUND: Black slightly sandy angular to subangular, fine to coarse gravel including concrete, brick and ceramic with a high ash content. Sand is coarse.	
		1.20	D	N=19 (3,4/4,6,5,4)				Medium dense light brown fine to medium SAND.	
		1.70 - 1.80			1.70				
		2.00		N=22 (3,5/5,5,7,5)				Stiff brown/grey slightly sandy slightly gravelly CLAY. Sand is medium to coarse. Gravel is subangular to subrounded, fine to coarse including sandstone and mudstone.	
		3.00		N=23 (4,6/5,6,6,6)					
		3.50 - 3.70			3.30			Very stiff dark brown occasionally grey slightly sandy laminated CLAY. Sand is medium to coarse.	
		4.00		N=34 (3,5/6,8,11,9)					
					4.40			End of borehole at 4.40 m	

Remarks

Service inspection pit hand excavated from GL to 1.20m. Groundwater not encountered.





Borehole Log

Borehole No.

WS402

Sheet 1 of 1

Project Name: North Manchester General Hospital - TCP05

Project No.
076686

Co-ords: -

Hole Type
WS

Location: Manchester

Level:

Scale
1:50

Client: Pennine Acute Trust

Dates: 08/03/2021 - 08/03/2021

Logged By
PN

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.25	ES		0.10 0.17 0.50 0.71			ASPHALT	
								MADE GROUND: Light brown/grey sandy angular to subrounded fine to medium gravel of aggregate, limestone and brick. Sand is medium to coarse.	
		1.20		N=7 (1,2/2,1,2,2)	1.20			MADE GROUND: Dark brown slightly sandy angular to subangular fine to coarse gravel including brick, concrete and metal with moderate cobble content. Cobbles are angular of brick.	1
		2.00		N=13 (2,3/3,2,4,4)				MADE GROUND: Dark brown/black slightly gravelly clay. Gravel is angular to subrounded fine to coarse including ceramic, brick and ash.	
		2.20 - 2.30	D					Medium dense light brown fine to medium SAND.	2
								Firm dark brown slightly gravelly occasionally sandy CLAY. Sand is medium to coarse. Gravel is subangular to subrounded fine to coarse including sandstone and mudstone.	
		3.00		N=20 (3,3/5,5,4,6)	3.00			Medium dense slightly clayey medium to coarse SAND.	3
		3.00 - 3.10	D		3.41			Stiff brown occasionally mottled orange slightly sandy lamiated CLAY. Sand is medium to coarse.	
		4.00		N=29 (4,4/7,7,6,9)	3.78			Dense light brown/orange fine to medium sand with thin (1mm) black laminations.	4
		4.50 - 5.00	B						
		5.00		N=25 (6,5/5,6,8,6)	5.00			End of borehole at 5.00 m	5
									6
									7
									8
									9
									10

Remarks

Service inspection pit hand excavated from GL to 1.20m. Seepage at 2.00m bgl.





Borehole Log

Borehole No.

WS403

Sheet 1 of 1

Project Name: North Manchester General Hospital - TCP05

Project No.
076686

Co-ords: -

Hole Type
WS

Location: Manchester

Level:

Scale
1:50

Client: Pennine Acute Trust

Dates: 09/03/2021 - 09/03/2021

Logged By
PN

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.15	ES		0.07			GRASS over TOPSOIL: Brown slightly sandy clay with frequent rootlets and rare gravel. Sand is medium to coarse. Gravel is subangular to subrounded fine to coarse of brick.	
					0.80			MADE GROUND: Brown slightly sandy gravelly clay with moderate ash content. Sand is medium to coarse. Gravel is angular to subrounded fine to coarse including concrete, brick, clinker and wood.	1
		1.20		N=10 (2,2/4,2,2,2)	1.20			Medium dense light brown medium to coarse SAND.	
		1.50 - 1.60	D					Firm brown/orange slightly sandy CLAY. Sand is fine to medium.	
		2.00		N=6 (1,1/1,2,2,1)	2.00 2.10			Loose brown medium to coarse SAND.	2
								Firm brown/orange slightly sandy CLAY. Sand is fine to medium.	
		3.00		N=17 (2,3/4,5,4,4)	3.00			Stiff light brown sandy CLAY. Sand is medium to coarse.	3
		3.40 - 3.50	D						
		4.00		N=26 (3,6/7,7,9,3)					4
					5.00			End of borehole at 5.00 m	5

Remarks

Service inspection pit hand excavated from GL to 1.20m. Deposits damp at 2.00m bgl.





Borehole Log

Borehole No.

WS301

Sheet 1 of 1

Project Name: North Manchester General Hospital Stage 2

Project No.
076686.301

Co-ords: 384994.81 - 402586.00

Hole Type
WS

Location: Manchester

Level: 73.55

Scale
1:50

Client: MFT

Dates: 25/05/2021 - 25/05/2021

Logged By
RT

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.15			0.15	73.40		TOPSOIL: Grass over dark brown very silty clay with frequent rootlets.	
		0.49	ES		0.49	73.06		Dark brown slightly gravely silty clay with occasional rootlets. Gravel is coarse and angular of brick.	
		1.00			1.00	72.55		Medium dense brown slightly clayey fine to medium SAND.	1
		1.20		N=1 (1,0/0,1,0,0)				Very soft brown very sandy CLAY.	
		2.00		N=16 (1,3/3,4,4,5)	2.00	71.55		Firm brown slightly sandy CLAY.	2
		3.00		N=10 (2,3/3,2,2,3)					3
		3.00 - 3.45	D						
		4.00		N=9 (1,2/2,2,3,2)					4
		5.00		N=13 (2,2/3,3,3,4)					5
		5.45			5.45	68.10		End of borehole at 5.45 m	6
									7
									8
									9
									10

Remarks

Service clearance handpit to 1.20m bgl. Groundwater seepage noted at 3.00m bgl.



unstable, including where groundwater is encountered, and those more than 1.20m deep. Excavations shallower than 1.20m deep, requiring personnel access, will require closed side support.

The chosen contractor should provide details on how they intend to ensure the safety and stability of proposed excavations.

10.6 Ground Floor Slabs

Based on the observations on site together with the results of laboratory tests and that ground bearing floor slabs should not span granular and made ground soils due to potential for differential settlement, it is recommended that consideration is given to a suspended ground floor slab. As piled foundations are anticipated, a suspended slab is recommended to bear on the pile caps by a network of beams which will minimise any differential settlement between the floor and piled structure.

10.7 Soakaways

Three soakaways were proposed however, due to the significant thickness of made ground and recorded obstructions, SA301 and SA302 could not be undertaken.

The Infiltration Test results are typically calculated using

$$\text{Soil Infiltration Rate } f = \frac{V_{p75-25}}{a_{s50} \cdot t_{p75-25}} \quad \text{[Equation 5] (BRE365)}$$

Where:

V_{p75-25} is the effective storage volume of water in the soakage trial pit between 75% and 25% effective storage depth.

a_{s50} is the internal surface area of the soakage trial pit up to 50% effective storage depth and including the base area.

t_{p75-25} is the time for the water level to fall from 75% to 25% effective storage depth.

The results obtained are summarised in Table 10.6. It was not possible to complete more than one test due to the slow infiltration rate.

Table 10.7 – Soakaway Test Results

Location	V_{p75-25} (m ³)	a_{s50} (m ²)	t_{p75-25} (s)	Infiltration Rate
				Test 1
SA303	0.483	3.212	7200	2.09x10 ⁻⁵



Rotary Core Log

Borehole No.

BH301

Sheet 1 of 6

Project Name: NMGH Masterplanning

Project No.
076686.300

Co-ords: 384990.04 - 402447.62

Hole Type
RC

Location: North Manchester General Hospital

Level: 73.43

Scale
1:50

Client: Bruntwood

Dates: 24/03/2021 - 13/04/2021

Logged By
PN

Well	Water Strikes	Depth (m)	Type / Fl	Coring			Depth (m)	Level (m)	Legend	Stratum Description	
				TCR	SCR	RQD					
		0.05	ES				0.10	73.33		MADE GROUND: Dark grey slightly sandy subangular to rounded fine to coarse gravel of mixed lithologies including brick. Sand is medium to coarse.	1
							0.33	73.10			
							0.70	72.73		MADE GROUND: Light grey slightly sandy angular to subangular medium to coarse gravel of limestone/aggregate with low cobble content. Cobbles are angular of limestone.	
							1.10	72.33		MADE GROUND: Light brown slightly gravelly medium to coarse sand. Gravel is subangular to subrounded fine to medium of mixed lithologies including brick.	
		2.00 - 2.45	B							REWOKED GROUND?: Dark brown slightly sandy CLAY with rare gravel. Sand is medium to coarse. Gravel is subangular fine to medium of brick.	2
										Medium dense light brown slightly gravelly slightly gravelly medium to coarse SAND. Gravel is subrounded fine to medium of coal.	
							3.00	70.43		Firm light brown slightly sandy CLAY. Sand is fine to medium.	3
											4
		4.00 4.00 - 4.45	D U								5
											6
							6.00	67.43		Medium dense light brown fine SAND.	7
		6.50 - 6.95	B								8
											9
											10

Continued on next sheet

Remarks

Service inspection pit hand excavated from GL to 1.20m. No groundwater encountered.





Rotary Core Log

Borehole No.

BH301

Sheet 2 of 6

Project Name: NMGH Masterplanning

Project No.
076686.300

Co-ords: 384990.04 - 402447.62

Hole Type
RC

Location: North Manchester General Hospital

Level: 73.43

Scale
1:50

Client: Bruntwood

Dates: 24/03/2021 - 13/04/2021

Logged By
PN

Well	Water Strikes	Depth (m)	Type / Fl	Coring			Depth (m)	Level (m)	Legend	Stratum Description	
				TCR	SCR	RQD					
		11.00 - 11.45	U				10.50	62.93		Stiff dark brown slightly sandy slightly gravelly CLAY. Sand is fine to medium. Gravel is subrounded to rounded, fine to coarse of mixed lithologies including sandstone.	11
		14.50 - 14.95	U								12
		17.00 - 17.45	D				17.00	56.43		Very stiff brown sandy CLAY. Sand is medium to coarse.	17
		18.00	D								18
											19
											20

Continued on next sheet

Remarks

Service inspection pit hand excavated from GL to 1.20m. No groundwater encountered.





Rotary Core Log

Borehole No.

BH301

Sheet 3 of 6

Project Name: NMGH Masterplanning

Project No.
076686.300

Co-ords: 384990.04 - 402447.62

Hole Type
RC

Location: North Manchester General Hospital

Level: 73.43

Scale
1:50

Client: Bruntwood

Dates: 24/03/2021 - 13/04/2021

Logged By
PN

Well	Water Strikes	Depth (m)	Type / FI	Coring			Depth (m)	Level (m)	Legend	Stratum Description	
				TCR	SCR	RQD					
		21.00 - 21.45	D								21
							23.00	50.43			22
							23.30	50.13			23
		23.50 - 23.95	D							Very dense reddish brown medium to coarse SAND.	24
										Very stiff brown sandy slightly gravelly CLAY. Sand is medium to coarse. Gravel is subangular to rounded fine to coarse including sandstone and mudstone.	25
											26
											27
							27.30	46.13			28
										Very stiff dark brown slightly silty slightly gravelly CLAY with moderate cobble content. Gravel is subrounded to well rounded medium to coarse including sandstone and mudstone. Cobbles are subangular of sandstone.	29
											30

Continued on next sheet

Remarks

Service inspection pit hand excavated from GL to 1.20m. No groundwater encountered.





Rotary Core Log

Borehole No.

BH301

Sheet 4 of 6

Project Name: NMGH Masterplanning

Project No.
076686.300

Co-ords: 384990.04 - 402447.62

Hole Type
RC

Location: North Manchester General Hospital

Level: 73.43

Scale
1:50

Client: Bruntwood

Dates: 24/03/2021 - 13/04/2021

Logged By
PN

Well	Water Strikes	Depth (m)	Type / Fl	Coring			Depth (m)	Level (m)	Legend	Stratum Description	
				TCR	SCR	RQD					
							33.00	40.43		Very dense reddish brown medium to coarse SAND.	31 32 33 34 35 36 37 38 39 40

Continued on next sheet

Remarks

Service inspection pit hand excavated from GL to 1.20m. No groundwater encountered.





Rotary Core Log

Borehole No.

BH301

Sheet 6 of 6

Project Name: NMGH Masterplanning

Project No.
076686.300

Co-ords: 384990.04 - 402447.62

Hole Type
RC

Location: North Manchester General Hospital

Level: 73.43

Scale
1:50

Client: Bruntwood

Dates: 24/03/2021 - 13/04/2021

Logged By
PN

Well	Water Strikes	Depth (m)	Type / FI	Coring			Depth (m)	Level (m)	Legend	Stratum Description	
				TCR	SCR	RQD					
		50.10 - 50.26	C				50.30	23.13		From 49.36m to 49.45m highly fractured 49.45m to 50.30m 0 - 10 degrees very closely to closely spaced, locally extremely planar rough End of borehole at 50.00 m	
											51
											52
											53
											54
											55
											56
											57
											58
											59
											60

Remarks

Service inspection pit hand excavated from GL to 1.20m. No groundwater encountered.

