Ground Check Ltd
SITE INVESTIGATION SPECIALISTS

PROPOSED BUILDING EXTENSION
OMAGH DISTRICT COUNCIL GORTRUSH DEPOT
GORTRUSH INDUSTRIAL ESTATE
OMAGH
COUNTY TYRONE

GROUND INVESTIGATION REPORT

Client: Omagh District Council

Engineer: Wallace Doherty Consulting Engineers

Job Ref: 15-1226

Issued: February 2015

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1.0 INTRODUCTION

1.1 Terms of Reference

Ground Check Ltd was commissioned by Wallace Doherty Consulting Engineers, acting on behalf of Omagh District Council, to undertake a ground investigation for a proposed extension to an existing council building at Gortrush Industrial Estate, Omagh, County Tyrone. The location of the site is shown by Figure 1.

1.2 Method

The ground investigation was undertaken in accordance with the guidelines set-out in BS5930:1999 + A2 2010, Code of practice for site investigations and UK Specification for Ground Investigation, 2nd edition (2011), BS EN 1997-2 (2007) and BS EN ISO 22475-1 (2006) and related standards and the scope of works comprised of the following elements.

- **Exploratory Holes**

The locations of exploratory holes are shown by Figure 2 and logs are included in Appendix A.

- **Shell and Auger Boreholes:** One borehole was sunk using a Dando 2000 shell and auger drilling rig and was advanced to virtual refusal using 200mm diameter casing and tools.

- **Sampling and In-situ Testing**

- **Disturbed samples:** comprising sealed plastic bags of soil were recovered at intervals shown on the borehole log, generally being taken at one metre depth increments and from each stratum.
- **Standard Penetration Tests (SPT):** were undertaken at intervals shown on the borehole log and were conducted in accordance with BS1377:1990 Code of Practice: Methods of Test for Soils for Engineering Purposes - Part 9 In-Situ Tests.

- **Geotechnical Laboratory Testing**

Selected soil samples were scheduled for the following laboratory tests which were conducted in accordance with procedures outlined in BS1377. Test results are included in Appendix B:

- pH and Water Soluble Sulphate (2:1 Water Extract)

2.0 SITE DESCRIPTION

The site is located within the existing council depot on the southern side of Mullaghmena Park in Gortrush Industrial Estate off the western side of Derry Road on the north western outskirts of Omagh. It is approximately centred over Irish Grid Co-ordinates E243658 N373596 and the ground surface is generally flat and is surfaced with bitmac.

The existing layout of the site is shown by Figure 2 and Plate 1 provides an aerial overview.

Plate 1: Overview of Site

3.0 GROUND CONDITIONS

3.1 Geology

The geological maps of the area indicate the Site is underlain by the following strata.

- **Glacial Till**
- **Bedrock – Omagh Sandstone Group**

The results of the ground investigation are listed in Table 1 and summarised below.

- **Made Ground:** Extends to 0.60m depth and is composed of bitmac surfacing on a quarry stone base, which is underlain by light brown, silty, sandy gravel.
- **Recent Deposits:** Were encountered beneath the made ground to 7.20m depth. They are described generally as very soft to soft, dark brown, slightly gravelly, silty peat, underlain by soft, grey, slightly sandy silt. These materials are in turn underlain from 3.80m depth by very loose to loose, brown and grey, silty, sandy, gravel, interbedded with silty sand, changing to soft to firm, becoming firm, grey, sandy silt at 5.30m depth.
- **Glacial Till:** Occurs immediately beneath the geologically recent materials and continued to the borehole terminal depth. It is composed generally of stiff, grey and brown, gravelly, sandy, silty clay with medium cobble and boulder content and medium dense, silty, sand and gravel with medium cobble and boulder content.
- **Bedrock:** Not encountered.

3.2 Groundwater

A moderate flow of groundwater entered the borehole at 4.30m depth, rising to 4.00m after 20 minutes. Standing water level before start of the second day's boring was recorded at 4.00m below ground level. It should be noted, however, that such short term observations may not represent the position presence of a water table and that groundwater conditions can vary. Conditions established during the investigation may therefore not necessarily represent those prevailing during construction.

Table 1: Ground Conditions Summary

Exploratory Hole Reference	Completion Depth (m)	Stratum Base Depth (m)			Bedrock Top (m)
		Made Ground	Recent	Glacial Till	
BH1	11.50 (refusal)	0.60	7.20	>11.50	-

4.0 GEOTECHNICAL CONSIDERATIONS

4.1 Foundations and Floor Slabs

- **Foundations:** The made ground and geologically recent subsoils would not offer a uniform or competent bearing stratum for shallow foundations as they could be subject to unpredictable and adverse settlement which may be differential due the variable nature of the material. As these materials extend to depths of at least 7.20m below existing ground level a more elaborate foundation solution such as piles would be required. Piles would derive their carrying capacity by a combination of shaft adhesion and end bearing within glacial subsoils or possibly by end bearing within bedrock at greater depth. Since pile length would be dependent on the required working load, type of pile used and method of installation, specialist contractors should formulate safe working load/depth relationships based on their own particular systems. Negative skin friction may be imparted to piles due to consolidation of the geologically recent subsoils and this should be considered by piling contractors at design stage. The potential effects of vibration on adjacent structures or services should, however, be assessed when selecting the most suitable type of foundation solution.

- **Floor Slabs:** Floor slabs placed on the recent subsoils are likely to be subject to adverse settlement and it is therefore recommended that ground floors should be suspended.

- **Concrete Specification:** The results of sulphate concentration and pH tests indicate that Design Sulphate Class 1 (DS-1) and Aggressive Chemical Environment for Concrete Class of AC-1 (BRE Special Digest 1 (2005)) is suitable for use assuming a brownfield site and a mobile groundwater regime.

FIGURES

Project: PROPOSED BUILDING EXTENSION, OMAGH DISTRICT COUNCIL GORTRUSH DEPOT, GORTRUSH INDUSTRIAL ESTATE, OMAGH			Title: FIGURE 1 SITE LOCATION MAP		
Client: OMAGH DISTRICT COUNCIL			Engineer: WALLACE DOHERTY CONSULTING ENGINEERS		
Job Reference: 15-1226	Figure Ref: F15-1226/01	Revision: 0	Date: 25.02.2015	Produced by: LK	Scale: AS SHOWN

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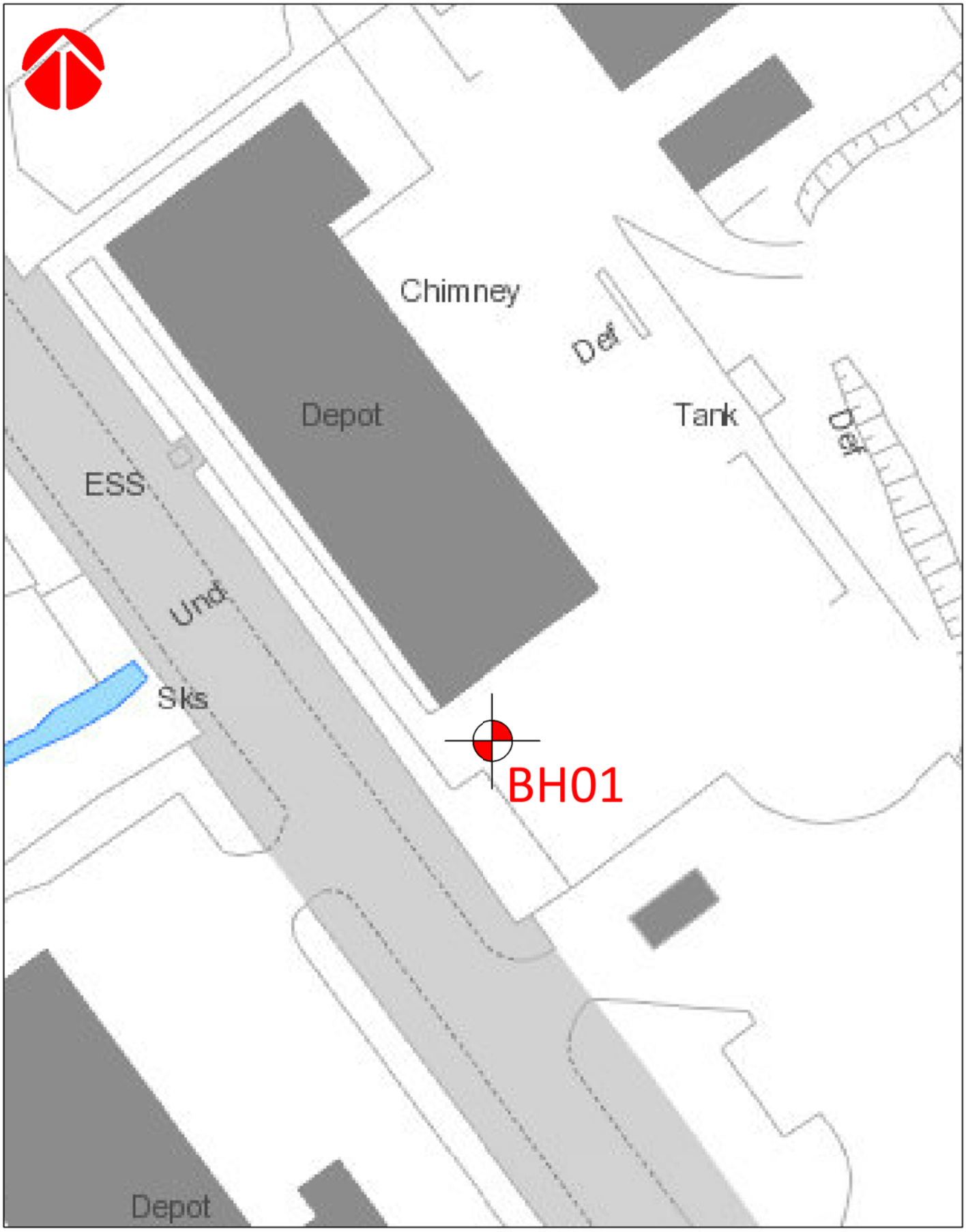

Project: PROPOSED BUILDING EXTENSION, OMAGH DISTRICT COUNCIL, GORTRUSH DEPOT, GORTRUSH INDUSTRIAL ESTATE, OMAGH			Title: FIGURE 2 EXPLORATORY HOLE LOCATION MAP		
Client: OMAGH DISTRICT COUNCIL			Engineer: WALLACE DOHERTY CONSULTING ENGINEERS		
Job Reference: 15-1226	Figure Ref: F15-1226/02	Revision: 0	Date: 25.02.2015	Produced by: LK	Scale: AS SHOWN

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APPENDIX A: BOREHOLE LOGS

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Site	Borehole Number
Proposed Building Extension, Omagh District Council, Gortrush Depot	1

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussive	200mm cased to 11.00m		Omagh District Council	15-1226

Location	Dates	Engineer	Sheet
	10/02/2015-11/02/2015	Wallace Doherty Consulting Engineers	1/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						(0.10) 0.10	BITMAC [MADE GROUND]		
						(0.10) 0.20	QUARRY STONE [MADE GROUND]		
0.50	D1					(0.40) 0.60	Light brown, silty, sandy, fine to coarse, angular GRAVEL. Sand is fine to coarse. [MADE GROUND]		
1.00	D2						Very soft to soft, dark brown, slightly gravelly, silty PEAT. Gravel is fine to medium, subrounded. [RECENT]		
1.20-1.65	SPT N=2			1,0/1,0,1,0					
2.00-2.45 2.00	SPT N=3 D3			1,0/1,1,0,1		(2.90)			
3.00-3.45 3.00	SPT N=7 D4			1,0/1,1,2,3					
						3.50 (0.30) 3.80	Soft, grey, sandy SILT. Sand is fine. [RECENT]		
4.00-4.45 4.00	SPT N=4 D5			1,0/0,1,1,2 Moderate(1) at 4.30m, rose to 4.00m in 20 mins. 10/02/2015:4.00m 11/02/2015:4.00m		(0.50) 4.30	Very loose, brown, silty, sandy, fine to medium, subangular to subrounded GRAVEL. [RECENT]		▼1 ▽1
						(0.50) 4.80	Loose, dark brown, silty, fine to coarse SAND. [RECENT]		
5.00-5.45 5.00	SPT N=6 D6			1,1/2,1,1,2		(0.50) 5.30	Loose, dark brown, silty, sandy, fine to medium, subangular to subrounded GRAVEL. Sand is fine to coarse. [RECENT]		
6.00-6.45 6.00	SPT N=10 D7			2,3/2,3,3,2		(1.90)	Soft to firm, becoming firm, grey, sandy SILT. Sand is fine to coarse. [RECENT]		
7.00	D8					7.20			
7.50-7.95	SPT N=27			3,3/4,6,6,11		(0.70) 7.90	Medium dense, reddish brown, silty, gravelly, fine to coarse SAND. Gravel is fine to coarse, subangular to subrounded. [GLACIAL]		
8.00	D9					(1.30)	Stiff, greyish brown, gravelly, sandy, silty CLAY with medium cobble and boulder content. Sand is fine to coarse. Gravel is fine to coarse, subangular to subrounded. [GLACIAL]		
9.00-9.45 9.00	SPT N=22 D10			2,2/4,5,7,6		9.20	Medium dense, becoming very dense, grey and brown, silty, sandy, fine to coarse GRAVEL with medium cobble and boulder content. Sand is fine to coarse. [GLACIAL]		

Remarks
Hand excavated inspection pit to 1.20m prior to boring.

Scale (approx)	Logged By
1:50	GF

Figure No. 15-1226.1

Ground Check Ltd

Site	Borehole Number
Proposed Building Extension, Omagh District Council, Gortrush Depot	1

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussive	200mm cased to 11.00m		Omagh District Council	15-1226
	Location	**Dates**	**Engineer**	**Sheet**
		10/02/2015-11/02/2015	Wallace Doherty Consulting Engineers	2/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
10.00	D11					(2.30)			
11.00-11.24	SPT 25*/10 50/230			20,5/17,19,14					
11.00	D12			11/02/2015:8.30m		11.50	Complete at 11.50m		

Remarks
Virtual refusal to boring at 11.50m depth.
Chiselling from 11.10m to 11.50m for 2.00 hours.

Scale (approx)	Logged By
1:50	GF

Figure No. 15-1226.1

APPENDIX B: GEOTECHNICAL LABORATORY TEST RESULTS

Ground Check Ltd

Laboratory Test Results

Site : Proposed Building Extension, Omagh District Council, Gortrush Depot

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Job Number 15-1226

Sheet 1 / 1

DETERMINATION OF THE pH VALUE AND THE SULPHATE CONTENT OF SOIL AND GROUNDWATER

Borehole/ Trial Pit	Depth (m)	Sample	Concentration of Soluble Sulphate			Percentage of sample passing 2mm Sieve %	pH	Classification	Laboratory Description
			Soil		Groundwater g /l				
			Total S03 %	S04 in 2:1 water:soil g /l					
1	2.00	D		0.29			7.3	DS-1	
1	5.00	D		0.19			7.3	DS-1	
1	9.00	D		0.23			7.0	DS-1	

Method of Preparation : BS 1377:PART 1:1990:7.5 Preparation of soil for chemical tests BS 1377:PART 3:1990:5.2, 5.3, 5.4 & 9.4

Method of Test : Laboratory in-house methods based on BS1377: Part 3 for contents of water soluble sulphate, total sulphate and pH.

Remarks : Classification relates to Design Sulphate Class of BRE Special Digest 1 (2005)

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