



Site Investigation Report

St George's Barracks
Rutland, UK

January 2018



Prepared for: Rutland County Council



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January 2018

Client:

Rutland County Council

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1. Introduction

Evolution Geological Limited were contacted to undertake a site investigation of an MOD owned, disused airfield known as St George's Barracks, to assess the potential for economic mineral extraction of any underlying limestone resource.

2. Location

The area that is the subject of this report, known as St George's Barracks, is located in Rutland, immediately southeast of Rutland Water reservoir, and some 8km southeast of Oakham.

The site still retains much of the airfield runway and surrounding road infrastructure. The Ordnance Survey grid reference of the centre of the site is 494310E, 304670N.

St George's Barracks is located 1.5km west of Hanson's Ketton quarry and cement works.



Figure 1 - Site Location Plan. © Ordnance Survey.

3. Topography

The Environment Agency LIDAR 2m DTM dataset for the locality shows that the area sits at the top of a topographic plateau which at its highest point reaches c.107m AOD. This plateau falls away gently towards the north east to c.100m AOD, and more steeply towards the south east to around 95m AOD.

This topography is a small part of the wider fluvial geomorphology, where erosion has contributed to the forming of a landscape characterised by high, dissected plateaus with numerous small stream valleys. The site sits atop one of these small plateaus, to the south of the Vale of Catmose, a broad shallow valley which drains to the Wreake in the north and the Welland in the south. The plateaus along this side of

the vale have been cut by rivers, running south ultimately into the Welland, to form a gently rolling landscape that has within it a number of shallow but sometimes steep-sided valleys separated by broad ridges.

The topography of the site and immediate surrounds can be seen in plan EG-SGB-TS-1801 in Appendix B.

4. Regional Geology

St George's Barracks is situated within the outcrop of Jurassic strata which strikes roughly southwest across England stretching from Dorset through Oxfordshire into the Peterborough/Rutland area. In this region, the strata comprises a series of intercalated limestones and clays of the Middle Jurassic Inferior and Great Oolite Groups, which overlays clays with occasional argillaceous limestones of the Lower Jurassic Lias Group.

4.1. Structure

The plateau on which the site sits forms part of the Inferior and Great Oolite escarpment. To the north and west, this escarpment drops towards the lowland of the Upper Lias clay outcrop upon which Rutland Water reservoir sits.

Regionally, strata dips to the east at between 1° and 5° such that strata generally 'young' to the east.

There is little evidence for any significant tectonic structure within the immediate area of the site, though there are some minor fault systems present to the east, in the vicinity of Ketton quarry.

4.2. Stratigraphy

Rutland Formation (formerly Upper Estuarine Series)

In the local area around the site, the upper lithologies encountered are the Rutland Formation, at the base of the Great Oolite Group, which outcrops along the very eastern margin of the site. This formation is described by the British Geological Survey (BGS) as comprising grey marine mudstone passing up into non-marine mudstone and siltstone, with a greenish-grey rootlet bed at the top. The basal beds comprise mainly fluvial and lacustrine sandstones. Subordinate sandstone beds occur higher in the sequence locally, as well as typically shelly and shell-detrital marine limestones and calcareous mudstones. The thickness of the Rutland Formation is typically 8 to 10m, but can be up to 15m. The presence and thickness of this unit is generally determined by the extent of glacial erosion.

Lincolnshire Limestone Formation

Beneath the Rutland Formation is found the Lincolnshire Limestone Formation, the upper member of the Inferior Oolite Group. The Lincolnshire Limestone Formation is subdivided into the Upper and Lower Lincolnshire limestones. The dividing marker is the 'Crossi' bed which is distinguished by the fossils of "Acanthothis crossi" it contains. The Crossi bed forms the top of the Lower Lincolnshire limestone, though it is not considered to be discernible in the local area.

The Lincolnshire Limestone Formation is described by the BGS as limestone, typically calcilutites, and peloidal wackestones and packstones in the lower part (Lower Lincolnshire Limestone) and high energy ooidal and shell fragmental grainstones in the upper part (Upper Lincolnshire Limestone). It commonly includes sandy limestone in the basal part and may contain substantial units of mudstone.

The Lincolnshire Limestone Formation is generally considered to be laterally consistent, with little variation in thickness. The full thickness, typically between 15m and 20m, is normally observed unless this has been reduced as a result of glacial erosion.

Grantham Formation (formerly Lower Estuarine Series)

The Grantham Formation (Inferior Oolite Group) underlies the Lincolnshire Limestone Formation. This formation comprises mudstones, sandy mudstones and argillaceous siltstone-sandstone, which is commonly ferruginous, and containing generally abundant plant debris. The upper boundary of this formation can be a sharp or apparently transitional and somewhat arbitrary interpreted boundary with limestones of the Lincolnshire Limestone Formation, which may be very sandy at the base. Such lower parts of the Lincolnshire Limestone are typically distinguished from the Grantham Formation by the presence of shell debris and peloids.

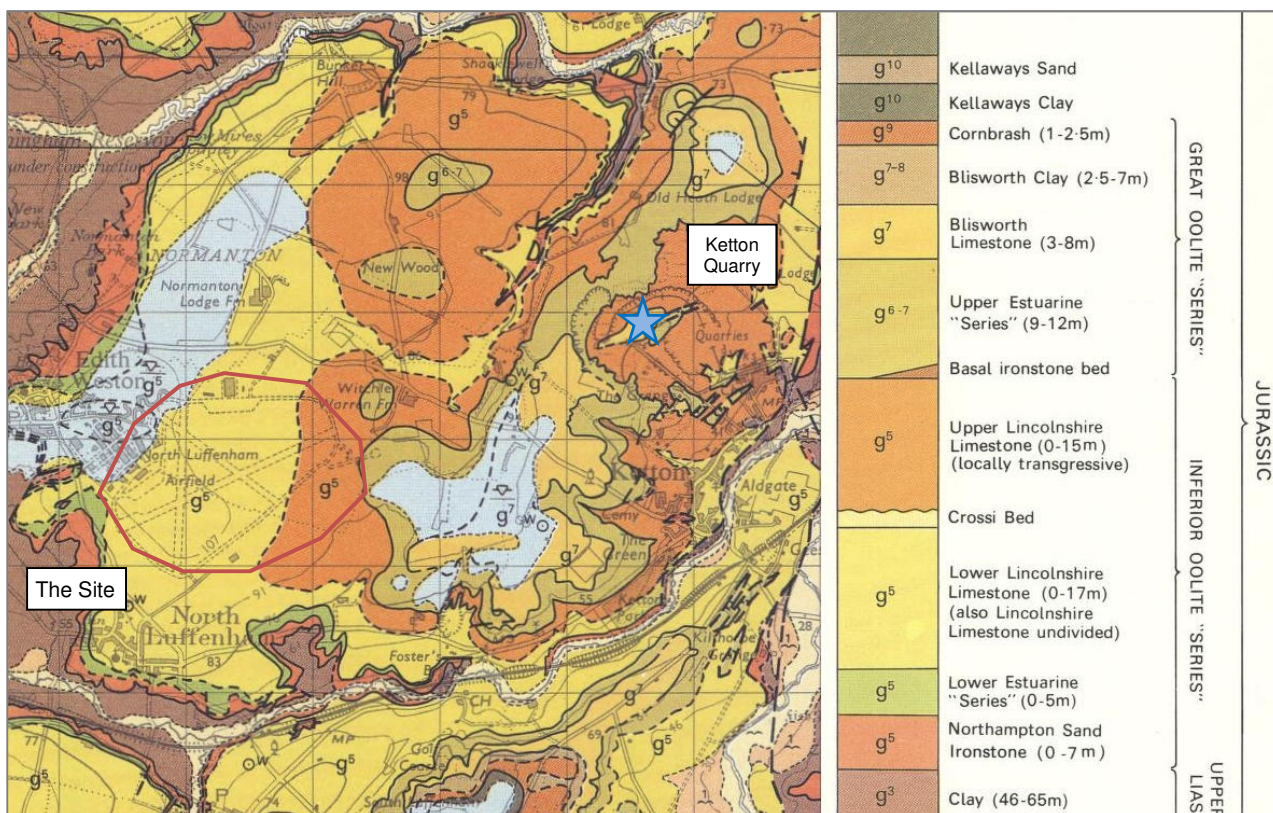


Figure 2 - Geological Map showing geological sequence around the St George's Barracks site. © British Geological Survey, 1978.

Northampton Sand Formation

Underlying the Grantham Formation is found the Northampton Sand Formation, comprising sandy, berthierine-oidal and sideritic ironstone, which is greenish grey where fresh but weathers to brown limonitic sandstone, typically displaying a box-stone structure. The uppermost beds are generally more or less ferruginous sandstone, whilst the basal part is commonly muddy and less ferruginous.

Quaternary deposits above this stratigraphy are limited to relatively small areas of glacial boulder clay on the higher topographic plateaus.

5. Borehole Investigation

A desk-based outline study was undertaken to review the published geological information to enable a ground investigation to be specified and undertaken. This study confirmed the stratigraphy of the site, as above, and identified the only potentially viable economic mineral target as the Lincolnshire Limestone Formation.

Ketton Quarry to the east of the site currently works the Lincolnshire Limestone Formation for the purpose of cement production. It is also understood to use clay from the overlying Rutland Formation and sand from the basal Northampton Sand Formation in the process.

As part of the desk study, historic borehole data available through the BGS was reviewed in order to predict the likely geological horizons and depths across the site. This predicted depths to the base of the Lincolnshire Limestone Formation to be between 6 and 20m.

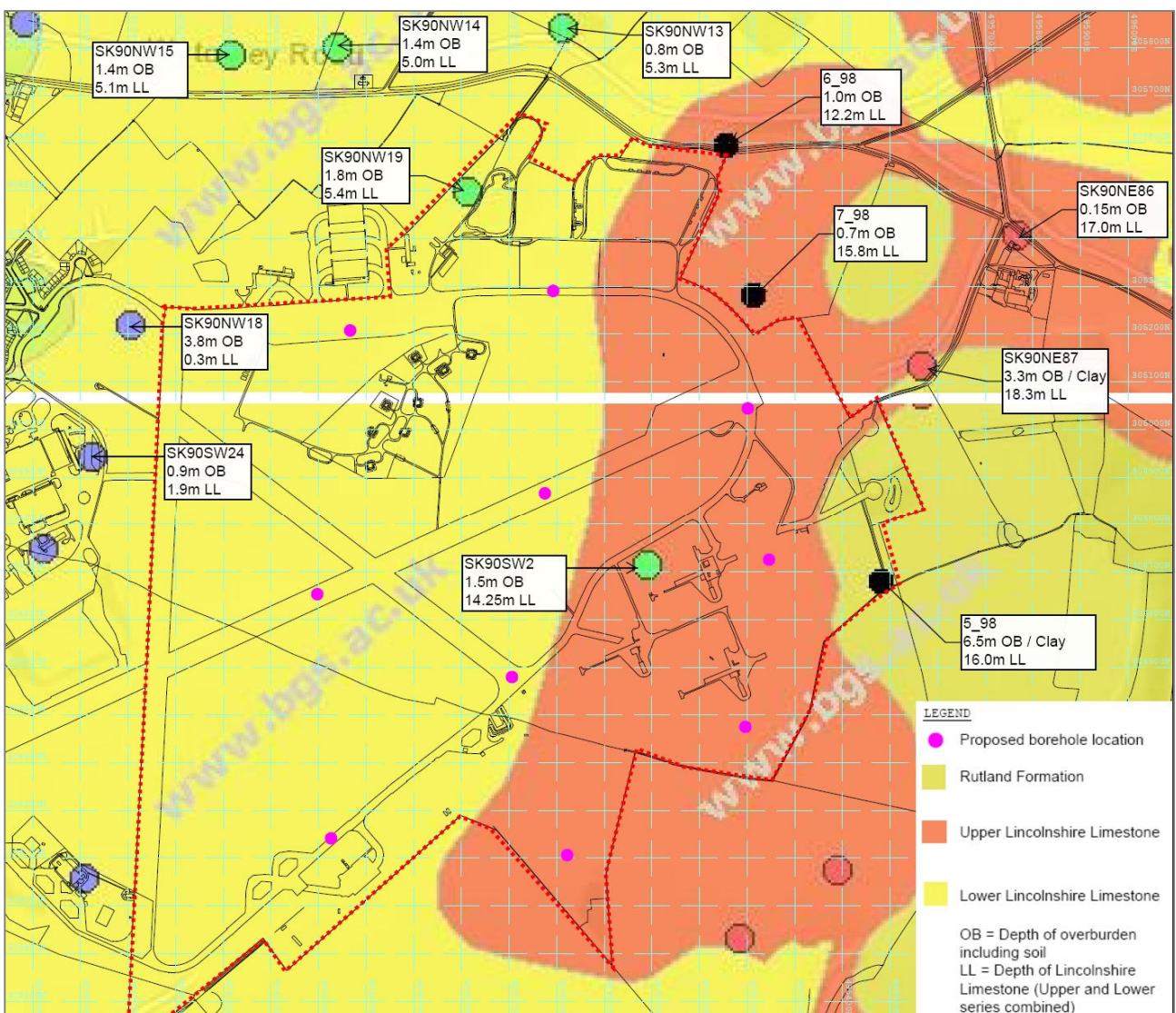


Figure 3 - Summary Geology Plan showing historic boreholes and their recorded thicknesses, together with the proposed borehole locations for the 2017 site investigation.

A site investigation comprising 10 cored boreholes (totalling c.150m) was designed and tendered, and Geobor-S core drilling, utilising a Fraste PL.G rig, was undertaken by Apex Drilling Ltd during December 2017. This was logged in early January 2018 by Evolution Geological, with the borehole logs presented at Appendix A. The results of the drilling are summarised below (and on plan EG-SGB-GSC-0118 in Appendix B).

5.1. Geology

The stratigraphy observed in the new borehole cores was confirmed to be as expected from the desk based study:

Quaternary

All boreholes encountered overlying soils and glacial boulder clay of the Quaternary, which was consistently 0.4 - 0.5m thick.

Lincolnshire Limestone Formation

Immediately beneath this, all 10 boreholes encountered the Lincolnshire Limestone Formation. In all holes, this initially comprised a heavily fractured and clay contaminated horizon, with evidence of weathering and dissolution. This upper, weathered zone was typically seen to be between 0.5 and 1.5m thick.

The Lincolnshire Limestone encountered seemed to demonstrate, as anticipated from the published information, two slightly different forms. An upper part of the sequence generally being less strong, of coarser texture, and more strongly oolitic and shelly. The lower parts of the limestone sequence encountered were typically strong to very strong, of finer texture and with fewer bioclasts.

Though the subdivision of the Upper and Lower Lincolnshire Limestones through the presence of the crossi bed is not discernible in the cores, the noticeable changes in strength, colour and texture seem to provide a reasonable differentiation which largely accords with the anticipated thicknesses of each member.

The Upper Lincolnshire Limestone is considered to have been present in 6 of the 10 boreholes. It was not thought to have been encountered in BHs 1, 4, 5 and 10 – essentially those holes on the western side of the site. In the remaining holes, thicknesses of between 1.0 and 5.1m were observed, with an average thickness of c.2.5m.

The Lower Lincolnshire Limestone was observed in all boreholes, ranging in thickness from 3.9 and 4.9m in the westernmost boreholes (BHs 1 and 5 respectively) to around 12m in the eastern boreholes (BHs 3,6,7,8,9).

Grantham Formation / Northampton Sand Formation

Beneath the Lincolnshire Limestone, all the boreholes passed into sands, siltstones and ferruginous sandstones of these formations.

5.2. Economic Geology

The Lincolnshire Limestone encountered in the boreholes was situated below a relatively small thickness of soils and clay overburden and as such would be considered not to be constrained by that factor for eventual economic extraction. The thicknesses of limestone encountered would also be compatible with economic extraction, though the thinning of the target strata to the west would become limiting at some point. The base of the limestone was 3D modelled as a digital terrain model (DTM) and this showed a relatively consistent dip of the strata of around 1.5° towards the southeast, and thickens in that direction beneath the escarpment (subject to surface topography and erosional controls).

The key aspect of suitability for future cement raw feed usage would be the chemistry of this part of the limestone. Following logging, the Lincolnshire Limestone from the cores were split into 33 samples to be subjected to a full suite of chemical analyses to assess their suitability or otherwise for cement.

NB. As the samples are yet to be tested, the suitability of the limestone chemistry from this specific site does not form part of this version of the report.

In addition to the suitability for cement usage, as part of the core logging an assessment was made of the potential suitability for aggregate use. This was a judgement formed from experience in aggregate products, based upon factors such as strength, rock quality designation (RQD), cleanliness (lack of clay / silt) and the presence of other potentially deleterious components.

This assessment is noted as “Indicative Aggregate Quality” in the borehole logs in Appendix A. Typically, the Upper Lincolnshire Limestone is slightly weaker and generally more heavily weathered near surface, so would be less suitable for aggregate use. The Lower Lincolnshire Limestone, certainly in the upper, cleaner sections before it becomes interspersed with sands and siltstones, would seem to be much more suitable for aggregate use. The presence of iron staining through much of the sequence would perhaps cause some concern for use in concrete products.

5.3. Resource Assessment

Following the results of the drilling, the depths and thicknesses of overburden (overlying soils and clays) and limestone were modelled in 3D to create DTMs from which some indicative volumetrics could be produced.

An appropriate area was considered for a potential future extraction operation, with conservative standoffs from all boundaries of the demarked site, and not considering limestone below a thickness of c.5m.

A conversion factor is required to convert a volume calculated from the modelling into a potential tonnage of the limestone resource. Certain assumptions are required to establish the appropriate conversion factor. The density of the Lincolnshire Limestone is c.2.3 tonnes / m³. However, applying such a factor would not take into account slight variations in the material, the presence of small bands of sand and silt and other deleterious materials, the presence of

fracturing and clay infill and the potential losses associated with practical mineral extraction.

Typically, a processing losses adjustment of c.5-10% would be applied in the production of reserve and resource assessments for this type of mineral operation, though the figure would be adjusted to take into account the specifics of any particular production process or geology. However, for the purposes of this exercise, to produce a very high level estimate of the potential limestone resource, a conservative waste factor of 20% has been utilised.

The potential limestone resource, as calculated from the DTMs created from the historic borehole information and the 2017 drilling, is therefore considered to be in the order of 20 Million tonnes.

The volume of overburden overlying this mineral was calculated as being around 2 Million cubic metres. This included all soils and overlying clays, but also the weathered and clay contaminated top of the limestone.

It should be noted that the borehole spacings from the 2017 drilling exercise are well over 400m, and as such are very much considered to be outline holes. Such outline drilling can give a good overview of the geology, and an idea of indicative resource volumes, but the spacing is such that no real statistical relationship can be established between the holes. This means that the level of confidence in any resource figure should be considered as low.

6. Summary

- 6.1. The St George's Barracks site is underlain by Lincolnshire Limestone, a potentially suitable target for economic mineral extraction.
- 6.2. 10 cored boreholes were drilled during December 2017, all of which penetrated Lincolnshire Limestone, and passed fully through this horizon into the basal strata
- 6.3. Overburden of soils and overlying Quaternary clays was encountered in all holes, with a thickness ranging from 0.4 to 0.5m.
- 6.4. Lincolnshire Limestone was encountered in all holes, with a total thickness ranging from 3.9m in the west (BH1) to 16.8m in the east (BH7). The base of the limestone dips to towards the southeast at c1.5°.
- 6.5. The top of the limestone in all holes was weathered and clay contaminated to a greater or lesser extent. An allowance has been made in the resource estimation for this material.
- 6.6. The subdivision between the Upper and Lower Lincolnshire Limestone is indistinct, though it can potentially be surmised from strength, colour and texture.
- 6.7. The Lincolnshire Limestone (both Upper and Lower) seemed suitable for economic mineral extraction, though its potential use as a cement raw feed will be determined by further chemical analysis.
- 6.8. The lower (and thicker) parts of the sequence of limestone were stronger, and generally cleaner, and could be suitable for aggregate use.
- 6.9. A potential future limestone resource could be in the order of 20 Million tonnes. This is only considered to be an outline, though conservative figure.

7. References

1. British Geological Survey, Sheet 157: Stamford 1:50,000, 1978.
2. British Geological Survey, GeoIndex – Borehole records, 2017.
3. Emerson Moore Geosciences, Mineral Reserves Assessment – Ketton Quarry, 2007.
4. Del Strother, Peter, Ketton Quarry Geological Field Guide, 2014.
5. Dawn, Alan, Middle Jurassic Sequence at Ketton (from Mercian Geologist 16), 2005.

Appendix A – Borehole Logs (2017)



Borehole Log

Site:	St George's Barracks	B/h no:	SGB17 / 01
Logged by:	Simon McCurdy	Date Drilled:	18/12/2017
Coordinates:	494365, 305187	Collar Elevation:	102.249

Depth from	Depth to	Length	Rock description	graphic log	Indicative Agg Quality	Elevation from	Elevation To	Solid Core Recovery			RQD		Sampled for analysis	
								Core Length	Core Recovered	SCR	Core Length	Core >100mm		RQD
0.00	0.80	0.80	No recovery - soils / ob Driller's log entry: 0.0 - 0.8 Clay & Broken Limestone			102.25	101.45	0.80	0.00	0%	0.80	0	0%	Sample 30: 1.7 - 6.2m
0.80	1.70	0.90	Stiff, brown, slightly sandy clay, with occasional gravel of pale grey, fine grained oomicrite limestone.			101.45	100.55	0.90	0.00	0%	0.90	0	0%	
1.70	5.60	3.90	Moderately strong, well cemented, pale grey / pinkish buff, fine grained oomicrite limestone. Well fractured, rubbly return. Occasional shell fragments throughout. Minor black speckling and iron staining on fracture surfaces. Grey clay horizons at 2.6m (5cm), 3.4m (5cm) and 5.5m (10cm).		MOD	100.55	96.65	3.90	3.30	85%	3.90	0.77	20%	
5.60	6.20	0.60	No recovery - suspected grey clay (see above). Driller's log entry: 5.5 - 6.2 Sand			96.65	96.05	0.60	0.00	0%	0.60	0	0%	
6.20	6.70	0.50	Weak, orange brown, clayey, silty ironstone.			96.05	95.55	0.50	0.00	0%	0.50	0	0%	
6.70	9.20	2.50	Weak to moderately strong, dark grey siltstone with occasional ironstone nodules.			95.55	93.05	2.50	0.00	0%	2.50	0	0%	
END OF HOLE				Drilling Contractor / Rig / Type: Apex Drilling / Fraste PL.G / Geobor-S										



Borehole Log



Site:	St George's Barracks	B/h no:	SGB17 / 02
Logged by:	Simon McCurdy	Date Drilled:	30/11/2017
Coordinates:	494785, 305280	Collar Elevation:	101.032

Depth from	Depth to	Length	Rock description	graphic log	Indicative Agg Quality	Elevation from	Elevation To	Solid Core Recovery			RQD		Sampled for analysis	
								Core Length	Core Recovered	SCR	Core Length	Core >100mm		RQD
0.00	1.20	1.20	No recovery - soils / ob Driller's log entry: 0.0 - 0.4 Clay 0.4 - 1.2 Broken Limestone & Clay			101.03	99.83	1.20	0.00	0%	1.20	0	0%	
1.20	1.70	0.50	Moderately strong, well cemented, buff, fine oomicrotic limestone. Well fractured, rubbly to gravelly return. Minor black speckling on fracture surfaces.			99.83	99.33	0.50	0.25	50%	0.50	0	0%	
1.70	4.15	2.45	Moderately strong to strong, well cemented, orange buff / buff, coarse oolitic limestone. Shell fragments throughout. Minor iron staining.		GOOD	99.33	96.88	2.45	2.20	90%	2.45	0.73	30%	Sample 14: 1.7 - 4.7m
4.15	6.70	2.55	Strong, well cemented, pale grey, medium oomicrotic limestone. Occasional shell fragments. Occasional silty bands. Minor plastic, grey clay infill on some fractures.		MOD	96.88	94.33	2.55	2.50	98%	2.55	1.98	78%	Sample 15: 4.7 - 7.7m
6.70	8.60	1.90	Moderately strong, well cemented, buff / brown, medium oomicrotic limestone, with occasional shelly and silty bands. Very fractured. Fine black speckling throughout. Grey brown clay on occasional fracture.		MOD	94.33	92.43	1.90	1.35	71%	1.90	0.86	45%	
8.60	9.40	0.80	Strong, well cemented, pale grey / buff, fine oomicrotic limestone. Occasional shelly fragments throughout. Minor iron staining on fracture surfaces.		GOOD	92.43	91.63	0.80	0.80	100%	0.80	0.7	87%	Sample 16: 7.7 - 9.4m



Borehole Log

Site:	St George's Barracks	B/h no:	SGB17 / 02
Logged by:	Simon McCurdy	Date Drilled:	30/11/2017
Coordinates:	494785, 305280	Collar Elevation:	101.032

Depth from	Depth to	Length	Rock description	graphic log	Indicative Agg Quality	Elevation from	Elevation To	Solid Core Recovery			RQD		Sampled for analysis	
								Core Length	Core Recovered	SCR	Core Length	Core >100mm		RQD
9.40	11.15	1.75	Weak, buff, fine grained, silty sandstone, becoming orange brown, heavily iron stained from 10.8m. Occasional ironstone nodules and small dissolution cavities.			91.63	89.88	1.75	0.00	0%	1.75	0	0%	
11.15	12.20	1.05	Weak, dark grey siltstone with organic fragments and occasional ironstone nodule.			89.88	88.83	1.05	0.00	0%	1.05	0	0%	
END OF HOLE				Drilling Contractor / Rig / Type: Apex Drilling / Fraste PL.G / Geobor-S										



Borehole Log

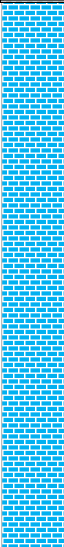
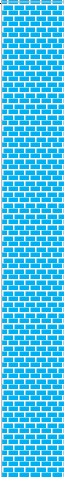



Site:	St George's Barracks	B/h no:	SGB17 / 03
Logged by:	Simon McCurdy	Date Drilled:	04/12/2017
Coordinates:	495179, 305011	Collar Elevation:	97.442

Depth from	Depth to	Length	Rock description	graphic log	Indicative Agg Quality	Elevation from	Elevation To	Solid Core Recovery			RQD		Sampled for analysis	
								Core Length	Core Recovered	SCR	Core Length	Core >100mm		RQD
0.00	1.20	1.20	No recovery - soils / ob Driller's log entry: 0.0 - 0.2 Topsoil 0.2 - 0.4 Clay 0.4 - 1.2 Broken Limestone & Clay			97.44	96.24	1.20	0.00	0%	1.20	0	0%	
1.20	1.45	0.25	Weak, plastic, red brown clay, with fragments (up to 5cm) of orange buff, coarse oolitic limestone.			96.24	95.99	0.25	0.00	0%	0.25	0	0%	
1.45	2.90	1.45	Strong, well cemented, pale orange buff, coarse oolitic limestone. Heavily fractured. Minor shell content, slight iron staining on fracture surfaces.		GOOD	95.99	94.54	1.45	1.45	100%	1.45	0.24	17%	Sample 5: 1.7 - 3.5m
2.90	3.50	0.60	Moderately strong to strong, well cemented, pale buff, medium biomicrite limestone. Well fractured, cobbly to gravelly return. Minor clay infill on fractures.		MOD	94.54	93.94	0.60	0.40	67%	0.60	0.15	25%	
3.50	5.40	1.90	Strong, well cemented, pale grey to buff, micritic limestone, becoming oolitic from 4.7m. Fractured, rubbly return. Slight black, dendritic speckling throughout, and minor iron staining on fracture surfaces. Stiff grey / brown clay present infilling subvertical fracture, and also infilling subhorizontal fracture at 5.3 - 5.4m.		GOOD	93.94	92.04	1.90	1.70	89%	1.90	0.4	21%	Sample 6: 3.5 - 6.2m
5.40	5.80	0.40	No recovery - suspected loss due to clay at 5.4m			92.04	91.64	0.40		0%	0.40		0%	
5.80	9.20	3.40	Moderately strong to strong, well cemented, orange buff, coarse oolitic limestone. Minor iron staining and black speckling on fracture surfaces. Stiff grey / brown clay present infilling subvertical fracture at 8.0m.		GOOD	91.64	88.24	3.40	3.20	94%	3.40	2.28	67%	Sample 7: 6.5 - 9.2m



Borehole Log




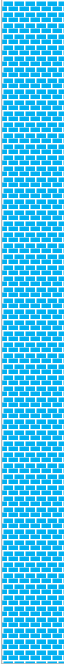
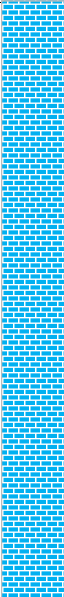
Site:	St George's Barracks	B/h no:	SGB17 / 03
Logged by:	Simon McCurdy	Date Drilled:	04/12/2017
Coordinates:	495179, 305011	Collar Elevation:	97.442

Depth from	Depth to	Length	Rock description	graphic log	Indicative Agg Quality	Elevation from	Elevation To	Solid Core Recovery			RQD		Sampled for analysis	
								Core Length	Core Recovered	SCR	Core Length	Core >100mm		RQD
9.20	12.40	3.20	Moderately strong to strong, pale grey / buff, fine to medium grained biomicrite limestone. Considerable black speckling on fracture surfaces, with minor iron staining throughout. Rubbly return.		GOOD	88.24	85.04	3.20	2.80	88%	3.20	1.78	56%	Sample 8: 9.2 - 12.4m
12.40	15.20	2.80	Moderately strong to strong, pale grey / buff, fine oomicrite limestone, with minor silty bands. Minor shelly fragments throughout. Occasional calcified fractures. Minor black speckling on joint surfaces. Stiff, grey brown, slightly gravelly, silty clay infilling fractures 12.8m and 13.1m. Suspected loss of recovery (1.2m) at 13.1m.		GOOD	85.04	82.24	2.80	1.76	63%	2.80	1.5	54%	
15.20	16.00	0.80	Stiff, grey / brown clay, with occasional fragment of siltstone / ironstone. Increasing amount of black, organic content towards base.			82.24	81.44	0.80	0.00	0%	0.80	0	0%	Sample 9: 12.4 - 15.2m
16.00	16.50	0.50	Weak, orange brown, silty ironstone with high organic content.			81.44	80.94	0.50	0.00	0%	0.50	0	0%	
16.50	16.70	0.20	Weak, fissile, black / dark grey mudstone. High organic content with strong sulphurous smell.			80.94	80.74	0.20	0.00	0%	0.20	0	0%	
END OF HOLE				Drilling Contractor / Rig / Type: Apex Drilling / Fraste PL.G / Geobor-S										



Borehole Log

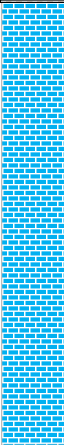


Site:	St George's Barracks	B/h no:	SGB17 / 04
Logged by:	Simon McCurdy	Date Drilled:	05/12/2017
Coordinates:	494784, 304840	Collar Elevation:	102.822

Depth from	Depth to	Length	Rock description	graphic log	Indicative Agg Quality	Elevation from	Elevation To	Solid Core Recovery			RQD		Sampled for analysis	
								Core Length	Core Recovered	SCR	Core Length	Core >100mm		RQD
0.00	1.00	1.00	No recovery - soils / ob Driller's log entry: 0.0 - 0.5 Clay 0.5 - 1.0 Broken Limestone & Clay			102.82	101.82	1.00	0.00	0%	1.00	0	0%	
1.00	1.20	0.20	Stiff, red brown clay.			101.82	101.62	0.20	0.00	0%	0.20	0	0%	
1.20	1.70	0.50	Moderately strong, well cemented, buff, fine to medium grained oomicrite limestone. Weathered and fractured, with clayey, gravelly return.		MOD	101.62	101.12	0.50	0.20	40%	0.50	0	0%	
1.70	5.60	3.90	Moderately strong to strong, well cemented, orange buff, coarse grained biomicrite limestone. Occasional small voids c.1cm, some calcified. Minor iron staining on fracture surfaces.		GOOD	101.12	97.22	3.90	3.90	100%	3.90	2.14	55%	Sample 31: 1.7 - 4.7m
5.60	9.10	3.50	Strong to very strong, well cemented, buff, fine biomicrite limestone. Occasional visible shelly fragments. Minor black speckling in places on fracture surfaces.		GOOD	97.22	93.72	3.50	3.40	97%	3.50	2.17	62%	Sample 33: 7.7 - 11.7m



Borehole Log

Site:	St George's Barracks	B/h no:	SGB17 / 04
Logged by:	Simon McCurdy	Date Drilled:	05/12/2017
Coordinates:	494784, 304840	Collar Elevation:	102.822

Depth from	Depth to	Length	Rock description	graphic log	Indicative Agg Quality	Elevation from	Elevation To	Solid Core Recovery			RQD		Sampled for analysis	
								Core Length	Core Recovered	SCR	Core Length	Core >100mm		RQD
9.10	11.70	2.60	Strong to very strong, well cemented, buff / pinkish buff, fine biomicrite limestone, with occasional silty horizons. Visible shelly fragments throughout.		GOOD	93.72	91.12	2.60	2.60	100%	2.60	2.3	88%	Sample 32: 4.7 - 7.7m
11.70	12.20	0.50	Weak, orange brown, clayey, siltstone.			91.12	90.62	0.50	0.00	0%	0.50	0	0%	
12.20	15.20	3.00	Moderately weak, orange brown, silty ironstone with many voids.			90.62	87.62	3.00	0.00	0%	3.00	0	0%	
END OF HOLE				Drilling Contractor / Rig / Type: Apex Drilling / Fraste PL.G / Geobor-S										



Borehole Log

Site:	St George's Barracks	B/h no:	SGB17 / 05
Logged by:	Simon McCurdy	Date Drilled:	06/12/2017
Coordinates:	494275, 304683	Collar Elevation:	104.712

Depth from	Depth to	Length	Rock description	graphic log	Indicative Agg Quality	Elevation from	Elevation To	Solid Core Recovery			RQD		Sampled for analysis	
								Core Length	Core Recovered	SCR	Core Length	Core >100mm		RQD
0.00	1.00	1.00	No recovery - soils / ob Driller's log entry: 0.0 - 0.5 Clay 0.5 - 1.0 Broken Limestone			104.71	103.71	1.00	0.00	0%	1.00	0	0%	
1.00	1.30	0.30	Stiff, orange brown, slightly sandy clay.			103.71	103.41	0.30	0.00	0%	0.30	0	0%	
1.30	1.70	0.40	Moderately strong, well cemented, pale grey, fine grained oomicrite limestone. Occasional shell fragments. Fractured, rubbly return.		MOD	103.41	103.01	1.60	0.40	25%	0.40	0	0%	
1.70	3.20	1.50	Moderately strong, well cemented, pale buff, fine grained oomicrite limestone. Occasional shell fragments. Very occasional black speckling on fracture surfaces. Heavily fractured.		MOD	103.01	101.51	1.50	2.90	193%	1.50	0.36	24%	Sample 22: 1.7 - 3.5m
3.20	6.20	3.00	Strong, well cemented, pale grey to pinkish buff, fine to medium biomicrite limestone. Black, dendritic speckling and minor iron staining on fracture surfaces. Clay feature with associated loss of recovery from 3.45 to 4.8m.		GOOD	101.51	98.51	3.00	2.18	73%	3.00	1.75	58%	Sample 23: 3.5 - 6.2m
6.20	7.70	1.50	No recovery Driller's log entry: 6.2 - 6.3 Limestone 6.3 - 7.7 Sand			98.51	97.01	1.50	0.00	0%	1.50	0	0%	



Borehole Log




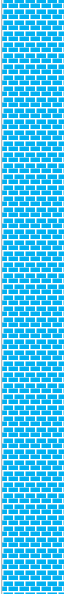
Site:	St George's Barracks	B/h no:	SGB17 / 05
Logged by:	Simon McCurdy	Date Drilled:	06/12/2017
Coordinates:	494275, 304683	Collar Elevation:	104.712

Depth from	Depth to	Length	Rock description	graphic log	Indicative Agg Quality	Elevation from	Elevation To	Solid Core Recovery			RQD		Sampled for analysis	
								Core Length	Core Recovered	SCR	Core Length	Core >100mm		RQD
7.70	10.70	3.00	Weak, orange brown, siltstone passing into ironstone with many voids.			97.01	94.01	3.00	0.00	0%	3.00	0	0%	
			END OF HOLE	Drilling Contractor / Rig / Type: Apex Drilling / Fraste PL.G / Geobor-S										



Borehole Log

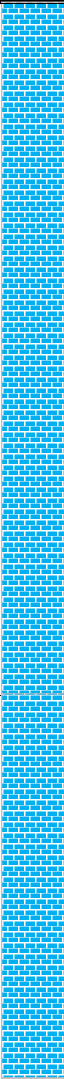
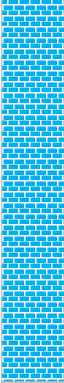


Site:	St George's Barracks	B/h no:	SGB17 / 06
Logged by:	Simon McCurdy	Date Drilled:	06/12/2017
Coordinates:	494667, 304475	Collar Elevation:	103.305

Depth from	Depth to	Length	Rock description	graphic log	Indicative Agg Quality	Elevation from	Elevation To	Solid Core Recovery			RQD		Sampled for analysis	
								Core Length	Core Recovered	SCR	Core Length	Core >100mm		RQD
0.00	0.70	0.70	No recovery - soils / ob Driller's log entry: 0.0 - 0.4 Clay 0.4 - 0.7 Broken Limestone			103.31	102.61	0.70	0.00	0%	0.70	0	0%	Sample 27: 1.7 - 4.7m
0.70	1.70	1.00	Moderately strong, well cemented, buff, coarse oolitic limestone. Weatered and fractured, with rubbly return. Minor iron staining on fracture surfaces.		MOD	102.61	101.61	1.00	0.80	80%	1.00	0	0%	
1.70	2.45	0.75	Moderately strong, well cemented, grey brown, fine grained oomicrite limestone. Occasional shell fragments throughout, and black speckling on fracture surfaces. Grey brown clay infill on fractures.		MOD	101.61	100.86	0.75	0.75	100%	0.75	0	0%	
2.45	7.45	5.00	Moderately strong to strong, well cemented, buff / orange, coarse oolitic limestone. Shelly fragments throughout. Black speckling and minor iron staining on fracture surfaces. Occasional dissolution voids, some of which are recalcified.		GOOD	100.86	95.86	5.00	4.65	93%	5.00	3.37	67%	



Borehole Log

Site:	St George's Barracks	B/h no:	SGB17 / 06
Logged by:	Simon McCurdy	Date Drilled:	06/12/2017
Coordinates:	494667, 304475	Collar Elevation:	103.305

Depth from	Depth to	Length	Rock description	graphic log	Indicative Agg Quality	Elevation from	Elevation To	Solid Core Recovery			RQD		Sampled for analysis	
								Core Length	Core Recovered	SCR	Core Length	Core >100mm		RQD
7.45	11.50	4.05	Strong to very strong, well cemented, buff / grey brown, fine oomicrite limestone. Occasional shell fragments. Minor silty horizons and occasional small siltstone bands. Very strong, coarsely recrystallised band (0.2m thick) at 10.9m.		GOOD	95.86	91.81	4.05	3.90	96%	4.05	2.94	73%	Sample 29: 7.7 - 12.0m
11.50	13.75	2.25	Strong to very strong, well cemented, pale pinkish grey / buff, fine oomicrite limestone, becoming dark grey towards base. Occasional shelly band.		GOOD	91.81	89.56	2.25	1.85	82%	2.25	1.28	57%	
13.75	15.10	1.35	Weak, orange brown, fine to medium silty sandstone, with small iron nodules and associated iron staining. Most of sample lost.			89.56	88.21	1.35	0.00	0%	1.35	0	0%	
15.10	16.50	1.40	Weak, orange brown, fine to medium silty, sandstone / ironstone with high proportion of ironstone nodules and voids.			88.21	86.81	1.40	0.00	0%	1.40	0	0%	
END OF HOLE				Drilling Contractor / Rig / Type: Apex Drilling / Fraste PL.G / Geobor-S										



Borehole Log

Site:	St George's Barracks	B/h no:	SGB17 / 07
Logged by:	Simon McCurdy	Date Drilled:	13/12/2017
Coordinates:	495231, 304722	Collar Elevation:	97.695

Depth from	Depth to	Length	Rock description	graphic log	Indicative Agg Quality	Elevation from	Elevation To	Solid Core Recovery			RQD		Sampled for analysis	
								Core Length	Core Recovered	SCR	Core Length	Core >100mm		RQD
0.00	0.50	0.50	No recovery - soils / ob Driller's log entry: 0.0 - 0.5 Clay			97.70	97.20	0.50	0.00	0%	0.50	0	0%	
0.50	1.20	0.70	Stiff, plastic, brown glacial clay.			97.20	96.50	0.70	0.00	0%	0.70	0	0%	
1.20	1.80	0.60	Moderately weak, highly weathered, orange brown, coarse oolitic limestone. Numerous shell fragments. Slightly clayey on fracture surfaces. Heavily fractured, rubbly return.		POOR	96.50	95.90	0.60	0.60	100%	0.60	0.12	20%	
1.80	6.30	4.50	Moderately strong to strong, orange to pinkish buff, coarse oolitic limestone. Occasional shell fragments. Iron stained bands, and staining on fracture surfaces. Occasional black speckling on some fractures. Heavily fractured, rubbly from 1.8 - 5.1m.		GOOD	95.90	91.40	4.50	4.30	96%	4.50	2.03	45%	Sample 17: 2.0 - 5.0m
6.30	8.40	2.10	Strong, well cemented, pale grey, fine oomicrite limestone. Shell fragments throughout. Black speckling and minor iron staining on fracture surfaces.		GOOD	91.40	89.30	2.10	2.10	100%	2.10	1.7	81%	Sample 18: 5.0 - 8.0m



Borehole Log


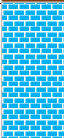
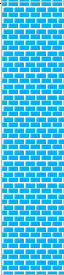

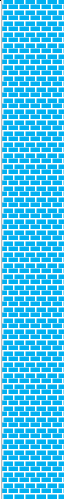
Site:	St George's Barracks	B/h no:	SGB17 / 07
Logged by:	Simon McCurdy	Date Drilled:	13/12/2017
Coordinates:	495231, 304722	Collar Elevation:	97.695

Depth from	Depth to	Length	Rock description	graphic log	Indicative Agg Quality	Elevation from	Elevation To	Solid Core Recovery			RQD		Sampled for analysis	
								Core Length	Core Recovered	SCR	Core Length	Core >100mm		RQD
8.40	12.20	3.80	Strong, well cemented, pale buff, medium oomicrite limestone. Shelly fragments throughout. Small dissolution voids and occasional calcified fractures. Heavy black speckling on fracture surfaces.		GOOD	89.30	85.50	3.80	3.15	83%	3.80	2.73	72%	Sample 19: 8.0 - 11.0m
12.20	16.75	4.55	Strong, well cemented, brownish buff / pinkish grey, fine grained biomicrite limestone. Occasional soft, brown / buff siltstone band (up to 10cm). Slight black speckling on some fracture surfaces. Approximately 0.15m recovery lost somewhere in this section.		GOOD	85.50	80.95	4.55	4.25	93%	4.55	2.96	65%	
16.75	17.00	0.25	Strong to very strong, dark grey, fine grained oomicrite limestone.		GOOD	80.95	80.70	0.25	0.25	100%	0.25	0.25	100%	Sample 21: 14.0 - 18.0m
17.00	17.60	0.60	Strong, well cemented, brownish buff / pinkish grey, fine grained biomicrite limestone. Occasional soft, brown / buff siltstone band (up to 10cm). Slight black speckling on some fracture surfaces.		GOOD	80.70	80.10	0.60	0.60	100%	0.60	0.3	50%	
17.60	18.00	0.40	Strong to very strong, dark grey, fine grained oomicrite limestone.		GOOD	80.10	79.70	0.40	0.40	100%	0.40	0.21	53%	
18.00	18.50	0.50	No recovery. Driller's log entry: 18.1 - 18.5 Sand			79.70	79.20	0.50	0.00	0%	0.50	0	0%	
18.50	19.10	0.60	Weak, orange, orange brown and grey bands of clay, siltstone and sandstone. Transitioning into orange and brown ironstone towards base.			79.20	78.60	0.60	0.00	0%	0.60	0	0%	
END OF HOLE				Drilling Contractor / Rig / Type: Apex Drilling / Fraste PL.G / Geobor-S										



Borehole Log

Site:	St George's Barracks	B/h no:	SGB17 / 08
Logged by:	Simon McCurdy	Date Drilled:	11/12/2017
Coordinates:	495193, 304373	Collar Elevation:	93.233

Depth from	Depth to	Length	Rock description	graphic log	Indicative Agg Quality	Elevation from	Elevation To	Solid Core Recovery			RQD		Sampled for analysis	
								Core Length	Core Recovered	SCR	Core Length	Core >100mm		RQD
0.00	0.70	0.70	No recovery - soils / ob Driller's log entry: 0.0 - 0.4 Clay 0.4 - 0.7 Broken Limestone			93.23	92.53	0.70	0.00	0%	0.70	0	0%	Sample 10: 1.7 - 4.7m
0.70	1.50	0.80	Moderately strong, well cemented, pale grey, coarse oolitic limestone. Well fractured, cobbly to gravelly return. Minor brown, plastic clay coating on fractures.		MOD	92.53	91.73	0.80	0.30	38%	0.80	0.1	13%	
1.50	3.20	1.70	Moderately strong, well cemented, pale grey / buff, coarse oolitic limestone. Minor iron staining. Well fractured with rubbly recovery, with pale brown, silty clay infill of some fractures.		GOOD	91.73	90.03	1.60	1.45	91%	1.70	0.31	18%	
3.20	4.80	1.60	Strong, well cemented, pale grey / buff, medium oomicrite limestone. Minor black speckling and iron staining on fracture surfaces. Occasional shell fragments. Well fractured, cobbly return. Very minor clay infill on fractures.		MOD	90.03	88.43	1.60	1.60	100%	1.60	0.66	41%	
4.80	9.40	4.60	Strong, well cemented, pale grey to buff, fine to medium biomicrite limestone, with slightly coarser oolitic bands. Slight black, dendritic speckling throughout, and minor iron staining on fracture surfaces. Becomes silty towards base from 8.5m.		GOOD	88.43	83.83	4.60	4.60	100%	4.60	3.88	84%	



Borehole Log

Site:	St George's Barracks	B/h no:	SGB17 / 08
Logged by:	Simon McCurdy	Date Drilled:	11/12/2017
Coordinates:	495193, 304373	Collar Elevation:	93.233

Depth from	Depth to	Length	Rock description	graphic log	Indicative Agg Quality	Elevation from	Elevation To	Solid Core Recovery			RQD		Sampled for analysis		
								Core Length	Core Recovered	SCR	Core Length	Core >100mm		RQD	
9.40	12.35	2.95	Strong, well cemented, pinkish buff, medium to fine oomicrite limestone with occasional shelly horizons and slightly silty bands. Shelly fragments throughout. Minor iron staining on fracture surfaces.		GOOD	83.83	80.88	2.95	2.83	96%	2.95	2.06	70%	Sample 12: 7.7 - 12.2m	
12.35	13.85	1.50	Interbedded pale grey, medium oomicrite limestone and orange brown / grey brown siltstone bands. Slight black speckling on fracture surfaces.		POOR	80.88	79.38	1.50	1.40	93%	1.50	1.18	79%		Sample 13: 12.4 - 15.2m
13.85	15.20	1.35	Strong, pale to dark grey, fine biomicrite limestone. Occasional black speckling. Some loss of recovery, suspected to be at c.14.85 (Driller's log entry: 15.0 - 15.2m Sand)		GOOD	79.38	78.03	1.35	1.00	74%	1.35	0.86	64%		
15.20	17.15	1.95	No recovery Driller's log entry: 15.2 - 17.0 Sand			78.03	76.08	1.95	0.00	0%	1.95	0	0%	Sample 13: 12.4 - 15.2m	
17.15	17.50	0.35	Stiff, buff / orange grey clay and siltstone interbeds. Heavily iron stained.			76.08	75.73	0.35	0.00	0%	0.35	0	0%		
17.50	19.20	1.70	Moderately weak, orange brown, silty ironstone with many voids.			75.73	74.03	1.70	0.00	0%	1.70	0	0%		
END OF HOLE				Drilling Contractor / Rig / Type: Apex Drilling / Fraste PL.G / Geobor-S											



Borehole Log

Site:	St George's Barracks	B/h no:	SGB17 / 09
Logged by:	Simon McCurdy	Date Drilled:	08/12/2017
Coordinates:	494819, 304104	Collar Elevation:	97.238

Depth from	Depth to	Length	Rock description	graphic log	Indicative Agg Quality	Elevation from	Elevation To	Solid Core Recovery			RQD		Sampled for analysis	
								Core Length	Core Recovered	SCR	Core Length	Core >100mm		RQD
0.00	0.70	0.70	No recovery - soils / ob Driller's log entry: 0.0 - 0.4 Clay 0.4 - 0.7 Broken Limestone			97.24	96.54	0.70	0.00	0%	0.70	0	0%	Sample 1: 1.0 - 4.0m
0.70	1.00	0.30	Moderately strong, well cemented, buff / orange brown, very clayey, slightly sandy, coarse oolitic limestone. Heavily fractured, recovered as gravel.		MOD	96.54	96.24	0.30	0.30	100%	0.30	0	0%	
1.00	3.10	2.10	Strong, well cemented, buff / brown, coarse oolitic limestone. Very minor clay on horizontal partings towards 3.1m.		GOOD	96.24	94.14	2.10	2.20	105%	2.10	0.31	15%	
3.10	4.00	0.90	Strong, well cemented, pale buff / brown, fine oolitic limestone with increasing clay towards base. Fractured, cobbly return. Clay band at 3.0m with suspected associated loss of recovery of c.0.3m.		GOOD	94.14	93.24	0.90	0.50	56%	0.90	0	0%	
4.00	5.10	1.10	Moderately strong to strong, well cemented, grey to buff, fine oomicrite limestone. Minor black, dendritic speckling and iron staining on fracture surfaces.		GOOD	93.24	92.14	1.10	0.90	82%	1.10	0.9	82%	
5.10	6.60	1.50	Strong, well cemented, pale buff to brownish buff, coarse biomicrite limestone.		GOOD	92.14	90.64	1.50	1.50	100%	1.50	1.43	95%	
6.60	8.20	1.60	Very strong to strong, well cemented, pale buff / grey, medium grained biomicrite limestone. Many vugs of c.1cm, some calcified. Black speckling and minor iron staining on fracture surfaces.		GOOD	90.64	89.04	1.60	1.60	100%	1.60	1.43	89%	
8.20	8.30	0.10	Moderately strong, orange brown, sandy, silty limestone band, showing fining structure.		MOD	89.04	88.94	0.10	0.10	100%	0.10	0.1	100%	Sample 3: 7.0 - 9.0m



Borehole Log

Site:	St George's Barracks	B/h no:	SGB17 / 09
Logged by:	Simon McCurdy	Date Drilled:	08/12/2017
Coordinates:	494819, 304104	Collar Elevation:	97.238

Depth from	Depth to	Length	Rock description	graphic log	Indicative Agg Quality	Elevation from	Elevation To	Solid Core Recovery			RQD		Sampled for analysis	
								Core Length	Core Recovered	SCR	Core Length	Core >100mm		RQD
8.30	12.30	4.00	Moderately strong, buff to grey brown, medium grained oomicrite limestone. Bands of heavily fractured limestone returned as gravel, associated with brown, sandy clay. Stiff, buff / brown clayey silt band containing rounded limestone gravel, c.0.3m thick at 12.0m. Loss of recovery from suspected clay/sand washout.		GOOD	88.94	84.94	4.00	2.70	68%	4.00	1.25	31%	Sample 4: 11.0 - 15.0m
12.30	14.15	1.85	Very strong to strong, pale buff / grey, fine to medium oomicrite limestone. Minor shell content throughout, with thin, distinctly shelly bands at 12.8m, 13.0m and 14.0m.		GOOD	84.94	83.09	1.85	0.20	11%	1.85	0	0%	
14.15	14.35	0.20	Very strong, dark grey, fine micrite limestone.		GOOD	83.09	82.89	0.20	0.20	100%	0.20	0	0%	
14.35	14.50	0.15	Strong, pale buff / grey, fine to medium oomicrite limestone. Minor shell content.		GOOD	82.89	82.74	0.15	0.15	100%	0.15	0	0%	
14.50	16.50	2.00	No recovery Driller's log entry: 14.5 - 16.5 Sand			82.74	80.74	2.00	0.00	0%	2.00	0	0%	
16.50	16.90	0.40	Weak to very weak, orange brown silty, fine to medium sand with small fragments of stronger siltstone.			80.74	80.34	0.40	0.00	0%	0.40	0	0%	
16.90	18.00	1.10	Weak, orange brown, silty, fine to medium sandstone with high proportion of ironstone nodules and voids. Rubbly to base.			80.34	79.24	1.10	0.65	59%	1.10	0.25	23%	
END OF HOLE				Drilling Contractor / Rig / Type: Apex Drilling / Fraste PL.G / Geobor-S										



Borehole Log


Site:	St George's Barracks	B/h no:	SGB17 / 10
Logged by:	Simon McCurdy	Date Drilled:	07/12/2017
Coordinates:	494319, 304156	Collar Elevation:	104.995

Depth from	Depth to	Length	Rock description	graphic log	Indicative Agg Quality	Elevation from	Elevation To	Solid Core Recovery			RQD		Sampled for analysis	
								Core Length	Core Recovered	SCR	Core Length	Core >100mm		RQD
0.00	1.00	1.00	No recovery - soils / ob Driller's log entry: 0.0 - 0.4 Clay 0.4 - 1.0 Broken Limestone & Clay			105.00	104.00	1.00	0.00	0%	1.00	0	0%	
1.00	1.70	0.70	Moderately strong, well cemented, buff, fine to medium grained oomicrite limestone. Occasional shell fragments throughout. Heavily fractured, weathered, rubbly return. Minor iron staining. Brown, plastic clay on fractures.		MOD	104.00	103.30	0.70	0.50	71%	0.70	0	0%	Sample 24: 1.7 - 4.5m
1.70	3.10	1.40	Moderately strong, well cemented, buff, medium grained oolitic limestone. Well fractured. Minor calcification on some fractures.		GOOD	103.30	101.90	1.40	1.40	100%	1.40	0.61	44%	
3.10	8.65	5.55	Strong, well cemented, buff / pinkish grey, fine to medium grained oolitic limestone, with occasional coarse grained oolitic bands. Occasional shelly fragments throughout. Minor black speckling on fracture surfaces. Minor clay infilling on some fractures.		GOOD	101.90	96.35	5.55	5.20	94%	5.55	3.72	67%	Sample 25: 4.5 - 6.0m
8.65	9.40	0.75	Very strong, well cemented, mid grey, fine oomicrite limestone. Occasional shell fragments and iron staining. Possibly slightly silicified.		GOOD	96.35	95.60	0.75	0.70	93%	0.75	0.36	48%	Sample 26: 6.0 - 9.0m

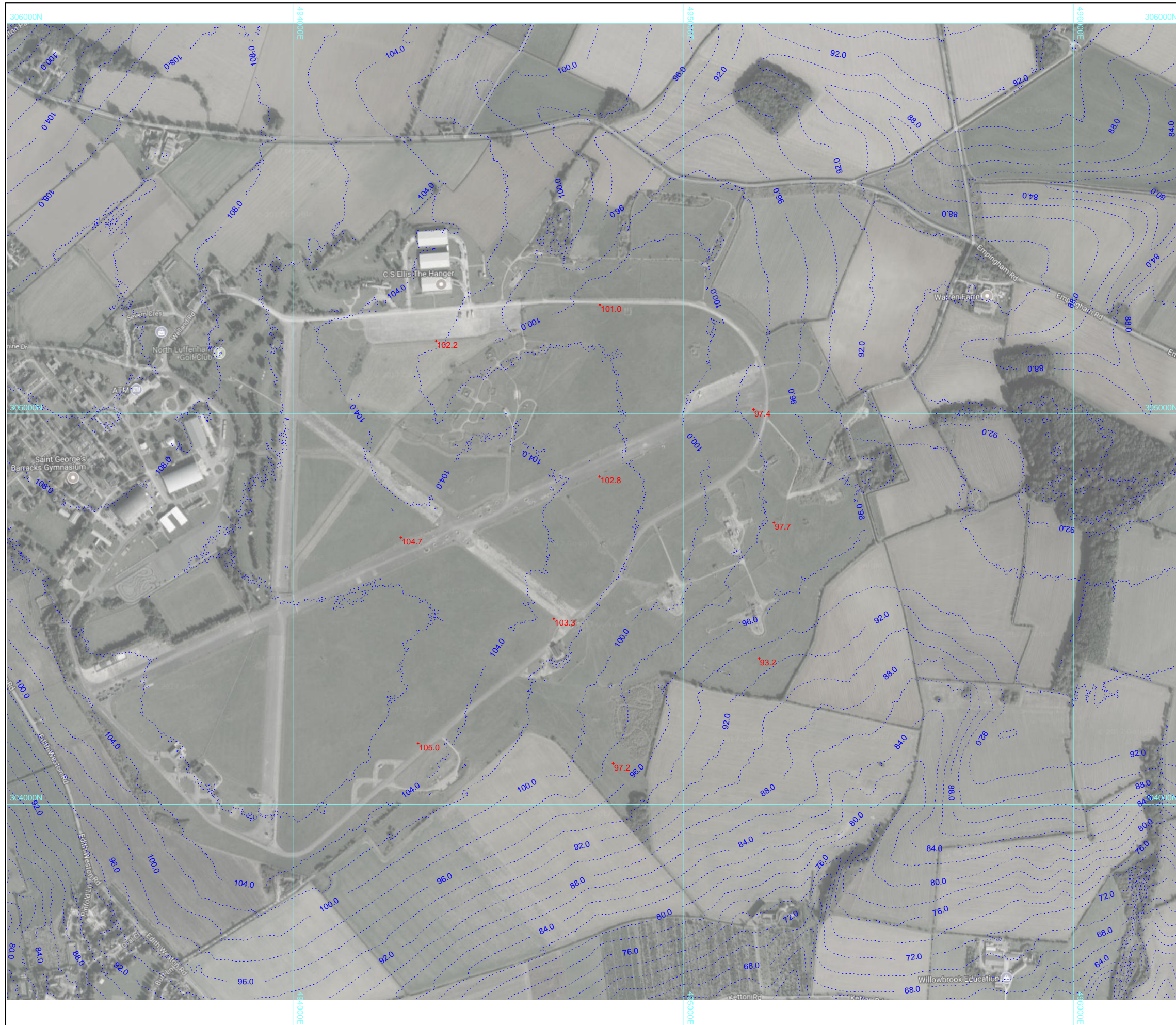


Borehole Log

Site:	St George's Barracks	B/h no:	SGB17 / 10
Logged by:	Simon McCurdy	Date Drilled:	07/12/2017
Coordinates:	494319, 304156	Collar Elevation:	104.995

Depth from	Depth to	Length	Rock description	graphic log	Indicative Agg Quality	Elevation from	Elevation To	Solid Core Recovery			RQD		Sampled for analysis		
								Core Length	Core Recovered	SCR	Core Length	Core >100mm		RQD	
9.40	12.00	2.60	No recovery - suspected clay and sand. Driller's log entry: 9.4 - 12.0 Sand			95.60	93.00	2.60	0.00	0%	2.60	0	0%		
12.00	13.50	1.50	Weak, orange brown, silty, fine to medium sandstone with high proportion of ironstone nodules and voids.			93.00	91.50	1.50	0.00	0%	1.50	0	0%		
END OF HOLE				Drilling Contractor / Rig / Type: Apex Drilling / Fraste PL.G / Geobor-S											

Appendix B – Drawings



Site Name:
St George's Barracks

Drawing Name:
**Site Topography
 from EA 2m LiDAR DTM**

Drawn By:
Simon McCurdy

Scale:
1 : 10000

Date:
17/01/2018

Drawing No:
EG-SGB-TS-0118





Site Name:
St George's Barracks

Drawing Name:
**Summary Geology Plan
 with limestone thickness isopachs**

Drawn By:
Simon McCurdy

Scale:
1 : 10000

Date:
11/01/2018

Drawing No.:
EG-SGB-SGC-0118



Appendix C – Core Photos (2017)



PH 11

Mr. Gumbel's
#12
Date

Mr. Gumbel's
#12
Date

Mr. Gumbel's
#12
Date

Mr. Gumbel's
#12
Date

BH 12

Field No. 12
Date 10/10/12
Loc. 12

Field No. 12
Date 10/10/12
Loc. 12

Field No. 12
Date 10/10/12
Loc. 12

Field No. 12
Date 10/10/12
Loc. 12



BH113

Soil Sample
Date: 7/20/11
Location: BH113

Soil Sample
Date: 7/20/11
Location: BH113

Soil Sample
Date: 7/20/11
Location: BH113

Soil Sample
Date: 7/20/11
Location: BH113





St. George's Bay
1. 100g
2. 100g
3. 100g
4. 100g
5. 100g
6. 100g
7. 100g
8. 100g
9. 100g
10. 100g

St. George's Bay
1. 100g
2. 100g
3. 100g
4. 100g
5. 100g
6. 100g
7. 100g
8. 100g
9. 100g
10. 100g

St. George's Bay
1. 100g
2. 100g
3. 100g
4. 100g
5. 100g
6. 100g
7. 100g
8. 100g
9. 100g
10. 100g

St. George's Bay
1. 100g
2. 100g
3. 100g
4. 100g
5. 100g
6. 100g
7. 100g
8. 100g
9. 100g
10. 100g







BH3/1

Sample 1
BH3/1
10/10/10

Sample 2
BH3/1
10/10/10

Sample 3
BH3/1
10/10/10

Sample 4
BH3/1
10/10/10

BH3/2

Stratigraphic Column
Box 4
BH3/2

Stratigraphic Column
Box 4
BH3/2

Stratigraphic Column
Box 4
BH3/2

BH313

Stratigraphic Column
BH313
1/17
1/17

Stratigraphic Column
BH313
1/17
1/17

Stratigraphic Column
BH313
1/17
1/17

Stratigraphic Column
BH313
1/17
1/17



BH3/4

FLORIAN'S BUSINESS
10-20-18
2018

FLORIAN'S BUSINESS
10-20-18
2018

FLORIAN'S BUSINESS
10-20-18
2018

FLORIAN'S BUSINESS
10-20-18
2018

BH 315

St. Lawrence, Ontario
Elev. 127m
Date 12/15

St. Lawrence, Ontario
Elev. 127m
Date 12/15

St. Lawrence, Ontario
Elev. 127m
Date 12/15

St. Lawrence, Ontario
Elev. 127m
Date 12/15

BH3/6

Soil Core
BH3/6
1/10/10

Soil Core
BH3/6
1/10/10

BH411

Stratigraphic Column
1.0m
Sample 2

Stratigraphic Column
1.0m
Sample 2

Stratigraphic Column
1.0m
Sample 2

Stratigraphic Column
1.0m
Sample 2





BH 4-12

Dr. K. S. Reddy
Cor. 10-10-10
2011/12 3

Dr. K. S. Reddy
Cor. 10-10-10
2011/12 3

Dr. K. S. Reddy
Cor. 10-10-10
2011/12 3

BH413

Dr. Robert E. Munn
6-20-10
Box 10

Dr. Robert E. Munn
6-20-10
Box 10

Dr. Robert E. Munn
6-20-10
Box 10

Dr. Robert E. Munn
6-20-10
Box 10



BH 4/4

W. L. ...
...

...

...

...





BH4-13

Soil Sample
Depth: 12 cm
Date: 10/10/10

Soil Sample
Depth: 15 cm
Date: 10/10/10

Soil Sample
Depth: 18 cm
Date: 10/10/10

Soil Sample
Depth: 21 cm
Date: 10/10/10

BH 5/1

Stratigraphic Column
1-2m
Jan 16

Stratigraphic Column
1-2m
Jan 16

Stratigraphic Column
1-2m
Jan 16

Stratigraphic Column
1-2m
Jan 16



BH512

Soil Sample
BH512
Depth: 0-10 cm
Date: 2018-05-10

Soil Sample
BH512
Depth: 10-20 cm
Date: 2018-05-10

Soil Sample
BH512
Depth: 20-30 cm
Date: 2018-05-10

Soil Sample
BH512
Depth: 30-40 cm
Date: 2018-05-10

BH515

Sample 6
6.2m - 7.7m

Sample 7
7.7m - 9.2m

Sample 8
9.2m - 10.7m

Sample 9
10.7m - 12.2m

Sample 10
12.2m - 13.7m



BH 6/11

Site: [unclear]
[unclear]
[unclear]

Site: [unclear]
[unclear]
[unclear]

Site: [unclear]
[unclear]
[unclear]

Site: [unclear]
[unclear]
[unclear]





BK612

St. Gabriel's Cemetery
Row 10, Grave 12
1876

St. Gabriel's Cemetery
Row 10, Grave 12
1876

St. Gabriel's Cemetery
Row 10, Grave 12
1876

St. Gabriel's Cemetery
Row 10, Grave 12
1876

BH 613

Dr. Galloway's Excavation
Excavation No. 1
Section No. 1

Dr. Galloway's Excavation
Excavation No. 1
Section No. 1

Dr. Galloway's Excavation
Excavation No. 1
Section No. 1

Dr. Galloway's Excavation
Excavation No. 1
Section No. 1

BH 6/4

St. James' Station
1720 10 Dec
BH 6/4

St. James' Station
1720 10 Dec
BH 6/4

St. James' Station
1720 10 Dec
BH 6/4

St. James' Station
1720 10 Dec
BH 6/4



BH 6/5

St. Catherine's Seamount
1952
10/20/52
10/20/52

St. Catherine's Seamount
Range 10/20/52
10/20/52

St. Catherine's Seamount
10/20/52
10/20/52

St. Catherine's Seamount
10/20/52
10/20/52

St. Catherine's Seamount
10/20/52
10/20/52

BH 7/1

St. Gabriel's Cemetery
Grave 2-100-1
July 19

St. Gabriel's Cemetery
Grave 2-100-1
July 19

St. Gabriel's Cemetery
Grave 2-100-1
July 19

St. Gabriel's Cemetery
Grave 2-100-1
July 19



BH712

Handwritten label on the left side of the top compartment.

Handwritten label on the right side of the top compartment.

Handwritten label on the left side of the bottom compartment.

Handwritten label on the right side of the bottom compartment.

BH 713

Sample 1
BH 713
Date: 10/10/10

Sample 2
BH 713
Date: 10/10/10

Sample 3
BH 713
Date: 10/10/10

Sample 4
BH 713
Date: 10/10/10



BH714

Excavation of the
Site of the
1970-71

The Excavation of the
Site of the
1970-71

Excavation of the
Site of the
1970-71

The Excavation of the
Site of the
1970-71

BH 715

Sample 1
BH 715
10/10/10

Sample 2
BH 715
10/10/10

Sample 3
BH 715
10/10/10

Sample 4
BH 715
10/10/10





B176

Handwritten label on the left side of the top row.

Handwritten label on the right side of the top row.

Handwritten label on the left side of the bottom row.

Handwritten label on the right side of the bottom row.



BH811

Dr. G. G. ...
...

Dr. G. G. ...
...

Dr. G. G. ...
...

Dr. G. G. ...
...



BH 8/2

Sample 1
BH 8/2
10/10

Sample 2
BH 8/2
10/10

Sample 3
BH 8/2
10/10

Sample 4
BH 8/2
10/10





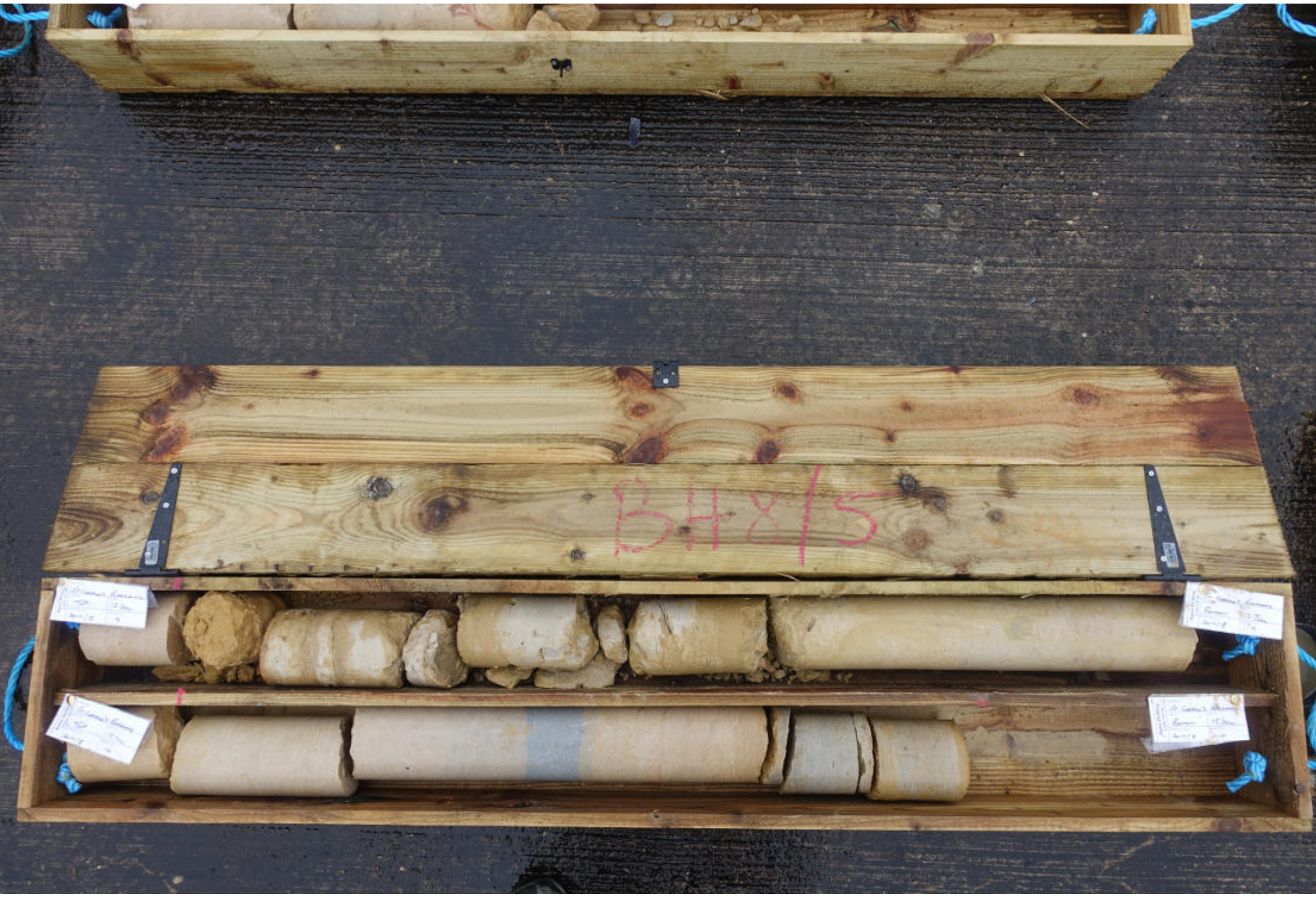
BH 8/5

Primary Contents
12.2m
BH 8/5

Primary Contents
12.2m
BH 8/5

Primary Contents
12.2m
BH 8/5

Primary Contents
12.2m
BH 8/5







BH9 / 1

Stratum 1
BH9 / 1
1

Stratum 1
BH9 / 1
1

Stratum 2
BH9 / 1
2

Stratum 2
BH9 / 1
2



BH9/2

Dr. G. J. ...
BH9/2
...

Dr. G. J. ...
BH9/2
...

Dr. G. J. ...
BH9/2
...

Dr. G. J. ...
BH9/2
...





BH 9/5

Streambed Sediment
100
100
100

Streambed Sediment
100
100
100

Streambed Sediment
100
100
100

Streambed Sediment
100
100
100



BH915

10.000000
10.000000
10.000000

10.000000
10.000000
10.000000

10.000000
10.000000
10.000000

10.000000
10.000000
10.000000



BH 916

Soil Sample
BH 916
Date: 10/10/16

Soil Sample
BH 916
Date: 10/10/16



BHODI

Dr. Sankar's Laboratory
Biodiversity
Date: / /

Dr. Sankar's Laboratory
Biodiversity
Date: / /

Dr. Sankar's Laboratory
Biodiversity
Date: / /

Dr. Sankar's Laboratory
Biodiversity
Date: / /

BH 10/2

St. Lawrence University
Geology Dept.
Box 100
Canton, NY 13618

St. Lawrence University
Geology Dept.
Box 100
Canton, NY 13618

St. Lawrence University
Geology Dept.
Box 100
Canton, NY 13618

St. Lawrence University
Geology Dept.
Box 100
Canton, NY 13618





FIELD

Soil Sample
Core
100m

Soil Sample
Core
100m

Soil Sample
Core
70m

Soil Sample
Core
70m

BH1014

10-10-14
BH1014
10-10-14

10-10-14
BH1014
10-10-14

10-10-14
BH1014
10-10-14

10-10-14
BH1014
10-10-14

10-10-14
BH1014
10-10-14