

Factual Site Investigation Report was received for Ground Investigation 1.

Summary of the report:

A total of five windowless sample holes were drilled in close proximity to the existing culvert passing beneath Boverton Road, several of which were located within the existing highway. Surface hard standing was cored with specialist diamond coring equipment, prior to drilling the borehole by a percussive method. In-situ CPT testing was undertaken at regular intervals within each windowless sample hole.

The boreholes were positioned in order to characterise the shallow ground conditions both upstream and downstream and either side of the existing culvert.

Variability in the ground conditions was noted at each windowless sample location. We have summarised the conditions local to each windowless location below.

WS1

This windowless sample hole was positioned within the existing highway on the western side of the bridge. A thin veneer of bituminous macadam (0.07m) was underlain by a mantle of compact, dark grey, coarse limestone gravel (sub base) to 0.4m depth below existing ground level.

This sub base was underlain by made ground deposits comprising loose, grey brown, slightly clayey, slightly silty, sandy gravel of angular and subangular micritic limestone and fragments of brick and ash with occasional cobbles of limestone. Uncorrected N values of between 6 and 10 indicate this deposit to be loose and poorly consolidated.

The made ground was proven to 3.0m depth below ground level and underlain by soft (uncorrected N value of 6) light brown and beige, slightly silty, slightly gravelly clay, which was proven to 3.5m depth. The windowless sample refused at 3.5m depth on either a cobble or boulder obstruction or suspected bedrock. The CPT test at 3.5m depth recorded an uncorrected N value of 50 blows for 95mm penetration.

WS2

This windowless sample hole was positioned at the junction of two roads. A veneer of bituminous macadam comprising two layers was identified. The upper layer comprised bitumen bound nominal 10mm aggregate of 0.07m thickness. The lower layer was 0.09m thick with bitumen bound fine, medium and coarse aggregate of up to 70mm in diameter.

This hard standing was underlain by a thin veneer of compact limestone gravel (sub base), proven to 0.4m below existing ground level. The sampling equipment refused on an obstruction or hard strata at 0.4m depth. No further progress was possible with the windowless sampler. A CPT test at the base of the hole recorded zero penetration for 50 blows.

WS3 and WS3A

These windowless sample holes were again drilled within the existing highway and positioned on the eastern side of the existing culvert. Surface bituminous macadam was cored at both locations and proven to be 0.1m thick and comprising of two separate 0.05m thick layers. Beneath this hard standing was a mantle of aggregate (sub base), which was proven to a depth of 0.25m below ground level.

An obstruction, most likely comprising an additional layer of bituminous macadam was recorded at the base of the aggregate layer. The corer was placed back in the windowless sample holes and attempts made to core this lower layer of bituminous macadam but the loose aggregate jammed the core barrel.

Both holes were abandoned after undertaking an in-situ CPT test which recorded zero penetration for 50 blows.

WS4

Windowless sample 4 was positioned just off the existing highway. A thin veneer of highly degraded bituminous macadam was underlain by a mantle of compact dark grey and brown angular gravel of concrete and brick to a depth of 0.6m below existing ground level.

This granular made ground was underlain by a thin layer of loose sand (between 0.6m to 0.8m), which was in turn underlain by soft to firm cohesive made ground described as dark grey and grey brown, slightly gravelly clay with fine, medium and coarse angular and subangular gravel of mudstone, brick, ash and concrete. The made ground was proven to a maximum depth of 1.8m below existing ground level.

The made ground was proven to be underlain by very soft beige and white clayey silt comprising either disturbed ground or a completely weathered limestone. This natural soil was proven to 3.0m depth, although it was sampled to 5.0m depth but no recovery was recorded.

In-situ CPT tests within this natural material ranged between 1 and 4, indicating it to comprise very poorly consolidated materials. Due to the poor recovery recorded, continuous

CPT testing was undertaken from 5.0m to 6.8m. Based on the uncorrected N values, these poor materials extended to 6.5m below ground level. Refusal of the continuous CPT occurred at 6.8m depth (50 blows for 210mm penetration), which may be indicative of the presence of bedrock strata.

Recommended Further Works

In order to delineate the extent of the soft and very soft ground identified during the initial fieldworks, it is recommended that a series of supplementary windowless sample boreholes are drilled in the vicinity of WS1 and ES4.

Additionally, it is recommended that a number of rotary cored boreholes are drilled to characterise the deeper ground conditions at location where it was not possible to penetrate the ground during the initial investigation works.