



Reference: 08052020Rep - New Hope Bridges 1 and 2(Sontinga Consulting)

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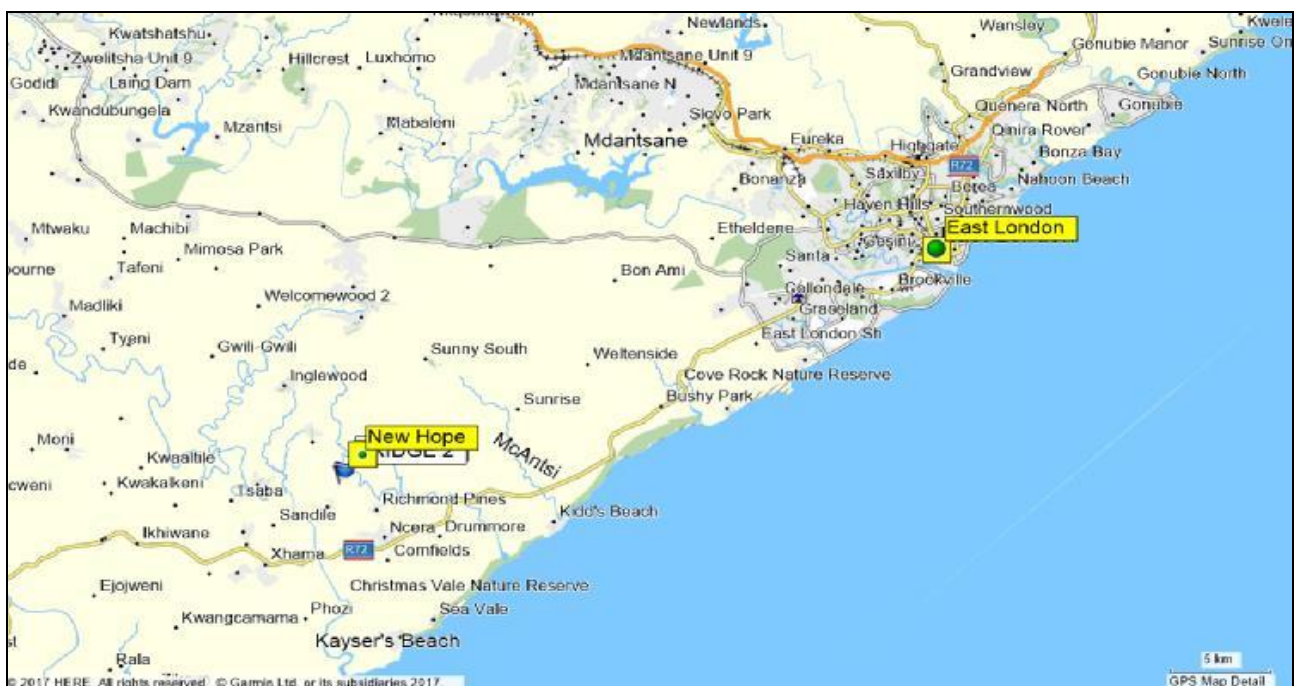
**ATTENTION: MR P KRUGER**

Dear Sir

## **NEW HOPE BRIDGES ONE AND TWO, EAST LONDON: BRIEF GEOTECHNICAL REPORT**

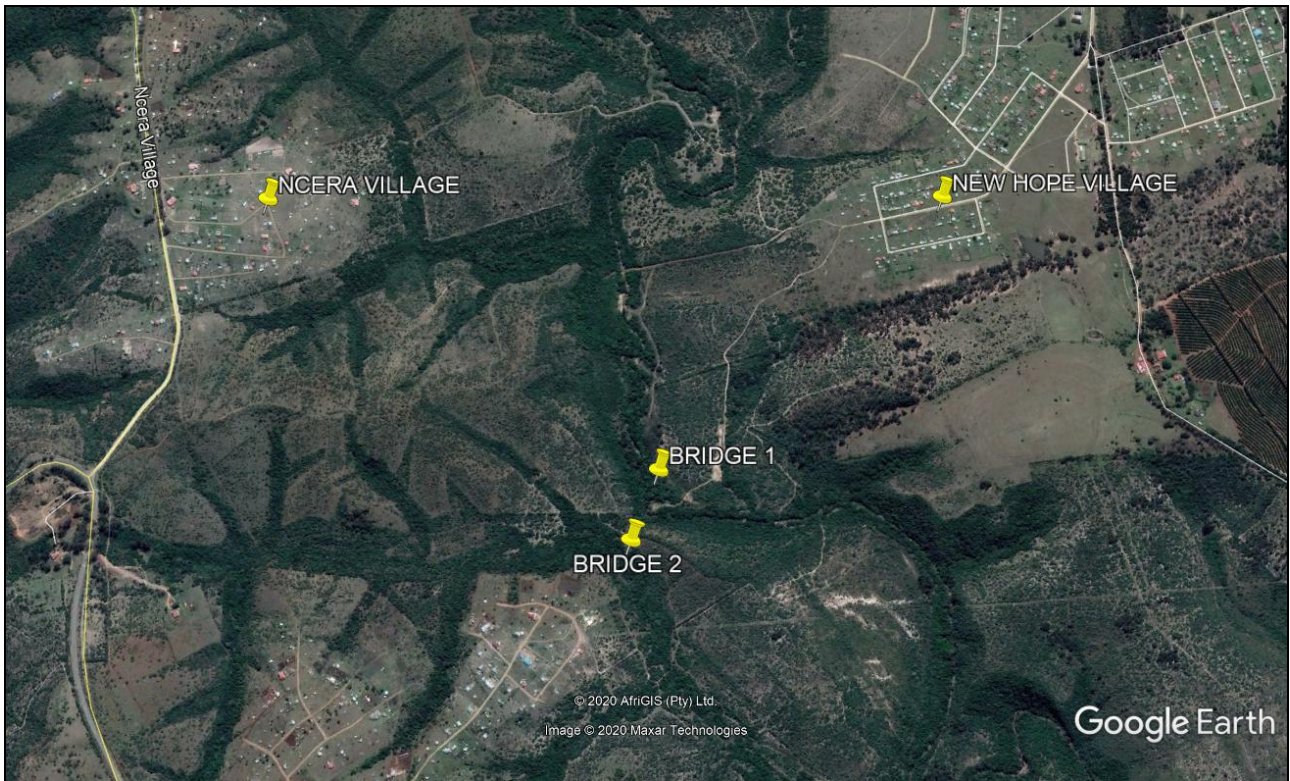
ControlLab was requested to do a geotechnical investigation on the above-mentioned project. The project consisted of two (2) river crossings and the investigation focused on determining the founding conditions. The bridges will give the community access from New Hope Village to the Ncera Village. Trial pits were excavated at the two (2) proposed positions and due to the limited access the trial pits were hand excavated. The trial pits were profiled by a qualified Engineering Technician utilising "The Revised Guide to Soil Profiling for Civil Engineering Purposes in Southern Africa" produced by Jennings, Brink and Williams. The trial pit profiles are attached to this document.

The bridge sites were situated approximately 32km west of East London, part of the Buffalo City Metropolitan Municipality within the Eastern Cape Province.

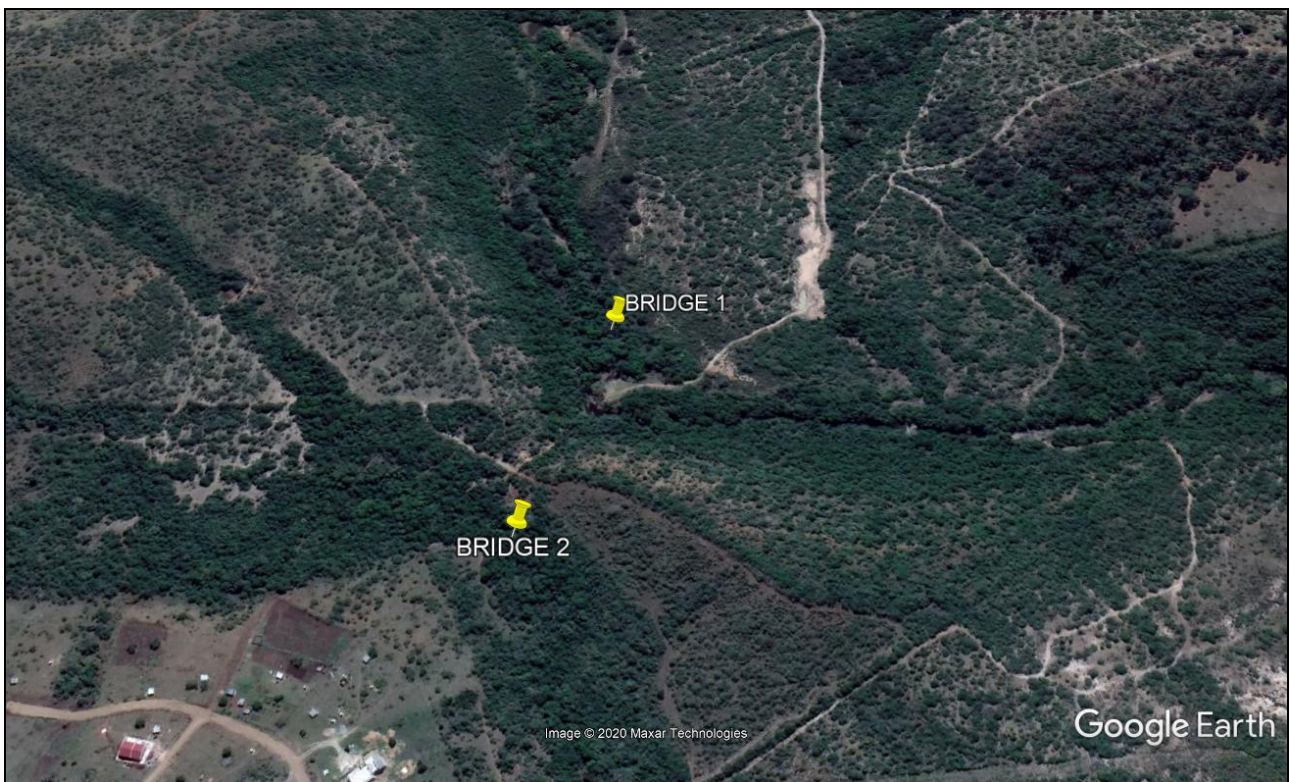


The co-ordinates for the two bridges were as follows:

- |            |               |               |
|------------|---------------|---------------|
| ➤ Bridge 1 | 33° 7'26.85"S | 27°34'49.30"E |
| ➤ Bridge 2 | 33° 7'32.90"S | 27°34'46.80"E |



Bridge Positions



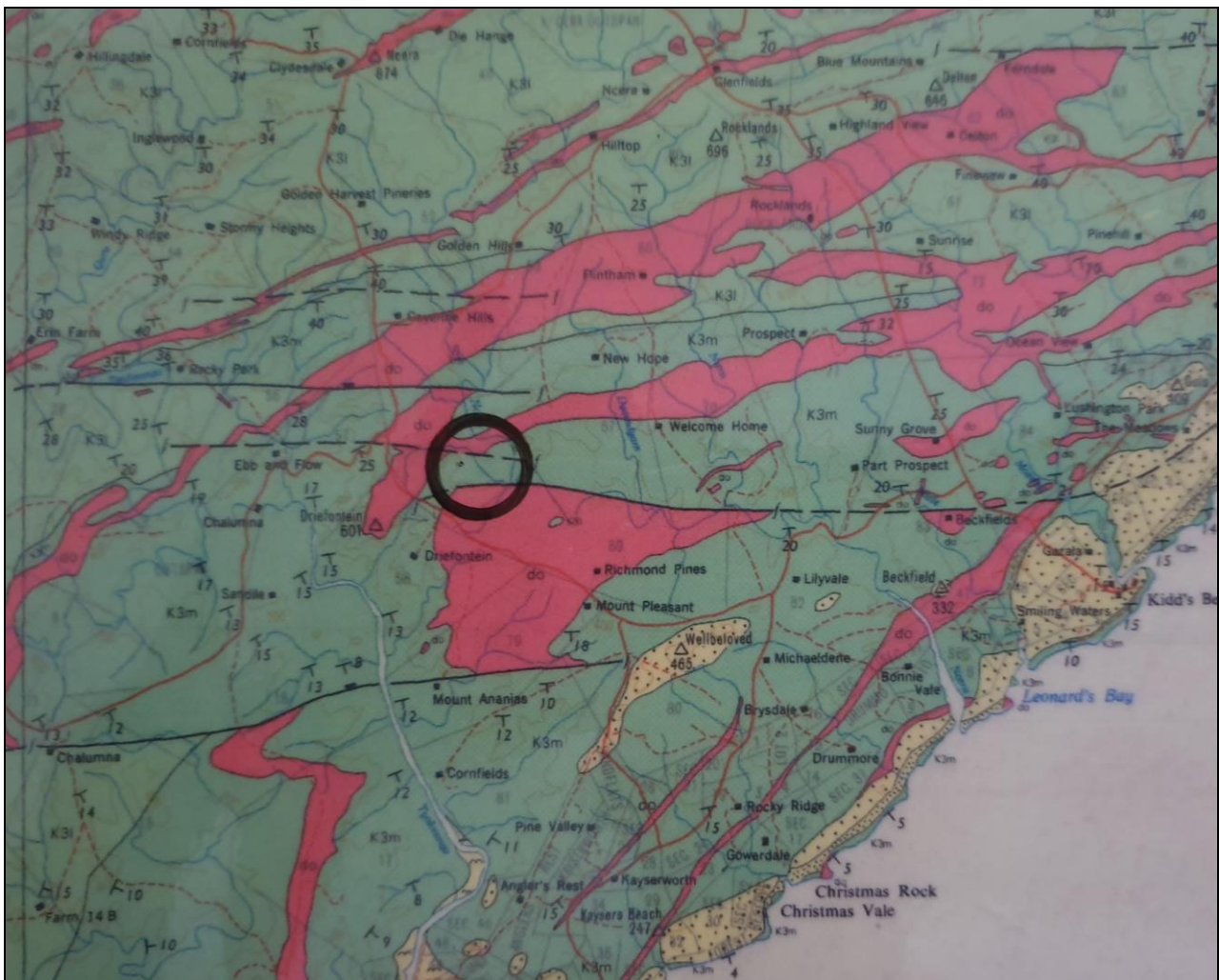
East London normally receives about 593mm of rain per year, with most rainfall occurring during summer. It receives the lowest rainfall (16mm) in July and the highest (79mm) in March. The monthly average midday temperatures for East London range from 20°C in July to 26°C in February. The region is the coldest during July when the temperature drops to 9.3°C on average during the night

The area investigated is situated on alternating layers of mudstone and sandstone, typical of the Balfour Formation belonging to the Adelaide Subgroup of the greater Karoo Supergroup.

The Balfour Formation consists of alternating layers of mudrock varying in colour from blue-grey to red-grey and sandstones, consisting of fine to medium grained particles which is classified as a lithofeldspathic sandstone. The sandstone is found to occur upon erosional surfaces of the mudstone which display a thin layer of mud pebble conglomerate above the erosional surface.

Overall the Balfour Subgroup is up to 2000m thick with the layers of mudstone ranging from 50m to 100m thick. The sandstone layers are notably thinner and have a maximum thickness of 60m and an average of 6m.

The mudstone and sandstone will weather under the dominant influence of chemical weathering as opposed to mechanical weathering due to the Wienerts climatic N number for the area being less than 2. This will result in clay and sandy material sourced from decomposed mudstone and sandstone respectively.



Faulting and/or deformation events are evident from the 1:250 000 geological map of Kidds Beach 3227B

Two (2) trial holes were excavated at the proposed site for bridge 1 and three (3) trial pits at the position of bridge 2 and the co-ordinates for the trial pits were as follows:

#### **Bridge 1**

➤ Trial Hole 1	S 33°07'26.9"	E 27°34'49.1"
➤ Trial Hole 2	S 33°07'26.7"	E 27°34'49.4"

#### **Bridge 2**

➤ Trial Hole 1	S 33°07'33.0"	E 27°34'46.9"
➤ Trial Hole 2	S 33°07'33.0"	E 27°34'47.1"
➤ Trial Hole 3	S 33°07'33.0"	E 27°34'47.2"

At bridge position 1, samples of the founding rock were taken for point load and UCS values. This was to determine the hardness of the founding material. At bridge position 2, the type of structure would probably have a raft foundation and the material properties of the founding material were determined (with the view to determine the risk with regards to erosion).

### **BRIEF INTERPRETATION OF THE TEST RESULTS**

- **Typical Horizons**

#### **Bridge 1**

The transported material varied in thickness between 600mm and 1100mm and varied between clayey sand and sandy silt. The residual material (rock) consisted of sandstone.

Excavation refusals were recorded on the residual sandstone at 1100mm in TP1 and 900mm in TP2.

#### **Bridge 2**

Thick (1400mm) of imported clayey sand was profiled in TP2. The transported material varied between silty sand and silty clay.

The only residual material profiled was at TP1 and consisted of decomposed dolerite.

- **Road Indicators**

A total of five (5) samples were tested to determine the material properties. The grading modulus of the materials tested ranged between 1,6 and 2,0 indicating that the material was well graded.

The plasticity values of the material ranged between 4 (dec Dol) up to 11 (clayey sand) indicating that the material would have some resistance against erosion.

The TRH14 material classification of the material tested generally conformed to a G9/G8 quality indicating that the material could be considered as backfill to the wing walls of the structure. At Bridge 1, a hydrometer test was performed and the result indicated that the decomposed dolerite had a low risk of heave and therefore should be stable under the foundation.

- **DCP Results/Bearing Capacity**

The DCP tests were performed adjacent to the trial pit positions. At bridge position 1 the DCP penetration rate at TP1, within the transported clayey sand, indicated low estimated safe bearing pressures (in the order of 75kPa). Although this is low the founding at this structure will be on the residual sandstone bedrock. At TP2 at bridge position 1, there was no DCP test performed due to the number of boulders that prevented penetration.

The estimated safe bearing pressure determined at bridge position 2 was all in excess of 100kPa.

Note that the DCP penetration rate will change with any changes to the moisture content or density of the material tested

- **Rock Core Strength Results**

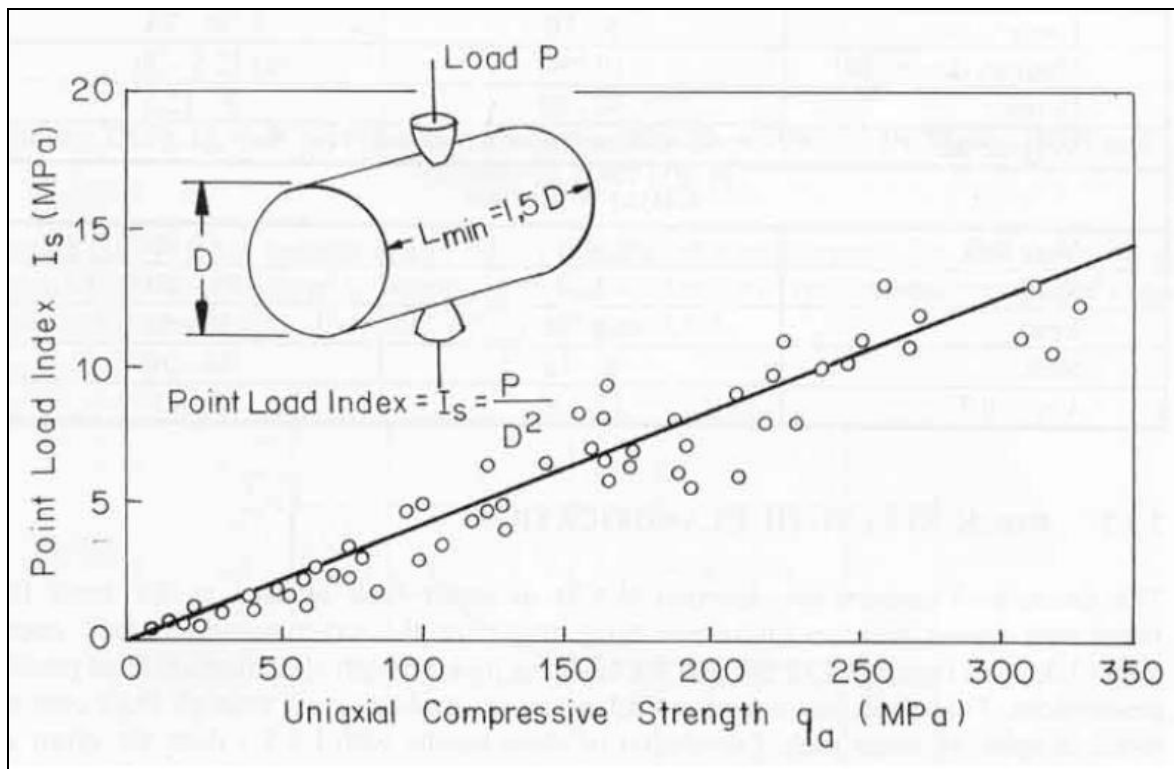
Rock cores were extracted from the two (2) trial pits at the proposed position of bridge structure 1. The rock samples were tested under point load as well as unconfined compressive strength tests. All the samples tested consisted of sandstone.

The results can be summarised as follows:

CORE DETAILS	STRENGTH UCS (MPa)	POINT LOAD STRENGTH INDICES
Centre of Crossing	110.8	12.40
LHS of Crossing	103.9	9.60
RHS of Crossing	101.0	8.00

The founding rock can be classified as very hard rock, both of UCS and point load values. The table below is out of the “A Guide to Practical Geotechnical Engineering in Southern Africa”.

Classification	Field Test	UCS (MPa)
Very soft rock	Can be peeled with a knife, material crumbles under firm blows with the sharp end of a geological pick	1 to 3
Soft rock	Can just be scraped with a knife, indentations of 2 to 4mm with firm blows of the pick point.	3 to 10
Medium hard rock	Cannot be scraped or peeled with a knife, hand held specimen breaks with firm blows of the pick point.	10 to 25
Hard rock		25 to 70
Very hard rock	Point load tests must be carried out in order to distinguish between these classifications. These results may be verified by unconfined compressive strength tests on selected samples.	70 to 200
Extremely hard rock		> 200



- **Ground Water/Dampness**

The trial pits were excavated at the proposed positions of the river crossings and the profiled indicated that material varied between moist and slightly moist. Although no water seepage was recorded it would be expected that water seepage would be present during the construction phase, especially if constructing during the rainy season.

Based on the materials investigation the site had minimal geotechnical constraints to be taken into account during the design of the structures. At bridge 1 the founding sandstone was in the order of 600mm to 1100mm below the ground level. The sandstone can be classified as very hard rock. At bridge position 2 there was no residual material that could be founded on. At this position the ESBP of the transported material as determined with the DCP was in the order of 100kPa. The laboratory tests indicated a low risk with regards to erosion of the material as the PI values ranged between 4 and 11.

Please note that the report does not offer a foundation design but assist in the interpretation of the test results.

Regards,

**DEON LOUW** Pr. Tech. Eng, MSc (Civil)  
MANAGING DIRECTORS