



UVOLT INVESTMENTS (PVT) LTD



**EPP-RFQ-REQ-ZIM-2021-023-Geotechnical and Topographical  
Investigation Services in Zimbabwe**

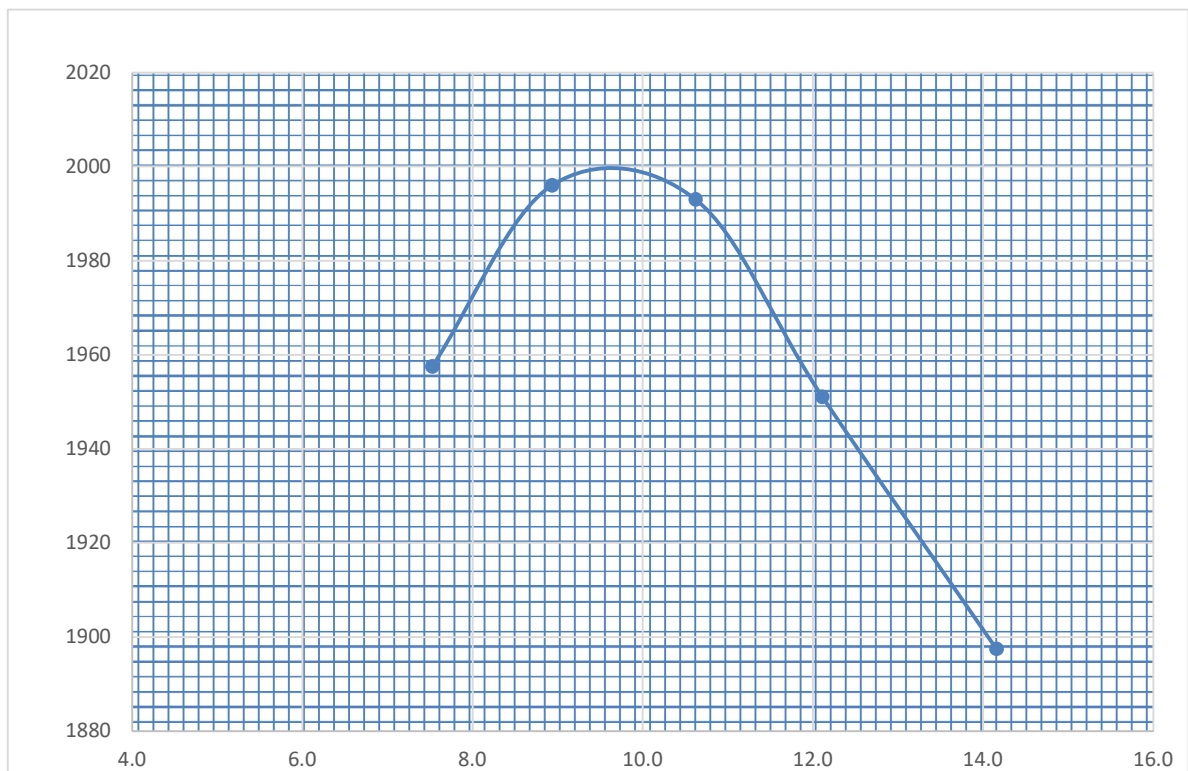
## 4.10 JOPA SAFE MARKET

### 4.10.1 METHODOLOGY

The proposed developments on this site are vertical structures. DCPT, Atterberg limits, CBR and many other tests were done on this site. Samples were collected for laboratory testing and results obtained were as follows.

### 4.10.2 COMPACTION TEST

|         |             |      |           |
|---------|-------------|------|-----------|
| PROJECT | UNOPS       | DATE | 17/6/2021 |
| SITE    | JOPA MARKET |      |           |
| SAMPLE  | QUARTZ + DG |      |           |



|                                   |      |       |       |       |      |
|-----------------------------------|------|-------|-------|-------|------|
| Mould No.                         | 2    | 2     | 2     | 2     | 2    |
| Mould Factor                      | 434  | 434   | 434   | 434   | 434  |
| Mass of Cylinder + wet sample (g) | 9855 | 10015 | 10085 | 10045 | 9996 |
| Mass of Cylinder                  | 5005 | 5005  | 5005  | 5005  | 5005 |
| Mass of wet sample (g)            | 4850 | 5010  | 5080  | 5040  | 4991 |
| Wet Density (kgm-3)               | 2105 | 2174  | 2205  | 2187  | 2166 |
| Water Added (ml)                  | 500  | 600   | 700   | 800   | 900  |
| Tare No.                          | 1    | 2     | 3     | 4     | 5    |
| Mass of wet sample (g)            | 500  | 500   | 500   | 500   | 500  |
| Mass of dry sample (g)            | 465  | 459   | 452   | 446   | 438  |
| Mass of water (g)                 | 35   | 41    | 48    | 54    | 62   |
| Moisture Content                  | 7.5  | 8.9   | 10.6  | 12.1  | 14.2 |
| Dry Density (kgm-3)               | 1958 | 1996  | 1993  | 1951  | 1897 |

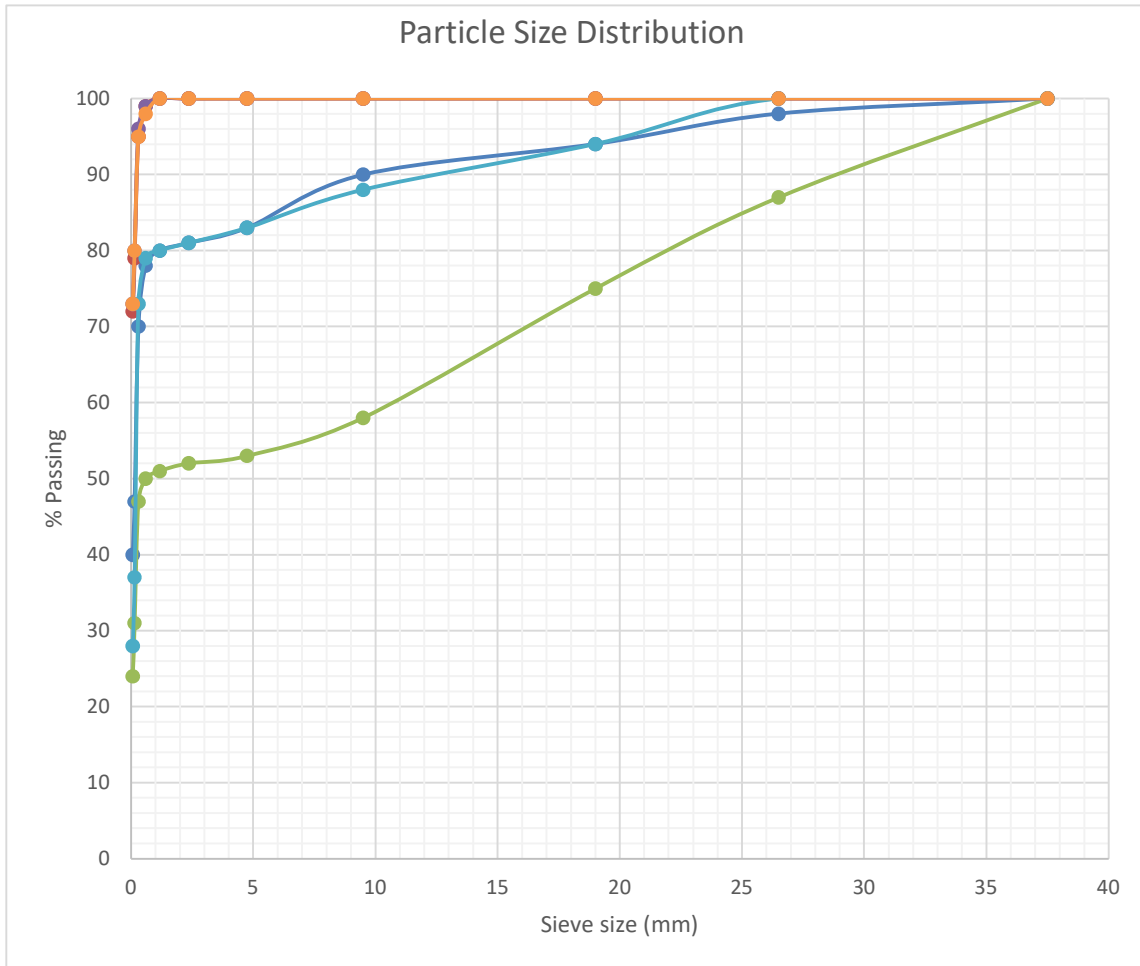
Max Dry Density (kgm-3): **2000**

Optimum Moisture Content:**9.80%**

#### 4.10.3 SUMMARY OF INDICATOR RESULTS

CLIENT                      **UNOPS**  
PROJECT                     **JOPA**  
DATE                         20/06/2021

| POSITION                      | TH1              | TH2       | TH3       | TH4       | TH5        | TH6       |
|-------------------------------|------------------|-----------|-----------|-----------|------------|-----------|
| SAMPLE No.                    | 1                | 2         | 3         | 4         | 5          | 6         |
| DEPTH                         | 0.2 - 0.6        | 0.3 - 1.0 | 0.5 - 1.0 | 0.3 - 1.0 | 0.15 - 1.0 | 0.2 - 1.0 |
| <b>Sieve Size (mm)</b>        | <b>% Passing</b> |           |           |           |            |           |
| <b>37.5</b>                   | 100              | 100       | 100       | 100       | 100        | 100       |
| <b>26.5</b>                   | 98               | 100       | 87        | 100       | 100        | 100       |
| <b>19</b>                     | 94               | 100       | 75        | 100       | 94         | 100       |
| <b>9.5</b>                    | 90               | 100       | 58        | 100       | 88         | 100       |
| <b>4.75</b>                   | 83               | 100       | 53        | 100       | 83         | 100       |
| <b>2.36</b>                   | 81               | 100       | 52        | 100       | 81         | 100       |
| <b>1.18</b>                   | 80               | 100       | 51        | 100       | 80         | 100       |
| <b>0.6</b>                    | 78               | 99        | 50        | 99        | 79         | 98        |
| <b>0.3</b>                    | 70               | 95        | 47        | 96        | 73         | 95        |
| <b>0.15</b>                   | 47               | 79        | 31        | 80        | 37         | 80        |
| <b>0.075</b>                  | 40               | 72        | 24        | 73        | 28         | 73        |
| <b>Liquid Limit (%)</b>       | NP               | 47        | NP        | 43        | NP         | NP        |
| <b>Plasticity Index (%)</b>   | NP               | 8         | NP        | 7         | NP         | NP        |
| <b>Plasticity Product(PP)</b> | 40               | 576       | 24        | 511       | 28         | 73        |
| <b>Reject index</b>           | 18               | nil       | 20        | nil       | 6          | nil       |
| <b>Classification</b>         | Q0335b           | CL0875a   | QO325e    | DG+S0875a | Q+DG0325b  | CL0375a   |



#### 4.10.4 CBR

CLIENT **UNOPS**  
PROJECT **JOPA**  
MATERIAL **QUARTZ + DG**

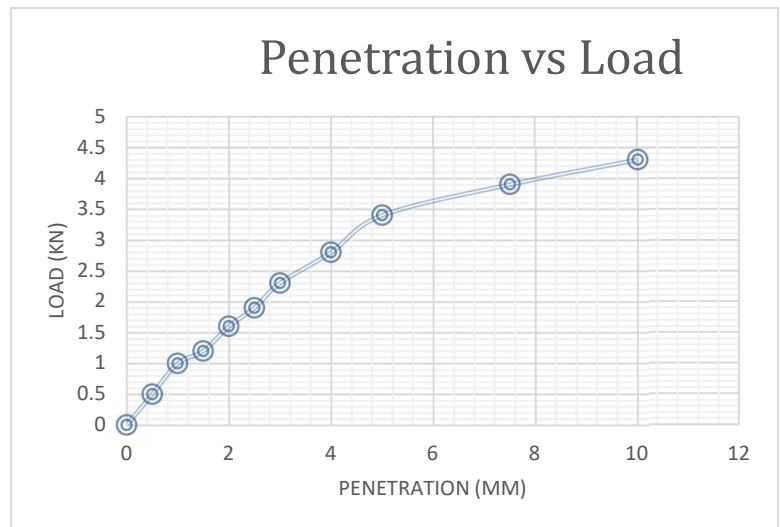
Date 20/06/2021

|                    |    |
|--------------------|----|
| Liquid Limit       | NP |
| Plasticity index   | NP |
| Plasticity product | 28 |
| fineness index     | 28 |

|                       |       |
|-----------------------|-------|
| Opt. Moisture Content | 9.80% |
| Max Dry Density       | 2000  |
| Compaction            | LCE   |

Load rate 21.9

| Pen (mm) | Load (Kn) | Gauge reading |
|----------|-----------|---------------|
| 0        | 0         |               |
| 0.5      | 0.5       |               |
| 1        | 1         |               |
| 1.5      | 1.2       |               |
| 2        | 1.6       |               |
| 2.5      | 1.9       | 87            |
| 3        | 2.3       |               |
| 4        | 2.8       |               |
| 5        | 3.4       | 155           |
| 7.5      | 3.9       |               |
| 10       | 4.3       |               |



| Pen(mm) | Load (kN) | Corrected Load (KN) | % CBR | % M.C |
|---------|-----------|---------------------|-------|-------|
| 2.5     | 1,9       | 1,9                 | 15.2  | 9.8   |
| 5       | 3.4       | 3,4                 | 17    | 9.8   |

**CBR value: 15%**

#### 4.10.5 DCP SUMMARY

| SITE | TRIAL HOLE NUMBER | DEPTH   | BEARING PRESSURE KPA | REMARKS                   | COMMENTS                            |
|------|-------------------|---------|----------------------|---------------------------|-------------------------------------|
| JOPA | 1                 | 0-0.5   | 457                  | rock encountered at 515mm | High bearing capacity               |
|      |                   |         |                      |                           |                                     |
|      | 2                 | 0-0.5   | 252                  |                           |                                     |
|      |                   | 0.5-1.0 | 52                   |                           | low bearing capacity from 0 to 1.5m |
|      |                   | 1.0-1.5 | 443                  |                           | Bounce at 1.5m                      |
|      | 3                 | 0-0.5   | 191                  |                           |                                     |
|      |                   | 0.5-1.0 | 264                  |                           | good bearing capacity from 0 to 2m  |
|      |                   | 1.0-1.5 | 210                  |                           |                                     |
|      |                   | 1.5-2.0 | 310                  |                           |                                     |
|      | 4                 | 0-0.5   | 183                  |                           |                                     |
|      |                   | 0.5-1.0 | 114                  |                           | Low bearing capacity                |
|      |                   | 1.0-1.5 | 66                   |                           |                                     |
|      |                   | 1.5-2.0 | 141                  |                           |                                     |
|      | 5                 | 0-0.5   | 436                  |                           |                                     |
|      |                   | 0.5-1.0 | 215                  |                           | high bearing capacity from 0 to 2m  |
|      |                   | 1.0-1.5 | 450                  |                           |                                     |
|      |                   | 1.5-2.0 | 453                  |                           |                                     |
|      | 6                 | 0-0.5   | 339                  |                           |                                     |
|      |                   | 0.5-1.0 | 180                  |                           |                                     |
|      |                   | 1.0-1.5 | 145                  |                           |                                     |
|      |                   | 1.5-2.0 | 328                  |                           |                                     |

#### 4.10.6 SHALLOW PROFILE

##### Jopa

| Trial hole | Depth      | Geological Origin           |
|------------|------------|-----------------------------|
| TH1        | 200 - 600  | Quartz                      |
| TH2        | 300 - 1000 | Clay                        |
| TH3        | 500 - 1000 | Quartz                      |
| TH4        | 300 - 1000 | Decomposed Granite + Sand   |
| TH5        | 300 - 1000 | Quartz + Decomposed Granite |
| TH6        | 0 – 1000   | Clay                        |
|            |            |                             |

#### **4.10.7 ANALYSIS**

Based on our field exploration, the soils have low plasticity but have a high percentage of fines. The CBR values are ok and the soil is capable of resisting heavy loads that maybe subjected to it. Good drainage observed on site. No surface runoff observed. No ground water observed during exploration. No rock or any debris deposits observed.

#### **4.10.8 RECOMMENDATIONS**

Foundation excavations must be monitored by a qualified structural engineer.

The foundation may be designed with a maximum average bearing pressure of 300Kpa. A normal shallow strip foundation can be used because the subsoil has a good bearing capacity.