PHASE 1
GEOTECHNICAL SITE INVESTIGATION

FOR

CLANWILLIAM HOUSING PHASE II PROJECT

FOR

ASLA DEVCO

CORE GEOTECHNICAL CONSULTANTS
Engineering Geology and Geohydrology

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PHASE 1 GEOTECHNICAL SITE INVESTIGATION FOR CLANWILLIAM HOUSING PHASE II PROJECT

Date: OCTOBER 2017 **Project no: 143**-17

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Appendix A: Site plans and site class designations
Appendix B: Test pit soil profiles
Appendix C: Dynamic Probe Light (DPL) Tests
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EXECUTIVE SUMMARY

The approximately 23Ha, currently undeveloped site, is located in the south-eastern part of Clanwilliam. The site has a sloping topography that slopes down from the west and south-west, towards the east and north-east (1(v) : 19(h)). No formal drainage lines traverse the site.

From surface the site is underlain by unconsolidated colluvially transported sands and gravelly silty sands, 0.2m to 0.8m thick. The transported soils are directly underlain by residual and weathered sandstone bedrock.

Groundwater was not intersected in any of the test pits. For most of the site, due to the sloping topography it is unlikely that a perched water table will develop and stormwater will preferentially drain downslope along the surface, as "runoff".

The principal geotechnical characteristics of the site are: -

- Highly to moderately compressible colluvial soils within the upper 0.3m to 0.8m of present ground level. Recompaction of these soils will thus be required for both surface beds, roads and foundations.
- The sloping topography will likely require terracing for houses.
- Both the transported soils and residual/weathered sandstone material should be suitable for use as general fill and selected layer material for use in earthworks operations.
- Difficulty in excavation was encountered within the shallow weathered sandstone bedrock encountered within 0.2m to 1.4m of surface.
- The granular nature of the surface sandy soils will make them prone to wind and water erosion once vegetation is removed from the site.

These geotechnical considerations will have impacts on the subsidy variations for the site.

The Residential Site Class Designation is S1/R, for areas where colluvium is deeper than 0.5m, while a site class of R is assigned to areas where the residual/weathered sandstone bedrock was encountered within 0.5m of surface (see site plan in Appendix A).

Recommendations for foundation design and drainage are given in Sections 8 and 9 respectively. Conventional shallow foundations on soils that are recompacted from surface or alternatively foundations that extend onto residual/weathered sandstone bedrock, are recommended. Surface beds can also be founded conventionally, after nominal recompaction of upper sandy soils, or can be designed as suspended slabs.

1. Introduction and terms of reference

At the request of ASLA Devco, we have carried out a Phase 1 Geotechnical Site Investigation for the Clanwilliam Phase II Housing Project.

The objectives of this investigation may be summarized as follows: -

a) Identify any potential hazards.

b) Define the ground conditions and provide Site Classifications including detailed soil profile and groundwater occurrences within the zone of influence of foundations.

c) Provide the geotechnical basis for safe and appropriate land use planning, infrastructure

design, housing unit design and the formulation of precautionary measures and risk management procedures.

d) Broadly classify the land that is to be developed for subsidy housing in terms of the Housing Code's Residential Site Class Designations.

2. Information used in the study

This investigation report has been prepared in accordance with the standard specifications of the National Housing Code for Project Linked Greenfield Subsidy Housing Projects (Standard Specification GFSH-2).

The following information sources were used in the investigation: -

a) The 1:250 000 geological map – 3218 Clanwilliam (Council for Geoscience).
b) Remote Google Earth imagery (2006-2016)

3. Site description

The area of investigation comprises an irregular shaped, currently undeveloped portion of land, approximately 23Ha in total area. The site is located in the south-eastern part of the town, Clanwilliam, located in the Western Cape. Reservoir Street and Bloekom Avenue form the northern and southern site boundaries, while Denne and Buitenkant Street form the western site boundaries. The golf course bounds the site to the east. The location of the site is indicated in the locality plan, Figure 3.1.

Figure 3.1 Site locality plan

In terms of topography (shown in Figure 3.2), the site slopes down from the west and south-west, towards the east and north-east (approx 1(v): 19(h)). There are no formal drainage lines that traverse the site. A small existing reservoir is located in the north-western part of the site.

The site is mostly covered with natural fynbos and shrub cover. A small clump of Bluegum trees are also found in the northern part of the site.

Housing structures (small, lightly loaded single-storey residential units) in the vicinity of the site

generally appear to be in sound condition from a structural point of view, with no evidence of significant cracking in brickwork.

No minerals or materials of significant economic value are known to underlie the site and the site is not undermined.

Figure 3.2 Site Topography

4. Nature of the investigation

4.1 Test pits and dynamic probe light (DPL) tests

The investigation comprised:

a) A walkover survey of the site and a literature survey of existing information in the area

b) Visual soil profiling of nineteen test pits, excavated using a Hitachi 20 ton tracked excavator.

c) Dynamic Probe Light (DPL) testing at seventeen test pit locations to determine the *in-situ* relative density of the underlying soils.

d) Laboratory testing, namely foundation indicator, moisture-density/CBR tests and geochemical testing was carried out to determine the engineering properties of the in-situ soils.

Test pit and DPL probe test positions are shown in the site plans included in Appendix A. Copies of the recorded test pit profiles and DPL probe test results are included in Appendices B and C respectively.

4.2 Laboratory testing

The following laboratory tests were carried out on selected soil samples: -

a) Indicator tests in the form of grading and Atterberg Limits analyses to determine basic soils engineering properties

b) Geochemical testing (pH and conductivity) to indicate possible deleterious effects of soils on concrete and buried services.

c) Moisture-density and CBR testing to determine the compaction characteristics and strength of relevant the soils

Copies of the full laboratory test results are included in Appendix D.

5. Site geology and groundwater conditions

5.1 General

Geological maps of the area indicate that regionally, the site is underlain by weathered quartzitic sandstone, shale and conglomerate rocks of the Table Mountain Group.

5.2 Soil profile

The profile on site consists of colluvially transported soils at surface. This colluvium consists mostly of a silty sand material with variable amounts of sandstone gravel and small sandstone boulders also present. There are however flatter lying areas on site (north, north-east and south) where the colluvium is more sandy in nature and has a low gravel content. The colluvium generally varies in thickness between 0.2m and 0.8m.

The colluvium is either directly underlain by completely to highly weathered sandstone bedrock, or alternatively by a deeper weathered residual sandstone horizon. In some areas this residual soils consists of a sandy gravel that has undergone variable degrees of pedogenesis (TP5 & TP8), in the form of ferruginization, while in other areas (TP15 in the lower lying parts of the site) a clay content is present within the residual soils.

5.3 Water table

Groundwater was not intersected within any of the test pits. Due to the sloping nature of the site, this is unlikely and stormwater will tend to preferentially drain downslope towards the north-east and east, as surface run-off.

The perched water table receives its main recharge from direct infiltration of rainfall, as well as from surrounding recharge of the much broader groundwater regime. The water table will be at its highest level at the end of winter, with water table elevations dropping over the dry summer season.

The groundwater in the area is essentially within the deeper fractured rock (“secondary aquifer”) of the Table Mountain Group (expected to be located at considerable depth). Borehole yields in this area are expected to be approximately 0.1-0.5 l/s are expected for the deeper secondary aquifer. Water quality is expected to be fair with electrical conductivity in the range of 70-300 mS/m expected.

6. Geotechnical evaluation

6.1 Engineering and materials characteristics

On the basis of the field investigation and soils engineering data, the following points relating to geotechnical character of the site, may be made: -

a) Soil profiles and DPL probe tests indicate that the colluvium on site is generally highly to moderately compressible over its full depth (0.3m to 0.8m). These soils are thus unsuitable for founding without some form of ground improvement such as compaction. The colluvium directly overlies the residual/weathered sandstone bedrock, which will form a competent founding horizon.

b) No difficulty in excavation was encountered within the colluvial soils. The excavator encountered some minor difficulty within the residual sandstone gravel and very soft rock sandstone, but ultimately met refusal in soft rock to medium hard rock sandstone bedrock.

c) Ground water was not encountered in any of the test pits. Due to the sloping topography it is unlikely that a perched groundwater table will develop on site. There is however a risk of surface runoff from upslope areas, as well as erosion, once the vegetation is removed.

d) In terms of material properties, the transported sands are granular, non-plastic and have a low post compaction strength. These soils should be suitable for use as a general fill and possibly a selected layer quality material (refer to Table 6.1 & 6.2). The transported gravelly silty sands are also granular. Post compaction strength is moderate. These soils should form a suitable quality general fill and selected layer quality material (refer to Table 6.1 & 6.2). Coarser fractions may however require crushing or selecting out before recompaction.

Table 6.1 Engineering properties of soils

Test Pit	Depth (m)	Material	LL	PI	LS	GM	MC	pH	Conductivity (mS/m)	CBR @ 95% Mod AASHTO
TP1	0-0.55	Transported sand	-	NP	-	1.27	-	-	-	15
TP2	0.45-0.6	Weathered sandstone	-	NP	-	1.65	-	-	-	23
TP4	0.6-0.9	Residual sandstone	-	NP	-	2.23	3.4	7.4	117	*25-30
TP5	0-0.6	Transported sands	-	NP	-	1.3	0.8	4.2	12	*12-15
TP5	0.6-1.1	Ferruginized sandy gravel	-	NP	-	1.6	-	-	-	26
TP10	0-0.4	Transported gravelly silty sand	-	NP	-	1.75	0.5	7.8	15	*30-35
TP12	0-0.3	Transported gravelly silty sand	-	NP	-	1.64	-	-	-	45
TP15	0.2-0.7	Residual sandstone	22	10	5	0.87	6.6	-	-	20

Key: LL – Liquid limit. PI – Plasticity index. LS – Linear Shrinkage. NP – non-plastic. GM – grading modulus CBR – California bearing ratio. *CBR – Computed CBR value. MC – Moisture content

Table 6.2 Engineering properties of compacted materials

Material	Potential Usage	Shear Strength when Compacted	Drainage Characteristics	Workability as a Construction Material	Probable TRH14 Classification
Transported sands	Selected layer or general fill	Low to moderate	Good	Good	G9
Transported gravelly silty sands	Selected layer or general fill	Low to moderate	Good	Good	G5-G7
Residual sandstone (sandy gravel)	Selected layer or general fill	Moderate	Good	Good	G5-G7
Completely weathered sandstone	Selected layer or general fill	Moderate	Good	Good	G7-G9

e) Apart from the area adjacent to the golf course (TP15) where the residual sandstone material has a low PI (PI of 10), the residual soils and weathered sandstone are generally granular and have a low to moderate post compaction strength, once excavated. They will also be suitable for use as a general fill and selected layer material. Where present the coarser gravel fraction will require crushing or selecting out in order to achieve suitable levels of compaction.

f) Geochemical results indicate that the transported sands are slightly acidic in terms of pH. Services in areas where these sands are located may thus require special precautionary measures in this regard. Other soils tested were neutral with regards to pH. All soils generally

exhibit a low to moderate conductivity and no significant deleterious effects on buried services are thus anticipated in this regard.

6.2 Slope stability and erosion

As a result of the sloping topography on site, with ground sloping down from the west and south-west towards the east and north-east (approx 1(v): 19(h)), terracing will most likely be required for housing structures. Due to the shallow depth of competent bedrock, there is however no real risk of large scale slope failures unless large cuts are envisaged.

Due to the granular and cohesionless nature of the surface soils on site, any slopes cut into these sandy soils will need to be trimmed back to an angle of not more than 45° to the horizontal. Cuts within the residual and weathered sandstone should be stable at angles of not more than 60° to the horizontal. These angles could be re-evaluated on site based on the strength of the material encountered in cut. Any cuts deeper than 3.0m will require formal lateral support measures.

As regards soil erosion, the sands are susceptible to erosion under the influence of both water and wind once the vegetation that covers most of the site is removed. Appropriate design precautions will thus be required.

6.3 Excavation classification with respect to services

Excavation in the transported sandy soils encountered at surface, classifies as “soft excavation” in terms of the SANS 1200 D Earthworks Specification. Depth of this horizon varies from 0.2m to 1.2m below ground level.

Excavation within the sandy gravel and residual sandstone classifies as “soft to intermediate excavation”. Refusal of the 40 ton excavator was generally met within soft rock to medium hard rock sandstone, within 1.5m of surface. Excavation within this material will classify as “hard rock excavation”

In practice, heavier earthmoving equipment, such as a powerful tracked excavator, fitted with a rock bucket, should provide the most suitable means of excavation within the upper 1.5m -2.0m. Below this depth, the use of power tools and rock breaking techniques will likely be required and provision would need to be made for this. For safety purposes, excavations deeper than 1.5m will require shoring or battering of sidewalls to not more than 45° to the horizontal, within the surface sandy soils, and to not more than 60° to the horizontal, within the residual and weathered sandstone.

6.4 Impact of the geotechnical character of the site on subsidy housing development

The geotechnical character of the site is expected to have an impact on subsidy housing development and subsidy variations. A schedule of generic subsidy variations applicable to the site is outlined in Table 6.3.

Positive impacts of the geotechnical character of the site on service installation include:

- The generally reasonable quality of the excavated colluvial soils (mainly sands) for use general backfill and selected layer mateial.
- The generally reasonable quality of the excavated residual and weathered sandstone material for use as general backfill and selected layer materials.

Negative impacts include:

- The sloping nature of the topography that will require terracing for structures.
- The difficulty of excavation within the shallow sandstone bedrock (hard rock excavation) encountered within 0.2m to 1.4m of surface.
- The sandy soils at surface are potentially erodable once the vegetation covering the site is removed.

- The compressible nature of the sandy sandy colluvium within the upper 0.3m to 0.8m of surface and the need for subgrade improvement to improve soil strength and compressibility for roads and foundations.

Table 6.3 Factors to Consider in Subsidy Variations

Category of subsidy Variation	Verification Criteria	Factors Affecting Amount of Subsidy Variation
Difficulty of servicing land due to slopes: Type 2 site	Average slope measured across the ref in any direction exceeds 1:20 but is flatter than or equal to 1:10	Terracing for houses/additional masonry units in foundation walls required.
Difficulty of excavation: Type 1 condition	Average slope measures across the ref in any direction is flatter than or equal to 1:10 and between 10 and 40% of material to a depth of 1.5m below per-development level is classified as hard rock excavation.	Additional cost of trench excavation.
Site conditions: 2. Readability of soils	Upper soils classified as SO or SM in terms of the Unified Soil Classification	Provision of sound surface water management and possibly wind erosion protection.
Founding conditions: 3. Compressive soils Class S1 at surface in certain areas on site	Site class designations classified in accordance with 2.5 of Part 1 Section2 of the NHBRC Home Building Manual	Masonry houses will require foundation design, building procedures and precautionary measures to be in accordance with Tables 5, 6 and 7 of Part 1 Section2 of the NHBRC Home Building Manual

7. Site classification

In areas where the highly to moderately compressible colluvial sandy soils (S1) have a depth of greater than 0.5m from surface and are underlain by residual/weathered sandstone bedrock (R), a classification of "**S1/R"** (after Watermeyer and Tromp and the Joint Structural Division) was assigned. In areas where the residual/weathered sandstone bedrock (R) occurs within 0.5m of surface, a site classification of "**R**" was assigned. This designation is indicated in the site plan included in Appendix A and in Table 7.1.

Table 7.1 Residential site class designations

Site Class	Founding material	Expected range of soil movement (mm)	Assumed differential movement (% of total)	Comment
S1/R	Loose transported sandy soils	10-20	50	Ensure adequate compaction of compressible sands before construction or alternatively found on deeper residual/weathered sandstone
R	Residual/weathered sandstone bedrock	NEGLIGIBLE	N/A	Found on residual/weathered sandstone bedrock.

8. Foundation recommendations

Recommended founding options, applicable to the site, are summarized in Table 8.1.

Table 8.1 Summary of founding conditions across the site

Site Classification	Founding option	Founding depth (m)	Comment	Allowable bearing capacity (kPa)	Expected range of soil movement (mm)
S1/R	1	0.4	Found conventionally using strip or pad footings on soils recompacted from surface.	100	8-12
	2	0.8-1.2	Found on deeper residual/weathered sandstone using either deepened strip footings or a system of piers and ground beams	250	<7
	3	surface	Compact from surface and found using stiffened concrete rafts.	70	15-20 (depending on raft dimensions)
R	1	0.5	Found conventionally using strip or pad footings on residual/weathered sandstone	250	<7

The following should be noted, with reference Site class designation S1/R (Refer to Table 8.1):-

- As a result of the sloping topography, terracing will most likely be required for most structures that are conventionally founded. Any terrace fill will need to be constructed using a suitable quality granular material (both the colluvium and residual/weathered sandstone, taken from cut, should be suitable in this regard) and compacted to at least 95% Mod AASHTO maximum dry density, over its entire depth.
- For option 1 & 3: Found as shallow as possible on recompacted soils using conventional strip footings (option 1) or alternatively using stiffened concrete raft foundations (option 3). Bearing pressure limitations will apply and the expected settlement would need to be factored into the design of the structure.
- For heavier loading, found directly on the residual/weathered sandstone using either deepened strip footings, or alternatively using a system of piers and groundbeams. Piers can be constructed using bases and columns or through the use of cement stabilized backfill.

For areas with site class designations of R (refer to Table 8.1):-

- Found directly on the residual/weathered sandstone using conventional strip or pad footings. Bearing pressures of up to 250kPa should be suitable on these soils.

Where applicable, structures will require modified normal construction techniques to be applied to cater for the predicted settlement (refer to Table 8.1). Suitable measures would include additional reinforcement in brickwork in plinth walls and above doors and windows, reinforcement of surface beds, articulation of brick panels using construction joints and effective water management as outlined in Section 9 (refer also to NHBRC Home Building Manual).

Surface beds can be founded conventionally on in-situ soils once this material has been compacted to at least 93% Mod. AASHTO maximum dry density. Reinforcement of the surface beds and isolating them from walls to accommodate possible settlement (where applicable) will minimize the risk of cracking. Alternatively surface beds may be designed as suspended slabs, in which case in-situ soils can be left in place (as is) and used only as a back-shutter.

Soil variability may be encountered and a geotechnical specialist should inspect earthworks and foundation excavations during construction.

9. Drainage

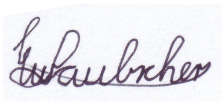
Groundwater was not encountered within any of the test pits during the investigation. Due to the sloping nature of the site and relatively shallow depth of the sandstone bedrock, stormwater will preferentially drain downslope toward the east and north-east as surface run-off. This carries the associated risk of erosion, once vegetation is removed. Careful attention to drainage design will thus be required. Measures would include effective design of storm water drainage and the collection and disposal of storm water and runoff from upslope areas as well as water from downpipes, away from the building structures. This should prevent water ingress into any engineered fill soils and soils below foundations and help minimize risks of any associated differential movements. Full drainage should also be provided behind all retaining walls.

10. Special precautionary measures

Apart from the relatively minor areas of concern outlined above, no special precautions with regard to infrastructure design are considered to be required.

11. Conclusions

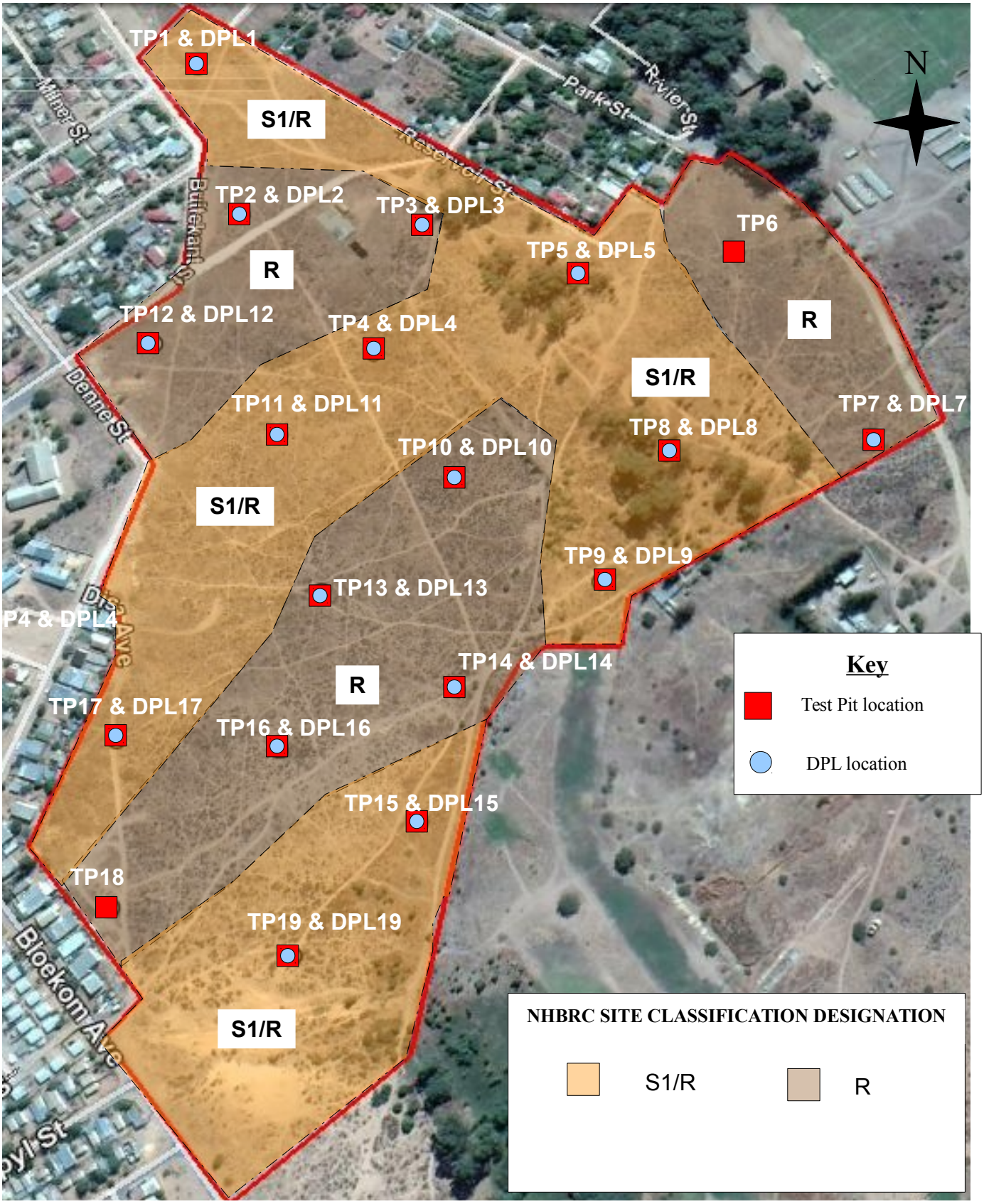
This Phase 1 geotechnical site investigation report indicates that the site classifies as both "S1/R" and "R" in terms of founding conditions and structural design requirements. Apart from difficulties in excavation in certain areas, site geotechnical conditions are generally good and relatively uniform and precautionary measures required in the design are expected to be minimal.



EUGENE LAUBSCHER

APPENDIX A

SITE PLAN AND CLASSIFICATION



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CLIENT: ASLA DEVCO					
PROJECT: CLANWILLIAM HOUSING PROJECT					
TITLE: SITE PLAN SHOWING SITE CLASSIFICATION, TEST PITS & DPL LOCATIONS					
DATE:	Oct-17	**TRACED BY:**	SS		
SCALE:	NTS	**FIG.NO.**	1	**JOB NO.**	143-17

APPENDIX B – SOIL PROFILES

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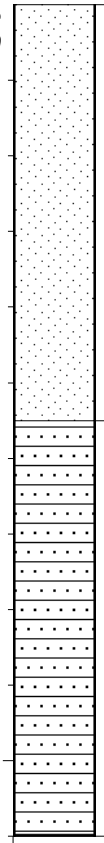
CLANWILLIAM HOUSING

TEST PIT SOIL PROFILES

HOLE No: TP01
Sheet 1 of 1

JOB NUMBER: 143-17

Scale 1:10



0.00 Dry creamy yellow brown very loose intact sand.
Transported - contains isolated gravel.

0.55 Reddish orange completely weathered medium grained closely jointed very soft rock sandstone.

1.10

NOTES

1) No seepage.
2) No sidewall collapse.
3) Refusal on hard rock sandstone.

CONTRACTOR :
MACHINE : Hitachi 20 Ton Excavator
DRILLED BY :
PROFILED BY : Eugene Laubscher
TYPE SET BY :
SETUP FILE : STANDARD.SET

LOCATION:
DIAM :
DATE :
DATE : 12 September 2017
DATE : 09/10/2017 11:31
TEXT : ..files\clanwilliam(3).txt

COLLAR LEVEL : Ground level
X COORD :
Y COORD :

HOLE No: TP01

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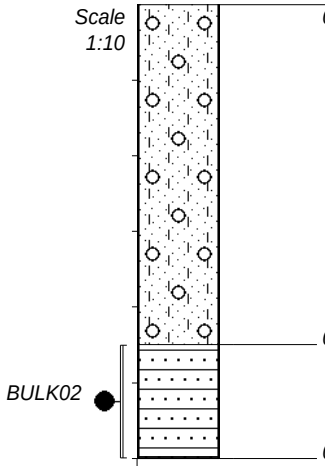
CLANWILLIAM HOUSING

TEST PIT SOIL PROFILES

HOLE No: TP02
Sheet 1 of 1

JOB NUMBER: 143-17



Dry brown and orange loose intact bouldery gravelly silty sand.
Transported - contains angular sandstone boulders and gravel.

Orange and red completely weathered medium grained thinly bedded closely jointed soft rock sandstone.

NOTES

1) No seepage.
2) No sidewall collapse.
3) Refusal on medium hard rock sandstone.
4) BULK02 sample at 0.45--0.6m.

CONTRACTOR :
MACHINE : Hitachi 20 Ton Excavator
DRILLED BY :
PROFILED BY : Eugene Laubscher
TYPE SET BY :
SETUP FILE : STANDARD.SET

LOCATION:
DIAM :
DATE :
DATE : 12 September 2017
DATE : 09/10/2017 11:31
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X COORD :
Y COORD :

HOLE No: TP02

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CLANWILLIAM HOUSING

TEST PIT SOIL PROFILES

HOLE No: TP03
Sheet 1 of 1

JOB NUMBER: 143-17

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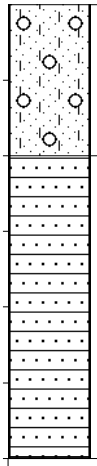

0.00 Moist brown loose intact gravelly silty sand.
Transported.

0.20 Orange and red completely weathered medium grained thinly bedded closely jointed soft rock sandstone.

0.60

NOTES

1) No seepage.
2) No sidewall collapse.
3) Refusal on medium hard rock sandstone.

CONTRACTOR :
MACHINE : Hitachi 20 Ton Excavator
DRILLED BY :
PROFILED BY : Eugene Laubscher
TYPE SET BY :
SETUP FILE : STANDARD.SET

LOCATION:
DIAM :
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DATE : 12 September 2017
DATE : 09/10/2017 11:31
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X COORD :
Y COORD :

HOLE No: TP03

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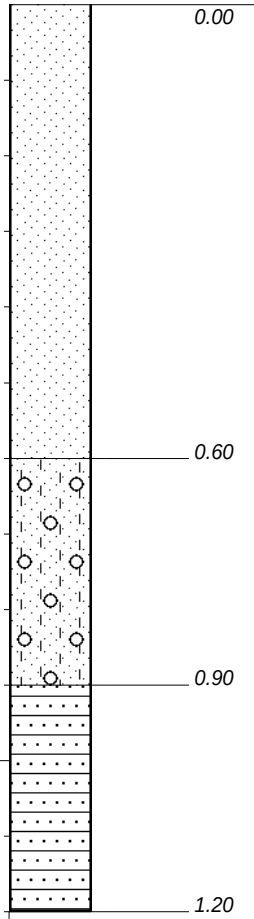
TEST PIT SOIL PROFILES

HOLE No: TP04
Sheet 1 of 1

JOB NUMBER: 143-17



Dry to slightly moist yellow brown very loose to loose sand with isolated gravel.
Transported.

MOist orange and cream dense gravelly silty sand.
Residual sandstone.

Orange and red completely weathered medium grained thinly bedded closely jointed soft rock sandstone.

NOTES

1) No seepage.
2) SMALL sample at 0.6--0.9m.
3) No sidewall collapse.
4) Refusal on medium hard rock sandstone.

CONTRACTOR :
MACHINE : Hitachi 20 Ton Excavator
DRILLED BY :
PROFILED BY : Eugene Laubscher
TYPE SET BY :
SETUP FILE : STANDARD.SET

LOCATION:
DIAM :
DATE :
DATE : 12 September 2017
DATE : 09/10/2017 11:31
TEXT : ..files\clanwilliam(3).txt

COLLAR LEVEL :
X COORD :
Y COORD :

HOLE No: TP04

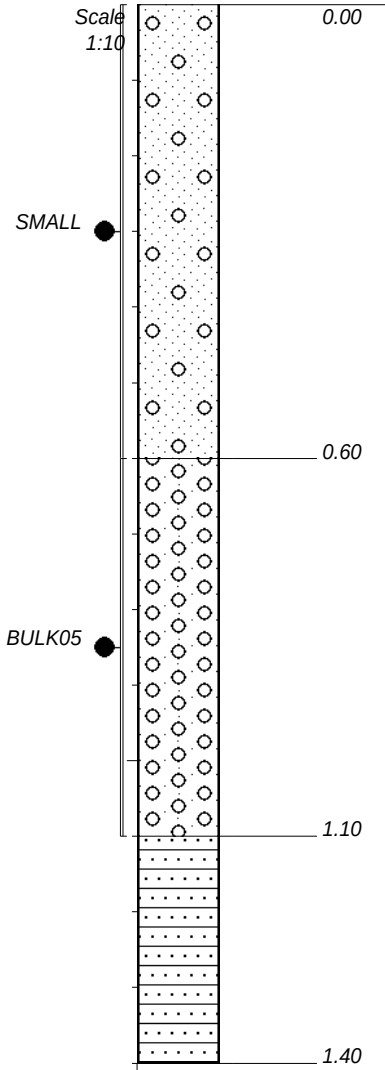
CORE GEOTECHNICAL CONSULTANTS
Engineering Geology and Geohydrology

CLANWILLIAM HOUSING

TEST PIT SOIL PROFILES

HOLE No: TP05
Sheet 1 of 1

JOB NUMBER: 143-17



0.00

Dry yellow brown loose to medium dense gravelly sand.
Transported.

0.60

Dry orange and red dense to very dense intact bouldery sandy gravel.
weakly ferruginised residual sandstone.

1.10

Orange and red completely weathered medium grained thinly bedded closely jointed soft rock sandstone.

1.40

NOTES

1) No seepage.
2) SMALL sample at 0.0--0.6m.
3) Sidewall collapse in upper sand.
4) Refusal on medium hard rock sandstone.
5) BULK05 sample at 0.6--1.1m.

CONTRACTOR :
MACHINE : Hitachi 20 Ton Excavator
DRILLED BY :
PROFILED BY : Eugene Laubscher
TYPE SET BY :
SETUP FILE : STANDARD.SET

LOCATION:
DIAM :
DATE :
DATE : 12 September 2017
DATE : 09/10/2017 11:31
TEXT : ..files\clanwilliam(3).txt

COLLAR LEVEL :
X COORD :
Y COORD :

HOLE No: TP05

CORE GEOTECHNICAL CONSULTANTS
Engineering Geology and Geohydrology

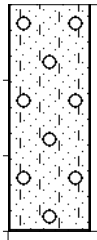
CLANWILLIAM HOUSING

TEST PIT SOIL PROFILES

HOLE No: TP06
Sheet 1 of 1

JOB NUMBER: 143-17

Scale 1:10



0.00

Dry brown loose intact gravelly silty sand.
Transported.

0.30

NOTES

1) No seepage.

2) No sidewall collapse.

3) Refusal on medium hard rock sandstone.

CONTRACTOR :
MACHINE : Hitachi 20 Ton Excavator
DRILLED BY :
PROFILED BY : Eugene Laubscher
TYPE SET BY :
SETUP FILE : STANDARD.SET

LOCATION:
DIAM :
DATE :
DATE : 12 September 2017
DATE : 09/10/2017 11:31
TEXT : ..files\clanwilliam(3).txt

COLLAR LEVEL :
X COORD :
Y COORD :

HOLE No: TP06

CORE GEOTECHNICAL CONSULTANTS
Engineering Geology and Geohydrology

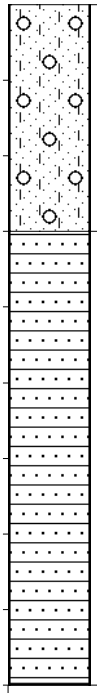
CLANWILLIAM HOUSING

TEST PIT SOIL PROFILES

HOLE No: TP07
Sheet 1 of 1

JOB NUMBER: 143-17

Scale 1:10



0.00 Dry yellow brown loose intact bouldery gravelly silty sand. Transported.

0.30 Orange and red completely weathered medium grained thinly bedded closely jointed soft rock sandstone.

0.90

NOTES

1) No seepage.
2) No sidewall collapse.
3) Refusal on medium hard rock sandstone.

CONTRACTOR :
MACHINE : Hitachi 20 Ton Excavator
DRILLED BY :
PROFILED BY : Eugene Laubscher
TYPE SET BY :
SETUP FILE : STANDARD.SET

LOCATION:
DIAM :
DATE :
DATE : 12 September 2017
DATE : 09/10/2017 11:31
TEXT : ..files\clanwilliam(3).txt

COLLAR LEVEL :
X COORD :
Y COORD :

HOLE No: TP07

CORE GEOTECHNICAL CONSULTANTS
Engineering Geology and Geohydrology

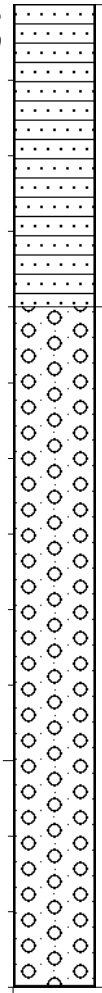
CLANWILLIAM HOUSING

TEST PIT SOIL PROFILES

HOLE No: TP08
Sheet 1 of 1

JOB NUMBER: 143-17

Scale 1:10



0.00 Orange and red completely weathered medium grained thinly bedded closely jointed soft rock sandstone.

0.40 Dry orange and red dense to very dense intact bouldery sandy gravel. Pedogenic - weakly ferruginised.

1.30

NOTES

1) No seepage.
2) Sidewall collapse in upper sand.
3) Refusal on medium hard rock sandstone.

CONTRACTOR :
MACHINE : Hitachi 20 Ton Excavator
DRILLED BY :
PROFILED BY : Eugene Laubscher
TYPE SET BY :
SETUP FILE : STANDARD.SET

LOCATION:
DIAM :
DATE :
DATE : 12 September 2017
DATE : 09/10/2017 11:31
TEXT : ..files\clanwilliam(3).txt

COLLAR LEVEL :
X COORD :
Y COORD :

HOLE No: TP08

CORE GEOTECHNICAL CONSULTANTS
Engineering Geology and Geohydrology

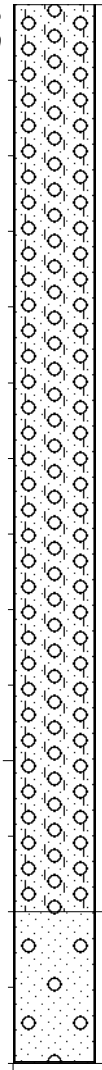
CLANWILLIAM HOUSING

TEST PIT SOIL PROFILES

HOLE No: TP09
Sheet 1 of 1

JOB NUMBER: 143-17

Scale 1:10



0.00

Dry to slightly moist yellow brown loose to medium dense silty sand with isolated gravel.
Transported.

1.20

Slightly moist orange dense to very dense gravelly sand.
Residual sandstone.

1.40

NOTES

1) No seepage.
2) Sidewall collapse in upper sand.
3) Refusal on medium hard rock sandstone.

CONTRACTOR :
MACHINE : Hitachi 20 Ton Excavator
DRILLED BY :
PROFILED BY : Eugene Laubscher
TYPE SET BY :
SETUP FILE : STANDARD.SET

LOCATION:
DIAM :
DATE :
DATE : 12 September 2017
DATE : 09/10/2017 11:31
TEXT : ..files\clanwilliam(3).txt

COLLAR LEVEL :
X COORD :
Y COORD :

HOLE No: TP09

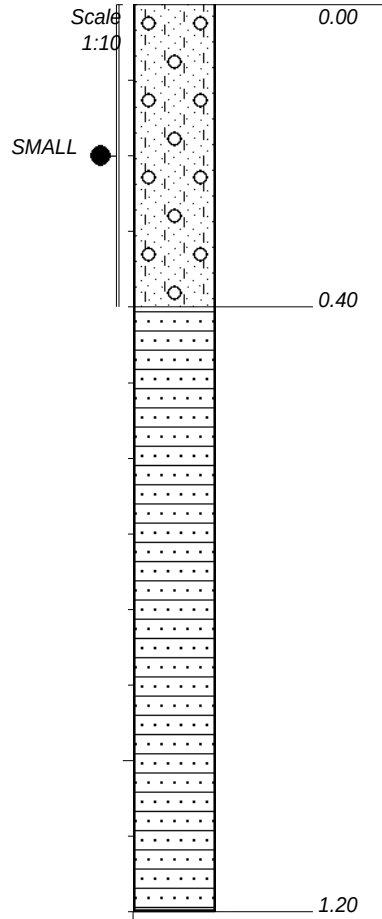
CORE GEOTECHNICAL CONSULTANTS
Engineering Geology and Geohydrology

CLANWILLIAM HOUSING

TEST PIT SOIL PROFILES

HOLE No: TP10
Sheet 1 of 1

JOB NUMBER: 143-17



Dry to slightly moist yellow brown loose gravelly silty sand.
Transported - low gravel content.

Orange and red completely weathered medium grained thinly bedded closely jointed soft rock sandstone.

NOTES

1) No seepage.
2) SMALL sample at 0.0--0.4m.
3) Sidewall collapse in upper sand.
4) Refusal on medium hard rock sandstone.

CONTRACTOR :
MACHINE : Hitachi 20 Ton Excavator
DRILLED BY :
PROFILED BY : Eugene Laubscher
TYPE SET BY :
SETUP FILE : STANDARD.SET

LOCATION:
DIAM :
DATE :
DATE : 12 September 2017
DATE : 09/10/2017 11:31
TEXT : ..files\clanwilliam(3).txt

COLLAR LEVEL :
X COORD :
Y COORD :

HOLE No: TP10

CORE GEOTECHNICAL CONSULTANTS
Engineering Geology and Geohydrology

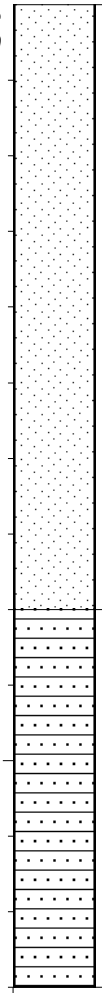
CLANWILLIAM HOUSING

TEST PIT SOIL PROFILES

HOLE No: TP11
Sheet 1 of 1

JOB NUMBER: 143-17

Scale 1:10



0.00 Dry yellow brown very loose to loose intact sand with isolated gravel.

0.80 Orange and red completely weathered medium grained thinly bedded closely jointed soft rock sandstone.

1.30

NOTES

1) No seepage.
2) Sidewall collapse in upper sand.
3) Refusal on medium hard rock sandstone.

CONTRACTOR :
MACHINE : Hitachi 20 Ton Excavator
DRILLED BY :
PROFILED BY : Eugene Laubscher
TYPE SET BY :
SETUP FILE : STANDARD.SET

LOCATION:
DIAM :
DATE :
DATE : 12 September 2017
DATE : 09/10/2017 11:31
TEXT : ..files\clanwilliam(3).txt

COLLAR LEVEL :
X COORD :
Y COORD :

HOLE No: TP11

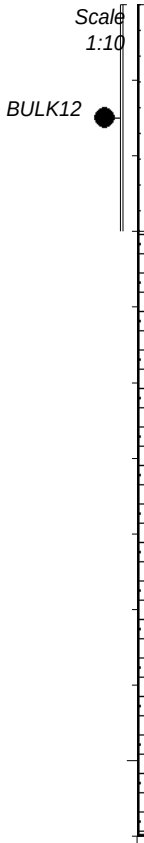
CORE GEOTECHNICAL CONSULTANTS
Engineering Geology and Geohydrology

CLANWILLIAM HOUSING

TEST PIT SOIL PROFILES

HOLE No: TP12
Sheet 1 of 1

JOB NUMBER: 143-17



Dry brown loose bouldery gravelly silty sand.
Transported.

Orange brown completely weathered medium grained thinly bedded closely jointed soft rock sandstone.

NOTES

1) No seepage.
2) Sidewall collapse in upper sand.
3) Refusal on medium hard rock sandstone.
4) BULK12 sample at 0.0--0.3m.

CONTRACTOR :
MACHINE : Hitachi 20 Ton Excavator
DRILLED BY :
PROFILED BY : Eugene Laubscher
TYPE SET BY :
SETUP FILE : STANDARD.SET

LOCATION:
DIAM :
DATE :
DATE : 12 September 2017
DATE : 09/10/2017 11:31
TEXT : ..files\clanwilliam(3).txt

COLLAR LEVEL :
X COORD :
Y COORD :

HOLE No: TP12

CORE GEOTECHNICAL CONSULTANTS
Engineering Geology and Geohydrology

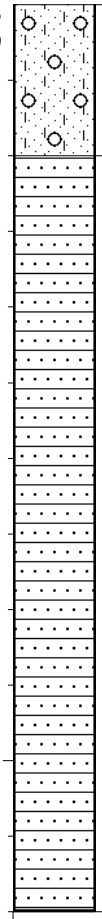
CLANWILLIAM HOUSING

TEST PIT SOIL PROFILES

HOLE No: TP13
Sheet 1 of 1

JOB NUMBER: 143-17

Scale 1:10



0.00 Dry yellow brown loose bouldery gravelly silty sand.
Transported.

0.20 Red and cream completely weathered medium grained thinly to medium bedded closely jointed very soft rock to soft rock sandstone.

1.20

NOTES

1) No seepage.
2) No sidewall collapse.
3) Refusal on medium hard rock sandstone.

CONTRACTOR :
MACHINE : Hitachi 20 Ton Excavator
DRILLED BY :
PROFILED BY : Eugene Laubscher
TYPE SET BY :
SETUP FILE : STANDARD.SET

LOCATION:
DIAM :
DATE :
DATE : 12 September 2017
DATE : 09/10/2017 11:31
TEXT : ..files\clanwilliam(3).txt

COLLAR LEVEL :
X COORD :
Y COORD :

HOLE No: TP13

CORE GEOTECHNICAL CONSULTANTS
Engineering Geology and Geohydrology

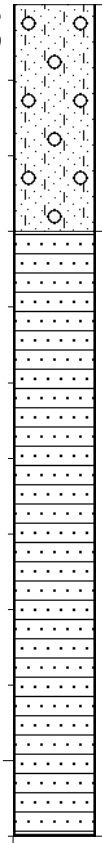
CLANWILLIAM HOUSING

TEST PIT SOIL PROFILES

HOLE No: TP14
Sheet 1 of 1

JOB NUMBER: 143-17

Scale 1:10



0.00 Dry brown loose bouldery gravelly silty sand.
Transported.

0.30 Orange brown completely weathered medium grained thinly bedded closely jointed soft rock sandstone.

1.10

NOTES

1) No seepage.
2) No sidewall collapse.
3) Refusal on medium hard rock sandstone.

CONTRACTOR :
MACHINE : Hitachi 20 Ton Excavator
DRILLED BY :
PROFILED BY : Eugene Laubscher
TYPE SET BY :
SETUP FILE : STANDARD.SET

LOCATION:
DIAM :
DATE :
DATE : 12 September 2017
DATE : 09/10/2017 11:31
TEXT : ..files\clanwilliam(3).txt

COLLAR LEVEL :
X COORD :
Y COORD :

HOLE No: TP14

CORE GEOTECHNICAL CONSULTANTS
Engineering Geology and Geohydrology

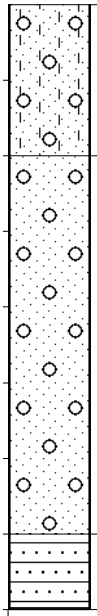
CLANWILLIAM HOUSING

TEST PIT SOIL PROFILES

HOLE No: TP15
Sheet 1 of 1

JOB NUMBER: 143-17

Scale 1:10



0.00 Dry to slightly moist yellow brown loose gravelly silty sand.
Transported - low gravel content.

0.20 Slightly moist orange and red dense to very dense bouldery gravelly sand.
Residual sandstone.

0.70 Orange brown completely weathered medium grained thinly bedded closely jointed soft rock sandstone.

0.80

NOTES

1) No seepage.

2) No sidewall collapse.

3) Refusal on medium hard rock sandstone.

CONTRACTOR :
MACHINE : Hitachi 20 Ton Excavator
DRILLED BY :
PROFILED BY : Eugene Laubscher
TYPE SET BY :
SETUP FILE : STANDARD.SET

LOCATION:
DIAM :
DATE :
DATE : 12 September 2017
DATE : 09/10/2017 11:31
TEXT : ..files\clanwilliam(3).txt

COLLAR LEVEL :
X COORD :
Y COORD :

HOLE No: TP15

CORE GEOTECHNICAL CONSULTANTS
Engineering Geology and Geohydrology

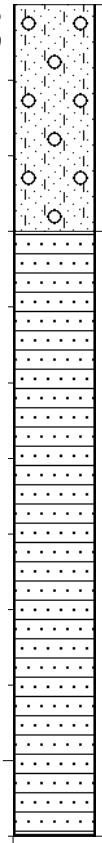
CLANWILLIAM HOUSING

TEST PIT SOIL PROFILES

HOLE No: TP16
Sheet 1 of 1

JOB NUMBER: 143-17

Scale 1:10



0.00 Dry yellow brown very loose to loose bouldery gravelly silty sand. Transported.

0.30 Orange brown completely weathered medium grained thinly bedded closely jointed soft rock sandstone.

1.10

NOTES

1) No seepage.
2) No sidewall collapse.
3) Refusal on medium hard rock sandstone.

CONTRACTOR :
MACHINE : Hitachi 20 Ton Excavator
DRILLED BY :
PROFILED BY : Eugene Laubscher
TYPE SET BY :
SETUP FILE : STANDARD.SET

LOCATION:
DIAM :
DATE :
DATE : 12 September 2017
DATE : 09/10/2017 11:31
TEXT : ..files\clanwilliam(3).txt

COLLAR LEVEL :
X COORD :
Y COORD :

HOLE No: TP16

CORE GEOTECHNICAL CONSULTANTS
Engineering Geology and Geohydrology

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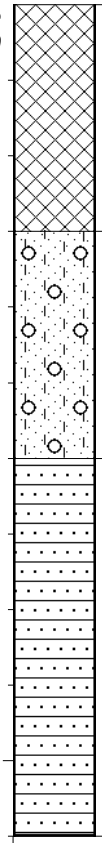
TEST PIT SOIL PROFILES

HOLE No: TP17
Sheet 1 of 1

JOB NUMBER: 143-17

Scale 1:10



0.00 Moist brown very loose silty sand with isolated gravel. Fill - contains waste material.

0.30 Dry to slightly moist yellow brown loose gravelly silty sand. Transported - low gravel content.

0.60 Orange brown completely weathered medium grained thinly bedded closely jointed soft rock sandstone.

1.10

NOTES

1) No seepage.
2) No sidewall collapse.
3) Refusal on medium hard rock sandstone.

CONTRACTOR :
MACHINE : Hitachi 20 Ton Excavator
DRILLED BY :
PROFILED BY : Eugene Laubscher
TYPE SET BY :
SETUP FILE : STANDARD.SET

LOCATION:
DIAM :
DATE :
DATE : 12 September 2017
DATE : 09/10/2017 11:31
TEXT : ..files\clanwilliam(3).txt

COLLAR LEVEL :
X COORD :
Y COORD :

HOLE No: TP17

CORE GEOTECHNICAL CONSULTANTS
Engineering Geology and Geohydrology

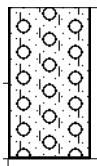
CLANWILLIAM HOUSING

TEST PIT SOIL PROFILES

HOLE No: TP18
Sheet 1 of 1

JOB NUMBER: 143-17

Scale 1:10



0.00

Dry yellow brown loose intact silty sand with isolated gravel.
Transported.

0.20

NOTES

1) No seepage.

2) No sidewall collapse.

3) Refusal on medium hard rock sandstone.

CONTRACTOR :
MACHINE : Hitachi 20 Ton Excavator
DRILLED BY :
PROFILED BY : Eugene Laubscher
TYPE SET BY :
SETUP FILE : STANDARD.SET

LOCATION:
DIAM :
DATE :
DATE : 12 September 2017
DATE : 09/10/2017 11:31
TEXT : ..files\clanwilliam(3).txt

COLLAR LEVEL :
X COORD :
Y COORD :

HOLE No: TP18

CORE GEOTECHNICAL CONSULTANTS
Engineering Geology and Geohydrology

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TEST PIT SOIL PROFILES

HOLE No: TP19
Sheet 1 of 1

JOB NUMBER: 143-17

Scale 1:10

0.00

Dry creamy yellow brown very loose intact sand.
Transported - contains isolated gravel.

1.30

NOTES

1) No seepage.

2) Sidewall collapse in sands.

3) Refusal on medium hard rock sandstone.

CONTRACTOR :
MACHINE : Hitachi 20 Ton Excavator
DRILLED BY :
PROFILED BY : Eugene Laubscher
TYPE SET BY :
SETUP FILE : STANDARD.SET

LOCATION:
DIAM :
DATE :
DATE : 12 September 2017
DATE : 09/10/2017 11:31
TEXT : ..files\clanwilliam(3).txt

COLLAR LEVEL :
X COORD :
Y COORD :

HOLE No: TP19

CORE GEOTECHNICAL CONSULTANTS
Engineering Geology and Geohydrology

CLANWILLIAM HOUSING

TEST PIT SOIL PROFILES

LEGEND
Sheet 1 of 1

JOB NUMBER: 143-17

	GRAVEL	{SA02}
	GRAVELLY	{SA03}
	SAND	{SA04}
	SANDY	{SA05}
	SILTY	{SA07}
	SANDSTONE	{SA11}
	FILL	{SA32}
Name	DISTURBED SAMPLE	{SA38}

CONTRACTOR :
MACHINE :
DRILLED BY :
PROFILED BY :

TYPE SET BY :
SETUP FILE : STANDARD.SET

LOCATION:
DIAM :
DATE :
DATE :

DATE : 09/10/2017 11:31
TEXT : ..files\clanwilliam(3).txt

COLLAR LEVEL :
X COORD :
Y COORD :

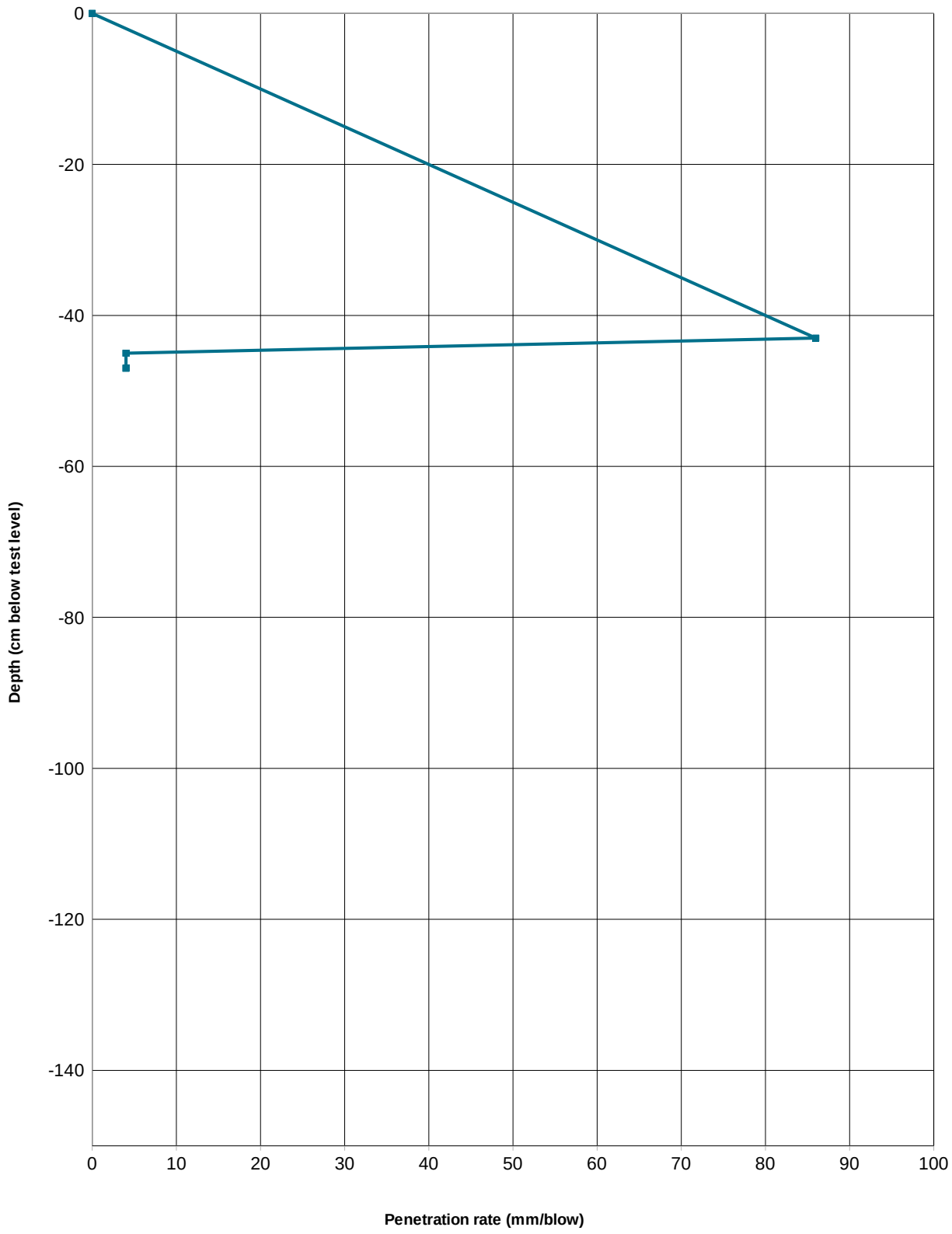
LEGEND
SUMMARY OF SYMBOLS

APPENDIX C – DYNAMIC PROBE LIGHT (DPL) TESTS

CORE GEOTECHNICAL CONSULTANTS
Engineering Geology and Geohydrology

CLANWILLIAM HOUSING **JOB NO.:** 143-17

DYNAMIC PROBE LIGHT (DPL) TEST **DPL NO:** 1
LEVEL: GL



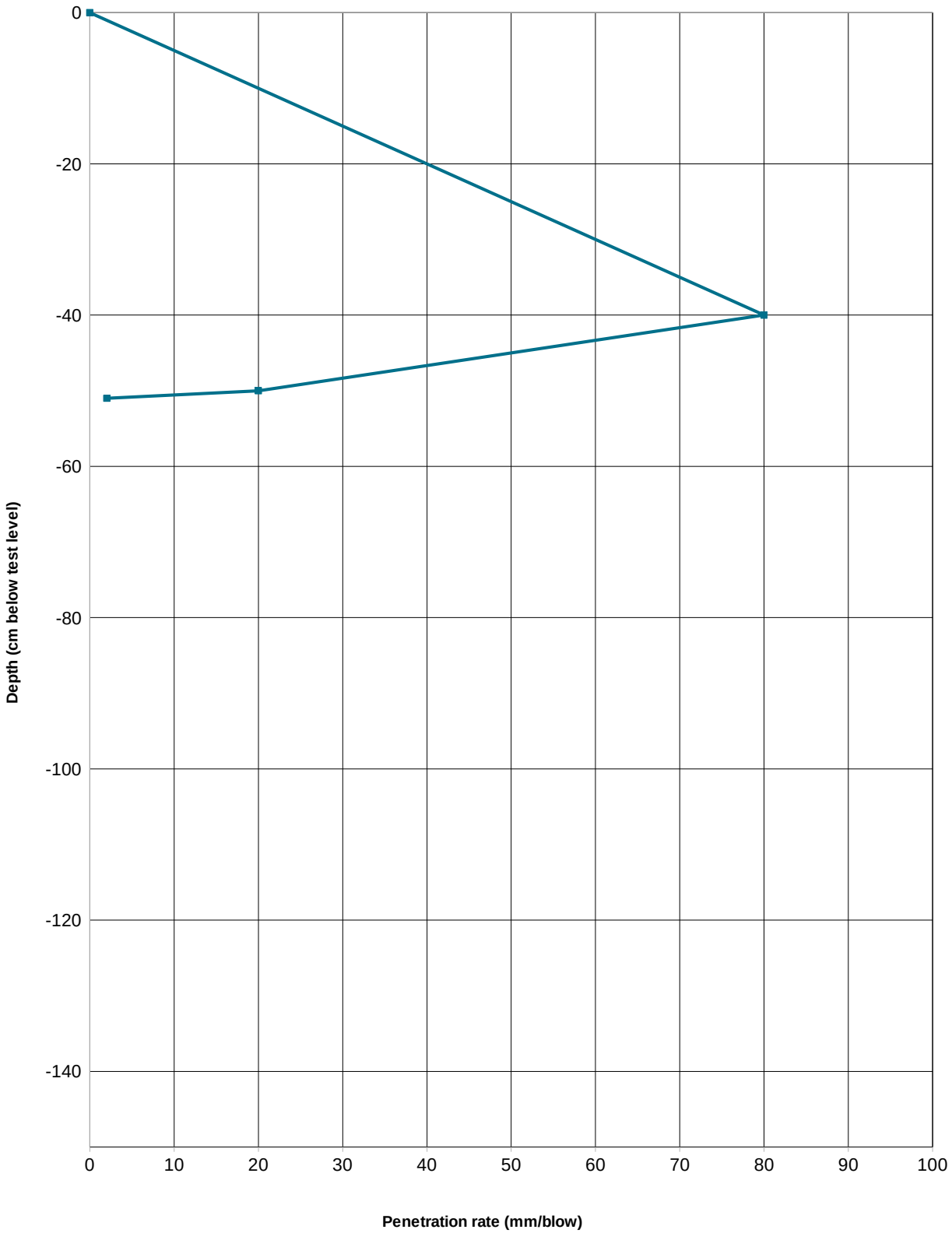
CORE GEOTECHNICAL CONSULTANTS
Engineering Geology and Geohydrology

CLANWILLIAM HOUSING

JOB NO.: 143-17

DYNAMIC PROBE LIGHT (DPL) TEST

DPL NO: 2
LEVEL: GL



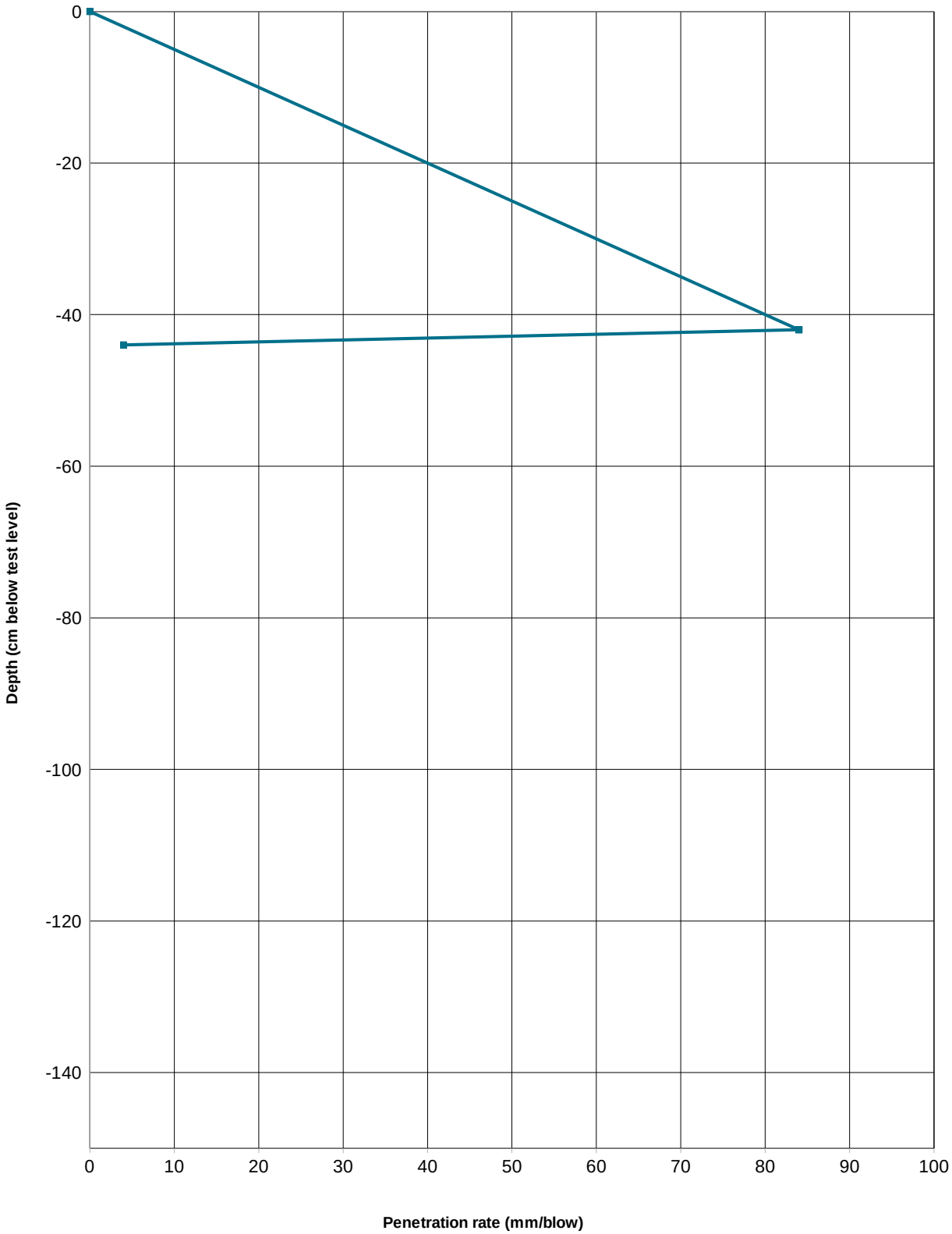
CORE GEOTECHNICAL CONSULTANTS
Engineering Geology and Geohydrology

CLANWILLIAM HOUSING

JOB NO.: 143-17

DYNAMIC PROBE LIGHT (DPL) TEST

DPL NO: 3
LEVEL: GL



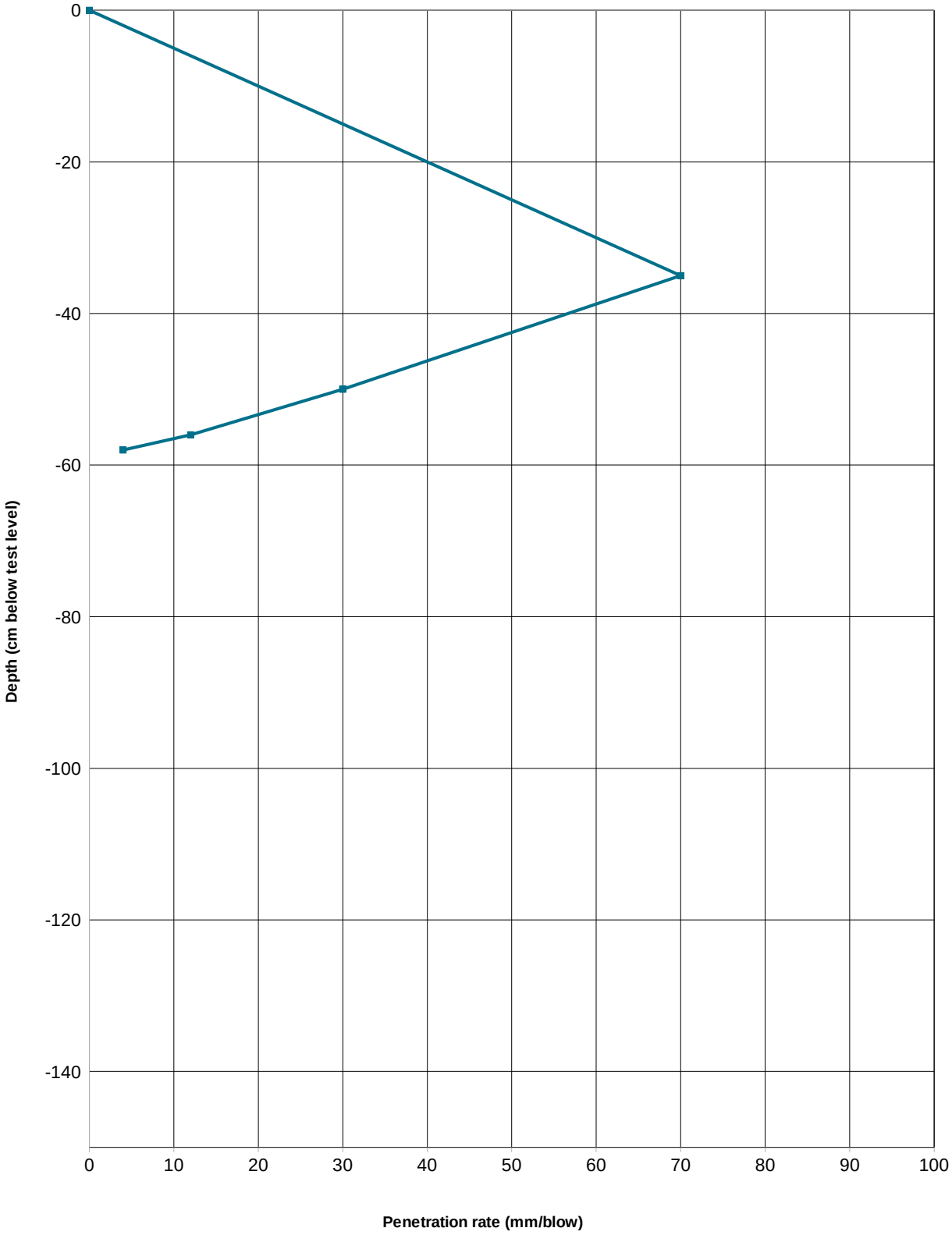
CORE GEOTECHNICAL CONSULTANTS
Engineering Geology and Geohydrology

CLANWILLIAM HOUSING

JOB NO.: 143-17

DYNAMIC PROBE LIGHT (DPL) TEST

DPL NO: 4
LEVEL: GL



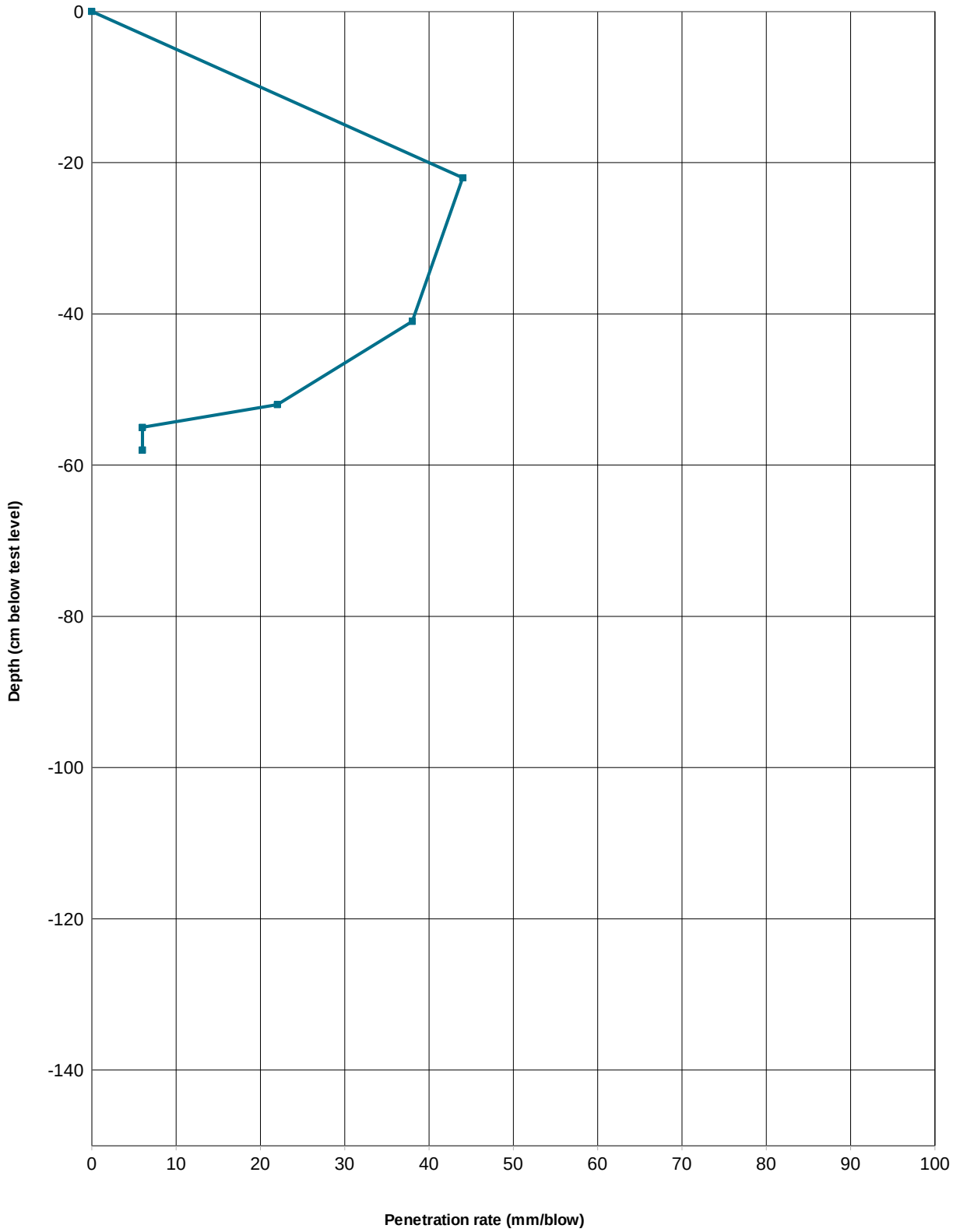
CORE GEOTECHNICAL CONSULTANTS
Engineering Geology and Geohydrology

CLANWILLIAM HOUSING

JOB NO.: 143-17

DYNAMIC PROBE LIGHT (DPL) TEST

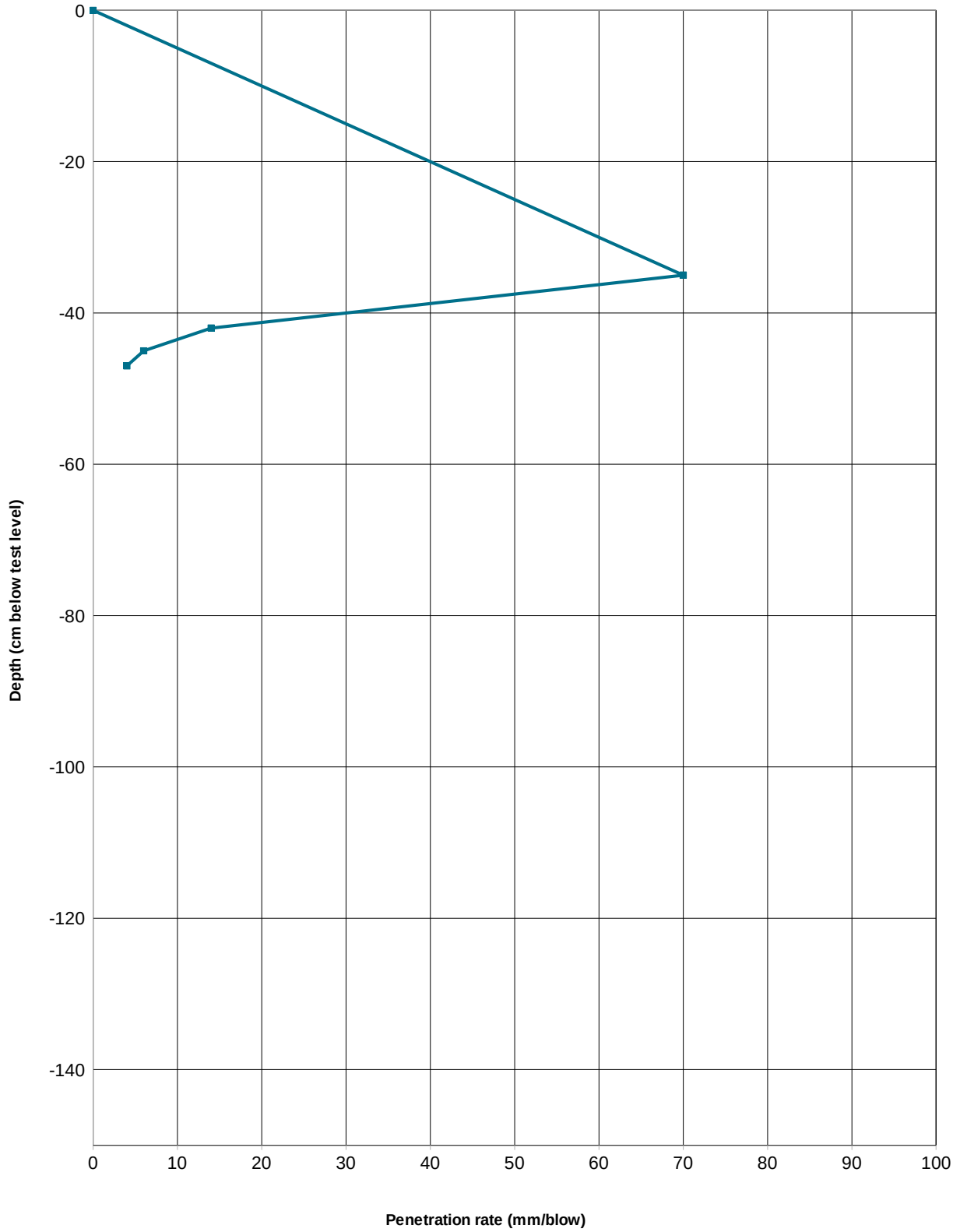
DPL NO: 5
LEVEL: GL



CORE GEOTECHNICAL CONSULTANTS
Engineering Geology and Geohydrology

CLANWILLIAM HOUSING **JOB NO.:** 143-17

DYNAMIC PROBE LIGHT (DPL) TEST **DPL NO:** 7
LEVEL: GL



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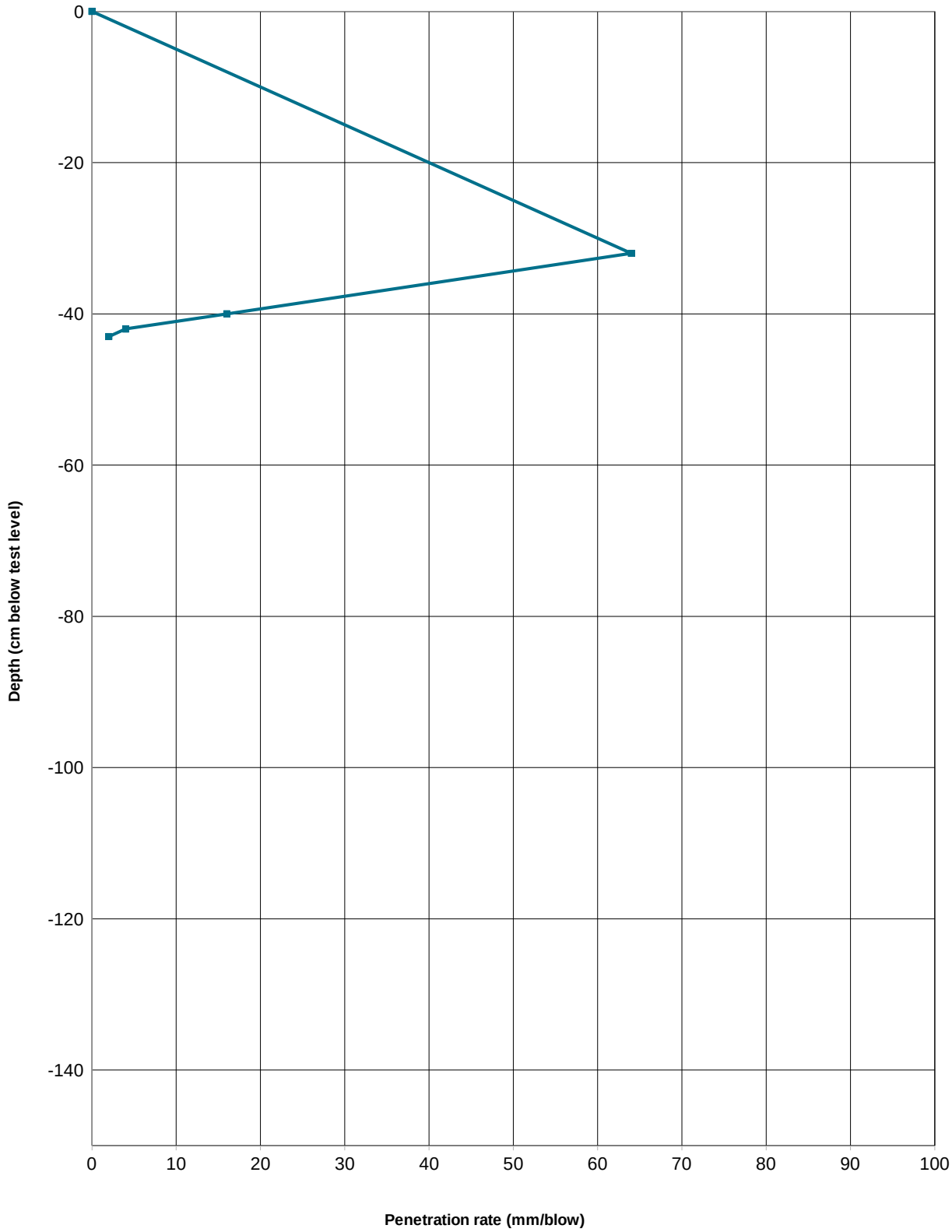
Engineering Geology and Geohydrology

CLANWILLIAM HOUSING **JOB NO.:** 143-17

DYNAMIC PROBE LIGHT (DPL) TEST **DPL NO:** 8
LEVEL: GL



CORE GEOTECHNICAL CONSULTANTS
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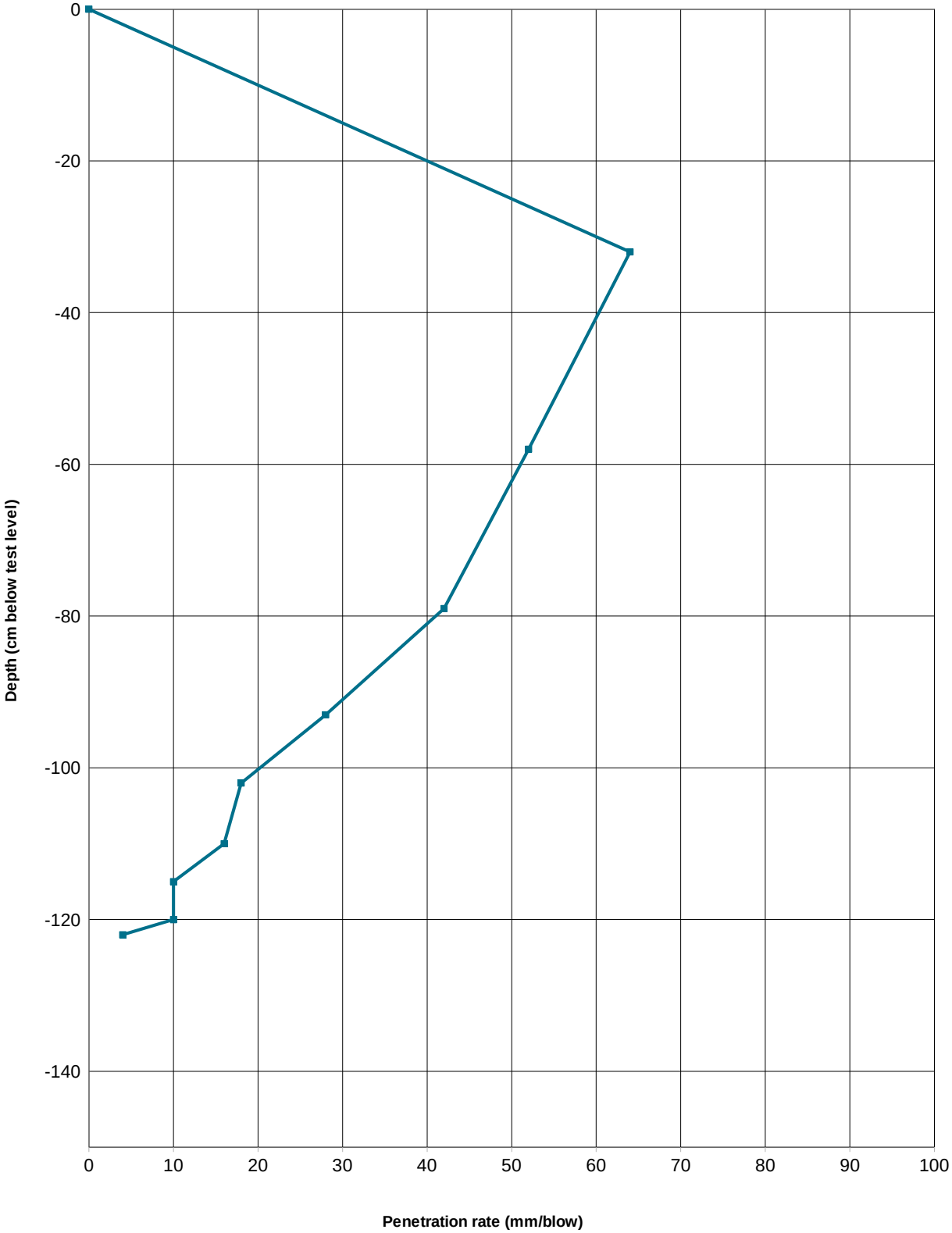
CLANWILLIAM HOUSING

JOB NO.: 143-17

DYNAMIC PROBE LIGHT (DPL) TEST

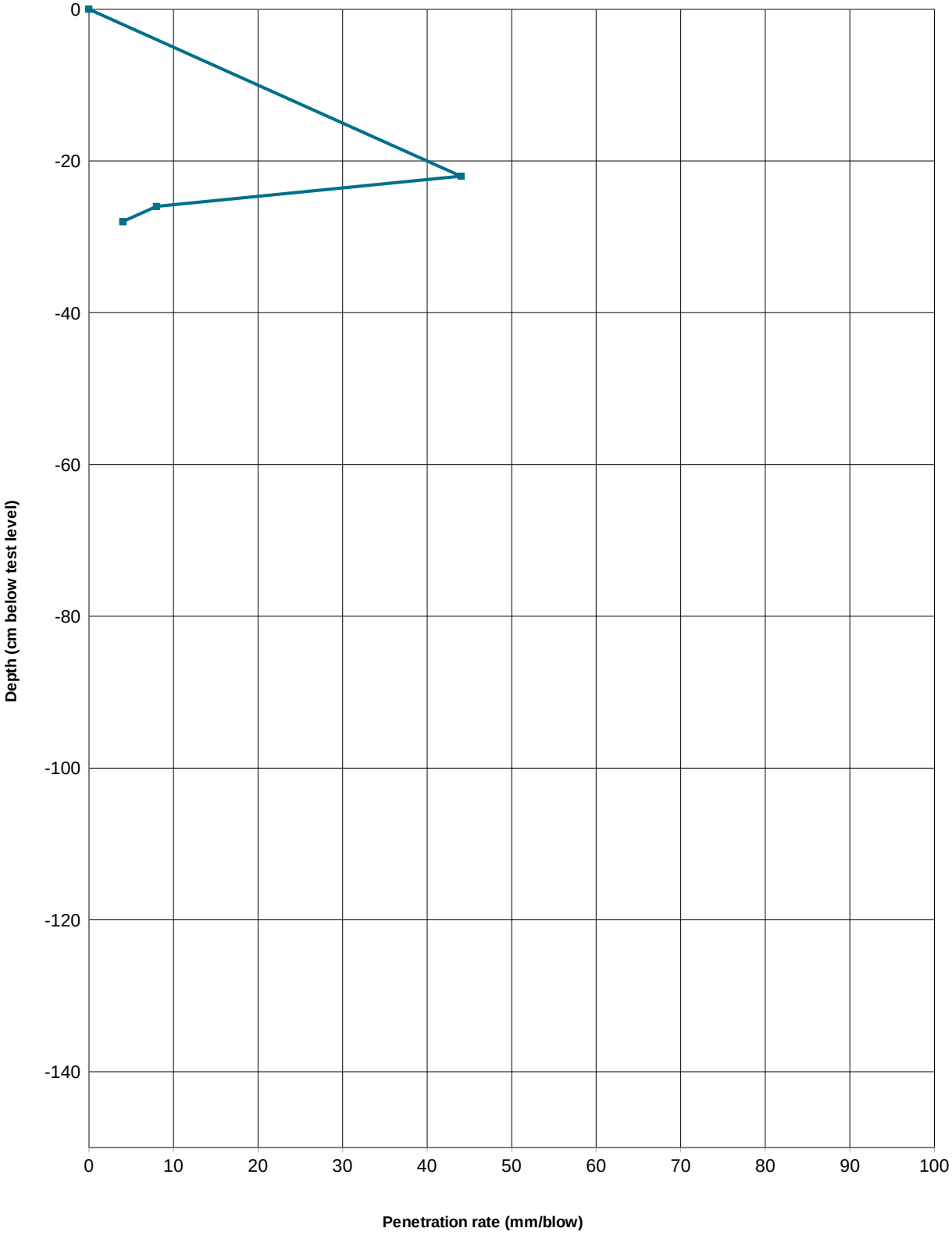
DPL NO: 9
LEVEL: GL



CORE GEOTECHNICAL CONSULTANTS
Engineering Geology and Geohydrology

CLANWILLIAM HOUSING **JOB NO.:** 143-17

DYNAMIC PROBE LIGHT (DPL) TEST **DPL NO:** 10
LEVEL: GL



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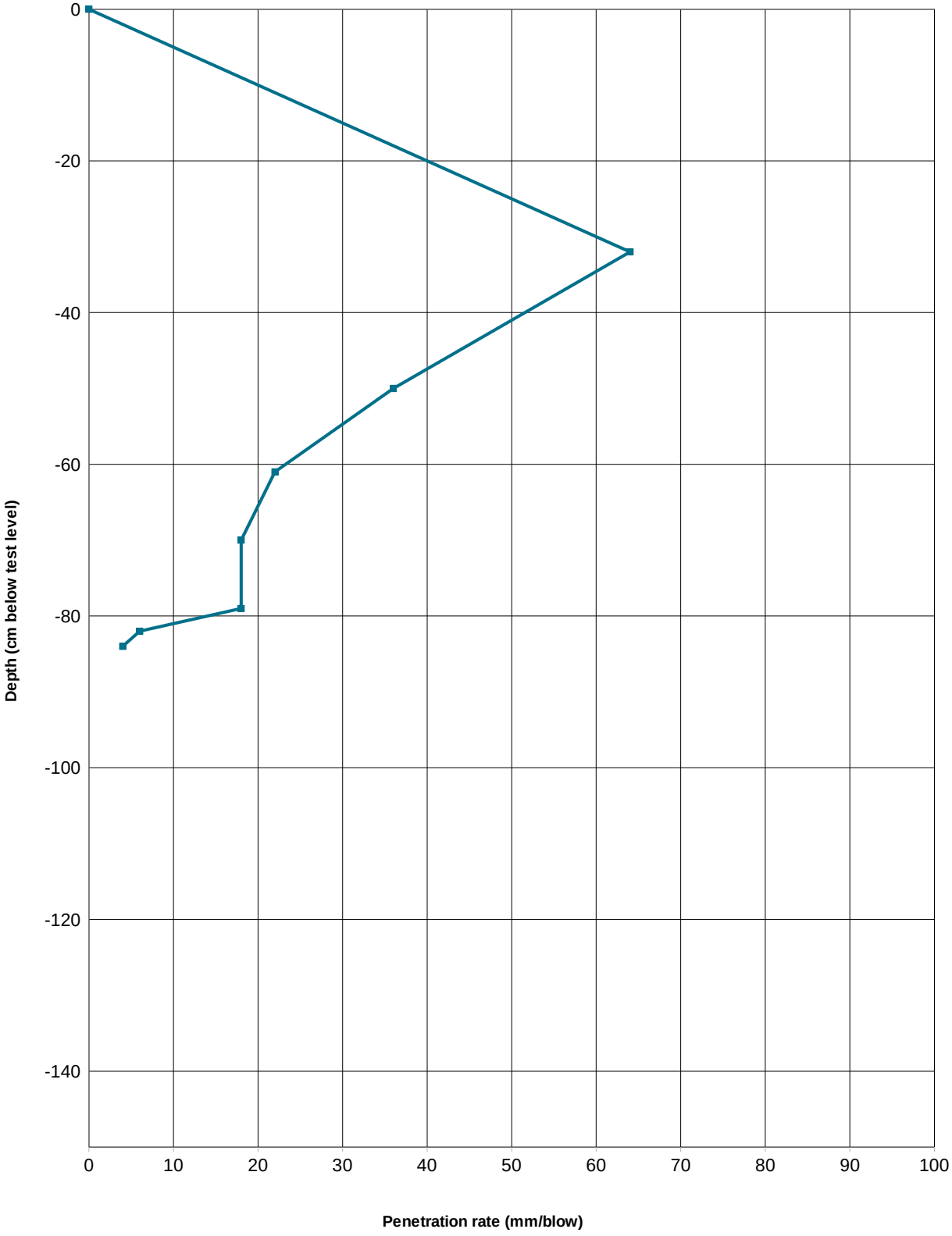
CLANWILLIAM HOUSING **JOB NO.:** 143-17

DYNAMIC PROBE LIGHT (DPL) TEST **DPL NO:** 11
LEVEL: GL



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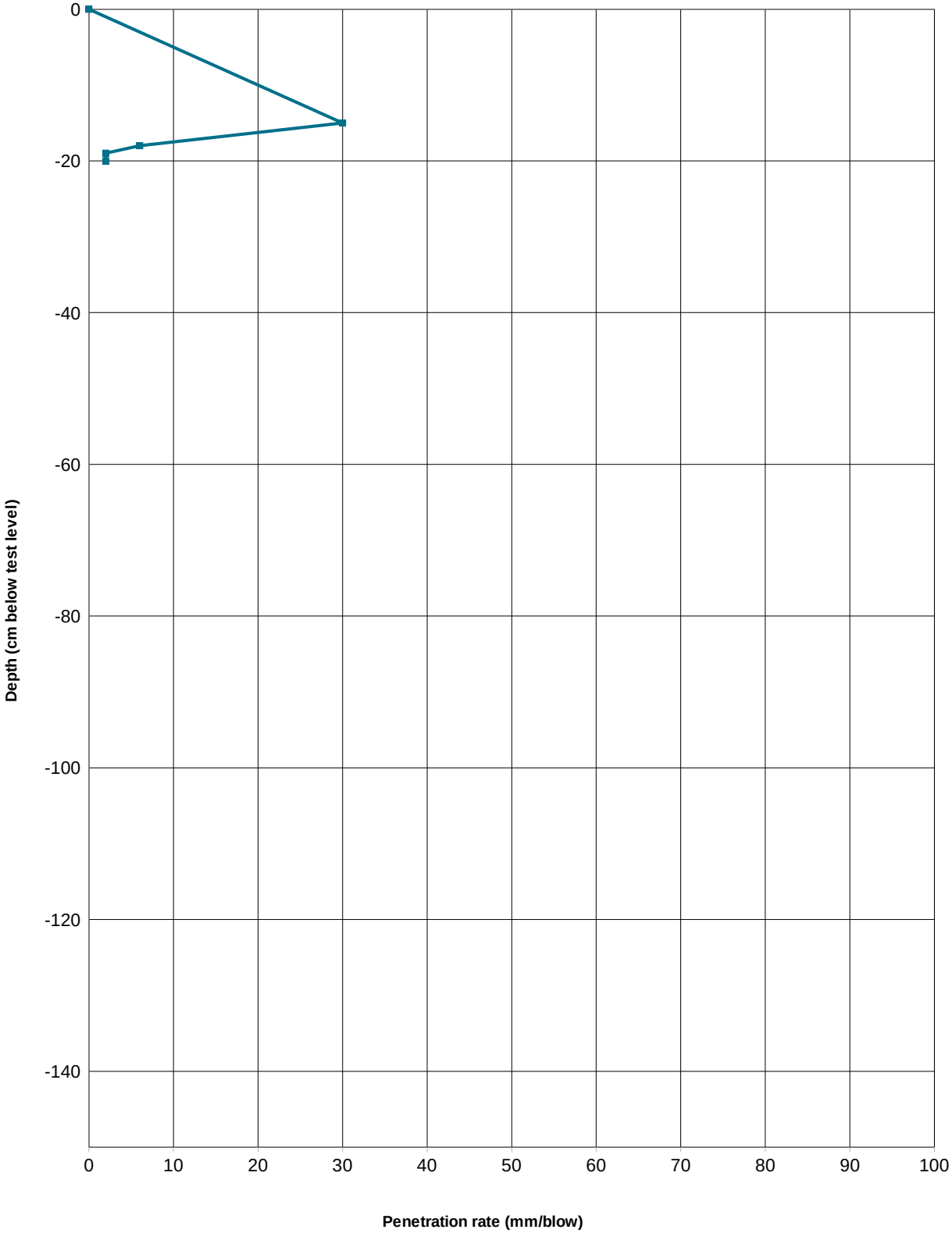
CLANWILLIAM HOUSING

JOB NO.: 143-17

DYNAMIC PROBE LIGHT (DPL) TEST

DPL NO: 12
LEVEL: GL



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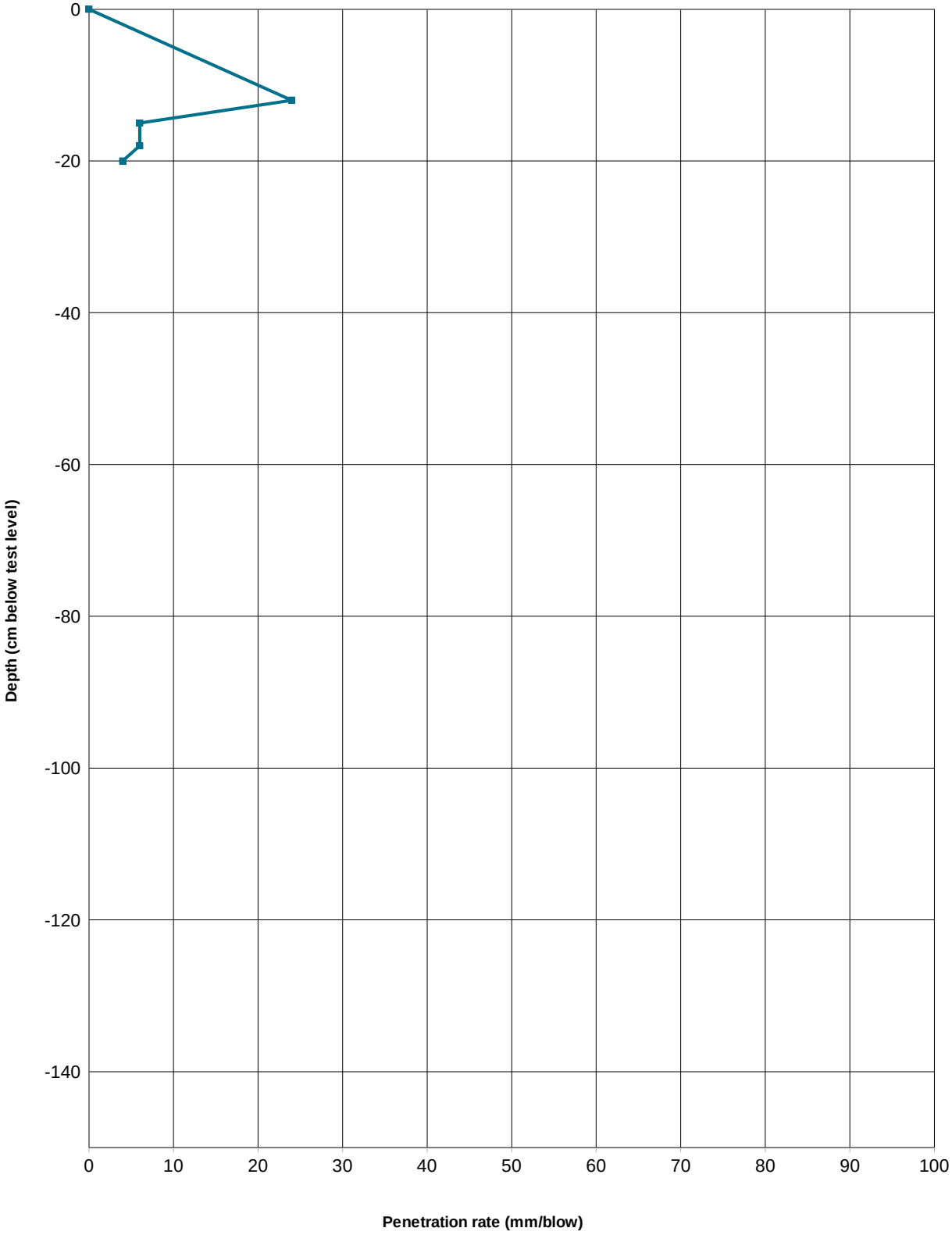
CLANWILLIAM HOUSING

JOB NO.: 143-17

DYNAMIC PROBE LIGHT (DPL) TEST

DPL NO: 13
LEVEL: GL



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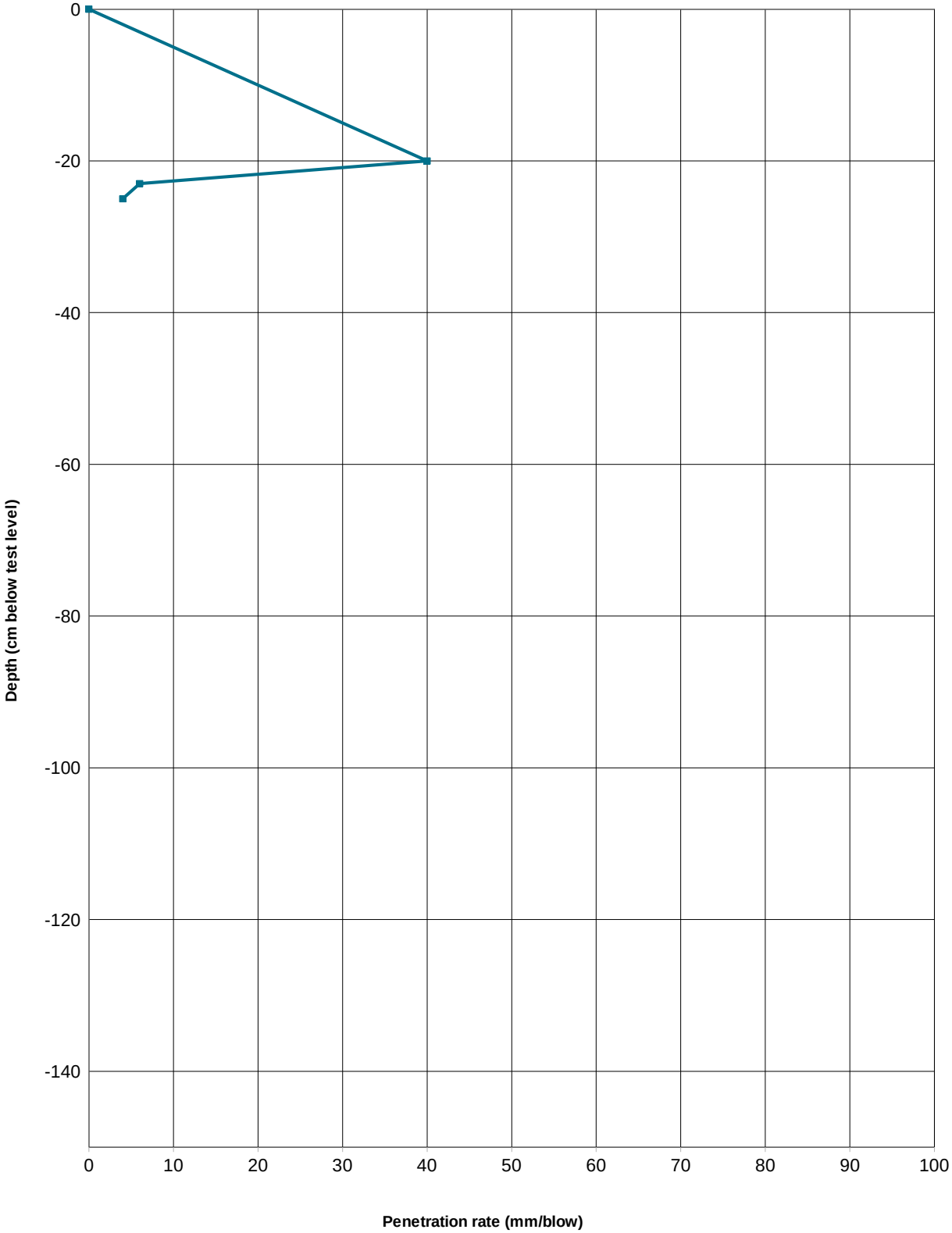
CLANWILLIAM HOUSING

JOB NO.: 143-17

DYNAMIC PROBE LIGHT (DPL) TEST

DPL NO: 14
LEVEL: GL



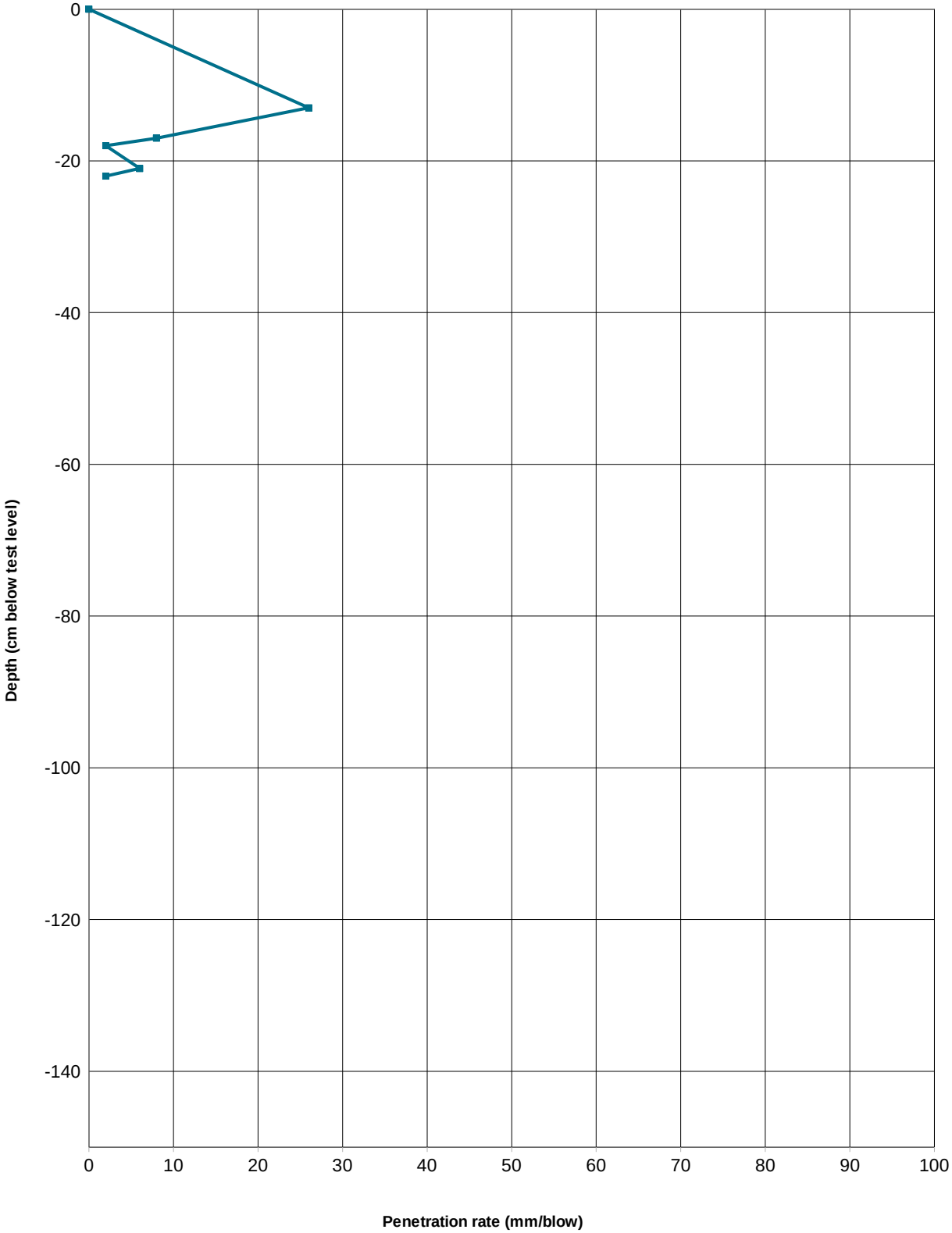
CORE GEOTECHNICAL CONSULTANTS
Engineering Geology and Geohydrology

CLANWILLIAM HOUSING

JOB NO.: 143-17

DYNAMIC PROBE LIGHT (DPL) TEST

DPL NO: 15
LEVEL: GL



CORE GEOTECHNICAL CONSULTANTS
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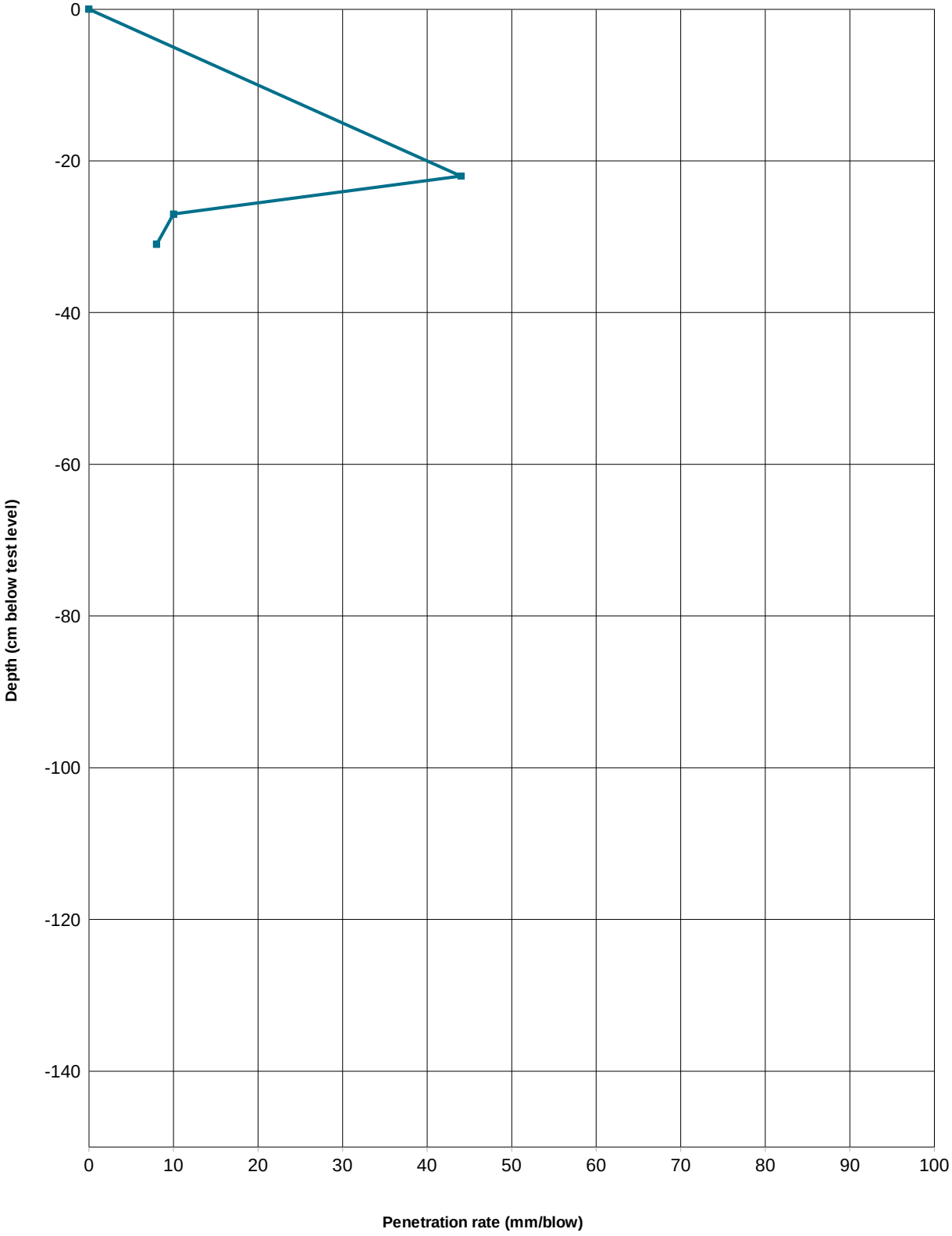
CLANWILLIAM HOUSING

JOB NO.: 143-17

DYNAMIC PROBE LIGHT (DPL) TEST

DPL NO: 16
LEVEL: GL



CORE GEOTECHNICAL CONSULTANTS
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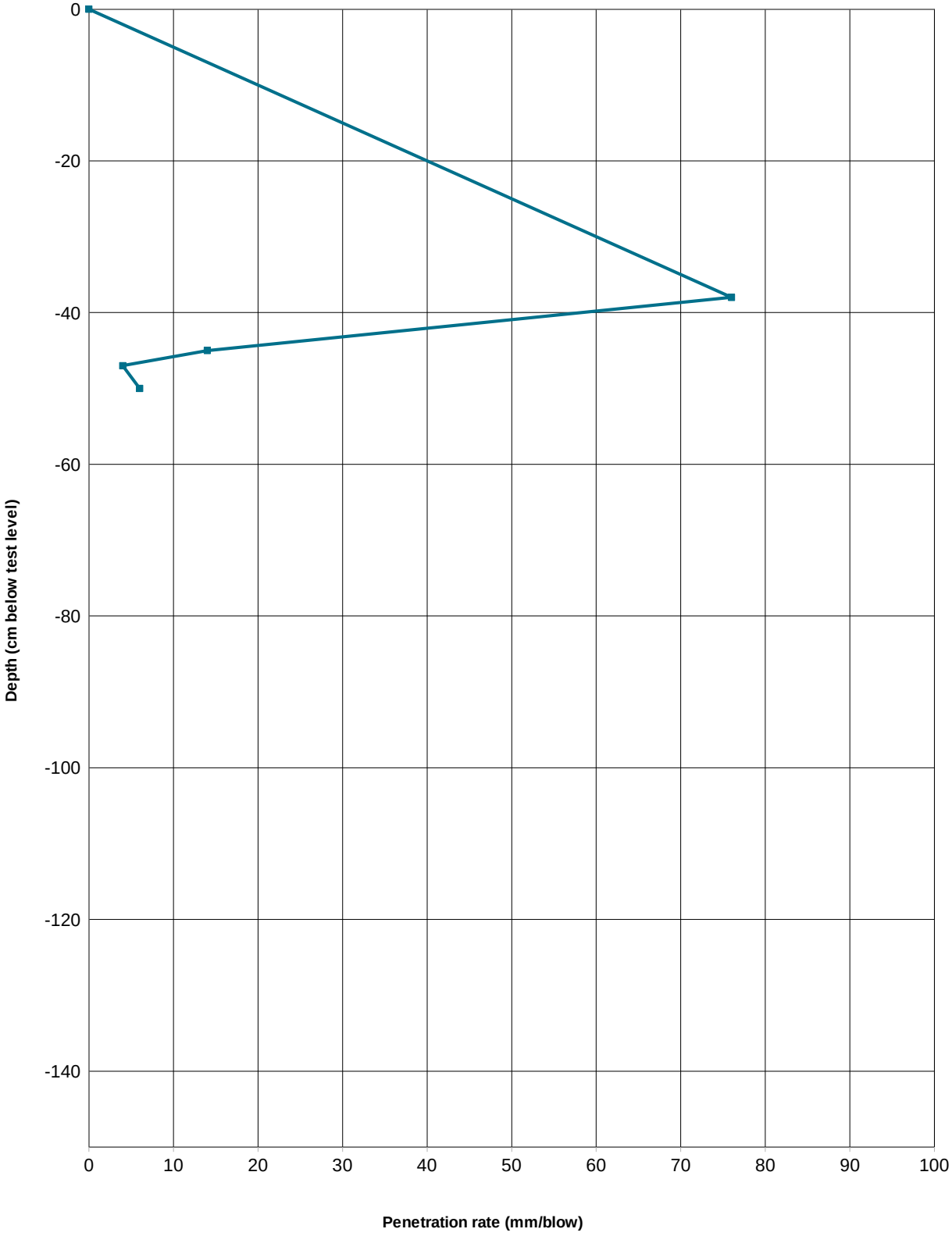
CLANWILLIAM HOUSING **JOB NO.:** 143-17

DYNAMIC PROBE LIGHT (DPL) TEST **DPL NO:** 17
LEVEL: GL



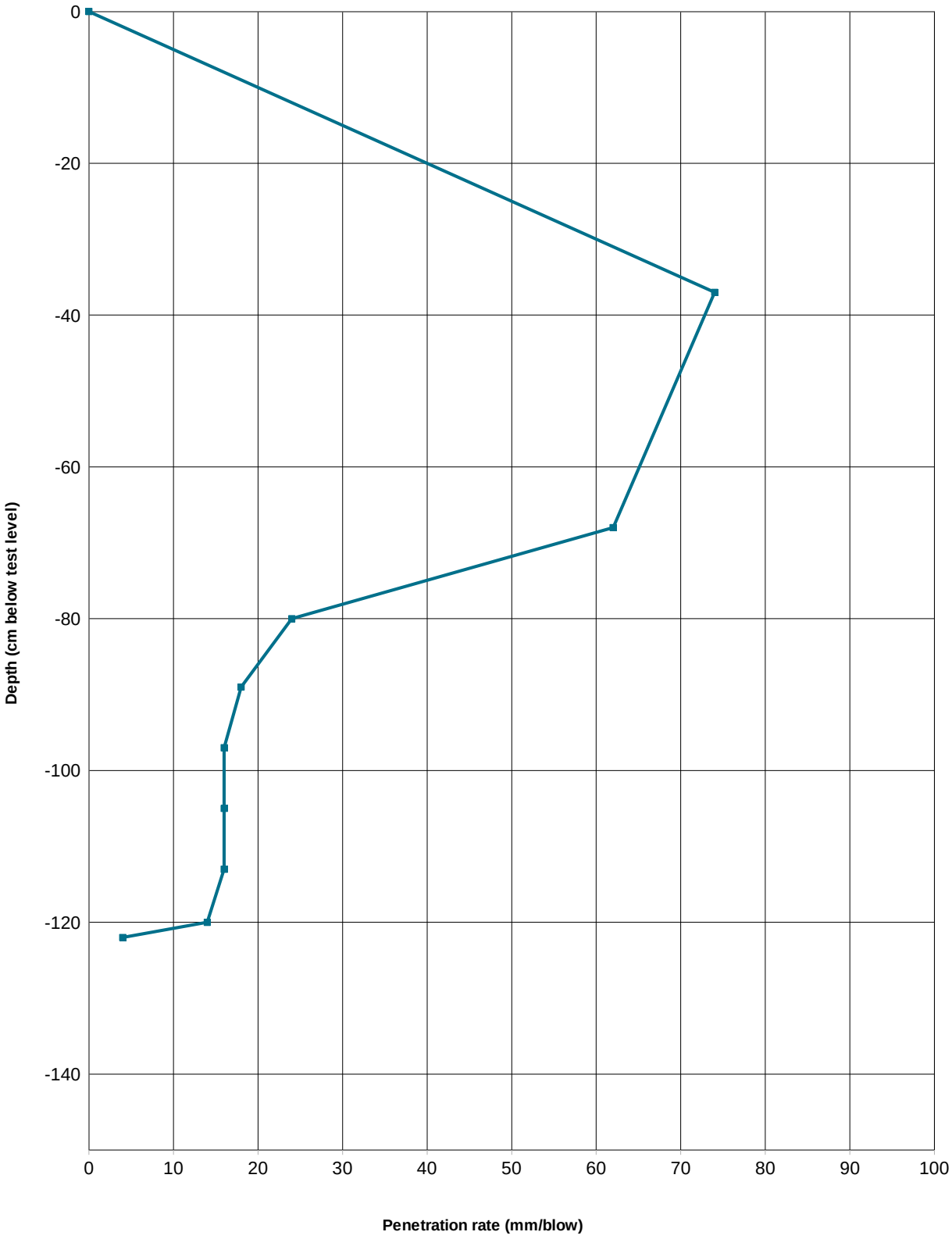
CORE GEOTECHNICAL CONSULTANTS
Engineering Geology and Geohydrology

CLANWILLIAM HOUSING

JOB NO.: 143-17

DYNAMIC PROBE LIGHT (DPL) TEST

DPL NO: 19
LEVEL: GL



APPENDIX D
Laboratory test results

GEOSCIENCE LABORATORIES (PTY) LTD

CLIENT:	Core Geotechnical Postnet Suite 177 Private Bag X3 Plumstead 7801	**PROJECT:**	Clanwilliam Housing
		DATE:	26-09-2017
ATT:	John Yates	**REF:**	L170920

ASTM D422 SIEVE ANALYSIS

DESCRIPTION :	yellow brown gvl silty sand	**SAMPLE NO. :**	29654
POSITION :	TP 4 @ 0.6-0.9m	**CLIENT SAMPLE NO. :**	

Sieve Analysis		Percent Passing
SIEVE SIZE (mm)	75,00	
	63,00	
	53,00	100
	37,50	88
	26,50	70
	19,00	61
	13,20	54
	9,50	47
	6,70	43
	4,75	41
	2,36	39
	2,00	39
	1,18	38
	0,600	34
	0,425	30
	0,300	23
	0,150	13
	0,0750	8

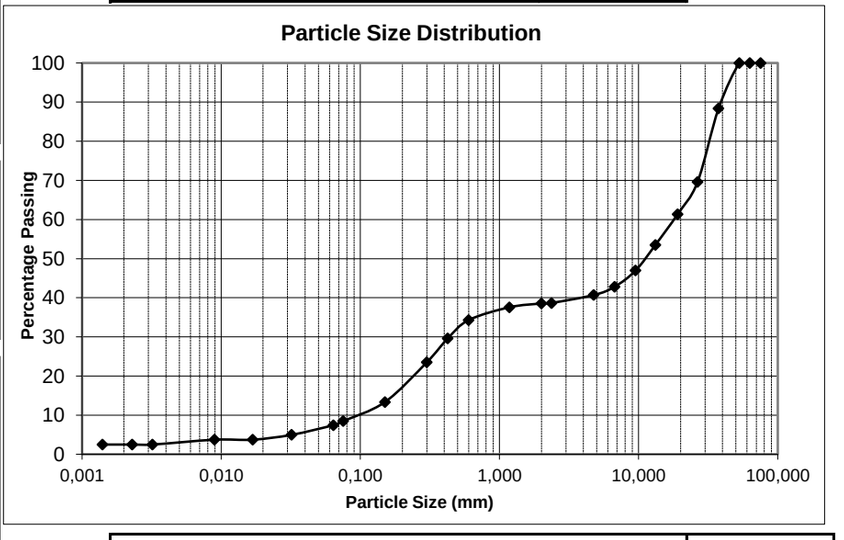
Hydrometer Analysis	
Diameter of particle (mm)	Percentage of soil suspension (%)
0,0740	7
0,0376	5
0,0190	4
0,0098	4
0,0035	2
0,0025	2
0,0014	2

SCS Dispersion Test	
Diameter of particle (mm)	Percentage of soil suspension (%)

% SCS Dispersion:	
Initial Moisture Content (%) :	3,4
pH:	7,40
Conductivity mS/m:	117

Atterberg Limits :	
Liquid Limit	
Plastic Index	N-P
Linear Shrinkage	

MOD AASHTO ; C.B.R. :	
MOD AASHTO (Kg/m³)	
O.M.C. (%)	
C.B.R. @ 100% Comp.	
C.B.R. @ 98 % Comp.	
C.B.R. @ 95 % Comp.	
C.B.R. @ 93 % Comp.	
C.B.R. @ 90 % Comp.	
Swell (max) %	



Tabulated Summary	Percentage
Gravel : Percentage - 4.75 mm	59
Sand : Percentage - 4.75mm and + 0.075mm	32
Silt : Percentage - 0.075mm and + 0.002mm	5
Clay : Percentage - 0.002mm	3

The above test results are pertinent to the samples received and tested only.
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For Geoscience:

Remarks:

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GEOSCIENCE LABORATORIES (PTY) LTD

CLIENT:	Core Geotechnical Postnet Suite 177 Private Bag X3 Plumstead 7801	**PROJECT:**	Clanwilliam Housing
		DATE:	26-09-2017
ATT:	John Yates	**REF:**	L170920

ASTM D422 SIEVE ANALYSIS

DESCRIPTION :	dark yellow silty sand	**SAMPLE NO. :**	29655
POSITION :	TP 5 @ 0-0.6m	**CLIENT SAMPLE NO. :**	

Sieve Analysis		Percent Passing
SIEVE SIZE (mm)	75,00	
	63,00	
	53,00	
	37,50	
	26,50	
	19,00	100
	13,20	98
	9,50	95
	6,70	92
	4,75	90
	2,36	88
	2,00	88
	1,18	87
	0,600	82
	0,425	73
	0,300	57
	0,150	24
	0,0750	9

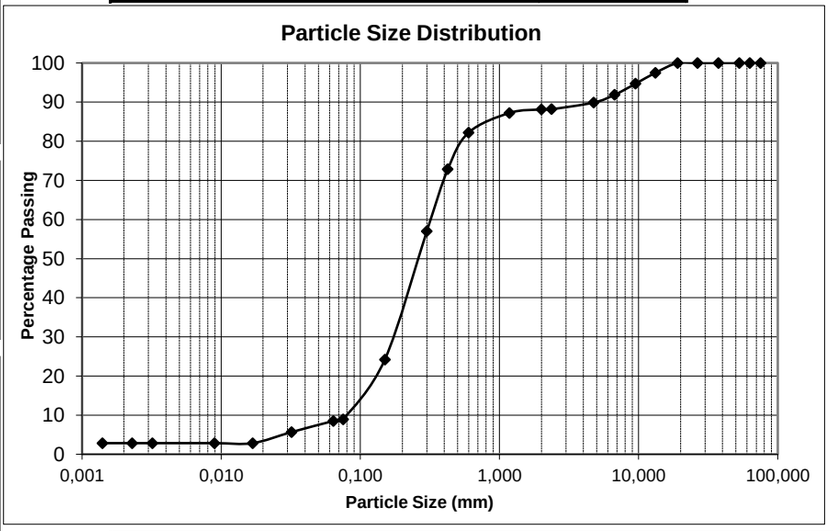
Hydrometer Analysis	
Diameter of particle (mm)	Percentage of soil suspension (%)
0,0760	9
0,0384	6
0,0193	3
0,0100	3
0,0035	3
0,0025	3
0,0015	3

SCS Dispersion Test	
Diameter of particle (mm)	Percentage of soil suspension (%)

% SCS Dispersion:	
Initial Moisture Content (%) :	0,8
pH:	4,20
Conductivity mS/m:	12

Atterberg Limits :	
Liquid Limit	
Plastic Index	N-P
Linear Shrinkage	

MOD AASHTO ; C.B.R. :	
MOD AASHTO (Kg/m³)	
O.M.C. (%)	
C.B.R. @ 100% Comp.	
C.B.R. @ 98 % Comp.	
C.B.R. @ 95 % Comp.	
C.B.R. @ 93 % Comp.	
C.B.R. @ 90 % Comp.	
Swell (max) %	



Tabulated Summary	Percentage
Gravel : Percentage - 4.75 mm	10
Sand : Percentage - 4.75mm and + 0.075mm	81
Silt : Percentage - 0.075mm and + 0.002mm	6
Clay : Percentage - 0.002mm	3

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For Geoscience:

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GEOSCIENCE LABORATORIES (PTY) LTD

CLIENT:	Core Geotechnical Postnet Suite 177 Private Bag X3 Plumstead 7801	**PROJECT:**	Clanwilliam Housing
		DATE:	26-09-2017
ATT:	John Yates	**REF:**	L170920

ASTM D422 SIEVE ANALYSIS

DESCRIPTION :	yellow brown gvl sand	**SAMPLE NO. :**	29656
POSITION :	TP 5 @ 0.6-1.1m	**CLIENT SAMPLE NO. :**	

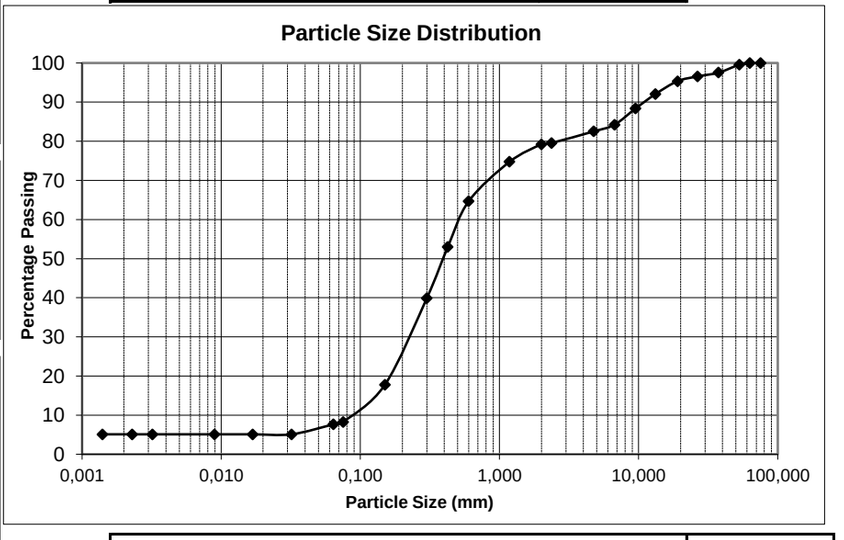
Sieve Analysis		Percent Passing
SIEVE SIZE (mm)	75,00	
	63,00	
	53,00	100
	37,50	98
	26,50	97
	19,00	95
	13,20	92
	9,50	88
	6,70	84
	4,75	83
	2,36	80
	2,00	79
	1,18	75
	0,600	65
	0,425	53
	0,300	40
	0,150	18
	0,0750	8

Hydrometer Analysis	
Diameter of particle (mm)	Percentage of soil suspension (%)
0,0760	8
0,0384	5
0,0192	5
0,0099	5
0,0035	5
0,0025	5
0,0014	5

SCS Dispersion Test	
Diameter of particle (mm)	Percentage of soil suspension (%)

% SCS Dispersion:	
Initial Moisture Content (%) :	
pH:	
Conductivity mS/m:	

Atterberg Limits :	
Liquid Limit	
Plastic Index	N-P
Linear Shrinkage	



MOD AASHTO ; C.B.R. :	
MOD AASHTO (Kg/m³)	1969
O.M.C. (%)	10,0
C.B.R. @ 100% Comp.	54
C.B.R. @ 98 % Comp.	40
C.B.R. @ 95 % Comp.	26
C.B.R. @ 93 % Comp.	20
C.B.R. @ 90 % Comp.	14
Swell (max) %	0,10

Tabulated Summary	Percentage
Gravel : Percentage - 4.75 mm	17
Sand : Percentage - 4.75mm and + 0.075mm	74
Silt : Percentage - 0.075mm and + 0.002mm	3
Clay : Percentage - 0.002mm	5

The above test results are pertinent to the samples received and tested only.
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For Geoscience:

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GEOSCIENCE LABORATORIES (PTY) LTD

CLIENT:	Core Geotechnical Postnet Suite 177 Private Bag X3 Plumstead 7801	**PROJECT:**	Clanwilliam Housing
		DATE:	26-09-2017
ATT:	John Yates	**REF:**	L170920

ASTM D422 SIEVE ANALYSIS

DESCRIPTION :	red brown gvl silty sand	**SAMPLE NO. :**	29657
POSITION :	TP 10 @ 0-0.4m	**CLIENT SAMPLE NO. :**	

Sieve Analysis		Percent Passing
SIEVE SIZE (mm)	75,00	
	63,00	100
	53,00	87
	37,50	75
	26,50	72
	19,00	71
	13,20	70
	9,50	70
	6,70	69
	4,75	69
	2,36	68
	2,00	68
	1,18	67
	0,600	60
	0,425	51
	0,300	40
	0,150	20
	0,0750	6

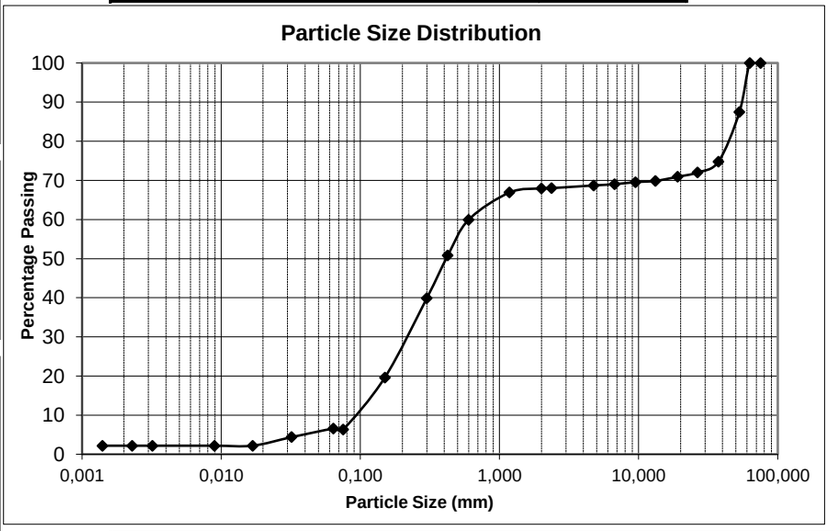
Hydrometer Analysis	
Diameter of particle (mm)	Percentage of soil suspension (%)
0,0760	7
0,0384	4
0,0193	2
0,0100	2
0,0035	2
0,0025	2
0,0015	2

SCS Dispersion Test	
Diameter of particle (mm)	Percentage of soil suspension (%)

% SCS Dispersion:	
Initial Moisture Content (%) :	0,5
pH:	7,80
Conductivity mS/m:	15

Atterberg Limits :	
Liquid Limit	
Plastic Index	N-P
Linear Shrinkage	

MOD AASHTO ; C.B.R. :	
MOD AASHTO (Kg/m³)	
O.M.C. (%)	
C.B.R. @ 100% Comp.	
C.B.R. @ 98 % Comp.	
C.B.R. @ 95 % Comp.	
C.B.R. @ 93 % Comp.	
C.B.R. @ 90 % Comp.	
Swell (max) %	



Tabulated Summary	Percentage
Gravel : Percentage - 4.75 mm	31
Sand : Percentage - 4.75mm and + 0.075mm	62
Silt : Percentage - 0.075mm and + 0.002mm	4
Clay : Percentage - 0.002mm	2

The above test results are pertinent to the samples received and tested only.
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GEOSCIENCE LABORATORIES (PTY) LTD

CLIENT:	Core Geotechnical Postnet Suite 177 Private Bag X3 Plumstead 7801	**PROJECT:**	Clanwilliam Housing
		DATE:	26-09-2017
ATT:	John Yates	**REF:**	L170920

ASTM D422 SIEVE ANALYSIS

DESCRIPTION :	red orange gvl silty sand	**SAMPLE NO. :**	29658
POSITION :	TP 12 @ 0-0.3m	**CLIENT SAMPLE NO. :**	

Sieve Analysis		Percent Passing
SIEVE SIZE (mm)	75,00	94
	63,00	92
	53,00	90
	37,50	86
	26,50	84
	19,00	83
	13,20	82
	9,50	81
	6,70	81
	4,75	81
	2,36	81
	2,00	80
	1,18	74
	0,600	60
	0,425	47
	0,300	32
	0,150	16
	0,0750	9

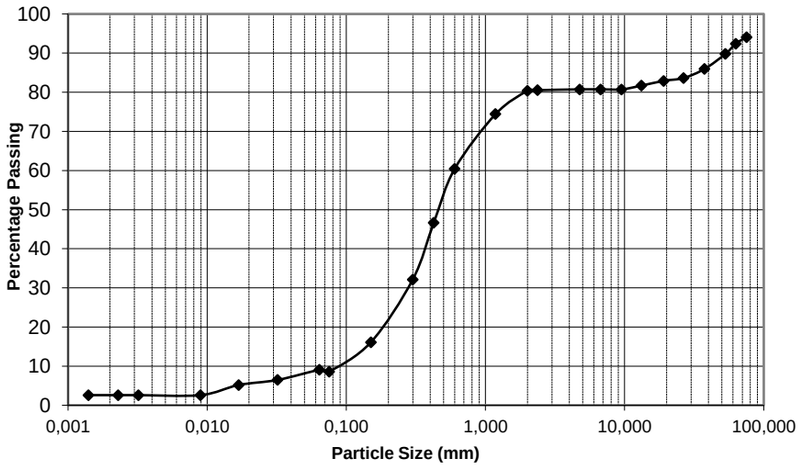
Hydrometer Analysis	
Diameter of particle (mm)	Percentage of soil suspension (%)
0,0760	9
0,0384	6
0,0192	5
0,0100	3
0,0035	3
0,0025	3
0,0015	3

SCS Dispersion Test	
Diameter of particle (mm)	Percentage of soil suspension (%)

% SCS Dispersion:	
Initial Moisture Content (%) :	
pH:	
Conductivity mS/m:	

Atterberg Limits :	
Liquid Limit	
Plastic Index	N-P
Linear Shrinkage	

Particle Size Distribution



MOD AASHTO ; C.B.R. :	
MOD AASHTO (Kg/m³)	1928
O.M.C. (%)	8,4
C.B.R. @ 100% Comp.	52
C.B.R. @ 98 % Comp.	49
C.B.R. @ 95 % Comp.	45
C.B.R. @ 93 % Comp.	43
C.B.R. @ 90 % Comp.	39
Swell (max) %	0,10

Tabulated Summary	Percentage
Gravel : Percentage - 4.75 mm	19
Sand : Percentage - 4.75mm and + 0.075mm	72
Silt : Percentage - 0.075mm and + 0.002mm	7
Clay : Percentage - 0.002mm	2

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For Geoscience:

Remarks:

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GEOSCIENCE LABORATORIES (PTY) LTD

CLIENT:	Core Geotechnical Postnet Suite 177 Private Bag X3 Plumstead 7801	**PROJECT:**	Clanwilliam Housing
		DATE:	26-09-2017
ATT:	John Yates	**REF:**	L170920

ASTM D422 SIEVE ANALYSIS

DESCRIPTION :	red brown clayey sand	**SAMPLE NO. :**	29659
POSITION :	TP 15 @ 0.2-0.7m	**CLIENT SAMPLE NO. :**	

Sieve Analysis		Percent Passing
SIEVE SIZE (mm)	75,00	
	63,00	
	53,00	
	37,50	
	26,50	
	19,00	100
	13,20	99
	9,50	99
	6,70	99
	4,75	98
	2,36	97
	2,00	97
	1,18	96
	0,600	89
	0,425	78
	0,300	63
	0,150	45
	0,0750	38

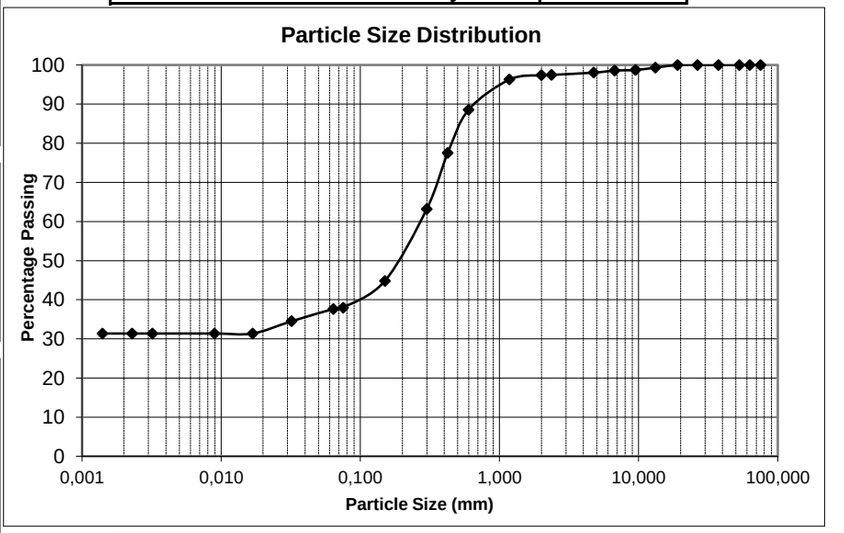
Hydrometer Analysis	
Diameter of particle (mm)	Percentage of soil suspension (%)
0,0699	38
0,0353	35
0,0179	31
0,0092	31
0,0032	31
0,0023	31
0,0013	31

SCS Dispersion Test	
Diameter of particle (mm)	Percentage of soil suspension (%)

% SCS Dispersion:	
Initial Moisture Content (%) :	6,6
pH:	
Conductivity mS/m:	

Atterberg Limits :	
Liquid Limit	22
Plastic Index	10
Linear Shrinkage	5,0

MOD AASHTO ; C.B.R. :	
MOD AASHTO (Kg/m³)	2016
O.M.C. (%)	8,7
C.B.R. @ 100% Comp.	37
C.B.R. @ 98 % Comp.	27
C.B.R. @ 95 % Comp.	20
C.B.R. @ 93 % Comp.	17
C.B.R. @ 90 % Comp.	11
Swell (max) %	0,20



Tabulated Summary	Percentage
Gravel : Percentage - 4.75 mm	2
Sand : Percentage - 4.75mm and + 0.075mm	60
Silt : Percentage - 0.075mm and + 0.002mm	7
Clay : Percentage - 0.002mm	31

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Remarks:

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APPENDIX E
VARIANCE CALCULATOR

NATIONAL HOUSING PROGRAMM **The adjustment of the subsidy amount to cater for extraordinary development conditions.**

Questionnaire

Name of project: Clanwilliam Housing Project

Project number:

ERF NRS:

		Size of House	40
1. GROUNDWATER	**YOU MAY HAVE ONLY ONE "Y" IN THIS SECTION**		
CATEGORY 1 - Permanent or perched water table equal to or less than 1.0m below ground level.			N
CATEGORY 2 - Permanent or perched water table more than 1.0 but less than 1.5m below ground level.			N
2. ERODIBILITY OF SOIL	**YOU MAY HAVE ONLY ONE "Y" IN THIS SECTION**		
CATEGORY 1 - High risk- Erodibility index 1-8			N
CATEGORY 2- Meduim risk - Erodibility index 9-15			Y
3. HARD EXCAVATION	**YOU MAY COMPLETE ONLY GATEGORY**		
CATEGORY 1 - Hard rock excavation		10% - 100%	35
CATEGORY 2 - Boulder excavation		10% - 100%	15
4. DOLOMITE (Site Class D)	***YOU MAY HAVE ONLY ONE "Y" IN SECTIONS 4-7***		
CATEGORY 1 - Class P and anticipated inherent risk Class 1 and 2: Dolomite area Class D2			N
CATEGORY 2 - Class P and anticipated inherent risk Class 3, 4 and 5: Dolomite area Class D3			N
5. EXPANSIVE CLAYS (Site Class H)	***YOU MAY HAVE ONLY ONE "Y" IN SECTIONS 4-7***		
CATEGORY 1 - Meduim - Class H1			N
CATEGORY 2 - High - Class H2		Low PE: 5 < CDS < 20	N
		OR Medium PE: 20 < CDS < 40	N
CATEGORY 3 - Very high - Class H3		High PE: 40 < CDS < 60	N
		OR Very High PE: CDS < 60	N
6. COLLAPSING SANDS (Site Class C)	***YOU MAY HAVE ONLY ONE "Y" IN SECTIONS 4-7***		
CATEGORY 1 - Class C1		Modified normal foundations	N
		OR Compaction below footings	N
CATEGORY 2 - Class C2		Compaction below footings	N
		OR Light raft	N
		OR Medium raft	N
		OR Heavy raft	N
		OR Special raft	N
7. COMPRESSIBLE SOILS (Site Class S)	***YOU MAY HAVE ONLY ONE "Y" IN SECTIONS 4-7***		
CATEGORY 1 - Class S1		Modified normal foundations	Y
		OR Compaction below footings	Y
CATEGORY 2 - Class S2		Light raft	N
		OR Medium raft	N
		OR Heavy raft	N
		OR Special raft	N
8. MINING SUBSIDENCE	**YOU MAY HAVE ONLY ONE "Y" IN THIS SECTION**		
CATEGORY 1 - Old under-mining depth 90m-240m below surface		Compaction below footings	N
		OR Medium raft	N
CATEGORY 2 - Mining within a depth of between 90m-240m below surface		Additional earthworks	N
		OR Soil mattress	N
9. SEISMIC ACTIVITY	**YOU MAY HAVE ONLY ONE "Y" IN THIS SECTION**		
CATEGORY 1 - Mining induced seismic activity >100 cm/s²		Stiffened strip footings	N
		OR Heavy raft	N
CATEGORY 2 - Natural induced seismic activity >100 cm/s²		Stiffened strip footings	N
		OR Heavy raft	N
10. TOPOGRAPHY OF THE SITE	**YOU MAY HAVE ONLY ONE "Y" IN THIS SECTION**		
CATEGORY 1 - Average ground slope flatter than 1:100			N
CATEGORY 2 - Average ground slope of between 1:11 and 1:20			Y
CATEGORY 3 - Average ground slope of between 1:7.5 and 1:10			N
CATEGORY 4 - Average ground slope of between 1:5 and 1:7.5			N
CATEGORY 5 - Average ground slope of more than 1:5			N
11. SOUTHERN CAPE COASTAL CONDENSATION AREAS			
Housing in the designated area is subject to severe condensation conditions.			N
12. LOCATION ADJUSTMENT			
Major Centre		Vredendal	
Distance from identified major centre (measured in ONE direction)			83.0 km
% allowance on material cost			2%
13. PHYSICAL DISABILLITIES AND SPECIAL HOUSING NEEDS			
CATEGORY A- Needs walking aids			
CATEGORY B - Partial usage of wheel chair.			
CATEGORY C - Full-time usage of wheel chair.			
CATEGORY D- Partially/profoundly deaf			
CATEGORY E- Partially/totally blind.			
CATEGORY F - Partially/ total movement loss/paralysis in the uper body limbs.			

Number of houses: