DAMON CLARK ASSOCIATES
CONSULTING GEOTECHNICAL ENGINEERS
2 PAMBATHI LANE, SIMBITHI
BALLITO 4420
cell. 082 - 554 8597
email damon@damonclark.co.za

Siebren du Plessis
siebren.duplessis@gmail.com

Dear Sir

8 October 2021

GEOTECHNICAL INVESTIGATION FOR THE PROPOSED DOUBLE STOREY DWELLING ON ERF 290 AT 59 NORTH BEACH ROAD, WESTBROOK

Ref No. J07200

1. Introduction & Terms of Reference

On 14 September 2007 Liesel Venter sent us an email formally appointing us to carry out a geotechnical investigation for the proposed house on the above site. Atelier & Associates, the architects for the house emailed us copies of the current drawings for the proposed house. The development was to comprise a double storey main house with a semi-basement garage at a lower level in front of the house. However, the site was subsequently sold to Siebren du Plessis who has had new house plans prepared. Siebren emailed Damon Clark copies of his house plans which essentially detail a double storey main house and a double storey garden flat as well as a proposed office pod. This is a slightly modified report on the geotechnical investigation which contains, inter alia, recommendations regarding the founding of the proposed buildings.

2. Site Investigation

The site investigation essentially comprised three dynamic cone penetrometer (DCP) tests. The approximate positions of the DCP tests, designated DCP 1 to DCP 3 are show on an attached sheet. Note that DCP 1 refused on what we consider is likely to be bedrock at a depth of approximately 6.2 metres, DCP 2 was close to full refusal (probably close to bedrock) at a depth of approximately 7.9 metres and DCP 3 was taken to a depth of 7 metres without refusal.

3. Site Description & Subsoil Conditions

The site is situated on the western side of North Beach Road, the road which runs along the beach frontage of Westbrook. It is bounded on its western side by the M4 National Road. The site slopes in an easterly direction down away from its M4 frontage to its North Beach Road frontage. Based on the Architect's cross section through the middle of the site, over the initial roughly 28 metres the average slope is approximately 1 vertical to 6 horizontal, then over the following roughly 36 metres the slope steepens to approximately 1 vertical to 2.25 horizontal before flattening again to about 1 vertical to 5 horizontal over the final 20 metres to its North Beach Road frontage. The site is undeveloped at present and is generally densely vegetated with bush, shrubs, and other smallish trees.

Based on the site investigation and our knowledge of the area, the site is underlain by a considerable depth of silty and clayey, uniformly grained aeolian sand. The Dynamic Cone Penetrometer Tests (DCP tests) carried out on the site indicate that although there is a fair degree of variability in the consistency of the subsoils, in the uppermost 1.1 metres to 2.7 metres the consistency generally ranges between very loose and loose, below which the subsoils are generally medium dense down to a depth of at least 5.7 metres. As stated above, we consider that DCP 1 refused on bedrock at a depth of approximately 6.2 metres. However, DCP 2 was taken to a depth of 7.9 metres without full refusal and DCP 3 was taken to a depth of 7 metres without coming close to refusal, indicating that the depth to bedrock increases as one moves up the slope. Based on the hand auger hole on the adjacent site, the uppermost 1.5 metres is generally moist, light orangey brown, very loose, slightly silty / clayey fine to medium grained aeolian sand. It should be noted that the uppermost sands are effectively cohesionless. As Figure 2, we have included one of the Architect's cross sections through the middle of the site, on which we have indicated a likely bedrock level based on the DCP tests.

4. Geotechnical Evaluation and Recommendations

4.1 Stability

We consider the site to be stable and suitable for development as proposed, provided the recommendations set out below are complied with.

It is apparent from the architects' drawings that an approximately 1.5 m to 2 m deep cuts banks will be required to building the proposed retaining walls on the upslope side of at least two of the proposed platforms for the buildings. We consider that these proposed cut depths are within the limits where it

would be feasible to build the retaining walls without having to resort to contiguous piling to ensure the stable excavation of the platforms. However, the excavation of these cut banks will have to approached with caution and we consider that it will only be feasible if the excavation and the construction of the retaining walls is done progressively in sections not exceeding approximately 7 metres. Note we consider that excavations higher than 3 metres would be is too risky without endangering the overall stability of the slope, unless an effective system of lateral support is installed. We consider that an appropriately designed anchored contiguous pile retaining wall could be utilised. However, it should be appreciated that such walls are relatively costly.

Included below are some general recommendations for carrying out earthworks in such areas.

1. Prior to the placement of fill over an area the vegetation should be stripped. Note however that the placement of fill over the very steep portions of the site should be avoided as such fill could destabilise these areas. As a general rule one should not add fill to slopes that are already close to the natural angle of repose of the subsoils. On this site the natural angle of repose of the soils is approximately 28 degrees.
2. Fills should be benched into the existing slope with minimum bench widths of three metres.
3. Cut and fill slopes should be formed at angles no steeper than 1 vertical to 1.75 horizontal and preferably at no steeper than 1 vertical to 2 horizontal. In the short term a cut slope of 1 vertical to 1.5 horizontal may be used provided the maximum depth of cut is less than 3.5 metres.
4. The minimum compaction of the fills should be 93% ModAASHTO density.
5. The uniformly grained aeolian sands are highly erodible thus effective storm water control both during and following construction is imperative. In this regard we recommend that both short and long term storm water control berms be formed at the tops of banks in order to obviate concentrated storm water flow down the banks. Appreciable uncontrolled volumes of storm water should not be allowed to concentrate at any point on the site as this will undoubtedly result in excessive scour. It will further be prudent to use strategically positioned rows of sandbags and silt control fences to reduce potential scour during the course of construction.
6. In order to minimise the risks of severe scour all banks should be vegetated as soon as is practicable. The type of vegetation utilised on the banks should be deep rooted and we recommend that a landscaping specialist be employed in this regard. Note that wherever possible the natural vegetation on the steep slopes should not be removed as this assists in stabilising the slope.

It should be noted that in terms of the SABS 1200 D classification for ease of excavation and measurement and payment purposes, we anticipate that all subsoils encountered in carrying out the earthworks will classify as soft excavation.

4.2 Foundations

In view inter alia, of the variable and generally very loose to loose consistency of the uppermost aeolian sands underlying the site, we strongly recommend that in order to obviate the risk of unacceptable cracks induced by differential settlements the proposed buildings be supported on piles. Such piles would serve to transmit the foundation loads through the uppermost loose sands either onto bedrock or into relatively dense sands that are less susceptible to settlement. As stated above we consider that DCP 1 refused on bedrock at a depth of approximately 6.2 metres. Thus it is quite likely that many if not all the piles will be end bearing piles that should be socketed at least 0.5 metres into competent bedrock. However based on our investigation we cannot be certain of the depths to bedrock and we therefore recommend that as a guide for budgeting purposes it conservatively be assumed that the piles will function primarily as friction piles and that the following embedment lengths are applicable to pressure grouted auger piles.

Pile Diameter	Maximum Working Load	Embedment Length in Natural Ground
mm	kN	m
250	250	11.0
300	350	11.5
350	500	13.0

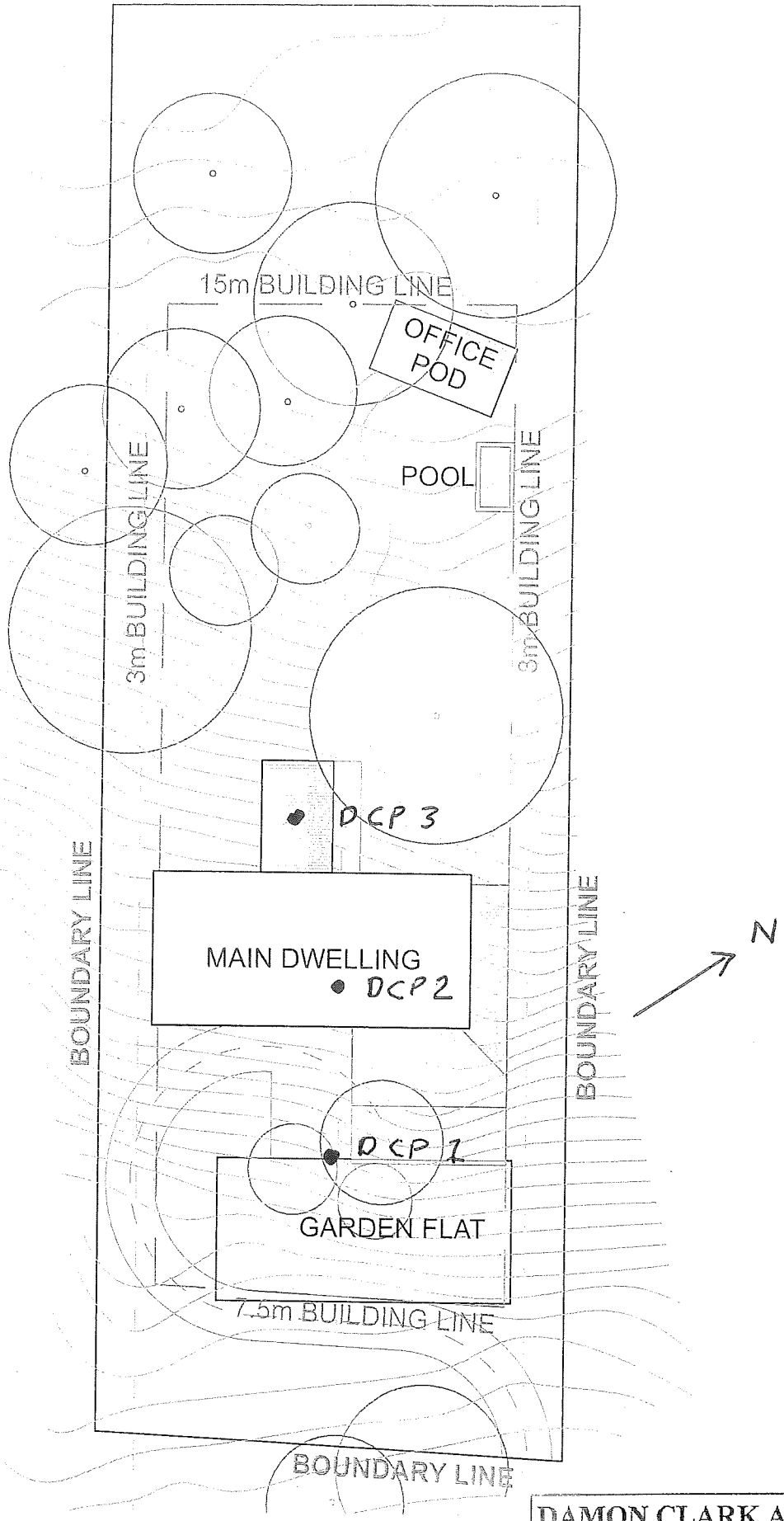
Note the final design of any piles sited in areas of fill will have to take into account the depth of the fill and down drag effects of the fill. All piles should be reinforced to a depth of at least 6 metres.

Note that the aeolian sands that underlie the site generally exhibit collapse settlement upon inundation with water. Thus, it is important that the finished ground is shaped in such a manner as to promote the flow of storm water away from the house and thereby prevent ponding of water in the vicinity of the house.

We trust that the above meets with your immediate requirements in this regard, and should you have any queries please do not hesitate to contact us.

Yours faithfully

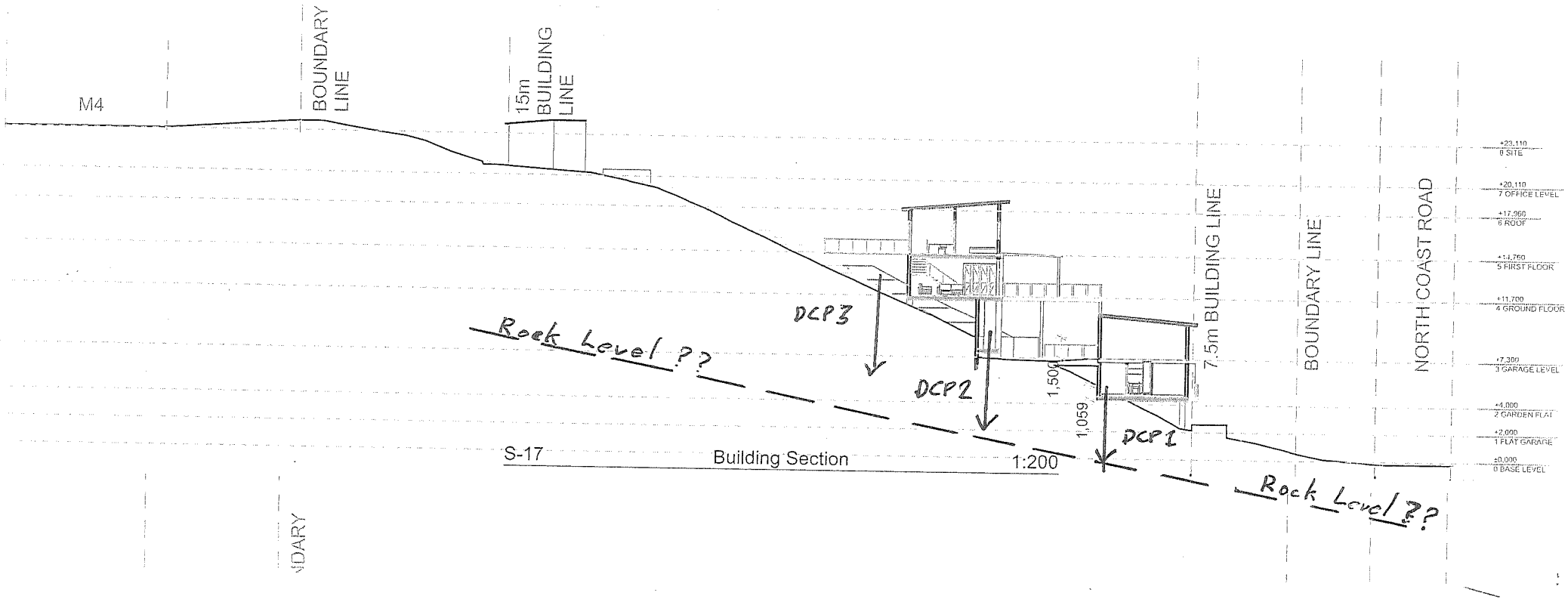
D L B CLARK Pr Eng (Reg. No. 870565)
DAMON CLARK ASSOCIATES



ERF 290 WESTBROOK AT 59 NORTH BEACH ROAD
SITE PLAN SHOWING THE APPROXIMATE POSITIONS OF THE INSPECTION PITS. THERE WAS A DYNAMIC CONE PENTROMETER TEST NEXT TO EACH PIT

DAMON CLARK ASSOCIATES
CONSULTING GEOTECHNICAL ENGINEERS
321 CATO ROAD, DURBAN 4001
Tel. (031) 206-1361
Fax. (031) 2052-830

Figure 1



ERF 290 WESTBROOK AT 59 NORTH BEACH ROAD
ESTIMATED BEDROCK LEVEL BASED ON THE DCP TESTS

DAMON CLARK ASSOCIATES
CONSULTING GEOTECHNICAL ENGINEERS
321 CATO ROAD, DURBAN 4001
Tel. (031) 206-1361
Fax. (031) 2052-830

Figure 2

DYNAMIC CONE PENETROMETER TESTS

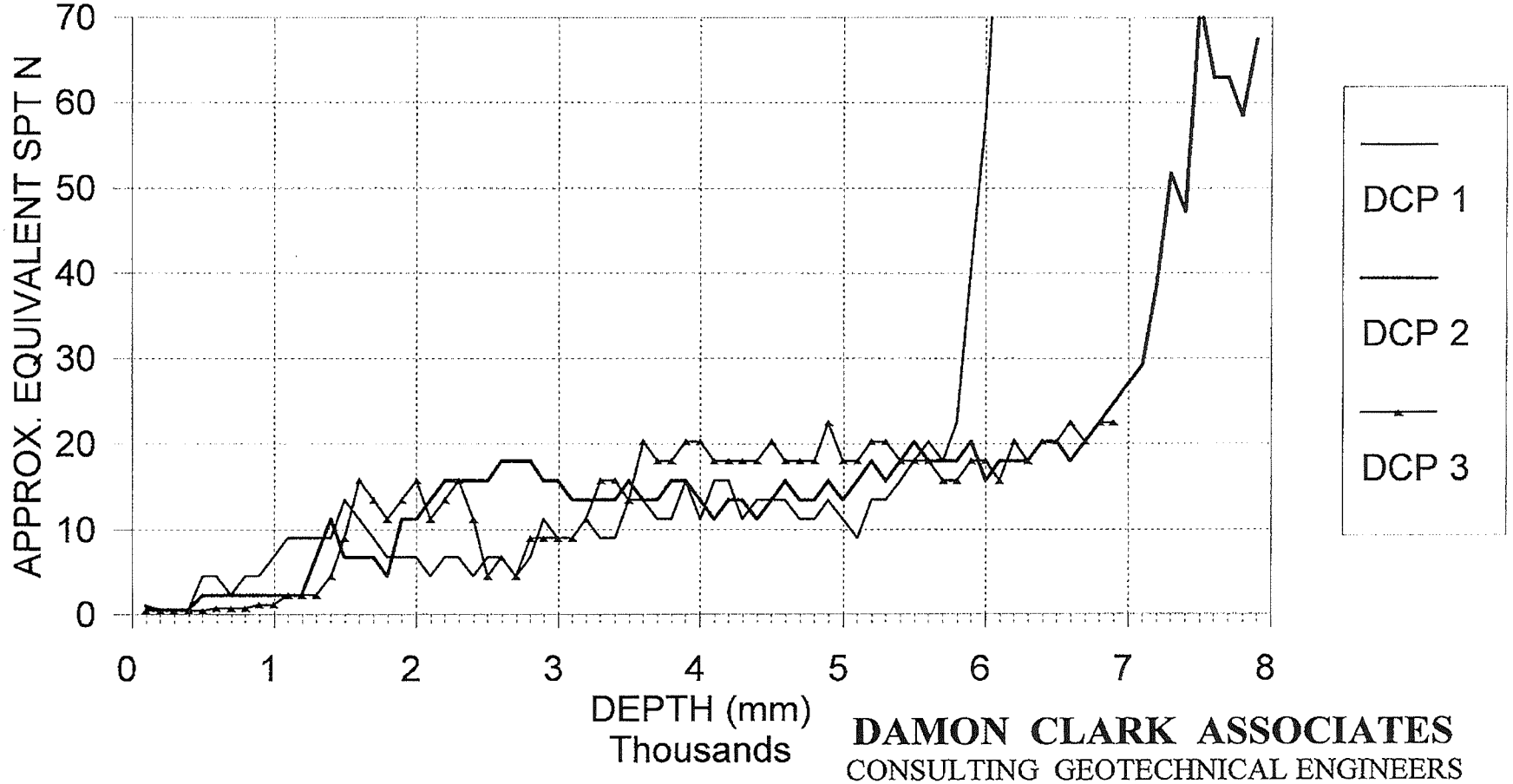
59 North Beach Rd - Tongaat

CONSISTENCY OF COHESIONLESS SOILS

SPT	0 - 4	VERY LOOSE
N	4 - 10	LOOSE
per	10 - 30	MEDIUM DENSE
300 mm	30 - 50	DENSE
	> 50	VERY DENSE

CONSISTENCY OF COHESIVE SOILS

SPT	0 - 2	VERY SOFT
N	2 - 4	SOFT
per	4 - 10	FIRM
300 mm	10 - 20	STIFF



DAMON CLARK ASSOCIATES
CONSULTING GEOTECHNICAL ENGINEERS
321 CATO ROAD, DURBAN 4001
tel (031) 2061361 fax 2052 830