Appendix 4

Geological & Geotechnical Survey





GAS FIRED POWER PLANT DEVELOPMENT IN SOUTHERN MOZAMBIQUE

GEOLOGICAL & GEOTECHNICAL REPORT

Dec.2012





Document Profile

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1 Introduction

At the request of **ORIENTAL CONSULTANTS CO. Ltd**, Shibuya-ku, Tokyo, 151-0071, Japan and with the scope of determining the geological and geotechnical model of the **Gas Fired Power Plant Development in Southern Mozambique** site, Ingérop Moçambique, with the collaboration of Geoarea supervised the ground investigation works and developed the geological and geotechnical design of the referred area.

Ground investigations were carried out between the 24th of October and the 8th of November and were undertaken by Tecnasol, consisting of rotary drill holes with core recovering.

Soil samples recovered from executed boreholes were laboratory tested including index and classification tests, specific gravity, moisture content, shear strength tests (unconfined compression test and direct shear test) and consolidation tests. Laboratory activity took place between the 28th of October and the 5th of December.

The current report is structured in 4 main chapters, including this one. A brief description is given bellow.

- Introduction
- **Site conditions**, where the geomorphology and geological setting is described including local hydrogeology and structural geology conditions.
- **Ground investigation works**, where a summary of executed ground investigation works is presented
- **Geotechnical interpretation**, presenting a discussion of various geotechnical aspects such as soil properties, terrain excavation ability and required foundation.

It is also presented, as an appendix to this report, the ensuing documents, bound as a separate volume.

- Ground investigation location plan
- Interpreted geotechnical cross-sections.
- Ground investigation data records and laboratory testing results





2 Site Conditions

2.1 General

The Study area is located at Maputo's Electricity of Mozambique old thermal power plant area, lying to the west of the city between the national road EN4 and the shoreline of Maputo Bay.

Figure 1 presents site location highlighted on a detailed aerial view framed up on a general aerial perspective of Maputo city.



Figure 1 – Location of studied area

Present site conditions include industrial ruins from the old thermal power plant and other accessory infrastructures.





2.2 Geomorphobgy

On geomorphologic unit terms, the studied location integrates the vast quaternary sedimentary deposits that dominate most of Mozambican south region and overlie the Sedimentary Mozambican Basin resulted after Gondwana dispersal

This area is situated downstream the confluence of Infulene River with Maputo Bay shoreline, where delta margins are dominated by flood plains that have been progressively intervened with earthworks throughout recent times.

The entire zone is integrated on a relatively flat area with elevation ranging from 3 to 5 meters, outlining a terrain morphology that was man modulated using landfill materials to raise the original levels.

Although preserved from the flood plains that characterize shorelines, all of the area might be periodically submitted to flood episodes due to heavy rains when combined with high sea waters or spring tides. In fairness, such scenario has not been reported happening since present site conditions were concluded for the previous thermal power plant.

Figure 3 presents a perspective of local terrain morphology and conditions.



Figure 2 – General view of site conditions





2.3 Geological Settings

2.3.1 Lithostratigraphy

Stratigraphic sequence occurring at the site location consists on Holocene superficial deposits that overlie Pleistocene (Congolote and Machava formation) and Pliocene (Ponta Vermelha formation) geological units described on the following paragraphs.

Holocene deposits compose all of the surface soils of the studied area, comprising landfill materials used to modulate terrain morphology at previous interventions. These materials are mainly constituted by silty-sandy soils with coal fragments and vegetal residues.

By this description one assume that most of it is of alluvium nature which might also occur in depth beneath the landfill deposits. Given these circumstances, it will be extremely difficult to differentiate one from the other and should all be treated as one unit.

Pleistocene unit known as Congolote formation (Qco) is mainly described as a coarse to fine grained sandy soil, poorly consolidated, of white, yellow or orange colouration. It represents aeolian materials of continental dunes, constituting a sandy stratum that overlies succeeding geological units.

Underlying the Congolote formation is the Machava formation (Qmc), mainly described as an interbedded sedimentary deposit of clayey sands with carbonated, salty and ferruginous formations and with a basal conglomerate.

Although its lateral limits are generally well defined, this geological unit may not be represented throughout all of the lower Pleistocene, enabling Congolote formation to settle directly on the Pliocene unit Ponta Vermelha through a stratigraphic unconformity.

Ponta Vermelha formation (TPv) comprises sand, siltstones and sandstones of reddish to yellowish colouration, occasionally with a ferruginous hard cover.

The Mozambican National Department of Geology published a geological map of Maputo on a scale of 1:50 000 (map 2532D3) of which an extract it is presented on the next figure with the approximate location of the new thermal power plant.





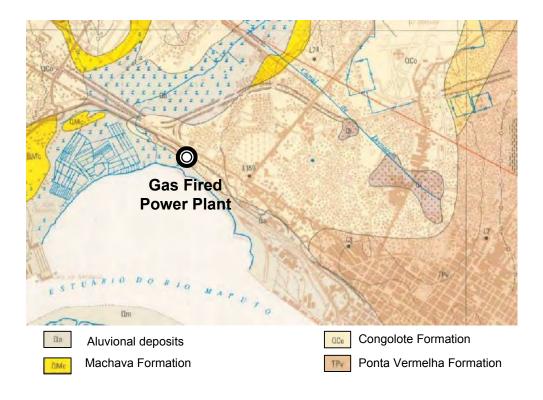


Figure 3 – Extract of Maputo geological map, 1:50 000 (published scale)

A few samples recovered from executed boreholes illustrate the described geology.









Figure 4 – Samples recovered from borehole S1 (above) and S2 (below)

Given the presented geological conditions there are no structural evidences of tectonic nature on the referred geomorphologic unit, as the deposited sediments overlie any bedrock that may exhibit any type of fragmentation.

For this reason there are no geological structural constraints at the purposed site.

2.3.2 Hydrogeology

Hydrogeological aptitude of a sedimentary deposit with the described features suggest the existence of a multi-layered aquifer system with alternating pervious to impervious stratum, depending on its grading characteristics.

Therefore, on a general approach, it may be assumed that this is a complex system where possibly confined and unconfined aquifers coexist and the existence of aquitards and aquifuges plays an essential role on the confinement of hydrogeological units and their own drainage.

Although, very little hydrogeological information in known regarding this area, soils are expected to be saturated a couple of meters below ground level as groundwater was identified on all boreholes at very superficial depths ranging from 0 to 2 meters.



3 GroundnvestigationWorks

3.1 General

Works started with a site visit to the future location of the new Maputo Thermal Power Plant on the 18th of October. At the time, a Client's representative was present (Mr Mitsuro Miyashita) as well as the general coordinator for the present study (Mr F. Gomes Pinto) and the geology and geotechnics consultant (Mr Luis Lopes). A topographical field team was also made available so that ground investigation locations would be promptly marked.

Ground investigation fieldworks comprised on 11 rotary drill holes. Final location was later adjusted by the geology and geotechnics consultant so that ground investigation data could be optimized for the design purpose. After fieldworks were completed these locations were surveyed by the topographic team.



The following image shows the final borehole locations.

Figure 5 – Borehole locations





3.2 Rotary Boring

Using standard rotary coring methods, 11 boreholes of 86mm internal diameter were drilled with Delta Base 520 equipment. In order to prevent soil to collapse, boreholes were lined with casing, particularly when sandy soil was intersected.

In situ field testing such as SPTs were carried out along the drilling process, between 1.0m intervals constituting, in fact, the main criterion for drilling stoppage, occurring when N_{SPT} hits a minimum of 50 blows on 5 consecutive times ($N_{SPT} > 50$).



Figure 6 – A - Rotary drilling at S1. B - Terzaghi's sample for the SPT. C – Recovered sample on drilling

The following table summarizes the geographic features of executed boreholes through their respective x, y and z coordinates considering UTM format and WGS84 datum.





Reference		(Coordinates		Remarks				
Re	ierence	Х	Y	Z	Rendres				
	S1	7130964.5 7	452773.81	3.32	Laboratory test sample collected between 4 - 5.2m (depth)				
	S2	7130907.9 9	452833.93	3.55	Laboratory test sample collected between 4 - 5.2m (depth)				
	S3	7130849.0 2	452891.05	3.20	Laboratory test sample collected between 4 - 4.5m (depth)				
	S4	7130955.9 0	452888.10		Laboratory test sample collected between 3.5 - 4.7m (depth)				
hole	S5	65 7130895.8 452937 3 452937	452937.72	3.42	Laboratory test sample collected between 4 - 4.6m (depth)				
y drill	S6	S6 7131012.0 4 452826.08 S7 7130894.2 9 452888.71 S8 7130847.7 4 452992.31		3.68	Laboratory test sample collected between 4 - 4.6m and 8.5 - 9.0 m (depth)				
rotary	S7			3.44	Laboratory test sample collected between 4 and 4.4m and 4.8 – 5.5 m(depth)				
	S8			3.35	Laboratory test sample collected between 5.0 - 5.5m (depth)				
	S9	7131012.3 6	452943.24	3.40	Laboratory test sample collected between 4,5 - 5.1m (depth)				
	S10	7130954.0 3	452997.92	4.81	Laboratory test sample collected between 5.0 - 6.2m (depth)				
	S11	7130899.7 9	453054.02	4.87	Laboratory test sample collected between 4.0 - 5.1m (depth)				

The main geological and geotechnical features of all boreholes are summarized in the following table.

Pof	Ref. GW Depth (m)			Geology	Total core recovery (%)					
Rei.			Depth (m)	Lithology	≤ 50	50 - 75	≥ 75			
			0.0 – 2.45	Landfill deposits. Silty sand with coal fragments and vegetal residues						
			2.45 - 3	Medium grained, clean sand, poorly graded						
S1	1.8	20.0	3 – 6.45	Fine to coarse grained clayey sand, on a loose density state, occasionally with gravel	0.0 - 4.0 5.2 - 14 15 - 16	14 - 15 18 – 20	4,0 - 5.2 16 - 18			
			6.45 - 8.0	Medium to coarse grained clayey sand with thin marly and calcarenite interbeds			10 - 10			
			8.0 – 10.0	Medium to fine grained sandstone						
			10.0 – 20.0	Fine to medium grained clayey sand, generally on a very dense state						
			0.0 - 2.0	Landfill deposits. Silty sand with coal fragments and vegetal residues	0.0 - 4.0		40.52			
S2	1.3	15.0	2.0 - 3.0	Fine grained clean sand, poorly graded.	5,2 - 8,0 12 - 13	8,0 - 11,0 14,0 -15,0	4,0 - 5,2 11,0 - 12,0 13,0 - 14,0			
			3.0 - 4.0	Fine grained clayey sand with calcarenite gravel						

Table 2 – Summarize features of boreholes





Ref.	GW level	Depth		Geology	Total core recovery (%)				
itei.	(m)	(m)	Depth (m)	Lithology	≤ 50	50 - 75	≥ 75		
			4.0 - 55	Gravel of variable dimension with sandy silt matrix					
			5.5 - 6.45	Fine to medium clayey sand, on a loose density state.					
			6.45 – 9.0	Coarse grained calcarenite with fossiles					
			9.0 -11.0	Fine to medium grained clayey sand with interbedded sandstone gravel, on a loose density state.					
			11.0 – 12.0	Fine to medium grained sandstone					
			12.0 – 15.0	Fine to medium grained clayey sand with sandstone gravel, on a very dense state.					
			0.0 – 3.45	Landfill deposits. Silty sand with coal fragments and vegetal residues					
S3	1.05	12.0	3.45 – 4.0	Medium grained clean sand, poorly graded.	0.0 - 1.0 2.0 - 4.0	1.0 - 2.0 6.0 - 7.0	4.0 - 4.6		
	50 1.00 12.0		4.0 – 12	Fine to medium grained clayey sand with gravel, on a dense to very dense state, with highly weathered sandstone interbeds (5-7.5m)	4.6 - 6,0 7.0 - 11	11 - 12			
			0.0 – 2.0	Landfill deposits. Silty sand with coal fragments and vegetal residues					
	54 1.0 10		2.0 - 3.0	Medium grained clean sand, poorly graded.					
S4		10.0	3.0 – 5.45	Fine grained clayey sand, with gravel, on a loose density sate	0.0 - 3.5 4.7 - 8.0	8.0 - 10.0	3.5 - 4.7		
			5.45 – 10.0	Fine to medium grained clayey sand, on a very dense state, with interbeds of highly weathered sandstone $(5.45 - 7.0)$					
			0.0 – 2.0	Landfill deposits. Silty sand with coal fragments and vegetal residues					
			2.0 - 3.45	Medium grained clean sand, poorly graded.					
S5	1.0	9.0	3.45 – 7.0	Weathered sandstone with occasionally highly weathered interbeds recovered as a clayey sand with gravel.	0.0 - 4.0 5.0 - 7.0	7.0 - 9.0	4.0 - 5.0		
			7.0 – 9.0	Fine to medium grained clayey sand, on a very dense state.					
			0 - 1.45	Landfill deposits. Silty sand with coal fragments and vegetal residues					
			1.45 – 4.0	Medium grained clean sand, poorly graded.					
			4.0 - 7.0	Fine to medium grained clayey sand, with gravel	0.0 - 4.0				
S6	1.0	15.0	7.0 – 8.0	Coarse grained calcarenite, weathered	4.6 - 8.5 9.0 - 11	11.0 - 12.0 11 - 12	4.0 - 4.6 8.5 - 9.0		
			8.0 – 12.0	Fine grained clayey sand, on a dense to very dense state	10 - 11 12 - 13	13 - 15			
			12.0 – 14.0	Medium grained weathered sandstone, with a fresh interbed between 13.6 and 14.0					
			14.0 – 15.0	Fine grained clayey sand, on a dense to very dense state					
S7	-	10.0	0.0 - 3.0	Landfill deposits. Silty sand with coal fragments and vegetal residues	0.0 - 4.0 4.4 - 4.9	5.5 - 7.0 8.0 - 9.0	4.0 - 4.4 4.9 - 5.5		





Def	GW	Depth		Geology	Tota	ery (%)			
Ref.	level (m)	(m)	Depth (m)	Depth (m) Lithology		50 - 75	≥ 75		
			3.0 – 4.0	Medium grained clean sand, poorly graded.	7.0 - 8.0		9.0 - 10.0		
			4.0 - 4.4	Coarse gravel with clayey to sandy matrix, poorly graded					
			4.4 – 5.45	Fine grained clayey sand, with gravel.					
			5.45 – 7.2	Medium grained sandstone with occasionally interbeded calcarenite					
			7.2 – 10.0	Fine to medium grained clayey sand, on a very dense state.					
			0.0 – 2.45	Landfill deposits. Silty sand with coal fragments and vegetal residues					
			2.45 – 3.0	Medium grained clean sand, poorly graded.					
S8	1.0	11.1	3.0 – 9.35	Fine grained clayey sand, with gravel, on a medium to very dense state.	0.0 - 5.0 5.6 - 6.0	6.0 - 9.0	5.0 - 5.6 9.0 - 11.0		
			9.35 – 11	Medium grained weathered sandstone with interbedded marls					
			11 – 11.1	Fine grained clayey sand, on a very dense state.					
			0.0 – 2.0	Landfill deposits. Silty sand with coal fragments and vegetal residues					
			2.0 - 4.0	Medium grained clean sand, poorly graded.	-		4.5 - 5.1		
		14.0	4.0 – 5.1	Fine to medium grained clayey sand, with gravel on a very loose density state					
S9	0.5		14.0	14.0	5.1 – 7.0	Medium grained weathered sandstone.		-	12.0 - 14.0
						7.0 – 9.45	Fine grained clayey sand, with gravel, on a medium density state		
			9.45 – 10.4	Fine grained weathered sandstone.					
			10.4 – 14.0	Fine grained clayey sand, on a very dense state.					
			0.0 - 3.0	Landfill deposits. Silty sand with coal fragments and vegetal residues					
			3.0 - 4.0	Fine grained weathered sandstone					
			4.0 - 5.0	Sandy clay, of hard consistency					
S10	0.0	14.0	5.0 – 6.2	Clayey sand with gravel	0.0 - 5.0 6.2 – 9.0	9.0 - 11	5.0 - 6.2		
0.0	0.0		6.2 – 7.4	Coarse grained weathered sandstone with interbedded marls	11 - 13	13 - 14	0.0 0.2		
			7.4 – 14	Fine grained clayey sand, with gravel, on a very dense state, with interbedded weathered sandstone between 13-13.38m.					
			0.0 – 3.0 Landfill deposits. Silty sand with coa						
S11	1.0	19.0	3.0 – 10.3	Fine to medium grained clayey sand, with gravel, on a medium to very dense state	0.0 - 4.0 5.1 - 8.0 10 - 11	8.0 - 10.0 11.0 - 16.0	4.0 - 5.1 18.0 - 19.0		
			10.3 – 11	Sandy clay, of hard consistency	16 - 17	17.0 - 18.0			
			11 - 18	Fine to medium grained clayey sand, with gravel, on a very dense state					





Standard Penetration Test (SPT)

This dynamic penetration test was undertaken at the bottom of the boreholes along with the drilling process at intervals of 1 m, allowing for the estimation of strength and deformation properties of intersected soils as well as obtainment of disturbed samples for identification purposes.

Its procedure consisted on driving a split spoon sampler of standard dimensions into the bottom of the borehole, at a given depth, by an automatic trip hammer that allowed a weight of 63,5 kg to fall on to a drive head from a height of 0,76m.

SPT field results are summarized in the following table and chart.

Depth Ref.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
S1	14	15	-	-	11	8	8	60	-	30	22	60	60	60	31	60	60	60	60	60
S2	-	-	-	-	60	10	54	60	10	16	60	60	60	60	60	-	-	-	-	-
S3	3	4	6	-	35 ⁽¹⁾	30	39	50	60	60	60	60	-	-	-	-	-	-	-	-
S4	14	13	15	-	22	60	60	60	60	60	-	-	-	-	-	-	-	-	-	-
S5	7	8	2	-	60	60	60	60	60	-	-	-	-	-	-	-	-	-	-	-
S6	7	5	10	-	10 ⁽¹⁾	40	44	28	38	60	60	60	60	60	60	-	-	-	-	-
S7	2	3	3	6 ⁽¹⁾	60 ⁽²⁾	60	60	60	60	60	-	-	-	-	I	-	-	-	-	-
S8	10	13	11	15	-	11 ⁽²⁾	60	60	60	60	60	-	-	-	I	-	-	-	-	-
S9	16	19	3	2	-	58	32	25	11	60	60	60	60	60	I	-	-	-	-	-
S10	18	17	60	45	-	60	60	41	31	60	60	60	60	60	I	-	-	-	-	-
S11	3	8	19	-	19	22	25	47	60	60	60	39	48	42	60	60	60	60	60	-
(1) - Tru	1) – True SPT depth is 4.5m																			

Table 3 – Summarize	of SPT	field	result	values
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(1) – True SPT depth is 4.5m

SPT refusal

(2) - True SPT depth is 5.5m





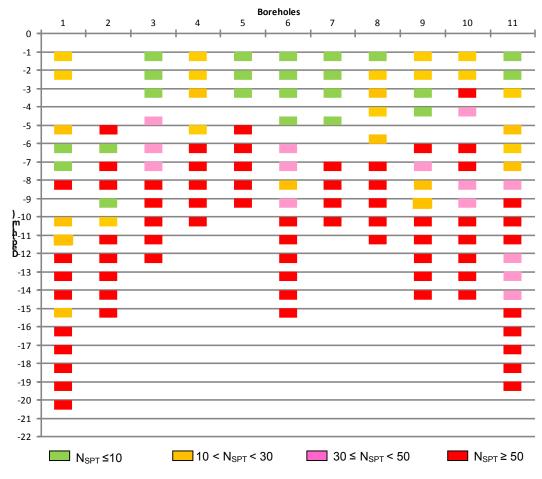


Figure 7 - Graphical view of SPT results

In order to obtain more reliable SPT results, the application of the appropriate correction factors was considered, in particular, energy delivered to the drive rods and energy loss due to the length of rods. Taking into account the moderated cohesive nature of the soils the effect of overburden pressure was not regarded.

Energy delivered to the drive rods was standardized to N_{60} so that $N_{60} = N.(ER_r/60)$, where N are the SPT field results and ER_r is the energy ratio of the test equipment (60%). That being said, this correction factor assumes a proportion of 1 on this particular case.

Correction for energy losses due to the length of rods considers the following correction factors.

Rod length below the anvil (m)	Correction factor
> 10	1,0
6 – 10	0,95
4 - 6	0,85
3 - 4	0,75

Table 4 – Correction	factors	for rod	length
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SPT corrected results are summarized in the following table.

Depth Ref.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
S1	11	11	-	-	9	7	8	57	-	29	22	60	60	60	31	60	60	60	60	60
S2	-	-	-	-	51	9	51	57	10	15	60	60	60	60	60	-	-	-	-	-
S3	2	3	5	-	30 ⁽¹⁾	26	37	57	57	57	60	60	-	-	-	-	-	-	-	-
S4	11	10	11	-	19	51	57	57	57	57	-	-	-	-	-	-	-	-	-	-
S5	5	6	2	-	51	51	57	57	57	-	-	-	-	-	-	-	-	-	-	-
S6	5	4	8	-	9 ⁽¹⁾	34	42	27	36	57	60	60	60	60	60	-	-	-	-	-
S7	2	2	2	5 ⁽¹⁾	51 ⁽²⁾	51	57	57	57	57	-	-	-	-	-	-	-	-	-	-
S8	8	10	8	13	-	9 ⁽²⁾	57	57	57	57	60	-	-	-	-	-	-	-	-	-
S9	12	14	2	2	-	49	30	24	10	57	60	60	60	60	-	-	-	-	-	-
S10	14	13	45	34	-	51	57	39	29	57	60	60	60	60	-	-	-	-	-	-
S11	2	6	14	-	16	19	24	45	57	57	60	39	48	42	60	60	60	60	60	-

Table 5 – Summarize of SPT corrected result values (NSPT_c)

(1) - True SPT depth is 4.5m

(2) - True SPT depth is 5.5m

The following points highlight the obtained results.

- The geological model is generally represented by superficial landfill deposits on a loose density state, with a generalized thickness of 2-3m that overlies Pleistocene sandy soils with occasionally interbedded weathered sandstone and calcarenite.
- Core recovery is mostly below 50% 60%, with the occasionally 75-100% recovery particularly when the special sampler was used for the laboratory tests samples.
- On general terms soil resistance estimated by the SPT increases with depth, with the occasional breaks, particularly when intersected clayey interbeds.
- All boreholes feature a minimum of 4 consecutive SPT refusals, starting at depths ranging between 5m and 15m
- Groundwater level was identified in every borehole with the exception of S7. Water level depths range between 0 and 1.8m which, in terms of elevation, translates on 1.5 to 4.8m. These water level values should be carefully analysed as most likely these readings do not match with stabilized groundwater levels.





3.3 Laboratory testing

Laboratory testing was carried out using available undisturbed and disturbed soil samples recovered throughout rotary drilling, although one must admit that in geotechnical work there is no such thing as undisturbed soil sample. In reality undisturbed means a sample where care has been taken to minimize damage.

Undisturbed samples were collected using the Moran sampler when a geotechnical stratum of N_{SPT} <15 was intersected, as in these conditions a scenario of cohesive soils was expected; and also, when partially consolidated stratums were cut across by the T2 sampler.

Disturbed samples were obtained throughout drilling using either the T2 sampler or the Terzaghi sampler of the SPT surveys.



Figure 8 – Moran sampler used for undisturbed sampling

The following table resumes all sample locations and submitted laboratory testing.





					Sdl	laboratory	tests		
Drill hole ref.	Sample ref. / Type of sample	Sample depth (m)	Grain size analysis	Atterberg limits	Moisture content	Specific gravity	Unconf. Compres. Strength	Direct Shear Strength (C.U.)	Consolid. test
	56727 / DS	2.4-3.0	\checkmark	\checkmark	~	~	-	-	-
	56724 / US	4.0-4.6	✓	\checkmark	~	~	-	~	-
S1	56725 / US	4.6-5.2	~	~	✓	~	-	-	-
	56728 / DS	14.0-15.0	~	~	~	~	-	-	-
	56726 / ST2	17.6-18.0	~	\checkmark	\checkmark	~	-	~	-
	56736 / US	4.0-5.2	~	✓	✓	~	-	-	-
S2	56740 / DS	9.4-10.0	~	✓	✓	~	-	-	-
	56737 / ST2	14.4-15.0	~	~	✓	~	-	~	-
	56741 / DS	1.4-2.0	✓	✓	\checkmark	✓	-	-	-
00	56738 / US	4.0-4.6	✓	✓	\checkmark	✓	-	-	✓
S3	56742 / DS	6.7-7.0	✓	~	~	~	-	-	-
	56739 / ST2	9.4-10.0	✓	~	~	~	-	~	-
	56764 / DS	2.4-3.0	~	✓	✓	~	-	-	-
S4	56753 / US	3.5-4.7	✓	✓	✓	~	-	~	-
	56754 / ST2	8.4-9.0	✓	✓	~	~	✓	~	-
	56765 / DS	3.6-4.0	✓	✓	✓	~	-	-	-
S5	56755 / US	4.0-4.2	~	✓	✓	~	-	-	-
	56756 / ST2	7.0-8.0	✓	✓	✓	~	-	~	-
	56730 / US	4.0-4.6	✓	✓	✓	~	-	~	✓
	56732 / DS	50-6.0	~	✓	✓	~	-	-	-
S6	56731 / ST2	8.4-9.0	~	✓	~	~	~	~	-
	56733 / DS	11.5-12.0	~	~	~	~	-	-	-
	56757 / US	4.0-4.2	✓	✓	✓	~	-	-	-
07	56758 / US	4.8-5.4	~	✓	✓	~	-	~	✓
S7	56766 / DS	7.7-8.0	~	✓	~	~	-	-	-
	56759 / ST2	9.5-10.0	✓	✓	~	~	-	~	-
	56767 / DS	3.6-3.9	✓	✓	✓	~	-	-	-
S8	56760 / US	5.0-5.6	✓	✓	✓	~	~	-	✓
	56761 / ST2	8.4-9.0	✓	✓	~	~	-	~	-
	56777 / US	4.5-5.1	✓	✓	✓	~	-	-	✓
S9	56778 / ST2	7.5-8.5	~	~	✓	~	-	~	-
	56781 / DS	13.5-14.0	~	~	✓	~	-	-	-
	56779 / US	5.0-6.2	✓	✓	✓	✓	✓	-	-
S10	56780 / ST2	8.5-9.0	~	~	~	~	-	~	-
	56782 / DS	11.5-12.0	~	~	✓	~	-	-	-
	56762 / US	4.0-5.1	✓	✓	✓	✓	-	✓	-
	56768 / DS	3.5-4.0	~	~	~	~	-	-	-
S11	56763 / ST2	9.5-10.0	~	~	~	~	~	~	-
	56769 / DS	17.4-17.8	~	~	~	~	-	-	-





Soil laboratory testing results are summarized in the following table. The complete laboratory data records are available in the appendix volume attached to this report.

Sample	dis	rticle s stributi passir	on	Atter lim	•	Class	ification	14/	~		Strength neters	qu (kPa)	Conso	lidation
reference / investigation point	0.074	0.42	2.0	WL (%)	PI(%)		AASHTO	What (%)	Gs (g/cm³)	c	Φ	E	Cc	Cv (cm²/s)
point	mm	mm	mm	₩₩⊑(/0)	F1(70)		AASHIO			(kPa)	(º)	(kPa)	e 0	K (cm/s)
56727 / S1	3	80	100	NP	NP	SP	A-3 (0)	22.8	2.67	-	-	-	-	-
56724 / S1	21	71	83	35	17	SC	A-2-6 (0)	24.0	2.74	42	22	-	-	-
56725 / S1	23	50	77	35	19	SC	A-2-6 (1)	20.0	2.75	-	-	-	-	-
56728 / S1	21	95	97	54	32	SC	A-2-7 (1)	23.4	2.72	-	-	-	-	-
56726 / S1	25	97	100	37	13	SC	A-2-6 (0)	26.6	2.75	52	37	-	-	-
				-						52	5/	-	-	-
56736 / S2	10	25	38	26	11	GP-GC	A-2-6 (0)	12.5	2.70	-	-	-	-	-
56740 / S2	26	83	92	44	19	SC	A-2-1 (1)	20.9	2.70	-	-	-	-	-
56737 / S2	16	96	100	41	18	SC	A-2-6 (0)	23.0	2.72	65	23	-	-	-
												-	-	-
56741 / S3	28	44	63	NP	NP	SM	A-2-4 (0)	33.6	2.42	-	-	-	-	-
56738 / S3	21	79	86	27	12	SC	A-2-6 (0)	25.3	2.72	-	-	-	0.16 0.81	1.8E-3 5.9E-8
56742 / S3	26	44	58	26	13	SM	A-2-6 (0)	11.6	2.74	-	-	-	-	-
56739 / S3	22	90	96	42	18	SC	A-2-7 (1)	25.7	2.75	34	30	-	-	-
56764 / S4	1	72	98	NP	NP	SP	A-3 (0)	19.3	2.65	_	-	-	-	-
56753 / S4	22	56	65	35	14	SC	A-2-6 (0)	20.1	2.76	0	41	-	-	-
										-		- 156	-	-
56754 / S4	21	93	97	39	17	SC	A-2-6 (0)	17.7	2.75	32	26	10968	-	-
56765 / S5	36	80	88	43	22	SC	A-7-6 (3)	26.1	2.72	-	-	-	-	
56755 / S5	15	30	36	37	19	GC	A-2-6 (0)	14.0	2.73	-	-	-	-	-
56756 / S5	16	92	97	44	23	SC	A-2-7 (0)	25.2	2.76	13	33	-	-	-
56730 / S6	31	84	89	40	21	SC	A-2-6 (2)	27.0	2.74	20	35	-	0.17 0.9	7.8E-3 2.1E-7
56732 / S6	17	53	68	34	20	SC	A-2-6 (0)	23.4	2.73	-	-	-	-	-
56731 / S6	16	86	94	48	25	SC	A-2-7 (0)		2.75	37	22	- 51	-	-
56733 / S6	19	96	99	38	16	SC	A-2-6 (0)		2.75	-	_	9167 -	-	
56757 / S7	12	28	37	37	18	GP-GC	. ,	14.4	2.72			-	-	-
										-	-	-	- 0.15	- 8.5E-3
56758 / S7	34	66	72	42	25	SC	A-2-7 (3)	24.0	2.74	17	36	-	0.77	2.0E-7
56766 / S7	18	95	99	41	18	SC	A-2-7 (0)	20.8	2.72	-	-	-	-	

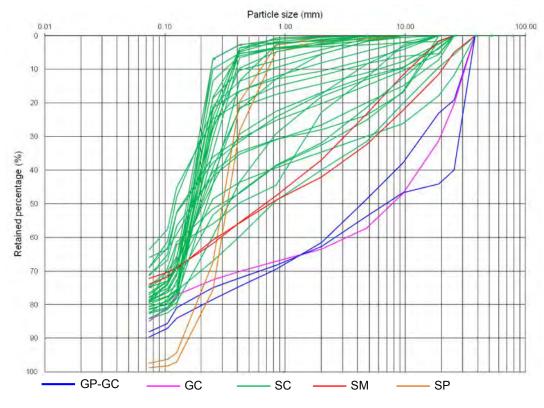
Table 7 – Summarized results of laboratory testing

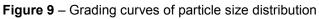




							1							
56759 / S7	21	95	98	39	18	SC	A-2-6 (0)	24.7	2.71	23	36	-	-	-
00100701	21	30	30	3	10	00	AZ-0 (0)	27.1	2.71	2	50	-	-	-
56767 / S8	29	65	74	28	12	SC	A-2-6 (0)	18.3	2.72	-	_	-	-	-
30707700	23	00		20	12	00	AZ-0 (0)	10.0	2.12	-	_	-	-	-
56760 / S8	29	69	80	46	27	SC	A-2-7 (2)	23.5	2.74	_	_	45	0.14	4.4E-3
30700700	23	03	00	P	21	00	RZ-1 (Z)	20.0	2.74	-	_	7692	0.79	8.2E-8
56761 / S8	19	96	100	40	20	SC	A-2-6 (0)	21.2	2.72	24	34	-	-	-
30/01/00	10	30	100	P	20	00	AZ-0 (0)	21.2	2.12	27	57	-	-	-
56777 / S9	21	53	67	49	26	SC	A-2-7 (1)	21.2	2.70	-	_	-	0.19	4.1E-3
00/11/00	21	50	01	42	20	00	RZ-1 (1)	21.2	2.70	-	_	-	0.90	1.9E-7
56778 / S9	18	97	98	44	21	SC	A-2-7 (0)	23.3	2.70	40	28	-	-	-
00110100	10	51	30		21	00	RZ-1 (0)	20.0	2.70	P	20	-	-	-
56781 / S9	24	90	98	42	21	SC	A-2-7 (1)	25.0	2.72	-	_	-	-	-
00/01/00	27	50	50	74	21	00	//2/(1)	20.0	2.12			-	-	-
56779 / S10	20	40	60	46	26	SC	A-2-7 (1)	15.1	2.72	_	_	22	-	-
00/10/010	20	-10	00	P	20	00	//2/(1)	10.1	2.12			2667	-	-
56780 / S10	17	56	82	44	25	SC	A-2-7 (0)	15.5	2.71	38	34	-	-	-
001007010	17		02		20	00	1121(0)	10.0	2.71	3		-	-	-
56782 / S10	21	94	98	48	22	SC	A-2-7 (1)	23.2	2.72	-	_	-	-	-
001027010	21	54		P		00	//2/(1)	20.2	2.12			-	-	-
56762 / S11	21	78	94	44	25	SC	A-2-7 (1)	29.0	2.73	15	34	-	-	-
001027011	21	10	01		20	00	//2/(1)	20.0	2.10	10	01	-	-	-
56768 / S11	31	68	83	45	25	SC	A-2-7 (2)	18.3	2.74	-	_	-	-	-
007007011	01		00	P	20	00	// Z / (Z)	10.0	2.77			-	-	-
56763 / S11	19	87	99	36	17	SC	A-2-6 (0)	18.4	2.70	25	34	120	-	-
001007011	10	01		3		00	, (20(0)	10	2.10	20	~	13684	-	-
56769 / S11	25	95	97	43	19	SC	A-2-7 (1)	23.8	2.71	_	_	-	-	-
	20		57	P	10	00	··· (1)	20.0	2.7 1			-	-	-

The next figures present the grading curves of particle size distribution and the plasticity chart for the fine fraction of soils.









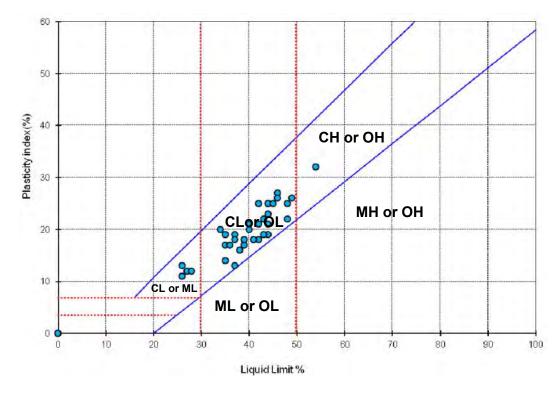


Figure 10 - Plasticity chart

Following figure exhibits the distribution of natural moisture content (in blue colour) within the computed Atterberg limits: liquid limit on the upper extreme and plastic limit on the lower extreme

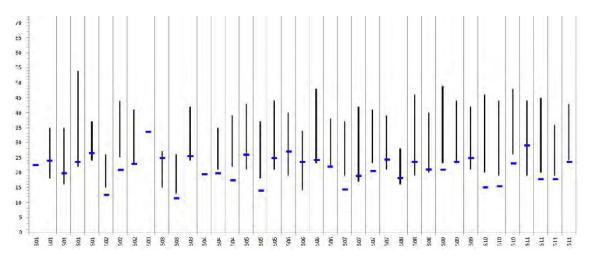


Figure 11 – Moisture content within Atterberg limits



4 Geotechnical Interpretation

4.1 General

The geotechnical deliberations set out in the following sub-chapters are based on the obtained data from the ground investigation works and laboratory testing specifically planned for this design.

It was also taken into consideration previous experience on similar geological settings by the geological team.

4.2 Geotechnical Zones

Local geotechnical conditions dictated a model comprising 5 geotechnical zones (GZ) outlined by its geology features and SPT results.

Table 8 exhibits the applied criterion when establishing these geotechnical zones.

Geotechnical zone	Geology	N _{SPT}	N _{SPTc}	
GZ5	Topsoil, landfill and organic soils	0 – 16	0 – 12	
GZ 4	Medium grained sand, poorly graded on a loose density state	0 - 19	0 – 14	
GZ 3		[2] 6 – 25 [30]	[2] 5 – 24 [29]	
GZ 2	Fine grained clayey sand with sandstone and calcarenite interbeds.	30 – 48	26 – 48	
GZ 1		54 - 60	49 - 60	

Table 8 – Geotechnical zoning criterion

[...] registered only once

These geotechnical zones are outlined in cross-sections A-A' to H-H' which can be consulted on the appended drawings referenced 02412.D01 and 02412.D02.

On a general note it's evident that the transition between geotechnical zones is not sequential, reflecting a high heterogeneity of geological materials and thus implying a wide range of soil shear strength parameters.

Geotechnical zone GZ5 represents the superficial soft soil horizon and includes materials such as topsoil and organic soil layers, landfill and earthwork debris. It was clearly identified in all of the surveyed area at depths that range from 1.5 to 3.5 m.





Geotechnical zone GZ4 represents a medium grained sandy soil that occurs on a loose to medium density state below GZ5, being identified throughout all of the surveyed area with the exception of the north-eastern sector, which comprises boreholes S10 and S11. Thickness varies between 0.5 and 2.5m and soil samples collected at matching depths mainly identified poorly graded sands (SP, on the Unified Soil Classification System (USC system))

Geotechnical zones GZ1 to GZ3 are mainly differentiated through SPT results as the sedimentary deposits exhibit an alternating sequence that tends to be repetitive in depth. It's expected that soil resistance improves from GZ3 to GZ1.

Soil identification on these geotechnical zones mainly comprise clayey sands (SC, on the USC system) with occasional gravel resulted out of the disaggregation of consolidated or partially consolidated sedimentary formations such as sandstones and calcarenites resulting in GP-GC and GC soils (USC system).

Geotechnical zone GZ1 constitutes the most capable geotechnical horizon and occurs at depths ranging from 5 to 15 metres, coinciding with the final surveyed segment. On occasion GZ1 was identified on upper levels of the geotechnical model, usually associated with interbeds of sandstones and calcarenites or very dense sandy stratums, with limited lateral continuity.

4.3 Geotechnical Design Parameters

To the greatest extent possible, geotechnical design parameters resulted of the analysis of N_{SPTc} corrected values, laboratory tests and published analytical procedures.

The geological and geotechnical design team also incurred on previous design experienced acquired on identical terrain conditions.

Table 9 presents the design values for the most relevant geotechnical parameters.





		Shea	r Strengh p Mohr-Coul		Stress-	Ultimate static tip capacity - P _{pu} (kN)			
GZ	γ _{wet} (kN/m³)		inantly lar soils	Dominantly cohesive soils	strain modulus E _s	Based on an	Based on N _{SPTc}		
		с (KPa)	w (°)	c _u (kPa)	(kPa)	analytical approach 1	results 1		
GZ5	14-18	0	26 - 30	-	2000-6000				
GZ4	14-10	0	26-32	-	2000-0000	Not considered			
GZ3	17 – 19	0-20	22-34	11 – 22	2600-7700				
GZ2	19-20	20-40	22-34	40–175	9100 - 15000	520 - 1540	1100 - 2000		
GZ1	20 - 22	13 - 65	23 - 37	60 - 360	12000 -17500	850 - 2600	2100 - 2500		

Table 9 - Geotechnical	design parameters
------------------------	-------------------

Wet unit weight was estimated through relative density evaluated from N_{SPTc} results and represents the soil in situ unit weight.

Shear strength parameters are presented for either drained and undrained conditions because geological survey data indicates a wide variety of lithological materials with an extensive range of fine percentages. This means that for Geotechnical Zone GZ3, 2 and 1 both conditions should be taken into account, depending on the intersected geology.

For dominantly granular soils these parameters were evaluated out of the laboratory test results. For cohesive soils, laboratory test results were considered as well as the correlation purposed by Bowles of Cu=5.74.N_{SPTc}.

For the assessment of the stress-strain modulus the relationship for saturated sands purposed by Bowles of Es= $250(N_{SPTc}+15)$ was used for GZ1 and GZ2. Other geotechnical horizons required laboratory test results (GZ3) and normalized correlations for superficial soils (GZ4 and 5) for the estimation of such property.

Ultimate static point capacity (P_{pu}) was computed through 2 different approaches. One based on the Mohr-Coulomb failure stress parameters and using Hansen's bearing capacity factors incurs on the following equation:

$$\mathsf{P}_{\mathsf{pu}} = \mathsf{A}_{\mathsf{p}}.(\mathsf{c}.\mathsf{N}_{\mathsf{c}}.\mathsf{d}_{\mathsf{c}} + \mathsf{q}.\mathsf{N}_{\mathsf{q}}.\mathsf{d}_{\mathsf{q}} + 0.5.\gamma_{\cdot}\mathsf{B}_{\mathsf{p}}.\mathsf{N}_{\gamma})$$

Where:

 A_p – is the area of pile tip effective in bearing N_c, N_q and N_y – are bearing capacity factors





 d_c and d_q – are depth factors

 B_p – is the width of pile tip

q – is the vertical effective pressure at pile toe

When making this point resistance computations it was assumed the following conditions:

- Groundwater level was 2 metres below ground surface
- Considered pile depth was 10 metres
- Considered pile width was 0.6 metres
- Considered pile shape was with a round cross-section.

The other approach considers N_{SPTC} values and uses the following equation (JICA Study team):

Where:

 N_{SPTc} – are the corrected SPT values for a given geotechnical zone A_p – is the area of pile point effective in bearing

Pile skin resistance capacity (kPa) may be estimated using N_{SPTc} results through Meyerhof's suggestion for sandy soils:

$$f_s = X_m N_{55}$$

Where

 X_m – a factor of 2.0 for piles with large-volume displacement; and 1.0 for small volume piles

 $N_{\rm 55}$ – statistical average of the blow count in the upper stratums, corrected for 55% SPT energy efficiency

Considering this a pile skin resistance of 20 to 30 kPa should be accounted for depths of 10 metres.





4.4 Foundations

Given the geological and geotechnical design model it is recommended that deep foundations are taken into consideration in order to guarantee the ultimate support for any considered structure, although subjected to the following conditions:

- Geotechnical zones GZ5, GZ4 and GZ3 are not suitable as a foundation soil and do not provide a suitable loading support.
- Geotechnical zones GZ2 or GZ1 are required to be intersected by the pile toe by at least 3 to 5 times the pile diameter.
- Minimum pile diameter shall be of 0.6m

The allowable pile capacity (P_a) may be estimated using the following equation:

$$P_a = 1/3.P_{pu} + 1/3.P_s$$

On the presented geotechnical and geological scenario the following allowable pile capacity may be considered.

- Geotechnical zone ZG2: 650 1800 kPa
- Geotechnical zone ZG1: 1000 3000 kPa

Awareness of Mozambique equipment availability suggests that the most indicated pile type is the cast in place concrete pile. Nevertheless a few cautions should be taken into consideration involving site location, namely expected high groundwater levels.

4.5 Excavations

Obtaining the recommended foundation depths will require terrain excavation. Considering the known geological model, excavations are expected to be done through direct mechanical digging using an excavator with a blade or a bucket.

Cut slopes are to assume minimum geometries of 1V:1.5H and provisions should be made to minimize rainwater and surface water flows. Vertical faces of excavations will unconditionally require support solutions.

Excavations should be kept dry during the construction period. If by chance groundwater level rises up to the bottom of the footing or surface water inflows





into the excavation, dewatering must be assured either by impervious water barriers, drainage wells such as sump pits or any other efficient methods.

4.6 Reuse of soils

In case a reuse of excavated soils is intended, Table 10 presents an engineering use chart for compacted soils in relation with the Unified Soil Classification (ASTM), adapted from Lambe & Whitman, 1979.

	Engineering Properties of Compacted Soil									
Soil group name	Group symb ol	Permeability	Shear strength (saturated)	Compressibility (saturated)	Workability as a construction material					
Well-graded gravel	GW	Pervious	Excellent	Negligible	Excellent					
Poorly graded gravel	GP	Pervious	Good	Negligible	Good					
Silty gravel	GM	Semipervious to impervious	Good	Negligible	Good					
Clayey gravel	GC	Impervious	Good to fair	Very low	Good					
Well-graded sands	SW	Pervious	Excellent	Negligible	Excellent					
Poorly graded sands	SP	Pervious	Good	Very low	Fair					
Silty sands	SM	Semipervious to impervious	Good	Low	Fair					
Clayey sands	SC	Impervious	Good to fair	Low to medium	Good					
Silt	ML	Semipervious to impervious	Fair	Medium	Fair					
Lean clay	CL	Impervious	Fair	Medium	Good to fair					
Organic silt and organic clay	OL	Semipervious to impervious	Poor	Medium to high	Fair					
Elastic silt	MH	Semipervious to impervious	Fair to poor	High	Poor					
Fat clay	СН	Impervious	Poor	High	Poor					
Organic silt and organic clay	ОН	Impervious	Poor	High	Poor					
Peat and other highly organic soils	РТ	-	-	-	-					

Table 10	- Engineering us	se chart for c	compacted soil
	Engineering ut		ompuolou son

Granular soils comprising well graded gravels (GW) down to clayey sands (SC) should be given priority when soil reuse is considered on embankments, even





though soils such as ML and CL will still provide acceptable geotechnical properties, depending on its particular use.

High plastic and organic soils should be regarded as unsuitable for any construction work as they settle unduly even under their own weight and not be considered reusable.

Maputo, December, 2012

Geological Engineer

six a'ls

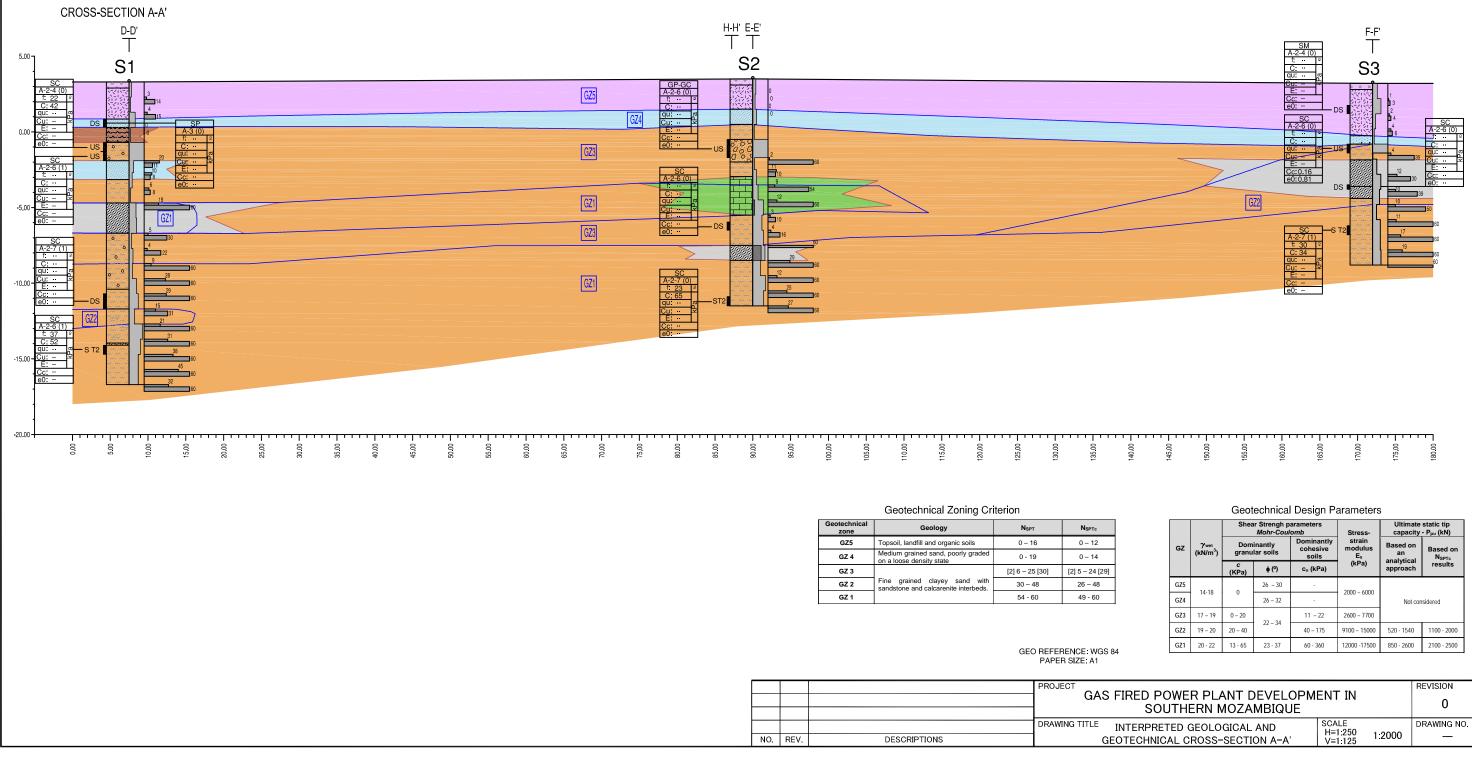
Engineering Geologist

Project Manager F. Gomes Pinto INGÉROP Cell: +258-82 310 5260 Telf: +258-21 496 650

Fax: +258-21 498 816 Email: <u>fgpinto@ingerop.co.mz</u>

Geographic Features of Ground Investigation Works

		5 1			5		
De	fa	C	oordinates		Remarks		
Reference		х	Y	Z	Remarks		
	S1	7130964.57	452773.81	3.32	Laboratory test sample collected between 4 - 5.2m (depth)		
	S2	7130907.99	452833.93	3.55	Laboratory test sample collected between 4 - 5.2m (depth)		
	S3	7130849.02	452891.05	3.2	Laboratory test sample collected between 4 - 4.5m (depth)		
	S4	7130955.9	452888.1	3.35	Laboratory test sample collected between 3.5 - 4.7m (depth)		
hole	S5	7130895.83	452937.72	3.42	Laboratory test sample collected between 4 - 4.6m (depth)		
rotary drillhole	S6	7131012.04	452826.08	3.68	Laboratory test sample collected between 4 - 4.6m and 8.5 - 9.0 m (depth)		
rota	S7	7130894.29	452888.71	3.44	Laboratory test sample collected between 4 and 4.4m and 4.8 – 5.5 m (depth)		
	S8	7130847.74	452992.31	3.35	Laboratory test sample collected between 5.0 - 5.5m (depth)		
	S9	7131012.36	452943.24	3.4	Laboratory test sample collected between 4,5 - 5.1m (depth)		
	S10	7130954.03	452997.92	4.81	Laboratory test sample collected between 5.0 - 6.2m (depth)		
	S11	7130899.79	453054.02	4.87	Laboratory test sample collected between 4.0 - 5.1m (depth)		

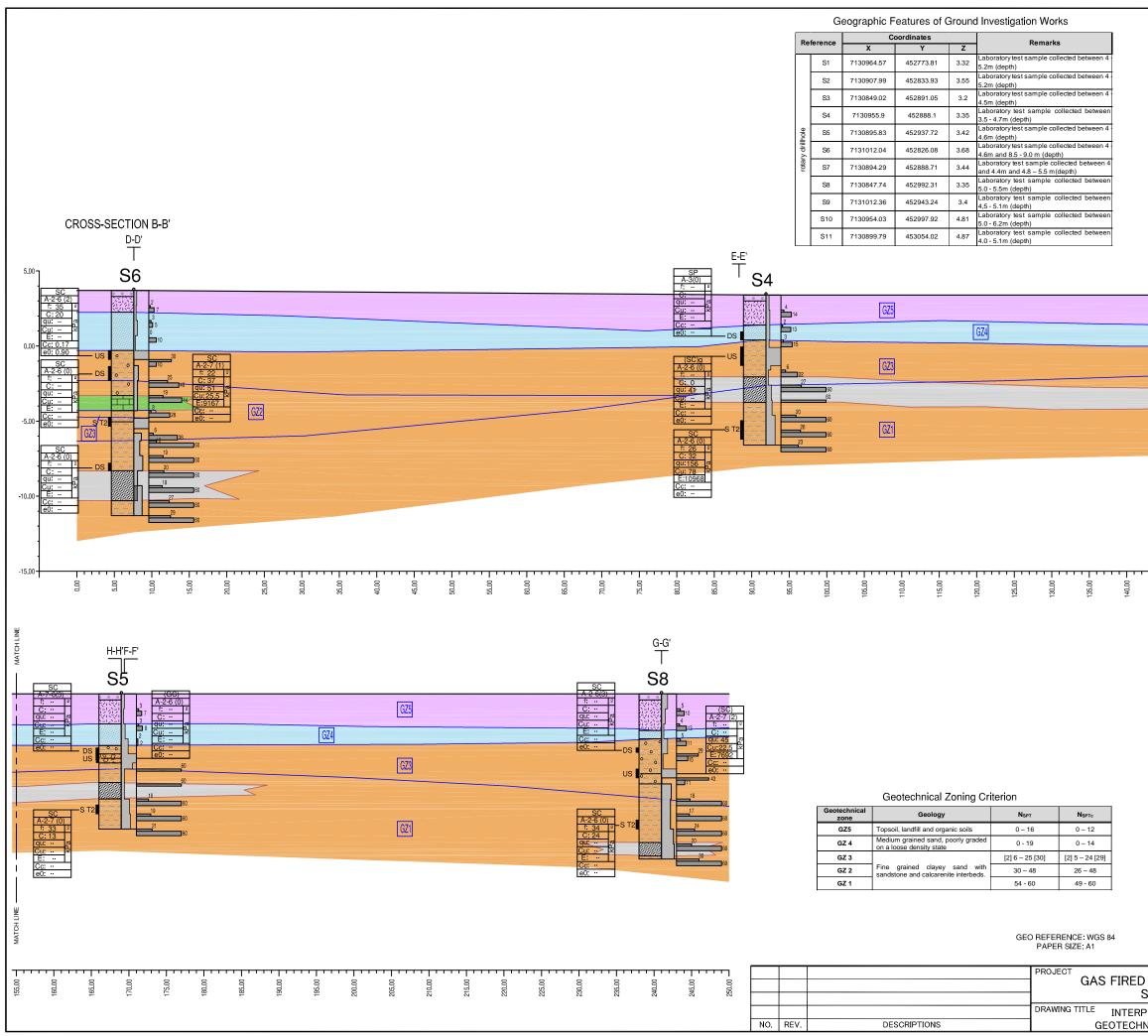


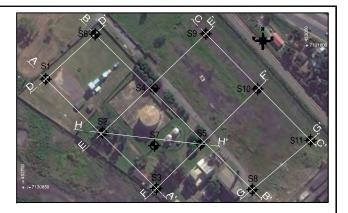


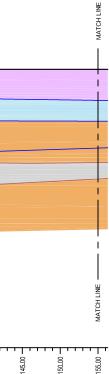
GZ		Shear Strengh parameters Mohr-Coulomb			Stress-	Ultimate static tip capacity - Ppu (kN)		
	γ _{wet} (kN/m³)	Dominantly granular soils		Dominantly cohesive soils	strain modulus E₅	Based on an	Based on N _{SPTc}	
		с (KPa)	\$ (°)	c _u (kPa)	(kPa)	analytical approach	results	
GZ5	14-18	0	26 - 30	-	2000 - 6000			
GZ4	14-10	U	26 - 32	-	2000 - 0000	Not con	nsidered	
GZ3	17 – 19	0 – 20	22 - 34	11 – 22	2600 - 7700			
GZ2	19 – 20	20 - 40		40 – 175	9100 - 15000	520 - 1540	1100 - 2000	
GZ1	20 - 22	13 - 65	23 - 37	60 - 360	12000 -17500	850 - 2600	2100 - 2500	

D POWER PLANT DEVELOPM			REVISION
SOUTHERN MOZAMBIQUE	0		
PRETED GEOLOGICAL AND	SCALE H=1:250		DRAWING NO.
HNICAL CROSS-SECTION A-A'	V=1:1250	1:2000	_

APP4-30





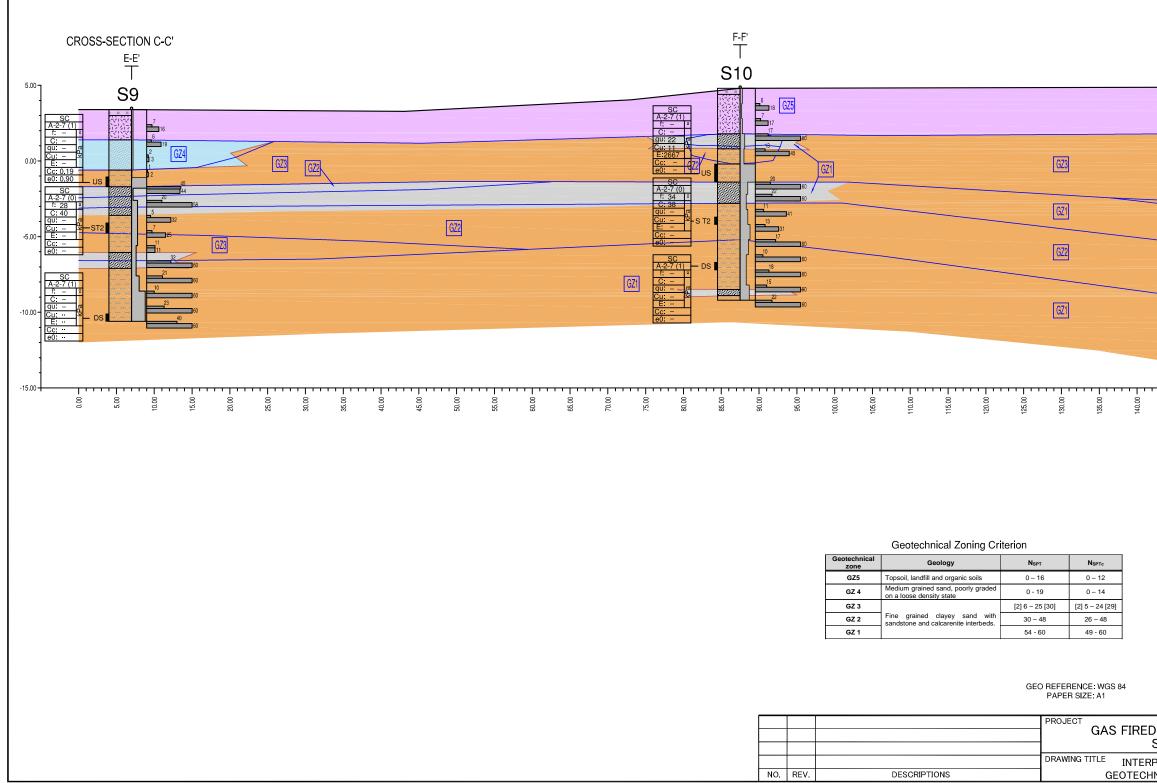


GZ		Shear Strengh parameters Mohr-Coulomb			Stress-	Ultimate static tip capacity - Ppu (kN)	
	Ƴ ^{wet} (kN/m³)	Dominantly granular soils		Dominantly cohesive soils	strain modulus E _s	Based on an	Based on N _{SPTc}
		с (KPa)	\$ (°)	c _u (kPa)	(kPa)	analytical approach	results
GZ5	14-18	0	26 - 30	-	2000 - 6000		
GZ4	14-10	U	26 - 32	-	2000 - 0000	Not considered	
GZ3	17 – 19	0 – 20	22 24	11 – 22	2600 - 7700		
GZ2	19 – 20	20 - 40	22 - 34	40 – 175	9100 - 15000	520 - 1540	1100 - 2000
GZ1	20 - 22	13 - 65	23 - 37	60 - 360	12000 -17500	850 - 2600	2100 - 2500

) POWER PLANT DEVELOPM SOUTHERN MOZAMBIQUE	REVISION 0		
PRETED GEOLOGICAL AND	SCALE H=1:250	1.2000	DRAWING NO.
NICAL CROSS-SECTIONS B-B'	V=1:125	1.2000	_

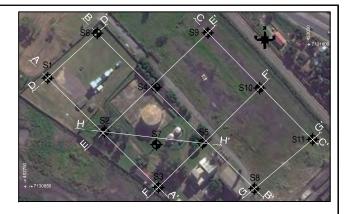


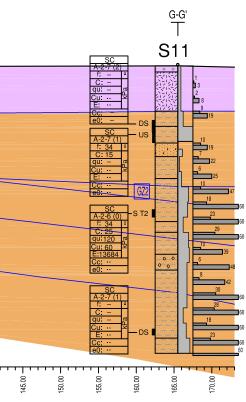
Bo	ference	C	oordinates		Remarks
Re	lerence	Х	Y	Z	Remarks
	S1	7130964.57	452773.81	3.32	Laboratory test sample collected between 4 5.2m (depth)
	S2	7130907.99	452833.93	3.55	Laboratory test sample collected between 4 5.2m (depth)
	S3	7130849.02	452891.05	3.2	Laboratory test sample collected between 4 - 4.5m (depth)
	S4	7130955.9	452888.1	3.35	Laboratory test sample collected between 3.5 - 4.7m (depth)
drillhole	S5	7130895.83	452937.72	3.42	Laboratory test sample collected between 4 - 4.6m (depth)
ry drill	S6	7131012.04	452826.08	3.68	Laboratory test sample collected between 4 - 4.6m and 8.5 - 9.0 m (depth)
rotary	S7	7130894.29	452888.71	3.44	Laboratory test sample collected between 4 and 4.4m and 4.8 – 5.5 m (depth)
	S8	7130847.74	452992.31	3.35	Laboratory test sample collected between 5.0 - 5.5m (depth)
	S9	7131012.36	452943.24	3.4	Laboratory test sample collected between 4,5 - 5.1m (depth)
	S10	7130954.03	452997.92	4.81	Laboratory test sample collected between 5.0 - 6.2m (depth)
	S11	7130899.79	453054.02	4.87	Laboratory test sample collected between 4.0 - 5.1m (depth)



NO. REV.

DESCRIPTIONS





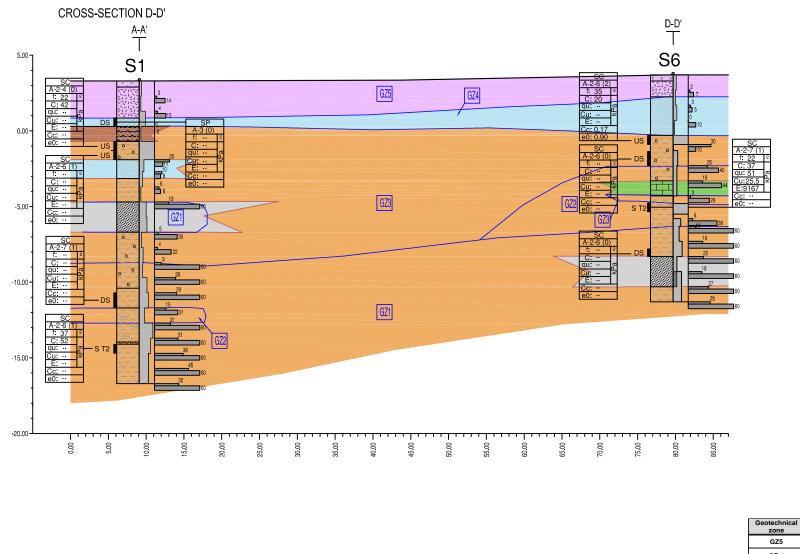
Geotechnical Design Parameters

		Shear Strengh parameters Mohr-Coulomb			Stress-	Ultimate static tip capacity - Ppu (kN)		
GZ	γ _{wet} (kN/m³)	Dominantly granular soils		Dominantly cohesive soils	strain modulus E₅	Based on an	Based on N _{SPTc}	
		с (KPa)	\$ (°)	c _u (kPa)	(kPa)	analytical approach	results	
GZ5	14-18	0	26 - 30	-	2000 - 6000			
GZ4	14-10	0	26 - 32	-	2000 - 0000	Not cor	nsidered	
GZ3	17 – 19	0 - 20	22 - 34	11 – 22	2600 - 7700			
GZ2	19 – 20	20 - 40	22 - 34	40 – 175	9100 - 15000	520 - 1540	1100 - 2000	
GZ1	20 - 22	13 - 65	23 - 37	60 - 360	12000 -17500	850 - 2600	2100 - 2500	

D POWER PLANT DEVELOPM	REVISION		
SOUTHERN MOZAMBIQUE	0		
RPRETED GEOLOGICAL AND HNICAL CROSS-SECTIONS C-C'	SCALE H=1:250 V=1:125	1:2000	DRAWING NO.

Geographic Features of Ground Investigation Works

		• •			
Bo	ference	C	oordinates		Remarks
Relefence		X Y Z		Z	Remarks
	S1	7130964.57	452773.81	3.32	Laboratory test sample collected between 4 - 5.2m (depth)
	S2	7130907.99	452833.93	3.55	Laboratory test sample collected between 4 - 5.2m (depth)
	S3	7130849.02	452891.05	3.2	Laboratory test sample collected between 4 4.5m (depth)
	S4	7130955.9	452888.1	3.35	Laboratory test sample collected between 3.5 - 4.7m (depth)
drillhole	S5	7130895.83	452937.72	3.42	Laboratory test sample collected between 4 4.6m (depth)
y drill	S6	7131012.04	452826.08	3.68	Laboratory test sample collected between 4 - 4.6m and 8.5 - 9.0 m (depth)
rotary	S7	7130894.29	452888.71	3.44	Laboratory test sample collected between 4 and 4.4m and 4.8 – 5.5 m(depth)
	S8	7130847.74	452992.31	3.35	Laboratory test sample collected between 5.0 - 5.5m (depth)
	S9	7131012.36	452943.24	3.4	Laboratory test sample collected between 4,5 - 5.1m (depth)
	S10	7130954.03	452997.92	4.81	Laboratory test sample collected between 5.0 - 6.2m (depth)
	S11	7130899.79	453054.02	4.87	Laboratory test sample collected between 4.0 - 5.1m (depth)



Geotechnical Zoning Criterion

Geotechnical zone	Geology	NSPT	NSPTC
GZ5	Topsoil, landfill and organic soils	0 – 16	0 - 12
GZ 4	Medium grained sand, poorly graded on a loose density state	0 - 19	0 - 14
GZ 3		[2] 6 – 25 [30]	[2] 5 – 24 [29]
GZ 2	Fine grained clayey sand with sandstone and calcarenite interbeds.		
GZ 1		54 - 60	49 - 60

GEO REFERENCE: WGS 84 PAPER SIZE: A1

PAPER	SIZE: A	41	

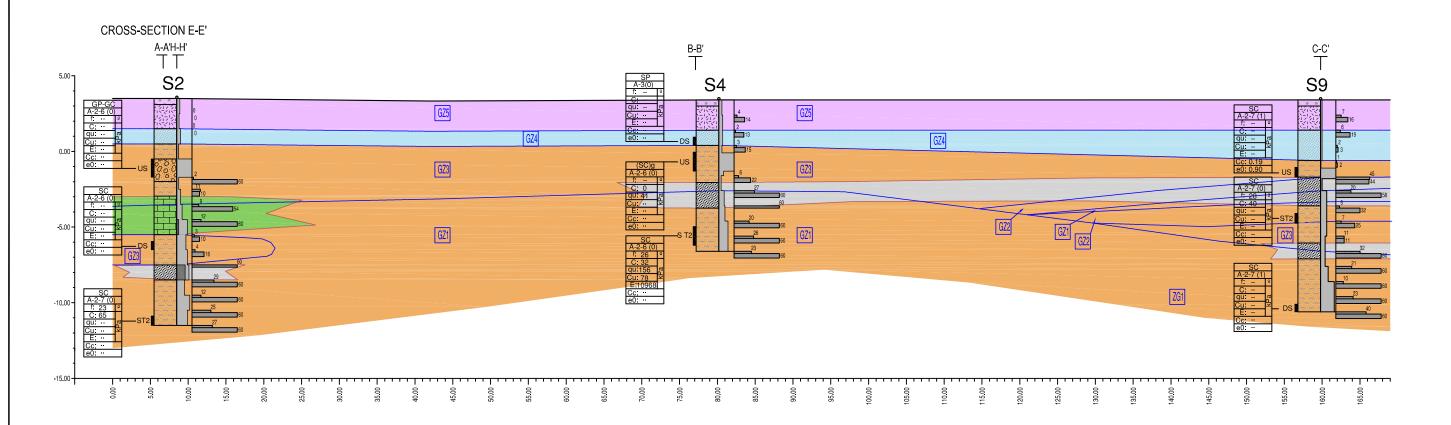
F				GAS FIRED POWER PLANT DEVELOPMENT IN SOUTHERN MOZAMBIQUE	revision 0
F					DRAWING NO.
	NO.	REV.	DESCRIPTIONS	GEOTECHNICAL CROSS-SECTIONS D-D' V=1:125 1:2000	



	?∕ _{wet} (kN/m³)	Shear Strengh parameters Mohr-Coulomb			Stress-	Ultimate static tip capacity - Ppu (kN)	
GΖ		Dominantly granular soils		Dominantly cohesive soils	strain modulus Es	Based on an	Based on
		с (KPa)	\$ (°)	c _u (kPa)	(kPa)	analytical approach	results
GZ5	14-18	0	26 - 30	-	2000 - 6000	Not considered	
GZ4	14-10	0	26 - 32	-	2000 - 6000		
GZ3	17 – 19	0 – 20	22 - 34	11 – 22	2600 - 7700		
GZ2	19 – 20	20 – 40	22 - 34	40 – 175	9100 - 15000	520 - 1540	1100 - 2000
GZ1	20 - 22	13 - 65	23 - 37	60 - 360	12000 -17500	850 - 2600	2100 - 2500

Geographic Features of Ground Investigation Works

Reference		C	oordinates		Remarks		
		Х	Y Z		Remarks		
	S1	7130964.57	452773.81	3.32	Laboratory test sample collected between 4 - 5.2m (depth)		
	S2	7130907.99	452833.93	3.55	Laboratory test sample collected between 4 - 5.2m (depth)		
	S3	7130849.02	452891.05	3.2	Laboratory test sample collected between 4 - 4.5m (depth)		
	S4	7130955.9	452888.1	3.35	Laboratory test sample collected between 3.5 - 4.7m (depth)		
drillhole	S5	7130895.83	452937.72	3.42	Laboratory test sample collected between 4 4.6m (depth)		
y drill	S6	7131012.04	452826.08	3.68	Laboratory test sample collected between 4 - 4.6m and 8.5 - 9.0 m (depth)		
rotary (S7	7130894.29	452888.71	3.44	Laboratory test sample collected between 4 and 4.4m and 4.8 – 5.5 m(depth)		
	S8	7130847.74	452992.31	3.35	Laboratory test sample collected between 5.0 - 5.5m (depth)		
	S9	7131012.36	452943.24	3.4	Laboratory test sample collected between 4,5 - 5.1m (depth)		
	S10	7130954.03	452997.92	4.81	Laboratory test sample collected between 5.0 - 6.2m (depth)		
	S11	7130899.79	453054.02	4.87	Laboratory test sample collected between 4.0 - 5.1m (depth)		



	Geotechnical Zoning Cr	iterion	
Geotechnical zone	Geology	NSPT	NSPTC
GZ5	Topsoil, landfill and organic soils	0 – 16	0 - 12
GZ 4	Medium grained sand, poorly graded on a loose density state	0 - 19	0 - 14
GZ 3		[2] 6 – 25 [30]	[2] 5 – 24 [29]
GZ 2	Fine grained clayey sand with sandstone and calcarenite interbeds.	30 - 48	26 – 48
GZ 1		54 - 60	49 - 60

GEO REFERENCE: WGS 84 PAPER SIZE: A1



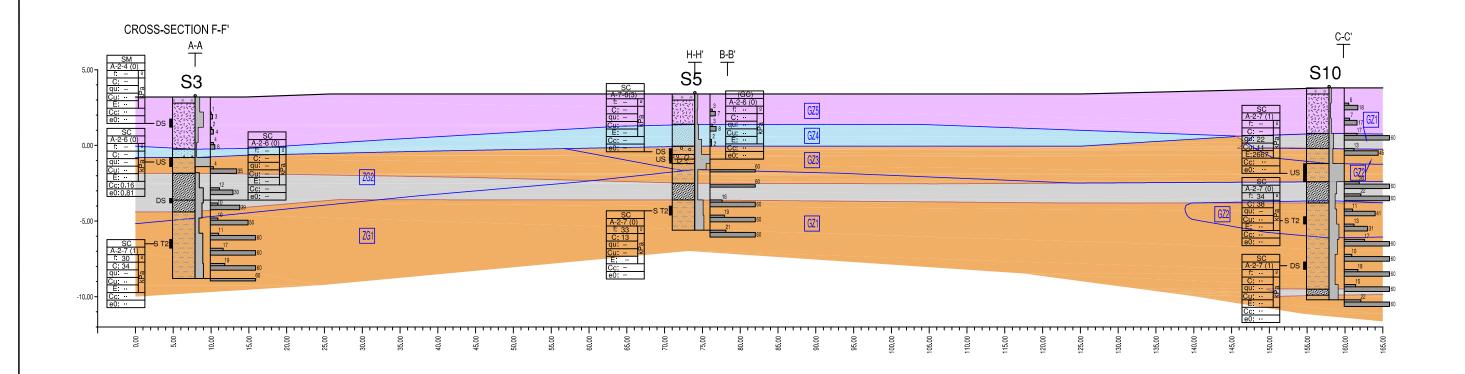
Geotechnical Design Parameters

		Shear Strengh parameters Mohr-Coulomb			Stress-	Ultimate static tip capacity - Ppu (kN)	
GZ	?∕ _{wet} (kN/m³)	Dominantly granular soils		Dominantly cohesive soils	strain modulus E₅	Based on an	Based on N _{SPTc}
		с (KPa)	\$ (°)	c _u (kPa)	(kPa)	analytical results	
GZ5	14-18	0	26 - 30	-	2000 - 6000		
GZ4	14-10	0	26 - 32		2000 - 0000	Not consider	isidered
GZ3	17 – 19	0 – 20		11 – 22	2600 - 7700		
GZ2	19 – 20	20 – 40	22 - 34	40 – 175	9100 - 15000	520 - 1540	1100 - 2000
GZ1	20 - 22	13 - 65	23 - 37	60 - 360	12000 -17500	850 - 2600	2100 - 2500

APP4-34

Geographic Features of Ground Investigation Works

		5 1			5
Reference		C	oordinates		Remarks
		Х	Y	Z	Remarks
	S1	7130964.57	452773.81	3.32	Laboratory test sample collected between 4 5.2m (depth)
	S2	7130907.99	452833.93	3.55	Laboratory test sample collected between 4 5.2m (depth)
rotary drillhole	S3	7130849.02	452891.05	3.2	Laboratory test sample collected between 4 4.5m (depth)
	S4	7130955.9	452888.1	3.35	Laboratory test sample collected between 3.5 - 4.7m (depth)
	S5	7130895.83	452937.72	3.42	Laboratory test sample collected between 4 4.6m (depth)
	S6	7131012.04	452826.08	3.68	Laboratory test sample collected between 4 4.6m and 8.5 - 9.0 m (depth)
	\$7	7130894.29	452888.71	3.44	Laboratory test sample collected between 4 and 4.4m and 4.8 – 5.5 m (depth)
	S8	7130847.74	452992.31	3.35	Laboratory test sample collected between 5.0 - 5.5m (depth)
	S9	7131012.36	452943.24	3.4	Laboratory test sample collected between 4,5 - 5.1m (depth)
	S10	7130954.03	452997.92	4.81	Laboratory test sample collected between 5.0 - 6.2m (depth)
	S11	7130899.79	453054.02	4.87	Laboratory test sample collected between 4.0 - 5.1m (depth)



	Geotechnical Zoning Cr	iterion	
Geotechnical zone	Geology	NSPT	NSPTC
GZ5	Topsoil, landfill and organic soils	0 – 16	0 – 12
GZ 4	Medium grained sand, poorly graded on a loose density state	0 - 19	0 - 14

Fine grained clayey sand with sandstone and calcarenite interbeds.

GZ 3

GZ 2

GZ 1

GEO REFERENCE: WGS 84

[2] 6 – 25 [30] [2] 5 – 24 [29]

30 - 48

54 - 60

26 - 48

49 - 60

			GAS FIRED POWER PLANT DEVELOPMENT IN SOUTHERN MOZAMBIQUE	REVISION 0
NO.	REV.	DESCRIPTIONS	DRAWING TITLE INTERPRETED GEOLOGICAL AND GEOTECHNICAL CROSS-SECTIONS F-F' V=1:125 V=1:125	DRAWING NO.



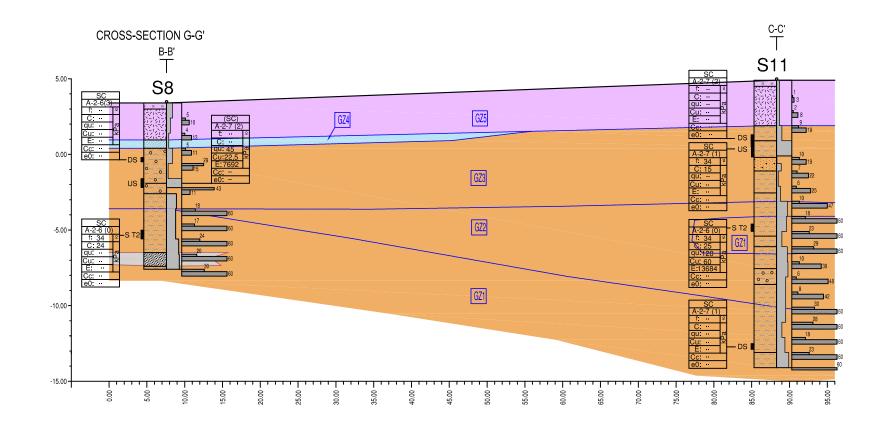
Geotechnical Design Parameters

		Shear Strengh parameters Mohr-Coulomb			Stress-	Ultimate static tip capacity - Ppu (kN)		
GZ	γ _{wet} (kN/m³)	Dominantly granular soils		s soils Es	modulus Es	Based on an	Based on NSPTC	
		с (KPa)	\$ (°)	c _u (kPa)	(kPa)	analytical approach	results	
GZ5	14-18	0	26 - 30	-	2000 - 6000			
GZ4	14-18	0	U	26 - 32	-	2000 - 6000	Not con	isidered
GZ3	17 – 19	0 - 20	22 - 34	11 – 22	2600 - 7700			
GZ2	19 – 20	20 - 40		40 – 175	9100 - 15000	520 - 1540	1100 - 2000	
GZ1	20 - 22	13 - 65	23 - 37	60 - 360	12000 -17500	850 - 2600	2100 - 2500	

APP4-35

Geographic Features of Ground Investigation Works

		с	oordinates			
Reference		X	Y	Z	Remarks	
	S1	7130964.57	452773.81	3.32	Laboratory test sample collected between 4 - 5.2m (depth)	
	S2	7130907.99	452833.93	3.55	Laboratory test sample collected between 4 - 5.2m (depth)	
rotary drillhole	S3	7130849.02	452891.05	3.2	Laboratory test sample collected between 4 - 4.5m (depth)	
	S4	7130955.9	452888.1	3.35	Laboratory test sample collected between 3.5 - 4.7m (depth)	
	S5	7130895.83	452937.72	3.42	Laboratory test sample collected between 4 4.6m (depth)	
	S6	7131012.04	452826.08	3.68	Laboratory test sample collected between 4 4.6m and 8.5 - 9.0 m (depth)	
	S7	7130894.29	452888.71	3.44	Laboratory test sample collected between 4 and 4.4m and 4.8 – 5.5 m(depth)	
	S8	7130847.74	452992.31	3.35	Laboratory test sample collected between 5.0 - 5.5m (depth)	
	S9	7131012.36	452943.24	3.4	Laboratory test sample collected between 4,5 - 5.1m (depth)	
	S10	7130954.03	452997.92	4.81	Laboratory test sample collected between 5.0 - 6.2m (depth)	
	S11	7130899.79	453054.02	4.87	Laboratory test sample collected between 4.0 - 5.1m (depth)	



Geotechnical Zoning Criterion

Geotechnical zone	Geology	NSPT	NSPTC
GZ5	Topsoil, landfill and organic soils	0 – 16	0 – 12
GZ 4	GZ 4 Medium grained sand, poorly graded on a loose density state		0 - 14
GZ 3		[2] 6 – 25 [30]	[2] 5 – 24 [29]
GZ 2	Fine grained clayey sand with sandstone and calcarenite interbeds.	30 - 48	26 - 48
GZ 1		54 - 60	49 - 60

GEO REFERENCE: WGS 84 PAPER SIZE: A1

F				GAS FIRED POWER PLANT DEVELOPMENT IN SOUTHERN MOZAMBIQUE	revision 0
					DRAWING NO.
	NO.	REV.	DESCRIPTIONS	GEOTECHNICAL CROSS-SECTIONS G-G' V=1:125 1:2000	

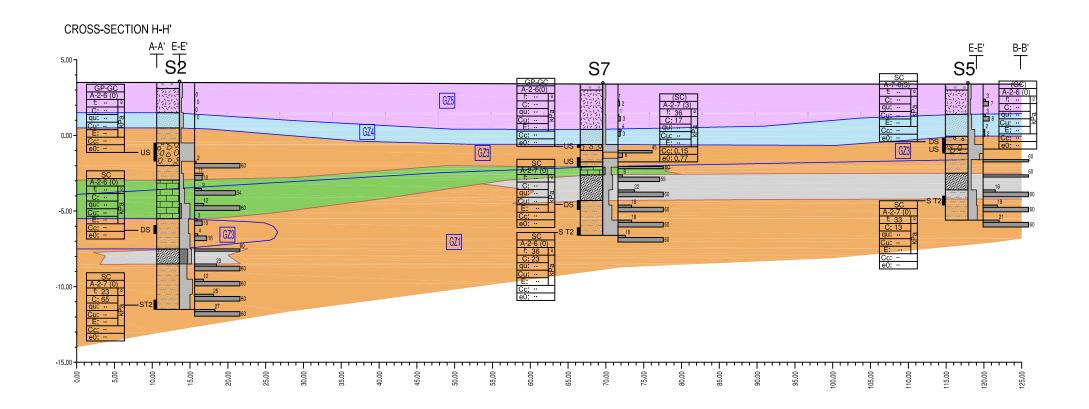


	Geotechnical	Design	Parameters
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		Shea	r Strengh p Mohr-Coul		Stress-		Ultimate static tip capacity - P _{pu} (kN)		
GZ	γ ^{wet} (kN/m ³)	Dominantly granular soils				Based on an	Based on N _{SPTc}		
		с (KPa)	¢ (º)	c _u (kPa)	(kPa)	analytical approach	results		
GZ5	14-18	0	26 - 30	-	2000 - 6000				
GZ4	14-18	0	U	26 - 32	-	2000 - 6000	Not considered		
GZ3	17 – 19	0 – 20	22 24	11 – 22	2600 - 7700				
GZ2	19 – 20	20 - 40	22 - 34	40 – 175	9100 - 15000	520 - 1540	1100 - 2000		
GZ1	20 - 22	13 - 65	23 - 37	60 - 360	12000 -17500	850 - 2600	2100 - 2500		

Geographic Features of Ground Investigation Works

Reference		C	oordinates		Remarks
		Х	Y	Z	Remarks
	S1	7130964.57	452773.81	3.32	Laboratory test sample collected between 4 - 5.2m (depth)
	S2	7130907.99	452833.93	3.55	Laboratory test sample collected between 4 - 5.2m (depth)
	S3	7130849.02	452891.05	3.2	Laboratory test sample collected between 4 - 4.5m (depth)
rotary drillhole	S4	7130955.9	452888.1	3.35	Laboratory test sample collected between 3.5 - 4.7m (depth)
	S5	7130895.83	452937.72	3.42	Laboratory test sample collected between 4 - 4.6m (depth)
	S6	7131012.04	452826.08	3.68	Laboratory test sample collected between 4 - 4.6m and 8.5 - 9.0 m (depth)
	S7	7130894.29	452888.71	3.44	Laboratory test sample collected between 4 and 4.4m and 4.8 – 5.5 m(depth)
	S8	7130847.74	452992.31	3.35	Laboratory test sample collected between 5.0 - 5.5m (depth)
	S9	7131012.36	452943.24	3.4	Laboratory test sample collected between 4,5 - 5.1m (depth)
	S10	7130954.03	452997.92	4.81	Laboratory test sample collected between 5.0 - 6.2m (depth)
	S11	7130899.79	453054.02	4.87	Laboratory test sample collected between 4.0 - 5.1m (depth)



Geotechnical Zoning Criterion	
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Geotechnical zone	Geology	NSPT	NSPTC
GZ5	Topsoil, landfill and organic soils	0 – 16	0 – 12
GZ 4	Medium grained sand, poorly graded on a loose density state	0 - 19	0 - 14
GZ 3		[2] 6 – 25 [30]	[2] 5 – 24 [29]
GZ 2	Fine grained clayey sand with sandstone and calcarenite interbeds.	30 - 48	26 – 48
GZ 1		54 - 60	49 - 60

GEO REFERENCE: WGS 84

PAF	'ER S	SIZE:	A1	

				REVISION
			GAS FIRED POWER PLANT DEVELOPMENT IN	0
			SOUTHERN MOZAMBIQUE	, C
			DRAWING TITLE INTERPRETED GEOLOGICAL AND SCALE H=1:250 1:2000	DRAWING NO.
NO.	REV.	DESCRIPTIONS	GEOTECHNICAL CROSS-SECTIONS H-H' V=1:125 1:2000	—



		Shea	r Strengh p Mohr-Coul		Stress-		
GZ	γ _{wet} (kN/m³)		inantly lar soils	Dominantly cohesive soils	strain modulus Es	Based on an	Based on N _{SPTc}
		с (KPa)	¢ (º)	c _u (kPa)	(kPa)	analytical approach	results
GZ5	14-18	0	26 - 30	-	2000 - 6000		
GZ4	14-10	0	26 - 32	-	2000 - 0000	Not con	Based on N _{SPTc} results
GZ3	17 – 19	0 – 20	22 - 34	11 – 22	2600 - 7700		
GZ2	19 – 20	20 - 40	22 - 34	40 – 175	9100 - 15000	520 - 1540	1100 - 2000
GZ1	20 - 22	13 - 65	23 - 37	60 - 360	12000 -17500	850 - 2600	2100 - 2500





Client: ORIENTAL CONSULTANTS CO. Ltd

Job: GAS FIRED POWER PLANT DEVELOPMENT IN SOUTHERN MOZAMBIQUE - GEOTECHNICAL SURVEY Process: 25512

Sample Type :

Undisturbed

Laboratory Test Results

B		D		Ļ	Classif.	w	ρ	WL	VB (g/100g)	12	article si aracteris		Comp.			CBR			Cons	olidation	S	hear St	rength		Permea- bility
rehole(N°)	Sample (N°)	e	Description	L s t r.	Unified RTR AASHTO	Sr EA (%)	ρ _d (g/cm ²) Dens. Part. G	¹ p V _S (%)	MO (%) Ph	<2.0 mm <0.42 mm (%)	<0.074 mm <0.002 mm (%)	dim. bigger part. Max. Min. (mm)	Wopt (%) Y dmax (kN/m ²) Light Heavy	CR (%)	Desv. Wopt (%)		Expan sibility (%)	CBR at 95% Penet.	Cc eo	Cv (cm ² /s) K (cm/s)	qu E (kPa)	σ ₃ σ ₁ (kPa)	C C' (kPa)	¢ ¢' (0)	Gradient 1 (kg/cm ⁻) K (cm/s)
S 1 (CTM)	56724	4.00	Fine sand, silty-clay, with gravel, dark gray		(SC) A-2-6(0)	24.0	2.74	35 17		83 71	21	30 11											42	22	
S 1 (CTM)	56725		Variable grain size sand, silty-clay, with gravel, grayish yellow		(SC) A-2-6(1)	20.0	2.75	35 19		77 50	23	18 9													
S I (CTM)	56726	17.60	Sandy silt, greenish yellow			26.4	1 44 1 50																52	37	
S 2 (CTM)	56736		Variable gravel, with sandy-silty-clay, bluish gray.		(GP-GC)s	12.5	2 70	26 11		38	10	54 13													
S 2 (CTM)	56737		Fine sand, silty-clay, brownish yellow		(SC) A-2-7(0)	23.0	2 72	41 18		100 96	16												65	23	
S 3 (CTM)	56738	1 m m m m m	Fine sand, silt-clay, with gravel, bluish gray		(SC) A-2-6(0)	25.3	2 72	27 12		86 79	21	29 14								1.8 EE-3					
S 3 (CTM)	56739	9 40 10 00	Fine sand, silty-clay, greenish yellow.		(SC) A-2-7(1)	25.7	2 75	42 18		96 90	22												34	30	
S 4 (CTM)	56753	3.50 4.70	Fine sand, silty-clayey, with variable gravel, bluish gray		(SC)g A-2-6(0)	20 1	2 76	35 14		65 56	22	41 10											0	41	
S 4 (CTM)	56754	8.40 9.00	Fine sand, silty-clayey, greenish yellow		(SC) A-2-6(0)	17.7	2 75	39 17		97 93	21	26 7									156 10968		32	26	
S 5 (CTM)	56755	4.00	Variable gravel, sandy-silty-clayey, grayish yellow		(GC)s A-2-6(0)	14.0	2 73	37 19		36 30	15	54 12													





Sample Type :

Undisturbed

Client: ORIENTAL CONSULTANTS CO. Ltd

Job: GAS FIRED POWER PLANT DEVELOPMENT IN SOUTHERN MOZAMBIQUE - GEOTECHNICAL SURVEY Process: 25512

Laboratory Test Results

B		D		L	Classif.	w	ρ	WL	VB (g/100g)	10.00	article si aracteri		Comp.			CBR			Con	solidation	s	ihear St	rength		Permea- bility
r eh o l e (N°)	Sample (N°)	e	Description	t. - s t r.	Unified RTR AASHTO	Sr EA (%)	Pd (g/cm ²) Dens. Part. G	¹ р V _S (%)	MO (%) Ph	<2.0 mm <0.42 mm (%)	<0.074 mm <0.002 mm (%)	dim. bigger part. Max. Min. (mm)	Wopt (%) Y dmax (kN/m ²) Light Heavy	CR (%)	Wopt	1.1.2	Expan sibility (%)	CBR at 95% Penet.	Ce	Cv (cm ² /s) K (cm/s)	qu E (kPa)	σ ₃ σ ₁ (kPa)	C C' (kPa)	¢ (0)	Gradien 1 (kg/cm ²) K (cm/s)
S 5 (CTM)	56756	7.40	Fine sand, silty-clayey, greenish yellow		(SC) A-2-7(0)	25.2	2.76	44 23		97 92	16	18	-										13	33	
S 6 (CTM)	56730		Fine sand, silty-clay, with dispersed gravel greenish gray		(SC) A-2-6(2)	27.0		40 21		89 84	31								12.5	7.8 EE-3			20	35	
S 6 (CTM)	56731	1.000	Fine sand, silty-clay, greenish yellow		(SC) A-2-7(0)	24.3	-	48 25		94 86	16								0.70	2.122.7	51 9167		37	22	
S 7 (CTM)	56757	1.	Coarse gravel, sandy silty-clayey, light gray		(GP-GC)s A-2-6(0)	14.4		37 18		37	12	48									.7107				
S 7 (CTM)	56758	4.80	Fine sand, silt-clayey, with gravel fine to medium greenish gray		(SC)g A-2-7(3)	24.0		42 25		72	34	40 5							1000	8 1 EE-3 2 0 EE-7			17	36	
S 7 (CTM)	56759	9.50 10.00	Fine sand, silty-clayey, greenish yellow.		(SC) A-2-6(0)	24.7	2.71	39 18		98 95	21												23	36	
S 8 (CTM)	56760		Fine sand, silt-clayey, with Fine to medium gravel, yellow		(SC)g A-2-7(2)	23.5	2 74	46 27		80 69	29	36 8								4 4 EE-3 8 2 EE-8	45 7692				
S 8 (CTM)	56761	8.40 9.00	Fine sand, silty-clayey, brownish yellow		(SC) A-2-6(0)	21.2	2 72	40 20		100 96	19												24	34	
8 9 (CTM)	56777		Variable grain size sand, silt-clayey, with fine to medium gravel, yellow		(SC)g A-2-7(1)	21.2	2.70	49 26		67 53	21	33 8							0.19	4 1 EE-3					
8 9 (CTM)	56778		Fine sand, silty-clayey, greenish yellow		(SC) A-2-7(0)	23 3		44 21		98 97	18	18 7											40	28	

Mod.PL.02.6/3

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Client: ORIENTAL CONSULTANTS CO. Ltd

Job: GAS FIRED POWER PLANT DEVELOPMENT IN SOUTHERN MOZAMBIQUE - GEOTECHNICAL SURVEY Process: 25512

Sample Type :

Undisturbed

Laboratory Test Results

	D		L	Classif.	w	ρ	WL	VB	Chi	aracteris	tics	Comp.						Con	solidation	s	hear St	rength		Permea- bility
Sample (N°)	e p t h (m)	Description	L str.	Unified RTR AASHTO	Sr EA (%)	ρ _d (g/cm ¹) Dens. Part. G	I _P V _S (%)	MO (%) Ph	<2.0 mm	<0.074 mm <0.002 mm (%)	dim. bigger part. Max. Min. (mm)	Wopt (%) Y dmax (kN/m ³) Light Heavy		Wopt		sibility	CBR at 95% Penet.	Cc eo	Cv (cm²/s) K (cm/s)	qu E (kPa)	σ ₃ σ ₁ (kPa)	C C (kPa)	¢ (0)	Gradient 1 (kg/cm ³) K (cm/s)
56779	1.1	to medium gravel, light yellow		(SC)g A-2-7(1)	15.1	2.72	26		60 40		43 12									22 2667			I	
56780		vellowish brown		(SC) A-2-7(0)	15.5	2.71	44 25		82 56		31 8											38	34	
56762	1.00	vellow		(SC) A-2-7(1)	29.0	0.72	44 25		94 78		16 6											15	34	
56763				(SC) A-2-6(0)	18.4	2 70	36 17		99 87											120 13684			34	
																		_						
											-										-			
	(N°) 56779 56780 56762 56763	Sample P t h (№) (m) 56779 6.20 56779 6.20 56760 9.00 56762 5.10 56763 9.50	Sample e p t t h Description (N") (m) 500 Variable grain size sand, silt-clayey, with fine to medium gravel, light yellow. 56779 8.50 56780 9.00 56762 4.00 56762 yellow 510 9.50	Sample Dec e i. i. P Description - t i. i. (N") (m) i. 56779 5 00 Variable grain size sand, silt-clayey, with fine to medium gravel, light yellow 6.20 - 56780 9 00 56762 yellowish brown 9 00 56763 4 00 510 - 9 50 Fine to medium sand, silty-clayey, brownish yellow 56763 9 50	D e bDescriptioni t t rClassified t t AASHTO(N")ma a cRTR a t rRTR AASHTO(N")(m)a ca cAASHTO56779500 to medium gravel, light yellow 6.20a cA2-7(1)56780 9.00 a yellowish brown 9.00a cA2-7(0)56762 9.00 a yellowA2-7(0)56763 9.00 a yellowA2-7(1)56763 9.00 a yellowA2-7(1)56763 9.00 a yellowA2-7(1)56763 9.00 a yellowA2-7(1)56763 9.00 a yellowA2-7(1)56763 9.00 a yellowA2-7(1)56763 9.00 a yellowa yellow56763 9.00 a yellowa yellow	D e P t hDescription I_{1} L t s t hClassif, Sr s r(N")mEA(N")(m)r.56779500 Variable grain size sand, silt-clayey, with fine to medium gravel, light yellowA567808.50 Fine to medium sand, clayey, with fine gravel, yellowish brown(SC) A-2-7(1)567629.00A-2-7(0)56762yellowish brown yellowA-2-7(0)567639.50 Fine to medium sand, silty-clayey, brownish yellow(SC) A-2-7(1)567639.50 Fine sand, silty-clayey, greenish yellowA-2-7(1)	$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	D e P t hDescriptionL i t L UnifiedClassif. UnifiedP P dPL ($p'100g$)Sample rP hDescriptionSr FPd RTR r.Ip PdMO ($\%$)(N°)(m)RTR rEA r.(g'cni) Part. ($\%$)MO ($\%$)56779500Variable grain size sand, silt-clayey, with fine to medium gravel, light yellow(SC)g15.146 2656780500Fine to medium sand, clayey, with fine gravel, yellowish brown(SC)15.5444 25567629.00A-2-7(0)2.7127256763400Fine to medium sand, silty-clayey, brownish yellow(SC)15.5444 25567639.50Fine sand, silty-clayey, greenish yellow(SC)18.436 17	D e P t hDescriptionL i i t s s t hClassif, i unifiedP P t hPL (1000) (20.00 mmChastif, (20.00 mmSample r hP P p tDescriptionSr s t rPd RTR rIp RTR (%)MO (%) (%)MO (%) (%)MO (%)MO (%)(N°) (N°)(m)Sr rAASHTO (%)(%)MO (%)MO (%)MO (%)MO (%)56779500 to medium gravel, light yellow.ASHTO (%)(%)15.146 2660056780900A-2-7(1)2.7240056762900A-2-7(0)2.71566 256762yellowish brown yellowKSC)29.044 2594 256510A-2-7(1)2.7378 7856763950 51050018.436 17990	D e P hDescriptionL i t t hClassif, UnifiedP P t t rP P t t rCharacteris (U) Sample P t hP P tDescription (U) t tUnified s t rSr RTR r AASHTOPd P t rIp MO (%) $(Characteris(%)(N°)(m)DescriptionSrrtrrAASHTORTR(%)EAPart(%)(Characteris(%)(Characteris(%)(Characteris(%)(N°)(m)Sr(m)(m)MO(%)(Characteris(%)(Characteris(%)(Characteris(%)(N°)(m)Sr(m)(m)NO(%)(Characteris(%)(Characteris(%)(Characteris(%)(N°)(m)Sr(m)(m)NO(%)(Characteris(%)(Characteris(%)(Characteris(%)(Characteris(%)(N°)(m)(m)(Characteris(m)$	b $\left[2 \\ P \\ T \\ h \\ h$	$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	D e p p hDescriptionL i tClassif. tPPP p tCharacteristic mm 	$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$

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Sample Type :

Client: ORIENTAL CONSULTANTS CO. Ltd

Job: GAS FIRED POWER PLANT DEVELOPMENT IN SOUTHERN MOZAMBIQUE - GEOTECHNICAL SURVEY Process: 25512

Laboratory Test Results

B		D		L	Classif.	w	ρ	wL	VB (g/100g)		rticle si racteris		Comp.		-	CBR			Cons	olidation	S	hear St	rength		Permea- bility
rehole(N°)	Sample (N°)	e	Description	t. - s t r.	Unified RTR AASHTO	Sr EA (%)	Pd (g/cm ²) Dens. Part. G	^I P ^V S (%)	MO (%) Ph	<2.0 mm <0.42 mm (%)	<0.074 mm <0.002 mm (%)	dim. bigger part. Max. Min. (mm)	Wopt (%) Y dmax (kN/m ³) Light Heavy	CR (%)	Desv. Wopt (%)	0	Expan sibility (%)	CBR at 95% Penet.	Cc	Cv (cm ² /s) K (cm/s)	qu E (kPa)	σ ₃ σ ₁ (kPa)	C C' (kPa)	¢.	Gradient 1 (kg/cm²) K (cm/s)
S I (CTM)	56727	2 45 3.00	Fine to medium sand, light gray		(SP) A-3(0)	22.8	2 67	N/P		100 80	3														
S 1 (CTM)	56728	14.00	Fine sand, silty-clay, light yellow.		(SC) A-2-7(1)	23.4	2 72	54 32		97 95	21														
S I (CTM)	56729	17.60	Fine sand, silty-clay, yellow		(SC) A-2-6(0)	26.6	2.75	37 13		100	25														
S 2 (CTM)	56740	9.45	Fine sand, silt-clay, with gravel scattered greyish yellow		(SC) A-2-7(1)	20.9		44 19		92 83	26	20 7													
S 3 (CTM)	56741	1.45	Variable grain size sand, silty, with thin to medium gravel, black		(SM)g A-2-4(0)	33.6	2.42	N/P		63 44	28	25 11													
S 3 (CTM)	56742		Variable grain size sand, silt-clay, with gravel medium to fine yellow		(SC)g A-2-6(0)	11.6	2 74	26 13		58 44	26	41 19													
S 4 (CTM)	56764	2.45	Fine to medium sand, light gray		(SP) A-3(0)	19.3	2.65	N/P		98 72	1														
S 5 (CTM)	56765		ay silty-sandy, with dispersed gravel, yellowish gray.		(SC) A-7-6(3)	26.1	2,72	43 22		88	36	39 8													
S 6 (CTM)	56732		Variable grain size sand, silty-clay, with gravel and medium grayish yellow		(SC)g A-2-6(0)	23.4	2 73	34 20		68 53	17														
S 6 (CTM)	56733	11.50 12.00	Fine sand, silty-clay, greenish yellow		(SC) A-2-6(0)	22.3	2 75	38 16		99 96	19														





Client: ORIENTAL CONSULTANTS CO. Ltd

Job: GAS FIRED POWER PLANT DEVELOPMENT IN SOUTHERN MOZAMBIQUE - GEOTECHNICAL SURVEY Process: 25512

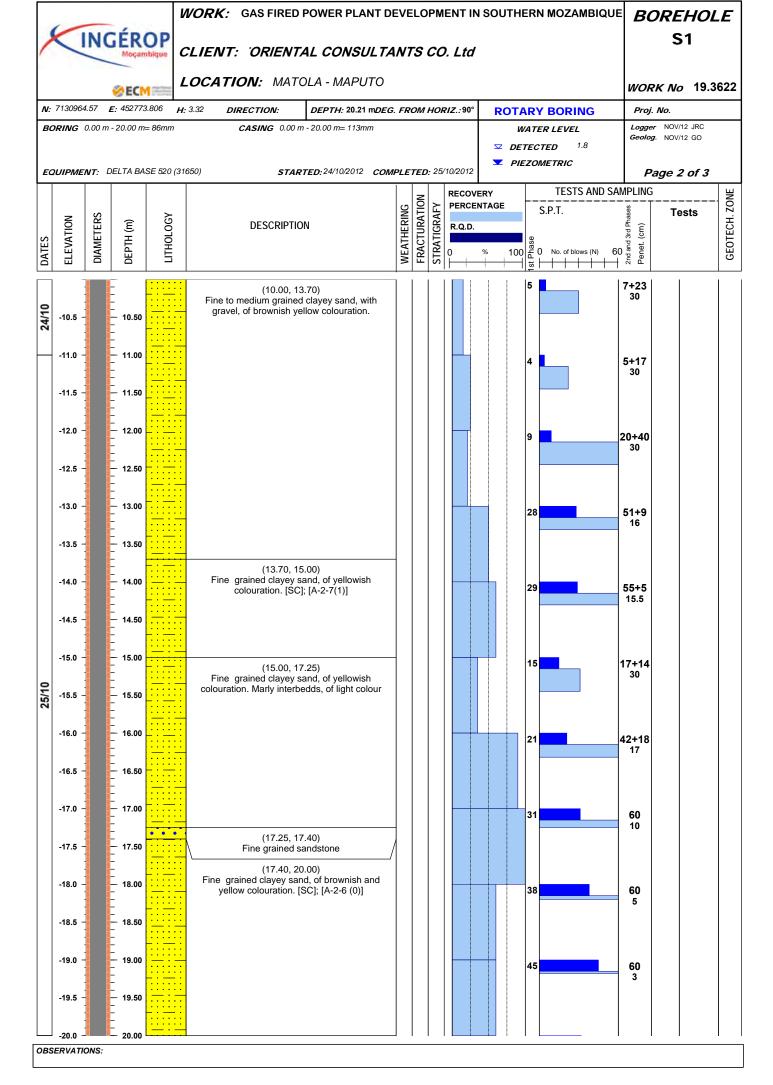
Sample Type :

Remolded

Laboratory Test Results

B		D		L	Classif.	w	ρ	WL	VB (g/100g)	C1.	article si aracteris		Comp.			CBR			Cons	olidation	S	hear St	rength		Permea- bility
ге <u>н</u> о – е (N ⁿ)	Sample (N")	e p t h (m)	Description	L · str	Unified RTR AASHTO	Sr EA (%)	ρ _d (g/cn ¹) Dens. Part. G	¹ р V _S (%)	MO (%) Ph		<0.074 mm <0.002 mm (%)		Wopt (%) Y dmax (kN/m ²) Light Heavy	CR (%)	Wopt	1.1	Expan sibility (%)	CBR at 95% Penet.	Cc eo	Cv (cm ² /s) K (cm/s)	qu E (kPa)	σ ₃ σ ₁ (kPa)	C C' (kPa)	¢ (0)	Gradient I (kg/cm²) K (cm/s)
S 7 (CTM)	56766	7.70 8.00	Fine sand, clayey, greenish yellow.		(SC) A-2-7(0)	20.8	2.72	41 18		99 95	18														
S 8 (CTM)	56767		Fine sand, silt-clayey, with fine to medium gravel, gray		(SC)g A-2-6(0)	183	2.72	28 12		74 65	29	27 6													
S 9 (CTM)	56781	13.50 14.00	Fine sand, silty-clay, dark yellow		(SC) A-2-7(1)	25.0	2.72	42 21		98 90	24														
S 10 (CTM)	56782	11 50	Fine sand, silty-clay, yellowish brown.		(SC) A-2-7(1)	23.2	2 72	48 22		98 94	21														
S 11 (CTM)	56768	3.50	Variable grain size sand, silt-clayey, with fine gravel, yellowish green.		(SC) A-2-7(2)	18.3	2.74	45 25		83 68	31	26 7													
S 11 (CTM)	56769		Fine sand, silty-clayey, greenish yellow		(SC) A-2-7(1)	23.8		43 19		97 95	25														
											_														

IDCATION: MATOLA - MAPUTO WORK NO 19.362 VISMENT MA32 DIRECTION DEFTH 321 MOGL FROM HORE 401 ROTARY BORING Page No VISME CASING QUORP 2000m-100m CASING QUORP 2000m-100m WATER LEVEL	8		NO		OP	NORK: GAS FIRED POWER PLANT						ERN MOZAMBIQ	NUE BOI	REHOL S1	LE
NMG 0.00m CLASING CLAS				⊘EC!	1 200 L	LOCATION: MATOLA - MAPUTO							WORK	<i>No</i> 19.3	622
UNMENT: DELTA BASE 50/01650 STARTED-24/02012 COMPLETED-55/02012 DETERTIO DETERTIO PRECOMENTION 000000000000000000000000000000000000							EG. FI	ROM	но	R <i>IZ.:</i> 90°	ROT	ARY BORING	-		
NUMERATY: DELITA BASE 520 (1980) STARTED-24/10/201 COMPLETED-25/10/201 VALENCE Page 1 of 3 00	BOI	RING (0.00 m	- 20.00 m	⊫ 86mm	CASING 0.00 m - 20.00 m= 113mm									
State State <th< td=""><td>EOI</td><td></td><td>NT. [</td><td>DELTA BA</td><td>SE 520 (31)</td><td>(650) STARTED.24/10/2012 C</td><td></td><td>ETEI</td><td>n. 25</td><td>/10/2012</td><td></td><td></td><td>Baa</td><td>1 of 2</td><td></td></th<>	EOI		NT. [DELTA BA	SE 520 (31)	(650) STARTED .24/10/2012 C		ETEI	n . 25	/10/2012			Baa	1 of 2	
u u									1		ERY	TESTS AND			Ц
u u		z	SS		72		UNIC	ATIO	AFY	PERCE	NTAGE	S.P.T.	lases	Tests	
u u	2	VATIO	METEI	LH (m	IOLO(DESCRIPTION	THE	CTUR	ATIGF	R.Q.D.		20 20			DTEC
0.00, 1.00 Topool and Landhill With Billy sand matrix, of Disk colour, with coal fragments and vegetal residues. 1.0 1.00 1.00 1.10 1.00 (1.00, 2.45) 1.10 1.00 (1.00, 2.45) 1.10 1.00 (2.45, 3.00) 1.10 1.00 (2.45, 3.00) 2.0 2.00 (2.45, 3.00) 2.10 (3.00, 4.00) Fine grained sand, poorly graded, of grey colour. 3.10 1.00 (4.00, 4.60) 4.15 1.50 Fine grained clayey sand, with gravel, of dark colour. 4.15 1.50 (4.00, 4.50) 4.5 5.50 Fine grained sandy poorly graded, of grey colour. 4.5 5.50 Fine grained sandy poorly graded, of grey colour. 4.5 5.50 Fine grained sandy poorly graded, of grey colour. 5.50 Fine grained sandy poorly graded, of grey colour. 6 5+3 6.50 (6.45, 8.00) Medium to colour sand and calcurente. 6 5.51 5.50 5.50 Fine grained sand, acturente. 6 5+3 7.70 7.00	DATES	ELEY	DIA	DEP	É		WF/	FRA	STR	0 	% 100) 옵 0 No. of blows (N)	^{2nd ar} 09		
0.5 0.50 black colour, with coal fragments and vegetal residues. 1.0 1.00 (1.00, 2.45) 1.10 1.60 (1.00, 2.45) 1.10 1.50 (1.00, 2.45) 1.10 1.50 (1.00, 2.45) 1.10 1.50 (1.00, 2.45) 1.10 1.50 (1.00, 2.45) 1.10 1.50 (2.45, 3.00) Medium grained sand, poorly graded, of grey colour (3.00, 4.00) Fine grained clayey sand, with gravel, of dark grey colour (SC); A-26 (1) 0 1.0 4.00 (4.00, 4.60) 4.1 Fine grained clayey sand, with gravel, of dark grey colour (SC); A-26 (1) 0 5.0 5.00 Variable grain cize grained clayey sand, with gravel, or dark colour, colour 5.1 5.50 Fine grained clayey sand, or gray, colour. 5.2 5.50 Fine grained clayey sand, or gray, colour. 5.3 5.60 Medium to corse grained clayey sand, or yealed, or gray, colour. 5.4 5.50 Fine grained clayey sand, or yealed, or gray, colour. 5.5 5.50 Fine grained clayey sand, or yealed, or gray, colour. 5.5 5.60 <	1	0.0		0.00 	/ /										
1.1.5 1.50 1.00, 2.45; Landfill with site with coal fragments. 3 5*9 30 2.0 2.00 2.00 7*6 30 7*6 3.0 2.00 Medium grained sand; poorly graded, of grey colour [SP]; (A:3 (0)] 0 7*6 3.0 3.00 Gao, 4.00 Fine grained clayey sand, organic, of dark colour, solution (SP); (A:3 (0)] 0 0 10 7*6 3.0 3.00 Fine grained clayey sand, organic, of dark colour 10 5*6 5:0 10 5*3 4.0 4.00 Fine grained clayey sand with gravel, of dark grey colour [SC]; A:2-6 (1) 10 5*3 30 10 5*3 5.0 Fine grained sand; poorly graded, of grey colour. 10 5*3 30 10 5*3 5.0 Variable grain size clayey sand, with gravel, grey colour. 10 5*3 30 10 5*3 5.0 Fine grained sand; poorly graded, of grey colour. 10 5*3 30 10 5*3 30 5.0 Fine grained clayey sand, off yellowid fock of marly sand and calcarenite. 10 5*3 30 10 5*3 30		-0.5 -		_ 0.50	/`/	black colour, with coal fragments and vegeta									
1.1.5 1.50 1.00, 2.45; Landfill with site with coal fragments. 3 5*9 30 2.0 2.00 2.00 7*6 30 7*6 3.0 2.00 Medium grained sand; poorly graded, of grey colour [SP]; (A:3 (0)] 0 7*6 3.0 3.00 Gao, 4.00 Fine grained clayey sand, organic, of dark colour, solution (SP); (A:3 (0)] 0 0 10 7*6 3.0 3.00 Fine grained clayey sand, organic, of dark colour 10 5*6 5:0 10 5*3 4.0 4.00 Fine grained clayey sand with gravel, of dark grey colour [SC]; A:2-6 (1) 10 5*3 30 10 5*3 5.0 Fine grained sand; poorly graded, of grey colour. 10 5*3 30 10 5*3 5.0 Variable grain size clayey sand, with gravel, grey colour. 10 5*3 30 10 5*3 5.0 Fine grained sand; poorly graded, of grey colour. 10 5*3 30 10 5*3 30 5.0 Fine grained clayey sand, off yellowid fock of marly sand and calcarenite. 10 5*3 30 10 5*3 30				-	$ \begin{pmatrix} \gamma & \gamma \\ \gamma & \gamma \end{pmatrix} $										
1.5 - 1.50 1.50 2.00 2.00 7.78 2.0 2.00 2.00 4 7.78 3.0 3.00 Medium grained sand, poorly graded, of grey colour (SP): [A:3 (0)] 0 0 3.0 3.00 Fine grained clayey sand, origanic, of dark colour 0 0 0 4.5 4.50 Fine grained clayey sand, with gravel, of dark colour (SC): A-26 (1) 0 0 0 5.6 5.00 Fine grained sand, poorly graded, of grey colour (SC): A-26 (1) 0 0 0 5.8 5.50 Fine grained clayey sand, with gravel, greyten, greyten		-1.0 –		1.00 - -	/ /							3			
2.5 2.50 (2.45, 3.00) Medium grained sand, poorly graded, of grey colour [SP]; [A-3 (0)] 0 3.0 3.00 3.0 (3.00, 4.00) Fine grained clayey sand, organic, of dark colour 0 4.0 -4.00 4.1 -4.00 4.2 -4.00 5.3 -3.00 (4.00, 4.60) Fine grained clayey sand with gravel, grey colour [SC]; A-2-6 (0) Variable grain size clayey sand with gravel, grey sish yellow [SC]; A-2-6 (1) (5.00, 6.45) Variable grain size clayey sand with gravel, grey ish yellow [SC]; A-2-6 (1) (5.10, 6.45) Fine grained sand, poorly graded, of grey colour. 6.0 6.0 6.0 7.0 7.0 7.0 7.0 7.0 7.0 7.0 7.0 7.0 7.0 7.0 7.0 7.0 7.0 7.0 7.0 7.0 7.0 7.0<		-1.5 -		- - 1.50	/``/										
2.5 2.50 (2.45, 3.00) Medium grained sand, poorly graded, of grey colour [SP]; [A-3 (0)] 0 3.0 3.00 3.0 (3.00, 4.00) Fine grained clayey sand, organic, of dark colour 0 4.0 -4.00 4.1 -4.00 4.2 -4.00 5.3 -3.00 (4.00, 4.60) Fine grained clayey sand with gravel, grey colour [SC]; A-2-6 (0) Variable grain size clayey sand with gravel, grey sish yellow [SC]; A-2-6 (1) (5.00, 6.45) Variable grain size clayey sand with gravel, grey ish yellow [SC]; A-2-6 (1) (5.10, 6.45) Fine grained sand, poorly graded, of grey colour. 6.0 6.0 6.0 7.0 7.0 7.0 7.0 7.0 7.0 7.0 7.0 7.0 7.0 7.0 7.0 7.0 7.0 7.0 7.0 7.0 7.0 7.0<				z	$\begin{pmatrix} \gamma & \gamma \\ \gamma & \gamma \end{pmatrix}$										
2.5 - 2.50 Medium grained sand, poorly graded, of grey colour [SP], [A-3 (0)]		-2.0 -		2.00 - -	/`/							4			
3.0 3.0 Medium grained sand, poorly graded, of grey colour [SP; [A-3 (0]] 3.0 3.00 (3.00, 4.00) Fine grained clayey sand, organic, of dark colour 0 4.0 (4.00, 4.60) Fine grained clayey sand with gravel, of dark grey colour [SC]; A-2-6 (0) Variable grain size clayey sand with gravel, grey sin yellow [SC]; A-2-6 (1) 5.0 5.00 5.0 (4.00, 5.20) Variable grain size clayey sand with gravel, grey sin yellow [SC]; A-2-6 (1) 5.0 (5.20, 6.45) Fine grained sand, poorly graded, of grey colour. 6.0 5+3 30 6.5 (6.45, 8.00) Medium (6.45, 8.00) Medium to coarse grained clayey sand, of yellowish colouration. Interbedds of mariy sand and calcarenite. 7.0 7.0 7.5 7.50 8.00 (8.00, 10.00) Fine to medium grained sandstone 19 6 5+3 30		-2.5 -		- - 2.50	/ [×] /	(0.45.0.00)									
3.0 - 3.00 (3.00, 4.00) Fine grained clayey sand, organic, of dark colour 0 4.0 - 4.00 (4.00, 4.60) Fine grained clayey sand, with gravel, of dark grey colour (SC; A-2-6 (0) 0 4.5 - 4.50 (4.00, 5.20) Variable grain size clayey sand with gravel, greyish yellow (SC; A-2-6 (1)) 0 4.5 - 5.50 Fine grained sand, poorly graded, of grey colour. 5.6 - 5.50 Fine grained sand, poorly graded, of grey colour. 6.0 - 6.00 6 6.5 - 6.50 Medium to coarse grained clayey sand, of yellowish colouration. Interbedds of marty sand and calcarentie. 6 7.0 - 7.00 (6.00, 10.00) Fine to medium grained sandstone				-		Medium grained sand, poorly graded, of gre	/								
3.5 -3.50 -3.60		-3.0 -		- 3.00 -		(3.00, 4.00)	_								
4.0 4.00 (4.00, 4.60) Fine grained clayey sand with gravel, grey colour [SC]; A-2-6 (0) 4.5 4.50 (4.60, 5.20) Variable grain size clayey sand with gravel, greyish yellow [SC]; A-2-6 (1) 5.0 (5.20, 6.45) Fine grained sand, poorly graded, of grey colour. 20 4+7 6.0 (5.20, 6.45) Fine grained sand, poorly graded, of grey colour. 10 5+3 6.0 (6.45, 8.00) Wedium to coarse grained clayey sand, of yellowish colouration. Interbedds of marky sand and calcarenite. 6 5+3 7.0 7.00 (6.00, 10.00) Fine to medium grained sandstone 19 60 6		-3.5 -		- - 3.50		Fine grained clayey sand, organic, of dark						0			
4.5 4.50 Fine grained clayey sand with gravel, of dark grey colour (SC): A-2-6 (0) Image: Colour (SC): A-2-6 (0) Image: Colour (SC): A-2-6 (1) 5.0 5.0 (4.60, 5.20) Variable grain size clayey sand with gravel, grey ish yellow (SC): A-2-6 (1) Image: Colour (SC): A-2-6 (1)				-	<u></u> :										
4.5 -4.50 Fine grained clayey sand with gravel, of dark grey colour (S: A-2-6 (0) Image: Clayer grey colour (S: A-2-6 (0)) Image: Clayer grey sand with gravel, grey sand with gravel, grey sand with gravel, grey ish yellow (SC); A-2-6 (1) Image: Clayer grey sand with gravel, grey ish yellow (SC); A-2-6 (1) Image: Clayer grey sand with gravel, grey ish yellow (SC); A-2-6 (1) Image: Clayer grey sand with gravel, grey ish yellow (SC); A-2-6 (1) Image: Clayer grey sand with gravel, grey ish yellow (SC); A-2-6 (1) Image: Clayer grey sand with gravel, grey ish yellow (SC); A-2-6 (1) Image: Clayer grey sand with gravel, grey ish yellow (SC); A-2-6 (1) Image: Clayer grey sand with gravel, grey ish yellow (SC); A-2-6 (1) Image: Clayer grey sand with gravel, grey ish yellow (SC); A-2-6 (1) Image: Clayer grey sand (1) Image: Clayer grey grey sand (1) Image: Clayer grey grey grey grey grey grey grey g		-4.0 -		- 4.00 -	 	(4.00, 4.60)									
-5.0 -5.00 (4.60, 5.20) Variable grain size clayey sand with gravel, greyish yellow [SC]: A-2-6 (1) -5.5 -5.50 (5.20, 6.45) Fine grained sand, poorly graded, of grey colour. 20 4+7 -6.0 -6.00 (6.45, 8.00) Wedium to coarse grained clayey sand, of yellowish colouration. Interbedds of marly sand and calcarenite. 10 5+3 30 -7.5 -7.50 (6.00, 10.00) Fine to medium grained sandstone 19 60 14		4 5				Fine grained clayey sand with gravel, of dark								A.I.	
gleysist yendw (300, A220 (1)) (5.20, 6.45) Fine grained sand, poorly graded, of grey colour. 6.0 (6.45, 8.00) Medium to coarse grained clayey sand, of yellowish colouration. Interbedds of marty sand and calcarenite. 7.0 7.0 (6.45, 8.00) Medium to coarse grained clayey sand, of yellowish colouration. Interbedds of marty sand and calcarenite. 6 5+3 (8.00, 10.00) Fine to medium grained sandstone 19		-4.5 -		4.50 - -											
-5.5 -5.50 Fine grained sand, of grey colour. 30 -6.0 -6.00 -6.00 -6.50 (6.45, 8.00) Medium to coarse grained clayey sand, of yellowish colouration. Interbedds of marty sand and calcarenite. 10 5+3 -7.0 -7.00 -7.50 -6.50 60 -7.5 -7.50 -6.00 -6.00 -6.00 -7.5 -7.50 -6.00 -6.00 -6.00 -7.5 -7.50 -6.00 -6.00 -6.00 -7.5 -7.50 -6.00 -6.00 -6.00 -7.5 -7.50 -6.00 -6.00 -6.00 -7.5 -7.50 -6.00 -6.00 -6.00 -7.5 -7.50 -6.00 -6.00 -6.00 -7.5 -7.50 -6.00 -7.50 -7.50 -7.5 -7.50 -6.00 -7.50 -7.50 -7.5 -7.50 -6.00 -7.50 -7.50 -7.5 -7.50 -6.00 -7.50 -7.50 -7.5 -7.50 -7.50 -7.50 -7.50	24/10	-5.0 -		- 5.00 -		Variable grain size clayey sand with gravel, greyish yellow [SC]; A-2-6 (1)								A.I	
$\begin{array}{c} 6.0 \\ 6.0 \\ 6.0 \\ 6.5 \\ 6.5 \\ 6.5 \\ 6.5 \\ 7.0 \\ 7.0 \\ 7.0 \\ 7.0 \\ 7.0 \\ 7.0 \\ 7.0 \\ 7.5$				- - 		(5.20, 6.45) Fine grained sand, poorly graded, of grey						20			
-6.5 -6.50 (6.45, 8.00) Medium to coarse grained clayey sand, of yellowish colouration. Interbedds of marly sand and calcarenite. 6 5+3 -7.0 -7.00 -7.00 -7.00 6 5+3 -7.5 -7.50 -7.50 -6.00 -6.00 -6.00 -8.0 (8.00, 10.00) Fine to medium grained sandstone 19 60 14		-5.5		- 5.50 - -											
-6.5 -6.50 (6.45, 8.00) Medium to coarse grained clayey sand, of yellowish colouration. Interbedds of marly sand and calcarenite. 6 -7.0 -7.00 -7.50 -7.5 -7.50 -8.0 (8.00, 10.00) Fine to medium grained sandstone 19		-6.0 -		- 6.00								10	5+3		
 -7.0 -7.0 -7.0 -7.00 Medium to coarse grained clayey sand, of yellowish colouration. Interbedds of marly sand and calcarenite. -7.5 -7.50 -7.50 -7.50 -8.00 (8.00, 10.00) Fine to medium grained sandstone 				-									30		
-7.0 - 7.00 - 7.		-6.5 -		6.50 - -		Medium to coarse grained clayey sand, of									
-7.5 - 7.50 -8.0 - 8.00 -8.0		-7.0 -		_ 7.00	····							6	5+3		
-8.0 (8.00, 10.00) Fine to medium grained sandstone				-											
(8.00, 10.00) Fine to medium grained sandstone		-7.5 -		7.50 - -											
Fine to medium grained sandstone		-8.0 -		- - 8.00								19	60		
		-8.5 -		8.50 - -											
-9.0		-9.0 -		- - - 9.00											
				- - -											
-9.5 - 9.50		-9.5 -		- 9.50 - -											
		-10.0		_ 10.00	••••										



			- 10-11		NORK:	GAS FIRED F	POWER PLAI	NT DE'	VEL	.OF	ME	NT IN	I SOUTH	ERN MOZAMBIQUE	BC	REHOL	E
1		N		ibique		T: ORIENTA			'TS	C	0	Ltd			WOR	S1 <i>K No</i> 19.3	622
N:	7130964	4.57	E: 452773	8.806 H	: 3.32 L	DIRECTION:	DEPTH: 20.21	mDEG. I	FRO	мн	IORI	<i>Z.:</i> 90°	ROT	ARY BORING	Proj.	No.	
			- 20.00 m= DELTA BA		1650)	CASING 0.00 m	- 20.00 m= 113mi " ED: 24/10/2012		LETI	ED:	25/10	0/2012	⊐ DE	VATER LEVEL TECTED ^{1.8} EZOMETRIC	Geolog.	NOV/12 JRC NOV/12 GO	
DATES	ELEVATION	DIAMETERS	DEPTH (m)	ГІТНОГОСУ		DESCRIPTIO	N		WEATHERING	FRACTURATION	RAFY	RECOVI PERCEI R.Q.D.	NTAGE	TESTS AND SAM	2nd and 3rd Phases And Penet. (cm)	Tests	GEOTECH. ZONE
25/10	-20.5 -		20.50											32	60 6		







0 – 8,0 m





8,0 – 17,00 m





17,00 – 20,21 m

8		M		WORK: GAS FIRED CLIENT: ORIEN LOCATION: MAT	TAL CONSULI						ern Mo	ZAMBIQUE		REHO S2 № 19.3	
N: 7	7130907	-	ECM 52833.926	H: 3.547 DIRECTION:	DEPTH: 15.00m DEC	. FR	ом	HOR	<i>1Z.:</i> 90°	ROTA	RY BO	RING	Proj. N		002
во	RING (0.00 m - 15.	00 m= 86mm		n - 15.00 m= 113mm						ATER LE		Logger	NOV/12 JRC	
										🔽 DET	ECTED	1.3	Geolog.	NOV/12 GO	
EQ	UIPMEI	VT: DELT.	A BASE 520 (31650) STAR	RTED: 27/10/2012 CON	IPLE	TED	: 29/	10/2012	🔽 PIE	ZOMETR	IC	Pag	ge 1 of 2	
							z		RECOVE	RY	TE	ESTS AND SA	MPLING	·	ЦЦ
	z	SS	>			SING	ATIO	RAFY	PERCEN	TAGE	S.P.T.		3rd Phases (cm)	Tests	
0	ELEVATION	DIAMETERS	UEPTH (m)	DESCRIPTIO	JN	WEATHERING	FRACTURATION	STRATIGRAFY	R.Q.D.		se		d 3rd Pt t. (cm)		
DAIES	ELEV	DIAN				WEA	FRA	STR/	0	% 100	st Pha	of blows (N) 6	2nd and Penet.		
	0.0	0.	00	(0.00, 1	45)										
	-	Ē		Topsoil and landfill with black colour, with coal fra	silty sand matrix of										
	-0.5 -	0. - -	50	residue	es.										
	-1.0 -	- 1	00	/											
											0		0+0 30		
	-1.5 -	- - 1.	50	(1.45, 2	00)	-									
	-			Landfill. Fine to mediu	m grained organic										
	-2.0 -	2. 	00	(2.00, 3		-					0		0+0		
		-		Fine grained sand, poc	orly graded, of grey								30		
1117	-2.5 -	2. - -	50												
	-3.0 -	- 3.	.00	•											
		Ē		(3.00, 4) Fine grained clayey sand											
	-3.5 -	3.	50	calcarenite	gravel										
		-		:											
	-4.0 -	4. - -	00		.49)										
	-4.5 -	-	.50	Gravel of variable size, w of bluish grey colour [0										A.I.	
	-4.0	- -													
	-5.0 -	- 5.	₀₀	<mark></mark>										A.I.	
	-	-		<u></u>							2		60		
	-5.5 -	5. -	50	(5.49, 6	.45)								14		
		Ē	.00	Fine to medium grained colour, pl											
	-6.0 –	- 6. -									11		5+5 30		
	-6.5 -	_ — 6.	50		00)	-									
	-	=	· · · · ·	Coarse grained calcarer	nite with oyster shell										
	-7.0 -	- - 7. -	00								9		32+22		
	-												30		
11167	-7.5 -	- 7. - -	50												
	- 8.0	- 8.	00												
			• • •	T							12		38+22 28		
	-8.5 -	- - 8. -	50	I											
	1	Ē	• • • •	I											
	-9.0 -	9. - -	00	. (9.00, 10		1					3		4+6 30		
	-9.5 -		50	Fine to medium grained of and yellow colouration	, with interbedded								30		
	-9.0 "	- 9. -		sandstone gravel [SC]; [A-2-7(0)]										
	-10.0	- 1	0.00	·											
SE	RVATIO	DNS:													

		NIC	GÉR	A	VORK: GAS	FIRED I	POWER PLANT I	DEVI	ELO	PM	ENT IN	ISOUTH	ERN	I MOZAMBIQUE	BC	DRE S	HOL	. E
/	-	140		abique C	CLIENT: OF	RIENTA	L CONSULTA	N7	50	<i>:0.</i>	Ltd					J	£	
			⊘ECN		OCATION:	MATC	DLA - MAPUTO								WOR	K No	19.3	622
N:	7130907	.99	E: 452833	8.926 H :	3.547 DIRECTI	ION:	DEPTH: 15.00m DE	G. FR	ROM	ноғ	2 /Z.: 90°	ROT	ARY	BORING	Proj.			
			- 15.00 m			VG 0.00 m	- 15.00 m= 113mm					⊻ DE	TEC	R LEVEL TED ^{1.3} METRIC		NOV/ NOV/		
EG	QUIPMEI	NT: C	DELTA BA	SE 520 (31	650)	STAR	TED: 27/10/2012 CO	MPLE	TED	; 29/			1			age 2	of 2	
								ŋ	LION	F	RECOV			TESTS AND SA			sts	GEOTECH. ZONE
	TION	TERS	(m) +	LOGY	DE	SCRIPTIO	Ν	HERIN	FURA	TIGRA	R.Q.D.				3rd Phases (cm)		010	ECH.
DATES	ELEVATION	DIAMETERS	DEPTH (m)	ГІТНОГОСУ				WEATHERING	FRACTURATION	STRATIGRAFY	0 ├──├──	% 100	1st Phase	No. of blows (N) 60	it g			GEOI
	-10.5 -		- - - - - - 10.50		Fine to medium and yellow co	olouration,	.00) ayey sand, of brown with interbedded SC]; [A-2-7(0)]						4		6+10 30			
	-11.0 -		_ _ 11.00	· · · · · · · · ·									60					
	-					(11.00, 12 dium grair	.00) ned sandstone											
	-11.5 -		- 11.50 - - -															
	-12.0 -		- 12.00 - -			(12.00, 13	.00)						22		51+9 16			
29/10	-12.5 -		- - - 12.50 - -		Fine to medium and yellow colou	grained cla uration, wit	ayey sand, of brown th sandstone gravel								10			
	-13.0 -		13.00 - - -		Fine to medium	(13.00, 15 grained cla	ayey sand, of brown						12		27+33 28			
	-13.5 -		- 13.50 - -		and yellow c	colouration	[SC]; [A-2-7(0)]											
	-14.0 -		- 14.00 - - -	; ; ;									25		39+21 23			
	-14.5 -		- 14.50 - - -															
	-15.0 -		- - 15.00					-					27		49+11 18			
	-15.5		15.50															







0 – 8,2 m







8,2 – 15,33 m

LOCATION: MATCLA - MAPUTO PORK NO 19.3 TIMMER W K 42 DECTOR DETTOR DETTOR DETTOR PORK NO 19.3 NUMBER W K 42 DECTOR DETTOR DETTOR DETTOR PORK NO 19.3 NUMBER W DECTOR CASING 0.00m - 12.00m -		NGÉR	OP		DCK9FD@BH8 LCONSULTA					9FB'ACI	N5A6=EI9	BO	REHO S3	LE
RING 0.00 m - 12.00 m = 60mm CASING 0.00 m - 12.00 m = 130mm MATER LEVEL Lager Monta and Company Monta		⊗ ECN	LOCAT	TION: MATC	DLA - MAPUTO							WORK	(<i>No</i> 19.	.362
ULTIMENT: DELTA BASE 520 (13650) STARTED: 30102012 COMPLETED: DETECTED Lob Page 1 of 2 000000000000000000000000000000000000	7130849.02					6. FR	ом н	ORIZ.:90						
Autremetrie DELTA BASE 520 (2010) TATELED: 2010/021 COMPLETED: 3011/021 VIEXNE Page 1 of 2 0	IRING 0.00	00 m - 12.00 m=	= 86 <i>mm</i>	CASING 0.00 m	- 12.00 m= 113mm									
Open Signed Si	UIIPMENT-	T. DELTA BA	SE 520 (31650)	STAR	TFD:30/10/2012 COI	IPI F	TFD:	30/10/2012	T PI		c	Ba	ao 1 of 2	,
ODE SP.T. OPENCENTAGE S.P.T. OPENCENTAGE Tests 0.0 0.00 0.00 0.00 0.00, 2.45 0										TE	STS AND SA		gerorz	
0.0 0.00 (0.00, 2.45) Topsoil and landill with sity sand matrix, of black colour, with coal fragments and vegetal residues. [SM]; [A-2-4(0)] 1 1 1+2 1.0 1.00 2.00 2 1+3 30 2.5 2.50 2.50 2.50 2.50 2.50 2.50 1.50 3.6 3.00 (2.45, 3.45) Landfill. Fine grained sity sand, of dark grey colour, with organic matter. 4 3+3 30 3.5 3.50 (3.45, 4.00) Medium grained sity sand, of grey colour 4 3+3 30 4.0 4.00 5.00 Fine grained sity sand, of grey colour 4 12+223 30 5.0 5.00 Fine to medium grained sandstone, weathered. Recovered as Expery sand with sandstone gravel, of ellow colour [SC]; [A-2- g(0)] 12 11+19 30 6.50 6.00 6.00 6.00 12 11+19 30 6.51 7.00 7.00 10 20+19 10 20+19	z x	SS o	~			SING	ATIO	PERC				lases	Tests	
0.0 0.00 (0.00, 2.45) Topsoil and landifi with salty sand matrix, of 1 1+2 1.0 2 1+3 1.1 1+2 30 1.5 1.50 1.50 2.0 2.00 2 2.1 1+3 3.0 3.00 3.5 2.50 2.5 2.50 2.5 2.50 2.5 2.50 2.5 2.50 3.60 (3.45, 4.00) Medium grained sity sand, of dark grey colour 4.1 3+3 3.5 5.50 5.60 (5.67, 7.45) Fine to medum grained sandstone, weathered. Recovered as clayey sand with sandstone gravel, of bluish grav colour [SC]; [A-2-6(0)] 4.5 5.50 5.50 5.50 5.50 Fine to medum grained sandstone, weathered. Recovered as clayey sand with sandstone gravel, of yellow colour [SC]; [A-2-5 (G)] 5.6 5.50 5.60 111+19 30 30 5.5 5.50 5.60 10 5.7 5.80<	ELEVATIO	DIAMETEI DEPTH (m	ГІТНОГОС	DESCRIPTIO	Ν	WEATHER	FRACTUR		% 100	o.o∧ 0 µase	f blows (N) 6(it o		CENTERU ZOME
1.5 -0.50 Topsoil and landill with salty sand matrix, of black colour, with call regeneries and vegetal residues. [SM]: [A-2.4(0)] 1.0 -1.0 -1.00 1.15 -1.50 -1.50 2.0 2.00 -1.50 2.0 2.00 -1.50 2.0 2.00 -1.50 2.0 2.00 -1.50 2.0 2.00 -1.50 2.0 2.00 -1.50 3.0 -3.00 -1.50 3.0 -3.00 -1.50 3.0 -3.00 -1.50 4.0 -1.50 -1.50 5.0 -1.50 -1.50 5.0 -1.50 -1.50 5.0 -1.50 -1.50 5.0 -1.50 -1.50 5.0 -1.50 -1.50 5.0 -1.50 -1.50 5.0 -1.50 -1.50 5.0 -1.50 -1.50 5.0 -1.50 -1.50 5.0 -1.50 -1.50 5.0 -1.50 -1.50 <	0.0	0.00	/ /	(0.00.2)	15)									
1.0 - - 0.50 residues. [SM]: [A-2-4(0)] 1.0 - 1.00 1+2 30 1.5 - 1.50 1+2 30 2.0 - 2.00 2 1+3 3.0 - 5.00 (2.45, 3.45) 1+3 3.0 - 5.00 (3.45, 4.00) 4 3+3 3.0 - 5.00 (4.00, 5.05) Fine grained silty sand, of grey colour 4 3+3 4.5 - 4.50 - - 12+223 30 5.0 - - - - 12+223 30 5.0 - - - - 12+23 30 5.0 - - - - 12+23 30 5.0 - - - - 12+23 30 6.01 - - - 12 11+19 30 6.5.5 - - - 10 20+19 10 20+19		Ē	/ / Topso black c	il and landfill with s	silty sand matrix. of									
1.5 1.6 1 1 1+2 30 2.0 2.0 2.0 1+3 30 2.5 2.50 (2.45, 3.45) Landiil. Fine grained sity sand, of dark grey colour, with organic matter. 2 1+3 30 3.6 3.60 3.60 (3.45, 4.00) Medium grained sity sand, of grey colour 4 3+3 30 4.0 4.0 (4.00, 5.05) Fine grained clayey sand, with gravel, of bluish grey colour [SC]; [A-2-6(0)] 4 12+23 30 5.0 (5.05, 7.45) Fine to medium grained sandstone, weathered. Recovered as clayey sand with sandstone gravel, of yellow colour [SC]; [A-2-6(0)] 12 11+19 6.0 6.00 (0) 12 11+19 6.5 7.0 7.0 7.00 10 20+19	-0.5 -	0.50 - -		residues. [SM];	[A-2-4(0)]									
1.5 1.50 30 2.0 2.00 1+3 2.5 2.50 (2.45, 3.45) Landfill. Fine grained silty sand, of dark grey colour, with organic matter. 3.6 3.6 3.00 3.6 3.00 3.6 3.00 3.6 3.00 3.6 3.00 3.6 3.00 3.6 3.00 3.6 3.00 3.6 5.00 Fine grained clayey sand, with gravel, of bluish grey colour [SC]; [A-2-6(0)] 5.0 Fine to medium grained sandstone, weathered. Recovered as clayey sand with sandstone gravet, of yellow colour [SC]; [A-2-6(0)] 6.0 6.00 6.0 6.00 6.0 6.00 6.0 6.00 6.0 12 11+19 130 12 11+19 130 10 20+19	-1.0 -	1.00	1.1							1		1+2		
2.0 2.00 1:43 30 2.5 2.50 (2.45, 3.45) 1:43 30 3.0 3.00 (2.45, 3.45) 1:43 31 3.0 3.00 (3.45, 4.00) 3:43 30 3.5 3.50 (4.00, 5.05) Fine grained clayey sand, with gravel, of bluish grey colour 4 12+23 4.5 4.50 Fine to medium grained sandstone, weathered. Recovered as clayey sand with sandstone gravel, of yellow colour [SC]; [A-2-6(0)] 4 12+23 30 6.0 6.00 6.00 6.00 12 11+19 30 6.5 5.50 5.50 9 12+23 10 20+19														
2.5 2.50 (2.45, 3.45) Landfill. Fine grained silty sand, of dark grey colour, with organic matter. 3.0 3.00 (3.45, 4.00) Medium grained silty sand, of grey colour 4.0 4.00 (4.00, 5.05) Fine grained clayey sand, with gravel, of bluish grey colour [SC]; [A-2-6(0)] 5.0 5.00 (5.05, 7.45) Fine to medium grained sandstone, weathered. Recovered as clayey sand with sandstone gravel, of yellow colour [SC]; [A-2-6(0)] 6.0 6.00 12+223 30 6.5 6.50 7.0 7.00	-1.5 -	1.50 -	1.1											
2.5 2.50 (2.45, 3.45) Landfill. Fine grained silty sand, of dark grey colour, with organic matter. 3.0 3.00 (3.45, 4.00) Medium grained silty sand, of grey colour 4.0 4.00 (4.00, 5.05) Fine grained clayey sand, with gravel, of bluish grey colour [SC]; [A-2-6(0)] 5.0 5.00 (5.05, 7.45) Fine to medium grained sandstone, weathered. Recovered as clayey sand with sandstone gravel, of yellow colour [SC]; [A-2-6(0)] 6.0 6.00 12+223 30 6.5 6.50 7.0 7.00	-2.0 –	- - 2.00	/ /									4.0		
.3.0 .3.0 .3.45 .3.0 .3.0 .3.45 .3.1 .3.0 .3.0 .3.2 .3.0 .3.45 .3.3 .3.0 .3.45 .3.4 .3.0 .3.45 .3.5 .3.0 .3.45 .3.6 .3.45 .3.45 .3.7 .3.0 .3.45 .3.8 .3.40 .3.45 .3.9 .3.40 .3.45 .3.1 .3.00 .3.45 .3.1 .3.00 .3.45 .3.1 .3.00 .3.45 .3.1 .3.00 .3.45 .3.1 .3.00 .3.45 .3.1 .3.00 .3.45 .3.1 .3.00 .3.45 .3.1 .3.00 .3.45 .3.00 .3.45 .3.45 .3.00 .3.45 .3.45 .3.00 .3.45 .3.45 .3.00 .3.45 .3.45 .3.00 .3.45 .3.45 .3.00 .3.45 .3.45		Ē	$\frac{1}{1}$							2				
3.0 -3.00 colour, with organic matter. 3.5 -3.50 (3.45, 4.00) Medium grained silty sand, of grey colour (4.00, 5.05) Fine grained clayey sand, with gravel, of bluish grey colour (SC); [A-2-6(0)] 4 5.0 -5.00 6.5 -5.50 6.00 6.00 6.5 -6.50 7.0 -7.00	-2.5 -	_ 2.50 _	111	(2.45, 3.4	45)									
-3.5 3.50 ^(3,45, 4.00) Medium grained silty sand, of grey colour ^(4,00, 5.05) Fine grained clayey sand, with gravel, of bluish grey colour [SC]; [A-2-6(0)] ^(4,00, 5.05) Fine grained clayey sand, with gravel, of bluish grey colour [SC]; [A-2-6(0)] ^(4,00, 5.05) Fine to medium grained sandstone, weathered. Recovered as clayey sand with sandstone gravel, of yellow colour [SC]; [A-2- ^(6,05, 7.45) ¹¹⁺¹⁹ 30 6.5 6.50 ^(6,00) ¹² ¹¹⁺¹⁹ 30	30-	- - - 3 00	Landfill	colour, with orga	y sand, of dark grey nic matter.									
4.0 (3.45, 4.00) Medium grained silty sand, of grey colour 4.0 (4.00, 5.05) Fine grained clayey sand, with gravel, of bluish grey colour [SC]; [A-2-6(0)] 5.0 (5.05, 7.45) Fine to medium grained sandstone, weathered. Recovered as clayey sand with sandstone gravel, of yellow colour [SC]; [A-2- 6(0)] 6.0 6.00 6.5 6.50 7.0 7.00	-5.0	-								4				
4.0 Medium grained silty sand, of grey colour 4.0 (4.00, 5.05) Fine grained clayey sand, with gravel, of bluish grey colour [SC]; [A-2-6(0)] 5.0 5.00 (5.05, 7.45) Fine to medium grained sandstone, weathered as clayey sand with sandstone gravel, of yellow colour [SC]; [A-2-6(0)] 6.0 6.00 6.5 6.50 7.0 7.00	-3.5 -	- 3.50 -		(3.45, 4.0)0)	-								
4.5 4.50 Fine grained clayey sand, with gravel, of bluish grey colour [SC]; [A-2-6(0)] 5.0 5.00 (5.05, 7.45) Fine to medium grained sandstone, weathered. Recovered as clayey sand with sandstone gravel, of yellow colour [SC]; [A-2-6(0)] 6.0 6.00 6.5 6.50 7.0 7.00		-	Medi											
4.5 - 4.50 12+23 30 -5.0 (5.05, 7.45) Fine to medium grained sandstone, weathered. Recovered as clayey sand with sandstone gravel, of yellow colour [SC]; [A-2-6(0)] 12 11+19 30 -6.0 - - - - 12 11+19 30 -6.5 - - - - 10 20+19	-4.0 -	4.00 - -	Fine	(4.00, 5.0)5) od with gravel of								=	
-5.0 -5.0 (5.05, 7.45) Fine to medium grained sandstone, weathered. Recovered as clayey sand with sandstone gravel, of yellow colour [SC]; [A-2-6(0)] 12 -6.0 -6.00 -6.5 -6.50 -7.0 -7.00	-4.5 -	_ 4.50	b	luish grey colour [S	SC]; [A-2-6(0)]								A	
.5.5 .5.0 .5.5 .5.0 .5.5 .5.0 .5.5 .5.0 .5.5 .5.0 .5.6 .5.0 .5.7 .5.0 .5.8 .5.0 .5.9 .5.0 .5.0		-	<u></u>							4				
-5.5 - 5.0 weathered. Recovered as clayey sand with sandstone gravel, of yellow colour [SC]; [A-2-6(0)] -6.0 - 6.00 - 6.00 - 6.50 - 6.50 - 7.00 - 7	-5.0 -	5.00 - -		(5.05, 7.4	45)									
$\begin{array}{c} -6.0 \\ -6.5 \\ -6.50 \\ -7.00 \end{array}$	-5.5 -	- - 5.50	weath	ered. Recovered a	s clayey sand with									
		=		6(0)]										
	-6.0 –	- 6.00 - -								12				
	-6.5 -	- 6.50												
		-												
	-7.0 -	7.00 - -								10				
	-7.5 -	- - 7.50	•••••	/	00)	-								
- (7.45, 10.00) -	-	-	Fine to to	medium grained cla	avey sand, of yellow									
	-8.0 -	- 8.00		greenian colour. [a	σσ], [m-∠-r(1)]					10				
	-85-	8 50										30		
	5.5	-												
	-9.0 -	- 9.00 -								11				
		-												
	-9.5 -	9.50 - - -												
	-10.0	- 10.00	·····											

1	\langle	N	GÉR	OP	VORK: ; 5G: I 981 C LIENT: ORIENTA						GCIH	<9FE	3°ACN5A6-EIS	BC	DREHC S3	DLE
			⊗ECN		OCATION: MATC)LA - MAPU	ТО							WOR	к No 19	.3622
N:	7130849	9.02	E: 452891	1.045 H :	3.2 DIRECTION:	<i>DEPTH:</i> 12.00r	m DEG. F l	ROM	нок	7/Z.: 90°	RO	rar)	BORING	Proj.	No.	
			n - 12.00 m		CASING 0.00 m					(10/2010		DETEC	ER LEVEL TED ^{1.05} METRIC	Geolog	NOV/12 JRCNOV/12 GO	
EG	UIPME	NT: I	DELTA BA	SE 520 (31)	550) STAR 1	TED: 30/10/2012	COMPLI		D; 30/				TESTS AND SA		age 2 of 2	
DATES	ELEVATION	DIAMETERS	DEPTH (m)	ГІТНОГОСУ	DESCRIPTIO	N	MEATHERING	FRACTURATION	STRATIGRAFY	RECOVI PERCEI R.Q.D.	NTAGE		TESTS AND SA S.P.T.) No. of blows (N) 61	nd 3rd Phases at. (cm)	Tests	GEOTECH. ZONE
30/10	-10.5 -		- - - - - - - - - - - - - - - - - - -		(10.00, 12 Fine to medium grained cla to greenish colour. [\$	ayey sand, of ye	ellow					17		37+23 23 39+21 23		
	-11.5 - -12.0 - -12.5 -		- 11.50 - 12.00 - 12.50									60				







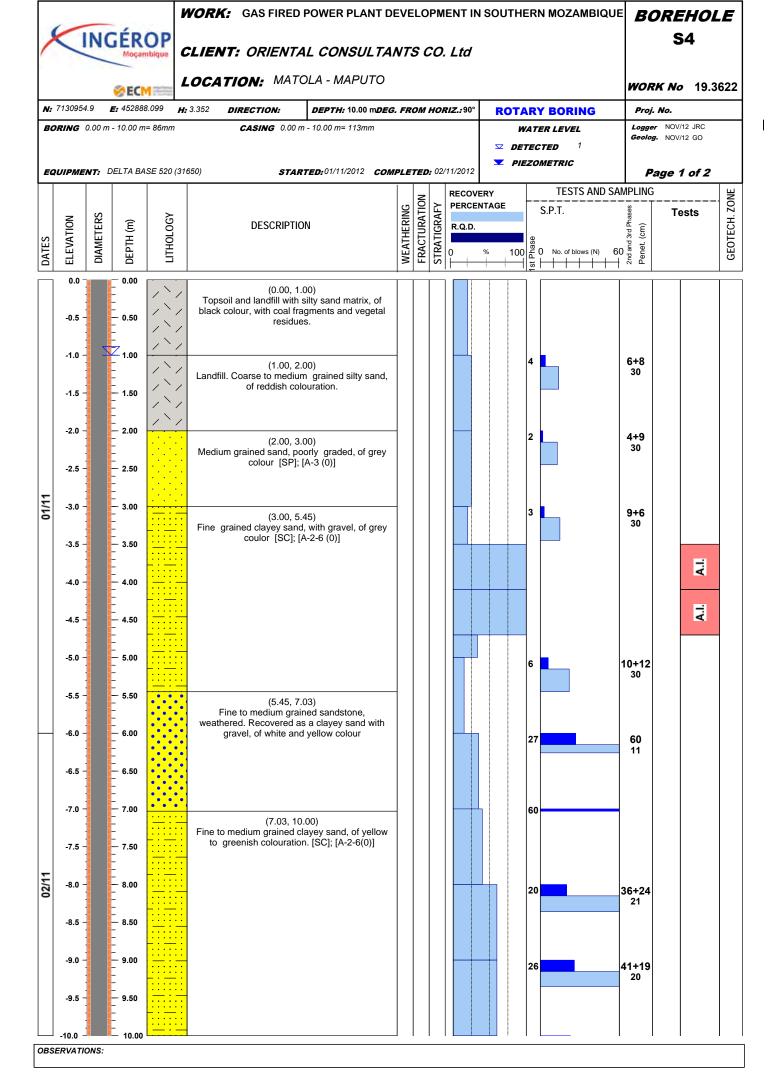
0 – 6,8 m







6,8 – 12,9 m



-		N		DP	CLIEN	T: GAS FIRED	L CONSULT	AN1				ISOUTH	ERN MOZAMBIQUE		DREHOI S4 KK No 19.3	
N:	7130954	1.9	E: 452888.	099 H	3.352	DIRECTION:	DEPTH: 10.00 m D	EG. Fl	ROM	HOR	<i>IZ.:</i> 90°	ROT	ARY BORING	Proj.	No.	
			- 10.00 m= DELTA BAS		1650)		- 10.00 m= 113mm TED:01/11/2012 CC	OMPLI	ETEL); 02/1	11/2012	▽ DE	VATER LEVEL TECTED ¹ EZOMETRIC	Geolog	 NOV/12 JRC NOV/12 GO Age 2 of 2 	
									z		RECOV	ERY	TESTS AND SA	MPLING		NE
DATES	ELEVATION	DIAMETERS	DEPTH (m)	ИТТНОГОСУ		DESCRIPTIO	N	WEATHERING	FRACTURATION	STRATIGRAFY	PERCEI R.Q.D.		S.P.T.	2nd and 3rd Phases Penet. (cm)	Tests	GEOTECH. ZONE
02/11	- -10.5 –		10.50										23	37+23 30		







0 – 8,0 m







8,0 – 10,35 m

				A	VOR	K: GAS FIR	RED F	POWER PL	ANT D	EVE	LO	PM	ENT II	N SOUT	ΉE	RN MOZAMBIQU	E BC	ORE	HOL	. E
1		N	GÉR	OP abique	LIE	NT: ORIEI	VTA	L CONSI	ULTA.	NT	s c	<i>:0.</i>	Ltd					S	5	
			Ø ECN		.0CA	A TION: M	ATO)LA - MAP	υτο								WOR	K Na	19.3	622
N:	7130895	5.83	E: 452937		3.422	DIRECTION:		DEPTH: 9.00)m DEG	. FR	ом	ноғ	R<i>IZ.:</i> 90°	RO	ΤΑΙ	RY BORING	Proj.	. No.		
ВС	ORING	0.00 m	- 9.00 m=	86mm		CASING (0.00 m	- 9.00 m= 113n	าฑ						WA	TER LEVEL		vr NOV/ g. NOV/		
																ECTED ¹			12 00	
EG	UIPME	NT: [DELTA BA	SE 520 (31	650)	s	STARI	TED: 31/10/201	2 сом	IPLE	TED	: 01/	11/2012		PIEZ	COMETRIC	P	age 1	1 of 1	
											N	٨	RECO	/ERY ENTAGE	-	TESTS AND SA				ONE
	NOI	ERS	Ē	ΟGY		DESCR	IPTIO	N		WEATHERING	FRACTURATION	STRATIGRAFY	R.Q.D.			S.P.T.	3rd Phases (cm)	Τe	ests	GEOTECH. ZONE
DATES	ELEVATION	DIAMETERS	DEPTH (m)	ПТНОLOGY						ATHI	ACTL	RATIC	0		00	0 20 CONo of blows (N) f	Penet. (cr			EOTE
DA	EL	DI	DE							M	Æ	ST	⊢ ⊢ ⊢			8 0 No. of blows (N) 6	Per 2nd			σ
	0.0 -		- 0.00 - -		Ŧ		00, 2.0													
	-0.5 -		- - 0.50		blac	soil and landfill k colour, with co	with s al frag sidues	gments and v	egetal											
			-	171		16.	Siddea													
	-1.0 -		Z 1.00 -												3	3	3+4			
			-	/ /													30			
	-1.5 -		1.50 - -	/`/																
	-2.0 -		_ 2.00	/ /						_					3	2	4+4			
0]		-		Medi	ium grained san		orly graded, o	of grey								30			
31/10	-2.5 -		2.50 			С	olour.													
	-3.0 -		_ _ — 3.00																	
	-3.0		- 3.00 - -												2	2	1+1 30			
	-3.5 -		- 3.50	• • •		(3.4	15, 3.6	50)												
			-		Bould	ders of sandston		ure with oyste	er shell	Λ										
	-4.0 -		4.00 			(3.6	60, 4.0	0)]											
	-4.5 -		- - 4.50	\bigcirc	Fine	grained clayey vith dispersed gr	sand,	of light grey	coulor, 0)]	/									A.I.	
			-				0, 4.6		I											
\square	-5.0 -		- 5.00			avel of variable ellow to greyish				/					e	50				
	-		-		Wea	(4.6) athered sandstor	60, 6.0 ne. Re	0) ecovered as c	oarse											
	-5.5 -		5.50 - -		to m	edium grained o ow colour with th	clayey	sand of whit erbedded ca	e and											
	-6.0 -		- - 6.00			carbonate				_						60				
			-		Мес	dium grained sar	0, 7.0 ndstor	ne, with small	karst							50				
	-6.5 -		- 6.50 -			features and c	alcite	precipitations												
			_ _ 																	
01/11	-7.0 -		7.00 - -		Fine	(7.0 to medium grain)0, 9.0 red cla		vellow	1					1	16	25+35 30			
0	-7.5 -		_ 7.50		to	greenish colour	ration.	[SC]; [A-2-7	(0)]											
	•		E																	
	-8.0 -		- 8.00 												1	19	33+27			
	-8.5 -		_ _ — 8.50														23			
	-0.0-		- 0.30 - -	<u> </u>																
	-9.0 -		9.00	·····						-						21	39+21			
	-		E														21			
	-9.5]	9.50	L						_	L					L				

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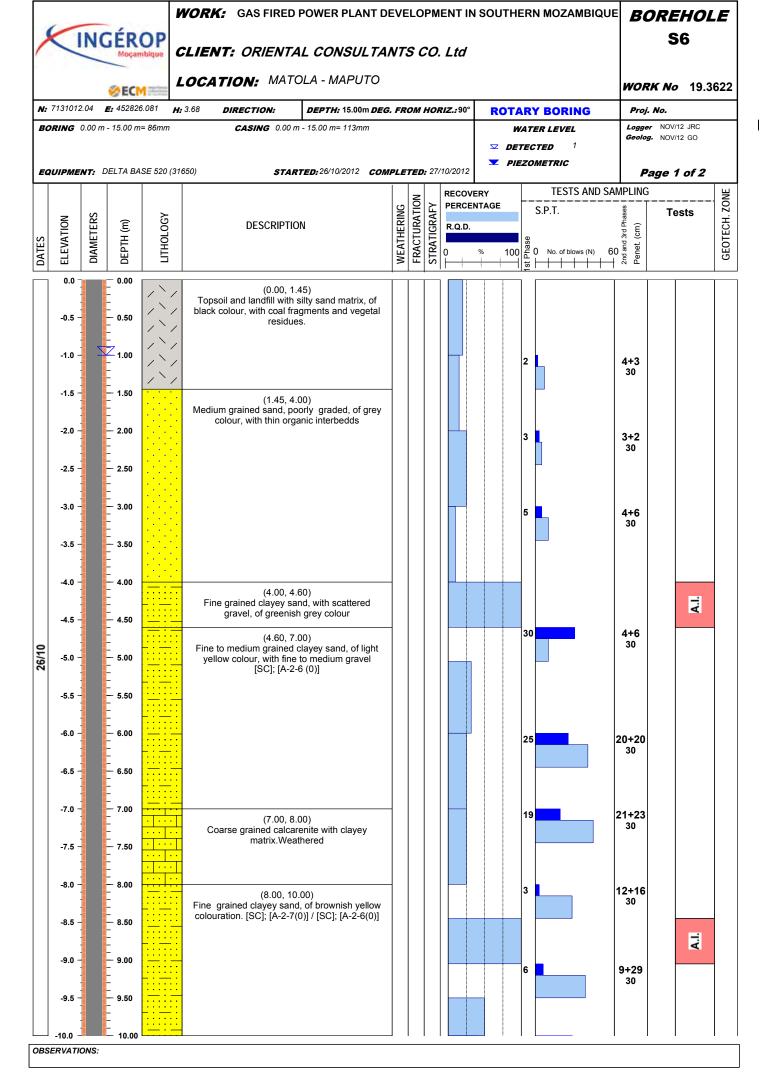
0 – 7,4 m







7,4 – 9,36 m



1	\langle	N		OP	WORK: GASFIRE						I SOUTH	IERI	N MOZAMBIQUE	BO	RE S	<i>HOL</i> 6	E
			⊘ECN		LOCATION: MA	TOLA - MAPUTO								WORK	K No	19.3	622
N:	7131012	2.04	E: 452826	6.081 H	B: 3.68 DIRECTION:	DEPTH: 15.00m DE	G. FR	гом	нон	r<i>IZ.:</i> 90°	ROT	AR	BORING	Proj. I	Vo.		
			- 15.00 m			0 m - 15.00 m= 113mm ARTED: 26/10/2012 CO	MPLE	TE	D: 27/	10/2012	⊻ DI	TEC	ER LEVEL TED ¹ METRIC	Logger Geolog. Pa		2 GO	
										RECOV	ERY		TESTS AND SA	MPLING			빌
DATES	ELEVATION	DIAMETERS	DEPTH (m)	ЛТНОГОСУ	DESCRIPT	TION	WEATHERING	FRACTURATION	STRATIGRAFY	PERCE R.Q.D.	NTAGE % 10		S.P.T.) No. of blows (N) 6(2nd and 3rd Phases Penet. (cm)	Tes	sts	GEOTECH. ZONE
	-10.5 -		- - - - - - - 10.50		(10.00, Fine grained clayey sa colouration. [SC]; [A-2:	and, of brownish yellow						28		33+27 19			
10	-11.0 -		_ 11.00 _ _ _									19		26+34 29			
26/10	-11.5 - - -12.0 -		- 11.50 - - - - - - 12.00		(12.00,	14.00)	_					24		42+18			
	-12.5 -		- - - - - - -		Medium grained sand fractured. Fresh rock 14.0	stone, weathered and between 13,6 m and								21			
	-13.0 -		- - 13.00 - - -									18		22+38 20			
27/10	-13.5 -		- 13.50 - - - - - - 14.00									07					
2	-14.5 -		- - - - 14.50 -		(14.00, Fine grained clayey sa colou	and, of brownish yellow						27		60 15			
	-15.0 -		- - - 15.00	<u> </u>	_		_					29		60 15			
	-15.5 -	1	15.50														







0 – 8,0 m







8,0 – 15,18 m

8		N	GÉR	OP nbique	WORK: GAS FIRED	AL CONSULTA					SOUTH	IERI	N MOZAMBIQUE	BO	REHC S7	DLE
			⊗EC	1200	LOCATION: MAT	OLA - MAPUTO								WORK	r <i>No</i> 19	.362
	7130894.		E: 452888		CASING 0.00	<i>DEPTH:</i> 10.00 m <i>DEC</i> <i>m</i> - 10.00 <i>m</i> = 113 <i>mm</i>	6. FR	ом	HOR	IZ.: 90°			F BORING	Proj. N	NOV/12 JRC	
50			- 10.00 m	- 00/////		n - 10.00 m– 110mm					v Di				NOV/12 GO	
EQ	UIPMEI	VT:	DELTA BA	SE 520 (310	(650) STA	RTED:31/10/2012 CON	IPLE	TED	: 31/1	0/2012	T P	EZO	METRIC	Pa	ge 1 of 2	?
								N		RECOVE			TESTS AND SA	-		
	NO	ERS	Ê	λg	DESCRIPTI	N	RING	RATIC	RAFY	PERCEN	TAGE		S.P.T.	3rd Phases (cm)	Tests	
DAIES	ELEVATION	DIAMETERS	DEPTH (m)	ПТНОLОGY			WEATHERING	FRACTURATION	STRATIGRAFY		% 10	Jase) No. of blows (N) 6(and 3rd Pr net. (cm)		
PA	ELE	DIA	DEI				ME	FR	STI		% 10	1 달 달		2nd and : Penet. (Č
	- 0.0		— 0.00 - -	/ /	(0.00, 1) Topsoil and landfill with	.00)										
	-0.5 -		- - 0.50	/`/	black colour, with coal fr residu	agments and vegetal										
			-	$ / \ / $												
	-1.0 -		1.00 	/ /	(1.00, 3	.00)						1		1+1 30		
	-1.5 -		- - 1.50	$ / \ / $	Landfill with silty sand m with coal fra									30		
			-	/ //												
	-2.0 -		- 2.00 -	/ \ /								1		2+1		
			-	$ \begin{pmatrix} & \cdot & \cdot \\ & \cdot & \cdot \\ & & \cdot & \cdot \end{pmatrix} $										30		
	-2.5 -		2.50 -	/ /												
	-3.0 -		- - 3.00	/ /								4		2+1		
			-		(3.00, 4) Medium grained sand, p	oorly graded, of grey						-		30		
	-3.5 -		- 3.50 -		colou	r,										
	-4.0 -		- - 4.00													
			-	\bigcirc	(4.00, 4) Coarse gravel with clay	.40) vey to sandy matrix,									A.I.	
	-4.5 -		- 4.50 -		light grey colour, poorly 2-6(0	graded [GP - GC]; [A-						45		4+2 30		
2			-		(4.40, 5											
31/10	-5.0 -		— 5.00 _ _		Fine grained clayey medium gravel of greer [SC]; [A-2	ish gray colouration									A.I.	
	-5.5 -		- - 5.50		(5.45, 6		-					60				
			-		Interbedded grey calca grained sandstone, of lig	renite and medium										
	-6.0 -		6.00 	••••	(6.00, 7	.22)	1					6		10+45		
	-6.5 -		- - - 6.50		Medium grained sandst fossiles, of light yellow of	one with oyster shell colour. Intersection of								30		
			- - -		a marly-clayey sand strai m, of light											
	-7.0 -		- 7.00 -									22		60		
	•		-	<u></u>	(7.22, 1									7		
	-7.5 -		— 7.50 - -		Fine to medium grained to greenish colouratior [SC]; [A-2	n. [SC]; [A-2-7 (0)] /										
	: - 8.0 -		- - 8.00		[SO], [A-2	-0 (0)]						18		32+28		
	-		-									10		19		
	-8.5 -		- 8.50 -		-											
	-9.0 -		- - - - 9.00													
	-9.0 -		9.00 - -									10		26+34 26		
	-9.5 -		_ 9.50 _		-											
	-		-													
	-10.0 -10.0 ERVATIO	Ne.	- 10.00		•			1						I	1	

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-		NC		DP	CLIEN	T: ORIENTA	POWER PLANT AL CONSULT DLA - MAPUTO	4N7				ISOUTH	ERN MOZAMBIQUE		DREHOI S7 KK No 19.3	
N:	7130894	.29	E: 452888.	706 h	: 3.438	DIRECTION:	DEPTH: 10.00 m D	EG. Fl	ROM	HOR	2 /Z.: 90°	ROT	ARY BORING	Proj.	No.	
			- 10.00 m= DELTA BAS		1650)		- 10.00 m= 113mm TED: 31/10/2012 CC	OMPLI	ETEL); 31/ [,]	10/2012	⊻ DE	IATER LEVEL TECTED EZOMETRIC	Geolog	 NOV/12 JRC NOV/12 GO Age 2 of 2 	
									z		RECOV	ERY	TESTS AND SAI	MPLING		ZONE
DATES	ELEVATION	DIAMETERS	DEPTH (m)	КЭОТОНТІ		DESCRIPTIO	Ν	WEATHERING	FRACTURATION	STRATIGRAFY	PERCEI R.Q.D.	-	S.P.T.	2nd and 3rd Phases Penet. (cm)	Tests	GEOTECH. ZO
31/10	-10.5 -		- - - 10.50										10	29+31 24		





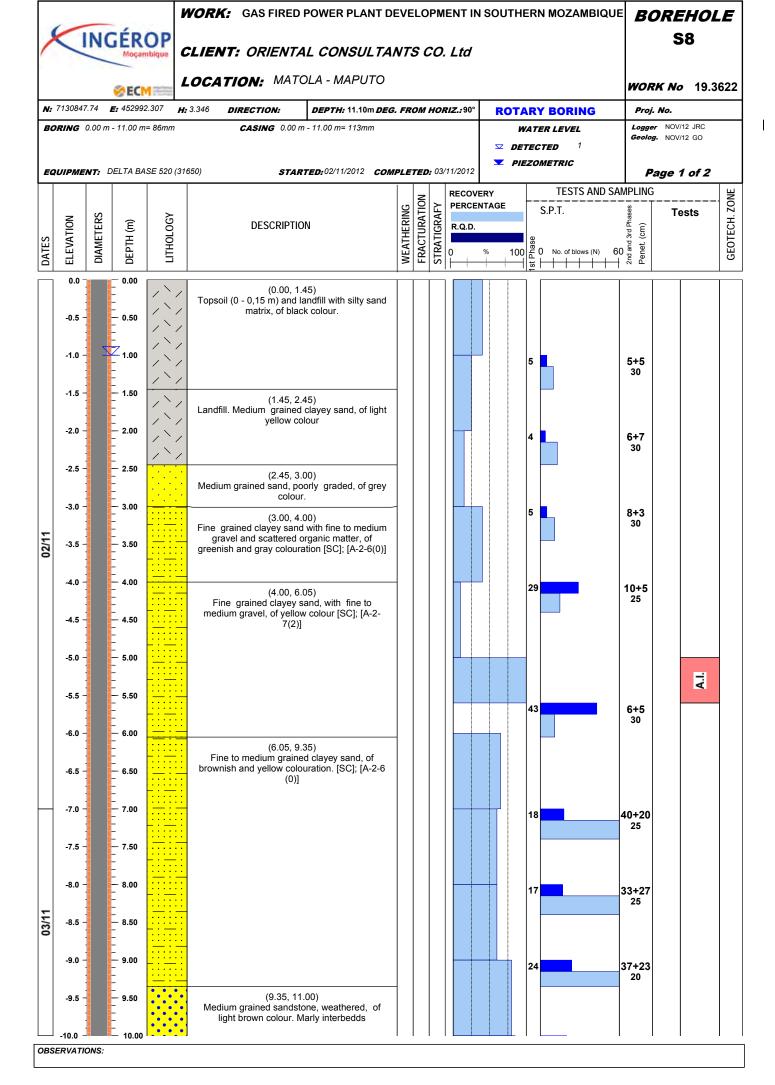


0 – 7,0 m





6,8 – 10,39 m



	WORK: GAS FIRED POWER PLANT DEVELOPMENT IN SOUTHERN MOZAMBIQU												N MOZAMBIQUE	BOREHOLE					
1	C	N			LIEN	T: ORIENTA	AL CONSUL	LTAN	v <i>t</i> s	50	:0.	Ltd					S	8	
			⊗ECN		.0CA1	TION: MAT	OLA - MAPU	то								WOR	RK No	19.3	622
N	N: 7130847.74 E: 452992.307 H: 3.346 DIRECTION: DEPTH: 11.10m DEG. FROM HORIZ.: 90° ROTARY BORING BORING 0.00 m - 11.00 m = 86mm CASING 0.00 m - 11.00 m = 113mm WATER LEVEL										Proj.	No.							
B	ORING	0.00 m	- 11.00 m=	= 86 <i>mm</i>		CASING 0.00 m	n - 11.00 m= 113mi	m						NATE	ER LEVEL		r NOV/1		
						V DETECTED ¹							Geolog. NOV/12 GO						
EQUIPMENT: DELTA BASE 520 (3)					650)	STAR	TED: 02/11/2012	сом	PLE7	TED:	, 03/	11/2012	🔽 PI	EZO	METRIC	Page 2 of 2			
								RECOVERY TESTS AND SA					MPLING			Ш			
	NOIL	TERS	Œ)	-0GY		DESCRIPTIC	DN		WEATHERING	FRACTURATION	STRATIGRAFY	PERCE R.Q.D.	-		 S.P.T.	3rd Phases (cm)	Te	sts	GEOTECH. ZONE
DATES	ELEVATION	DIAMETERS	DEPTH (m)	ПТНОLOGY					WEATH	FRACT	STRAT	0	% 100	Ist Phase	0 No. of blows (N) 60	2nd and 3 Penet. (c			GEOT
03/11	-10.5 -		- - - 10.50											20		60 15			
	-11.0 -		- 11.00 - 11.50		Fine g	(11.00, 1 grained clayey sar		our						30		60 15			





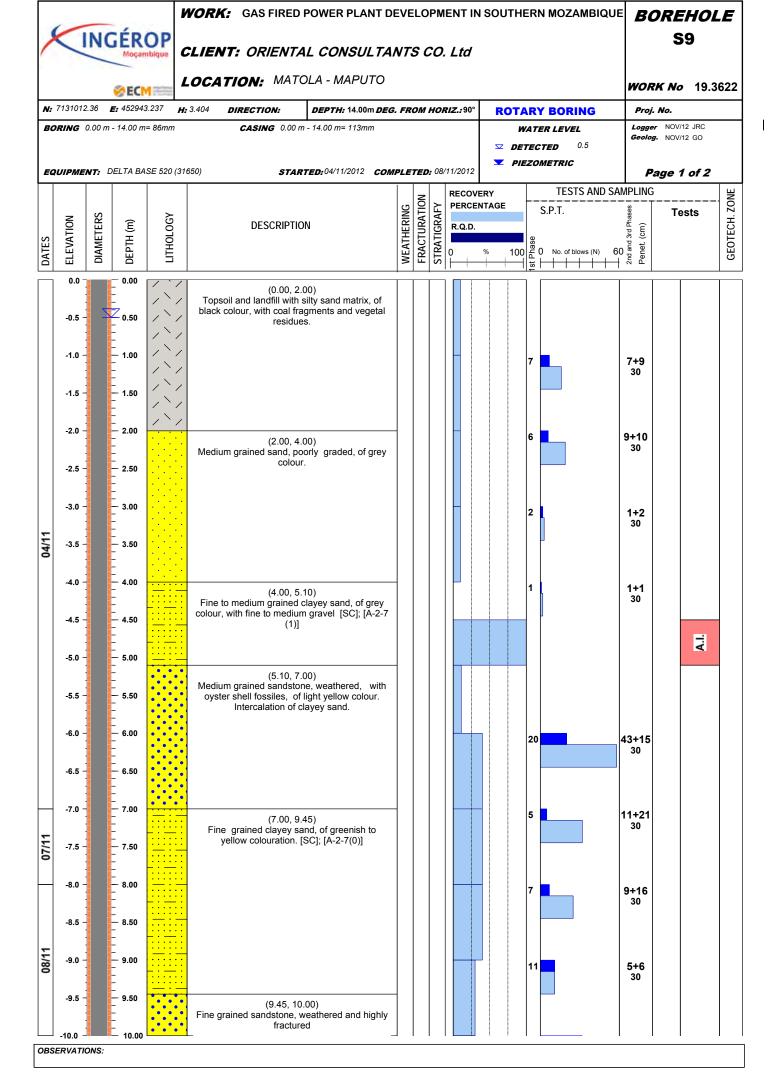
0 – 7,0 m







7,0 – 11,30 m



1	$\overline{\langle}$	NC	GÉR	OP	VORK: Gas fired						I SOUTH	ERN MOZAMB	BIQUE	DUN	EHOI S9	LE
			ØECN		LOCATION: MAT	OLA - MAPUTO								WORK N	<i>lo</i> 19.3	8622
BO		0.00 m	E: 452943			DEPTH: 14.00m DEC n - 14.00 m= 113mm RTED: 04/11/2012 COM					V V DE	ARY BORING WATER LEVEL TECTED 0.5 EZOMETRIC	i	Proj. No. Logger NO Geolog. NO		
		•7. 2		32 020 (07						RECOV	FRY	TESTS A	ND SAN		2 01 2	ш
DATES	ELEVATION	DIAMETERS	DEPTH (m)	КООТОНТИ	DESCRIPTIC	DN	WEATHERING	FRACTURATION	STRATIGRAFY	PERCEI R.Q.D.		S.P.T.		"	lests	GEOTECH. ZONE
08/11	-10.5 - -11.0 - -11.5 - -12.0 - -12.5 - -13.0 - -13.5 - -13.0 -		- 10.50 - 11.00 - 11.50 - 12.00 - 12.50 - 13.50 - 13.50 - 14.00		(10.00, 10 Fine grained sandstone, v fractur (10.41, 14 Fine grained clayey sa colouration. [SC	weathered and highly ed 4.00) and, of dark yellow						32 21 10 23 40	3	27+33 26 31+29 24 21+39 30 44+16 17 60		





0 – 8,00 m





8,0 – 14,24 m

INGÉROP					VORK: GAS FIRED	BOREHOLE S10										
. 7	120054	02		Constant of the local division of the local	LOCATION: MAT	OLA - MAPUTO								WORK		19.362
N: 7130954.03 E: 452997.923 BORING 0.00 m - 15.00 m= 86mm				= 86mm	:4.812 DIRECTION: CASING 0.001	V ⊻ DE	ARY BO VATER LE TECTED EZOMETR	0	Geolog.	NOV/12 J NOV/12 G	60					
ECUIPMENT: DELTA BASE 520 ELEVATION DIAMETERS DIAMETERS DEPTH (m) DEPTH (m)		АЭОТОНЦІ	DESCRIPTION								Tests (cm)					
	0.0 - -0.5 - -1.0 -		0.00 	/`/ /`/ /`/ /`/	(0.00, 2 Topsoil and landfill with black colour, with coal fr residue	silty sand matrix, of agments and vegetal						6		9+9		
	-1.5 - -2.0 -		- - - - - - - - 2.00		Landfill. Coarse to mediu	(2.00, 3.00) Landfill. Coarse to medium grained silty sand,						7		30 8+9 30		
	-2.5 - -3.0 - -3.5 -	-2.5 - 2.50 of red colour. -3.0 - 3.00 (3.00, 4.00) Fine grained sandstone, weathered ar fractured				.00) ne, weathered and	_					17		60 15		
	-4.0 - -4.5 -		- - - - - - - - - - - - - - - - - - -		(4.00, 5 Sandy clay, hard, of ye	.00) Ilowish grey colour	_					13		29+16 30		
	-5.0 -		- - - - - - - - 5.50		(5.00, 6 Variable grain size clay medium gravel, light ye	ey sand, with fine to	_									A.I. A.I.
	-6.0 - -6.5 - -7.0 -		- 6.00 - - - 6.50 - - - - - - - - -		(6.20, 7 Coarse grained sandsto fractured, of yellowish col of grey c	one, weathered and our. Marly interbedds						20		27+33 30 29+31		
	-7.5 - -8.0 -		- - - - - - - - - 8.00 - - - -		(7.39, 10 Fine grained clayey s orange colouration. Fine the top. [SC]; [A-2-7(1	and, light yellow to do medium gravel at						11		23 14+27 30		
	-8.5 - -9.0 - -9.5 -		- - - - - - - - - - - - - - - - - - -									13		14+17 30		
	-9.5 -10.0		- 9.50 - - - - 10.00													

1		N	GÉR	OP			POWER PLAN					SOUT	HERI	N MOZAMBIQUI	201	R <i>EF</i> S1		E
			ECN		OCATION	: MATO	OLA - MAPUT	0							WORK	No	19.30	622
N:	7130954	1.03	E: 452997	.923 H :	4.812 DIREC	TION:	DEPTH: 14.00m	DEG. F	ROM	но	2/Z.: 90°	RO	TAR	Y BORING	Proj. N	o.		
			n - 15.00 m DELTA BA	= 86mm SE 520 (310			n - 15.00 m= 113mm P TED: 06/11/2012	COMPL	ETEI	0 : 07/	/11/2012		DETEC	ER LEVEL ETED ⁰ METRIC	Logger Geolog. Pag		GO	
									-		RECOVE	RY		TESTS AND SA	-			١E
DATES	ELEVATION	DIAMETERS	DEPTH (m)	LITHOLOGY	D	escriptic	DN		FRACTURATION	STRATIGRAFY	PERCEN R.Q.D.			S.P.T. D No. of blows (N) 6	2nd and 3rd Phases Penet. (cm)	Test	ts	GEOTECH. ZONE
07/11	-10.5 - -11.0 - -11.5 - -12.0 - -12.5 - -13.0 - -13.5 -		- 10.50 - 11.00 - 11.50 - 12.00 - 12.50 - 13.00 - 13.50		Medium grain	(13.00, 13 (13.00, 13 ed sandsto fracture (13.38, 14	and, light yellow to do medium gravel] / [SC]; [A-2-7(1)] 3.38) one, Weathered ar ed	nd					17 15 18 15		32+28 24 20+40 28 33+27 22 28+32 23			
	-14.0 - -14.5 -		- 14.00 										22		36+24 25			







0 – 8,00 m

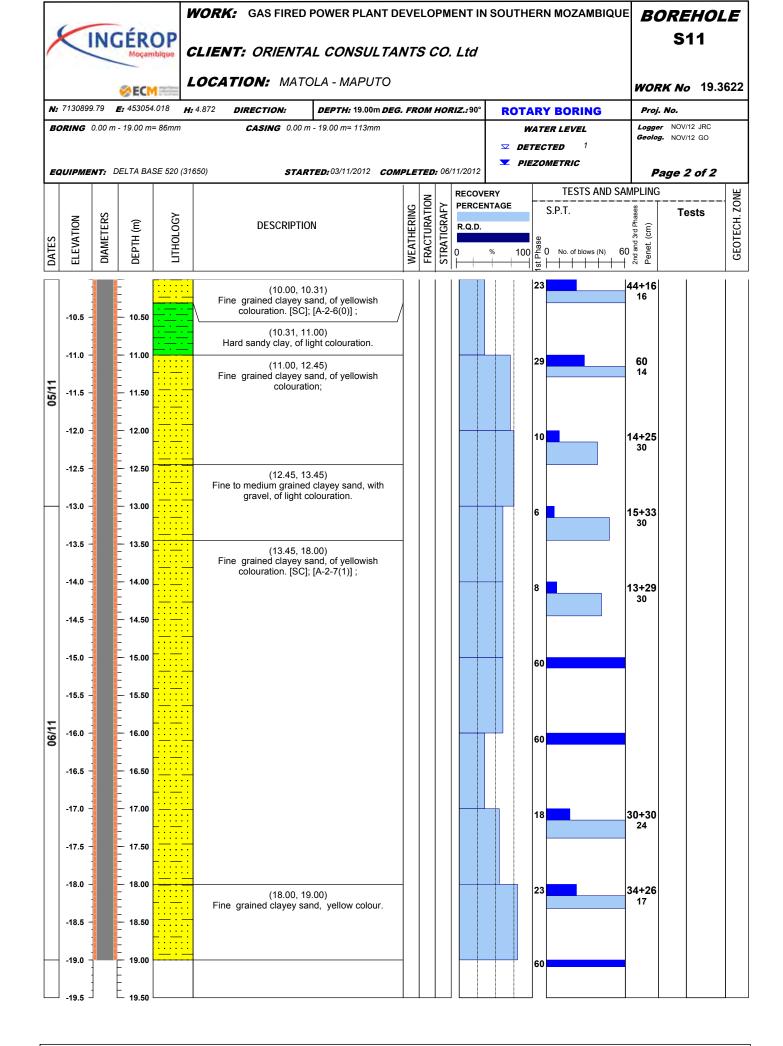




8,0 – 14,40 m

4		NI	GÉR	A	WORK: GAS FIRED	POWER PLANT D	EVE	ELO	PMI	ENT IN	I SOUTH	ERI	N MOZAMBIQUE	BC	DRE S1		. E
(-	-		nbique C	CLIENT: ORIENTA	L CONSULTA	NT.	'S C	<i>:0.</i>	Ltd					J		
			⊗EC!		LOCATION: MATC	DLA - MAPUTO								WOR	K No	19.3	622
	7130899		E: 453054		4.872 DIRECTION:	DEPTH: 19.00m DEG). FR	ом	HOR	<i>IZ.:</i> 90°	ROT	AR	BORING	Proj.			
BO	RING (0.00 n	ו 19.00 m - 19	= 86mm	CASING 0.00 m	- 19.00 m= 113mm						VATI TEC	ER LEVEL		NOV/1		
50				SE 520 /21	650)				- 06/	11/2012			METRIC				
EQUIPMENT: DELTA BASE 520				SE 520 (37		TED:03/11/2012 COM			00/	RECOV	FRY		TESTS AND SA		age 1	01 2	ш
	7	S		~			WEATHERING	FRACTURATION	AFΥ	PERCE			S.P.T.		Те	sts	I. ZON
DATES	ELEVATION	DIAMETERS	DEPTH (m)	ПТНОLOGY	DESCRIPTION				STRATIGRAFY	R.Q.D.) No. of blows (N) 60	Lests Penet: (cm) Penet: (cm)			GEOTECH. ZONE
	0.0		0.00			202	1					<u> </u> € 					
	-		E	171	(0.00, 2.0) Topsoil and landfill with s black colour, with coal frag	ilty sand matrix, of											
	-0.5 -		0.50 - -	$\begin{pmatrix} \gamma \\ \gamma \end{pmatrix}$	residues												
	-1.0 -	Ξ	- Z 1.00	1.1								1		2+1			
-]		E									ľ		30			
03/11	-1.5 -		1.50 -	/ / /`/													
	-2.0 -		_ _ 2.00	/ \ /										215			
	•		-	/ \/	(2.00, 3.0 Landfill. Medium grained						2		3+5 30				
	-2.5 -		2.50	$\gamma \gamma \gamma$	colour.												
	-3.0 -		_ _ 3.00	1.1													
				<u> </u>	(3.00, 4.00) Variable grain size clayey sand with fine							9		13+6 30			
	-3.5 -		- 3.50 -	<u></u>	gravel, yellowish [S	SC]; A-2-7(2)											
			-														
	-4.0 -		4.00 - -		(4.00, 5.1) Fine to medium clayey sa	0) nd brownish vellow										А.І.	
	-4.5 -		- 4.50		[SC]; A-2-	7(1)										◄	
	•		Ē													A.I.	
	-5.0 -		5.00 -		(5.10, 6.0	00)						10		10+9			
	-5.5 -		_ 5.50		Fine to medium grained yellow.	silty sand, of light								30			
	-																
	-6.0 -		6.00 - -		(6.00, 7.4	l5)	1					7		10+12 30			
	-6.5 -		- - 6.50	<u></u>	Medium grained claye colouration with lime	y sanu, yenowish estone gravel											
-	-		-														
05/11	-7.0 -		7.00 									6		12+13 30			
	-7.5 -		- - 7.50				-							30			
	-		Ē		. (7.45, 10) Fine grained clayey sa colouration. [SC];	and, of yellowish											
	-8.0 -		- 8.00 	<u></u>		[/ \-∠-∪(U)] ,						10		18+29			
	-8.5 -		_ _ 8.50											30			
	-0.0																
	-9.0 -		- 9.00 -									18		25+35			
			-											28			
	-9.5 -		— 9.50 - -	<u> </u>													
	-10.0		_ 	<u> </u>													
DBSE	RVATIO	ONS:															

T



OBSERVATIONS:





0 – 8,0 m





8,0 – 15,20 m





15,2 – 19,09 m