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CAIRO-ASSUIT HIGHWAY FEASIBILITY STUDY

FINAL REPORT

Appendix Volume 4

DESIGN OF THE PROPOSED NEW CAIRO-ASSUIT HIGHWAY

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بواسطة
ويلبر سميث وشركاه
المجموعة الإستشارية المصرية
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January 1987

FORWARD

This fourth volume of appendices presents the engineering investigations of the proposed new Cairo-Assuit Highway. The alignment option phase, which took up the first two months of the Study, is summarized, and then the photo-interpretation, soils surveys and the engineering design are presented.

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SUMMARY OF ALIGNMENT OPTIONS REPORT

This Appendix summarizes the results of the alignment options study, which was made to define the preliminary alignment of the new Cairo-Assuit Highway. This work was completed as the first task in the Study before data collection had commenced, and many of the figures estimated, in particular costs, were substantially revised later in the Study.

The overall objectives of this Study were to determine whether a major investment in highways was warranted in the corridor between Cairo and Assuit, and to determine the nature of such an investment. The two possible investments for the Study to investigate were specified in the Contract. The first was the construction of an entirely new road between Cairo and Assuit; the second was the improvement of the existing highway. The Study also had to consider combinations of these two possibilities.

This report was concerned only with the first of the two possibilities for investment, that of building a completely new road. The report presented the results of a preliminary task of the Study to evaluate alternative alignment options. The scope of this work was defined in Task 5 of the Contract "Identify and Screen New Road Options".

It is stressed that this report made no recommendation on whether or not a new road should be constructed. It simply answered the question "If a new road was to be built between Cairo and Assuit, where should it be located?"

Alignment Options Evaluated

Four major alignments options were identified, the East and West Nile Alignments generally located close to the Nile just outside the existing developed areas, and the Eastern and Western Desert Alignments located far from the Nile. Some variations were defined within these alignments; specifically, two alternatives from Minia to Assuit on the East Nile Alignment, and three alternative approaches to Cairo on the West Nile Alignment. Also, two Nile crossing points were identified allowing the possibility of combined alignments, starting on one bank and crossing to the other using the new Nile bridges at Beni Suef or Minia. The alignment options are shown by Figure 4A-1.

Allowing for distances on existing roads, the shortest route was the Eastern Desert Alignment at 360 kilometers, and the longest were the two routes passing to the west of Fayoum at 435 to 447 kilometers. The main West Nile Alignment was about 370 kilometers and the East Nile Alignment was about 10 kilometers longer. The two alignments crossing the Nile were both about 400 kilometers.

Engineering Evaluations and Cost Estimates

Construction costs for the four alignment options were prepared initially for a 4-lane divided highway, but with a supplementary estimate for a 2-lane highway. The northern terminus of each alignment was taken as the planned Cairo Ring Road and the southern terminus as the town center at Assuit. Unit construction costs were based on recent construction contract prices, field investigations, anticipated geology, and experience in other countries with similar conditions. Estimates for the Eastern and Western Desert Alignments were strictly order of magnitude due to the lack of adequate maps and detail. Construction costs were also estimated for access roads to the two Nile Alignments.

Considering only the cost of the main alignment, the construction costs of the Nile Alignments were similar, at around LE 85 million. The lowest cost alignment was the Combined Nile Alignment which stayed on the east bank from Cairo to Minia, thus making maximum use of the current construction which would be incorporated into the new road, and then crossed the Nile to take advantage of the easy west bank terrain between Minia and Assuit.

Constructing to 2-lane standard would reduce costs by about a third, rather more for the East Nile Alignment because of the use made of the current construction.

The cost of access roads to the towns along the corridor added about 20 percent to the cost of the West Nile Alignment, but more than doubled the cost of the East Nile Alignment because of the need to provide bridges across the Nile.

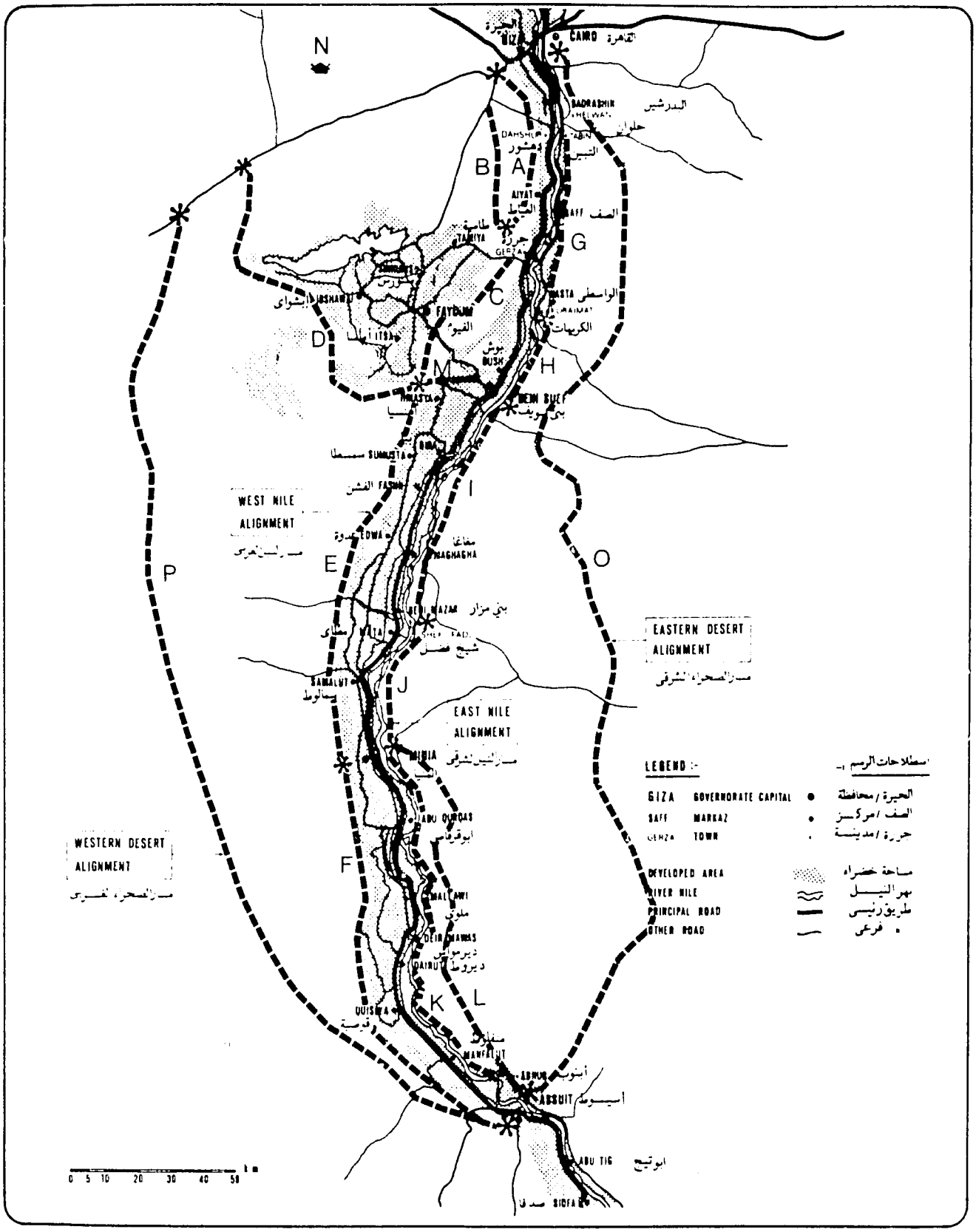
The Desert Alignments were both expensive at about LE 125 million.

NOTE: Detailed investigations later in the Study substantially raised these costs, in most cases doubling them. This was at least partly due to the need for much stronger pavements than normally used in Egypt, thus rendering previous per-kilometer costs invalid.

Traffic Appraisal

Traffic was estimated for each of the alignment options based on traffic flows analyzed and projected by the 1984 Egypt National Transport Study (ENTS) (Reference 1). The estimates took account of the accessibility to corridor communities provided by each alignment. The traffic estimates for the West Nile Alignment took account of the impact of the current highway construction projects on the east bank which were throught likely to attract some traffic in competition with the West Nile Alignment.

It was concluded that traffic on the East Nile Alignment would be the greater, but only if it were assumed that additional Nile bridges would be provided to give access to the main communities of the corridor which are virtually entirely located on the west bank. Without such access links, traffic on the East Nile Alignment dropped to below the estimates for the West Nile Alignment.



Cairo – Assuit Highway Feasibility Study

ALIGNMENT OPTIONS EVALUATED

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Figure 4A - 1

The two desert alignments were throught unlikely to attract high volumes of traffic, mainly because of the lack of good connections to the communities in the corridor.

Economic Appraisal

An economic appraisal was undertaken for the purpose of ranking the alignment options. Ranking was determined by comparing ratios derived from dividing the estimated vehicle operating cost benefits in the year 2000 by the corresponding construction cost. Benefits were calculated by subtracting total vehicle operating costs for each alternative facility from total vehicle operating costs for the null or do-nothing base case transport facility. The end result of the screening procedure was a preference ranking of proposed alternative Cairo-Assuit highway alignments.

The West Nile Alignments were ranked highest and the results for the East Nile alignment were distinctly inferior. The East Nile Alignment performed badly in this economic ranking because of the high cost of bridges across the Nile which were deemed essential to provide access to the existing communities on the west bank. For the case where access bridges were not provided, benefits dropped and this alternative had an even lower ranking.

The combined Nile Alignments, starting on the east bank and crossing to the other bank at Beni Suef or Minia, did not perform particularly well, mainly because of the access problems associated with the East Nile Alignment, but also because of increased length of alignment caused by the Nile crossing.

The Desert Alignments performed better than expected, but these results were throught suspect because of the difficulty of estimating construction costs. It was concluded therefore that the West Nile Alignment performs best from the point of view of this economic ranking.

Other Considerations

In addition to the engineering, traffic and economic evaluations, the alternative alignment options were evaluated from four other viewpoints: access and development, strategic, archeology and social.

Access and Development - These aspects were considered from three points of view: access to existing development, access to new areas in the corridor, and access to the part of Upper Egypt south of Assuit.

It was concluded, from the point of view the existing developments in the corridor, that the main West Nile Alignment offered the best possibilities for access. This was essentially because the East Nile Alignment could not serve the population located on the west bank unless access bridges were provided across the Nile, and this would be a very expensive undertaking.

It was also concluded that the current highway construction on the east bank could serve adequately to open up this previously inaccessible region; therefore there would be little further advantage from the point of view of development access to prefer the East Nile Alignment for the Cairo-Assuit Highway. Instead, it was concluded that the West Nile Alignment would have a more beneficial impact in this regard, by providing access to the currently undeveloped areas immediately outside the existing agricultural area on the west bank.

All four alignment options would provide good access to Upper Egypt south of Assuit, with the two Nile alignments and the Eastern Desert Alignment preferable because of shorter distance. However potential congestion on the Nile alignments was not a convincing argument for preferring the less heavily trafficked desert alignments, since the Nile Alignment traffic volumes were themselves not expected to be high.

Strategic - All four alignments could serve a strategic role, principally in relation to the planned East Africa Highway from Cairo to southern Africa. The alignments on the west bank were preferred because they connected more easily with the Desert Road to the port of Alexandria.

Archeology - With the rich history of Egypt, there are many historical sites through the length of the Cairo-Assuit corridor. This aspect was considered from two points of view: the possible damaging effect of a new road on important sites, and the potential beneficial effects of opening up currently inaccessible sites to exploration and tourism. It was concluded that for the part of the corridor between Cairo and Minia, a west bank alignment was preferable because most sites are located on the west bank of the Nile, and there is sufficient room to construct a highway without damage to sites. However, south of Minia, an east bank alignment was preferable since this would make accessible a number of important sites of great interest. Unfortunately, the constricted space near the Nile on this part of the east bank makes a highway difficult to construct without damaging sites, so the alternative of constructing Segment L as shown in Figure 4A-1 through the hills from Minia to Assuit was preferred.

Social - The corridor is predominantly a rural society and, compared to other parts of Egypt, can be classed as under-developed. Improved access would overcome many of the obstacles to improving mobility, reducing accidents and relieving pressure on congested infrastructure. It was concluded that the West Nile Alignment would do most to bring about such changes because of the greater proximity and access to the population centers of the corridor.

Final Conclusions and Recommendations

Four major alternative alignments for a new road from Cairo to Assuit were evaluated, together with some variations within these alignments.

It was considered that neither of the alignments located far from the Nile, the Eastern Desert Alignment and the Western Desert Alignment, were suitable for a new Cairo-Assuit highway. The only advantage they appeared to offer was slightly easier traffic conditions for vehicles travelling between Cairo and south of Assuit, but the benefits from this were

a

negligible. These alignments could do little to relieve the existing highway, could not serve the existing communities, and could not assist new development in the corridor. Egypt cannot afford the luxury of a separate road to serve only the part of Upper Egypt south of Assuit, and so it was recommended that the two desert alignments not be considered further.

It was also concluded that the west Nile Alignment via Construction Segment D which passed on the west side of Fayoum had no advantages, and some disadvantages, compared with the other Nile Alignments and should not be considered further.

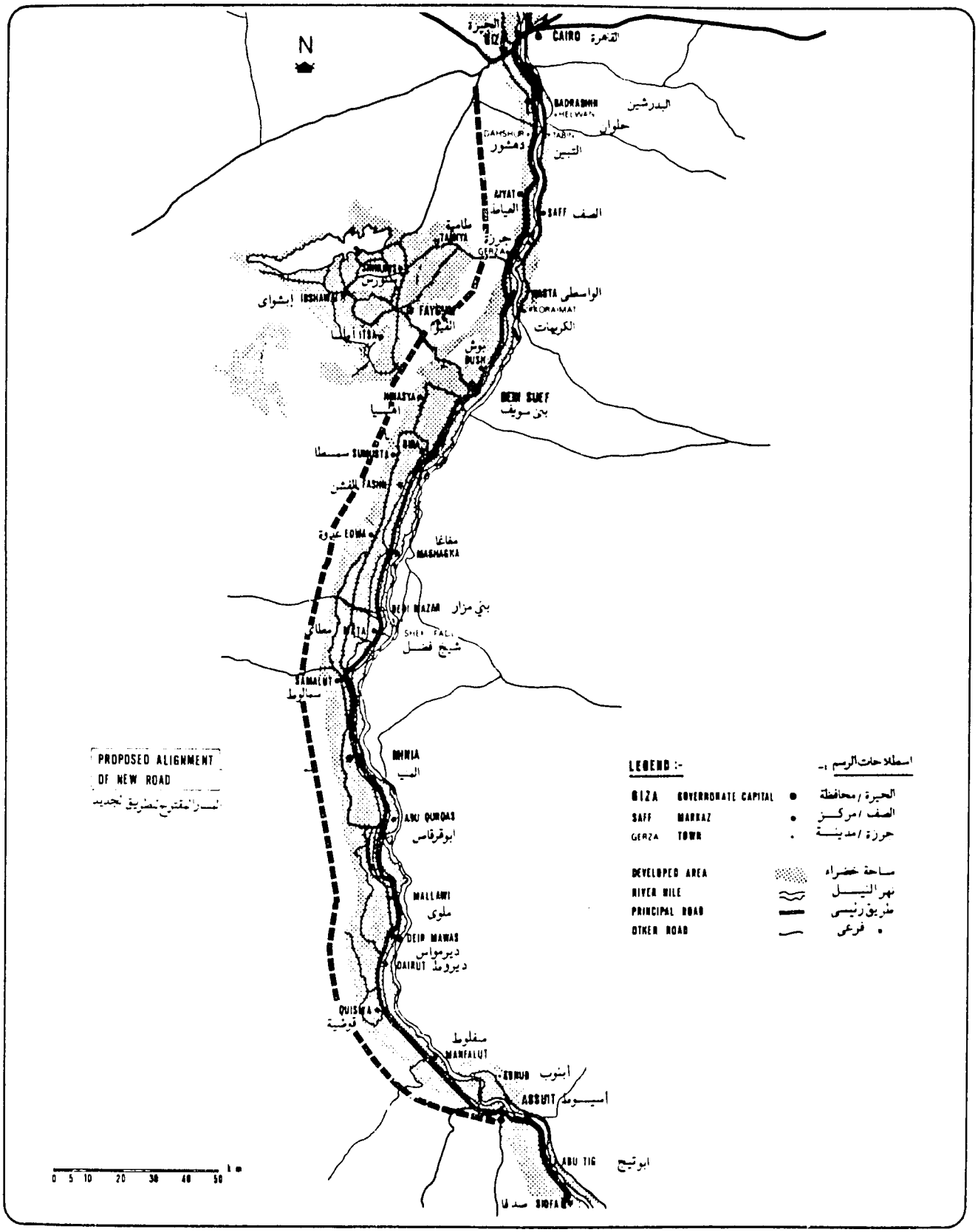
Therefore the choice of alignment lay between the two Nile Alignments which were located close to the Nile but just outside the existing developed and agricultural areas.

The East Nile Alignment did have certain advantages. A new paved road was already in construction on the east bank and, by incorporating this construction in the East Nile Alignment, savings in costs could be made compared with building in a completely new location. However, further south between Minia and Assuit, construction costs would be particularly high due to the difficult terrain.

The East Nile Alignment could also give most relief to the Governorate capitals of Minia and Beni Suef since it is actually closer in location, although on the opposite bank of the Nile. However, The Nile barrier presented a problem for the East Nile Alignment in giving access to the other communities along the Cairo-Assuit corridor which could only be overcome by the construction of bridges. This could double the cost of the road. Whithout these access bridges, the benefits to the East Nile Alignment were reduced considerably.

It was concluded that most of the advantages lay with the West Nile Alignment. Construction costs were not high because the terrain was easy and access could be provided to all the communities along the route at reasonable cost. This alignment could open up new areas for development for both industry and agriculture more easily than a road on the east bank, which would in any case be adequately provided for by other new road construction projects there. The approaches to Cairo and the links through to the port of Alexandria were good and provided a better connection than the East Nile Alignment. Finally, the preliminary economic analysis indicated that the West Nile Alignment had the best chance of being economically feasible.

Therefore it was recommended that the West Nile Alignment be selected for preliminary engineering design, and for aerial photography. Of the two alternative alignments on the immediate approach to Cairo, the route via Construction Segment B was preferred on engineering and cost grounds. The complete recommended alignment is shown in Figure 4A-2.



Cairo – Assuit Highway Feasibility Study

RECOMMENDED ALIGNMENT

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Figure 4A - 2

Appendix 4B

PHOTOGEOLOGICAL STUDIES OF THE ALIGNMENT FOR THE NEW CAIRO-ASSUIT HIGHWAY

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Appendix 4B

PHOTOGEOLOGICAL STUDIES OF THE ALIGNMENT FOR THE NEW CAIRO-ASSUIT HIGHWAY

In January 1986, an aerial photograph survey was undertaken of the alignment for the proposed new Cairo-Assuit Highway. This appendix presents an assessment of the geological features of the alignment based on interpretation of the 1:25,000 scale photographs produced from the survey.

General Features of the Expressway Corridor

The following are the most important landforms and man-made features identified from the aerial photographs. Some of these features represents potential obstacles to construction in some areas.

1. West of Aiyat, there is rocky land with rugged topography and steep slopes of 40 meters facing the Fayoum Depression.

2. There is new construction in the desert area between the Nile Valley and the Fayoum Depression.

3. Drainage water fills a drainage line extending from Gebel Monqar El Lahout, at the end of the northern part of the desert between the Nile Valley and the Fayoum Depression, to the cultivated land.

4. A canal has been constructed in Wadi El Rayan.

5. A pipeline for gas crosses the study area at Beni Suef.

6. An area of desert land, extending to the west of the cultivated land between Sumusta and Abu Qurqas, has been prepared for reclamation. This area reaches its maximum width at Minia.

7. Recently reclaimed cultivated land is noted in the silty flood plain land between Sumusta and Abu Qurqas.

8. Sand dunes cover most of the area between the cultivated land and the scarp of the limestone plateau between Minia and Abu Qurqas.

9. The desert low land between the cultivated land and the limestone plateau becomes very narrow between Deir Mawas and Qusiya with a width of 500 meters.

10. Factories have been constructed between Manfalut and Assiut.

Geological and Soil Studies

The geology, geomorphology and soil studies of the desert area are discussed in this report in segments defined by towns and cities along the route. Figures 25-29 in the Plan Volume of this Report show a geological section along the route of the alignment.

Giza to Aiyat - This rocky land is a part of the Libyan Plateau with a mean elevation of about 125 meters above sea level. It is gently sloping towards the north and northwest to west directions. The land is characterized by an almost fault-free, uniform surface. The surface uniformity is seldom broken by any conspicuous relief features except for the steep high slope near Aiyat facing the Fayoum Depression, which is about 40 meters in height. Parts of this surface are barren while others are covered with sand and gravel.

From Badrashin to Aiyat the surface becomes slightly undulated, and is formed from shale and sandstone intercalations with a thick gravelly layer. This area is nearly uniform and it is crossed by dense drainage lines and notable wadis attaining widths ranging from 50 to 20 meters, but of mostly shallow depth.

From the scarp near Aiyat southwards, the elevation decreases from 100 meters at the foot of the scarp to 75 meters away from the scarp. Drainage lines here are of lower density, and wadis are narrow, 50 meters wide, and shallow.

Geologically, the strip is covered with thinly bedded, easily weathered, sandstone and sandy limestone with shale intercalations. Topographically, the beds dip towards the north and appear as stone steps towards the south. The lower parts between the steps are filled with sand.

Aiyat to Matania - The strip between Aiyat and Matania represents the most rugged and the highest land in the Study area. It embraces two scarps and three depressions. The higher land extending along the central part of the strip is made up of sandstone and clay intercalations. To the west of the high land, the steps are constituted of sandstone and limestone beds bound by three depressions filled with sand. To the east, however, the land is more rugged and is made up of shale, sand and gravel. This strip seems to be faulted.

Matania to Gerza - This strip is covered by thinly bedded sandstone, limestone and shale intercalations, with limestone at the lower levels. The land is of lower relief, 50 meters high and less rugged. Between the weathered north-dipping beds, some of the drainage basins are filled with sands and are directed towards the Fayoum Depression. Wadis draining towards the Nile Valley range in width from 100 to 200 meters. Generally this strip is covered with sand and gravel.

Gerza to Ishmunt - This strip lies in the northern part of the land between the Fayoum Depression and the Nile Valley. The general slope here is towards the Nile Valley. The western part near Fayoum is dominated by high land with high hills constituted of sand, clay and gypsiferous shale intercalations, covered with conglomerate. Bounding these hills there are some pediments of sand and clay. The land underlaying the pediments and the cultivated land is covered with a gravel layer up to eight meters thick as observed in the quarries near the Wasta-Fayoum road and near the Giza-Fayoum road. These rocky beds are not observed in the gravelly land.

North of Bahr Youssef, where the elongated Gebel Monqar El Lahout (130 meters high) stands, the land is covered with boulders as well as gravel of different sizes. Drainage lines present are shallow, with one filled with drainage water. The land bordering the cultivated land is covered with sand while some patches of land are covered with water.

Ishmunt to Beni Suef - This strip represents the southern part of the land between the Fayoum Depression and the Nile Valley. It is covered by the same geological succession encountered in the northern part. There is also an elongated hill in the southern strip, namely, Gebel El Saloun facing Gebel Lahout in the northern strip. These hills are geologically linked. The rocky land in the former strip is wider to the north while the gravelly sand land is narrower than in the case of the northern strip. In the southern strip the land near the cultivated land is more rugged, and the former has developed at the expense of easily weathered low hills. These hills are constituted of clay mixed in some parts with gypsum, and gravel and sand mixed with limestone. This hilly land is rugged and is dissected by many drainage lines and wadis.

Beni Suef to 4 km South Wadi Rayan - This strip is uniform, nearly flat, with very low easily weathered sand, gravel and clay,and thin limestone beds. The strip slopes gently from west to east, with a decrease in elevation ranging from 75 to 30 meters near the cultivated land. Drainage lines are of low density and wadis are narrow, ranging from 10 to 50 meters in width. The land parallel to the cultivated land is mainly covered with thick gravel, while all the strip is covered with sands increasing in thickness near the cultivated land. North of Wadi Rayan a gravel quarry has been observed.

Wadi Rayan to Sumusta - This strip extends for about 16 km, and is formed of mesas and hills. These land forms extend parallel to the cultivated land and is divided by very narrow wadis. The mesas reach 60 m high and are constituted of limestone, clay and sand with marl beds. The sand and limestone beds extend westward as nearly flat land slightly dipping towards the north, and with steep slopes towards the south. Between the steep wall scarp and the gentle slope there exists a notable basin filled with sand and gravel. The strip under consideration is terminated by a steep scarp about 40 meters high.

Sumusta to Edwa - The elevation of this land decreases from 60 meters at the west to 30 meters near the cultivated land. Wadis crossing this strip are 50 to 250 meters wide. The surface of the strip range from flat to slightly undulated. The undulated land facing Fashn, is constituted mainly of clay, marl and sand while the flat land is covered with gravel, silt and sand. There are some pieces of land prepared for cultivation. There is also a quarry south of Sumusta near the reclaimed land.

Edwa to Maghagha - The elevation of this strip ranges from 30 to 50 meters. Topographically the strip is a hilly land one km wide, extending parallel to the development zone. It is covered mainly with clay, gravel and marl. To the west the land becomes flat, highly drained and covered with thick gravel and sand.

Maghagha to Matai - This strip is nearly flat to slightly undulated, highly drained by numerous braided channels. The flat parts are covered by thick gravel and sand, while the undulated land is covered with clay, sand and gravel. Near Beni Mazar, north of the development zone, there are thin beds of easily weathered marl and clay. A quarry has been observed near the asphaltic road.

Matai to Burgaya - The elevation of this strip gradually decreases to 40 meters where the development zone is extensive. The desert land is mainly covered with gravels and sands, and is almost flat with few drainage lines. Elongated sand dunes extend along the strip with a south and south west orientation. These dunes attain a 250 meter elevation extension near the development zone at Samalut. The appearance of the dunes is similar to a chain of barchan dunes. Sands blown by the westerly winds accross the surface of the desert are arranged in lines parallel to the direction of wind. To the west and near the plateau, the coverage of the dunes is two km wide or more. Wind-blown sand is also represented in the strip by sand sheets and sand streams. To the south near Burgaya a considerable land area prepared for development has been extended into the desert land. Between the cultivated land and the land prepared for reclamation lies silty flood plain land. In this stretch sand dunes extent into the silt.

Burgaya to Minia - This strip is the extension of the previous strip where the land prepared for reclamation becomes wider until it reaches the sand dunes. The sand dunes extend into the flood plain and extend parallel to the cultivated land.

Minia to Abu Qurqas - This strip is covered by sand sheets, sand streams and sand dunes. The sand deposits cover the gravel plain which extend from the limestone plateau to the cultivated land. The sand deposits also cover some parts of the silty flood plain. The lower relief sand dunes covering the silty land seem to be more stable than those near the plateau. The latter seem to have moved towards the south east.

Abu Qurqas to Mallawi - Topographically, the low land becomes less than 50 meters high and it narrows to 200 meters wide between the hills at the foot of the plateau scarp and the cultivated land. The strip is completely covered with sand sheets and sand dunes. The elongated dunes disappear as they have been replaced by barchans. South of Mahras the barchans disappear and are replaced by sand sheets. The general slope of the low land becomes steeper at Baragil and Mallawi than in the northern lands. The low plain reaches a width of 0.75 km in some parts, limited by the cultivated land and the low rugged marly hills on the West.

Mallawi to Dairut - The cultivated land is bordered with a thin sand plain, where denise palm trees grow. Moreover the sands extend into the flood plain. Beyond the sand to the west there is a gravelly plain 0.5 to 1.5 km wide with sand streams. To the west of the gravelly plain there lies a highly rugged rocky land 100 to 200 meters high. These hills are made up of marl beds which become harder at higher elevations. This strip is crossed by major, wide, steep walled wadis at Raqabet Umm El Bah, Abu

Haz, El Dilaaw, El Ghuzlani and Haramawi. Some of these wadis form depressions at their contacts with the cultivated land.

Near Deir Mawas the sand sheets parallel to the cultivated land become wider, reaching about 200 to 300 m in width. At Darb El Haramawi, the sand sheets become very thin, and the gravelly land becomes narrow to the south, attaining a width of 0.5 km at the curvature of the palteau. South of Naslt Bawit there is an elongated sand dune, 2.5 km long, extending parallel to the limestone plateau. The scarp of the plateau is very steep, while its surface is rugged and covered with flinty limestone.

Dairut to Qusiya - In this strip, the marly hilly land is extensive while the gravelly land is less than 1.25 km wide. South of the bend of the plateau the plain reaches 1.75 km wide. Near Qusiya sand sheets become scarce and the land is composed of pediments covered with boulders and gravel.

Qusiya To Manfalut - In this strip the gravelly land between the cultivated land and the plateau becomes wider and reaches about 4 km in width north and south of Beni Rafi. There are a few thin sand dunes extending parallel to the scarp of the limestone plateau, and the plateau increases in elevation toward the south. The surface of the plateau is rugged and hard.

Manfalut to Assuit - In this strip, 4 km south of Manfalut the gravelly plain becomes very narrow about 0.5 km in width for about 2 km in length where the pediments reach the cultivated land. The pediments are easily weathered and are constituted of marl and shale. These pediments extend in a southward direction for about 12 km where the gravelly plain again becomes wider, reaching 4 km in width. The land is nearly flat with few drainage lines.

Facing Abnub, the limestone plateau becomes very high with a steep scarp while moderate to low pediments are present near its foot. These pediments are rugged and are made up of marl beds. The surface of the plateau is very rugged and highly drained, and it is covered by cherty limestone. These land forms extend to Assiut.

Appendix 4C

SOILS INVESTIGATION OF THE ALIGNMENT OF THE NEW CAIRO-ASSUIT HIGHWAY

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Appendix 4C

SOILS INVESTIGATION OF THE ALIGNMENT OF THE NEW CAIRO-ASSUIT HIGHWAY

Introduction

The purpose of this investigation was to study soil conditions along the alignment of the new Cairo-Assuit Highway and give recommendations for roadway design based on soil conditions.

The Expressway alignment is in the western desert near the boundaries of the cultivated land of the Nile valley. It starts at the intersection of Fayoum and El-Wahat roads south of Giza and passes through high lands having elevations in excess of 120m and crosses the road from Gerza at an elevation of about 48m. The alignment then passes through the desert between the cultivated land of the Nile valley and the Fayoum depression and continues to the south at the boundaries of the cultivated land to Assuit to an intersection with the New Valley Road. The elevation of the ground surface varies from about 50m to 125m above sea level. The total length of the proposed road is about 360 km.

This analysis of soil conditions along the alignment is based on 32 shallow borings 2m deep and laboratory tests of the borings carried out at the soils laboratory of Sami Saad Company.

Site Geology and Geomorphology

Geological and geomorphological studies of the soil along the road alignment, which were interpreted from 1:25,000 vertical aerial photographs taken in 1986 by the Remote Sensing Center, Cairo, are reported in Appendix 4B, Photogeological Studies. Relevent results from this investigation are discussed below.

Site Investigation and Soil Profiles

Figures 4C-1 to 4C-5 show the location of 32 soil borings along the alignment, and the 5 sites where samples were extracted from potential quarry locations. The borings were made to a depth of 2m below ground surface, except when rock or hard soil was encountered. Borings were carried out by the contractor Sami Saad Company under the supervision of a qualified engineer from the Study. The borings were executed normally as open shafts about 1.0m in diameter.

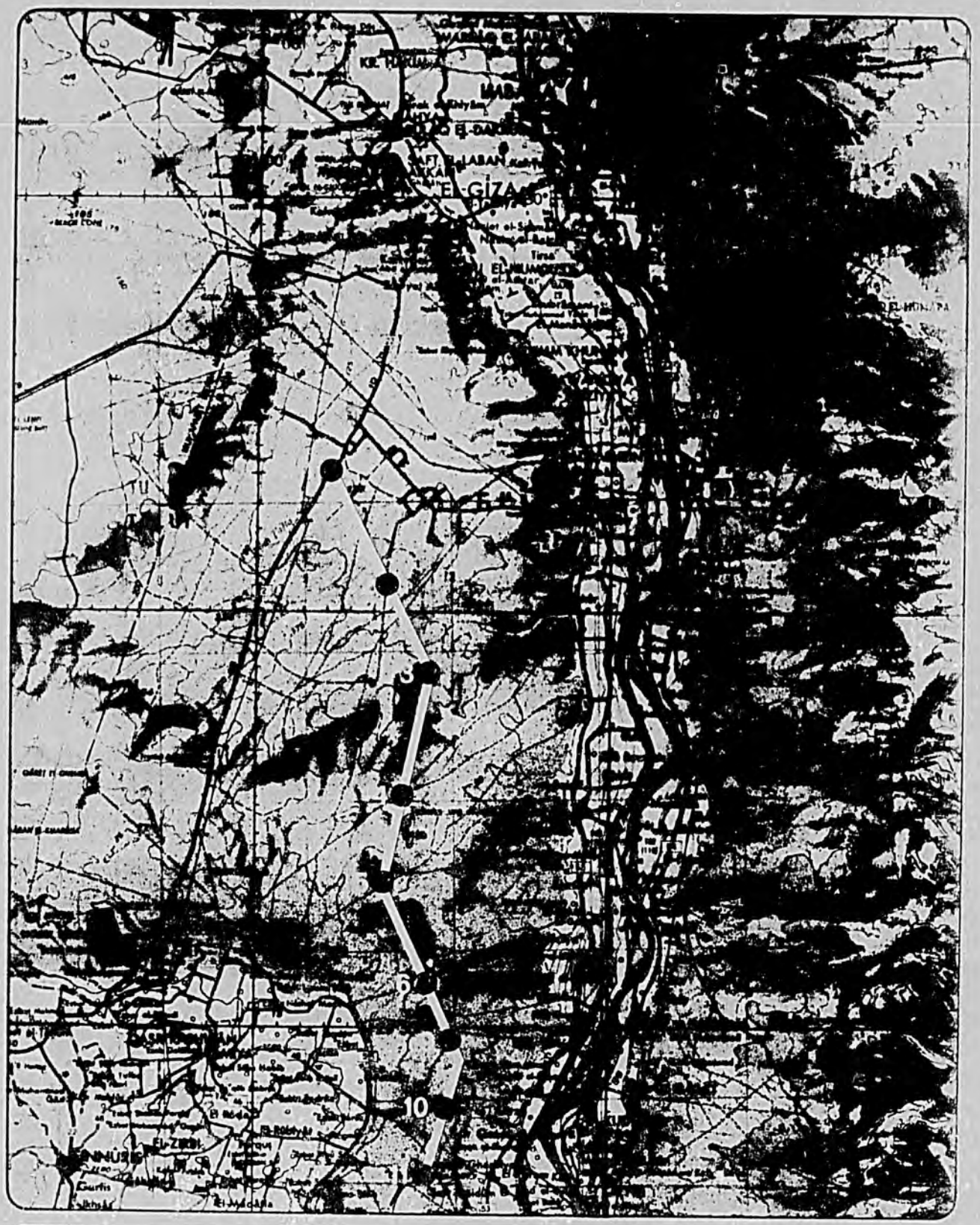
Representative samples were taken every 0.5m or as the soil changed. These samples were sent to the soil laboratory for visual inspection and classification. Representative samples were also sent for laboratory testing.

Table 4C-1 shows the depths of each boring and the type of soil at the end of each boring, and it also shows the elevation of ground surface at each boring as deduced from the topographic maps. Sketches of the borings are included in Annex 4C-2.

Table 4C-1

DEPTHS OF BOREHOLES AND TYPES OF SOIL

BOREHOLE	APPROX. DISTANCE (km)	ELEVATION (m)	DEPTH (m)	TYPE OF SOIL (End Of Boring)
1	14	120	2.0	Hard silty clay and cemented sand
3	28	125	2.0	Sand, traces of gravel and fines
4	36	72	1.6	Hard sandy silty clay,some silty sand.
5	42	50	1.05	Hard sandy silty clay, traces of sand
6	49	52	1.6	Hard silty clay (cal.)
9	54	53	1.65	Cemented sand and sand (cal.)
10	57	48	2.0	Gravel and sand
11	64	52	2.0	Sand, cemented pieces, traces of fines.
12	73	50	2.0	Fine sand and cemented pieces
14	92	70	0.25	Limestone
15	100	50	1.6	Limestone
16	106	50	2.0	Sandy silt,traces of cemented pieces
17	114	50	2.0	Pieces of cemented sand and clay
18	124	50	1.9	Sand, traces of gravel
19	132	125	1.9	Clayey sand to sandy clay
20	142	95	2.0	Sand, traces of gravel
21	161	72	2.0	Gravel, traces of sand,cal.fines
22	171	120	2.0	Sand, traces of gravel
23	182	110	2.0	Sand and cemented pieces
24	191	75	2.0	Large gravel, some sand, traces of fines
25	202	70	2.0	Sand and cal.fines, traces of gravel
26	212	75	2.0	Sand, cal.fines, gravel and cemented pieces
27	227	47	2.0	Sand, cal.fines, traces of gravel
28	238	100	2.0	Silty sand, pieces of stones
29	251	75	2.0	Fine sand
30	263	75	1.5	Large gravel and some sand, cal.fines
31	283	50	2.0	Sand, traces of cal.fines
32	305	50	2.0	Gravel and sand, traces of cal.fines
33	315	60	2.0	Fine sand
34	331	75	2.0	Sand, traces of cal.fines
35	347	90	2.0	Sand, traces of gravel and cemented pieces
36	357	95	2.0	Sand, traces of gravel



Cairo – Assuit Highway Feasibility Study

LOCATION OF BORINGS
GIZA TO GERZA

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Figure 4C-1

Cairo - Assuit Highway Feasibility Study

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LOCATION OF BORINGS
GERZA TO FASHN

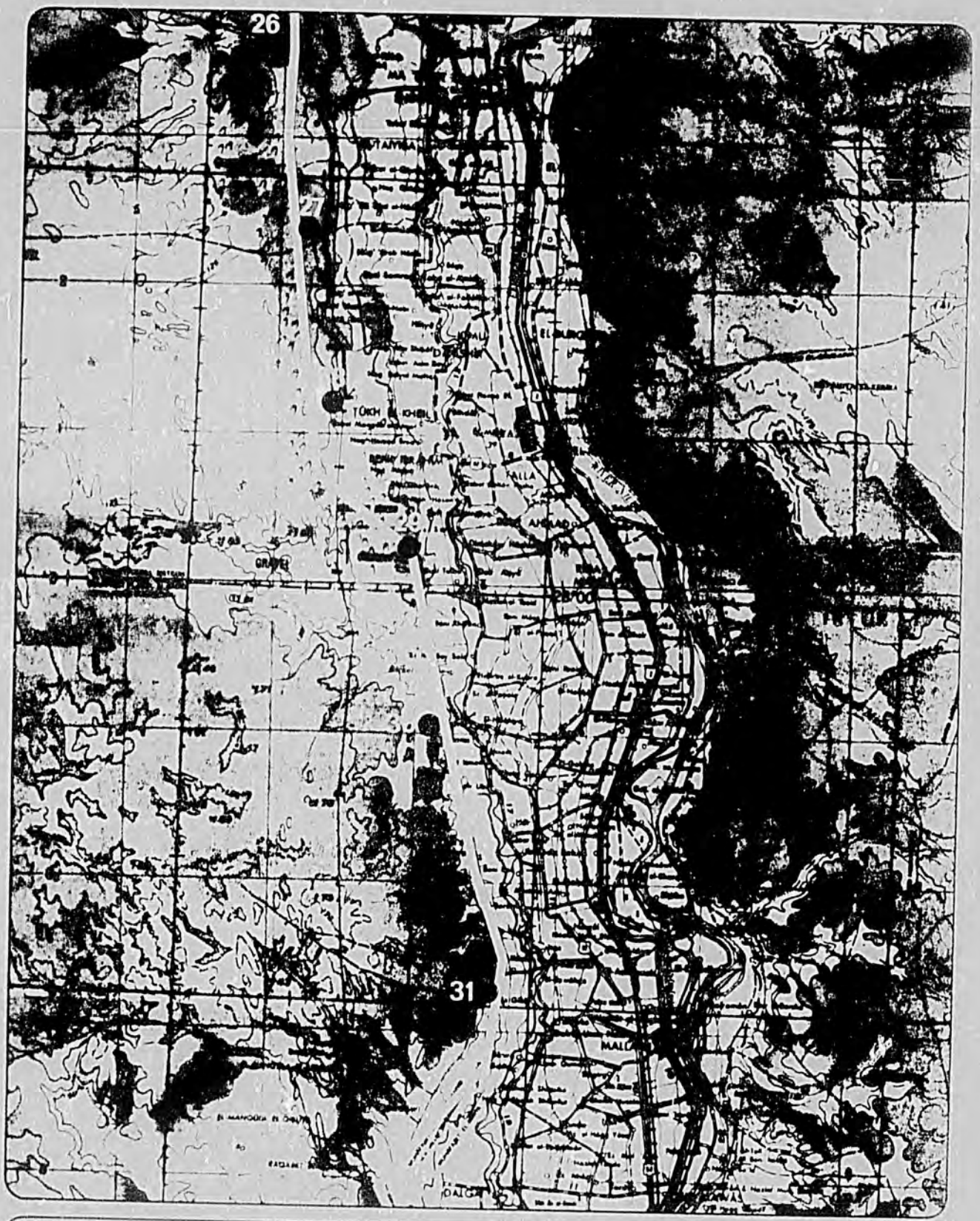
Figure 4C - 2

Cairo – Assuit Highway Feasibility Study

Wilbur Smith & Associates
Egyptian Consultants Consortium

LOCATION OF BORINGS
FASHN TO SAMALUT

Figure 4C-3



Cairo – Assuit Highway Feasibility Study

Wilbur Smith & Associates
Egyptian Consultants Consortium

LOCATION OF BORINGS
SAMALUT TO DEIR MAWAS

Figure 4C - 4

Cairo – Assuit Highway Feasibility Study

Wilbur Smith & Associates
Egyptian Consultants Consortium

LOCATION OF BORINGS
DEIR MAWAS TO ASSUIT

Figure 4C - 5

Ground Water

No ground water was encountered in any of the borings carried out. However, it was noted in the Photogeological Studies Report, Appendix 4B, that in the strip from Gerza to Ishmunt north of Bahr Youssef, one of the shallow drainage lines was filled with water. Moreover the land bordering the cultivated area was covered with sand, while some patches of land were covered with water.

Soil Tests

The following laboratory tests were carried out on representative samples of soils. Tests were performed according to specifications. These tests were:

a) Sieve analysis test.
b) Atterberg limits.
c) Modified proctor test.
d) California Bearing Ratio (CBR) Test.

A summary of test results carried out at the Road Laboratory (Sami Saad Company) is given in Annex 4C-1.

Soil Conditions

The soil layers are described in details in the borehole logs. The soil layers are discussed in relation to the geological and geomorphological studies in this section. The soil conditions along the new road alignment are divided into zones from north to south, named after the towns bounding these zones. Soil conditions of each zone are discussed as follows.

From Giza to Gerza, (Boreholes 1-10) - The main elevation at the north end of this strip is about 125m. Steep slopes occur near Aiyat where the elevation becomes about 72m. From Aiyat to Matania it drops to about 50m and then it continues at this elevation to Gerza.

Most borings in this zone end in hard silty clay to sandy silty clay (boreholes 1, 4, 5 and 6) or cemented sand (borehole 9), except boreholes 3 and 10 which terminate in sand and gravel.

These results agree with the photogeological studies which expected this strip to be covered with thinly bedded, easily weathered, sandstone and sandy limestone with shale intercalation. The beds dip towards the north and appears as stone steps towards the south. The lower parts between the steps are filled with sand and gravel.

From Gerza to Ishmunt, (Boreholes. 11-14) - This strip lies in the northern part of the land between the Fayoum Depression and the Nile Valley. The elevation varies from about 50m to 70m (at Ishmunt).

Borings end in this strip in sand and cemented pieces (boreholes 11 and 12), except borehole 14 which terminates in limestone. This also agrees with the photogeological studies which shows that the surface soil bounding the hill in this strip is composed of sand and clay. Rock was encountered in the location of borehole 14.

From Ishmunt to Beni Suef, (Boreholes 15-17) - This strip represents the southern part of the land between the Fayoum Depression and the Nile Valley. The elevation is about 50m. It is covered with the same geological succession encountered in the northern part. There is also Gebel El-Saloun facing Gebel El-Lahoun in the northern strip, which are geologically similar.

In this strip, borehole 15 ended with limestone, whereas borehole 16 ended in sandy silt and borehole 17 ended in cemented sand and clay.

These results agree with the photogeological studies, which reveal that the surface soil in this strip starts with rocky land near borehole 15 and then is followed by hilly land of clay with gypsum, gravel and sand mixed with limestone at borehole 17. The hilly land is rugged and dissected by many drainage wadis. This explains how boring 16 terminates in sandy silt.

From Beni Suef to Sumusta, (Boreholes 18-19) - The elevation in this strip increases from 50m to 125m. Borehole 18 ends in sand and gravel, whereas borehole 19 ends in clayey sand to sand clay.

These results agree with the photogeological studies which show that the high lands (mesetas) are constituted of limestone, clay and sand with marl beds (borehole 19). Between the walls of the Wadi there is a basin filled with sand and gravel.

From Sumusta to Matai, (Boreholes 20-25) - The elevation in this strip varies from about 70m to 120m. Boreholes in this strip either end in sand and traces of gravel (boreholes 20, 22, 23 and 25) or gravel and traces of sand (boreholes 21 and 24).

These results confirm the photogeological studies which indicate that the flat land from Sumusta to Edwa is covered with gravel, silt and sand (borehole 20) and from Edwa to Maghagha the flat land to the west is highly drained and covered with thick gravel and sand (Borehole 21). From Maghagha to Matai the flat parts are covered with thick gravel and sand (borehole 24), and the undulated land is covered with clay, sand and gravel (boreholes 22, 23 and 25)

From Matai to Minia, (Boreholes 26-28) - The elevation in this strip varies from about 47m to 100m. Boreholes 26 and 27 ends in sand, gravel and cemented pieces, whereas borehole 28 end in silty sand.

These results follows the interpretations of the photogeological studies, which state that the desert land in this zone is mainly covered with gravel and sand (borehole 28). Sand dunes extend to the south and west of this strip.

From Minia to Dairut, (Boreholes 29-32) - The elevation in this strip varies from about 50m to 75m. Boreholes 30 and 32 ends in gravel, whereas borehole 31 end in sand. Borehole 29 lies in sand dunes.

The photogeological studies show that the sand dunes (borehole 29) interfinger with the silty flood plain near Minia. From Minia to Abu Qurqas, the sand sand deposits cover the gravel plain (borehole 30), while from Abu Qurqas to Mallawi the strip is completely covered with sand sheets and sand dunes (borehole 31). Further to the south up to Qusiya, there is a gravelly plain with sand streams (borehole 32).

From Dairut to Assuit, (Boreholes 33-36) - The elevation in this strip varies from about 60m to 90m. Borehole 33 lies in a sand dune and borehole 34 ends in sand. Boreholes 35 and 36 end in sand and traces of gravel.

The photogeological studies show that south to Qusiya up to Manfalut there are some thin sand dunes (boreholes 33 and 34). Further to the south, the gravelly plain with sand becomes relatively narrow (boreholes 35 and 36).

Recommendations for Road Design

The recommendations given below for the various zones along the route of the new highway of the new highway are based on the soil classifications and laboratory analyses described above.

From Giza to Gerza - The soil is mainly composed of hard silty clay and some silty sand (locations of boreholes 1, 4, 5, 6 and 9) and the classifications ranges from A-2-7 to A-7-6. This means that this area can be generally rated as fair to poor as subgrade. Laboratory test results values for CBR are from 1-8 to 13 depending on the soil subgroup. At locations of boreholes 3 and 10, the soil is composed of medium to coarse sand and some gravel and it is classified as A-1-b. This implies that soil in these locations are rated as excellent to good subgrade. Values for CBR from laboratory test results for these areas is 40.

From Gerza to Ishmunt - The soil is mainly composed of sand with different percentages of cemented pieces (locations of boreholes 11 and 12) and crushed limestone (location of borehole 14). The soils are classified from A-1-b to A-3, which means that they are excellent to good for subgrade. Values of CBR from test results vary from 13 to 40 depending on the soil subgroup. It should be noted that limestone is very near to the ground surface (0.25m) at the location of borehole 14.

From Ishmunt to Beni Suef - The soil varies from silty clay and sand to fine sand and silt, with traces of cemented pieces in locations of boreholes 16 and 17. The soil is classified as A-4. This means that it is fair to poor as subgrade with values for CBR from test results of about 5-8. Except at the location of borehole 15, the soil is composed of cemented sand and gravel and some sand. The soil is classified as A-1-b and rated as good to excellent for subgrade, with value for CBR from test

results about 40. At the location of borehole 15, limestone is also close to ground surface (1.60m).

From Beni Suef to Sumusta - The soil is mainly composed of sand, traces of gravel to cemented sand and gravel (locations of boreholes 18 and 19), and the soil is classified as A-3. This shows that it is excellent to good as subgrade, with values for CBR from test results of about 13.

From Sumusta to Assuit - The soil is mainly composed of sand with different percentages of gravel, cut-fines and cemented pieces (locations of boreholes 20 to 36). The soils are classified as A-1-a, A-1-b and A-3 which implies that they are excellent to good as subgrade, and values for CBR from test results vary from 13 to 84 depending on the soil subgroup.

Layers of silty clay and sandy silty clay in this investigation are expected to be swelling soils. Their degree of swelling depends on many factors including initial dry unit weight, clay content and type of clay mineral. Precautions have to be taken in such areas against the damaging effect that soil swelling has on highways.

Layers of cemented sand and silt are expected to be collapsible soils. Their collapsibility will depend on the initial dry unit weight percentage of fines, type of cementing material and other factors. Special measures have to be taken to prevent the subsidence of these soils.

Tests on Quarry Samples

Tests on the potential quarry samples showed suitable material for constructing pavement sub-bases.

SOIL TEST RESULTS

Sample No		1	3	4	5	6	9	10	11	12	14	15	16	17	18	19	20
Layer No		2	2	3	2	2	6	3	1	2	2	2	4	2	3	2	
Sieve Size Designation		% Passed															
inch	M.M																
3	75.00	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
2½	63.000	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
2	50.000	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
1½	37.500	100	97	100	100	100	100	100	100	100	100	100	100	100	100	100	100
1	25.000	100	95	100	100	100	100	91	100	100	99	99	100	100	100	100	100
¾	19.000	100	90	100	100	100	100	89	98	100	96	98	100	100	100	100	100
½	12.500	100	87	100	100	100	100	84	94	100	92	93	100	100	100	100	100
⅜	9.500	100	83	100	100	100	100	82	92	100	86	90	100	100	100	100	100
NO 4	4.750	100	75	100	100	100	100	71	87	100	71	80	100	100	100	100	100
NO 10	2.000	94	66	99	100	97	95	66	80	79	61	68	99	100	98	96	76
NO 40	0.425	77	28	98	99	96	72	45	50	60	38	33	90	92	56	58	26
NO 200	0.075	32	4	97	98	91	49.4	1.9	7	10	8.2	2.4	69	59	0.6	2.2	0
Liquid Limit		43	N.P	66	38	42	28	N.P	N.P	N.P	N.P	N.P	25	26	N.P	N.P	N.P
Plastic Limit		17	N.P	25	21	25	20	N.P	N.P	N.P	N.P	N.P	16	19	N.P	N.P	N.p
Plasticity Index		16	N.P	41	17	17	8	N.P	N.p	N.P	N.P	N.P	9	7	N.P	N.p	N.p
Soil Classification		(A-2-7)	(A-1-6)	(A-7-6)	(A-6)	(A-7-6)	(A-4)	(A-1-b)	(A-1-b)	(A-3)	(A-1-b)	(A-1-b)	A-4	(A-4)	(A-3)	(A-3)	(A-3)
Proctor	M.D.D	1.89		1.66	1.68	1.7	1.76	2.11	1.89	1.67	1.90			1.73		1.95	
	O.M.C	14		23	18	22	18	8	13	14	13			18		11	
C.B.R	% C.B.R	13		1.8	6.3		8	40		73				5		13	
	% Swell	1.3		3	2.6		0.7	0		0				1.3		0	

ANNEX 4C-1 SUMMARY OF SOILS TESTS

Soil TEST RESULTS

Test			21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
Sample No			21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
Layer No			1	2	3	2	2	2	2	1	1	1	2	1	1	2	2	1
Sieve Analysis	Sieve Size Designation		% Passed															
	Inch	m.m.																
	3	75.00	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	2½	63.000	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	2	50.000	100	100	100	75	100	100	100	100	100	100	100	100	100	100	100	94
	1½	37.500	100	100	100	64	100	100	98	100	100	100	100	100	100	100	100	89
	1	25.000	99	100	100	50	95	[illegible]	88	99	100	97	100	100	100	100	96	81
	¾	19.000	97	100	100	42	94	[illegible]	85	94	100	95	100	100	100	100	95	78
	½	12.500	93	100	100	32	90	[illegible]	77	80	100	93	100	100	100	100	94	76
	⅜	9.500	90	100	100	28	87	96	69	69	100	90	100	100	100	100	93	75
	NO 4	4.750	77	100	100	22	74	93	49	41	100	85	100	100	100	100	91	71
	NO 10	2.000	56	91	90	17	64	89	40	24	100	80	74	92	93	97	88	64
	NO 40	0.425	24	61	56	7	38	63	33	17	95	58	57	69	75	60	70	28
	NO 200	0.075	1	1	0	2	1	11.2	11.0	1	0	1	10	0	3	2	2	1
Liquid Limit			N.P	N.P	N.P	N.P	N.P	N.P	N.P	28	N.P	N.p	N.P	N.P	N.P	N.p	N.P	N.P
Plastic Limit			N.P	N.P	N.P	N.P	N.P	N.P	N.P	22	N.P	N.P	N.P	N.p	N.P	N.p	N.P	N.P
Plasticity Index			N.p	N.P	N.P	N.P	N.P	N.P	N.P	6	N.P	N.P	N.P	N.P	N.P	N.P	N.P	N.P
Soil Classification			(A-1-b)	(A-3)	(A-3)	(A-1-a)	(A-1b)	(A-2-4)	(A-1-b)	(A-1-a)	(A-3)	(A-3)	(A-3)	(A-3)	(A-3)	(A-3)	(A-3)	(A-1b)
Proctor	M.D.D							1.95		2.25								
	O.M.C							12		7								
C.B.R	% C.B.R							26		84								
	% Swell							0.22		0								

ANNEX 4C-1 SUMMARY OF SOILS TESTS

Quarries Test Results

Sample			1	2	3	4	6
Description			P.R.G	P.R.G	L.S	G	G
TEST	SIEVE ANALYSIS	Sieve Size Design	% Passed				
		Inch / MM					
		3 / 75	100	91	100	100	100
		2½ / 63	100	91	100	97	100
		2 / 50	96	82	100	88	85
		1½ / 37	84	72	100	82	74
		1 / 25	61	66	86	74	50
		¾ / 19	48	63	72	67	33
		½ / 12	40	60	41	60	17
		⅜ / 9.5	35	59	23	54	8
		NO. 4 / 4.7	26	57	1	47	2
		NO. 10 / 2.0	18	52	0	29	0
		No. 40 / 0.425	7	25	0	27	0
		NO. 200 / 0.075	0.1	1.5	0	1.9	0
	Sp Gr. For Saturated dry Surface				2.62	2.28	2.63
	% Absorption				1	7	0.9
	% Degradation After 24 Hrs In Water				0.1	2.4	0.1
	% Abrasion (100rev.)				5	10.5	5
	% Abrasion (500 rev.)				20	52	19
	Liquid Limit		N.P	N.P			
	Plastic Limit		N.P	N.P			
	Plasticity Index		N.P	N.p			
	Soil Classification		(A-1-a	(A-1-b)			
	Proctor Method	C.M.S	4.0	5.0			
		M.D.D	2.29	2.09			
	C.B.R	% C.B.R	64	36			
		% Swell	0	0			

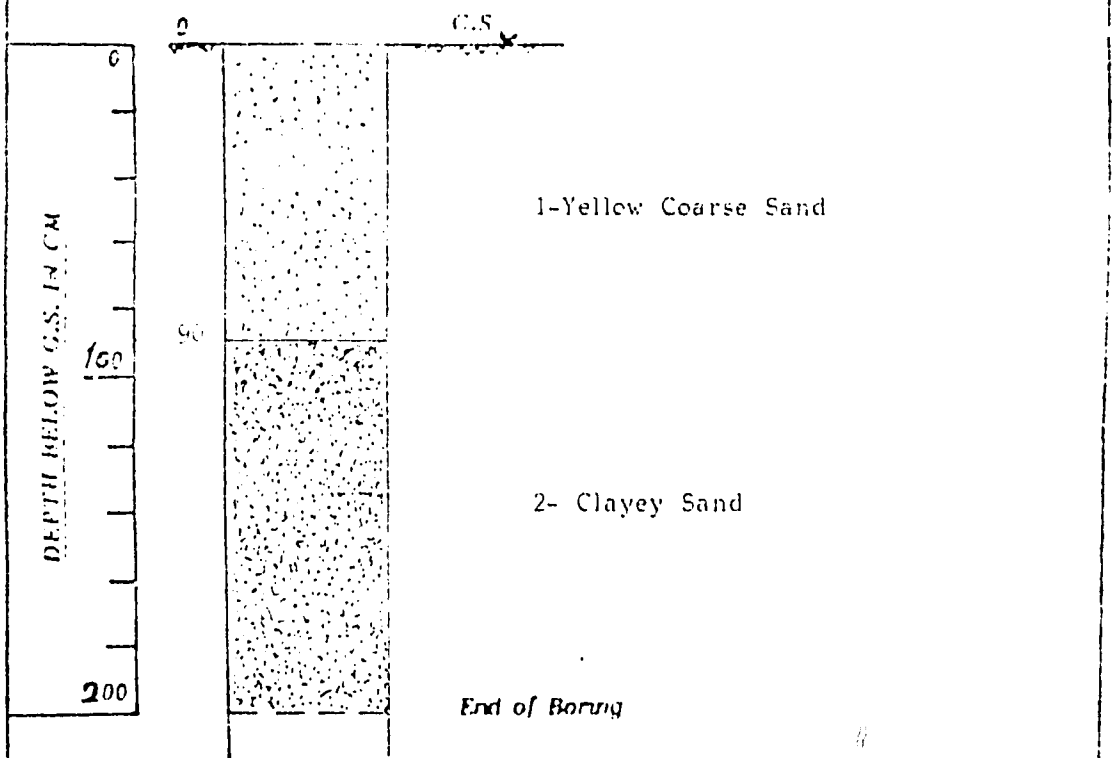
9 Mansouria St. Ahram, Giza, A.R.E.
Tel.: 850636 - 850637 - 850638

MAIN LABORATORY

Lab Ref. : ML/ /13/198
Applicant Ref.: Letter 29/1/86
Test No. :
Date : 8/2/86

Applicant : U.S.A
Samples : 1.3C
New Road

BORING SECTION



M.L. Eng.:

M.L. Manager: M.F

74

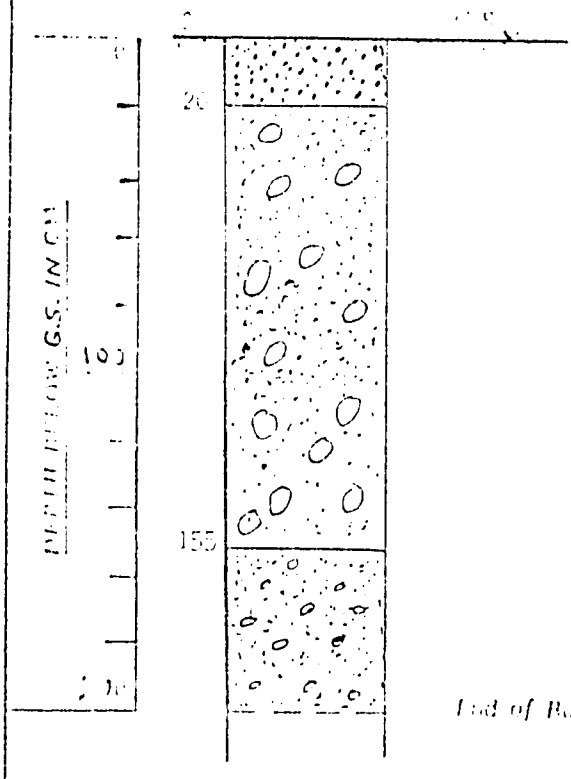
9 Kamaleria St. Abram, Giza, A.R.E.
Tel.: 850636 - 850637 - 850638

MAIN LABORATORY

Lab Ref. : ML/ /130 1986
Applicant Ref.: Letter 29/1/1986
Test No. :
Date : 19/2/86

Applicant : W.S.A
Samples : 3/36
New Road

BORING SECTION



M.L. Eng.:

M.L. Manager:

[illegible]

Lab Ref. : [illegible]

Applicant Ref.: Letter 29-1-1986

Test No. : [illegible]

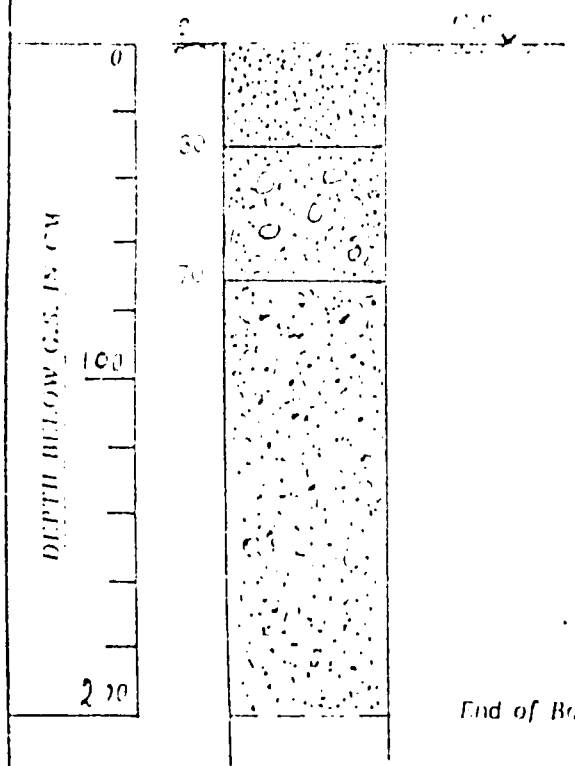
Date : 19.2.86

Applicant : W.S.A

Samples : 4/36

-New Road

BORING SECTION



1- Fine Sand

2- Cemented Sand With Calcareous Cemented Material - Need a Powerful Raper of Buldozer for Excavation

3- Clay (A-7-6)

End of Boring

M.I. Eng.:

M.I. Manager:

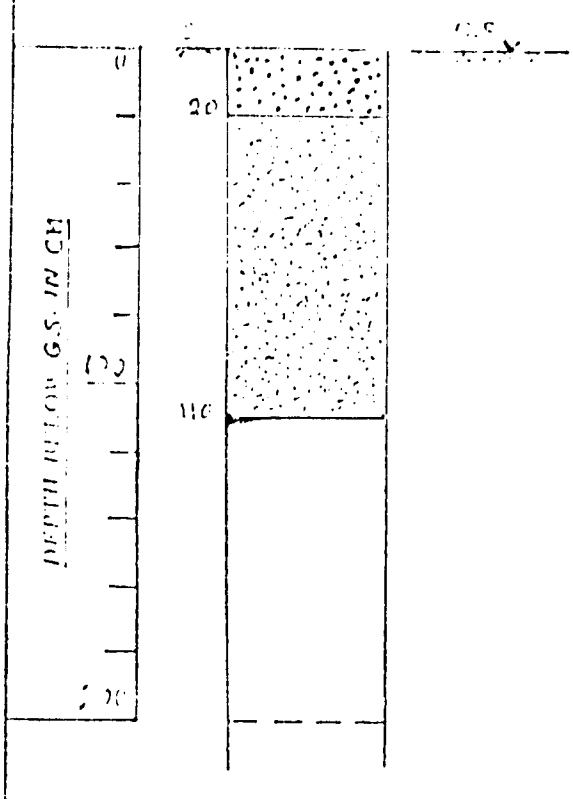
[illegible] & Co.
9 Mansouria St. Mirar, Giza, A.R.E.
Tel.: 850636 - 850637 - 850638

MAIN LABORATORY

Lab Ref. : ML/ /130/1986
Applicant Ref.: Letter 29/1/1986
Test No. : _____
Date : 19/2/86

Applicant : W.S.A
Samples : 5/36
New Road

BORING SECTION



1- Fine Yellow Sand & Silt

2- Clay (A-6)

End Of Boring

M.L. Eng.:

M.L. Manager: M.F.

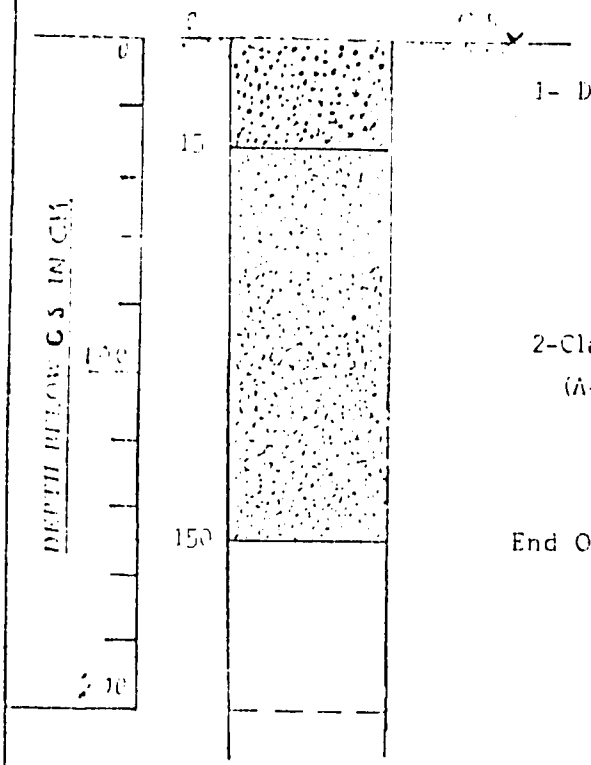
[illegible] & Co.
9 Mansouria St. Ahram, Giza, A.R.E.
Tel.: 850636 - 850637 - 850638

MAIN LABORATORY

Lab Ref. : ML/ /130/1986
Applicant Ref.: Letter 29/1/1986
Test No. :
Date : 22/2/86

Applicant : W.S.A
Samples : 6.36
New Road

BORING SECTION



1- Dark Silty Sand Soil

2-Clay
(A-7-6)

End Of Boring

M.L. Eng.:

M.L. Manager:

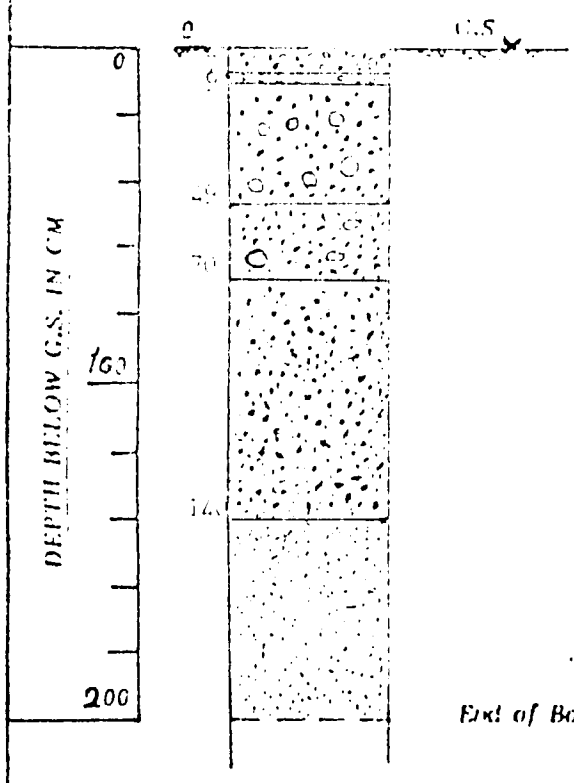
9 Kasr el Ainy St., Abdeen, Giza, A.R.E.
Tel.: 850630 - 850637 - 850638

MAIN LABORATORY

Lab Ref. : ML/ /83/1986
Applicant Ref.: Letter 29.1.1986
Test No. :
Date :

Applicant : W.S.A
Samples : 9.36
New Road

BORING SECTION



M.L. Eng.:

M.L. Manager:

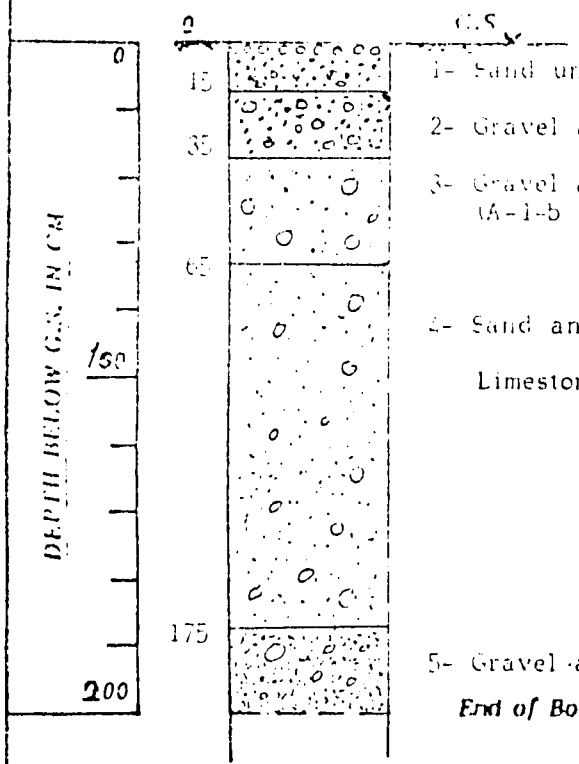
9 Mansouria St. Mhram, Giza, A.R.E.
Tel.: 850636 - 850637 - 850638

MAIN LABORATORY

Lab Ref. : ML/ /13/1986
Applicant Ref.: Letter 29/1/1986
Test No. :
Date : 30/3/86

Applicant : W.S.A
Samples : 13-30
Nile Road

BORING SECTION



M.L. Eng.:

M.L. Manager:

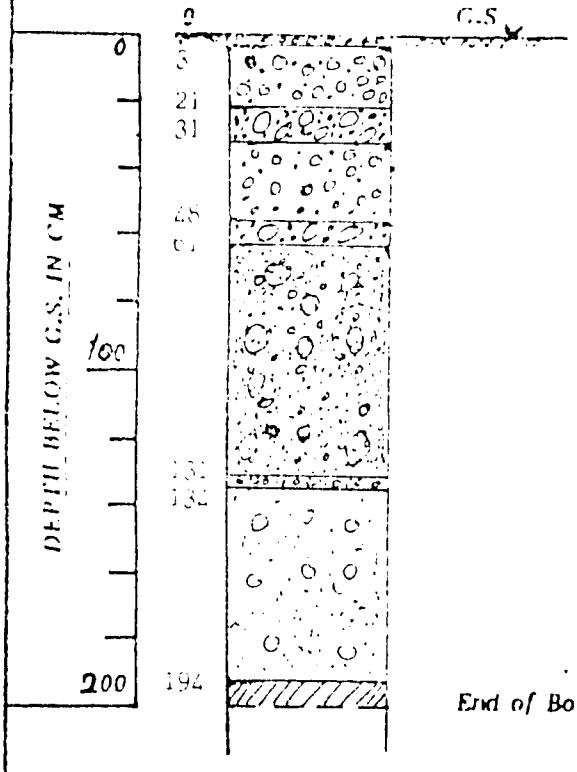
9 Mansouria St. Ahram, Giza, A.R.E.
Tel.: 850636 - 850637 - 850638

MAIN LABORATORY

Lab Ref. : ML/ /13/198
Applicant Ref.: Letter 29/4/1985
Test No. :
Date : 3-3-86

Applicant : W.S.A
Samples : 1-20
Bor Head

BORING SECTION



1-Thin Layer of Gravel and Sand
2-Gravel and Reddish Sand (A-1-b)
3-Gravel and yellow Sand (A-1-b)
4-Gravel and Reddish Sand (A-1-a)
5-Agglomerated Gravel and Reddish sand(A-1-a)
6-Gravel and reddish sand(A-1-b)
7-Gravel And Sand (A-1-a)
8-Sand and Gravel
End of Boring 9-Agglomerated Gravel and Sand

M.L. Eng.:

M.L. Manager:

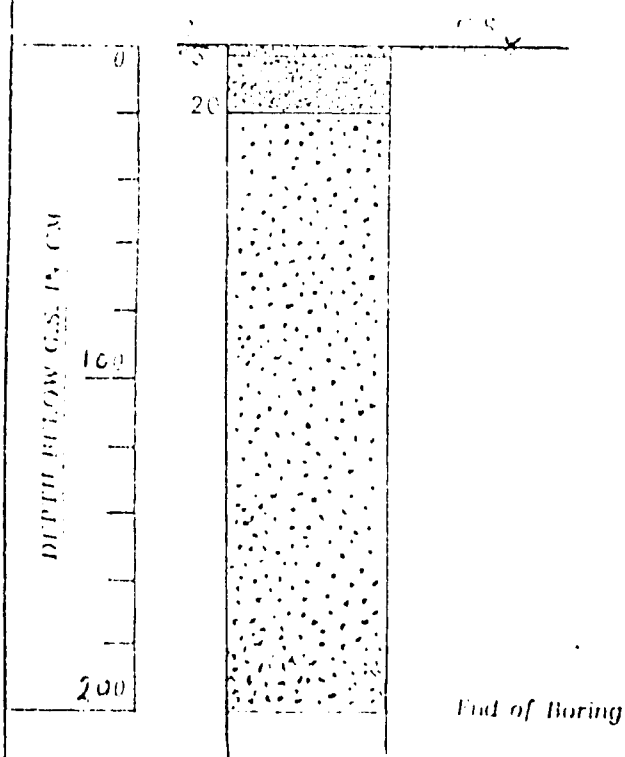
[illegible]
9 Mansouria St., Mohandessin, Giza, A.R.E.
Tel.: 850630 - 850637 - 850638

PAVEMENT

Lab Ref. : MI/ /130 for 6
Applicant Ref.: Letter 29/1/1986
Test No. :
Date : 5/4/86

Applicant : W.S.A
Samples : 12/36
New Road

BORING SECTION



1- Loose Layer Of Sand
2- Agglomerated Sandy Silty Soil (A-3)
3- Agglomerated Sand With Silt most Of it Can Be Easilty disaggregated By Hand .

End of Boring

M.I. Eng.: E.S

M.I. Manager: K.E.S

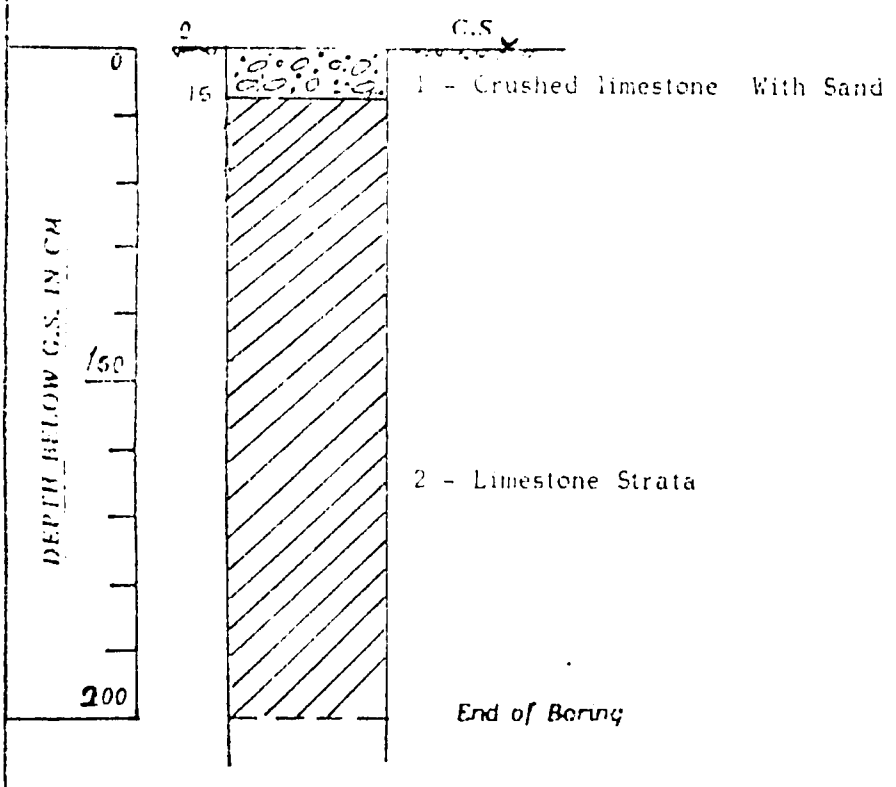
9 Ramsis St. Abraa, Giza, A.R.E.
Tel.: 850636 - 850637 - 850638

MAIN LABORATORY

Lab Ref. : NL/ /30/198
Applicant Ref.: Letter 284/1980
Test No. :
Date : 7-4-81

Applicant : W.C.A
Samples : 14/30
New Road

BORING SECTION



M.L. Eng.:

M.L. Manager:

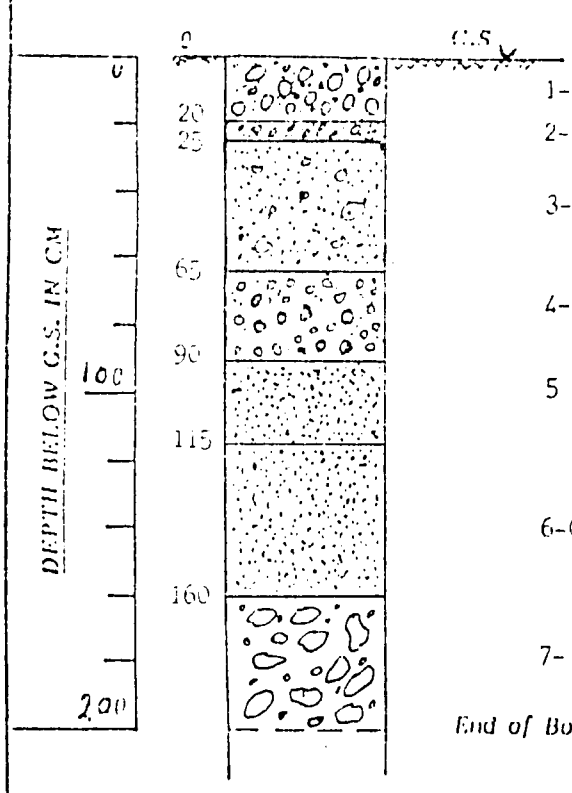
Saint Gobain & Co.
9 Mansouria St. Ahram, Giza, A.R.E.
Tel.: 850636 - 850637 - 850638

MAIN LABORATORY

Lab Ref. : ML/ /130/1986
Applicant Ref.: Letter 29/1/1986
Test No. :
Date : 7/4/86

Applicant : W.S.A
Samples : 15/36 New Road

BORING SECTION



1- Gravel and Grey Sand
2- Cemented Lime Sand And Gravel (A-1-b)
3- Yellow Silty Sand And Gravel
4- Cemented Gavel And Sand
5 -Cemented Coarse Sand
6-Cemented Med. Grey Sand
7- Broken Limestone

End of Boring

M.L. Eng.: E.S

M.L. Manager: K.E.C

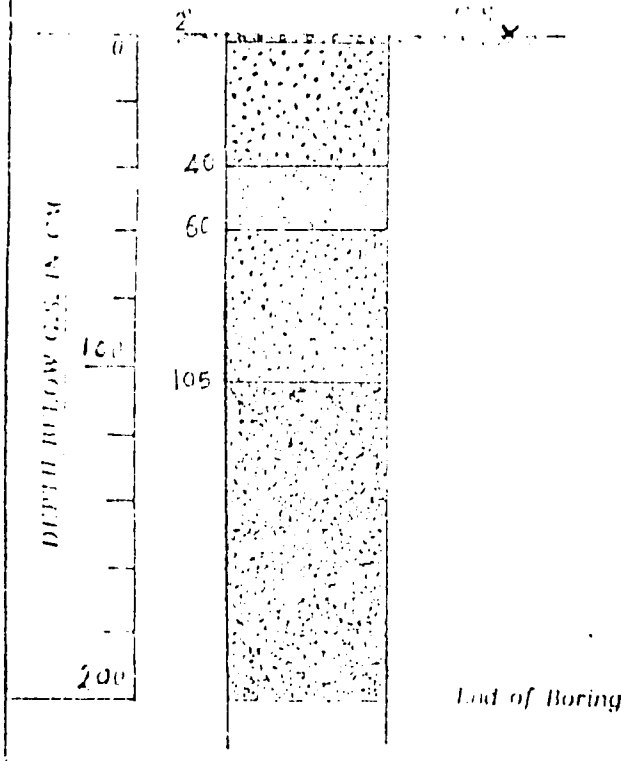
[illegible]
9 Mahmoudia St. Mohandessin, Giza, A.R.E.
Tel.: 850616 - 850617 - 850638

MAIN LABORATORY

Lab Ref. : ML/ /130 [illegible]
Applicant Ref.: Letter 29/1/1986
Test No. :
Date : 13/4/86

Applicant : W.S.A
Samples : 16/30
New Road

BORING SECTION



1- Gravel and Sand

2- Fine Sand Grey Colour With Traces Of Lime

3- Cemented Coarse Sand

4-Black Silt (A- 4)

5 - Fine Dark Silty sand

M.L. Eng.:

M.L. Manager:

[illegible] & Co.
9 [illegible] St. [illegible], Giza, A.R.E.
Tel.: [illegible]

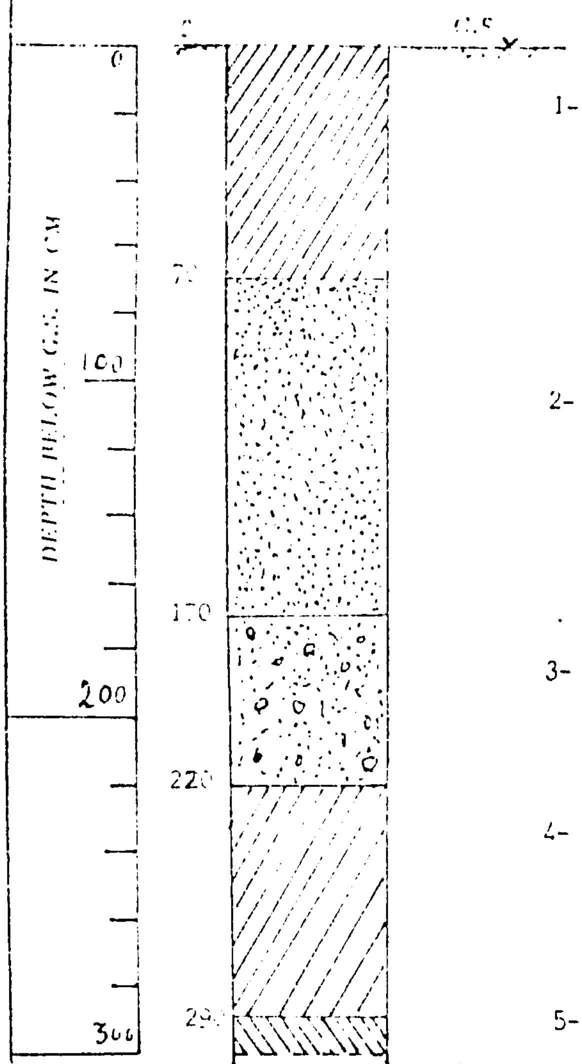
[illegible]

Lab Ref. : M[illegible] /130 1986
Applicant Ref.: Letter 29 [illegible]
Test No. :
Date : 6/4/86

Applicant : W.S.A

Samples : 17/36
New Road.

BORING SECTION



1- Cemented Fine Silty Sand Easily Broken By Hand

2- Silt Soil (A-4)

3- Fine Lime Cemented Sand

4- Cemented Fine Silty Sand Easily Broken By Hand

5- Cemented Lime Silty Sand Difficult To be Broken By Hand

M.L. Eng.:

M.L. Manager:

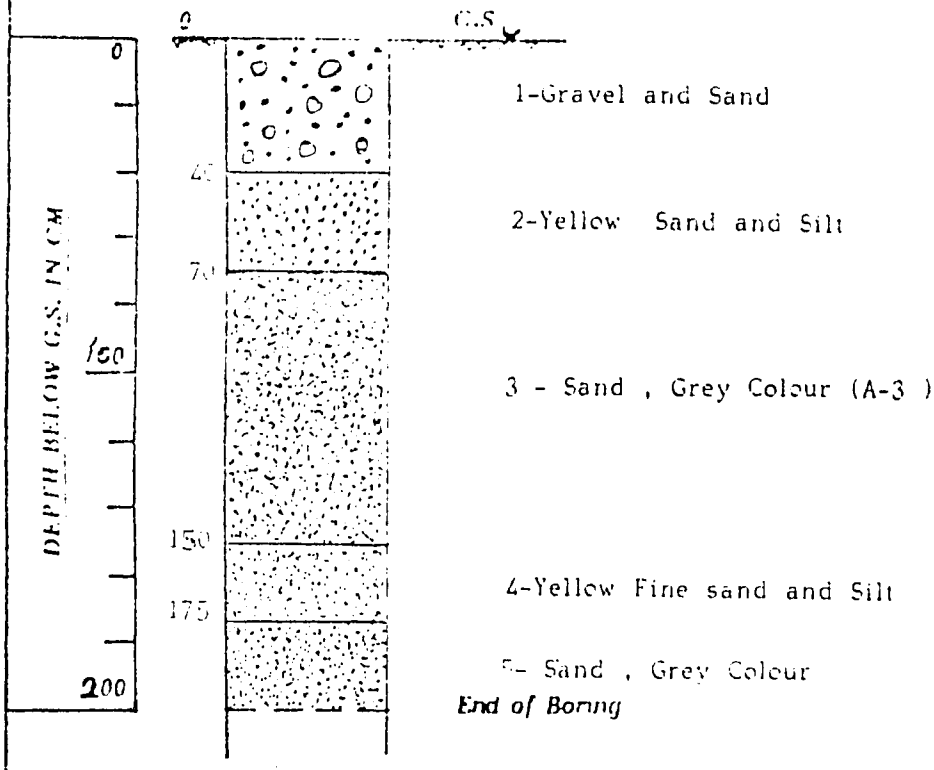
9 Kamouria St. Ahram, Giza, A.R.E.
Tel.: 850636 - 850637 - 850638

MAIN LABORATORY

Lab Ref. : ML/ /30/1986
Applicant Ref.: Letter 29/1/1986
Test No. :
Date : 7/4/86

Applicant : U.S.A
Samples : 15 S
New Head

BORING SECTION



M.L. Eng.:

M.L. Manager:

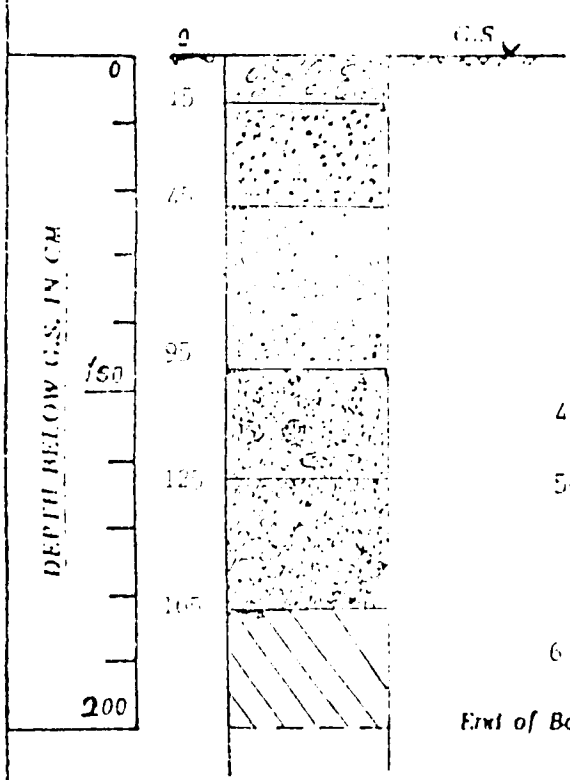
9 Mahgoub St., Ahram, Giza, A.R.E.
Tel.: 850636 - 850637 - 850638

MAIN LABORATORY

Lab Ref. : ML/ /[illegible]/198.
Applicant Ref.: letter 29 I 1986
Test No. :
Date : 7 2 87

Applicant : W.S.A
Samples : 19 36
New Road

BORING SECTION



1- Layer Of Sand And Gravel

2- Fine Sand (A-3)

3- Yellow Fine Silty Sand

4- Fine Cemented Sand (A-3)

5- Cemented Sand with Calcarious Cementing material need a powerf. Naper of Buldefer to Be Excavated

6 - As Above But Less Cemented

End of Boring

M.L. Eng.:

M.L. Manager:

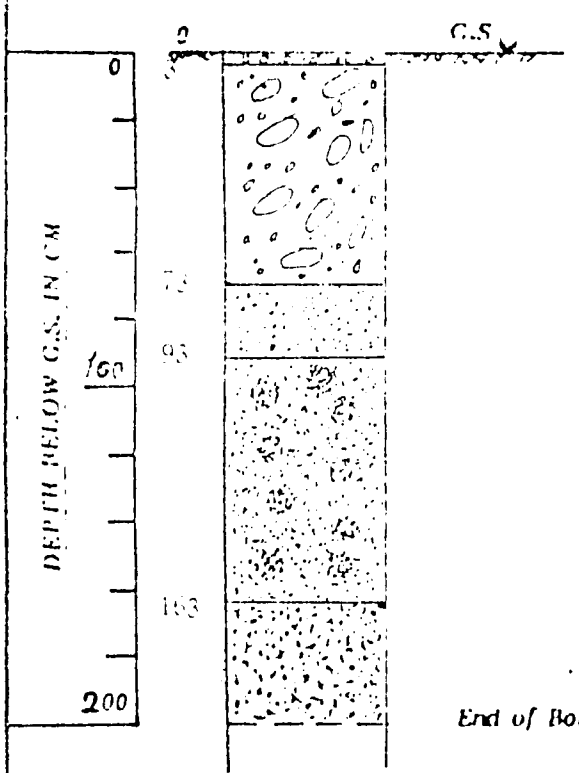
9 Mansouria St., Giza, A.R.E.
Tel.: 850636 - 850637 - 850638

HAIN LABORATORY

Lab Ref. : NL/ /30/198
Applicant Ref.: Letter 29/1/1986
Test No. :
Date :

Applicant : W.S.A
Samples : 20 36
New Road

BORING SECTION



1-Thin Layer Of Fine Sand And Gravel

2- Weathered Strata Of Limestone

3- Yellow Med. Silty Sand

4- Brownish Coarse Aggregated Sand.

5- Fine Sand (A-3)

End of Boring

M.L. Eng.:

M.L. Manager:

[illegible] & Co.

[illegible] St. [illegible], Giza, A.R.E.

Tel.: [illegible]

Lab. Ref. : M.L/ /130 136 6

Applicant Ref.: Letter 29/3/1986

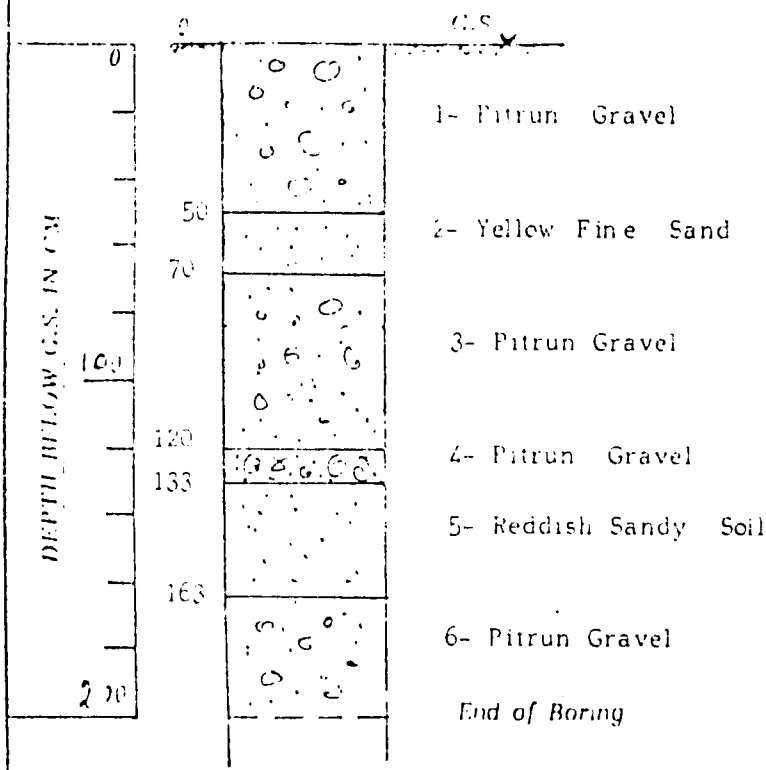
Test No. : [illegible]

Date : 20/4/86

Applicant : W.S.A

Samples : 21/36
New Road

BORING SECTION



M.I. Eng.: E.S

M.I. Manager: K.F.S

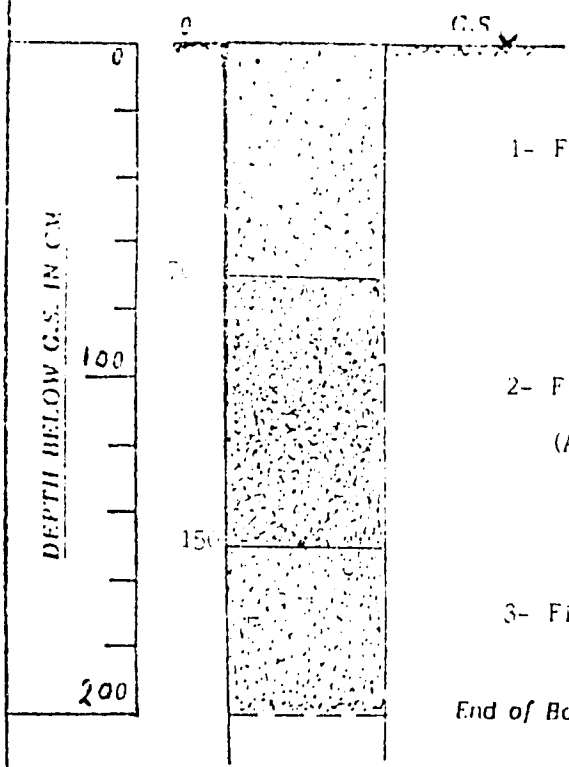
Soil Mech & Co.
9 Mansouria St. Ahram, Giza, A.R.E.
Tel.: 850636 - 850637 - 850638

MAIN LABORATORY

Lab Ref. : ML/ /130/1986
Applicant Ref.: Letter 29/1/1986
Test No. :
Date : 8/2/86

Applicant : W.S.A
Samples : 22/35
New Road

BORING SECTION



M.L. Eng.:

M.L. Manager: M.E.S.

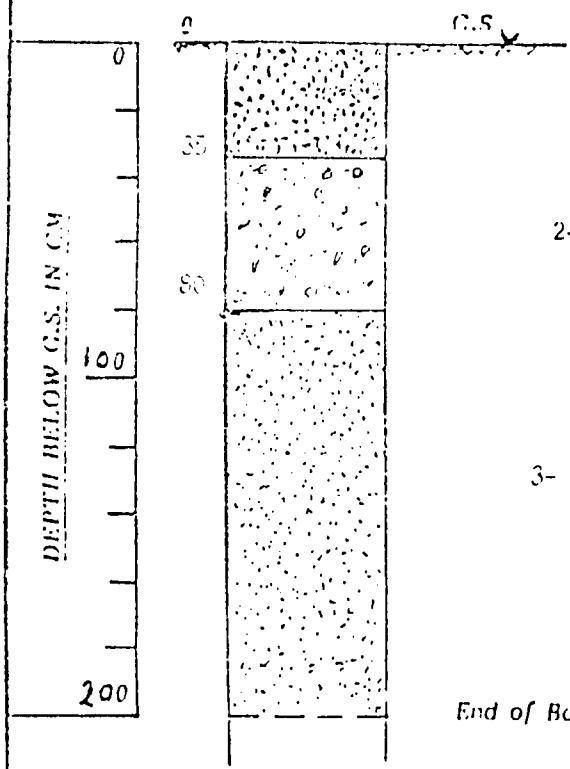
Soil Mech & Co.
9 Mansouria St. Ahram, Giza, A.R.E.
Tel.: 850636 - 850637 - 850638

MAIN LABORATORY

Lab Ref. : ML/ /130/1986
Applicant Ref.: Letter 29/1/1986
Test No. : _____
Date : 8/2/86

Applicant : W.S.A
Samples : 23/30 New Road

BORING SECTION



M.L. Eng.: _____

M.L. Manager: _____

[illegible]
9 Mansouria St. Ahram, Giza, A.R.E.
Tel.: 850636 - 850637 - 850638

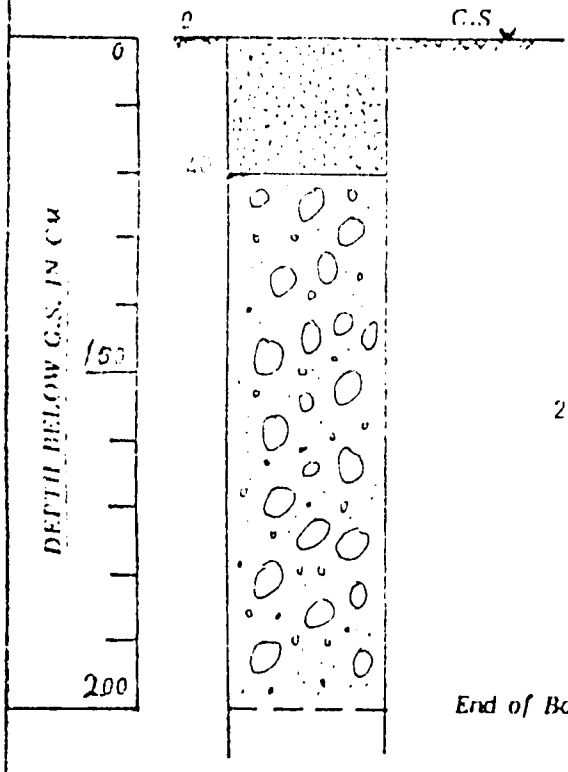
MAIN LABORATORY

Lab Ref. : ML/ /139/1986
Applicant Ref.: Letter 29 1 86
Test No. :
Date : 5 2 86

Applicant : W.S.A

Samples : 24/36
New Road

BORING SECTION



1- Yellow Fine Sand

2- Graded Gravel With Small Percentage Of Sand (A-1-a)

End of Boring

M.L. Eng.:

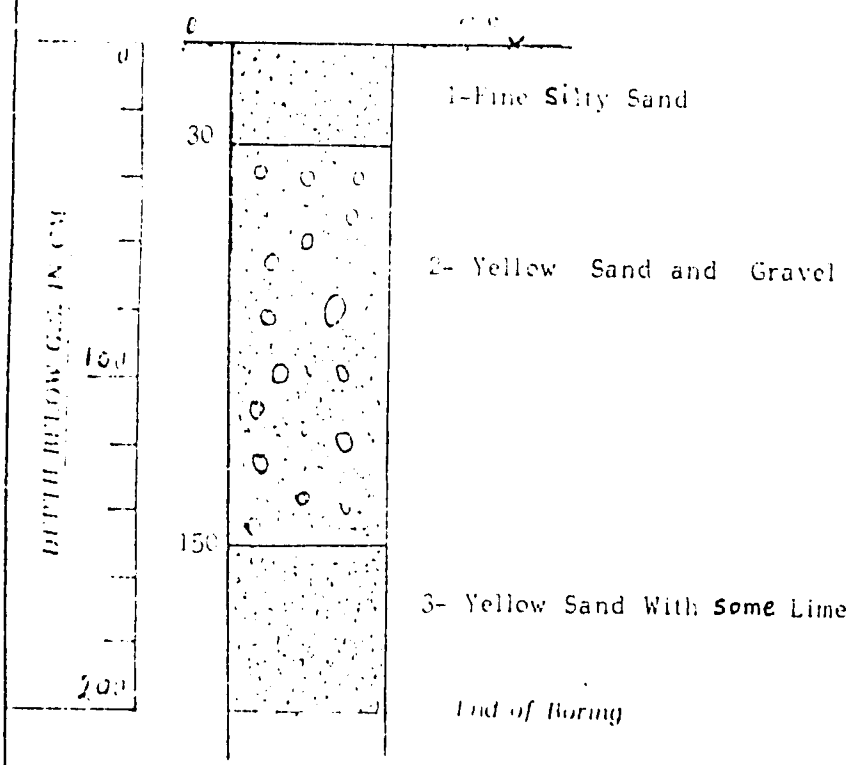
M.L. Manager:

[illegible]
9 [illegible] St. Ahram, Giza, A.R.E
Tel.: [illegible]

[illegible]

Lab Ref.	: RL/ /130 [illegible]	Applicant	: W.S.A
Applicant Ref.:	Letter 29 1.1986		
Test No.	:	Samples	: 25/36
Date	: [illegible]		New Road

BORING SECTION



R.L. Eng.: [signature]
R.L. Manager: [signature]

9 Ramsis St. Ahram, Giza, A.R.E.
Tel.: 850636 - 850637 - 850638

MAIN LABORATORY

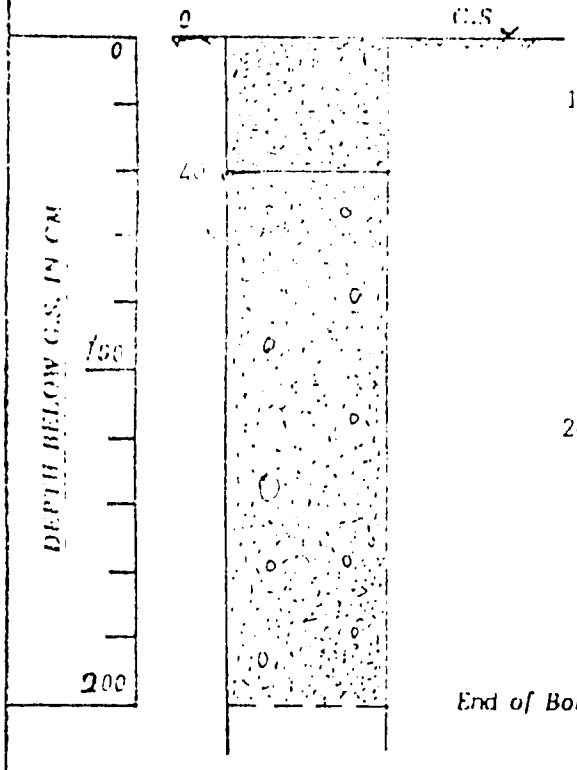
Lab Ref. : ML/ /13/1986 Applicant : W.S.A

Applicant Ref.: Letter 20/1/1986

Test No. : Samples : 26/36

Date : 5/4/86 Sea Bank

BORING SECTION



1- Yellow Silty Sand

2- Gravel And Silty Sand
(A-2-4)

End of Boring

M.L. Eng.: E.S

M.L. Manager: K.F.

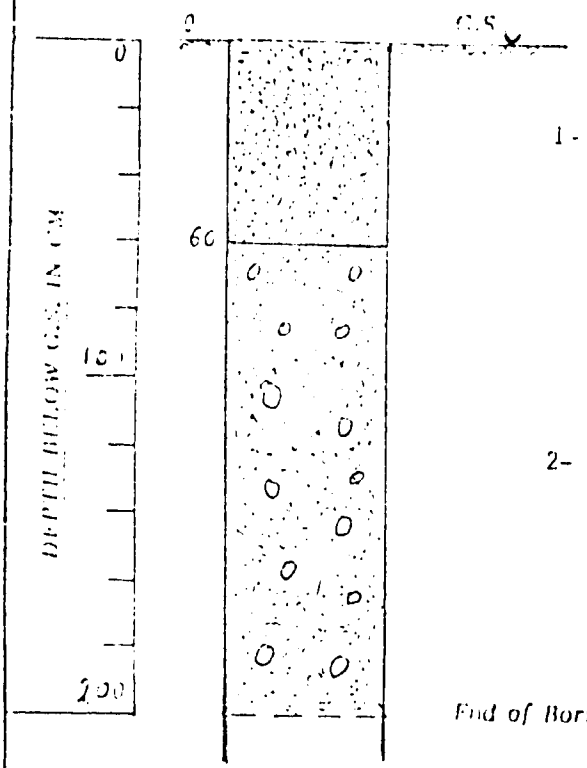
[illegible] & Co.
9 Mansour.a St. Ahram, Giza, A.R.E.
Tel.: 850636 - 850637 - 850638

MAIN LABORATORY

Lab Ref. : ML/ /130 1986
Applicant Ref.: Letter 29 1/1986
Test No. :
Date : 18 4 86

Applicant : W.S.A
Samples : 27/30

BORING SECTION



1- Yellow Fine Sand

2- Angular Gravel And Sand

End of Boring

M.L. Ing.:

M.L. Manager:

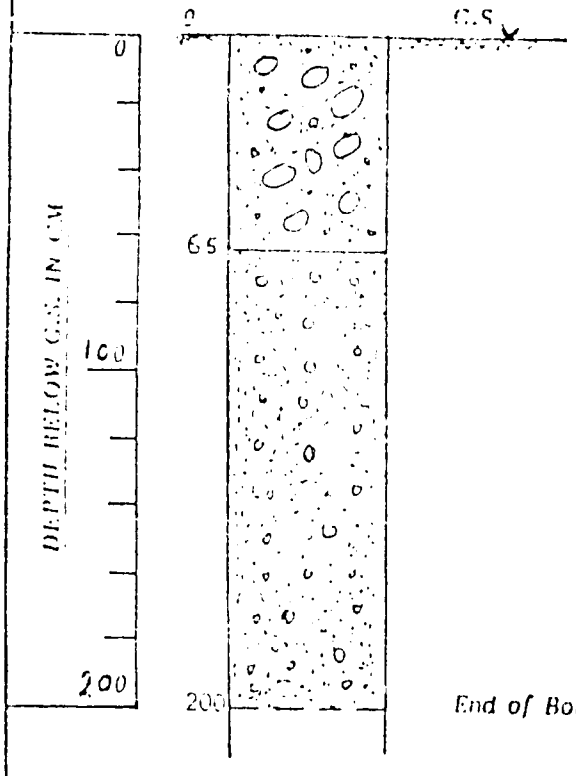
Soil Stone & Co.
9 Kinsouria St. Ahram, Giza, A.R.E.
Tel.: 850636 - 850637 - 850638

MAIN LABORATORY

Lab Ref. : ML/ /130/1986
Applicant Ref.: Letter 29/1/1986
Test No. :
Date : 8 - 86

Applicant : W.S.A
Samples : 28 36
New Road

BORING SECTION



1- Reddish Pitrun Gravel
(A-1-a)

2- Dark Grey Pitrun Gravel

End of Boring

M.L. Ing.:

M.L. Manager:

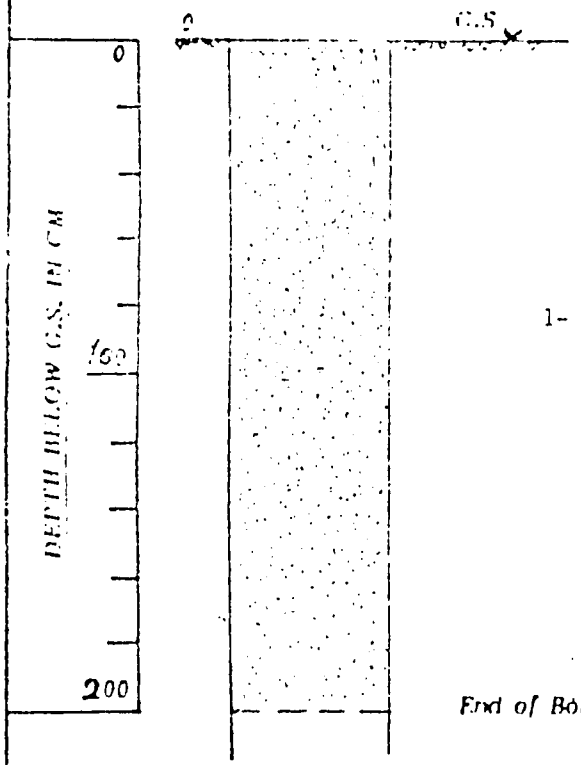
9 Mansouria St. Miram, Giza, A.R.E.
Tel.: 850436 - 850637 - 850638

MAIN LABORATORY

Lab Ref. : ME/ /130/1986
Applicant Ref.: letter 29/1/1986
Test No. : ____
Date : 25/2/86

Applicant : W.S.A
Samples : 28/30
New Road

BORING SECTION



1- Area Of Sand Dunes
Single Size - Fine Sand (A-3)

End of Boring

M.L. Eng.: [illegible]

M.L. Manager: [illegible]

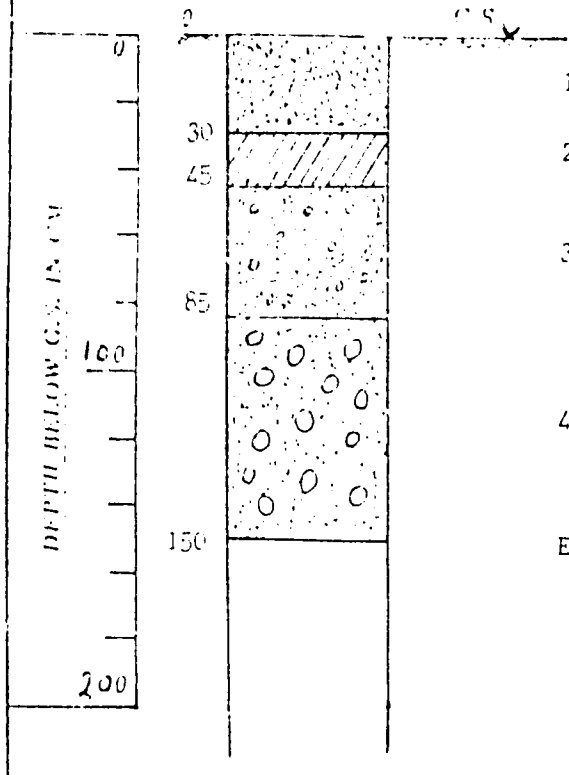
Soil Mech. & Co.
9 Manchuria St. Abbas, Giza, A.R.E.
Tel.: 850636 - 850637 - 850638

MAIN LABORATORY

Lab Ref. : M.L/ /130/1986
Applicant Ref.: Letter 29/1/1986
Test No. :
Date : 15/2/86

Applicant : W.S.A
Samples : 30/36 New Road

BORING SECTION



1- Yellow Fine Sand (A-3)

2- Cemented Salty Calcarious Sand And Gravel

3- Aggregated Sand

4- Pilrun Gravel

End Of Boring

M.L. Eng.:

M.L. Manager:

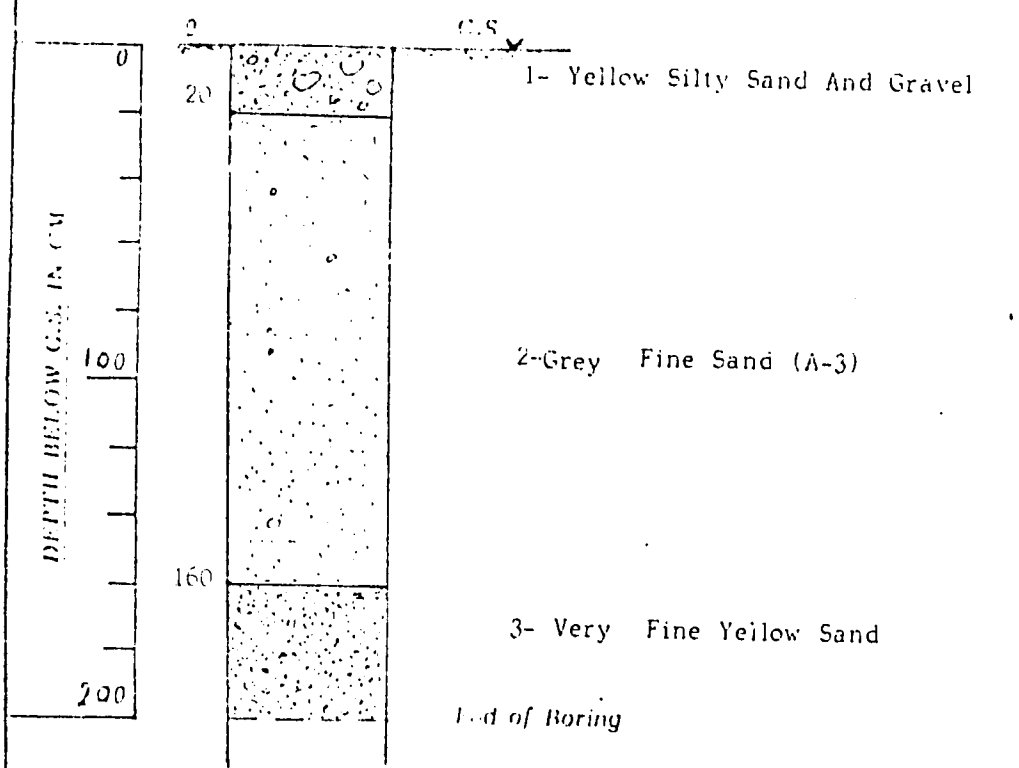
[illegible] & Co.
9 Mansouria St. Abram, Giza, A.R.E.
Tel.: 850636 - 850637 - 850638

MAIN LABORATORY

Lab Ref. : ML/ /130 1986
Applicant Ref.: Letter 29 I 1986
Test No. : _____
Date : 20/2/86

Applicant : W.S.A
Samples : 31/36
New Road

BORING SECTION



M.L. Eng.: [illegible]

M.L. Manager: [illegible]

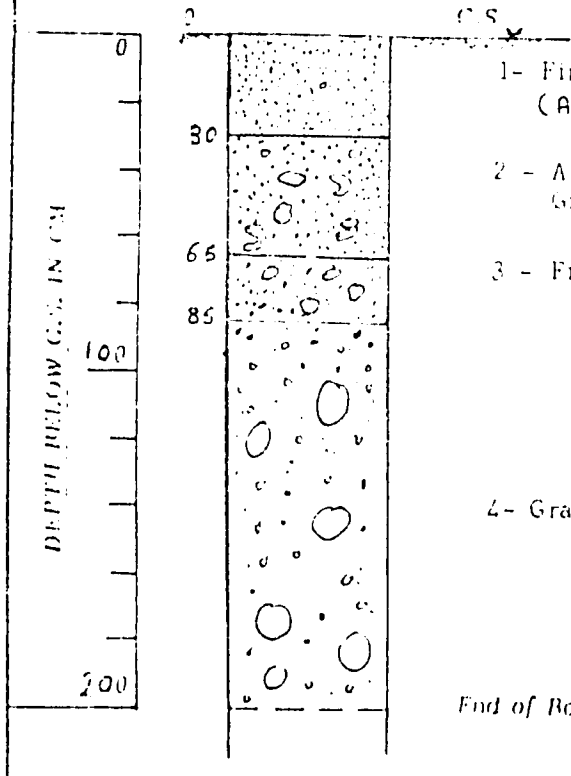
[illegible] & Co.
9 Mansouria St. Ahram, Giza, A.R.E.
Tel.: 850636 - 850637 - 850638

MAIN LABORATORY

Lab Ref. : ML/ /130/1986
Applicant Ref.: Letter 29/1/1986
Test No. :
Date : 20/2/86

Applicant : W.S.A
Samples : 32/36 New Road

BORING SECTION



1- Fine Cemented Silty Calcarious Sand (A-3)

2 - A mixture of angular and Rounded Gravel

3 - Fine Sand And Gravel

4- Graded Big Size Gravel And Sand

End of Boring

M.L. Eng.: [illegible]

M.L. Manager: [illegible]

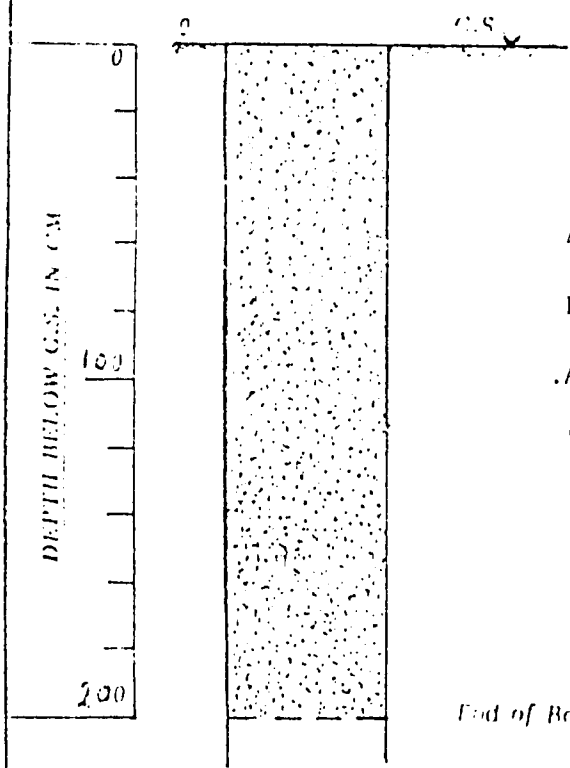
[illegible] & Co.
9 Mansouria St. Abram, Giza, A.R.E.
Tel.: 850636 - 850637 - 850638

MAIN LABORATORY

Lab Ref. : ML/ /130/1986
Applicant Ref.: Letter 29/1/1986
Test No. :
Date : 15/4/86

Applicant : W.S.A
Samples : 23/26 New Road

BORING SECTION



Area Of Sand Dunes

Loose Sand With Traces of Lime .And Some Peblbes .

(A-3)

End of Boring

M.L. Eng.:

M.L. Manager: K.E.D

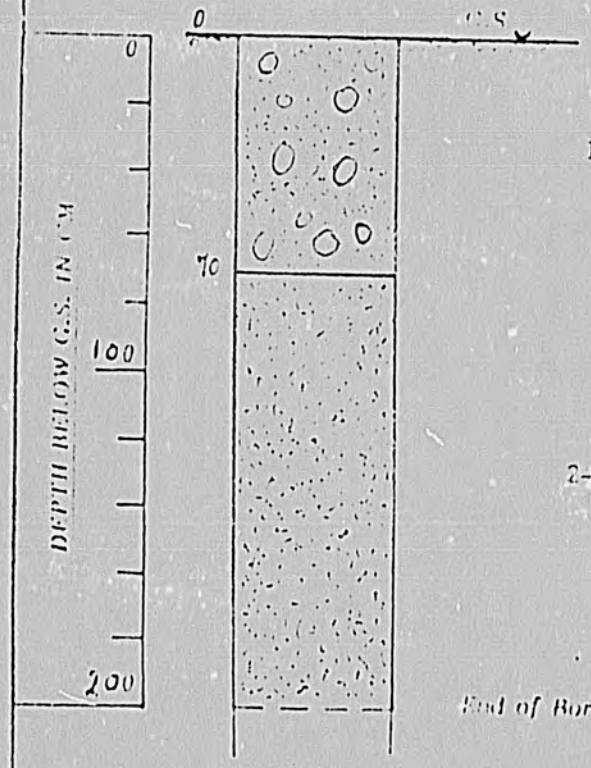
[illegible] & Co.
9 Mansouria St. Ahram, Giza, A.R.E.
Tel.: 850636 - 850637 - 850638

MAIN LABORATORY

Lab Ref. : ML/ /130 1986
Applicant Ref.: Letter 29 1 1986
Test No. :
Date : 8/4/86

Applicant : W.S.A
Samples : 34/36
New Road

BORING SECTION



M.L. Eng.

M.L. Manager:

63

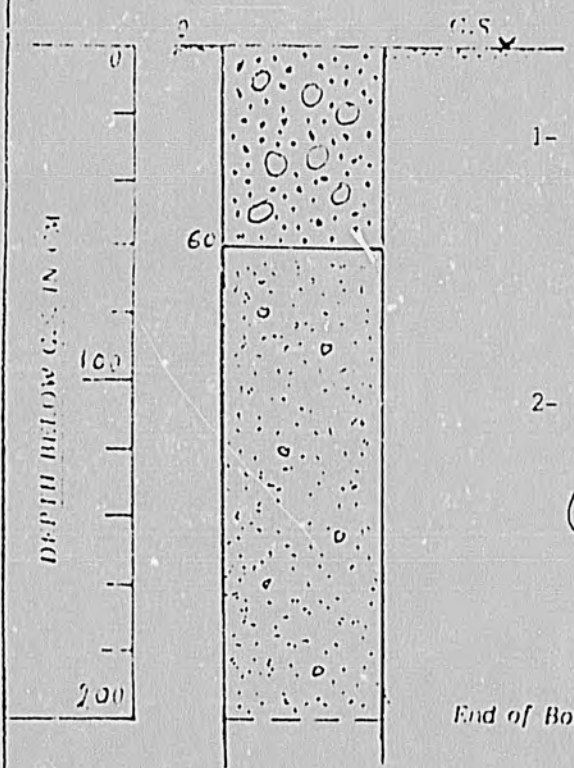
[illegible] & Co.
9 Mansouria St. Ahram, Giza, A.R.E.
Tel.: 850636 - 850637 - 850638

MAIN LABORATORY

Lab Ref. : MI/ /130/1986
Applicant Ref.: Letter 29/1/1986
Test No. :
Date : 15/4/86

Applicant : W.S.A
Samples : 35/36
New Road

BORING SECTION



1- Fine Sand And Med. Gravel

2- Fine Sand And Small Percentage Of Fine Gravel.
(A-3)

End of Boring

M.L. Eng.: E.S

M.L. Manager: R.S

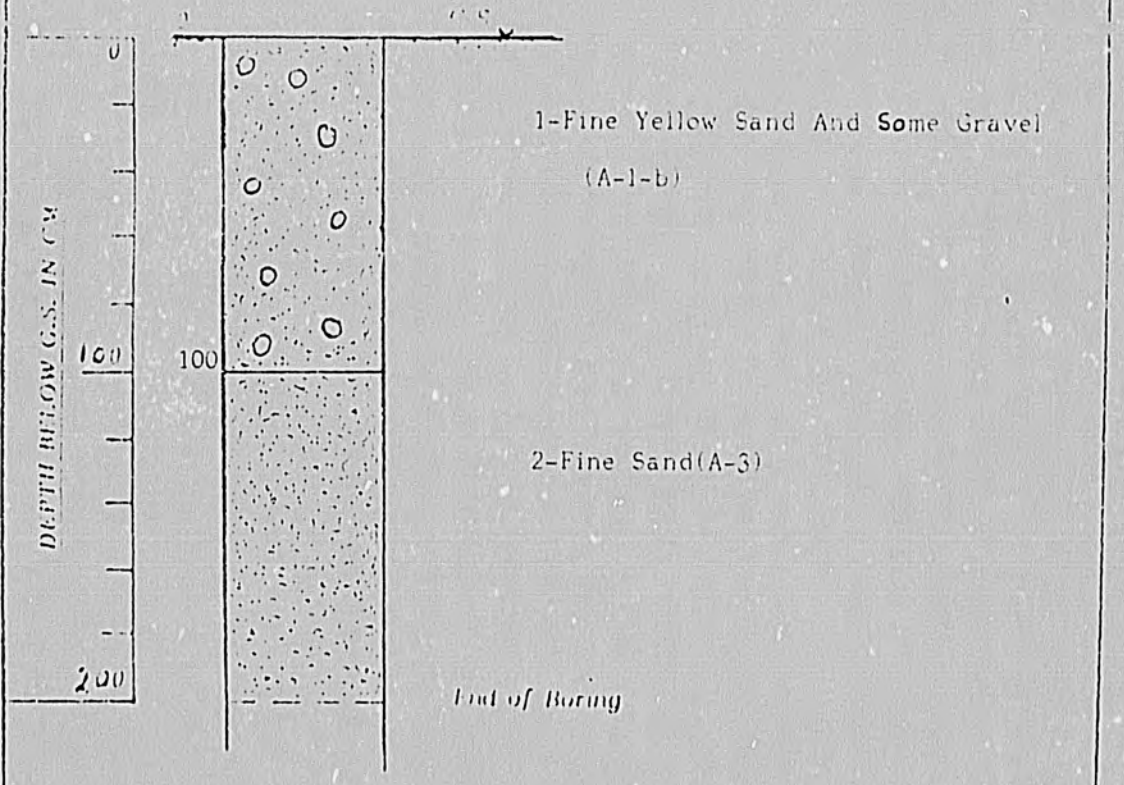
Soil Mech. & Geo.
9 Mansouria St. Ajram, Giza, A.R.E.
Tel.: 850036 - 850617 - 850035

PAIR LABORATORY

Lab Ref. : ML/ /130/1986
Applicant Ref.: Letter 29/1/1986
Test No. :
Date : 13/4/86

Applicant : W.S.A
Samples : 36/36

BORING SECTION



M.L. Eng.: [illegible]

M.L. Manager: [illegible]

Appendix 4D

DESIGN OF THE NEW CAIRO-ASSUIT HIGHWAY

TABLE OF CONTENTS

TABLES

FIGURES

ANNEXES

Appendix 4D

DESIGN OF THE NEW CAIRO-ASSUIT HIGHWAY

This appendix covers the major engineering task of the Study which was the preparation of a preliminary engineering design for a new Cairo-Assuit Highway.

New Highway Layout Plans

The plans for the new highway are presented in a separate Plan Volume on 29 drawings. The contents of each drawing are listed in Table 4D-1.

Drawing 1 is a layout plan at scale 1:250,000 showing the location of the highway in the Cairo-Assuit corridor.

Drawings 2-17 show the horizontal and vertical alignments of the new road at scales of 1:25,000 horizontal and 1:250 vertical.

Drawing 18 shows some typical layouts for at-grade intersections considering the expressway as a 2-lane highway, which is an option for first stage construction. These plans are to scale 1:1,000.

Drawing 19 shows possible layouts for grade separated interchanges at the northern terminus of the route, one between the new highway and the Fayoum Desert Road, and the other between the Fayoum Desert Road and the planned Cairo Ring Road. The layout for this latter interchange is taken directly from the current plans for the Ring Road, and is included to show the additional slip road which would be required to take the extra traffic for the new Cairo-Assuit Highway. These plans are to scale 1:2,500.

Drawing 20-23 show layouts for grade-separated junctions at each intersection which would be required for a second stage of construction. These are shown at scale 1:1,000.

Drawing 24 shows cross-section for a 4-lane highway, indicating pavement structure and super-elevation requirements. The scale is 1:50.

Drawings 25-29 show geological sections along the highway derived from photo interpretation (see Appendix 4B). These are drawn to scales 1:25,000 horizontal and 1:100 vertical.

In addition to these printed plans, the Study prepared a set of 46 map transparencies at a scale of 1:25,000 showing the line of the new highway together with the location of other important local features such as the high voltage transmission lines from Aswan to Cairo and the petroleum product pipeline under construction from Cairo to Assuit.

Finally, at the request of RBA, the Study prepared a horizontal and vertical alignment for a possible new route on the east bank of the Nile between the Helwan Autostrade and Koraimat, where the existing desert section of the East Bank Highway begins. These plans are shown in drawings 30 to 32 of the Plan Volume.

Table 4D-1

DRAWINGS AND PLANS OF THE NEW HIGHWAY

DRAWING NUMBER	SCALE	TITLE
1	1:250,000	Layout Plan
2-17	1:25,000 (Hor) 1:250 (Ver)	Horizontal and Vertical Alignment
18	1:1,000	Typical At-grade Intersections
19	1:2,500	Fayoum Desert Road & Cairo Ring Road Interchanges (Grade-Separated)
20	1:1,000	Fayoum-Beni Suef Interchanges (Grade-Separated)
21	1:1,000	Typical Grade-Separated Interchange (Gerza, Mallawi and New Valley Road)
22	1:1,000	Typical Grade-Separated Interchange (Aiyat, Fashn, Maghagha, Beni Mazar, Samalut, Minia, Qusiya and Manfalut)
23	1:1,000	Dairut Interchange (Grade-Separated)
24	1:50	Typical Cross-Sections
25-29	1:25,000 (Hor) 1:100 (Ver)	Geological Sections along Line of Proposed New Highway from Photo Interpretation
30-32	1:25,000 (Hor) 1:250 (Ver)	Horizontal and Vertical Alignment for a New East Bank Highway from Tebin to Koraimat.

NOTE: All drawings are contained in the Plan Volume to this Report.

Alignment Option Report

The first task of the Study was to evaluate alternative alignments for the new highway and recommend an alignment for more detailed study. This task, which occupied the first two months of the Study, considered alignments on both sides of the Nile, including some located in the desert far from the existing corridor. The Alignment Options Report was presented on December 15 1985 recommending a route on the west side of the Nile located in the desert just outside the existing agricultural area. A summary of the Alignment Options Report is presented in Appendix 4A. Following intensive discussions, the recommended alignment was accepted and on December 30, 1985, authority was given for work to commence on the detailed alignment studies.

Mapping and Photographs

An alignment for the new highway had been selected based on available mapping during the Alignment Options Phase. This alignment was used to define a flight plan for a complete aerial photographic survey of the new route. The survey commenced in mid-January and was completed by the end of the month. Photographs were prepared to scale 1:25,000 and, following a review by the military authorities, 219 out of a total of 244 photographs were delivered to the Study in mid-February.

A complete set of US Army topographic maps of the corridor to scale 1:50,000 (Cairo to Minia) and scale 1:100,000 (Minia to Assuit) were received from USAID on January 15. The maps along the alignment of the highway were enlarged by the Study to scale 1:25,000.

Route Description

The maps in Figures 4D-1 to 4D-5 show the alignment selected for the new highway, together with the associated access roads.

The northern terminus of the road is a junction with the Fayoum Desert Road about 4 kilometers south of the Dahshur Road/Fayoum Desert Road intersection. The new road is aligned in a south-easterly direction heading across desert land towards the region of Aiyat and Gerza. The alignment then turns south to pass between the Fayoum Oasis and the agricultural developments in the main Nile corridor. The route crosses the Gerza-Tamiya Road turning south-west to reach the Beni Suef-Fayoum Road. The terrain from the northern terminus of the road to the Beni Suef-Fayoum Road is easy and the few rock escarpments in this area are easily avoided.

The alignment crosses the Beni Suef-Fayoum Road at a point 6.5 kms west of El Lahoun which marks the boundary between Beni Suef and Fayoum. Since there is continuous agricultural development along the road linking Beni Suef with Fayoum, it is inevitable that the new route passes through some agricultural land. The crossing point selected is at the narrowest point of this agricultural strip where it is only 1.25 kms wide.

South of this point, the alignment of the new road meets the high

voltage transmission lines from Aswan to Cairo, and the alignment of the planned new petroleum product pipeline from Tebin (just south of Helwan on the east bank of the Nile) to Assuit. The pipeline is located on the east bank of the Nile only as far as Beni Suef where it crosses the river to the west bank. From this point for much of the way to Assuit, the alignments of the new road, the high voltage transmission lines and the product pipeline all share the same general alignment in the desert just outside the existing agricultural area.

The alignment of the new highway crosses the high voltage transmission lines at three points between Beni Suef and Assuit, and many of the access roads also cross the transmission lines. This was discussed with the National Electricity Company who made no objection as long as sufficient reserve was allowed between the pylons and the edge of highway. The pipeline is crossed at two locations. This was discussed with the National Pipeline Company who made no objection as long as all crossings were at right angles to the pipeline (which will be buried) and the edge of highway was maintained at least 50 meters from the pipeline in sections where the two followed parallel alignments.

Between Beni Suef and Maghagha, some poor soil conditions were encountered and a few wadis, but these were the only problems. South of Maghagha, extensive new agricultural areas were identified from aerial photographs, extending to Minia. The line of both the high voltage transmission line and the pipeline pass through this area, but the new highway was located further to the west in the desert.

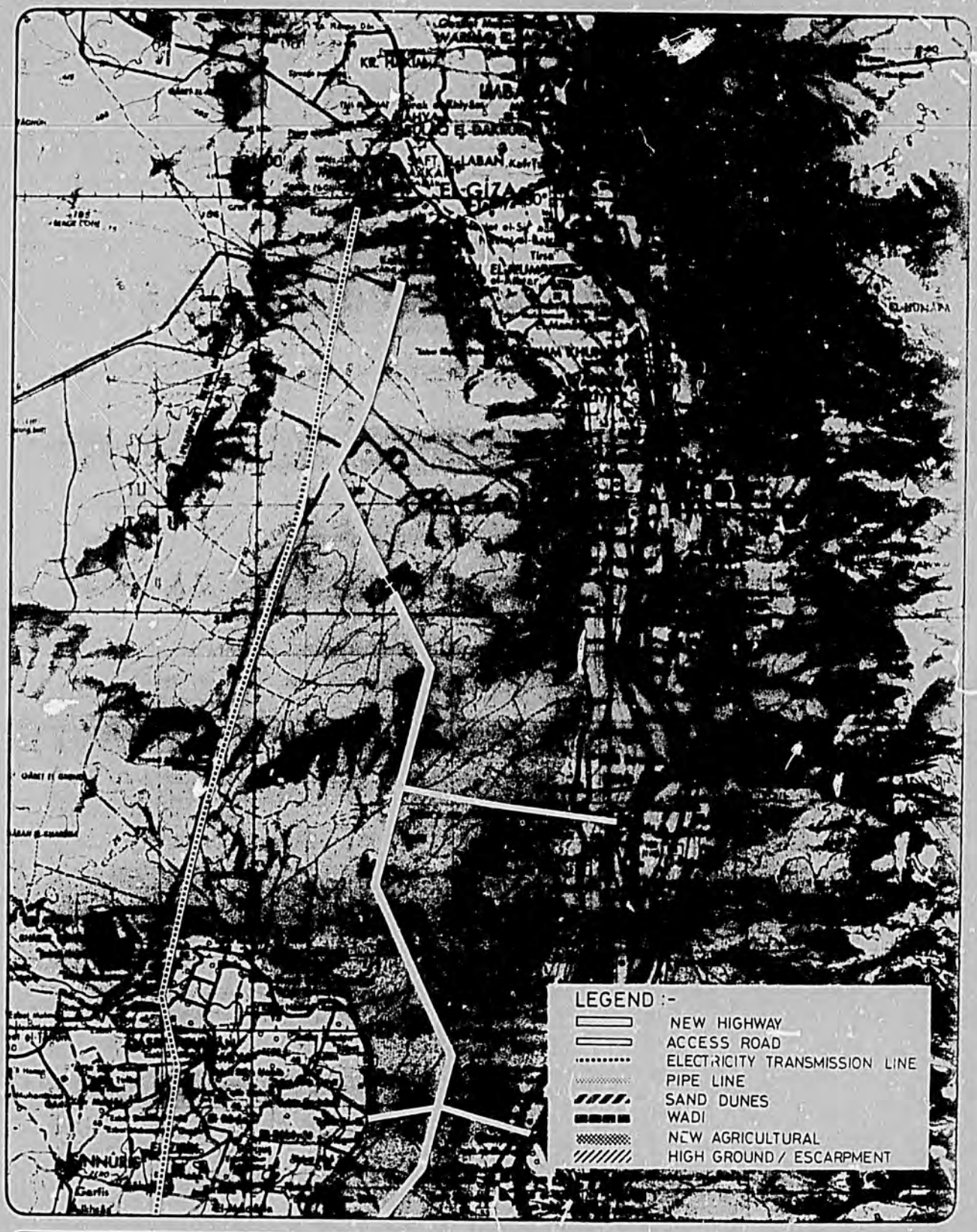
From Matai to Mallawi (about 75 kilometers located on either side of Minia), the road alignment passes through an area of dunes which would require stabalization.

The most difficult section for the road alignment is between Dairut and Quisiya, where the desert between the agricultural land and the rock escarpments narrows suddenly to between 100 and 150 meters. However, study of the aerial photographs and field visits showed that the new highway could be located in this strip without reducing design standards.

South of Mallawi, the escarpments are set back further from the agricultural land and there is little difficulty in locating the new highway. Close to Assuit, the line of the road avoids the new cement plant and oil refinery under construction, passing between them and the agricultural land.

The new highway terminates on the New Valley Road in a junction about 8 kms from the main West Bank Highway. This location was chosen to permit extension of the new road beyond Assuit in a later stage. A choice is available to take this southern extension either close to Assuit town or over the high ground to the west of Assuit. The terminus chosen in this Study permits either alignment, but no investigation was made of these alternatives.

The total length of the alignment from the Fayoum Desert Road (station



Cairo – Assuit Highway Feasibility Study

NEW HIGHWAY LOCATION
GIZA TO GERZA

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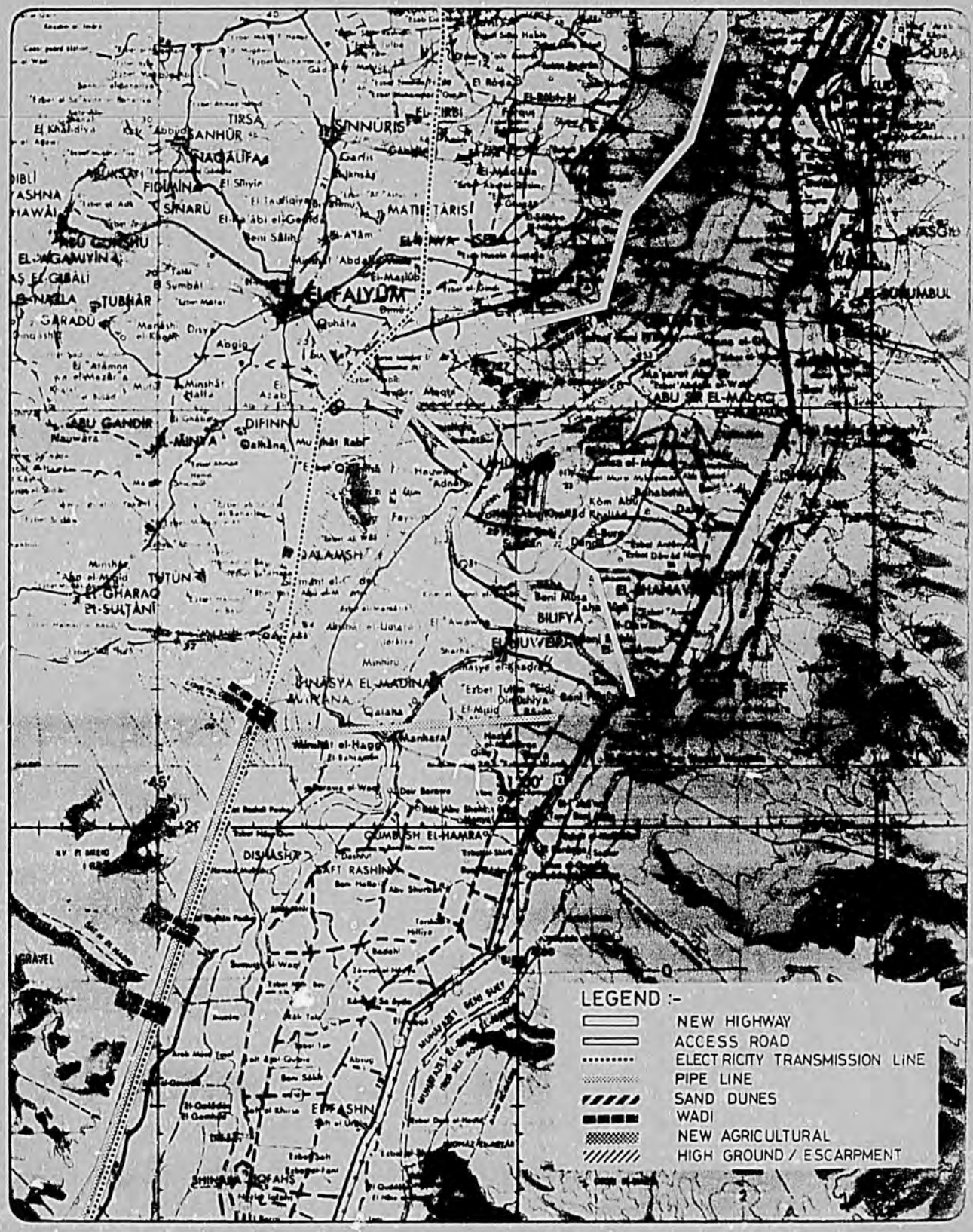
Figure 4D-1



Cairo – Assuit Highway Feasibility Study

NEW HIGHWAY LOCATION
GERZA TO FASHN

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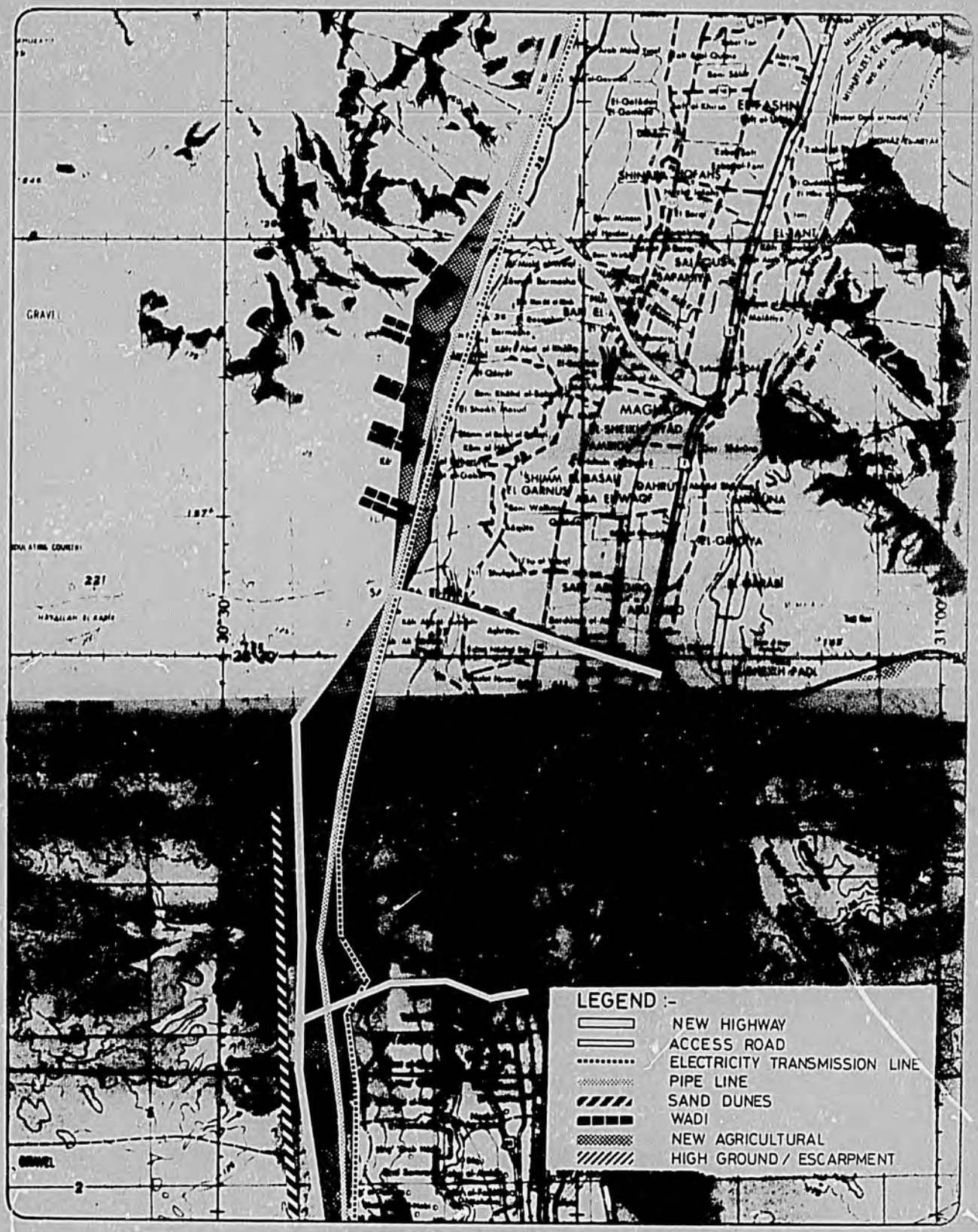
Egyptian Consultants Consortium

Figure 4D-2



Cairo – Assuit Highway Feasibility Study

NEW HIGHWAY LOCATION
FASHN TO SAMALUT

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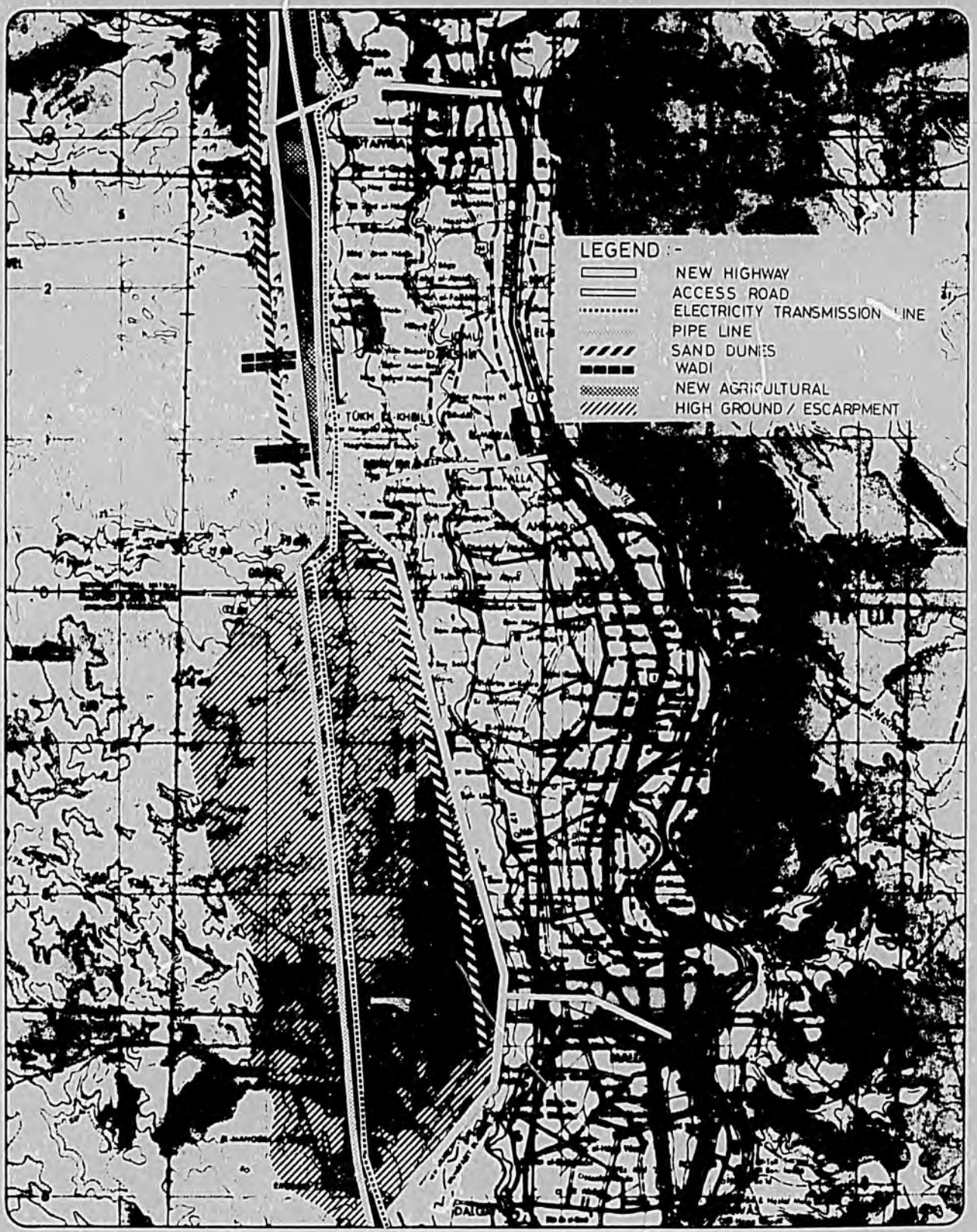
Figure 4D-3



Cairo – Assuit Highway Feasibility Study

NEW HIGHWAY LOCATION
SAMALUT TO DEIR MAWAS

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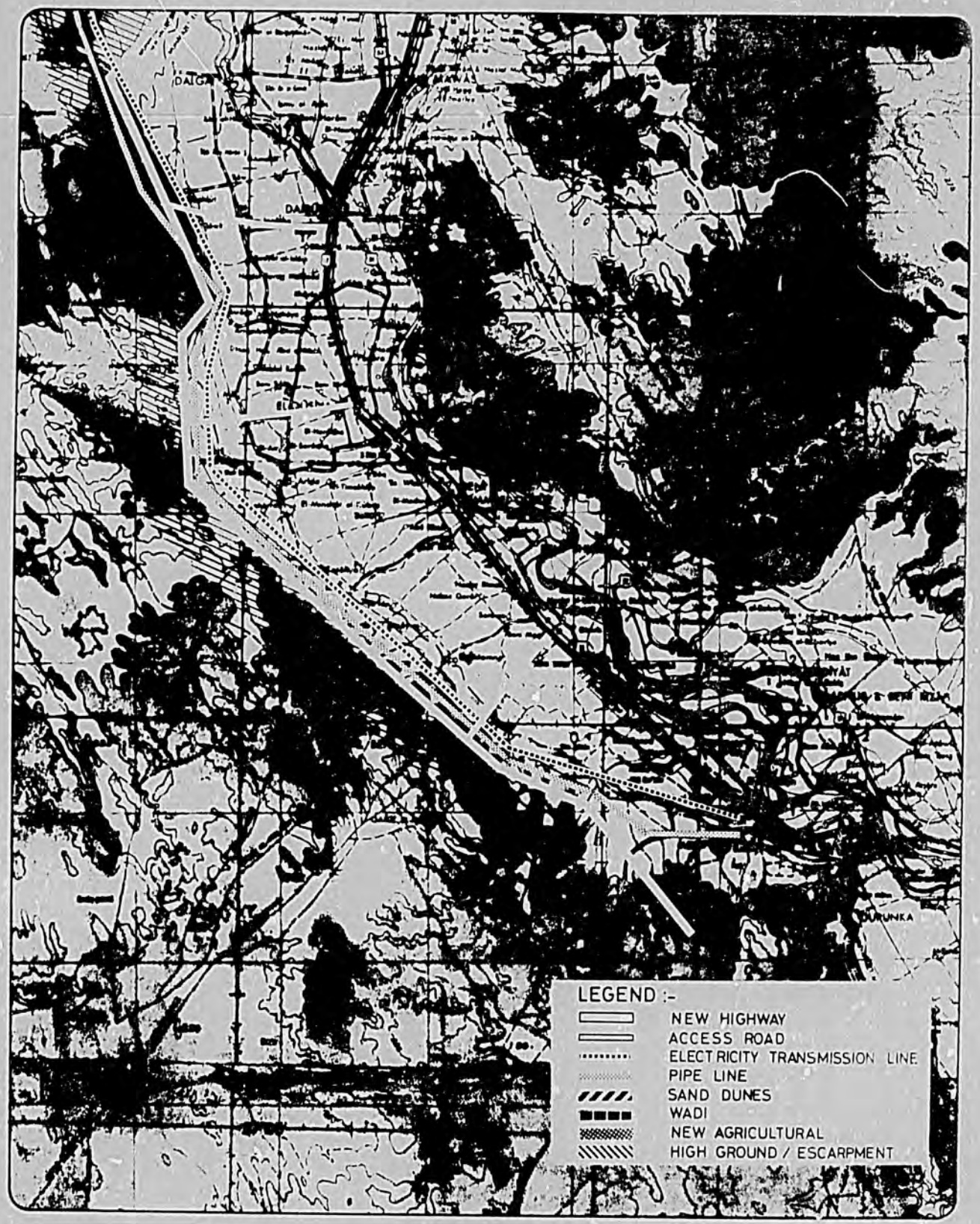
Figure 4D:4



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NEW HIGHWAY LOCATION
DEIR MAWAS TO ASSUIT

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Figure 4D-5

12.5) to the New Valley Road (station 355.8) is 343.3 kilometers.

Design Standards

Geometric design standards used for this preliminary engineering design of the new highway were taken from the ASHTO standard given in the 1984 edition of "A Policy on Geometric Design of Highways and Streets" (Reference 15). The key parameters are summarized in Table 4D-2.

A design speed of 110 kilometers per hour was assumed for the new highway, and 65 kilometers per hour for the access roads. All other parameters, including curvatures, superelevation, stopping and passing sight distances were selected appropriate to these speeds.

The terrain is easy and there were few problems in locating the new highway in conformity with these standards. The only sections which presented any difficulty were that opposite Minia, where the new alignment enters the narrow section between Minia and Mallawi, and that between Mallawi and Dairut. However, the road could be located in both these sections according to design standards.

The design team went to the extent of calculating spiral transitions for horizontal curves taking full account of the length of transition to achieve full superelevation. Vertical transition curves between grades were also calculated, assuming parabolic curves and ensuring minimum sight distances were adhered to. Horizontal and vertical curve locations and parameters are set out in detail on Drawing 1 of the Plan Volume to this Report. It was concluded that a full 4-lane expressway could be located in the selected corridor designed to the highest standards of alignment.

The cross-section adopted for the 4-lane design is shown in Figure 4D-6. It consists of two 8.5 meter carriageways marked as two 3.75 meter lanes with a 1.0 meter strip adjacent to the median. Shoulders of 3.0 meters were adopted, and a median of 10.0 meters. Staged construction for a 2-lane design would use just one carriageway, adding an additional shoulder of 2.0 meters adjacent to the 1.0 meter carriageway strip, giving two 3.0 meter shoulders as in the full design.

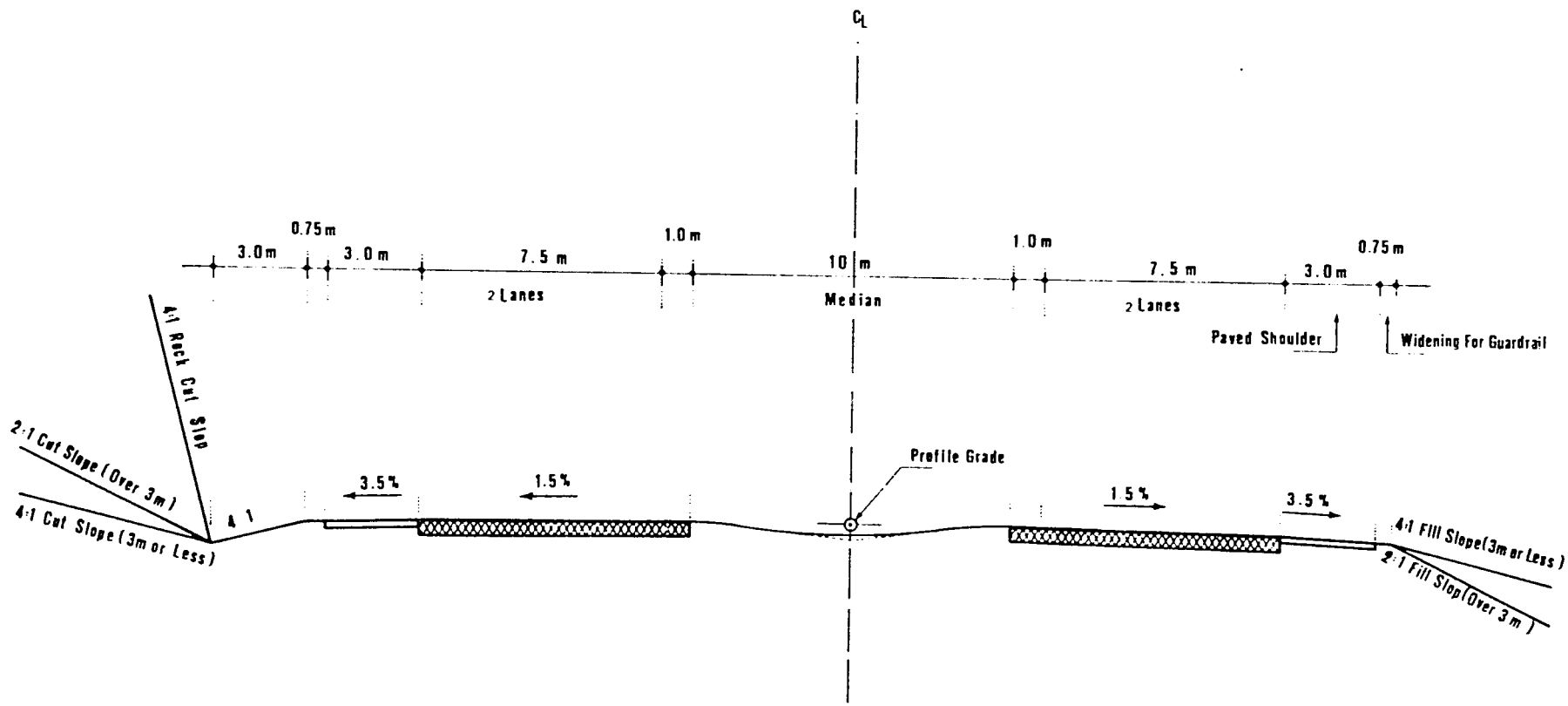
Pavement Design

Much pavement construction in Egypt appears to use standard designs with little regard to actual or predicted axle loadings. A typical section consists of a 30 cm crushed stone sub-base, a 6 cm asphaltic concrete (A.C.) base, and a 5 cm A.C. wearing surface. Using pavement design charts (see below) it is estimated that this design would be good for a maximum cumulative axle loading of perhaps 2 million equivalent axle loads (EAL) with favorable soil conditions (CBR greater than about 8 percent). Measurements of axle loads in this Study indicate that this loading could be accumulated with less than one year's traffic, indicating early pavement failure for such a design.

Table 4D-2

GEOMETRIC DESIGN STANDARDS

DESIGN CHARACTERISTICS	ACCESS ROADS	NEW HIGHWAY
Design Speed (kph)	65	110
Average Running Speed (kph)	58	93
Maximum Curvature	13°	3°30'
Minimum Radius (m)	135	500
Maximum Superelevation	10%	10%
Maximum Grade		
Flat	3%	3%
Rolling	5%	4%
Stopping Sight Distance (m)	85-100	190-260
Passing Sight Distance (m)	460	770
K Value for Crest Vertical Curves	20-25	90-165
K value for Sag Vertical Curves	20-25	45-70
Max.Curvature for Normal Crown Section	0°49'	0°19'
Minimum Curve Radius for Normal Crown Section (m)	2134	5620



Cairo—Assuit Highway Feasibility Study

TYPICAL CROSS SECTION OF NEW HIGHWAY

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Figure : 4D-5

Design Procedure - The approach taken in this Study was to design the new highway pavement to withstand forecast design loadings. Appendix 3B discusses alternative methods of pavement assessment and design. It was concluded that the most useful method for this Study was that of TRRL Road Note 29 (Reference 13), essentially because the method was straight forward to apply, provided for the very high axle loadings encountered in Egypt, and discussed designs in terms of materials commonly used in Egypt.

Design charts for sub-base and base design from Road Note 29 were presented in Figures 3B-1 and 3B-2 of Appendix 3B. For the purposes of this Study, the values in the charts were extracted to give the sub-base, base and wearing surface thicknesses for different expected cumulative axle loadings. These are presented in Table 4D-3.

Axle Loadings - Axle loadings on the new highway were estimated for a 10 and 20 year period assuming opening in 1990 (recommended opening year is discussed elsewhere in this report). As discussed in Appendix 3B, it was assumed that some control of axle loadings would be introduced, but that loadings as high as 50 percent over legal axle loads would still persist. This resulted in the estimates of cumulative EALs shown in Table 4D-4.

Table 4D-4

ESTIMATED CUMULATIVE AXLE LOADINGS
ON THE NEW CAIRO-ASSUIT HIGHWAY

SECTION	CUMULATIVE EAL 1990-1999	CUMULATIVE EAL 1990-2009
Giza-Beni Suef	25-27 million	15-20 million
Beni Suef-Assuit	65-70	40-50

Soil Conditions - The soils survey (Appendix 4C) indicated that CBR values for soils along the route were generally good, being above 8 percent for almost all sections. However, there were some low CBR values encountered between Aiyat and Gerza, and between Beni Suef and Fashn. Therefore the minimum sub-base thickness of 15 cm was adopted for the main design, but a 20 cm sub-base was costed for the two sections indicated.

The analysis of quarry materials indicated that they were satisfactory for sub-base construction, all having CBRs greater than the minimum 30 percent indicated in the Road Note 29 design charts.

Table 4D-3

PAVEMENT DESIGNS FOR
SPECIFIED AXLE LOADINGS

CUMULATIVE EQUIVALENT AXLE LOADS (millions)	CBR (%)	CRUSHED STONE SUB-BASE (mm)	ROLLED A.C. BASE (mm)	A.C. SURFACE (mm)
1.0	4	260	90	70
	>6	150	90	70
2.0	4	280	100	80
	>6	150	100	80
4.0	4	290	110	90
	>6	150	110	90
6.0	4	310	110	90
	>6	150	110	90
10.0	4	310	120	100
	>7	150	120	100
15.0	4	320	140	100
	>7	150	140	100
20.0	4	330	150	100
	>7	150	150	100
30.0	4	340	160	100
	>7	150	160	100
40.0	4	350	180	100
	>8	150	180	100
60.0	4	360	200	100
	>8	150	200	100
80.0	4	370	210	100
	>8	150	210	100
100.0	4	380	220	100
	>8	150	220	100
150.0	4	390	250	100
	>8	150	250	100

SOURCES: TRRL Road Note 29
Consultants

Pavement Structure - On the basis of the forecast axle loadings and the design values given in Table 4D-3, a standard pavement structure was adopted as follows:

Crushed stone sub-base	15 cm
Asphalt base course	18-20
Wearing surface	5

It was assumed that an additional 5 cm strengthening overlay would be placed after 10 years. South of Beni Suef, a reduction in thickness of the base course from 20 to 18 cm was allowed according to expected reduced axle loadings.

Costs of Construction

Costs of construction were estimated based on the preliminary design quantities using the unit costs set out in Appendix 3A. Cut and fill was estimated from the road profile, and pavement quantities from the cross-section design. Some agricultural land would be required where the road crosses the agricultural strip linking Beni Suef and Fayoum. Costs of structures were estimated individually, as discussed below.

Cost of Structures - The first stage of construction assumed at-grade intersections which have little additional cost to the main cost of the roadway. Preliminary designs were prepared for grade-separated interchanges at the Northern termimus on the Fayoum Desert Road, and at the intersection with the Beni Suef-Fayoum Road. All other grade-separated interchanges are discussed later in this appendix in relation to access roads.

The Fayoum Desert Road interchange, shown in Drawing 19 of the Plan Volume, assumes a 3-leg trumpet design and was costed at LE 2.63 million. The interchange with the Beni Suef-Fayoum Road assumes a 4-leg design, but is further complicated by the requirement to cross the Bahr Youssef Canal almost immediately after crossing the Beni Suef-Fayoum Road. The solution adopted envisages a continuous 900 meter structure crossing both road and canal with a half-clover leaf interchange design, as shown in Drawing 20 of the Plan Volume. The interchange and structure were costed at LE 19.0 million.

The opening of the new highway would put additional traffic pressure on the Cairo Ring Road/Fayoum Desert Road intersection, located just to the North of the northern terminus of the new highway. The initial design for this intersection envisages at-grade construction, but it is understood that a grade-separated design is considered necessary by the year 2000. While no additional costs would be imposed on the at-grade design, an additional slip road would be required to accomodate Cairo-Assuit highway traffic in the grade-separated design. This additional sliproad was costed at LE 3.65 million. The layout envisaged (based on designs in preparation elsewhere) is shown in Drawing 19 of the Plan Volume.

Wadis - Photographs and maps showed numerous wadis crossing the proposed alignment of the new highway. Flooding of the wadis can be

expected to be rare, although the aerial photographs indicated water in one wadi (see Appendix 4B). Structures were costed for each important wadi location, allowing LE 60-80,000 depending on size. For the Wadi Wadat el Raiuan at station 130.5, a larger structure was provided for at LE 125,000. These costs applied to the 4-lane design; they were reduced by 25 percent for the 2-lane design.

Dune Stabilization - In the 75 kilometer section between Matai and Mallawi, stabalization of dunes would be required. This could be achieved placing rock facing for about 7-10 meters on either side of the carriageway. A total volume of 116,000 cubic meters of facing were estimated, at a cost of LE 42 per cubic meter.

Total Costs of Construction - Total costs of construction are set out in detail in Annex 4D-1 to this Appendix. They are summarized in Table 4D-5 below.

Table 4D-5

CONSTRUCTION COSTS OF THE NEW CAIRO-ASSUIT HIGHWAY
(LE millions, 1985/86)

COST CLASS	FIRST STAGE CONSTRUCTION(1)	TOTAL CONSTRUCTION(2)
Financial	88.6	179.4
Economic	118.2	240.7
Foreign Exchange	33.6	69.4

(1) 2-lane construction with at-grade interchanges
(2) 4-lane construction with grade-separated interchanges

NOTE: (1) Access roads with their intersections costed separately
(2) Excluding Cairo Ring Road Slip road

Access Roads

An important feature of the design of the new highway was the identification of suitable access roads linking the new road to the existing communities in the corridor. The aim was to provide a link to each of the Markez capitals. Since these communities were almost exclusively located along the line of the existing West Bank Highway, the access roads had to cross the existing agricultural area which is in places 20 kilometers wide. It was therefore inevitable that some agricultural land would be used in the construction of access roads, but to reduce this to a minimum, maximum use was made of existing roads. In all cases, access roads were based on an existing road, widening to a standard section, and extending the roads to the line of the new highway. All new construction was in desert areas or areas of reclaimed land on the

fringe of the desert. No new construction, other than widening, was envisaged in the existing agricultural area.

Only one major Markaz capital remained unconnected, that of Abu Qurqas, where no existing road suitable for modification was found. Other Markaz capitals shared the same access road. Excluding the connections with existing main roads at the northern terminus (Fayoum Desert Road) and with the Beni Suef-Fayoum Road, a total of 12 access roads were identified, including the connection along the New Valley Road to the southern terminus of the route. They are listed in Table 4D-6.

Table 4D-6

ACCESS ROADS TO THE NEW CAIRO-ASSUIT HIGHWAY
(kms)

LOCATION		LENGTH			LAND REQUIREMENT	
Name	Station (1) (kms)	Existing (kms)	New (kms)	Total (kms)	Recl ('000 sq m)	Agric
Aiyat	36.5	3.0	12.2	15.2	0	30
Gerza	59.0	6.2	0.0	6.2	0	10
Fashn	136.1	19.1	2.5	21.6	0	154
Maghagha	151.0	22.1	2.5	24.6	0	221
Beni Mazar	180.2	20.3	0.9	21.2	0	157
Samalut	209.0	15.1	1.5	16.6	0	141
Minia	237.0	5.8	10.5	16.3	30	58
Mallawi	271.2	13.7	1.4	15.1	0	137
Dairut	295.4	12.3	1.5	13.8	0	118
Quisiya	313.1	8.3	3.6	11.9	42	83
Manfalut	244.3	9.0	1.4	10.4	0	90
New Valley Rd	355.8	8.0	0.0	8.0	0	20
		142.9	38.0	180.9	72	1,219

(1) Measured from Km 0.0 at Cairo Ring Road. The northern terminus of the new highway at the Fayoum Desert Road is at station 12.5 kms.

All of the access roads pass through some small settlements, but the only villages of any consequence are Idwa (Maghagha Road), Sandafa el Far (Beni Mazar Road) and Talba (Minia Road). A minimum 7.5 meter carriageway width is available through all villages.

The total length of access road was estimated at 181 kilometers of which 143 kilometers was existing roadway. A total of 1.2 million square meters of agricultural land would be required adjacent to the existing roads for improvement, and 72 thousand square meters of reclaimed land.

Access Road Cross-section - Inspection of the candidate access roads showed most to be sub-standard in terms of width, pavement condition and

shoulders. A standard section was prepared for widening the existing roads, and this is shown in Figure 4D-6 together with the cross-section assumed for new construction.

Pavement structure depended on location (desert or agricultural land) and forecast axle loadings. Forecast loadings varied by location, so for design purposes the access roads were grouped into three classes, with forecast cumulative standard axle loadings (EAL) over the period 1990-2009 as follows:

Class 1 - New Valley Road 44 million EALs

Class 2 - Gerza and Minia 16

Class 3 - All others 2-6

Pavement structures were defined as in Table 4D-7:

Table 4D-7

ACCESS ROAD PAVEMENT STRUCTURES
(cms)

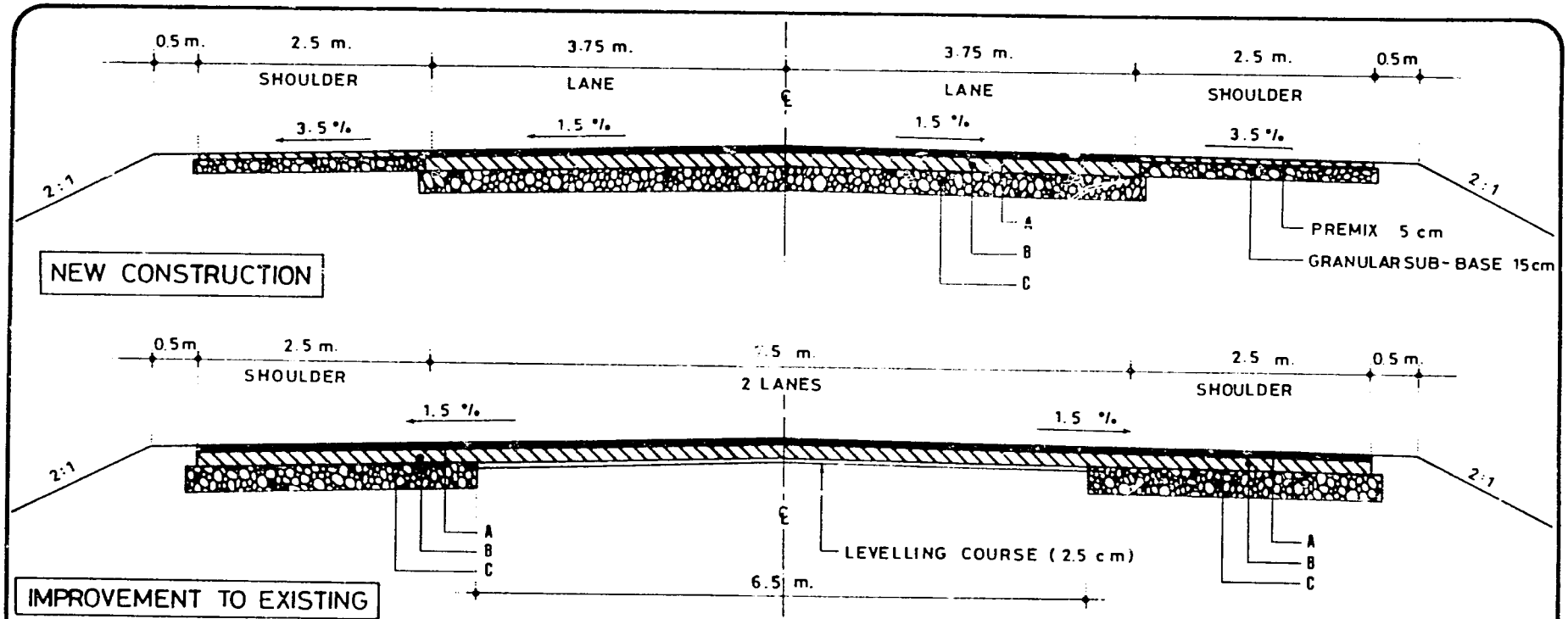
	BITUMINOUS BASE COURSE		GRANULAR SUB-BASE	
CLASS	Agric	Desert	Agric	Desert
1	18	18	35	15
2	14	14	32	15
3	11	11	30	15

All were assumed to require an initial 5 cm wearing course, with a further 5 cm overlay 10 years after initial construction or improvement. All existing pavements were assumed to require a 2.5 cm levelling course, followed by the base course and wearing surface as specified above.

Intersections and Structures - It was assumed that all intersections with the new highway would be at-grade in the first stage of construction, but that grade-separated intersections would be required when traffic volumes increased. Most intersections were 3-leg with the access road terminating at the new highway. Three 4-leg intersections were required, one each at Gerza and New Valley Road where the road continues on the west side of the new highway, and one at Mallawi to allow access to the important Tuna El Gabel archeological site.

Costs of grade-separated 4-leg interchanges at Gerza, Mallawi and the New Valley Road, were estimated at LE 3.75 million each, and 3-leg interchanges (at all other access road intersections) at LE 2.65 million each.

Inspections of the access roads showed some narrow or otherwise inadequate bridges which would have to be replaced. These were estimated to cost LE



		CLASS 1		CLASS 2		CLASS 3	
		AGRIC	DESERT	AGRIC	DESERT	AGRIC	DESERT
		cm	cm	cm	cm	cm	cm
WEARING COURSE	A	5	5	5	5	5	5
BITUMINOUS BASE COURSE	B	18	18	14	14	11	11
GRANULAR SUB-BASE	C	35	15	32	15	30	15

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TYPICAL CROSS-SECTION FOR ACCESS ROADS

Figure 4D-7

12,500 each. Some larger bridges would also be required to cross the Bahr Youssef Canal, and these were estimated at LE 260,000 each.

Access roads requiring bridges are listed in Table 4D-8 below:

Table 4D-8

ACCESS ROAD BRIDGES

ACCESS ROAD	CROSSINGS OF BAHR YOUSSEF	NUMBER OR OTHER MINOR BRIDGES
Fashn	1	3
Maghagha	0	4
Beni Mazar	1	2
Samalut	1	4
Minia	1	4
Mallawi	0	3
	4	20

Although the Beni Suef-Fayoum Road was not treated as an access road as such, one major item of construction on this route would be required to accomodate traffic to and from the new highway, which would be a new bridge over the Bahr Youssef Canal in the area of El Lahoun, on the boundary between Beni Suef and Fayoum Governorates. The existing road crossing of the canal is very tortuous and could not handle increased volumes of traffic. The cost of a new crossing was estimated at LE 510,000.

All costs above are in terms of financial costs.

Costs of Access Roads - Total costs of access roads are presented in Annex 4D-2 to this Appendix. Costs are summarized in Table 4D-9 below.

Table 4D-9

CONSTRUCTION COSTS OF ACCESS ROADS
(LE millions, 1985/86)

COST CLASS	FIRST STAGE CONSTRUCTION(1)	TOTAL CONSTRUCTION (2)
Financial	28.6	64.0
Economic	36.9	84.7
Foreign Exchange	9.3	25.4

(1) At-grade intersections
(2) Grade separated intersection

ANNEX 4D-1 NEW CAIRO-ASSUIT HIGHWAY, 2-LANE, QUANTITIES AND COSTS (FINANCIAL)

Eco cost? (0=N,1=Y):	0	ROADWAY		UNIT PRICES	FIN	ECO	FOR X	
		No. carriageway	1	Cut/Fill	3.00	1.281	0.334	per m3
LAYER THICKNESSES		No. shoulders	2	Crushed stone sub-base	20.00	1.360	0.453	per m3
Road sub-base	15.0 cms	Carriage width	8.5 meters	Prime coat	0.20	1.121	0.205	per m2
(A-G, BS-F)	20.0	Shoulder width	3.0 meters	Binder/Premix base	45.00	1.397	0.415	per m3
Shoulder sub-base	15.0	Paint lines/car	3	Tack coat	0.15	1.068	0.224	per m2
Road base (FR-BS)	20.0	If one car, cut	0.66	Wearing course	52.00	1.344	0.350	per m3
(BS-A)	18.0	fill	0.49	Striping	260.00	1.038	0.080	per km
Wearing course	5.0	1-car drain fac	0.75	Major structs		1.350	0.453	
Should base (premix)	5.0			Minor structs		1.300	0.326	
Number of tack coats	2.0			Dune Facing	42.00	1.300	0.326	per m3
				Land	3.60	1.000	0.000	per m2

LOCATION	LENGTH	CUT	FILL	SUB-BASE Road	SUB-BASE Should	PRIME COAT	ROAD BASE	TACK COAT	WEAR COURSE	SHOULD BASE	STRIPE MARKING	STRUC	DUNE FACING	AREA LAND
	(kms)	(m3)	(m3)	(m3)	(m3)	(m2)	(m3)	(m2)	(m3)	(m3)	(kms)		(m3)	(m2)
Quantities (thousands, except kilometers)														
Fayoum Road	12.6	147	147	17	9	170	21	214	5	3	38			0
Fayoum Rd-Aiyat	24.0	674	638	32	18	324	41	408	10	6	72			0
Aiyat-Gerza	22.5	1,048	680	41	17	304	38	383	10	6	68			0
Gerza-Beni Suef	34.8	502	522	47	26	470	59	592	15	9	104			44
Beni Suef-Fashn	42.3	990	1,465	76	32	571	65	719	18	11	127			6
Fashn-Maghagha	14.9	336	255	20	11	201	23	253	6	4	45			0
Maghagha-Beni Mazar	29.2	307	447	39	22	394	45	496	12	7	88			0
Beni Mazar-Samalut	28.7	552	734	39	22	387	44	488	12	7	86		10	0
Samalut-Minia	28.0	16	842	38	21	378	43	476	12	7	84		11	0
Minia-Mallawi	34.2	10	2,729	46	26	462	52	581	15	9	103		94	0
Mallawi-Dairut	24.2	192	644	33	18	327	37	411	10	6	73			0
Dairut-Qusiya	17.7	667	425	24	13	239	27	301	8	4	53			0
Qusiya-Manfalut	31.2	700	622	42	23	421	48	530	13	8	94			0
Manfalut-Assuit	11.5	293	118	16	9	155	18	196	5	3	35			0
	355.8	6,434	10,267	509	267	4,803	560	6,049	151	89	1,067	0	116	50

Costs of Construction (LE thousands)														TOTAL COST
Fayoum Road	291	216	340	189	34	964	32	278	142	10	0	0	0	2,496
Fayoum Rd-Aiyat	1,335	938	648	360	65	1,836	61	530	270	19	105	0	0	6,167
Aiyat-Gerza	2,074	1,000	810	338	61	1,721	57	497	253	18		0	0	6,829
Gerza-Beni Suef	993	767	940	522	94	2,662	89	769	391	27		0	158	7,413
Beni Suef-Fashn	1,960	2,154	1,523	635	114	2,912	108	935	476	33	399	0	22	11,269
Fashn-Maghagha	665	375	402	224	40	1,026	38	329	168	12	90	0	0	3,369
Maghagha-Beni Mazar	608	657	788	438	79	2,010	74	645	329	23	240	0	0	5,892
Beni Mazar-Samalut	1,094	1,078	775	431	77	1,976	73	634	323	22		437	0	6,920
Samalut-Minia	31	1,237	756	420	76	1,928	71	619	315	22	120	466	0	6,061
Minia-Mallawi	20	4,012	923	513	92	2,355	87	756	385	27		3,948	0	13,118
Mallawi-Dairut	381	947	653	363	65	1,666	62	535	272	19		0	0	4,963
Dairut-Qusiya	1,321	625	478	266	48	1,219	45	391	199	14		0	0	4,005
Qusiya-Manfalut	1,387	914	842	468	84	2,148	80	690	351	24		0	0	6,988
Manfalut-Assuit	580	174	311	173	31	792	29	254	129	9		0	0	2,481
	12,740	15,092	10,190	5,337	961	25,215	907	7,863	4,003	278	954	4,851	180	88,570

ANNEX 4D-1 NEW CAIRO-ASSUIT HIGHWAY, 2-LANE, QUANTITIES AND COSTS (ECONOMIC)

Eco cost? (0=N,1=Y):	1
LAYER THICKNESSES	
Road sub-base	15.0 cms
(A-C, BS-F)	20.0
Shoulder sub-base	15.0
Road base (FR-BS)	20.0
(BS-A)	18.0
Wearing course	5.0
Should base (premix)	5.0
Number of tack coats	2.0

ROADWAY	
No. carriageway	1
No. shoulders	2
Carriage width	8.5 meters
Shoulder width	3.0 meters
Paint lines/car	3
If one car, cut	0.66
fill	0.49
1-car drain fac	0.75

UNIT PRICES	FIN	ECO	FOR X	
Cut/Fill	3.00	1.291	0.334	per m3
Crushed stone sub-base	20.00	1.360	0.453	per m3
Prime coat	0.20	1.121	0.205	per m2
Binder/Premix base	45.00	1.397	0.415	per m3
Tack coat	0.15	1.068	0.224	per m2
Wearing course	52.00	1.344	0.350	per m3
Striping	260.00	1.038	0.080	per km
Major structs		1.350	0.453	
Minor structs		1.300	0.326	
Dune Facing	42.00	1.300	0.326	per m3
Land	3.60	1.000	0.000	per m2

LOCATION	LENGTH	CUT	FILL	SUB-BASE Road	SUB-BASE Should	PRIME COAT	ROAD BASE	TACK COAT	WEAR COURSE	SHOULD BASE	STRIPE MARKING	STRUC	DUNE FACING	AREA LAND
	(kms)	(m3)	(m3)	(m3)	(m3)	(m2)	(m3)	(m2)	(m3)	(m3)	(kms)		(m3)	(m2)
Quantities (thousands, except kilometers)														
Fayoum Road	12.6	147	147	17	9	170	21	214	5	3	38			0
Fayoum Rd-Alyat	24.0	674	638	32	16	324	41	408	10	6	72			0
Alyat-Gerza	22.5	1,048	680	41	17	304	38	383	10	6	68			0
Gerza-Beni Suef	34.8	502	522	47	26	470	59	592	15	9	104			44
Beni Suef-Fashn	42.3	990	1,465	76	32	571	65	719	18	11	127			6
Fashn-Maghagha	14.9	336	255	20	11	201	23	253	6	4	45			0
Maghagha-Beni Mazar	29.2	307	447	39	22	394	45	496	12	7	88			0
Beni Mazar-Samalut	28.7	552	734	39	22	387	44	488	12	7	86		10	0
Samalut-Minia	28.0	16	842	38	21	378	43	476	12	7	84		11	0
Minia-Mallawi	34.2	10	2,729	46	26	462	52	581	15	9	103		94	0
Mallawi-Dairut	24.2	192	644	33	18	327	37	411	10	6	73			0
Dairut-Qusiya	17.7	667	425	24	13	239	27	301	8	4	53			0
Qusiya-Manfalut	31.2	700	622	42	23	421	48	530	13	8	94			0
Manfalut-Assuit	11.5	293	118	16	9	155	18	196	5	3	35			0
	355.8	6,434	10,267	509	267	4,803	560	6,049	151	89	1,067	0	116	50

Costs of Construction (LE thousands)														TOTAL COST
Fayoum Road	373	277	463	257	38	1,347	34	374	198	10	0	0	0	3,370
Fayoum Rd-Alyat	1,710	1,202	881	490	73	2,565	65	713	377	19	137	0	0	8,231
Alyat-Gerza	2,657	1,280	1,102	459	66	2,405	61	668	354	18		0	0	9,073
Gerza-Beni Suef	1,273	983	1,278	710	105	3,719	95	1,034	547	28		0	158	9,930
Beni Suef-Fashn	2,511	2,759	2,071	863	128	4,069	115	1,256	665	34	531	0	22	15,024
Fashn-Maghagha	852	481	547	304	45	1,433	41	443	234	12	117	0	0	4,509
Maghagha-Beni Mazar	779	841	1,072	596	88	2,809	80	867	459	24	312	0	0	7,927
Beni Mazar-Samalut	1,401	1,381	1,054	585	87	2,760	78	852	451	23		568	0	9,242
Samalut-Minia	40	1,585	1,028	571	85	2,693	76	832	440	23	156	606	0	8,134
Minia-Mallawi	25	5,139	1,256	698	104	3,269	93	1,016	537	28		5,132	0	17,318
Mallawi-Dairut	488	1,213	889	494	73	2,328	66	719	380	20		0	0	6,668
Dairut-Qusiya	1,692	800	650	361	54	1,702	48	526	278	14		0	0	6,126
Qusiya-Manfalut	1,776	1,170	1,145	636	94	3,001	85	927	490	25		0	0	9,352
Manfalut-Assuit	742	222	422	235	35	1,106	31	342	181	9		0	0	3,326
	16,320	19,333	13,858	7,258	1,077	35,226	969	10,568	5,592	288	1,253	6,306	180	118,228

For X cost? (0=N,1=Y)	1	ROADWAY		UNIT PRICES	FIN	ECO	FOR X	
		No. carriageway	1	Cut/Fill	3.00	1.281	0.334	per m3
LAYER THICKNESSES		No. shoulders	2	Crushed stone sub-base	20.00	1.360	0.453	per m3
Road sub-base	15.0 cms	Carriage width	8.5 meters	Prime coat	0.20	1.121	0.205	per m2
(A-G, BS-F)	20.0	Shoulder width	3.0 meters	Binder/Premix base	45.00	1.397	0.415	per m3
Shoulder sub-base	15.0	Paint lines/car	3	Tack coat	0.15	1.068	0.224	per m2
Road base (FR-BS)	20.0	If one car, cut	0.66	Wearing course	52.00	1.344	0.350	per m3
(BS-A)	18.0	fill	0.49	Striping	260.00	1.038	0.080	per km
Wearing course	5.0	1-car drain fac	0.75	Major structs		1.350	0.453	
Should base (premix)	5.0			Minor structs		1.300	0.326	
Number of tack coats	2.0			Dune Facing	42.00	1.300	0.326	per m3
				Land	3.60	1.000	0.000	per m2

LOCATION	LENGTH	CUT	FILL	SUB-BASE Road	SUB-BASE Should	PRIME COAT	ROAD BASE	TACK COAT	WEAR COURSE	SHOULD BASE	STRIPE MARKING	STRUC	DUNE FACING	AREA LAND
	(kms)	(m3)	(m3)	(m3)	(m3)	(m2)	(m3)	(m2)	(m3)	(m3)	(kms)		(m3)	(m2)
Quantities (thousands, except kilometers)														
Fayoum Road	12.6	147	147	17	9	170	21	214	5	3	38			0
Fayoum Rd-Aiyat	24.0	674	638	32	18	324	41	408	10	6	72			0
Aiyat-Gerza	22.5	1,048	680	41	17	304	38	383	10	6	68			0
Gerza-Beni Suef	34.8	502	522	47	26	470	59	592	15	9	104			44
Beni Suef-Fashn	42.3	990	1,465	76	32	571	65	719	18	11	127			6
Fashn-Maghagha	14.9	336	755	20	11	201	23	253	6	4	45			0
Maghagha-Beni Mazar	29.2	307	447	39	22	394	45	496	12	7	88			0
Beni Mazar-Samalut	28.7	552	734	39	22	387	44	488	12	7	86		10	0
Samalut-Minia	28.0	16	842	38	21	378	43	476	12	7	84		11	0
Minia-Mallawi	34.2	10	2,729	46	26	462	52	581	15	9	103		94	0
Mallawi-Dairut	24.2	192	644	33	18	327	37	411	10	6	73			0
Dairut-Qusiya	17.7	667	425	24	13	239	27	301	8	4	53			0
Qusiya-Manfalut	31.2	700	622	42	23	421	48	530	13	8	94			0
Manfalut-Assuit	11.5	293	118	16	9	155	18	196	5	3	35			0
	355.8	6,434	10,267	509	267	4,803	560	6,049	151	89	1,067	0	116	50

Costs of Construction (LE thousands)														TOTAL COST
Fayoum Road	97	72	154	86	7	400	7	97	59	1	0	0	0	980
Fayoum Rd-Aiyat	446	313	294	163	13	762	14	186	112	1	34	0	0	2,338
Aiyat-Gerza	693	334	367	153	12	714	13	174	105	1		0	0	2,567
Gerza-Beni Suef	332	256	426	236	19	1,105	20	269	162	2		0	0	2,828
Beni Suef-Fashn	655	719	690	287	23	1,209	24	327	197	3	163	0	0	4,298
Fashn-Maghagha	222	125	182	101	8	426	9	115	70	1	29	0	0	1,289
Maghagha-Beni Mazar	203	219	357	198	16	834	17	226	136	2	78	0	0	2,288
Beni Mazar-Samalut	365	360	351	195	16	820	16	222	134	2		142	0	2,624
Samalut-Minia	10	413	342	190	15	800	16	217	131	2	39	152	0	2,328
Minia-Mallawi	7	1,340	418	232	19	977	20	265	160	2		1,287	0	4,726
Mallawi-Dairut	127	316	296	164	13	691	14	187	113	2		0	0	1,924
Dairut-Qusiya	441	209	216	120	10	506	10	137	83	1		0	0	1,733
Qusiya-Manfalut	463	305	382	212	17	891	18	241	146	2		0	0	2,677
Manfalut-Assuit	194	58	141	78	6	329	7	89	54	1		0	0	955
	4,255	5,041	4,616	2,418	197	10,464	203	2,752	1,661	22	344	1,581	0	33,555

ANNEX 4D-1 NEW CAIRO-ASSUIT HIGHWAY, 4-LANE, QUANTITIES AND COSTS (FINANCIAL)

Eco cost? (0=N,1=Y): 0

LAYER THICKNESSES

Road sub-base	15.0 cms
(A-G, BS-F)	20.0
Shoulder sub-base	15.0
Road base (FR-BS)	20.0
(BS-A)	18.0
Wearing course	5.0
Should base (premix)	5.0
Number of tack coats	2.0

ROADWAY

No. carriageway	2
No. shoulders	2
Carriage width	8.5 meters
Shoulder width	3.0 meters
Paint lines/car	3
If one car, cut	0.66
fill	0.49
1-car drain fac	0.75

UNIT PRICES	FIN	ECO	FOR x	
Cut/Fill	3.00	1.281	0.334	per m3
Crushed stone sub-base	20.00	1.360	0.453	per m3
Prime coat	0.20	1.121	0.205	per m2
Binder/Premix base	45.00	1.397	0.415	per m3
Tack coat	0.15	1.008	0.224	per m2
Wearing course	52.00	1.344	0.350	per m3
Striping	260.00	1.038	0.080	per km
Major structs		1.350	0.453	
Minor structs		1.300	0.326	
Dune Facing	42.00	1.300	0.326	per m3
Land	3.60	1.000	0.000	per m2

LOCATION	LENGTH	CUT	FILL	SUB-BASE Road	SUB-BASE Should	PRIME COAT	ROAD BASE	TACK COAT	WEAR COURSE	SHOULD BASE	STRIPE MARKING	STRUC	DUNE FACING	AREA LAND
	(kms)	(m3)	(m3)	(m3)	(m3)	(m2)	(m3)	(m2)	(m3)	(m3)	(kms)		(m3)	(m2)
Quantities (thousands, except kilometers)														
Fayoum Road	12.6	147	147	34	11	290	43	428	11	4	76			0
Fayoum Rd-Aiyat	24.0	674	638	65	22	552	82	816	20	7	144			0
Aiyat-Gerza	22.5	1,048	680	81	20	518	77	765	19	7	135			0
Gerza-Beni Suef	34.8	502	522	94	31	800	118	1,183	30	10	209			44
Beni Suef-Fashn	42.3	990	1,465	152	38	973	129	1,438	36	13	254			6
Fashn-Maghagha	14.9	336	255	40	13	343	46	507	13	4	89			0
Maghagha-Beni Mazar	29.2	307	447	79	26	672	89	993	25	9	175			0
Beni Mazar-Samalut	28.7	552	734	77	26	660	88	976	24	9	172		10	0
Samalut-Minia	28.0	16	842	76	25	644	86	952	24	8	168		11	0
Minia-Mallawi	34.2	10	2,729	92	31	787	105	1,163	29	10	205		94	0
Mallawi-Dairut	24.2	192	644	65	22	557	74	823	21	7	145			0
Dairut-Qusiya	17.7	667	425	48	16	407	54	602	15	5	106			0
Qusiya-Manfalut	31.2	700	622	84	28	718	95	1,061	27	9	187			0
Manfalut-Assuit	11.5	293	118	31	10	265	35	391	10	3	69			0
	355.8	6,434	10,267	1,019	320	8,183	1,121	12,097	302	107	2,135	0	116	50

Costs of Construction (LE thousands)														TOTAL COST
Fayoum Road	441	441	680	227	58	1,928	64	557	170	20	2,630	0	0	7,215
Fayoum Rd-Aiyat	2,023	1,914	1,296	432	110	3,672	122	1,061	324	37	140	0	0	11,132
Aiyat-Gerza	3,143	2,040	1,620	405	104	3,443	115	995	304	35		0	0	12,202
Gerza-Beni Suef	1,505	1,566	1,879	626	160	5,324	177	1,538	470	54		0	158	13,459
Beni Suef-Fashn	2,970	4,395	3,046	761	195	5,825	216	1,870	571	66	19,185	0	22	39,120
Fashn-Maghagha	1,008	766	805	268	69	2,052	76	659	201	23	120	0	0	6,046
Maghagha-Beni Mazar	922	1,340	1,577	526	134	4,021	149	1,291	394	46	320	0	0	10,719
Beni Mazar-Samalut	1,657	2,201	1,550	517	132	3,952	146	1,269	387	45		437	0	12,292
Samalut-Minia	47	2,525	1,512	504	129	3,856	143	1,238	378	44	160	466	0	11,001
Minia-Mallawi	30	8,188	1,847	616	157	4,709	174	1,512	462	53		3,948	0	21,696
Mallawi-Dairut	577	1,932	1,307	436	111	3,332	123	1,070	327	38		0	0	9,252
Dairut-Qusiya	2,001	1,275	956	319	81	2,437	90	782	239	28		0	0	8,209
Qusiya-Manfalut	2,101	1,865	1,685	562	144	4,296	159	1,379	421	49		0	0	12,660
Manfalut-Assuit	878	354	621	207	53	1,584	59	508	155	18		0	0	4,437
	19,303	30,801	20,380	6,404	1,637	50,430	1,815	15,726	4,803	555	22,555	4,851	180	179,440

Eco cost? (0=N,1=Y): 1

LAYER THICKNESSES

Road sub-base	15.0 cms
(A-G, BS-F)	20.0
Shoulder sub-base	15.0
Road base (F&R-BS)	20.0
(BS-A)	18.0
Wearing course	5.0
Should base (premix)	5.0
Number of tack coats	2.0

ROADWAY

No. carriageway	2
No. shoulders	2
Carriage width	8.5 meters
Shoulder width	3.0 meters
Paint lines/car	3
If one car, cut	0.66
fill	0.49
1-car drain fac	0.75

UNIT PRICES

	FIN	ECO	FOR X	
Cut/Fill	3.00	1.281	0.334	per m3
Crushed stone sub-base	20.00	1.360	0.453	per m3
Prime coat	0.20	1.121	0.205	per m2
Binder/Premix base	45.00	1.397	0.415	per m3
Tack coat	0.15	1.068	0.224	per m2
Wearing course	52.00	1.344	0.350	per m3
Striping	260.00	1.038	0.080	per km
Major structs		1.350	0.453	
Minor structs		1.300	0.326	
Dune Facing	42.00	1.300	0.326	per m3
Land	3.60	1.000	0.000	per m2

LOCATION	LENGTH	CUT	FILL	SUB-BASE Road	SUB-BASE Should	PRIME COAT	ROAD BASE	TACK COAT	WEAR COURSE	SHOULD BASE	STRIPE MARKING	STRUC	DUNE FACING	AREA LAND
	(kms)	(m3)	(m3)	(m3)	(m3)	(m2)	(m3)	(m2)	(m3)	(m3)	(kms)		(m3)	(m2)
Quantities (thousands, except kilometers)														
Fayoum Road	12.6	147	147	34	11	290	43	428	11	4	76			0
Fayoum Rd-Aiyat	24.0	674	638	65	22	552	82	816	20	7	144			0
Aiyat-Gerza	22.5	1,048	680	81	20	518	77	765	19	7	135			0
Gerza-Beni Suef	34.8	502	522	94	31	800	118	1,183	30	10	209			44
Beni Suef-Fashn	42.3	990	1,465	152	38	973	129	1,438	36	13	254			6
Fashn-Maghagha	14.9	336	255	40	13	343	46	507	13	4	89			0
Maghagha-Beni Mazar	29.2	307	447	79	26	672	89	993	25	9	175			0
Beni Mazar-Samalut	28.7	552	734	77	26	660	88	976	24	9	172		10	0
Samalut-Minia	28.0	16	842	76	25	644	86	952	24	8	168		11	0
Minia-Mallawi	34.2	10	2,729	92	31	787	105	1,163	29	10	205		94	0
Mallawi-Dairut	24.2	192	644	65	22	557	74	823	21	7	145			0
Dairut-Qusiya	17.7	667	425	48	16	407	54	602	15	5	106			0
Qusiya-Manfalut	31.2	700	622	84	28	718	95	1,061	27	9	187			0
Manfalut-Assuit	11.5	293	118	31	10	265	35	391	10	3	69			0
	355.8	6,434	10,267	1,019	320	8,183	1,121	12,097	302	107	2,135	0	116	50
Costs of Construction (LE thousands)														TOTAL COST
Fayoum Road		565	565	925	308	65	2,693	69	749	238	20	3,419	0	0	9,615
Fayoum Rd-Aiyat		2,591	2,452	1,763	588	124	5,130	131	1,426	453	39	182	0	0	14,877
Aiyat-Gerza		4,026	2,613	2,203	551	116	4,809	123	1,337	424	36		0	0	16,239
Gerza-Beni Suef		1,928	2,006	2,556	852	179	7,438	190	2,067	656	56		0	158	18,087
Beni Suef-Fashn		3,804	5,630	4,142	1,036	218	8,137	230	2,513	798	68	25,891	0	22	52,489
Fashn-Maghagha		1,292	981	1,094	365	77	2,866	81	885	281	24	156	0	0	8,102
Maghagha-Beni Mazar		1,181	1,717	2,144	715	151	5,617	159	1,735	551	47	416	0	0	14,432
Beni Mazar-Samalut		2,123	2,819	2,108	703	148	5,521	156	1,705	541	46		568	0	16,428
Samalut-Minia		60	3,235	2,056	685	144	5,386	153	1,663	528	45	208	606	0	14,770
Minia-Mallawi		38	10,489	2,512	837	176	6,579	186	2,032	645	55		5,132	0	28,692
Mallawi-Dairut		739	2,475	1,777	592	125	4,655	132	1,438	456	39		0	0	12,429
Dairut-Qusiya		2,564	1,633	1,300	433	91	3,405	96	1,051	334	29		0	0	10,937
Qusiya-Manfalut		2,692	2,388	2,291	764	161	6,002	170	1,853	588	51		0	0	16,960
Manfalut-Assuit		1,125	454	845	282	59	2,212	63	683	217	19		0	0	5,958
		24,727	39,456	27,716	8,710	1,835	70,451	1,938	21,136	6,710	576	30,272	6,306	180	240,013

ANNEX 4D-1 NEW CAIRO-ASSUIT HIGHWAY, 4-LANE, QUANTITIES AND COSTS (FOREIGN EXCHANGE)

For X cost? (0=N,1=Y)	1
LAYER THICKNESSES	
Road sub-base	15.0 cms
(A-G, BS-F)	20.0
Shoulder sub-base	15.0
Road base (FR-BS)	20.0
(BS-A)	18.0
Wearing course	5.0
Should base (premix)	5.0
Number of tack coats	2.0

ROADWAY	
No. carriageway	2
No. shoulders	2
Carriage width	8.5 meters
Shoulder width	3.0 meters
Paint lines/car	3
If one car, cut	0.66
fill	0.49
1-car drain fac	0.75

UNIT PRICES	FIN	ECO	FOR X	
Cut/Fill	3.00	1.281	0.334	per m3
Crushed stone sub-base	20.00	1.360	0.453	per m3
Prime coat	0.20	1.121	0.205	per m2
Binder/Premix base	45.00	1.397	0.415	per m3
Tack coat	0.15	1.068	0.224	per m2
Wearing course	52.00	1.344	0.350	per m3
Striping	260.00	1.038	0.080	per km
Major structs		1.350	0.453	
Minor structs		1.300	0.326	
Dune Facing	42.00	1.300	0.326	per m3
Land	3.60	1.000	0.000	per m2

LOCATION	LENGTH	CUT	FILL	SUB-BASE Road	SUB-BASE Should	PRIME COAT	ROAD BASE	TACK COAT	WEAR COURSE	SHOULD BASE	STRIPE MARKING	STRUC	DUNE FACING	AREA LAND
	(kms)	(m3)	(m3)	(m3)	(m3)	(m2)	(m3)	(m2)	(m3)	(m3)	(kms)		(m3)	(m2)
Quantities (thousands, except kilometers)														
Fayoum Road	12.6	147	147	34	11	290	43	428	11	4	76			0
Fayoum Rd-Aiyat	24.0	674	638	65	22	552	82	816	20	7	144			0
Aiyat-Gerza	22.5	1,048	680	81	20	518	77	765	19	7	135			0
Gerza-Beni Suef	34.8	502	522	94	31	800	118	1,183	30	10	209			44
Beni Suef-Fashn	42.3	990	1,465	152	38	973	129	1,438	36	13	254			6
Fashn-Maghagha	14.9	336	255	40	13	343	46	507	13	4	89			0
Maghagha-Beni Mazar	29.2	307	447	79	26	672	89	993	25	9	175			0
Beni Mazar-Samalut	28.7	552	734	77	26	660	88	976	24	9	172		10	0
Samalut-Minia	28.0	16	842	76	25	644	86	952	24	8	168		11	0
Minia-Mallawi	34.2	10	2,729	92	31	787	105	1,163	29	10	205		94	0
Mallawi-Dairut	24.2	192	644	65	22	557	74	823	21	7	145			0
Dairut-Qusiya	17.7	667	425	48	16	407	54	602	15	5	106			0
Qusiya-Manfalut	31.2	700	622	84	28	718	95	1,061	27	9	187			0
Manfalut-Assuit	11.5	293	118	31	10	265	35	391	10	3	69			0
	355.8	6,434	10,267	1,019	320	8,183	1,121	12,097	302	107	2,135	0	116	50

Costs of Construction (LE thousands)														TOTAL COST
Fayoum Road	147	147	308	103	12	800	14	195	71	2	857	0	0	2,656
Fayoum Rd-Aiyat	676	639	587	196	23	1,524	27	371	134	3	46	0	0	4,226
Aiyat-Gerza	1,050	681	734	183	21	1,429	26	348	126	3		0	0	4,601
Gerza-Beni Suef	503	523	851	284	33	2,210	40	538	195	4		0	0	5,181
Beni Suef-Fashn	992	1,468	1,380	345	40	2,417	48	654	237	5	8,667	0	0	16,254
Fashn-Maghagha	337	256	364	121	14	851	17	231	83	2	39	0	0	2,316
Maghagha-Beni Mazar	308	448	714	238	28	1,669	33	452	164	4	104	0	0	4,161
Beni Mazar-Samalut	554	735	702	234	27	1,640	33	444	161	4		142	0	4,675
Samalut-Minia	16	843	685	228	26	1,600	32	433	157	3	52	152	0	4,228
Minia-Mallawi	10	2,735	837	279	32	1,954	39	529	192	4		1,287	0	7,898
Mallawi-Dairut	193	645	592	197	23	1,383	28	374	136	3		0	0	3,574
Dairut-Qusiya	668	426	433	144	17	1,011	20	274	99	2		0	0	3,095
Qusiya-Manfalut	702	623	763	254	29	1,783	36	483	175	4		0	0	4,852
Manfalut-Assuit	293	118	281	94	11	657	13	178	64	1		0	0	1,712
	6,447	10,288	9,232	2,901	336	20,929	406	5,504	1,993	44	9,766	1,581	0	69,428

ANNEX 4D-2 NEW CAIRO-ASSUIT HIGHWAY, STAGE 1, ACCESS ROAD QUANTITIES AND COSTS (FINANCIAL)

Eco cost? (0=N,1=Y) 0 Construc stage 1

	CLASS 1		CLASS 2		CLASS 3		
LAYER THICKNESSES	Agric	Desert	Agric	Desert	Agric	Desert	
Road sub-base	35	15	32	15	30	15	cms
Road base (binder)	18	18	14	14	11	11	cms
Shoulder sub-base	15	15	cms				
Wearing course	5	5	cms				
Shoul base (premix)	5	5	cms				
Levelling course	2.5	2.5	cms				

Carriage width	7.5	meters	EMBANKMENT	New	Exist
Shoulder width	2.5	meters	Right of way	19.0	10.0 meters
Exist car width	6.5	meters	Cross-sec Area	12.3	2.8 sq mts
Paint lines/car	3				

UNIT PRICES		FIN	ECO	FOR X
Embankment		3.00	1.281	0.334
Crushed stone sub-base		20.00	1.360	0.453
Prime coat		0.20	1.121	0.205
Binder/Premix base		45.00	1.397	0.415
Tack coat		0.15	1.068	0.224
Wearing course		52.00	1.344	0.359
Striping		260.00	1.038	0.080
Major structures			1.350	0.453
Minor structures			1.300	0.326
Land	agric	3.60	1.000	0.000
	reclaim	1.40	1.000	0.000

LOCATION	CLASS	TOTAL LENGTH	REC/AG	EMBANK	SUB-BASE Road	SUB-BASE Should	PRIME COAT	ROAD BASE	TACK COAT	WEAR COURSE	SHOULD BASE	STRIPE MARKING	STRUC	LEVEL COURSE	AREA LAND
		(kms)		(m3)	(m3)	(m3)	(m2)	(m3)	(m2)	(m3)	(m3)	(kms)			(m2)
New Construction Quantities (thousands, except kms)															
Aiyat	3	12.2	0.0	150	14.6	9.2	152.5	10.1	91.5	4.6	3.1	36.6			0.0
Gerza	2	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			0.0
Beni Suef		0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			0.0
Fashn	3	2.5	0.0	31	3.0	1.9	31.3	2.1	18.8	0.9	0.6	7.5			0.0
Maghagha	3	2.5	0.0	31	3.0	1.9	31.3	2.1	18.8	0.9	0.6	7.5			0.0
Beni Mazaar	3	0.9	0.0	11	1.1	0.7	11.3	0.7	6.8	0.3	0.2	2.7			0.0
Samalut	3	1.5	0.0	18	1.8	1.1	18.8	1.2	11.3	0.6	0.4	4.5			0.0
Minia	2	10.5	1.6	129	12.6	7.9	131.3	11.0	78.8	3.9	2.6	31.5			30.4
Mallawi	3	1.4	0.0	17	1.7	1.1	17.5	1.2	10.5	0.5	0.4	4.2			0.0
Dairut	3	1.5	0.0	18	1.8	1.1	18.8	1.2	11.3	0.6	0.4	4.5			0.0
Quisiya	3	3.6	2.2	44	4.3	2.7	45.0	3.0	27.0	1.4	0.9	10.8			41.8
Manfalut	3	1.4	0.0	17	1.7	1.1	17.5	1.2	10.5	0.5	0.4	4.2			0.0
New Valley	1	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			0.0
		38.0	3.8	467.4	45.6	28.5	475.0	33.7	285.0	14.3	9.5	114.0	0.0	0.0	72.2
Existing Rd Improvement Quantities (thousands, except kms)															
Aiyat	3	3.0	3.0	8.4	1.4	2.3	18.0	2.5	57.0	1.9	0.0	9.0		0.5	30.0
Gerza	2	6.2	1.0	17.4	1.7	4.7	37.2	6.5	117.8	3.9	0.0	18.6		1.0	10.0
Beni Suef		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0
Fashn	3	19.1	15.4	53.5	7.8	14.3	114.6	15.8	362.9	11.9	0.0	57.3		3.1	154.0
Maghagha	3	22.1	22.1	61.9	9.9	16.6	132.6	18.2	419.9	13.8	0.0	66.3		3.6	221.0
Beni Mazaar	3	20.3	15.7	56.8	8.1	15.2	121.8	16.7	385.7	12.7	0.0	60.9		3.3	157.0
Samalut	3	15.1	14.1	42.3	6.6	11.3	90.6	12.5	286.9	9.4	0.0	45.3		2.5	141.0
Minia	2	5.8	5.8	16.2	2.8	4.4	34.8	6.1	110.2	3.6	0.0	17.4		0.9	58.0
Mallawi	3	13.7	13.7	38.4	6.2	10.3	82.2	11.3	260.3	8.6	0.0	41.1		2.2	137.0
Dairut	3	12.3	11.8	34.4	5.4	9.2	73.8	10.1	233.7	7.7	0.0	36.9		2.0	118.0
Quisiya	3	8.3	8.3	23.2	3.7	6.2	49.8	6.8	157.7	5.2	0.0	24.9		1.3	83.0
Manfalut	3	9.0	9.0	25.2	4.1	6.8	54.0	7.4	171.0	5.6	0.0	27.0		1.5	90.0
New Valley	1	8.0	2.0	22.4	2.4	6.0	48.0	10.8	152.0	5.0	0.0	24.0		1.3	20.0
		142.9	121.9	400	60	107	857	125	2,715	89	0	429	0	23	1,719

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Eco cost? (0=N,1=Y) 0 Construc stage 1

LAYER THICKNESSES	CLASS 1 Agric	CLASS 1 Desert	CLASS 2 Agric	CLASS 2 Desert	CLASS 3 Agric	CLASS 3 Desert	
Road sub-base	35	15	32	15	30	15	cms
Road base (binder)	18	18	14	14	11	11	cms
Shoulder sub-base	15	15	cms				
Wearing course	5	5	cms				
Shoul base (premix)	5	5	cms				
Levelling course	2.5	2.5	cms				

Carriage width 7.5 meters
Shoulder width 2.5 meters
Exist car width 6.5 meters
Paint lines/car 3

EMBANKMENT	New	Exist	
Right of way	19.0	10.0	meters
Cross-sec Area	12.3	2.8	sq mts

UNIT PRICES	FIN	ECO	FOR X
Embankment	3.00	1.281	0.334
Crushed stone sub-base	20.00	1.360	0.453
Prime coat	0.20	1.121	0.295
Binder/Premix base	45.00	1.397	0.415
Tack coat	0.15	1.068	0.224
Wearing course	52.00	1.344	0.390
Striping	260.00	1.038	0.080
Major structures		1.350	0.453
Minor structures		1.300	0.324
Land agric	3.60	1.000	0.000
reclaim	1.40	1.000	0.000

LOCATION	CLASS	TOTAL LENGTH (kms)	LENGTH REC/AG (kms)	EMBANK (m3)	SUB-BASE Road (m3)	SUB-BASE Should (m3)	PRIME COAT (m2)	ROAD BASE (m3)	TACK COAT (m2)	WEAR COURSE (m3)	SHOULD BASE (m3)	STRIPE MARKING (kms)	STRUC	LEVEL COURSE	AREA LAND (m2)
Total Quantities (thousands, except kms)															
Aiyat	3	15.2		158.5	16.0	11.4	170.5	12.5	148.5	6.5	3.1	45.6	0.0	0.5	30.0
Gerza	2	6.2		17.4	1.7	4.7	37.2	6.5	117.8	3.9	0.0	18.6	0.0	1.0	10.0
Beni Suef		0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fashn	3	21.6		84.2	10.8	16.2	145.9	17.8	381.7	12.9	0.6	64.8	0.0	3.1	154.0
Maghagha	3	24.6		92.6	12.9	18.5	163.9	20.3	436.7	14.8	0.6	73.8	0.0	3.6	221.0
Beni Mazaar	3	21.2		67.9	9.2	15.9	133.1	17.5	392.5	13.0	0.2	63.6	0.0	3.3	157.0
Samalut	3	16.6		60.7	8.4	12.5	109.4	13.7	298.2	10.0	0.4	49.8	0.0	2.5	141.0
Minia	2	16.3		145.4	15.4	12.2	166.1	17.1	169.0	7.6	2.6	48.9	0.0	0.9	88.4
Mallawi	3	15.1		55.6	7.8	11.3	99.7	12.5	270.8	9.1	0.4	45.3	0.0	2.2	137.0
Dairut	3	13.8		52.9	7.2	10.4	92.6	11.4	245.0	8.3	0.4	41.4	0.0	2.0	118.0
Quisiya	3	11.9		67.5	8.1	8.9	94.8	9.8	184.7	6.5	0.9	35.7	0.0	1.3	124.8
Manfalut	3	10.4		42.4	5.7	7.8	71.5	8.6	181.5	6.2	0.4	31.2	0.0	1.5	90.0
New Valley	1	8.0		22.4	2.4	6.0	48.0	10.8	152.0	5.0	0.0	24.0	0.0	1.3	20.0
		181		868	106	136	1,332	159	3,000	104	10	543	0	23	1,291
Costs of Construction (LE thousands)															TOTAL COST
Aiyat	3			475	320	228	34	564	22	335	137	12	0	22	108	2,258
Gerza	2			52	33	93	7	293	18	202	0	5	0	45	36	784
Beni Suef				0	0	0	0	0	0	0	0	0	510	0	0	510
Fashn	3			253	215	324	29	802	57	670	28	17	298	140	554	3,386
Maghagha	3			278	259	369	33	913	66	767	28	19	50	162	796	3,739
Beni Mazaar	3			204	184	318	27	787	59	677	10	17	285	148	565	3,269
Samalut	3			182	167	249	22	616	45	520	17	13	310	110	508	2,759
Minia	2			436	308	245	33	770	28	393	118	13	310	42	251	2,948
Mallawi	3			167	157	227	20	561	41	473	16	12	38	100	493	2,302
Dairut	3			159	144	207	19	512	37	429	17	11	0	90	425	2,049
Quisiya	3			203	161	179	19	442	28	340	41	9	0	61	357	1,939
Manfalut	3			127	115	156	14	386	27	320	16	8	0	66	324	1,559
New Valley	1			67	48	120	10	486	23	260	0	6	0	59	72	1,150
				2,603	2,111	2,714	266	7,133	450	5,385	428	141	1,800	1,045	4,489	28,564

Eco cost? (0=N,1=Y) 1 Construc stage 1

LAYER THICKNESSES	CLASS 1 Agric	CLASS 1 Desert	CLASS 2 Agric	CLASS 2 Desert	CLASS 3 Agric	CLASS 3 Desert	
Road sub-base	35	15	32	15	30	15	cms
Road base (binder)	18	18	14	14	11	11	cms
Shoulder sub-base	15	15	cms				
Wearing course	5	5	cms				
Shoul base (premix)	5	5	cms				
Levelling course	2.5	2.5	cms				

Carriage width	7.5	meters	EMBANKMENT	New	Exist
Shoulder width	2.5	meters	Right of way	19.0	10.0 meters
Exist car width	6.5	meters	Cross-sec Area	12.3	2.8 sq mts
Paint lines/car	3				

UNIT PRICES	FIN	ECO	FOR X
Embankment	3.00	1.281	0.334
Crushed stone sub-base	20.00	1.360	0.453
Prime coat	0.20	1.121	0.265
Binder/Premix base	45.00	1.397	0.411
Tack coat	0.15	1.068	0.224
Wearing course	52.00	1.344	0.359
Striping	260.00	1.038	0.080
Major structures		1.350	0.453
Minor structures		1.300	0.326
Land agric	3.60	1.000	0.000
reclaim	1.40	1.000	0.000

LOCATION	CLASS	TOTAL LENGTH (kms)	LENGTH REC/AG	EMBANK (m3)	SUB-BASE Road (m3)	SUB-BASE Should (m3)	PRIME COAT (m2)	ROAD BASE (m3)	TACK COAT (m2)	WEAR COURSE (m3)	SHOULD BASE (m3)	STRIPE MARKING (kms)	STRUC	LEVEL COURSE	AREA LAND (m2)
New Construction Quantities (thousands, except kms)															
Aiyat	3	12.2	0.0	150	14.6	9.2	152.5	10.1	91.5	4.6	3.1	36.6			0.0
Gerza	2	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			0.0
Beni Suef		0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			0.0
Fashn	3	2.5	0.0	31	3.0	1.9	31.3	2.1	18.8	0.9	0.6	7.5			0.0
Maghagha	3	2.5	0.0	31	3.0	1.9	31.3	2.1	18.8	0.9	0.6	7.5			0.0
Beni Mazaar	3	0.9	0.0	11	1.1	0.7	11.3	0.7	6.8	0.3	0.2	2.7			0.0
Samalut	3	1.5	0.0	18	1.8	1.1	18.8	1.2	11.3	0.6	0.4	4.5			0.0
Minia	2	10.5	1.6	129	12.6	7.9	131.3	11.0	78.8	3.9	2.6	31.5			30.4
Mallawi	3	1.4	0.0	17	1.7	1.1	17.5	1.2	10.5	0.5	0.4	4.2			0.0
Dairut	3	1.5	0.0	18	1.8	1.1	18.8	1.2	11.3	0.6	0.4	4.5			0.0
Quisiya	3	3.6	2.2	44	4.3	2.7	45.0	3.0	27.0	1.4	0.9	10.8			41.8
Manfalut	3	1.4	0.0	17	1.7	1.1	17.5	1.2	10.5	0.5	0.4	4.2			0.0
New Valley	1	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			0.0
		38.0	3.8	467.4	45.6	28.5	475.0	33.7	285.0	14.3	9.5	114.0	0.0	0.0	72.2
Existing Rd Improvement Quantities (thousands, except kms)															
Aiyat	3	3.0	3.0	8.4	1.4	2.3	18.0	2.5	57.0	1.9	0.0	9.0		0.5	30.0
Gerza	2	6.2	1.0	17.4	1.7	4.7	37.2	6.5	117.8	3.9	0.0	18.6		1.0	10.0
Beni Suef		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0
Fashn	3	19.1	15.4	53.5	7.8	14.3	114.6	15.8	362.9	11.9	0.0	57.3		3.1	154.0
Maghagha	3	22.1	22.1	61.9	9.9	16.6	132.6	18.2	419.9	13.8	0.0	66.3		3.6	221.0
Beni Mazaar	3	20.3	15.7	56.8	8.1	15.2	121.8	16.7	385.7	12.7	0.0	60.9		3.3	157.0
Samalut	3	15.1	14.1	42.3	6.6	11.3	90.6	12.5	286.9	9.4	0.0	45.3		2.5	141.0
Minia	2	5.8	5.8	16.2	2.8	4.4	34.8	6.1	110.2	3.6	0.0	17.4		0.9	58.0
Mallawi	3	13.7	13.7	38.4	6.2	10.3	82.2	11.3	260.3	8.6	0.0	41.1		2.2	137.0
Dairut	3	12.3	11.8	34.4	5.4	9.2	73.8	10.1	233.7	7.7	0.0	36.9		2.0	118.0
Quisiya	3	8.3	8.3	23.2	3.7	6.2	49.8	6.8	157.7	5.2	0.0	24.9		1.3	83.0
Manfalut	3	9.0	9.0	25.2	4.1	6.8	54.0	7.4	171.0	5.6	0.0	27.0		1.5	90.0
New Valley	1	8.0	2.0	22.4	2.4	6.0	48.0	10.8	152.0	5.0	0.0	24.0		1.3	20.0
		142.9	121.9	400	60	107	857	125	2,715	89	0	429	0	23	1,219

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ANNEX 4D-2 NEW CAIRO-ASSUIT HIGHWAY, STAGE 1, ACCESS ROAD QUANTITIES AND COSTS (ECONOMIC)

Eco cost? (0=N,1=Y) 1 Construc stage 1

LAYER THICKNESSES	CLASS 1 Agric	CLASS 1 Desert	CLASS 2 Agric	CLASS 2 Desert	CLASS 3 Agric	CLASS 3 Desert	
Road sub-base	35	15	32	15	30	15	cms
Road base (binder)	18	18	14	14	11	11	cms
Shoulder sub-base	15	15	cms				
Wearing course	5	5	cms				
Shoul base (premix)	5	5	cms				
Levelling course	2.5	2.5	cms				

Carriage width	7.5 meters	EMBANKMENT	New	Exist
Shoulder width	2.5 meters	Right of way	19.0	10.0 meters
Exist car width	6.5 meters	Cross-sec Area	12.3	2.8 sq mts
Paint lines/car	3			

UNIT PRICES	FIN	ECO	FOR X
Embankment	3.00	1.281	0.334
Crushed stone sub-base	20.00	1.360	0.459
Prime coat	0.20	1.121	0.295
Binder/Premix base	45.00	1.397	0.419
Tack coat	0.15	1.068	0.224
Wearing course	52.00	1.344	0.359
Striping	260.00	1.038	0.090
Major structures		1.350	0.453
Minor structures		[illegible]	0.326
Land agric	3.60	1.000	0.000
reclaim	1.40	1.000	0.000

LOCATION	CLASS	TOTAL LENGTH	REC/AG	EMBANK	SUB-BASE Road	SUB-BASE Should	PRIME COAT	ROAD BASE	TACK COAT	WEAR COURSE	SHOULD BASE	STRIPE MARKING	STRUC	LEVEL COURSE	AREA CAND
		(kms)		(m3)	(m3)	(m3)	(m2)	(m3)	(m2)	(m3)	(m3)	(kms)			(m2)
Total Quantities (thousands, except kms)															
Aiyat	3	15.2		158.5	16.0	11.4	170.5	12.5	148.5	6.5	3.1	45.6	0.0	0.5	30.0
Gerza	2	6.2		17.4	1.7	4.7	37.2	6.5	117.8	3.9	0.0	18.6	0.0	1.0	10.0
Beni Suef		0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fashn	3	21.6		84.2	10.8	16.2	145.9	17.6	391.7	12.9	0.6	64.8	0.0	3.1	154.0
Maghagha	3	24.6		92.6	12.9	18.5	163.9	20.3	436.7	14.8	0.6	73.8	0.0	3.6	221.0
Beni Mazaar	3	21.2		67.9	9.2	15.9	133.1	17.5	392.5	13.0	0.2	63.6	0.0	3.3	157.0
Samalut	3	16.6		60.7	8.4	12.5	109.4	13.7	298.2	10.0	0.4	49.8	0.0	2.5	141.0
Minia	2	16.3		145.4	15.4	12.2	166.1	17.1	189.0	7.6	2.6	48.9	0.0	0.9	89.4
Mallawi	3	15.1		55.6	7.8	11.3	99.7	12.5	270.8	9.1	0.4	45.3	0.0	2.2	137.0
Dairut	3	13.8		52.9	7.2	10.4	92.6	11.4	245.0	8.3	0.4	41.4	0.0	2.0	116.0
Quisiya	3	11.9		67.5	8.1	8.9	94.8	9.8	184.7	6.5	0.9	35.7	0.0	1.3	124.8
Manfalut	3	10.4		42.4	5.7	7.8	71.5	8.6	181.5	6.2	0.4	31.2	0.0	1.5	90.0
New Valley	1	8.0		22.4	2.4	6.0	48.0	10.8	152.0	5.0	0.0	24.0	0.0	1.3	20.0
		181		868	106	136	1,332	159	3,000	104	10	543	0	23	1,791
Costs of Construction (LE thousands)															TOTAL COST
Aiyat	3			609	435	310	38	788	24	451	192	12	0	31	108	2,998
Gerza	2			67	45	126	8	409	19	271	0	5	0	63	36	1,050
Beni Suef				0	0	0	0	0	0	0	0	0	689	0	0	689
Fashn	3			324	293	441	33	1,120	61	900	39	17	387	195	554	4,364
Maghagha	3			356	352	502	37	1,276	70	1,031	39	20	65	226	796	4,769
Beni Mazaar	3			261	250	432	30	1,100	63	910	14	17	371	207	565	4,220
Samalut	3			233	228	339	25	861	48	699	24	13	403	154	506	3,534
Minia	2			559	418	333	37	1,076	30	529	165	13	403	59	251	3,873
Mallawi	3			214	213	308	22	783	43	635	22	12	49	140	493	2,935
Dairut	3			203	196	282	21	716	39	577	24	11	0	126	425	2,619
Quisiya	3			259	219	243	21	617	30	457	57	10	0	85	357	2,355
Manfalut	3			163	156	212	16	539	29	430	22	8	0	92	324	1,992
New Valley	1			86	65	163	11	679	24	349	0	6	0	82	72	1,734
				3,334	2,871	3,690	299	9,964	481	7,238	597	146	2,366	1,460	4,489	36,935

ANNEX 4D-2 NEW CAIRO-ASSUIT HIGHWAY, STAGE 1, ACCESS ROAD QUANTITIES AND COSTS (FOREIGN EXCHAN

For X cost? (0=N,1= 1 Construc stage 1

LAYER THICKNESSES	CLASS 1 Agric	CLASS 1 Desert	CLASS 2 Agric	CLASS 2 Desert	CLASS 3 Agric	CLASS 3 Desert
Road sub-base	35	15	32	15	30	15 cms
Road base (binder)	18	18	14	14	11	11 cms
Shoulder sub-base	15	15 cms				
Wearing course	5	5 cms				
Shoul base (premix)	5	5 cms				
Levelling course	2.5	2.5 cms				

Carriage width	7.5 meters	EMBANKMENT	New	Exist
Shoulder width	2.5 meters	Right of way	19.0	10.0 meters
Exist car width	6.5 meters	Cross-sec Area	12.3	2.8 sq mts
Paint lines/car	3			

UNIT PRICES	FIN	ECO	FOR
Embankment	3.00	1.281	0.3
Crushed stone sub-base	20.00	1.360	0.4
Prime coat	0.20	1.121	0.2
Binder/Premix base	45.00	1.397	0.4
Tack coat	0.15	1.068	0.2
Wearing course	52.00	1.344	0.3
Striping	260.00	1.038	0.0
Major structures		1.350	0.4
Minor structures		1.300	0.3
Land agric	3.60	1.000	0.0
reclaim	1.40	1.000	0.0

LOCATION	CLASS	TOTAL LENGTH LENGTH	REC/AC	EMBANK	SUB-BASE Road	SUB-BASE Should	PRIME COAT	ROAD BASE	TACK COAT	WEAR COURSE	SHOULD BASE	STRIPE MARKING	STRUC	LEVEL COURSE	AREA LAND
		(kms)		(m3)	(m3)	(m3)	(m2)	(m3)	(m2)	(m3)	(m3)	(kms)			(m2)
New Construction Quantities (thousands, except kms)															
Aiyat	3	12.2	0.0	150	14.6	9.2	152.5	10.1	91.5	4.6	3.1	36.6			0.0
Gerza	2	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			0.0
Beni Suef		0.0	0.0	0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0			0.0
Fashn	3	2.5	0.0	31	3.0	1.9	31.3	2.1	18.8	0.9	0.6	7.5			0.0
Maghagha	3	2.5	0.0	31	3.0	1.9	31.3	2.1	18.8	0.9	0.6	7.5			0.0
Beni Mazaar	3	0.9	0.0	11	1.1	0.7	11.3	0.7	6.8	0.3	0.2	2.7			0.0
Samalut	3	1.5	0.0	18	1.8	1.1	18.8	1.2	11.3	0.6	0.4	4.5			0.0
Minia	2	10.5	1.6	129	12.6	7.9	131.3	11.0	78.8	3.9	2.6	31.5			30.4
Mallawi	3	1.4	0.0	17	1.7	1.1	17.5	1.2	10.5	0.5	0.4	4.2			0.0
Dairut	3	1.5	0.0	18	1.8	1.1	18.8	1.2	11.3	0.6	0.4	4.5			0.0
Quisiya	3	3.6	2.2	44	4.3	2.7	45.0	3.0	27.0	1.4	0.9	10.8			41.8
Manfalut	3	1.4	0.0	17	1.7	1.1	17.5	1.2	10.5	0.5	0.4	4.2			0.0
New Valley	1	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			0.0
		38.0	3.8	467.4	45.6	28.5	475.0	33.7	285.0	14.3	9.5	114.0	0.0	0.0	72.2
Existing Rd Improvement Quantities (thousands, except kms)															
Aiyat	3	3.0	3.0	8.4	1.4	2.3	18.0	2.5	57.0	1.9	0.0	9.0		0.5	30.0
Gerza	2	6.2	1.0	17.4	1.7	4.7	37.2	6.5	117.8	3.9	0.0	18.6		1.0	10.0
Beni Suef		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0
Fashn	3	19.1	15.4	53.5	7.8	14.3	114.6	15.8	362.9	11.9	0.0	57.3		3.1	154.0
Maghagha	3	22.1	22.1	61.9	9.9	16.6	132.6	18.2	419.9	13.8	0.0	66.3		3.6	221.0
Beni Mazaar	3	20.3	15.7	56.8	8.1	15.2	121.8	16.7	385.7	12.7	0.0	60.9		3.3	157.0
Samalut	3	15.1	14.1	42.3	6.6	11.3	90.6	12.5	286.9	9.4	0.0	45.3		2.5	141.0
Minia	2	5.8	5.8	16.2	2.8	4.4	34.8	6.1	110.2	3.6	0.0	17.4		0.9	58.0
Mallawi	3	13.7	13.7	38.4	6.2	10.3	82.2	11.3	260.3	8.6	0.0	41.1		2.2	137.0
Dairut	3	12.3	11.8	34.4	5.4	9.2	73.8	10.1	233.7	7.7	0.0	36.9		2.0	118.0
Quisiya	3	8.3	8.3	23.2	3.7	6.2	49.8	6.8	157.7	5.2	0.0	24.9		1.3	83.0
Manfalut	3	9.0	9.0	25.2	4.1	6.8	54.0	7.4	171.0	5.6	0.0	27.0		1.5	90.0
New Valley	1	8.0	2.0	22.4	2.4	6.0	48.0	10.8	152.0	5.0	0.0	24.0		1.3	20.0
		142.9	121.9	400	60	107	857	125	2,715	89	0	429	0	23	1,219

ANNEX 4D-2 NEW CAIRO-ASSUIT HIGHWAY, STAGE 1, ACCESS ROAD QUANTITIES AND COSTS (FOREIGN EXCHANGE)

For X cost? (0=N,1= 1 Construc stage 1

LAYER THICKNESSES	CLASS 1 Agric	CLASS 1 Desert	CLASS 2 Agric	CLASS 2 Desert	CLASS 3 Agric	CLASS 3 Desert	
Road sub-base	35	15	32	15	30	15	cms
Road base (binder)	18	18	14	14	11	11	cms
Shoulder sub-base	15	15	cms				
Wearing course	5	5	cms				
Shoul base (premix)	5	5	cms				
Levelling course	2.5	2.5	cms				

UNIT PRICES	FIN	ECO	FOR X
Embankment	3.00	1.291	0.334
Crushed stone sub-base	20.00	1.360	0.453
Prime coat	0.20	1.121	0.295
Binder/Premix base	45.00	1.397	0.415
Tack coat	0.15	1.063	0.324
Wearing course	52.00	1.344	0.350
Striping	260.00	1.038	0.090
Major structures		1.350	0.433
Minor structures		1.300	0.326
Land agric	3.60	1.000	0.000
reclaim	1.40	1.000	0.000

Carriage width	7.5 meters	EMBANKMENT	New	Exist	
Shoulder width	2.5 meters	Right of way	19.0	10.0	meters
Exist car width	6.5 meters	Cross-sec Area	12.3	2.8	sq mts
Paint lines/car	3				

LOCATION	CLASS	TOTAL LENGTH (kms)	REC/AC	EMBANK (m3)	SUB-BASE Road (m3)	SUB-BASE Should (m3)	PRIME COAT (m2)	ROAD BASE (m3)	TACK COAT (m2)	WEAR COURSE (m3)	SHOULD BASE (m3)	STRIPE MARKING (kms)	STRUC	LEVEL COURSE	AREA LAND (m2)
Total Quantities (thousands, except kms)															
Aiyat	3	15.2		158.5	16.0	11.4	170.5	12.5	148.5	6.5	3.1	45.6	0.0	0.5	30.0
Gerza	2	6.2		17.4	1.7	4.7	37.2	6.5	117.8	3.9	0.0	18.6	0.0	1.0	10.0
Beni Suef		0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fashn	3	21.6		84.2	10.8	16.2	145.9	17.8	381.7	12.9	0.6	64.8	0.0	3.1	154.0
Maghagha	3	24.6		92.6	12.9	18.5	163.9	20.3	438.7	14.8	0.6	73.8	0.0	3.6	221.0
Beni Mazaar	3	21.2		67.9	9.2	15.9	133.1	17.5	392.5	13.0	0.2	63.6	0.0	3.3	157.0
Samalut	3	16.6		60.7	8.4	12.5	109.4	13.7	298.2	10.0	0.4	49.8	0.0	2.5	141.0
Minia	2	16.3		145.4	15.4	12.2	166.1	17.1	189.0	7.6	2.6	48.9	0.0	0.9	88.4
Mallawi	3	15.1		55.6	7.8	11.3	99.7	12.5	270.8	9.1	0.4	45.3	0.0	2.2	137.0
Dairut	3	13.8		52.9	7.2	10.4	92.6	11.4	245.0	8.3	0.4	41.4	0.0	2.0	118.0
Quisiya	3	11.9		67.5	8.1	8.9	94.8	9.8	184.7	6.5	0.9	35.7	0.0	1.3	124.8
Manfalut	3	10.4		42.4	5.7	7.8	71.5	8.6	181.3	6.2	0.4	31.2	0.0	1.5	90.0
New Valley	1	8.0		22.4	2.4	6.0	48.0	10.8	152.0	5.0	0.0	24.0	0.0	1.3	20.0
		181		868	106	136	1,332	159	3,000	104	10	543	0	23	1,291
Costs of Construction (LE thousands)															TOTAL COST
Aiyat	3			159	145	103	7	234	5	117	57	1	0	9	0 837
Gerza	2			17	15	42	2	122	4	71	0	0	0	19	0 291
Beni Suef				0	0	0	0	0	0	0	0	0	231	0	0 231
Fashn	3			84	98	147	6	333	13	234	12	1	97	58	0 1,083
Maghagha	3			93	117	167	7	379	15	268	12	2	16	67	0 1,143
Beni Mazaar	3			60	83	144	5	327	13	237	4	1	93	62	0 1,038
Samalut	3			61	76	113	4	256	10	182	7	1	101	46	0 857
Minia	2			146	139	111	7	320	6	138	49	1	101	18	0 1,035
Mallawi	3			56	71	103	4	233	9	165	7	1	12	42	0 702
Dairut	3			53	65	94	4	213	8	150	7	1	0	37	0 632
Quisiya	3			68	73	81	4	183	7	119	17	1	0	25	0 577
Manfalut	3			43	52	71	3	160	6	112	7	1	0	27	0 481
New Valley	1			22	22	54	2	202	5	91	0	0	0	24	0 423
				869	956	1,229	55	2,960	101	1,885	117	11	652	434	0 9,329

Eco cost? (0=N,1=Y) 0 Construc stage 2

	CLASS 1		CLASS 2		CLASS 3		
LAYER THICKNESSES	Agric	Desert	Agric	Desert	Agric	Desert	
Road sub-base	35	15	32	15	30	15	cms
Road base (binder)	18	18	14	14	11	11	cms
Shoulder sub-base	15	15	cms				
Wearing course	5	5	cms				
Shoul base (premix)	5	5	cms				
Levelling course	2.5	2.5	cms				

Carriage width 7.5 meters
Shoulder width 2.5 meters
Exist car width 6.5 meters
Paint lines/car 3

EMBANKMENT New Exist
Right of way 19.0 10.0 meters
Cross-sec Area 12.3 2.8 sq mts

UNIT PRICES	FIN	ECO	FOR X
Embankment	3.00	1.281	0.334
Crushed stone sub-base	20.00	1.360	0.453
Prime coat	0.20	1.121	0.205
Binder/Premix base	45.00	1.397	0.415
Tack coat	0.15	1.068	0.224
Wearing course	52.00	1.344	0.350
Striping	260.00	1.038	0.080
Major structures		1.350	0.453
Minor structures		1.300	0.326
Land agric	3.60	1.000	0.000
reclaim	1.40	1.000	0.000

LOCATION	CLASS	TOTAL LENGTH	REC/AG	EMBANK	SUB-BASE Road	SUB-BASE Should	PRIME COAT	ROAD BASE	TACK COAT	WEAR COURSE	SHOULD BASE	STRIPE MARKING	STRUC	LEVEL COURSE	AREA LAND
		(kms)		(m3)	(m3)	(m3)	(m2)	(m3)	(m2)	(m3)	(m3)	(kms)			(m2)
New Construction Quantities (thousands, except kms)															
Alyat	3	12.2	0.0	150	14.6	9.2	152.5	10.1	91.5	4.6	3.1	36.6			0.0
Gerza	2	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			0.0
Beni Suef		0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			0.0
Fashn	3	2.5	0.0	31	3.0	1.9	31.3	2.1	18.8	0.9	0.6	7.5			0.0
Maghagha	3	2.5	0.0	31	3.0	1.9	31.3	2.1	18.8	0.9	0.6	7.5			0.0
Beni Mazaar	3	0.9	0.0	11	1.1	0.7	11.3	0.7	6.8	0.3	0.2	2.7			0.0
Samalut	3	1.5	0.0	18	1.8	1.1	18.8	1.2	11.3	0.6	0.4	4.5			0.0
Minia	2	10.5	1.6	129	12.6	7.9	131.3	11.0	78.8	3.9	2.6	31.5			30.4
Mallawi	3	1.4	0.0	17	1.7	1.1	17.5	1.2	10.5	0.5	0.4	4.2			0.0
Dairut	3	1.5	0.0	18	1.8	1.1	18.8	1.2	11.3	0.6	0.4	4.5			0.0
Quisiya	3	3.6	2.2	44	4.3	2.7	45.0	3.0	27.0	1.4	0.9	10.8			41.8
Manfalut	3	1.4	0.0	17	1.7	1.1	17.5	1.2	10.5	0.5	0.4	4.2			0.0
New Valley	1	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			0.0
		38.0	3.8	467.4	45.6	28.5	475.0	33.7	285.0	14.3	9.5	114.0	0.0	0.0	72.2
Existing Rd Improvement Quantities (thousands, except kms)															
Alyat	3	3.0	3.0	8.4	1.4	2.3	18.0	2.5	57.0	1.9	0.0	9.0		0.5	30.0
Gerza	2	6.2	1.0	17.4	1.7	4.7	37.2	6.5	117.8	3.9	0.0	18.6		1.0	10.0
Beni Suef		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0
Fashn	3	19.1	15.4	53.5	7.8	14.3	114.6	15.8	362.9	11.9	0.0	57.3		3.1	154.0
Maghagha	3	22.1	22.1	61.9	9.9	16.6	132.6	18.2	419.9	13.8	0.0	66.3		3.6	221.0
Beni Mazaar	3	20.3	15.7	56.8	8.1	15.2	121.8	16.7	385.7	12.7	0.0	60.9		3.3	157.0
Samalut	3	15.1	14.1	42.3	6.6	11.3	90.6	12.5	286.9	9.4	0.0	45.3		2.5	141.0
Minia	2	5.8	5.8	16.2	2.8	4.4	34.8	6.1	110.2	3.6	0.0	17.4		0.9	58.0
Mallawi	3	13.7	13.7	38.4	6.2	10.3	82.2	11.3	260.3	8.6	0.0	41.1		2.2	137.0
Dairut	3	12.3	11.8	34.4	5.4	9.2	73.8	10.1	233.7	7.7	0.0	36.9		2.0	118.0
Quisiya	3	8.3	8.3	23.2	3.7	6.2	49.8	6.8	157.7	5.2	0.0	24.9		1 3	83.0
Manfalut	3	9.0	9.0	25.2	4.1	6.8	54.0	7.4	171.0	5.6	0.0	27.0		1.5	90.0
New Valley	1	8.0	2.0	22.4	2.4	6.0	48.0	10.8	152.0	5.0	0.0	24.0		1.3	20.0
		142.9	121.9	400	60	107	857	125	2,715	89	0	429	0	23	1,219

100

ANNEX 4D-2 NEW CAIRO-ASSUIT HIGHWAY, STAGE 2, ACCESS ROAD QUANTITIES AND COSTS (FINANCIAL)

Eco cost? (0=N,1=Y) 0 Construc stage 2

LAYER THICKNESSES	CLASS 1 Agric	CLASS 1 Desert	CLASS 2 Agric	CLASS 2 Desert	CLASS 3 Agric	CLASS 3 Desert	
Road sub-base	35	15	32	15	30	15	cms
Road base (binder)	18	18	14	14	11	11	cms
Shoulder sub-base	15	15	cms				
Wearing course	5	5	cms				
Shoul base (premix)	5	5	cms				
Levelling course	2.5	2.5	cms				

Carriage width	7.5 meters	EMBANKMENT	New Exist
Shoulder width	2.5 meters	Right of way	19.0 10.0 meters
Exist car width	6.5 meters	Cross-sec Area	12.3 2.8 sq mts
Paint lines/car	3		

UNIT PRICES	FIN	ECO	FOR X
Embankment	3.00	1.281	0.334
Crushed stone sub-base	20.00	1.360	0.453
Prime coat	0.20	1.121	0.205
Binder/Premix base	45.00	1.397	0.415
Tack coat	0.15	1.068	0.224
Wearing course	52.00	1.344	0.350
Striping	260.00	1.038	0.000
Major structures		1.350	0.453
Minor structures		1.300	0.326
Land agric	3.60	1.000	0.000
reclaim	1.40	1.000	0.000

LOCATION	CLASS	TOTAL LENGTH LENGTH	REC/AG	EMBANK	SUB-BASE Road	SUB-BASE Should	PRIME COAT	ROAD BASE	TACK COAT	WEAR COURSE	SHOULD BASE	STRIPE MARKING	STRUC	LEVEL COURSE	AREA LAND
		(kms)		(m3)	(m3)	(m3)	(m2)	(m3)	(m2)	(m3)	(m3)	(kms)			(m2)
Total Quantities (thousands, except kms)															
Aiyat	3	15.2		158.5	16.0	11.4	170.5	12.5	148.5	6.5	3.1	45.6	0.0	0.5	30.0
Gerza	2	6.2		17.4	1.7	4.7	37.2	6.5	117.8	3.9	0.0	18.6	0.0	1.0	10.0
Beni Suef		0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fashn	3	21.6		84.2	10.8	16.2	145.9	17.8	381.7	12.9	0.6	64.8	0.0	3.1	154.0
Maghagha	3	24.6		92.6	12.9	18.5	163.9	20.3	438.7	14.8	0.6	73.8	0.0	3.6	221.0
Beni Mazaar	3	21.2		67.9	9.2	15.9	133.1	17.5	392.5	13.0	0.2	63.6	0.0	3.3	157.0
Samalut	3	16.6		60.7	8.4	12.5	102.4	13.7	296.2	10.0	0.4	49.8	0.0	2.5	141.0
Minia	2	16.3		145.4	15.4	12.2	166.1	17.1	189.0	7.6	2.6	48.9	0.0	0.9	88.4
Mallawi	3	15.1		55.6	7.8	11.3	99.7	12.5	270.8	9.1	0.4	45.3	0.0	2.2	137.0
Dairut	3	13.8		52.9	7.2	10.4	92.5	11.4	245.0	8.3	0.4	41.4	0.0	2.0	118.0
Quisiya	3	11.9		67.5	8.1	8.9	94.8	9.8	184.7	6.5	0.9	35.7	0.0	1.3	124.8
Manfalut	3	10.4		42.4	5.7	7.8	71.5	8.6	181.5	6.2	0.4	31.2	0.0	1.5	90.0
New Valley	1	8.0		22.4	2.4	6.0	46.0	10.8	152.0	5.0	0.0	24.0	0.0	1.3	20.0
		181		868	106	136	1,332	159	3,000	104	10	543	0	23	1,291
Costs of Construction (LE thousands)															TOTAL COST
Aiyat	3			475	320	228	34	564	22	335	137	12	2,650	22	108	4,908
Gerza	2			52	33	93	7	293	18	202	0	5	3,850	45	36	4,634
Beni Suef				0	0	0	0	0	0	0	0	0	510	0	0	510
Fashn	3			253	215	324	29	802	57	670	28	17	2,948	140	554	6,036
Maghagha	3			278	259	369	33	913	66	767	28	19	2,700	162	796	6,389
Beni Mazaar	3			204	184	318	27	787	59	677	10	17	2,935	148	565	5,930
Samalut	3			182	167	249	22	616	45	520	17	13	2,960	110	508	5,402
Minia	2			436	308	245	33	770	28	393	118	13	2,960	42	251	5,598
Mallawi	3			167	157	227	20	561	41	473	16	12	3,888	100	493	6,152
Dairut	3			159	144	207	19	512	37	429	17	11	2,650	90	425	4,699
Quisiya	3			203	161	179	19	442	28	340	41	9	2,650	61	357	4,488
Manfalut	3			127	115	156	14	386	27	320	16	8	2,650	66	324	4,209
New Valley	1			67	48	120	10	486	23	260	0	6	3,850	59	72	5,000
				2,603	2,111	2,714	266	7,133	450	5,385	428	141	37,200	1,045	4,489	63,964

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Eco cost? (0=N,1=Y) 1 Construc stage 2

LAYER THICKNESSES	CLASS 1 Agric	CLASS 1 Desert	CLASS 2 Agric	CLASS 2 Desert	CLASS 3 Agric	CLASS 3 Desert	
Road sub-base	35	15	32	15	30	15	cms
Road base (binder)	18	18	14	14	11	11	cms
Shoulder sub-base	15	15	cms				
Wearing course	5	5	cms				
Shoul base (premix)	5	5	cms				
Levelling course	2.5	2.5	cms				

UNIT PRICES	FIN	ECO	FOR X
Embankment	3.00	1.281	0.334
Crushed stone sub-base	20.00	1.300	0.453
Prime coat	0.20	1.121	0.205
Binder/Premix base	45.00	1.397	0.419
Tack coat	0.15	1.000	0.224
Wearing course	52.00	1.344	0.350
Striping	260.00	1.038	0.080
Major structures		1.350	0.453
Minor structures		1.300	0.326
Land agric	3.60	1.000	0.000
reclaim	1.40	1.000	0.000

Carriage width	7.5 meters	EMBANKMENT	New Exist
Shoulder width	2.5 meters	Right of way	19.0 10.0 meters
Exist car width	6.5 meters	Cross-sec Area	12.3 2.8 sq mts
Paint lines/car	3		

LOCATION	CLASS	TOTAL LENGTH (kms)	LENGTH REC/AC	EMBANK (m3)	SUB-BASE Road (m3)	SUB-BASE Should (m3)	PRIME COAT (m2)	ROAD BASE (m3)	TACK COAT (m2)	WEAR COURSE (m3)	SHOULD BASE (m3)	STRIPE MARKING (kms)	STRUC	LEVEL COURSE	AREA LAND (m2)
New Construction Quantities (thousands, except kms)															
Aiyat	3	12.2	0.0	150	14.6	9.2	152.5	10.1	91.5	4.6	3.1	36.6			0.0
Gerza	2	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			0.0
Beni Suef		0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			0.0
Fashn	3	2.5	0.0	31	3.0	1.9	31.3	2.1	18.8	0.9	0.6	7.5			0.0
Maghagha	3	2.5	0.0	31	3.0	1.9	31.3	2.1	18.8	0.9	0.6	7.5			0.0
Beni Mazaar	3	0.9	0.0	11	1.1	0.7	11.3	0.7	6.8	0.3	0.2	2.7			0.0
Samalut	3	1.5	0.0	18	1.8	1.1	18.8	1.2	11.3	0.6	0.4	4.5			0.0
Minia	2	10.5	1.6	129	12.6	7.9	131.3	11.0	78.8	3.9	2.6	31.5			30.4
Mallawi	3	1.4	0.0	17	1.7	1.1	17.5	1.2	10.5	0.5	0.4	4.2			0.0
Dairut	3	1.5	0.0	18	1.8	1.1	18.8	1.2	11.3	0.6	0.4	4.5			0.0
Quisiya	3	3.6	2.2	44	4.3	2.7	45.0	3.0	27.0	1.4	0.9	10.8			41.8
Manfalut	3	1.4	0.0	17	1.7	1.1	17.5	1.2	10.5	0.5	0.4	4.2			0.0
New Valley	1	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			0.0
		38.0	3.8	467.4	45.6	28.5	475.0	33.7	285.0	14.3	9.5	114.0	0.0	0.0	72.2
Existing Rd Improvement Quantities (thousands, except kms)															
Aiyat	3	3.0	3.0	8.4	1.4	2.3	18.0	2.5	57.0	1.9	0.0	9.0		0.5	30.0
Gerza	2	6.2	1.0	17.4	1.7	4.7	37.2	6.5	117.8	3.9	0.0	18.6		1.0	10.0
Beni Suef		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0
Fashn	3	19.1	15.4	53.5	7.8	14.3	114.6	15.8	362.9	11.9	0.0	57.3		3.1	154.0
Maghagha	3	22.1	22.1	61.9	9.9	16.6	132.6	18.2	419.9	13.8	0.0	66.3		3.6	221.0
Beni Mazaar	3	20.3	15.7	56.8	8.1	15.2	121.8	16.7	385.7	12.7	0.0	60.9		3.3	157.0
Samalut	3	15.1	14.1	42.3	6.6	11.3	90.6	12.5	286.9	9.4	0.0	45.3		2.5	141.0
Minia	2	5.8	5.8	16.2	2.8	4.4	34.8	6.1	110.2	3.6	0.0	17.4		0.9	58.0
Mallawi	3	13.7	13.7	38.4	6.2	10.3	82.2	11.3	260.3	8.6	0.0	41.1		2.2	137.0
Dairut	3	12.3	11.8	34.4	5.4	9.2	73.8	10.1	233.7	7.7	0.0	36.9		2.0	118.0
Quisiya	3	8.3	8.3	23.2	3.7	6.2	49.8	6.8	157.7	5.2	0.0	24.9		1.3	83.0
Manfalut	3	9.0	9.0	25.2	4.1	6.8	54.0	7.4	171.0	5.6	0.0	27.0		1.5	90.0
New Valley	1	8.0	2.0	22.4	2.4	6.0	48.0	10.8	152.0	5.0	0.0	24.0		1.3	20.0
		142.9	121.9	400	60	107	857	125	2,715	89	0	429	0	23	1,219

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Eco cost? (0=N,1=Y) 1 Construc stage 2

	CLASS 1		CLASS 2		CLASS 3		
LAYER THICKNESSES	Agric	Desert	Agric	Desert	Agric	Desert	
Road sub-base	35	15	32	15	30	15	cms
Road base (binder)	18	18	14	14	11	11	cms
Shoulder sub-base	15	15	cms				
Wearing course	5	5	cms				
Shoul base (premix)	5	5	cms				
Levelling course	2.5	2.5	cms				

Carriage width	7.5 meters	EMBANKMENT	New	Exist
Shoulder width	2.5 meters	Right of way	19.0	10.0 meters
Exist car width	6.5 meters	Cross-sec Area	12.3	2.8 sq mts
Paint lines/car	3			

UNIT PRICES	FIN	ECO	FOR X
Embankment	3.00	1.281	0.334
Crushed stone sub-base	20.00	1.360	0.453
Prime coat	0.20	1.121	0.205
Binder/Premix base	45.00	1.397	0.415
Tack coat	0.15	1.068	0.224
Wearing course	52.00	1.344	0.350
Striping	260.00	1.038	0.080
Major structures		1.350	0.453
Minor structures		1.300	0.326
Land agric	3.60	1.000	0.000
reclaim	1.40	1.000	0.000

LOCATION	CLASS	TOTAL LENGTH	REC/AC	EMBANK	SUB-BASE Road	SUB-BASE Should	PRIME COAT	ROAD BASE	TACK COAT	WEAR COURSE	SHOULD BASE	STRIPE MARKING	STRUC	LEVEL COURSE	AREA LAND
		(kms)		(m3)	(m3)	(m3)	(m2)	(m3)	(m2)	(m3)	(m3)	(kms)			(m2)
Total Quantities (thousands, except kms)															
Aiyat	3	15.2		158.5	16.0	11.4	170.5	12.5	148.5	6.5	3.1	45.6	0.0	0.5	30.0
Gerza	2	6.2		17.4	1.7	4.7	37.2	6.5	117.8	3.9	0.0	18.6	0.0	1.0	10.0
Beni Suef		0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fashn	3	21.6		84.2	10.8	16.2	145.9	17.8	381.7	12.9	0.6	64.8	0.0	3.1	154.0
Maghagha	3	24.6		92.6	12.9	18.5	163.9	20.3	438.7	14.8	0.6	73.8	0.0	3.6	221.0
Beni Mazaar	3	21.2		67.9	9.2	15.9	133.1	17.5	392.5	13.0	0.2	63.6	0.0	3.3	197.0
Samalut	3	16.6		60.7	8.4	12.5	109.4	13.7	298.2	10.0	0.4	49.8	0.0	2.5	141.0
Minia	2	16.3		145.4	15.4	12.2	166.1	17.1	189.0	7.6	2.6	48.9	0.0	0.9	88.4
Mallawi	3	15.1		55.6	7.8	11.3	99.7	12.5	270.8	9.1	0.4	45.3	0.0	2.2	137.0
Dairut	3	13.8		52.9	7.2	10.4	92.6	11.4	245.0	8.3	0.4	41.4	0.0	2.0	118.0
Quisiya	3	11.9		67.5	8.1	8.9	94.8	9.8	184.7	6.5	0.9	35.7	0.0	1.3	124.8
Manfalut	3	10.4		42.4	5.7	7.8	71.5	8.6	181.5	6.2	0.4	31.2	0.0	1.5	90.0
New Valley	1	8.0		22.4	2.4	6.0	48.0	10.8	152.0	5.0	0.0	24.0	0.0	1.3	20.0
		181		868	106	136	1,332	159	3,000	104	10	543	0	23	1,291

Costs of Construction (LE thousands)														TOTAL COST
Aiyat	3	609	435	310	38	788	24	451	192	12	3,578	31	108	6,575
Gerza	2	67	45	126	8	409	19	271	0	5	5,198	63	36	6,247
Beni Suef		0	0	0	0	0	0	0	0	0	689	0	0	689
Fashn	3	324	293	441	33	1,120	61	900	39	17	3,964	195	554	7,942
Maghagha	3	356	352	502	37	1,276	70	1,031	39	20	3,643	226	796	8,347
Beni Mazaar	3	261	250	432	30	1,100	63	910	14	17	3,948	207	565	7,798
Samalut	3	233	228	339	25	861	48	699	24	13	3,981	154	509	7,111
Minia	2	559	418	333	37	1,076	30	529	105	13	3,981	59	251	7,451
Mallawi	3	214	213	308	22	783	43	635	22	12	5,246	140	493	8,133
Dairut	3	203	196	282	21	716	39	577	24	11	3,578	126	425	6,199
Quisiya	3	259	219	243	21	617	30	457	57	10	3,578	85	357	5,932
Manfalut	3	163	156	212	16	539	29	430	22	8	3,578	92	324	5,569
New Valley	1	86	65	163	11	679	24	349	0	6	5,198	82	72	6,736
		3,334	2,871	3,690	299	9,964	481	7,238	597	146	50,156	1,460	4,489	84,729

ANNEX 4D-2 NEW CAIRO-ASSUIT HIGHWAY, STAGE 2, ACCESS ROAD QUANTITIES AND COSTS (FOREIGN EXC

For X cost? (0=N,1= 1 Construc stage 2

LAYER THICKNESSES	CLASS 1 Agric	CLASS 1 Desert	CLASS 2 Agric	CLASS 2 Desert	CLASS 3 Agric	CLASS 3 Desert	
Road sub-base	35	15	32	15	30	15	cms
Road base (binder)	18	18	14	14	11	11	cms
Shoulder sub-base	15	15	cms				
Wearing course	5	5	cms				
Shoul base (premix)	5	5	cms				
Levelling course	2.5	2.5	cms				

Carriage width	7.5 meters	EMBANKMENT	New	Exist
Shoulder width	2.5 meters	Right of way	19.0	10.0 meters
Exist car width	6.5 meters	Cross-sec Area	12.3	2.8 sq mts
Paint lines/car	3			

UNIT PRICES	FIN	ECO	F
Embankment	3.00	1.281	(
Crushed stone sub-base	20.00	1.360	(
Prime coat	0.20	1.121	(
Binder/Premix base	45.00	1.397	(
Tack coat	0.15	1.068	(
Wearing course	52.00	1.344	(
Striping	260.00	1.038	0
Major structures		1.350	0
Minor structures		1.300	0
Land agric	3.60	1.000	0
reclaim	1.40	1.000	0

LOCATION	CLASS	TOTAL LENGTH	REC/AC	EMBANK	SUB-BASE Road	SUB-BASE Should	PRIME COAT	ROAD BASE	TACK COAT	WEAR COURSE	SHOULD BASE	STRIPE MARKING	STRUC	LEVEL COURSE	AREA LAND
		(kms)		(m3)	(m3)	(m3)	(m2)	(m3)	(m2)	(m3)	(m3)	(kms)			(m2)
New Construction Quantities (thousands, except kms)															
Aiyat	3	12.2	0.0	150	14.6	9.2	152.5	10.1	91.5	4.6	3.1	36.6			0.0
Gerza	2	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			0.0
Beni Suef		0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			0.0
Fashn	3	2.5	0.0	31	3.0	1.9	31.3	2.1	18.8	0.9	0.6	7.5			0.0
Maghagha	3	2.5	0.0	31	3.0	1.9	31.3	2.1	18.8	0.9	0.6	7.5			0.0
Beni Mazaar	3	0.9	0.0	11	1.1	0.7	11.3	0.7	6.8	0.3	0.2	2.7			0.0
Samalut	3	1.5	0.0	18	1.8	1.1	18.8	1.2	11.3	0.6	0.4	4.5			0.0
Minia	2	10.5	1.6	129	12.6	7.9	131.3	11.0	78.8	3.9	2.6	31.5			30.4
Mallawi	3	1.4	0.0	17	1.7	1.1	17.5	1.2	10.5	0.5	0.4	4.2			0.0
Dairut	3	1.5	0.0	18	1.8	1.1	18.8	1.2	11.3	0.6	0.4	4.5			0.0
Quisiya	3	3.6	2.2	44	4.3	2.7	45.0	3.0	27.0	1.4	0.9	10.8			41.8
Manfalut	3	1.4	0.0	17	1.7	1.1	17.5	1.2	10.5	0.5	0.4	4.2			0.0
New Valley	1	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			0.0
		38.0	3.8	467.4	45.6	28.5	475.0	33.7	285.0	14.3	9.5	114.0	0.0	0.0	72.2
Existing Rd Improvement Quantities (thousands, except kms)															
Aiyat	3	3.0	3.0	8.4	1.4	2.3	18.0	2.5	57.0	1.9	0.0	9.0		0.5	30.0
Gerza	2	6.2	1.0	17.4	1.7	4.7	37.2	6.5	117.8	3.9	0.0	18.6		1.0	10.0
Beni Suef		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0
Fashn	3	19.1	15.4	53.5	7.8	14.3	114.6	15.8	362.9	11.9	0.0	57.3		3.1	154.0
Maghagha	3	22.1	22.1	61.9	9.9	16.6	132.6	18.2	419.9	13.8	0.0	66.3		3.6	221.0
Beni Mazaar	3	20.3	15.7	56.8	8.1	15.2	121.8	16.7	385.7	12.7	0.0	60.9		3.3	157.0
Samalut	3	15.1	14.1	42.3	6.6	11.3	90.6	12.5	286.9	9.4	0.0	45.3		2.5	141.0
Minia	2	5.8	5.8	16.2	2.8	4.4	34.8	6.1	110.2	3.6	0.0	17.4		0.9	58.0
Mallawi	3	13.7	13.7	38.4	6.2	10.3	82.2	11.3	260.3	8.6	0.0	41.1		2.2	137.0
Dairut	3	12.3	11.8	34.4	5.4	9.2	73.8	10.1	233.7	7.7	0.0	36.9		2.0	118.0
Quisiya	3	8.3	8.3	23.2	3.7	6.2	49.8	6.8	157.7	5.2	0.0	24.9		1.3	83.0
Manfalut	3	9.0	9.0	25.2	4.1	6.8	54.0	7.4	171.0	5.6	0.0	27.0		1.5	90.0
New Valley	1	8.0	2.0	22.4	2.4	6.0	48.0	10.8	152.0	5.0	0.0	24.0		1.3	20.0
		142.9	121.9	400	60	107	857	125	2,715	89	0	429	0	23	1,219

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ANNEX 4D-2 NEW CAIRO-ASSUIT HIGHWAY, STAGE 2, ACCESS ROAD QUANTITIES AND COSTS (FOREIGN EXCHANGE)

For X cost? (0=N,1= 1 Construc stage 2

LAYER THICKNESSES	CLASS 1 Agric	CLASS 1 Desert	CLASS 2 Agric	CLASS 2 Desert	CLASS 3 Agric	CLASS 3 Desert	
Road sub-base	35	15	32	15	30	15	cms
Road base (binder)	18	18	14	14	11	11	cms
Shoulder sub-base	15	15	cms				
Wearing course	5	5	cms				
Shoul base (premix)	5	5	cms				
Levelling course	2.5	2.5	cms				

Carriage width	7.5 meters	EMBANKMENT	New	Exist
Shoulder width	2.5 meters	Right of way	19.0	10.0 meters
Exist car width	6.5 meters	Cross-sec Area	12.3	2.8 sq mts
Paint lines/car	3			

UNIT PRICES	FIN	ECO	FOR X
Embankment	3.00	1.281	0.334
Crushed stone sub-base	20.00	1.360	0.453
Prime coat	0.20	1.121	0.265
Binder/Premix base	45.00	1.397	0.415
Tack coat	0.15	1.068	0.224
Wearing course	52.00	1.344	0.350
Striping	260.00	1.038	0.080
Major structures		1.350	0.453
Minor structures		1.300	0.326
Land agric	3.60	1.000	0.000
reclaim	1.40	1.000	0.000

LOCATION	CLASS	TOTAL LENGTH	REC/AG	EMBANK	SUB-BASE Road	SUB-BASE Should	PRIME COAT	ROAD BASE	TACK COAT	WEAR COURSE	SHOULD BASE	STRIPE MARKING	STRUC	LEVEL COURSE	AREA LAND
		(kms)		(m3)	(m3)	(m3)	(m2)	(m3)	(m2)	(m3)	(m3)	(kms)			(m2)
Total Quantities (thousands, except kms)															
Aiyat	3	15.2		158.5	16.0	11.4	170.5	12.5	148.5	6.5	3.1	45.6	0.0	0.5	30.0
Gerza	2	6.2		17.4	1.7	4.7	37.2	6.5	117.8	3.9	0.0	18.6	0.0	1.0	10.0
Beni Suef		0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fashn	3	21.6		84.2	10.8	16.2	145.9	17.8	381.7	12.9	0.6	64.8	0.0	3.1	154.0
Maghagha	3	24.6		92.6	12.9	18.5	163.9	20.3	438.7	14.8	0.6	73.8	0.0	3.6	221.0
Beni Mazaar	3	21.2		67.9	9.2	15.9	133.1	17.5	392.5	13.0	0.2	63.6	0.0	3.3	157.0
Samalut	3	16.6		60.7	8.4	12.5	109.4	13.7	298.2	10.0	0.4	49.8	0.0	2.5	141.0
Minia	2	16.3		145.4	15.4	12.2	166.1	17.1	189.0	7.6	2.6	48.9	0.0	0.9	88.4
Mallawi	3	15.1		55.6	7.8	11.3	99.7	12.5	270.8	9.1	0.4	45.3	0.0	2.2	137.0
Dairut	3	13.8		52.9	7.2	10.4	92.6	11.4	245.0	8.3	0.4	41.4	0.0	2.0	118.0
Quisiya	3	11.9		67.5	8.1	8.9	94.8	9.8	184.7	6.5	0.9	35.7	0.0	1.3	124.8
Manfalut	3	10.4		42.4	5.7	7.8	71.5	8.6	181.5	6.2	0.4	31.2	0.0	1.5	90.0
New Valley	1	8.0		22.4	2.4	6.0	48.0	10.8	152.0	5.0	0.0	24.0	0.0	1.3	20.0
		181		868	106	136	1,332	159	3,000	104	10	543	0	23	1,291
Costs of Construction (LE thousands)															TOTAL COST
Aiyat	3			159	145	103	7	234	5	117	57	1	1,200	9	0 2,038
Gerza	2			17	15	42	2	122	4	71	0	0	1,744	19	0 2,035
Beni Suef				0	0	0	0	0	0	0	0	0	231	0	0 231
Fashn	3			84	98	147	6	333	13	234	12	1	1,297	58	0 2,283
Maghagha	3			93	117	167	7	379	15	268	12	2	1,217	67	0 2,343
Beni Mazaar	3			68	83	144	5	327	13	237	4	1	1,293	62	0 2,238
Samalut	3			61	76	113	4	256	10	182	7	1	1,302	46	0 2,057
Minia	2			146	139	111	7	320	6	138	49	1	1,302	18	0 2,235
Mallawi	3			56	71	103	4	233	9	165	7	1	1,756	42	0 2,446
Dairut	3			53	65	94	4	213	8	150	7	1	1,200	37	0 1,833
Quisiya	3			68	73	81	4	183	6	119	17	1	1,200	25	0 1,777
Manfalut	3			43	52	71	3	160	6	112	7	1	1,200	27	0 1,681
New Valley	1			22	22	54	2	202	5	91	0	0	1,744	24	0 2,167
				869	956	1,229	55	2,960	101	1,885	177	11	16,688	434	0 25,365