DETAILED MATERIALS
INVESTIGATION FOR A
RAILWAY CORRIDOR
WEST OF LAKE WOODS,
NORTHERN TERRITORY.
VOLUME 1



CENTRAL ENGINEERING SERVICES

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ENGINEERING GEOLOGIST



GREG MULES

FOR
DEPARTMENT OF MINES
AND ENERGY.

Australian National

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1.0 INTRODUCTION

At the request of the Geological Survey of the Northern Territory a materials search within a 15 km corridor west of Lake Woods, was commenced on 10th May, 1982. The Geological Survey was acting on behalf of Australian National Railways, the design and construction authority for the Darwin to Alice Springs Railway.

The search was to determine the availability of near-surface gravels which might be suitable as a selectfill zone for a railway enbankment constructed of surface sandy material. Available quantities were to be determined with some degree of certainty and representative bulk samples were required for testing.

The Geological Survey provided aerial photos at scale 1:50,000 from which a photomosaic was prepared. Also available were images from Landsat at scale 1:250,000, aerial photo interpretation maps (Mules, 1982) and a report on previous investigation (Soiltech, 1982).

This report presents the results of a 7 week field programme and tests carried out on 8 bulk samples.

2.0 REGIONAL SETTING

2.1 Physiography

The investigated corridor is some 240 km in length extending from the northern boundary of Newcastle Waters Station to the Short Range, and passing 25 km west of Lake Woods, Elliot . It lies within the sand dune terrain of the Tanami Desert which has encroached on black soil plains to the east and low rocky outcrop to the south and north, Fig. 1.

West of Lake Woods a dominating broad frontal dune transects the project area from west to north-east parallel to the Lake and is suggested to represent a paleo-shoreline of a lake which has since retreated to the east. (B.M.R., NEWCASTLE WATERS).

North of the dune, wind blown sand has piled into a gently undulating terrain covered by thick mulga scrub.

South of the dune, low longitudinal dunes and irregular transverse dunes are covered by wattle, eucalypts and spinifex. Low gravelly rises and rocky ridges outcrop further south on the flanks of the Ashburton and Short Ranges.

Black soil plains border Lake Woods and occur patchily on the eastern margin of the corridor and support growths of Mitchell and Flinders grass.

2.2 Geology

The area has been mapped at scale 1:250 000 by workers of the Bureau of Mineral Resources (B.M.R.) with results and explanatory notes being published as the NEWCASTLE WATERS, SOUTH LAKE WOODS AND TENNANT CREEK sheets. These results have been condensed onto a composite sheet at scale 1:1,000,000 for the B.M.R. report on the WISO BASIN. A section of that sheet is presented as Fig. 1 of this report and was compiled by the Geological Survey.

This work shows the surface geology of the project area to be

predominantly superficial deposits of Quarternary aeolian sands (Qs) with isolated clay pans (Ql). In the southern section, distinctive outcrops of rocks of Proterozoic and Palaeozoic age have been mapped. Specifically these are sandstones, siltstones and conglomerates of the Tomkinson Creek Beds (Pt), the fossiliferous siltstones, cherts, silicified limestone and sandstones of the Gum Ridge Formation and tholeitic basalt, minor sandstone and breccia of the Helen Springs Volcanics.

The results of the present investigation and of previous aerial photo interpretation (Mules, 1982), support the B.M.R. mapping but adds more detail in the southern section where further outcrop and low gravelly rises have been identified, Figs. 6-8. Here extensive surface laterite gravels and isolated outcrops of rocks of the Tomkinson Creek Beds occur in sections previously mapped as aeolian sand.

Some areas in the north, previously identified as gravelly rises were remapped as distinctly coloured clayey sands.

Black soil plains (Czb) marginal to Lake Woods were noted to be covered by patchy superficial deposits of ironstone and sandstone gravels and cobbles.

3.0 INVESTIGATION TECHNIQUES

3.1 Approach

In the absence of surface expression of near-surface gravels a sample grid of approximately 5 km was decided upon. North of the dune previous investigations indicated no gravels within a depth of 3 m (Soiltech, 1982). Landsat images suggested calcrete at shallow depths south of the dune. This was supported by previous investigations. Areas to the south, where rock outcrops or is covered by a thin layer of sand, were outlined from Landsat images and aerial photo interpretation.

All targets were marked onto the aerial photo mosaic and tied into the sampling grid. Scout auger drilling to 5 m depth was carried out at these nominated sample points. Where substantial gravel stata were intercepted within potentially economic depths a surrounding pattern of a further 2 or 3 holes was drilled at 500 m spacings. Areas which continue to hold promise were then trenched using either excavator or backhoe to obtain a geological log and representative bulk sample of the strata.

Where gravels were abundant, such areas were explored approximately every 10 km to prove a minimum of 20,000 cu. metres in each area.

3.2 Method of Investigation

Surveying

The access track and all connecting tracks were accurately plotted onto the aerial photomosaics during a light aircraft reconnaissance.

From its northern end the track was pegged at 5 km intervals measured on a vehicle odometer. Auger locations marked on the aerial photos were measured for distance and bearings from known points on the track. Appropriate compass bearings were sighted and the required distance of traverse measured on a vehicle odometer.

Plotted locations of auger holes and trenches are considered accurate to within 300 m. In places, accuracy was improved where features were

clearly recognized on the aerial photos or where holes were located on the access track.

Scout Augering

Using an hydraulic drive Proline auger mounted on a Toyota four wheel drive fitted with puncture-proof types, the scout programme as outlined in Section 3.1, continued throughout the field period.

Holes of 165 mm diameter were drilled to 5 m depth or refusal. Some holes were continued to a depth of 6 metres. Each change of strata was measured, described and given a visual classification. No samples were taken during scout augering.

Trenching

Using a tracked John Deere 690 excavator and a John Deere 400 backhoe, a logging and sampling programme was undertaken in the last 3 weeks of the field period. At selected areas a trench was excavated to a depth that proved sufficient quantities of suitable gravel or to refusal. One or two holes were excavated in each area.

A log was made of the trenches and bulk samples selected to allow testing to provide results representative of materials within the region.

Testing

Testing was undertaken on 4 sand and 7 gravel samples in compliance with ASA standards and included Mechanical Analysis, determination of Atterberg Limits, Linear Shrinkage and Compaction Tests of 4 of the gravel samples.

Results are presented on standard forms in Vol. 1 of this report.

Tested soils have been classified in accordance with the Unified Soils Classification while more detailed descriptions are available from the relevant trench log or auger hole.

4.0 INVESTIGATION RESULTS

4.1 Presentation

The results of the investigation are presented as a combination of plans, logs, test results and area descriptions.

Plans at aerial photo scale show auger hole and trench locations and summarize visual classifications of intersected strata. These are presented in Vol. 2 as Figs. 2-8.

Logs of auger holes and trenches are presented in Vol. 2 as are results of tests carried out on representative sand and gravel samples.

Descriptions of selected areas proven to feasibility stage are presented in Section 4.3 and include plans of the investigation programme (Figs. 9-18).

4.2 Stratigraphy and Distribution

The distribution of shallow stratigraphic types can be conveniently divided into three sections. The northern section extends from 00 km to 75 km, the central section from 75 km to 140 km and the southern section from 140 km to 240 km and are described below.

The irregular dune terrain in the north typically has silty surface sands with sands of increased clay content and in situ density to depths greater than 5 m. The sequence thins to the north where, in places, calcrete and laterite strata occur at 3 to 5 metres depth. At the northern most end, rock and laterite gravels outcrop outside the project area.

The central section is confined by the frontal dune on the west and the black soil plains associated with Lake Woods on the east. The stratigraphic sequence is typically of loose surface sand grading into clayey sands above an apparently continuous deposit of weathered calcrete gravels. The upper surface of the calcrete layer is weathered to varying degrees, producing silty clays. Less weathered calcrete at depth, produce silty gravels with high strength particles.

Isolated occurrences of surface calcrete-ironstone gravel grade into nodular calcrete deposits showing varying degrees of weathering.

Approaching the southern area at 120 km, a typical stratigraphic section is of aeolian sand with an increasing (with depth) clay content and the development of weakly cemented ironstone nodules. Below this is a calcrete deposit with a highly weathered upper surface producing silty clays grading into high strength silty gravels.

The northern boundary of the southern section is marked by the appearance of dune sand covering weathered rock and corresponds with the southern-most occurrence of calcretes. The dune sand is generally uniform in nature to depths of 5 metres. Some increase in in situ density and clay content with depth, was noted in places.

Where rock outcrops, slopes may be covered by rocky gravel scree or nodular laterite gravels. The deposits are typically thin, grading into high strength rock or cemented laterite. Between rock outcrops, colluvial deposits of a sand, laterite and rocky gravel mix were noted. Such areas predominate south of a Trigonometric Station at 172 km.

4.2 Borrow Areas

Plans at scale 1:10,000 are presented for each selected area, showing the investigation programme and summarizing the results. Average depths to the top of the gravel deposits are indicated, as are assumed minimum thicknesses. The latter are usually taken as the maximum intersection obtained and assumes a near horizontal upper surface to the gravels.

Potential volumes have been calculated. The location of the areas are indicated by bearings and distances from points along access tracks.

AREA 'A' - DISTANCE 7 KILOMETERS

A very gently sloping area with no significant airphoto pattern. Prominent occurrence of patches of a medium height, small leafed mulga within the area.

Area 'A' is located 2.4 km west of the 7.2 km distance along the access track and is indicated on Fig. 2. Details of the investigation programme and summary results are shown on Fig. 9.

An area of 1,625,000 sq. m. was proven to feasibility stage with four auger holes (AH 10 ± 13) and one trench (T1). With an average depth of 3.0 m of overburden and assuming a continuous gravel layer at least 2 m thick, the area could produce 3,250,000 cu. m. of gravelly material.

The gravels are a mix of silty sand and low to high strength weathered calcrete nodules grading into calcretes with nodules of a predominantly high strength. Some cemented sand concretions of low strength are present. Only minor low plasticity fines are indicated however breakdown of weathered calcrete may increase the percentage of fines.

Overburden consists of poorly sorted sands with medium-low plasticity fines and is of generally consistent thickness across the area.

AREA 'B' - DISTANCE 13 KILOMETERS

The area consists of broad depressions covered by light grey silty sand forming a distinct light coloured aerial photo pattern over an area of 2.5 sq. km. A distinctive vegetation association was noted.

Area 'B' is located on the access track at distance 13 km and is indicated on Fig. 2. Details of the investigation programme and summary results are shown on Fig. 10.

An area of 600,000 sq. m. was proven to feasibility stage with three auger holes (AH 23 - 25) and two trenches (T2 and T3). With an average depth of 2.9 m of overburden and assuming a continuous gravel layer at least 2.4 m thick, the area could produce 1,000,000 cu. m. of gravel.

The gravels are a mix of silty sands and low to high strength calcrete nodules grading into weathered calcretes with nodules of a predominantly high strength. Minor low plasticity fines are indicated however breakdown of weathered calcrete may increase the percentage of fines.

Overburden consists of silty sands with minor clays of low plasticity. T3 suggests that overburden may be thinnest in the eastern section of the area.

AREA 'C' - DISTANCE 68 KILOMETERS

This area was originally thought to contain gravels at depth, but follow-up trenching has proven unproductive. The intersection of dense material during scout augering suggested calcrete gravels may be present. The aerial photo pattern and the topography suggested a large area where groundwater levels are seasonally shallow. This was thought an ideal environment for calcrete deposition and with the prospect of finding gravels on the northern side of the steep dune a total of 3 trenches were excavated in this area (T4, T5, T6). These intersected dense to very dense mottled silty sands which may represent completely weathered calcretes but no high strength gravels were located. The investigation in this area is summarized in Fig. 11.

AREA 'D' - DISTANCE 75 KILOMETERS

Located at the windward toe of the frontal dune, the area comprises a series of low parallel dunes and interdune depressions. Typical vegetation is spinifex and scattered eucalypt trees.

Area D is located at 7.5 km on the eastern side of the track and is indicated on Fig. 3. Details of the investigation programme and summary results are shown on Fig. 12.

An area of 1 sq. km was proven to feasibility stage with four auger holes (AH 46, AH 54 - 56) and a backhoe trench (T7). With an average depth of 1.4 m of overburden and assuming a minimum thickness of 1.8 m, the area could produce 1,800,000 cu. m. of gravel.

The calcrete gravels are weathered at the top of the deposit producing a silty gravel with low strength nodules. Below 2.0 m however a less weathered material of higher strength is encountered with 30-40% of the gravel fraction being of medium strength or stronger.

Overburden consists of loose to medium dense sand grading into the silty weathered calcrete. Depths of overburden are considerably increased over low dunes (AH 54).

AREA 'E' - DISTANCE 80 KILOMETERS

A very gently undulating sandy terrain dominated by a spinifex and scattered eucalypt vegetation.

Area E is located on the track at 80 km and is indicated on Fig. 4. Details of the investigation programme and summary results are shown on Fig. 13.

An area of 80,000 sq. m. was proven to feasibility stage by one auger hole (AH 47) and two backhoe trenches (T8 and T9). With an average depth of 2.2 m of overburden and assuming a continuous gravel layer of 1.7 m minimum thickness, the area could produce 136,000 cu. m. of gravels.

The deposit is a silty gravel of medium to high strength nodular calcrete. There is little plasticity, as most of the fines are silts derived from the weathering of calcrete. The degree of weathering decreases with depth.

Overburden consists of loose to medium dense sand grading into silty sand above the gravel deposit. Thickness of sand overburden is uniform however depths to suitable gravel material may vary across the area.

AREA 'F' - DISTANCE 90 KILOMETERS

A flat terrain of spinifex and scattered eucalypt vegetation. Patches of medium grained surface gravels occur in this area and, increasingly so, to the east.

Area F is located 3.3 km east of the 90 km mark on the access track from Benaud Bore and is indicated on Fig. 4. Details of the investigation programme and summary results are shown on Fig. 14.

An area of 1 sq. km was proven to feasibility stage with 4 auger holes (AH 50 - 53) and one backhoe trench (T10). With an average depth of 0.9 m of overburden and assuming a continuous gravel layer of 1.9 m minimum thickness, this area could produce 1,900,000 cu. m. of gravelly material.

In general, the gravels are of medium to high strength weathered calcrete nodules with non-plastic sand and silt fines. In places, sandy surface gravels occur as medium to high strength nodular iron-stone considered to be derived from the underlying calcrete.

Overburden is thin consisting of loose to medium dense aeolian sand.

AREA 'G' - DISTANCE 98 KILOMETERS

A low ridge of surface gravels, sparsely grassed and supporting isolated eucalypt trees, is distinguishable on aerial photos from more densely vegetated surrounds.

Area G is located 4.6 km from the 95 km mark of the access track on a bearing of 110⁰ and is indicated on Fig. 4. Details of the investigation programme and summary results are shown on Fig. 15.

An area of 70,000 sq. m was proven to feasibility stage with one auger hole (AH 93) and two trenches (T11 and T12). With an average depth of 0.8 m of overburden and assuming a continuous layer of 2.6 m minimum thickness, this area could produce 1,820,000 cu. m. of gravelly material.

Surface and near surface sandy gravels are typically of medium to high strength nodular ironstone derived from high strength silty calcrete gravels at depth.

Overburden, where present, is of loose to dense aeolian sand.

Approximate area of surface gravels is 10,500 sq. m. Further similar deposits may be present on a north-south strike along this low ridge.

AREA 'H' - DISTANCE 115 KILOMETERS

A flat terrain of spinifex and scattered eucalypt trees with no significant aerial photo pattern.

Area H is located 3.4 km on a bearing of 067° from 115 km on the access track and is indicated on Fig. 5. Details of the investigation programme and summary results are shown on Fig. 16.

An area of 570,000 sq. m. was proven to feasibility stage with 3 auger holes (AH 103 - 105) and one backhoe trench (T15). With an average depth of 1.4 m of overburden and assuming a continuous gravel layer of 2.2 m minimum thickness, this area could produce 1,254,000 cu. m. of gravelly material.

The gravel is high to very high strength nodular calcrete with a percentage of silty sand and minor plastic fines.

Overburden is of loose to medium dense aeolian sand.

AREA 'I' - DISTANCE 130 KILOMETERS

A gently undulating dune terrain with patchy wattle growth and regrowth and isolated eucalypt trees, this area shows no significant aerial photo pattern.

Area I is located at 130 km on the access track and is indicated on Fig. 5. The investigation programme and summary results are shown on Fig. 17.

An area of 200,000 sq. m. was proven to feasibility stage with 3 auger holes (AH 113 - 115) and one backhoe trench (T14). With an average depth of 3.1 m of overburden and assuming a minimum gravel thickness of 1.2 m, this area could produce 240,000 cu. m. of gravel.

The stratigraphy appears consistent across the area with a surface layer of aeolian sand grading into a gravel of well rounded cemented sand nodules of low strength. Below this is a silty clay presumably developed from the weathering of high strength nodular calcrete gravels which occur deeper.

AREA 'J' - DISTANCE 137 KILOMETERS

A gently undulating dune terrain with patchy wattle and scattered eucalypt trees, this area also shows no significant aerial photo pattern.

Area J is located at 137 km on the access track and is indicated on Fig. 6 while the investigation programme and summary results are shown on Fig. 18. This is the most southerly intersection of calcrete gravels encountered during the investigation programme.

An area of 200,000 sq. m. was proven to feasibility stage with one auger hole (AH 117) and two trenches (T16 and T17). With an average depth of 1.0 m of overburden and assuming a minimum gravel thickness of 2.0 m this area could produce 400,000 cu. m. of gravelly material.

Beneath a layer of aeolian sand are nodular calcrete gravels of high strength, well graded and containing a high proportion of silty and low plastic fines.

AREA 'K' - DISTANCE 172 KILOMETERS

A distinctive trough between outcropping rock, the area supports stunted wattle and eucalypt and open grass with surface gravels. Surrounding terrain is sandy with tall wattle and eucalypt.

Area K is located 6 km west from the access track along the track towards the Trig. Station and is indicated on Fig. 7.

An area of 70,000 sq. m. of surface gravels was proven to feasibility stage with one backhoe trench (T20). A depth of 2 m of gravel was proven showing this area could produce up to 140,000 cu. m. of material.

The gravels are typically a mixture of colluvial pisolitic laterite gravels and angular quartzite cobbles of low to high strength.

Nearby rocky ridges demonstrate the abundance of in situ laterite and residual gravels, particularly on lower slopes. However, the natural sorting and mixing found in colluvial deposits make such areas better prospects for suitable gravels.

AREA 'L' - DISTANCE 177 KILOMETERS

Low rocky ridges and laterite rises covered by spinifex and grass with scattered eucalypt trees. The area forms two distinctive aerial photo patterns with a sharp boundary separating the Gum Ridge Formation and the Helen Springs Volcanics.

Located 1.8 km from 177 km on bearing 068° the area is shown on Fig. 7. A surface extent in excess of 2 sq. km was observed and proven to feasibility stage with three auger holes (AH 155 - 157) A depth of 0.5 m was drilled to refusal indicating this area could produce in excess of 1,000,000 cu. m. With deep ripping this volume could be greatly increased.

The gravel is of high strength material of either lateritic or residual origin with low percentages of sandy fines with little plasticity. Pisolitic laterites appear to have developed in the Helen Springs Volcanics (AH 157) while angular chert, quartzite and ironstone gravels occur on the Gum Ridge Formation (Ah 155 - 156). Some reworking of the gravels is expected and colluvial deposits are likely to occur between the low gravelly rises.

AREA 'M' - DISTANCE 192.5 KILOMETERS

A low rise of surface gravels with spinifex and isolated eucalypts, the area was developed to feasibility stage with three auger holes 250 m apart (AH145 - 147). The area is shown on Fig. 7 and extends for in excess of 2 sq. km. With laterite gravels from the surface to 1.5 m, this area could provide in excess of 3,000,000 cu. m. of gravelly material.

The gravels, from the surface, are medium to high strength silty laterites with minor low plasticity fines.

AREA 'N' - DISTANCE 225 KILOMETERS

An extensive deposit of surface rocky gravels occurs along the track approaching a bore and black soil plains. The area was proven to feasibility stage with one auger hole (AH 162) and one trench (T27).

In excess of 2 sq. km and with a depth of 1.5 m the area could provide more than 3,000,000 cu. m. of gravelly material. The area is shown in Fig. 8.

The gravels consist of residual cherts and ironstone particles of high strength with a percentage of sand with minor plastic fines. Some larger cobbles are present.

AREA 'O' - DISTANCE 238 KILOMETERS

A low gravelly rise covered by wattle and spinifex forming a distinctive aerial photo pattern.

Area 0 is located predominantly east of distance 236 to 240 km flanking the Short Range and is indicated in Fig. 8.

An area in excess of 2.0 sq. km was noted on the ground and can be seen from aerial photos.

The area was proven to feasibility stage with two trenches (T25-26) and one auger hole (AH 133). . With a maximum intersection of 2 m from the surface, the area could produce in excess of 4,000,000 cu. m. of lateritic gravels.

The deposit grades from loose sandy gravels to a cemented laterite gravel which breaks out with difficulty. Break-down of sandy horizons produces a fine fraction of low plasticity.

5.0 CONCLUSIONS AND RECOMMENDATIONS

The results of the investigation demonstrate the general availability of high strength gravels within the corridor of study.

Deep, subsurface, calcrete gravels are available as far south as the 14 km distance. South of this and extending to the windward toe of the frontal dune at 75 km, a thick deposit of aeolian sand provides no prospect of suitable deposits of gravelly material.

South of the frontal dune, apparently continuous shallow subsurface and isolated surface calcrete occurs to 140 km. The degree of weathering of the calcretes is variable across the area and hence quality may be patchy. However, results indicated that deposits of high strength gravels were generally shallower in the eastern section of the corridor, bordering Lake Woods.

Beyond the calcretes to the Trig. Station at 172 km, a blanket of dune sand covers residual gravels at uneconomic depths.

Numerous laterite and residual gravels occur south from the Trig. Station and, in places, colluvial deposits of naturally mixed sand and gravel are available.

One section of thick dune sand occurs between 195 and 210 km, however surrounding surface deposits of gravel are abundant.

The quality of gravelly deposits varies throughout the project area both in particle gradings and strength as well as origin and composition.

The northern calcretes and those south of the frontal dune appear to be ancient deposits beneath a layer of aeolian sand and are presently undergoing degradation by chemical weathering. The high degree of weathering has reduced the particle strength and increased the percentage of fines in the upper layer of all calcrete deposits. Break down of weathered particles by wetting and mechanical impact was noted during testing. Less weathered calcretes develop gravels with high strength, coarse grained particles and low percent fines. Mixing of the entire calcrete strata should, in general, produce a graded gravel with low plastic fines which could be suitable as a protective selectfill.

The southern laterite and residual gravels are thin but occur extensively on the surface. They consist of medium to very high strength particles ranging from fine gravels to cobbles. Some breakdown of sandy laterites was noted during testing but plasticity and linear shrinkage are generally low (Lab. No. 158 and 160).

Deep ripping within these deposits will greatly increase the available volume and would be likely to produce gravels of increased particle strength but reduced fines.

The surface sandy material which is ubiquitous throughout the project area is a medium to fine grained, non plastic sand easilly worked and compacted. Plasticity generally increases with depth however, and below 1.5 m is a clay sand which has a moderately high shrinkage and may be difficult to work due to its sticky nature.

Except in the case of dune sands, the loose surface material was generally thin being underlain by medium dense to dense sands with considerable bearing capacity. Dune sands were noted to be very loose to medium dense where encountered.

Further investigations should attempt to more clearly define the physical characteristics of the various gravel types revealed by this study. In particular attempts could be made to test strata mixtures to obtain an optimal combination for the various stratigraphic sequences. The clayey sands may need to be mixed with silty surface sands and the upper weathered calcretes with deeper sections of the deposits in order to obtain materials which best satisfy design and construction specifications.

Borrow areas could be sampled in greater detail to more clearly define quantities, and variations in overburden depth. This is particularly so for the calcretes south of the dune where low sand dunes and a variable degree of weathering combine with an apparent thinning of overburden to the east to give scope for optimizing the economic recovery of gravel from that area by more detailed investigations.

The investigation has highlighted the value of using a buckettype excavator in support of a scout augering programme to allow an appreciation of the in situ nature of the deposits. Auger samples were sometimes proven unrepresentative of the in situ material and at times were unable to penetrate the upper surface of the calcrete gravels. The excavator trenches also gave an appreciation of the break-out effort required during excavation and of the workability of the excavated material.

REFERENCES

TENNANT CREEK, Explanatory notes, 1:250,000 Geological Series, B.M.R., 1978.

NEWCASTLE WATERS, Explanatory notes, 1:250,000 Geological Series, B.M.R. 1969.

SOUTH LAKE WOODS, Explanatory notes, 1:250,000 Geological Series, B.M.R.

MULES, G.J., Katherine - Tennant Creek Terrain Appraisal, 1982.

SOILTECH, Report on High Strength Embankment Material for Possible Railway Routes West of Lake Woods, Northern Territory, 1982.

CENTRAL ENGINEERING SERVICES

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REPORT OF FIELD DENSITY TEST RESULTS

10 Dept. of Mines & Energy

REPORT No:

820071

ATTENTION R. Hindrichs

In accordance with your request dated signed by Field Density tests have been carried out in accordance with AS 1289 E3.1 using the sand replacement method 8 sand cone apparatus. The density sand used passed 1.18 mm and was retained on 600 mm sieves. Compaction testing was done to AS 1289 E1.1 # E2.1. Dry density ratio was calculated to AS 1289 E4.1...

2. The following information was supplied in connection with the samples.

CONTRACT NO:81/124

CONTRACTOR : Central Engineering

FEATURE: Materials Investigation

SAMPLED BY: D.D. & G.M

PROJECT: Lake Woods Corridor

LOCATION: a smotch is is not attached

DIAMETER OF HOLES:

(m m)

DATE SAMPLED:

3. The test results and details of locations are shown below-

Laboratory Reference No.	CE82	157	158	159	160	"		
Project Reference No.	0.101							
Chainage								
Offset from centre-lin	ne (m)							
(5) sub gr Material type (8) base c (F) fill	ourse							
Position from surface	(mm)							
Strendered Modified Maxim Dry Density (Pd)	ium (t/m³)	2.36	1.77	1.98	2.14			
Secondarial Modified Optim Moisture Content(wo)	um (%)	8.0	3.0	12.0	8.0			
Field Dry Density(ft)	(1/m³)							
Moisture Content in Laboratory(wf)	(%)							
Moisture Variation (w _v)	(%)							
Dry Density Ratio(8 _D)	(%)							

REMARKS

Propared by Kul

Checked by

Distribution

1. Lab. File

2.

3.



This Laboratory is registered by the National Association of Testing Authorities, Australia. The testifs reported herein have been personally in accordance with its terms of registration. The document shall not be reproduced except in Citi.

Luchera

for O.I.C. Materials Laboratory

218/1182

CENTRAL ENGINEERING SERVICES

5dx:RailwaxxInners. Alice Springs N.T. ph. \$25.755x

524092

REPORT OF TEST RESULTS ON SOILS

Dept. of Mines & Energy

Report No.:

820071

Attention: R. Hinrichs

1. In accordance with your request duted

CONTRACT NO.: 81/124

and signed by

the following tests have

been carried out to the methods specified by AS 1289-1977

2. The following information was supplied in connection with the samples

PROJECT: Lake Woods Corridor

CONTRACTOR: Central Engineering

LOCATION: Various

FEATURE: Materials Investigation

MATERIAL TYPE: Various

SAMPLED BY: D. D. & G.M.

DATE SAMPLED:

3. Test results are set out be'ow-

Laboratory Refe	rence No.	C.E.82	157	158	159	160		
Suppliers No.			T2	AH156	Т3	AH133		
Chainage	Depth	m	1.5-3	-0.5	1.6-2.	80.2-1	8	
Reptb	Chainage	Km	13	175	13	137		-
		75·0 mm						
		63-0mm	100	100				
		37-5 mm	97	99	100			
		26·5 mm	92	94	97			
		19·0 mm	83	83	94	100		
	LA _1 ·	13·2 mm	68	68	91	95		
Mechanical Analysis Percentage Passing		9.50 mm	55	57	89	87		
		6.70mm	43	50	87	75		
		4·75 mm	36	45	85	65		
A.S.Sieve		2:36mm	29	38	80	54		
	1-1 8mm	26	36	77	48			
		600µm	24	36	74	42		
		4 2 5µm	22	36	72	39		
		300дт		34	67	34		
		212 _M m						_
		150µm	15	23	42	23		
		75µm		13	27	11		
Dust Ratio (75	/425um)%		48	37	38	29		_
	Standard /Selection Met	hod)	29	NO	31	NO		
*Plastic Limit			15	NO	13	NO		+
Plasticity Inde	ex		14	NP		NP		
Linear Shrink	age (% on 250 mm mould)		7.0	0.5	8.0	1.5	-	
Determination	of Soil Particle Density Rei	sing/2-36 mm/Combined			1	atu et	-	
IIn	ified Soils Cla	ssification	GW-GC	GM	SC	SW-SM		

REMARKS: All samples wet/ Try sleved

*Air/OVeX dried at 45%

K. m. Phenon

Prepared by K. McP.

MASI

for OIC Materials Laboratory

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CENTRAL ENGINEERING SERVICES

\$kxBailwayxxTextext Alice Springs N.T. ph. <u>\$25₹55</u> 524092

REPORT OF TEST RESULTS ON SOILS

Dept. of Mines & Energy

Report No.:

820071

Attention: R. Hinrichs

1. In accordance with your request duted

and signed by

the following tests have

been carried out to the methods specified by AS 1209-1977

2. The following information was supplied in connection with the samples

CONTRACTOR: Central Engineering

PROJECT: Lake Woods Corridor

CONTRACT NO.: 81/124

LOCATION: Various

Various Sand, Sand/clay

FEATURE: Materials Investigation SAMPLED BY: D.D. & G.M.

MATERIAL TYPE: DATE SAMPLED:

2. Test coulds are set out he few-

aboratory Reference No.	C.E.82	161	162	163	164		بنجوي
uppliers No.		T 1	T11_	Т6	Т9		
hainage	km	7.2	98	75	80		
Depth	m	•6-3	0.3-1.	50-0.3	0.3-1.	5	
	75·0 mm						
	43.0mm					<u> </u>	
	37·5 mm				ŧ		
	26·5 mm						
	19.0 mm					-	
At a toxical Applica	13·2 mm						
: Mechanical Analysis	9-50 mm						
Percentage Passing	6-70mm						
Percentuge russing	4.75 mm						
A C Claus	2·36mm		100		100		
A.S.Sieve	1-1 8mm	100	99		99		
	600µm	99	90	100	97		
	425µm	1	80	98	92		
	300дт	0.0	69	91	82		
	2 12 _M m				1	-	
2	150µm	57	45	47	51		
	75µm		25	34	28		
Just Ratio (75/425µm)%		40	31_	35	30	<u> </u>	
Liquid Limit(Standard/Subsidiary Met	hod)	30	27	N.O.		-	
Plastic Limit		10	11	N.O.	10		
Plasticity Index		20	16	N.P.	13_		
Linear Shrinkage (%on 250mm mould)		9.0	8.0	0.5	5.5		
Determination of Soil Particle Density Res	sing/2-36 mm/Combined		_			-	-

REMARKS: All samples wet Mry slaved

Prepared by: K. McP. Checked by:

Distribution:

Ttab File

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DXX to boish WWO/siA#

for OIC Materials Laboratory 2/9/1982

\$ k x Bailwayx x Tex sper Alice Springs N.T. ph. \$25755 524092

REPORT OF TEST RESULTS ON SOILS

Dept. of Mines & Energy

Report No.:

风沙川71

Attention: R. Hinrichs

1. In accordance with your request dated

and signed by

the following tests have

been carried out to the methods specified by AS 1209-1977

2. The following information was supplied so connection with the samples **CONTRACT NO.:** 81/124

PROJECT: Lake Woods Corridor

LOCATION: Various

CONTRACTOR: Central Engineering FEATURE: Materials Investigation MATERIAL TYPE:

Various Sand, Sand/cla

SAMPLED BY: D.D. & G.M.

DATE SAMPLED:

3. Yest results are set out below-

Laboratory Reference No.	L.E.82	161	162	163	164		-
Suppliers No.	. 2.01.	T1	T11	Т6	19		
Chainage	km	7.2	98	75	80		
Depth	m		0.3-1.	50-0.3	0.3-1.	5	-
	75·0 mm						1
	43-0mm						
	37-5 mm						
	26.5 mm						
	19.0 mm						
Mechanical Analysis	13-2 mm						_
Mechanical Allolysis	9-50 mm					L	
Percentage Passing	6.70mm						
Leicatione Lossinh	4·75 mm					-	4-
A.S.Sieve	2·36mm		100		100		
W.7.2.eve	1-1 8mm	100	99		99		
	600µm	99	90	100	97	-	
	4 2 5µm	98	80	98	92		
	300дг	92	69	91	82		
	212ди					1	_
	150µm	57	45_	47	51		
	75дп	39	25	34	28		
Dust Ratio (75/425µm)%		40	31_	35	30	-	
Liquid Limit(Standard/Subsidiary Method	4)	30	27	N.O.			
*Plastic Limit		10	11	N.U.			
* Plasticity Index		20	16	N.P.	13		
Linear Shrinkage (%on 250mm mould)		9.0	8.0	0.5	5.5	-	-
Determination of Soil Particle Density Retains	2-36 mm/Combine		1		-	+	

REMARKS: All samples wel Mry sleved

Prepared by: K. McP.

Checked by:

Distribution:

Lob File

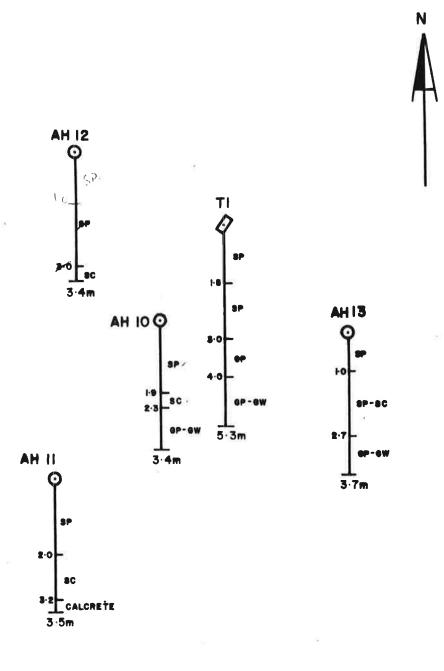
2 3 с китель в с Т

2%K to boirb MWO/riA#

tor OIC Materials Laboratory 2/9/1982

AREA = 1625 000m²
AVERAGE DEPTH = 3·0m
MINIMUM THICKNESS = 2·0m
VOLUME = 3 250 000 m³

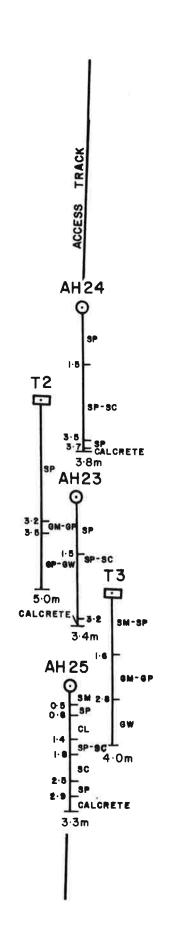
LOCATION = FROM 7.2 Km ON TRACK, BEARING 274° FOR 2.4 Km



AREA 'A'

FIG 9

SCALE 1:10000



SCALE 1:10000

AREA = 600 000 m²
AVERAGE DEPTH = 2.9 m
MINIMUM THICKNESS = 2.4 m
VOLUME = 1 440 000 m³

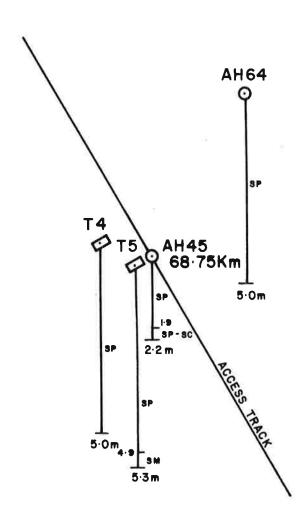
LOCATION = 13 Km ON TRACK

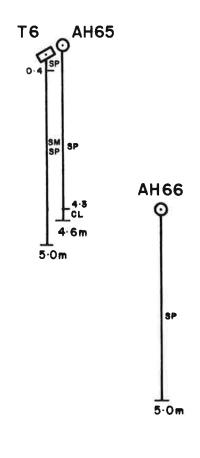
A N

AREA B

FIG IO







AREA 'C' FIG II

SCALE 1:10 000

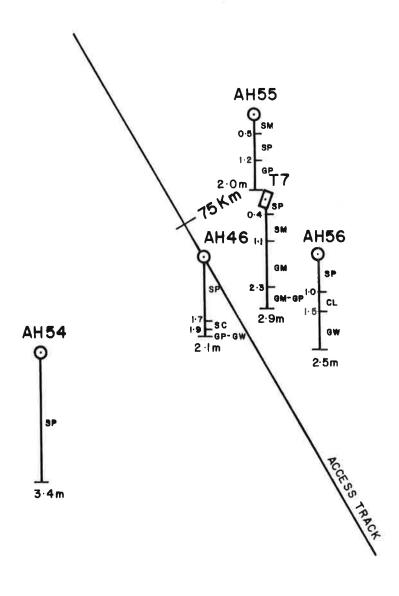


=1000000m² AREA AVERAGE DEPTH = 1.4 m

MINIMUM THICKNESS = 1-8 m

= 1 800 000 m ³ VOLUME

LOCATION = 75 Km ON TRACK

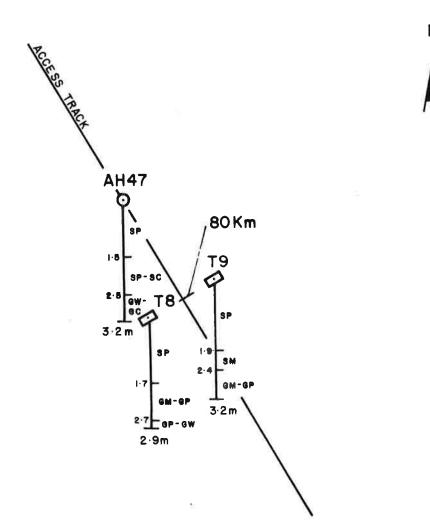


AREA 'D'

FIG 12

AREA = 80.000m^2 AVERAGE DEPTH = $2 \cdot 2 \text{ m}$ MINIMUM THICKNESS = $1 \cdot 7 \text{m}$ VOLUME = 136.000 m^3

LOCATION = 80 Km ON TRACK



AREA 'E'

FIG 13

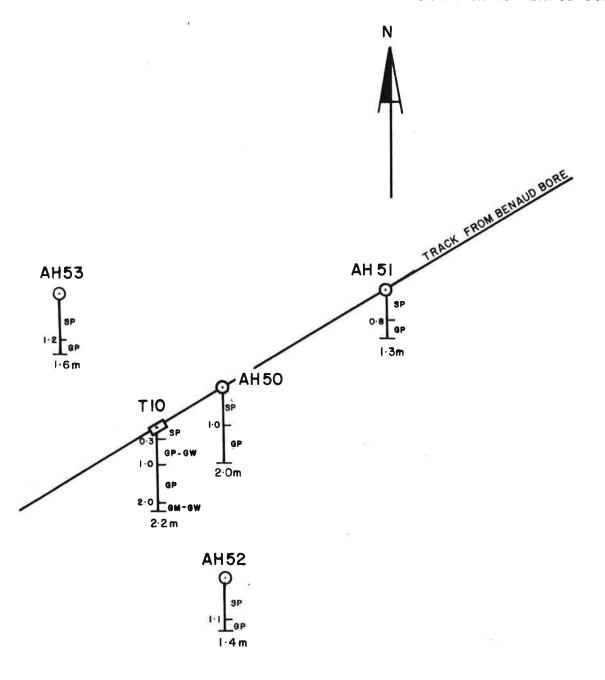
AREA = 1000 000m²

AVERAGE DEPTH = 0.9m

MINIMUM THICKNESS = 1.9m

VOLUME = 1900 000m³

LOCATION = 3.3 Km EAST OF 90 Km ON TRACK TO BENAUD BORE



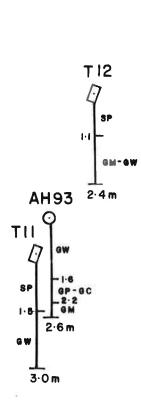
AREA 'F'

FIG 14

SCALE 1:10000

AREA = 70 000 m²
AVERAGE DEPTH = 0.8 m
MINIMUM THICKNESS = 2.6 m
VOLUME = 182 000 m³

LOCATION = FROM 95 Km ON MAIN TRACK BEARING 110° FOR 4.6 Km



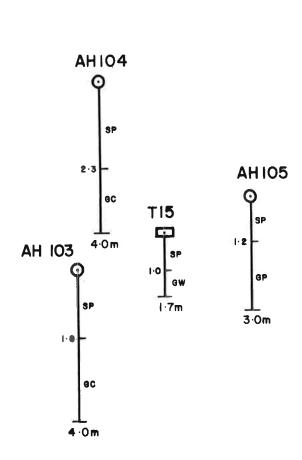
AREA 'G'

FIG 15

AREA = 570000 m^2 AVE RAGE DEPTH = 1.4 mMINIMUM THICKNESS = 2.2 mVOLUME = 1254000 m^3

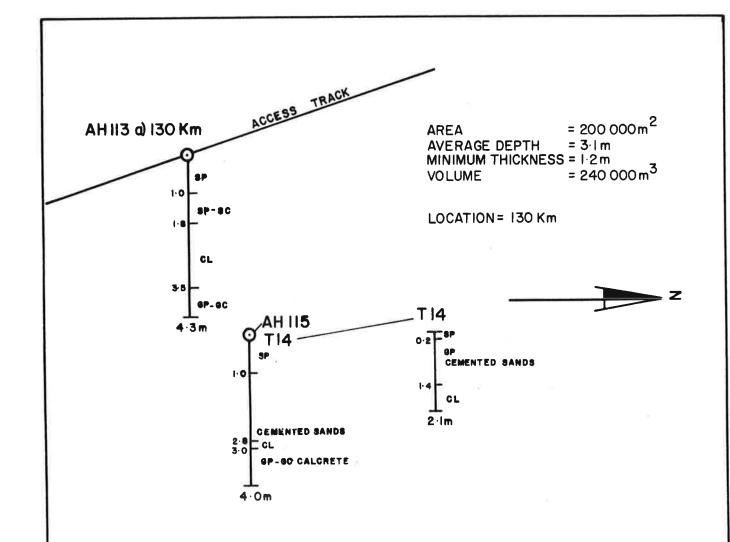
LOCATION = FROM 115 Km ON TRACK BEARING 67° FOR 3.4 Km

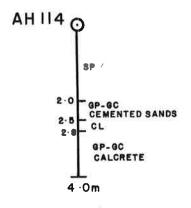




AREA 'H'

FIG 16



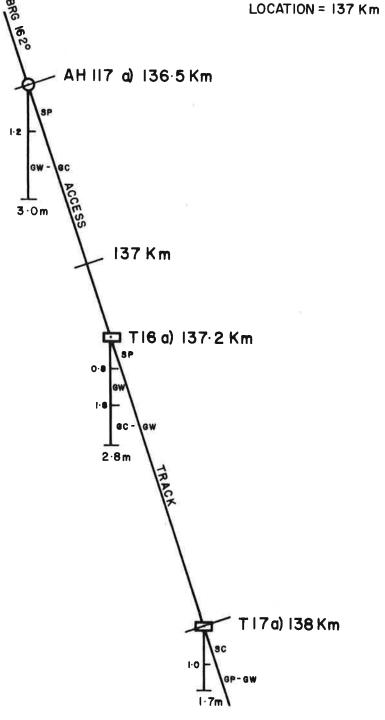


AREA 'I'

FIG 17

SCALE 1:10000

= 200 000 m² AREA AVERAGE DEPTH = 1.0 m MINIMUM THICKNESS = 2.0 m $= 400000 \,\mathrm{m}^3$ **VOLUME**



AREA 'J'

FIG 18

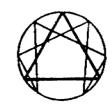
DETAILED MATERIALS
INVESTIGATION FOR A
RAILWAY CORRIDOR
WEST OF LAKE WOODS,
NORTHERN TERRITORY.

VOLUME 2



CENTRAL ENGINEERING SERVICES

81 ELDER STREET,
P.O. BOX 3370, ALICE SPRINGS, N.T.
Phone 52 4092



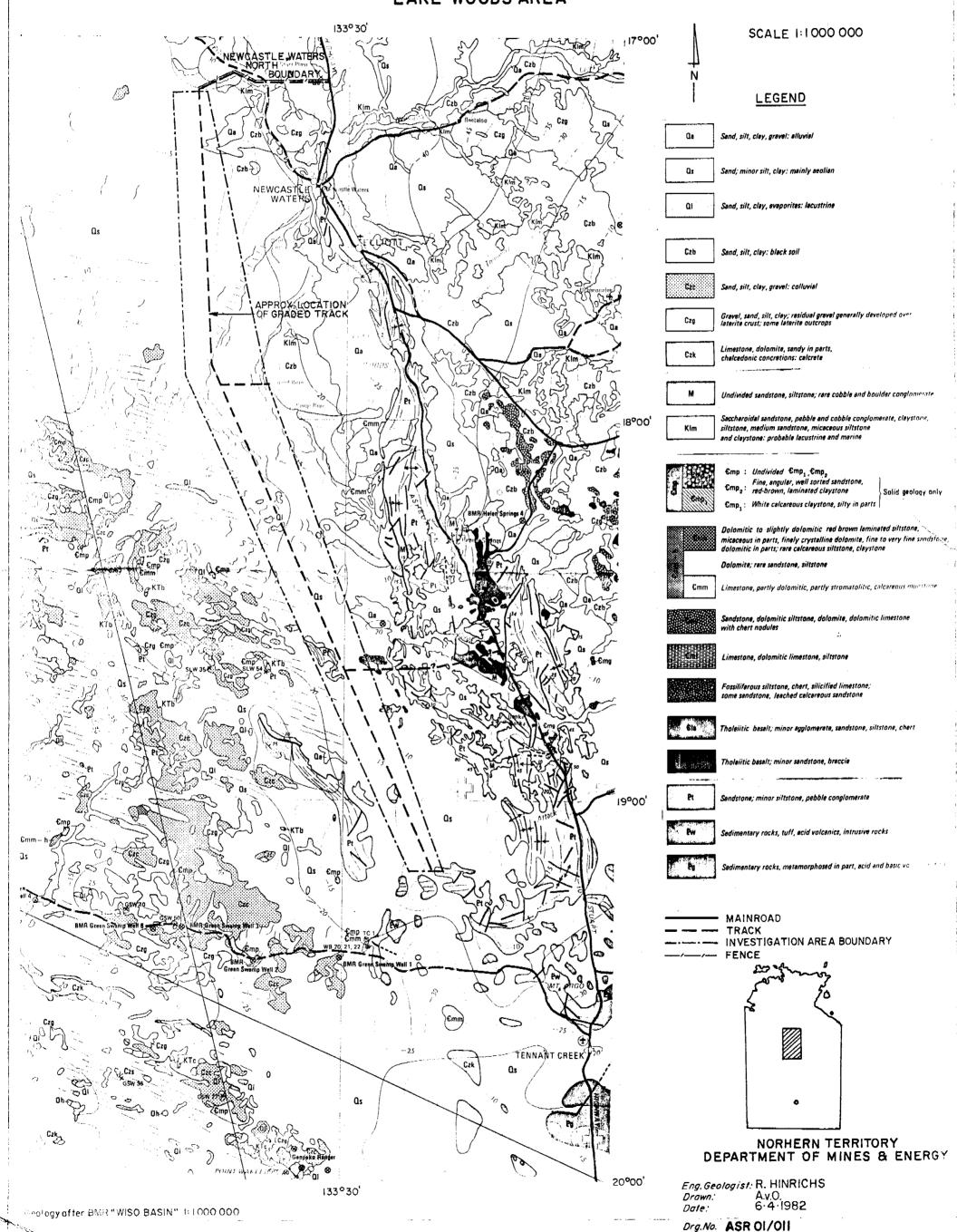
ENGINEERING GEOLOGIST GREG MULES

FOR
DEPARTMENT OF MINES
AND ENERGY.

Australian National

COBY 12

ALICE SPRINGS-DARWIN RAILWAY PROJECT Proposed Materials Investigation Corridor and Road Location LAKE WOODS AREA



HOLE NO. NORTHERN TERRITORY GEOLOGICAL SURVEY CENTRAL ENGINEERING SERVICES Page GEOLOGICAL LOG PROJECT ALICE. SPRINGS-DARWIN RAILWAY COORDINATES y see Fig.m. DIP...... FEATUREMATERIALS SEARCH LOCATION WEST OF LAKE WOODS BEARING..... **SYSTEM** DATUM...... ..то:......то:.....то:..... HOLE SIZE. 165mm TO:..... DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL DEGREE OF SYMBOL NUMBER SECLOSICAL DESCRIPTION Group name, general maximum size, in situ moisture and density, pleaticity, field test date SAND, m.-f.gr., dry, non plastic SP AEOLIAN SAND Orange brown. END HOLE 5.Om ENGINEERING GEOLOGY. WEATHERING. Excevation Method . . AUGER. & Soil Classification CW - Completely weathered System: Unified. المهووما HW- Highly weathered MW- Mederately weathered (__) meens Leberatery Clessification. SW- Slightly wor Frat - Fresh, with timonite stained joints

Checked.....

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NORTHERN TERRITORY GEOLOGICAL SURVEY AH 2 CENTRAL ENGINEERING SERVICES Page GEOLOGICAL LOG PROJECT ALICE SPRINGS-DARWIN RAILWAY CO-ORDINATES FEATUREMATERIALS . SEARCH Y.See Fig.m. DIP...... LOCATION WEST OF LAKE WOODS BEARING..... SYSTEM DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL MAPHIC GEOLOGICAL DESCRIPTION SYMBOL NUMBER Group name, general maximum size, in situ moisture and density, plasticity, field test date LOG SAND, m.-f.gr., AEOLIAN SAND SP dry, non plastic Orange Brown SAND, m.-f.gr., dry, non plastic AEOLIAN SAND SP Red, Brown 4.5M END HOLE Excavation Method AUGER WEATHERING. ENGINEERING GEOLOGY. **a Soil** Classification CW-Completely weathered System: Unified. Date لمهووما HW-Highly weathered (....) means Laboratory MW- Moderately weathered Classification. SW- Slightly weathered Operator... Fr8t-Freeh, with limonite stained joints Fr - Fresh

HOLE NO.

HOLE NO. NORTHERN TERRITORY GEOLOGICAL SURVEY AH 3 CENTRAL ENGINEERING SERVICES Page of GEOLOGICAL LOG PROJECT . DARWIN-ALICE SPRINGS RAILWAY COORDINATES DIP..... FEATURE MATERIAL SEARCH SYSTEM BEARING...... LOCATION WEST OF LAKESWOOD. DATUM...... EGRAPHIC DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL DEGREE OF GEOLOGICAL DESCRIPTION GROUP SAMPLE TESTS Group name, general maximum size, in situ moisture and density, plasticity, field test date DEPTHE LOS Type of deposit or material, mineral composition, あきまき porticle shape, comentation, colour, structures しょうしょう AEGLIAN SAND SAND, m.-f.gr., dry Orange Brown SPnon plastic AEOLIAN Sand SAND, m.-f.gr., Red brown SP moist, non plastic Clayey sand, m.-f.gr., AEOLIAN SAND SPmoist, low plasticity Red Brown SC END HOLE WEATHERING. ENGINEERING GEOLOGY. Excavation Method .AUGER..... **Soil Classification** CW-Completely weathered System: Unified. Date Logged HW-Highly weathered .,) means Laboratory MW- Moderately weathered Classification. Operator SW- Slightly weathered Commenced FrSt-Fresh, with limonite stained joints Fr - Fresh

HOLE NO. NORTHERN TERRITORY GEOLOGICAL SURVEY AH 4 CENTRAL ENGINEERING SERVICES . Page GEOLOGICAL LOG DIP.,,.... FEATURE, MATERIAL, SEARCH SYSTEM BEARING..... LOCATION WEST OF LAKESWOOD. DATUM................... DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL DEGREE OF WEATHERING BORAPHIC GEOLOGICAL DESCRIPTION GROUP SAMPLE TESTS Group name, general maximum size, in situ moisture and density, plasticity, field test date Type of deposit or material, mineral composition, カッチョン particle shape, comentation, colour, structures LOG AEOLIAN SAND SP SAND, m.-f.gr., dry, Orange brown non plastic SAND, m.-f.gr., dry, AEOLIAN SAND becoming moist, Red brown SP low plasticity Sandy gravel, moist, GP-LATERITE 30% gravel, max. size GC Red brown 10mm low plasticity END HOLE Excavation Method AUGER WEATHERING. ENGINEERING GEOLOGY. 4 Soil Classification CW- Completely weathered System: Unified. Logged Date HW- Highly weathered () means Laboratory MW- Mederately weathered Classification. Operator..... 8W- Slightly weathered FrSt-Fresh, with limonite stained joints Fr -- Freeh Checked, ...

NORTHERN TERRITORY GEOLOGICAL SURVEY CENTRAL ENGINEERING SERVICES

HOLE NO. AH 5

Page

	GEOLOGICAL	LOG
4		
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PROJECT DARWIN-ALICE SPRINGS

CO-ORDINATES

y See plans DIP...... FEATURE MATERIALS SEARCH... BEARING...... LOCATIONWEST OF LAKESWOOD DEGREE OF WEATHERING E GRAPHIC DEPTHE LOG DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL GEOLOGICAL DESCRIPTION GROUP SAMPLE TESTS Group name, general maximum size, in situ moisture and density, plasticity, field test date Type of deposit or material, mineral composition, 52223 particle shape, comentation, colour, structures AEOLIAN SAND SAND m.-f.gr., dry, Orange brown SP non plastic

SAND, m.-f.gr. dry/ AEOLIAN SAND non limete to Red Brown SP · low plasticity END HOLE 5.0M

Excavation Method AUGER.

WEATHERING. CW-Completely weathered HW- Highly weathered MW- Moderately weathered SW- Slightly weathered FrSt-Fresh, with limonite stained joints

& Soil Classification System: Unified. (....) means Laboratory Classification.

ENGINEERING GEOLOGY. Logged Drawn Checked,

HOLE NO. NORTHERN TERRITORY GEOLOGICAL SURVEY AH 6 CENTRAL ENGINEERING SERVICES Page GEOLOGICAL LOG PROJECT DARWIN-ALICE SPRINGS RAIL X....m. CO-ORDINATES Y. See. plam. DIP...... FEATURE MATERIALS, SEARCH ... BEARING..... LOCATION WEST OF LAKE WOODS **DATUM.....** HOLE SIZE......TO:......TO:......TO:....... DEGREE OF WEATHER ING DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL EGRAPHIC DEPTHE LOG GEOLOGICAL DESCRIPTION SYMBOL NUMBER Group name, general maximum size, in situ moisture and density, plasticity, field test date Type of deposit or material, mineral composition, particle shape, comentation, colour, structures SAND, m.-f.gr., dry, SP non plastic AEOLIAN SAND Orange brown SP SAND, m.-f.gr., AEOLIAN SAND Moist, low plasticity Red Brown 4.7M END HOLE WEATHERING. Excavation Method . . AUGER ENGINEERING GEOLOGY. **■** Soil Classification CW-Completely weathered System: Unified. Make...... Date Logged HW-Highly weathered (....) means Laboratory MW- Moderately weathered Classification. Operator....... SW- Slightly weathered FrSt-Fresh, with limonite stained joints Fr — Fresh Checked . .

HOLE NO. NORTHERN TERRITORY GEOLOGICAL SURVEY CENTRAL ENGINEERING SERVICES

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	GEOLOG	ICAL LOG	Page of
PROJECT DARWIN-ALICE SPRINGS RAIL	WAY	X.,,m.	SURFACE ELEVATION
FEATURE MATERIALS SEARCH .	CO-ORDINATES	Ysee.plan.m.	DIP
OCATION .WEST .OF. LAKESWOOD.	SYSTEM		BEARING

DATUM...... DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL DEGREE OF GEOLOGICAL DESCRIPTION GROUP SAMPLE TESTS Group name, general maximum size, in situ moisture and density, plasticity, field test date Type of deposit or meterial, mineral composition, particle shape, comentation, colour, structures LOG SAND, m.-f.gr., AEOLIAN SAND SP dry becoming moist, Orange brown non plastic Clayey sand, m.-f.gr., AEOLIAN SAND SC moist, low plasticity Red Brown Gravelly sand, m.-f.gt LATERITE SC 10% gravel Max. size Red Brown 7.5mm, low plasticity END HOLE 5.0M WEATHERING. ENGINEERING GEOLOGY. Excavation Method .AUGER..... Soil Classification CW- Completely weathered System: Unified. Logged Date HW- Highly weathered () means Laboratory Туре MW- Moderately weathered Classification. Operator.... SW- Slightly weathered Drawn . . . FrSt-Fresh, with limonite stained joints

Commenced

Fr — Fresh

NORTHERN TERRITORY GEOLOGICAL SURVEY CENTRAL ENGINEERING SERVICES

HOLE NO. 8 HA

GEOLOGICAL LOG

PROJECT DARWIN-ALICE SPRINGS RAILWAY CO-ORDINATES SEARCH. SEARCH. X See Plan M. See Plan M.

Page SURFACE ELEVATION.....m.

Fr - Fresh

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DIP.....

LOCATION WEST OF LAKESWOOD. SYSTEM BEARING..... DATUM..... DEGREE OF WEATHERING GEOLOGICAL DESCRIPTION DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL Type of deposit or material, mineral composition, あきまま particle shape, comentation, colour, structures Group name, general maximum size, in situ moisture and density, plasticity, field test date GROUP SAMPLE TESTS LOG AEOLIAN SAND Orange brown SAND, m.-f.gr., SP dry, non plastic Ferruginous cement 4.2M END HOLE Excavation Method ..AUGER.....ENGINEERING GEOLOGY. & Soil Classification Make..... CW- Completely weathered System: Unified. Logged HW-Highly weathered (...) means Laboratory MW— Moderately weathered SW— Slightly weathered Operator, Classification. FrSt-Fresh, with limonite stained joints

	NORTHERN TERRITORY GEOLOGICAL SURVEY CENTRAL ENGINEERING SERVICES	AH 9
	GEOLOGICAL LOG	Page of
PROJECT, DARWIN-ALICE, SPRIM	GS RAILWAY Xm. SURFAC	E ELEVATIONm.
FEATURE, MAJEKLALS, SEAN.A.	T. see.plam.	
LOCATION WEST OF LAKESWOOD		G
HOLE SIZE TO:		energatiss of sou
GEOLOGICAL DESCRIPTION Type of deposit or material, mineral composition, particle shape, comentation, colour, structures	DESCRIPTION AND ENGINEERING F WEATHERING DEPTHS LOS COUP name, general maximum size, in situ moisture and density, plasticity, field test date	GROUP SAMPLE TESTS
		-
AEOLIAN SAND Orange brown	SAND, mf.gr., dry, non plastic	SP.
AEOLIAN SAND Red brown	SAND, mf.gr., moist low plasticity	sc
Ferruginous cement 4.3		-
	END HOLE	
Excavation Method AUGER Make	CW- Completely weathered System: Unified. HW- Highly weathered () means Laboratory MW- Moderately weathered Classification.	IGINEERING GEOLOGY. gged Date
Operator	SW- Slightly weathered FrSt- Fresh, with limonite stained joints	awn

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HOLE NO. NORTHERN TERRITORY GEOLOGICAL SURVEY AH 10 CENTRAL ENGINEERING SERVICES Page GEOLOGICAL LOG PROJECT DARWIN-ALICE SPRINGS RAILWAY CO-ORDINATES y see plan. .m. DIP..... FEATURE MATERIALS SEARCH ... BEARING..... SYSTEM LOCATION WEST OF LAKEWOODS DATUM..... DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL DEGREE OF WEATHERING GRAPHIC GROUP SAMPLE TESTS GEOLOGICAL DESCRIPTION Group name, general maximum size, in situ moisture and density, plasticity, field test date LOG Type of deposit or material, mineral composition, particle shape, comentation, colour, structures L. C. R. E. E. T. main SPSand, m.-f.gr., dry, AEOLIAN SAND non plastic Orange brown SP Sand, m.-f.gr., dry, AEOLIAN SAND non plastic Red brown Clayey sand, m.-f.gr AEOLIAN SAND moist, 10%, gravel max. size 10mm, Red brown SC GP-Silty gravel, max. CALCRETE GRAVEL size 25mm, low Gw Lt. brown-white plasticity 3.4mEND HOLE ENGINEERING GEOLOGY. WEATHERING. Excavation Method Soil Classification CW- Completely weathered Date System: Unified. Logged Make.................. HW-Highly weathered (__) means Laboratory GM.DO. Type MW- Moderately weathered Classification. SW-Slightly weathered Operator.... Drawn FrSt-Fresh, with limonite stained joints Checked

Fr - Fresh

3

NORTHERN TERRITORY GEOLOGICAL SURVEY

CENTRAL ENGINEERING SERVICES

HOLE	NO.
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GE	OLOGICAL	LOG

PROJECT DARWIN-ALICE SPRINGS RAIL

FEATURE MATERIALS SEARCH

3

CO-ORDINATES

y, see plans.m. DIP.,.....

BEARING.....

Checked . .

LOCATIONWEST OF LAKE WOODS **SYSTEM**

GEOLOGICAL DESCRIPTION rpe of deposit or material, mineral composition, article shape, comentation, colour, structures	DEGREE OF WEATHERING DEPTH 上に内国主語 maines	E GRAPHIC	DESCRIPTION AND ENGINEERIN Group name, general maximum size, in situ maisture and density, plasticity, field test date	G PROPERTIE	SAMPLE NUMBER	L TESTS	WATER
AEOLIAN SAND Orange brown	-		Sand, mf.gr., dry, non plastic	SP			-
	-						-
							-
AEOLIAN SAND Red brown		+	Sand, m-f.gr., mois low plasticity	t, SC			1 1
		 					_
CALCRETE GRAVELS . Red brown 3,5m			Clayey sand, mf.g Moist 15% gravel m size 10mm. low plastic	r., SC ax itv			
		1	END HOLE				-
		+					-
		+					<u> </u>
Excavation Method	WEATHERING. CW- Completely HW- Highly wed! MW- Moderately	hered	& Soil Classification System: Unified. () means Laboratory Classification.	ENGINEERIN Logged	G GEOLOG	Date	

FrSt - Freeh, with limonite stained joints Fr - Freeh

HOLE NO. NORTHERN TERRITORY GEOLOGICAL SURVEY AH 12 CENTRAL ENGINEERING SERVICES Page of GEOLOGICAL LOG FEATURE MATERIALS SEARCH Ysee plans ..m. DIP.,..... LOCATION . WEST. OF LAKE WOODS SYSTEM DATUM............ PRAPHIC DEGREE OF WEATHERING DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL GEOLOGICAL DESCRIPTION GROUP SAMPLE TESTS Group name, general maximum size, in situ moisture and density, plasticity, field test date LOG Type of deposit or material, mineral composition, Signature particle shape, comemetion, colour, structures Sand, m,-f.gr.,dry, AEOLIAN SAND non plastic. Orange brown CLAYEY SAND, m-fgr. AEOLIAN SAND moist, low plasticity Red brown Cememted sands 3/4m END HOLE

5

Excavation Method WEATHERING.

GW- Completely weathered System: Unified.

Type MW- Moderately weathered (...) means Laboratory
Operator.

Commenced FrSt- Freeh, with limonite stained joints

WEATHERING.

& Sail Classification
System: Unified.
(...) means Laboratory
Classification.

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NORTHERN TERRITORY GEOLOGICAL SURVEY

CENTRAL ENGINEERING SERVICES
GEOLOGICAL LOG

HOLE	NO.
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PROJECT DARWIN-ALICE SPRINGS RAIL

FEATURE MATERIALS, SEARCH...

LOCATION .WEST .OF. LAKE. WOODS

CO-ORDINATES X.....m.
Y. see . plans.m.

Y. SEE PLANS.M.

SURFACE ELEVATION......m.
DIP......

BEARING.....

DATUM..... DEGREE OF WEATHERING DEPTHE LOG DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL GEOLOGICAL DESCRIPTION GROUP SAMPLE TESTS Group name, general maximum size, in situ moisture and density, plasticity, field test date Type of deposit or material, minoral composition, . 苏女子子 particle shope, comentation, colour, structures 上,上八九五二〇 SP SAND, m-f.gr., dry, AFOLIAN SANDS non plasticity. 3rown CLAYEY SAND, m.-f.gr., SC-AEOLIAN SAND SP moist,low-med Red brown plasticity GP-Gravel, moist, max. CALCRETE GRAVEL size 15mm, low GW Light brown-white Plasticity. 3.7MEND HOLE WEATHERING. ENGINEERING GEOLOGY. d Seil Classification CW-Completely weathered System: Unified. Logged HW-Highly weathered ...) means Laborak

MW- Moderately weathered SW- Slightly weathered

Fr - Fresh

FrSt-Fresh, with limonite stained joints

Classification.

Checked.....

NORTHERN TERRITORY GEOLOGICAL SURVEY CENTRAL ENGINEERING SERVICES

HOLE	NO.
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PROJECT DARWIN-ALICE SPRINGS RAIL

FEATURE, MATERIALS, SEARCH ...

LOCATION WEST, OF LAKE, WOODS

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 $\boldsymbol{\chi}_{\dots\dots,\boldsymbol{m}_{\ell}}$ CO-ORDINATES

Y. see plan. m.

DIP.....

BEARING.....

DATUM.....

GEOLOGICAL DESCRIPTION Type of deposit or material, mineral composition, porticle shape, commetten, colour, structures	DEGREE OF WEATHER ING	DEPTHO LOG	DESCRIPTION AND ENGINEERING Group name, general maximum size, in situ moisture and density, plasticity, field test date	PROPERTIES GROUP SYMBOL N	GROUND WATER LEVELDS	
AEOLIAN SAND Orange brown			Sand, m-f.gr., dry. non plastic	SP		
AEOLIAN SAND Red brown			Clayey sand, m,-f.gr., moist, low plasticity	SP- SC	•	-
Excevation Method Make. Type Operator Commenced	HW Hig MW Mc SW Slig	RING. nplotely weathered hity weathered oderstely weathered each, with limonite	() means Laboratory Classification.		G GEOLOGY.	

HOLE NO. NORTHERN TERRITORY GEOLOGICAL SURVEY AH 15 CENTRAL ENGINEERING SERVICES Page GEOLOGICAL LOG PROJECT DARWIN-ALICE SPRINGS RAIL COORDINATES SEE Plan -y see plan .m. DIP...... FEATURE MATERIALS SEARCH ... BEARING..... LOCATION WEST OF LAKE WOODS SYSTEM DATUM..... DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL DEGREE OF WEATHERING GEOLOGICAL DESCRIPTION BRAPHIC STOUP SAMPLE TESTS Group name, general maximum size, in situ moisture and density, plasticity, field test date Type of descrit or material, mineral composition, 5 2 2 3 matrice particle shape, comentation, colour, structures LOG SP Sand, m.-f.gr., dry, AEOLIAN SAND non plastic urange brown Clayey sand, m.-f.gr., AEOLIAN SAND moist, low-med. Red brown plasticity Calcareous cemented 3.0m sand END HOLE ENGINEERING GEOLOGY. WEATHERING. Excavation Method Soil Classification CW- Completely weathered System: Unified. Date Logged HW-Highly weathered () means Laboratory MW- Moderately weathered Classification. SW- Slightly weathered FrSt-Fresh, with limonite stained joints Checked. Fr - Fresh

HOLE NO. NORTHERN TERRITORY GEOLOGICAL SURVEY AH 16 CENTRAL ENGINEERING SERVICES Page GEOLOGICAL LOG PROJECT DARWIN-ALICE SPRINGS RAIL CO-ORDINATES Y. see plan .m. DIP...... FEATURE MATERIALS SEARCH ... BEARING..... LOCATION WEST, OF LAKE WOODS SYSTEM DATUM....... DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL DEGREE OF WEATHERING GRAPHIC GEOLOGICAL DESCRIPTION GROUP SAMPLE TESTS Group name, general maximum size, in situ moisture and density, plasticity, field test date LOG Type of deposit or material, mineral composition, ルカミショ particle shape, comentation, colour, structures SP Sand, m.-f.gr., dry. AEOLIAN SAND non plastic Orange brown Clayey sand, m.-f.gr. SP-AEOLIAN SAND SC Dry, low plasticity Red brown Clayey sand, m.-f.gr., AEOLIAN SAND moist, low-med. Red brown plasticity as above CALCRETE GRAVEL 15-20% grave1 Red brown max size 20mm END HOLE 4.5m ENGINEERING GEOLOGY. WEATHERING. Excavation Method & Soil Classification CW- Completely weathered System: Unified. Date Logged HW-Highly weathered (...) means Laboratory MW- Moderately weathered Cigasification. Operator.... SW- Slightly weathered Drawn FrSt-Freeh, with limonite stained joints

Checked . .

Fr - Fresh

HOLE NO. NORTHERN TERRITORY GEOLOGICAL SURVEY CENTRAL ENGINEERING AMEVICES AH 17 GEOLOGICAL LOG Page PROJECT DARAIN-ALICE SPRINGS RAIL X MEATURE MATERIALS JEARCH CO-ORDINATES YSOE plan --ysee plan .m. DIP...... LOCATION WEST OF LAKE WOODSTYSTEM BEARING...... DATUM....... DEGREE OF WEATHERING DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL DEPTHE LOS GEOLOGICAL DESCRIPTION GROUP SAMPLE TESTS Group name, general maximum size, in situ moisture and density, plasticity, field test date Type of deposit or material, mineral composition, particle shape, comentation, colour, structures SP Sand m.-f.gr. dry, AEOLIAN SAND non plastic Orange brown Clayey sand, AEOLAIN SAND SC m.-f. gr., moist Red brown low-med plast city. Cemented sand 4.8m END HOLE WEATHERING. Excavation Method ENGINEERING GEOLOGY. 4 Seil Classification CW- Completely weathered System: Unified. Logged HW-Highly weathered (....) meens Laboratory MW- Mederately weathered SW- Slightly weathered Classification. Drown FrSt-Fresh, with limonite steined joints

Commenced . . .

Fr - Fresh

HOLE NO. NORTHERN TERRITORY GEOLOGICAL SURVEY CENTRAL ENGINEERING SERVICES AH 18 GEOLOGICAL LOG Page of PROJECT DARWIN-ALICE SPRINGS RAIL CO-ORDINATES FEATURE MATERIALS SEARCH Y. see plan .m. DIP..... LOCATION WST OF LAKE WOODS SYSTEM BEARING....... DATUM.......... DEFTINE LOS DEGREE OF WEATHERING DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL GEOLOGICAL DESCRIPTION GROUP SAMPLE TESTS Group name, general maximum size, in situ moisture and density, plasticity, field test date Type of deposit or material, mineral composition, porticle shape, comentation, colour, structures 23,5,5,7 SPSand, m.-f.gr., dry. AEOLIAN SAND non plastic Orange brown SC Sand, m.-f.gr. dry, AEOLIAN SAND low plasticity Brown CL Silty clay, 10-15% sand CLAY dry, med plasticity Lt. brown SP Sand, m.-f. gr., dry SAND non plastic Lt. brown Sand m.f. grain, dry SP CEMENTED SAND 3.9m END HOLE WEATHERING. ENGINEERING GEOLOGY. Excavation Method & Soil Classification CW- Completely weathered System: Unified. Logged Date

HW- Highly weathered

Fr -- Fresh

MW- Moderately weathered

FrSt-Fresh, with limonite stained joints

SW- Slightly weathered

Type

Operator....

() means Laboratory

Classification.

NORTHERN TERRITORY GEOLOGICAL SURVEY CENTRAL ENGINEERING SERVICES

HOLE NO. AH 19

Page of

GEOLOGICAL LOG

PROJECT DARWIN-ALICE SPRINGS RAIL X
FEATURE MATERIALS SEARCH COORDINATES VSEE PLAN

LOCATION WEST OF LAKE WOODS

BEARING.....

HOLE SIZE 150mm	1	O:		TUM			
GEOLOGICAL DESCRIPTION po of degasti or metarial, mineral estapocition, orisis shape, commission, scient, structures	CHOMES OF MEATHER MA LLASES	DEFTION LOS	DESCRIPTION AND ENGINEER Group name, general meximum size, in situ moisture and density, plasticity, field test date	PROPERTIES	SAMPLE TESTS NUMBER	N T	
AEOLIAN SAND RED BROWN			SAND, m-f.gr.dry, non plastic				
LATERITE GRAVEL Red brown 5.0	n		Gravelly sand, m-f.gr., dry non plastic; 10-15% gravel, well rour max size 10mm END HOLE	nded SP			
Excevelien Method	HW— Hight MW— Med SW— Sligh	ING. Intely weathered y weathered try weathered try weathered th, with limenite t	Cigati i Carioni.		GEOLOGY.		

HOLE NO. NORTHERN TERRITORY SEOLOGICAL SURVEY OS HA CENTRAL ENGINEERING SERVICES Page GEOLOGICAL LOG DIP....... LOCATION WEST, OF LAKE WOODSTATEM BEARING..... DATUM...... HOMEE OF DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL GEOLOGICAL DESCRIPTION SYNBOL SAMPLE TESTS AEOLIAN SAND Sand, m.-f.gr., dry, non-plastic SPRed brown END HOLE 5.0m WEATHERING. ENGINEERING GEOLOGY. CW- Completely worth System : Unified. Logged Date HW- Highly weathered MW- Mederately weathered (....) means Laborat GM, DD SW- Slightly weathered Drawn PrSt - Fresh, with limenite stained joints

NORTHERN TERRITORY SECUCICAL SURVEY CENTRAL ENGINEERING SERVICES

HOLE NO. AH 21

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LOCATION/EST. OF LAKE WOODS SYSTEM

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DIP.....

BEARING.....

GEOLOGICAL DESCRIPTION Type of depend or material, minoral composition, partials chaps, commentation, ecleur, structures AEOLIAN SAND Orange brown	DEGREE OF SECTION SECT	2	Group no in sifts mo	mf.gr. n-plastic	e sice, dry	SYMBOL	ES OF SOI SAMPLE NUMBER	TESTS	TRACTION US 1996 1 1 1 1 1 1 1 1 1
AEOLIAN SAND		/	Sand	, mf.gr	., dry				
		3							
Weakly cemented sand 4.7m									
			END	HOLE					

System: Unified.

(....) means Laborator: Classification.

HW- Highly weathered MW- Mederately weathered SW- Stightly weathered

Pritt- Fresh, with limenite stained joints Fr - Fresh

NORTHERN TERRITORY GEOLOGICAL SURVEY

CENTRAL ENGINEERING SERVICES

HOLE NO.

22 HA

Page of

GEOLOGICAL LOG

PROJECT DARWIN-ALICE SPRINGS RAIL X SEE PLAN FEATURE MATERIALS SEARCH

DIP.......

BEARING......

LOCATION WEST OF LAKE WOODSWITTEN

HOLE SIZE 1 50mm TO: TO: TO: DATUM....... DEGREE OF MEATHERING DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL GEOLOGICAL DESCRIPTION SYMBOL SAMPLE TESTS Group name, general maximum size, in situ moisture and density, pleaticity, field test data LOS Sand, m.-f.gr., dry, AFOLIAN SAND non plastic Orange brown Weakly cemented sand 3.5m END HOLE ENGINEERING GEOLOGY. Seil Classification **GW-** Completely weethered stem: Unified. Date HW- Highly weathered MW- Mederately weathered SW- Slightly weathered GM.DO Pr\$1- Fresh, with lim Fr — Frank

HOLE NO. NORTHERN TERRITORY GEOLOGICAL SURVEY AH 23 CENTRAL ENGINEERING SERVICES Page GEOLOGICAL LOG PROJECTDARWIN-ALICE SPRINGS RAIL X SHE FLAN FEATURE MATERIALS SEARCH COORDINATES SEE FLAN DIP.,,.... LOCATION WEST, OF LAKE WOODSSYSTEM BEARING............ BRAPHIC DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL DEGREE OF GEOLOGICAL DESCRIPTION SYMBOL NUMBER Group name, general maximum size, in situ moisture and density, pigaticity, field test date LOS Sand, m.-f.gr., dry., SP AEOLIAN SAND non plastic Red brown Clayey sand, m.-f.gr. moist, low-med. plasticity SP-AS ABOVE Gravels max. size 25mm, well rounded, med. sphericity; no CALCRETE GRAVEL plastic fines Lt. brown/white 3.4m END HOLE

Excavation Method
Meke...
Type...
Operator...
Commenced
Completed

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WEATHERING.
CW—Completely weathered
HW—Highly weathered
MW—Mederately weathered
SW—Slightly weathered

Fr - Fresh

FrSt-Freeh, with limonite stained joints

d: Seil Classification System: Unified. (....) meens Leboratory Classification. ENGINEERING GEOLOGY.
Logged Date
GM.DO

Checked

NORTHERN TERRITORY GEOLOGICAL SURVEY

CENTRAL ENGINEERING SERVICES

HOLE NO. AH 24

GEOLOGICAL LOG Page of PROJECTDARWIN-ALICE SPRINGS RAIL X FEATURE MATERIALS SEARCH COORDINATES SEED PLAN SURFACE ELEVATION......m. DIP..... LOCATION WEST OF LAKE WOODSSYSTEM BEARING.....

HOLE SIZE 120 MINTO	7 7 77	TO: DATUM.	
GEOLOGICAL DESCRIPTION Type of deposit or meterial, minoral composition particle shape, commutation, colour, structures	DEGREE OF MEATHER HAD DEFTING LOS	DESCRIPTION AND ENGINEERING F Group name, general maximum size, in situ moisture and density, plasticity, field test date	PROPERTIES OF SOIL PERSONNEL SAMPLE TESTS SELECTION OF SAMPLE TESTS SELECTION OF SAMPLE SELECTION OF SAMPL
ACOLIAN SAND Orange brown		Gand, mf.gr., dry, non plastic	SP -
AEOLIAN SAND Red brown		Clayey sand, mf.gr moist, low - med. plasticity	SP-
	3_		
CALCRETE GRAVEL Lt. brown/white, med grained, well rounde med. sphericity 3.8m		Clayey gravel, nas. size 25mm; ned. plasticity fines	GP-GC
Meke	WEATHERING. CW- Completely weathered HW- Highly weathered	& Soil Clessification ENGIN System: Unified. Logge	IEERING GEOLOGY.

MW- Mederately weathered SW- Slightly weathered

FrSt-Fresh, with limenite stained joints

Cleanification.

GM. OD

Checked

NORTHERN TERRITORY GEOLOGICAL SURVEY

CENTRAL ENGINEERING SERVICES

SEOLOGICAL LOG

PROJECTDARWIN-ALICE SPRINGS RAIL
MATERIALS SEARCH CO-ORDINATES CO-CONCEMATES X SEE PLAN

HOLE NO.

AH 25

LICENTION WEST OF LAKE WOODS

DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL Silty sand, f.gr., COLLUVIAL SAND dry, non plastic SM Lt. grey Sand, m.-f.gr., dry, AS ABOVE SP low plasticity Lt. brown Silty clay, med. COLLUMIAL CLAY plasticity, dry CLLt. brown SC Clayey sand, m.-f.gr. AEOLIAN SAND moist, low - med Orange brown plasticity Clayey sand, m.-f.gr. moist, low - med. plasticity AS ABOVE SC Red brown Sand, m.f.gr., dry, SP AS ABOVE non plastic CALCRETE Gravel, max size 25 - 30mm Lt. brown/white, med gr. rounded nodules END HOLE ENGINEERING GEOLOGY.

NORTHERN TERRITORY GEOLOGICAL SURVEY CENTRAL ENGINEERING SURVICES

HOLE NO. 98 HA

Page of

GEOLOGICAL LOG

PROJECT DARWIN-ALICE SPRINGS RAIL X
FEATUREMATERIALS SEARCH COORDINATES Y SEE PLAN

LOCATION// UST. O.F. LAKE, WOODS SYSTEM.....

BEARING.....

DIP.....

AECUTAN CAND Red brown
AECLIAN TAND Sand, mf.gr., dry, SF non plastic

tem: Unified.

(....) means Laboratory

Cleanification.

HW-Highly weathered

Fr - Fresh

MW- Mederately weathered SW- Slightly weathered

PrSt-Fresh, with limonite stained joints

CENTRAL ENGINEERING SERVICES

AH 27

GEOLOGICAL LOG

PRATURE MATERIALS SEARCH COCHOMATES SEE PLAN

DIP......

LICCATIONIEST OF LAKE WOODS SYSTEM ---- 150mm ---

GEOLOGICAL SESCRIPTION			DESCRIPTION AND E	NOWEERWOO !	HOPERTH	3 of so		3 .
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Red brown								-
								
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Type.	HIP-High Mile Hode Sile-Might	y wydiared welle welleryd Hy walliared	() means Laborator Classification.	<u>.</u>	;		Date.	
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HOLE NO. NORTHERN TERRITORY GEOLOGICAL SURVEY AH 28 CENTRAL ENGINEERING SERVICES BEOLOGICAL LOS PROJECT DARWIN-ALICE SPRINGS RAIL X SEE PLAN DIP..... LECATION WEST OF LAKE WOODS BEARING...... Sand, m.-f.gr., dry, non plastic SPAFOLIAN SAND Orange brown to red brown

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MORTHERN TERRITORY GEOLOGICAL SURVEY CENTRAL ENGINEERING SERVICES

HOLE NO. AH 29

GEOLOGICAL LOG

PROJECTDARWIN-ALICE SPRINGS RAIL X. PEATURE MATERIALS SEARCH COORDINATES SEE PLAN.

DIP......

LOCATION WEST, OF, LAKE WOODSPATEN HELE SIZE 1 50mm TO: TO: TO: GEGLOGICAL DESCRIPTION DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL AEOLIAN SAND Sand, m.-f.gr., dry, Red brown non plastic WEAKLY CEMENTED END HOLE ENGINEERING GEOLOGY.

HOLE NO. NORTHERN TERRITORY SECLOSICAL SURVEY CENTRAL ENGINEERING SERVICES GEOLOGICAL LOG PROJECTDARWIN-ALICE SPRINGS RAIL FEATURE MATERIALS SEARCH CO-ORDINATES SEE PLAN DIP..... LOCATION WEST OF LAKE WOODSTATEM BEARING..... HOLE SIZE 150mm TO: TO: TO: DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL GEOLOGICAL DESCRIPTION SYMBOL" | SAMPLE | Sand, m.-f.gr., dry, SP non plastic AEOLIAN SAND Orange brown

END HOLE

ENGINEERING GEOLOGY.

HOLE NO. NORTHERN TERRITORY GEOLOGICAL SURVEY AH 31 CENTRAL ENGINEERING SERVICES GEOLOGICAL LOG PROJECTDARWIN -ALICE SPRINGS RAIL X FEATURE MATERIALS SEARCH COORDINATES SEE PLAN DIP..... LOCATION WEST OF LAKE WOODS BEARING............ HOLE SIZE 150mm DATUM...... SECLOSICAL DESCRIPTION DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL AEOLIAN SAND Sand, m.-f.gr., dry, non plastic SPOrange brown 5.0m END HOLE ENGINEERING GEOLOGY. Pr St - Fresh, with

HOLE NO. NORTHERN TERRITORY GEOLOGICAL SURVEY CENTRAL ENGINEERING SERVICES GEOLOGICAL LOG PROJECT DARWIN-ALICE SPRINGS RAIL X. PEATURE MATERIALS SEARCH CO-ORDINATES V. SEE PLAN DIP........ LOCATION NEST, OF LAKE WOODS BEARING...... HOLE SIZE 150mmo: To: To: DATUM...... DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL GEOLOGICAL DESCRIPTION SYMBOL NUMBER LOS Sand, m.-f.gr., dry, non plastic SPAEOLIAN SAND Orange brown

Execution Nothed WEATHERING.

GW - Completely weathered Byston: Unified.

Type Body - State Classification Byston: Unified.

(...) means Laberdary
Classification.

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Completed Pr 9r - Fresh, with limenite stained jointe
Completed Pr 9r - Fresh Checked

CENTRAL ENGINEERING SERVICES

HOLE NO.

GEOLOGICAL LOG

PROJECT DARWIN-ALICE SPRINGS RAIL X
MARRETALS SEARCH COORDINATES VSEE PLAN

DIP.......

LOCATION WEST. OF LAKE WOODS SYSTEM

BEARING......

HOLE SIZE 150mmro: To: To: DATUM...... DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL GEOLOGICAL DESCRIPTION SYMBOL HUMBER LOS Sand, m.-f.gr., dry non plastic SP AEOLIAN SAND Orange brown 5.0m END HOLE ENGINEERING GEOLOGY. Date

PEATUREMATERIALS SE LOCATION WEST OF LAK HOLE SIZE 150mm TO:	TE WOO	ODS SYSTEM		BEARIN DATUM.				
OFGLOBICAL BESCRIPTION of dispate or material, minoral composition risks chaps, committed in, select, structure		LOS	GENERATION AND ENG Grown name, general maximum in also moisture and density, the field had deter-	MICERTON 1 pine, patietry,		SAMPLE NUMBER		
AFOLIAN SAND Red brown			Samd. mf.gr. non plastic	, dry	, SP			
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		# 3 #						
Weakly cemented			moist, low pla	ıstici	.ty			
LATERITE GRAVEL 4	M		Gravel				<u> </u>	土

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AH 78 CENTRAL ENGINEERING SERVICES PROJECT DARWIN-ALICE SPRINGS RAIL FEATURE MATERIALS SHARCH COORDINATES SEE PLAN DIP..... LOCATION . WEST OF LAKE WOODSYSTEM BEARING...... DATUM..... SECLOSICAL DESCRIPTION DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL SYMBOL NUMBER AS ABOVE AS ABOVE SP 6.0m END HOLE ENGINEERING GEOLOGY.

NORTHERN TERRITORY SEDLOSICAL SURVEY

HOLE NO.

CENTRAL ENGINEERING SERVICES

HOLE NO. AH 79

	GEOLOGICAL	LO
 DARWIN-ALICE	SPRINGS RAIL .	

PROJECT DARWIN-ADICE SPRINGS RATE
MATERIALS SEARCH COORDINATES SEE PLAN

LOCATION WEST OF LAKE WOODSVETEM HOLE SIZE 150mm TO: TO: TO: DIP.......

BEARING.....

DATUM.....

GEOLOGICAL DESCRIPTION	COUNTY TAXABLE	07	PANTAK	DESCRIPTION AND ENGINEERS)
po of deposit or motorial, minoral composition, prilate shape, comentation, aslear, structures	111	2/	LOS	Group natio, ganeral maximum size, in situ mainture and density, planticity, field tool dute.	SYMBOL.	MAMPLE NUMBER	12318	31
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PrSt - Fresh, with limenite stained joints

CENTRAL ENGINEERING SERVICES

HOLE NO. 08 HA

SEOLOGICAL LOS

PROJECT DARWIN-ALICE SPRINGS RAIL X
PEATURE MATERIALS SEARCH COORDINATES SEE PLAN

DIP.......

LICATION WEST OF LAKE WOODSTEEM

GEOLOGICAL DESCRIPTION SYNEOL NAMPLE TESTS SP Sand, m.-f.gr., dry AFOLIAN SAND non plastic Red brown 5.0m END HOLE ENGINEERING GEOLOGY.

CENTRAL ENGINEERING SERVICES

HOLE NO. AH 81

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GEOLOGICAL LOG PROJECTDARWIN-ALICE SPRINGS RAIL
FEATUREMATERIALS SEARCH COORDINATES VSEE PLAN
LOCATION WEST OF LAKE WOODS
SYSTEM
HOLE SIZE 150mmo: To:

DIP......

SEARING.......

GEOLOGICAL DESCRIPTION	BEAT	E 07		-		ering p	ROPERTIE	3 OF SO	L	
pe of deposit or motoriel, minoral composition, orticle shape, committellen, asleur, structures	1			.00	in alle moisture and density, plantic line description of the line	Ny,	SYMBOL.	HUM BER		3
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AEOLIAN SAND			\mathbb{H}		Sand, mf.gr.,	dry,	SP			
Red brown			H		non plastic					卜
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NORTHERN TERRITORY DEOLOGICAL SURVEY AH 81 CENTRAL ENGINEERING SERVICES GEOLOGICAL LOG PEATURE MATERIALS SEARCH COORDINATES V.S.F.E. PLAN. LOCATION WEST OF LAKE WOODS DIP...... BEARING...... DATUM....... DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL SECLOSICAL DESCRIPTION AS ABOVE AS ABOVE END HOLE 6.0m ENGINEERING GEOLDSY.

NORTHERN TERRITORY GEOLOGICAL SURVEY AH 82 Page GEOLOGICAL LOG PROJECT Darwin-Alice Springs Rail xm SURFACE ELEVATION......m. FEATURE Material Search DIP..... BEARING..... LOCATIONWest of Lake Woods SYSTEM DATUM...... DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL DEGREE OF WEATHERING GRAPHIC GEOLOGICAL DESCRIPTION SYMBOL NUMBER Group name, general maximum size, in situ maisture and density, plasticity, field test date LOG Type of deposit or material, mineral composition, . あままる particle shape, comentation, colour, structures 中心内室で Sand, m.-f.gr., dry Aeolian Sand non plastic. Red brown Dry, non plastic SPWeakly cemented End of hole WEATHERING. ENGINEERING GEOLOGY. · Soil Classification CW-Completely weathered System: Unified: Make.......... Logged HW-Highly weathered ...) means Laboratory Type ... MW- Moderately weathered Classification. Operator, SW- Slightly weathered Drawn FrSt- Fresh, with limonite stained joints Commenced ... Checked. Fr - Fresh

Completed .

HOLE NO.

CENTRAL ENGINEERING SERVICES

HOLE NO. AH 160

Page

GEOLOGICAL LOG

SURFACE ELEVATION......m. DIP.....

LOCATION WEST. OF LAKE WOODSSYSTEM

BEARING.....

Checked . . .

HOLE SIZE 6.5mm TO: TO: TO: DATUM...... DEGREE OF WEATHERING DEPTHY
Type of deposit or material, mineral composition, のままる matricel

Type of deposit or material, mineral composition, のままる matricel

L. のままる matric DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL GROUP SAMPLE TESTS Group name, general maximum size, in eitu maisture and density, plasticity, field test date SPSand, m.-f.gr., AEOLIAN SAND dry, non plastic Orange brown SP AS ABOVE AS ABOVE Low plastic fines AS ABOVE AS ABOVE LOW- med plastic SC Red brown fines, moist 5.0m END HOLE Excavation Method WEATHERING. ENGINEERING GEOLOGY. **4** Soil Classification CW- Completely weathered System: Unified. Logged Date HW-Highly weathered (...) means Laboratory GM 00 MW- Moderately weathered Classification. Operator, SW-Slightly weathered

FrSt-Fresh, with limonite stained joints

Fr - Fresh

NORTHERN TERRITORY GEOLOGICAL SURVEY CENTRAL ENGINEERING SERVICES

HOLE NO. AH 161

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GEOLOGICAL LOG

PROJECT DARWIN-ALICE SPRINGS RAIL X
FEATURE MATERIALS SEARCH COORDINATES Y SEE PLAN LOCATION WEST OF LAKE WOODS

SURFACE ELEVATION.....m. DIP.....

HOLE SIZE 165mmro		EM	TO :	BEARIN Datum.	IG.,			
GEOLOGICAL DESCRIPTION Type of deposit or material, mineral composition, particle shape, commettion, colour, structures	DEGREE OF	BRAPHIC LOG		ERING	PROPERTIE GROUP #	ES OF SO	IL TESTS	GROUND- WATER
AEOLIAN SAND Orange brown	2		Sand mf.gr., dr non plastic to l plastic fines	у.	SP			
AS ABOVE Red brown 5.0m	4		AS ABOVE medlow plastic fines, moist END HOLE		sc			- -
Make. C Type. H Operator. S Commenced. Fr	VEATHERING. IW— Completely weather IW— Highly weathered IW— Moderately weath IW— Slightly weathere ITST— Fresh, with limon IT— Fresh	nered d	4: Soil Classification System: Unified. (.) means Laboratory Classification. ined joints	ENGII Logge GM.	<i>DO</i>			

CENTRAL ENGINEERING SERVICES

HOLE NO.

T 1 Page

GEOLOGICAL LOG

PROJECT DARWIN-ALICE SPRINGS RAIL X FIG. 9 m. FEATURE MATERIALS SEARCH CO-ORDINATES FIG. 9 m.

SURFACE ELEVATION......m.
DIP......

Checked

BEARING.....

LOCATION 7.2km

Operator............

SW- Slightly weathered

Fr - Fresh

FrSt-Fresh, with limonite stained joints

SYSTEM

DATUM.....

GEOLOGICAL DESCRIPTION Type of deposit or material, mineral composition, particle shape, comentation, colour, structures	DEGREE OF WEATHERING いかえるまた	DEPTHE LOG	DESCRIPTION AND ENGINEERI Group name, general maximum size, in situ moisture and density, plasticity, field test date	NG PROPERTIES GROUP SYMBOL	OF SOIL MAMPLE TESTS	SHOUN WATER
AEOLIAN SAND Orange bro wn			Sand, mf.gr., dr non plastic	ry SP		
AEOI,IAN SAND Orange brown		2	Clayey sand, mf moist, low plastic	.gr ity (SC)		
CALCRETE GRAVELS Red brown-white rounded, low-med sphericity, low- high strength, HW- MW nodules.		3	SILTY GRAVEL, 30% gr., with cobbles, max. size 150mm; 1 low plastic fines; mf.gr., silty sa	0% GM=GF		
CALCRETE GRAVELS Brown-white, round angular, med-low sphericity, low-hi strength, HW-MW nodules	11111		SANDY GRAVEL, 60% mc.gr., max size 100mm; 10% low str cemented sand; 20- mf.gr. sand; dry non plastic	ength -30%		
Excavation Method .EXCAV.A.TOF Make	CW- Con	RING. npletely weathered becately weather.	() means Laboratory	ENGINEERING	GEOLOGY.	 •

HOLE NO. NORTHERN TERRITORY GEOLOGICAL SURVEY CENTRAL ENGINEERING SERVICES Page GEOLOGICAL LOG PROJECT DARWIN-ALICE SPRINGS RAIL MATTERTALS SEARCH COORDINATES FEATURE MATERIALS SEARCH LOCATION 7.2km yFIG. 9.m. DIP...... BEARING...... **DATUM.....** DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL DEGREE OF GEOLOGICAL DESCRIPTION GROUP SAMPLE TESTS Group name, general maximum size, in situ moisture and density, plasticity, field test date Type of deposit or meterial, mineral composition, particle shape, comentation, colour, structures AS ABOVE AS ABOVE END HOLE 5.3m STRATA CONTINUING WEATHERING. ENGINEERING GEOLOGY. Soil Classification CW-Completely weathered System: Unified. Date Logged HW-Highly weathered (__) means Laboratory MW - Moderately weathered SW - Slightly weathered Classification. Operator, FrSt-Fresh, with limonite stained joints Fr - Fresh

HOLE NO. NORTHERN TERRITORY GEOLOGICAL SURVEY T 2 CENTRAL ENGINEERING SERVICES GEOLOGICAL LOG PROJECT DARWIN-ALICE SPRINGS RAIL PROJECT MATERIALS SEARCH COORDINATES Y FIG. 10 TEATURE. DIP....... LOCATION 14km BEARING...... DATUM............... GRAPHIC DEPTHE LOG DEGREE OF DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL GEOLOGICAL DESCRIPTION GROUP SAMPLE TESTS Group name, general maximum size, in situ moisture and density, plasticity, field test date Type of deposit or material, mineral composition, 万多夏夏夏 particle shape, comentation, colour, structures 一次为五十 SP Sand, m.-f.gr., dry AEOLIAN SAND non plastic Dk. orange brown, loose even texture, organic matter Sand, m.-f.gr., moist AEOLIAN SAND minor, low plastic fines Red brown, med. dense, even texture SP Sand, m.-f.gr., dry, AS ABOVE non plastic Dense SILTY GRAVEL, 50% m.-CALCRETE GRAVEL c.gr., max. size 30mm 50% silty sand, f.gr. Mot. red brn-brnwhite, dense with well dry, non plastic rounded, med.-high strength, HW-MW nodules GRAVEL, 70% m.-c.gr. GP-GW CALCRETE GRAVEL max. size 40mm; 30% Mt. red brn-brnsilty sand, f.gr. dry white, v. dense with rounded med-v. high hon plastic strength HW-SW nodules END HOLE-STRATA CONTED 5.Om WEATHERING. Excavation Method EXCAVATOR ENGINEERING GEOLOGY. **a** Soil Classification CW-Completely weathered System: Unified. Logged HW-Highly weathered (....) means Laboratory MW- Moderately weathered Classification. SW-Slightly weathered

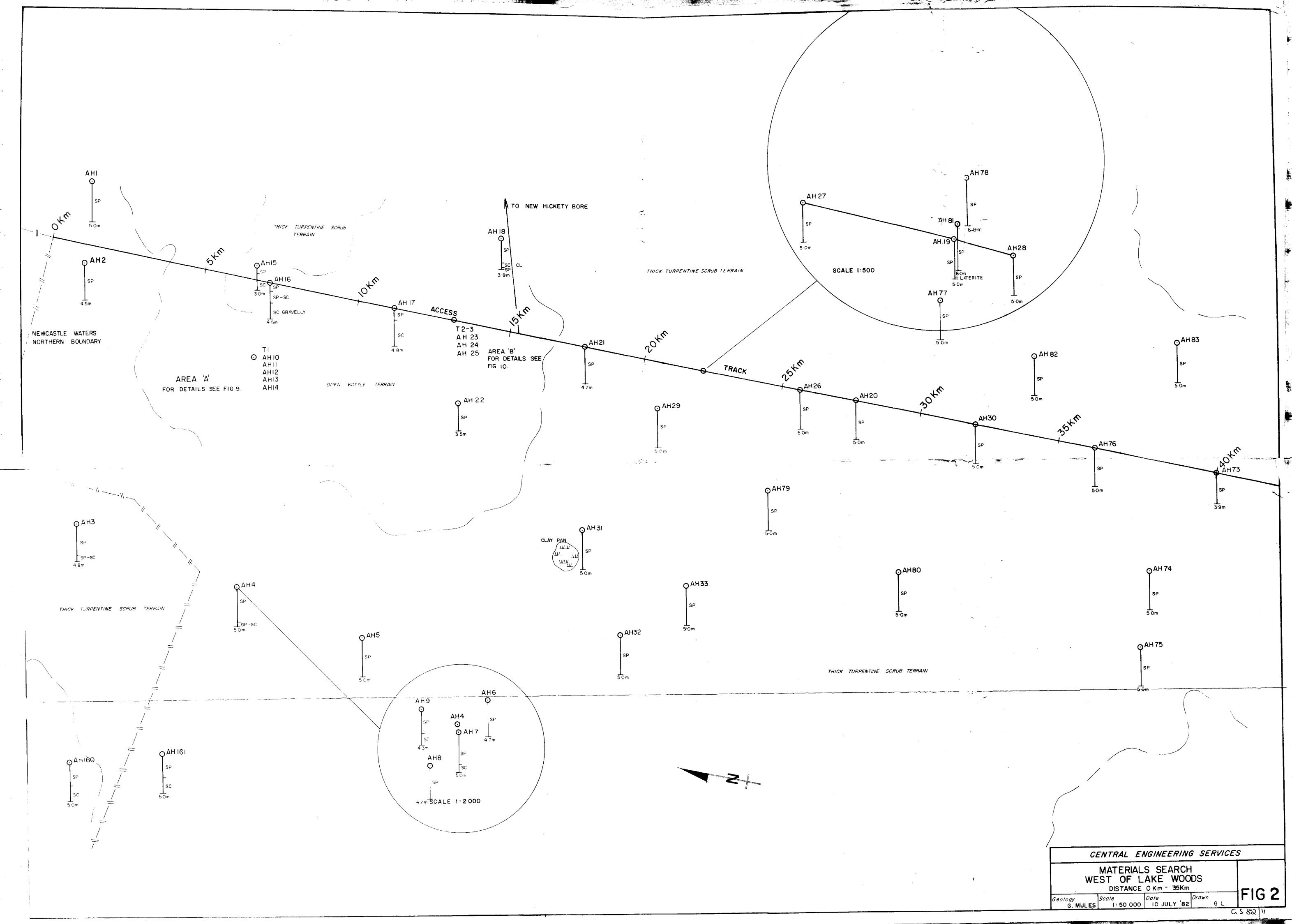
Fr31 - Fresh, with limonite stained joints

Fr - Fresh

NORTHERN TERRITORY GEOLOGICAL SURVEY CENTRAL ENGINEERING SERVICES Page GEOLOGICAL LOG PROJECTDARWIN-ALICE SPRINGS RAIL PROJECTDARWIN-ALICE SPRINGS RAIL X FEATURE MATERIALS SEARCH CO-ORDINATES FIG. 10 m. DIP....... BEARING..... LOCATION 14km SYSTEM DATUM......... DEGREE OF WEATHERING DEPTH DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL GRAPHIC SYMBOL NUMBER GEOLOGICAL DESCRIPTION Group name, general maximum size, in situ moisture and density, plasticity, field test date LOG SILTY SAND, f.gr., dry SM COLLUVIAL SAND, grey Loose, even texture organic matter. mon plastic SILTY SAND, f.-m.gr. SM-SP dry, minor low AS ABOVE plastic fines Yellow brown SILTY GRAVELS, 30-40%GM-CALCRETE GRAVEL m.-c.gr. max size 50mm GP Mt. red brn-brn-20-30% silt; minor low plastic fines, dry white, med. dense with well rounded to angular, elongate med. sphericity, med v.high strength, CW SW nodules. GW SANDY GRAVEL, 60-70% CALCRETE GRAVEL 3 f.c.gr. max size 40mm As above except 30% f.-c.gr. silty sand, mot. Lt. brn-brndry, non plastic white. dense END HOLE 4.Om STRATA CONTINUING ENGINEERING GEOLOGY. Excavation Method EXCAVATOR WEATHERING. & Soil Classification CW-Completely weathered System: Unified. Logged HW-Highly weathered (__) means Laboratory GM Type MW- Moderately weathered Classification. SW-Slightly weathered Operator....... Drawn Fr31- Fresh, with limonite stained joints Checked Fr - Fresh

Completed ,

HOLE NO.



CENTRAL ENGINEERING SERVICES

HOLE NO.

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PROJECT DARWIN-ALICE SPRINGS RAIL
FEATURE MATTERIALS SEARCH COORDINATES SEEF FLAN

DIP......

BEARING......

LOCATION WEST OF LAKE WOODSVETEM
HOLE SIZE 150mm TO: TO:

DATUM..... DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL GEOLOGICAL DESCRIPTION SYMBOL NUMBER LOS AEOLIAN SAND Sand, m.-f.gr., dry, non plastic 5P Orange brown AFOLIAND SAND as above SP low plasticity Red brown Clayey sand, m.-f.gr SC moist, med. plasticity AS ABOVE 4.9m END HOLE ENGINEERING GEOLOGY. Byotom: Unified. Date

(....) means Labori

NORTHERN TERRITORY GEOLOGICAL SURVEY CENTRAL ENGINEERING SERVICES

HOLE NO. AH 35

Page

GEOLOGICAL LOG

PROJECTDARWIN-ALICE SPRINGS RAIL X
FEATURE MATERIALS SEARCH CO-ORDINATES V SEE PLAN

DIP...... BEARING......

LOCATION WEST, OF, LAKE WOODSTYSTEM

DATUM...... BESCRIPTION AND ENGINEERING PROPERTIES OF SOIL GEOLOGICAL DESCRIPTION SYMBOL" NUMBER Sand, m.-f.gr., dry non plastic SPAEOLIAN SAND Orange brown SP AEOLIAN SAND AS ABOVE Red brown WEAKLY CEMENTED 5.0m END HOLE

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ENGINEERING GEOLOGY.

CENTRAL ENGINEERING SERVICES

HOLE NO. AH 36

GEOLOGICAL LOG

PROJECT DARWIN-ALICE SPRINGS RAIL
FEATURE MATERIALS SEARCH CO-ORDINATES SEE PLAN

SURFACE ELEVATION......m. DIP.....

LOCATIONWEST OF LAKE WOODS SYSTEM

HOLE SIZE 150mm TO: TO: TO: GEOLOGICAL DESCRIPTION DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL SYMBOL NUMBER AFOLIAN SAND Sand, m.-f.gr., dry, non plastic \mathtt{SP} Orange brown AEOLIAN SAND AS ABOVE SP Red brown WEAKLY CEMENTED 5.0m END HOLE ENGINEERING GEOLOGY.

CENTRAL ENGINEERING SERVICES

HOLE NO. AH 37

Page of

GEOLOGICAL LOG

DIP.....

LOCATION WEST, QF, LAKE WOODSWITTEN --- 150mmBEARING...... DATUM

HOLE SIZE 150mmro		TO: DATUM.	ROPERTIES OF SOIL	.
GEOLOGICAL DESCRIPTION pp of deposit or material, minoral composition, sortate shape, commission, colour, structures	PART CONTRACTOR	DESCRIPTION AND ENGINEERING I Group name, general manimum size, in oils moistyn and density, planticity, field lost data	SYMBOL NUMBER	
AEOLIAN SAND Orange brown		Sand, mf.gr., dry non plastic	SP	
	2-	AS ABOVE	SP	
WEAKLY CRENTED	4-			
5.0m Excevation Mothed	WEATHERING. GW- Completely weathered	A State Augustinguism	IGINEERING GEOLOGY.	1

HOLE NO. NORTHERN TERRITORY SECLOSICAL SURVEY AH 38 CENTRAL ENGINEERING SERVICES GEOLOGICAL LOG PROJECTDARWIN-ALICE SPRINGS RAIL X. SEE PLAN FEATURE MATERIALS SEARCH COORDINATES V. SEE PLAN DIP....... BEARING..... LOCATION WEST, OF, LAKE WOODSBYSTEM..... DATUM...... DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL SECLOSICAL DESCRIPTION LOG Sand, m.-f.gr., dry non plastic SP AEOLIAN SAND Red brown END HOLE 5.0m ENGINEERING GEOLOGY.

central engineering services

HOLE NO. AH 39

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 TATIBLE AT T	CITI	CDDIMCC	DAT	T		

DIP........

LOCATION MEST. OF LAKE WOODSTYSTEM.....

BEARING......

DATUM....... DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL SECLOSICAL DESCRIPTION SYMBOL SAMPLE TESTS LOS SP Sand, m.-f.gr., moist, low plasticity AFOLIAN SAND Red brown AS ABOVE SP WEAKLY CEMENTED DRY NON PLASTIC 3.2m END HOLE ENGINEERING GEOLOGY.

CENTRAL ENGINEERING SERVICES

HOLE NO. AH 40

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LOCATION WEST OF LAKE WOODSTEM

DIP.,.....

BEARING.....

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HOLE SIZE 150mm TO:	SECRET C		DESCRIPTION AND ENGINEERING	PROPERTIES OF SOIL			
type of deposit or motorial, interest emposition, partials shape, comentation, esteur, structures	- PART	Construct.	Group name, general mesimum size, in offer meletyre and density, planticity, field test data	SYMBOL*	SAMPLE NUMBER	TENTS	Bill
AFOLIAN SAND Orange brown			Sand, f.gr., dry non plastic	SP			
AEOLIAN SAND Red brown		3-	Sand, mf.gr., dry non plastic	SP			
3.5m		4-	END HOLE				
Exercation Method	6W- Coi 160- 144 16W- 164 16W- 161	Enine., mplotoly weathered they weathered gerotely weathered print weathered resh, with limenite took	System: Unified. () means Laboratory (Classification.	Drawn		Date	

HOLE NO. AH 41

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GEOLOGICAL LOG	ruge or
DARWIN-ALICE SPRINGS RAIL	SURFACE ELEVATION
PROJECT DARWIN-ALICE SPRINGS RAIL X. COORDINATES Y.SEE PLAN	DIP
WEST OF LAKE WOODS	BEARING
LOCATION WEST OF LAKE WOODS SYSTEM	DATUM

HOLE SIZETO:			то:.		T0:				5. (
GEOLOGICAL DESCRIPTION	MEATH.	E O		LOS	DESCRIPTION AND ENGINEERING Group name, general maximum sing, in airs material and despity, plotficity,			TESTS	
topo of deposit or material, minoral composition, particle shape, comentation, solver, structures	站	毕			in situ moisture and detaily, planticity, field test data	SYMBOL"	NUMBER		1
AEOLIAN SAND Orange brown					Sand, f.gr., dry non plastic	SP			-
AEOLIAN SAND Red brown				- 	Sand, mf.gr., dry non plastic	SP			-
AS ABOVE				2 -	Clayey sand, mf.g moist, minor low plasticity fines	SP-	5 C		-
AS ABOVE WEAKLY CEMENTED 3.2m				<u>* </u>	Sand, m. f.gr., dry non plastic	, SP			
				4+					-
Essevation Method Make. Type	GW HW M/R	- Ca - Hi /- N	ghly w leders	uly wasther regiliered hely westhic	od System: Volfied. () means Laboratory red Cincelfection.	ENGINEERI GM .00	NG GEOLO	NGY.	
Type Cperator Commenced Completed	MYR SYN Pri	/ M \$4	ledere lehtly resh,	tely weaths weathered	Glassification.	GM .DO Drewn Checked			

CENTRAL ENGINEERING SERVICES

AH 42

GEOLOGICAL LOG

PROJECT DARWIN-ALICE SPRINGS RAIL
FEATURE MATERIALS SEARCH COORDINATES SEE PLAN

DIP..... BEARING............

LOCATION WEST OF LAKE WOODS SYSTEM

DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL SECLOSICAL DESCRIPTION LOG SP Sand, m.-f.gr., dry AEOLIAN SAND non plastic Orange brown AEOLIAN SAND SP as above Red brown Weakly cemented 5.0m END HOLE ENGINEERING GEOLOGY.

CENTRAL ENGINEERING SERVICES

HOLE NO. AH 43 Page

Date

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PROJECT DARWIN-ALICE SPRINGS RAIL X. PEATURE MATERIALS SEARCH CO-ORDINATES VS

CO-ORDINATES VSEE PLAN

LOCATION WEST OF LAKE WOODSTATEM

DIP..... SEARING..............

DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL SECLOSICAL DESCRIPTION dryup name, general maximum sies, in situ meletyre and density, planticity, field test date SYMBOL HUMBER Sand, m.-f.gr., dry SPAEOLIAN SAND non plastic Orange brown AEOLIAN SAND \mathfrak{SP} AS ABOVE Red brown Weakly cemented END HOLE ENGINEERING GEOLOGY.

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CENTRAL ENGINEERING SERVICES

SEOLOGICAL LOS

PROJECT DARWIN-ALICE SPRINGS RAIL X
FEATURE MATERIALS SEARCH COORDINATES SEE PLAN LISCATION WEST OF LAKE WOODSEYSTEM
HOLE SIZE 150mm To: To:

SECLOSICAL DESCRIPTION AEOLIAN SAND Sand, f.gr., dry, SP non plastic Orange brown SP AS ABOVE AEOLIAN SAND Red brown END HOLE 4.5m

ENGINEERING GEOLOGY.

CENTRAL ENGINEERING SERVICES

SEOLOGICAL LOS

PROJECT DARWIN-ALICE SPRINGS RAIL X. SEE PLAN PEATURE MATERIALS SEARCH COORDINATES VSEE PLAN LOCATION WEST OF LAKE WOODSTEEM

DIP......

AH 45

BEARING......

HOLE SIZE 1.50mmyo:		. 70:		TO: DATU				
GEOLOGICAL DESCRIPTION Type of deposit or material, minoral composition,	· Paki		100	DESCRIPTION AND ENGINEERING Group name, general maximum sing, in this materiage and density, planticity,	G PROPERTION OF SYMBOL	SAMPLE NUMBER	TENTS	
AEOLIAN SAND Lt. orange brown				Sand, mf.gr., dry non plastic	y, SP			-
AEOLIAN SAND Orange brown			7	AS ABOVE moist, minor low plasticity fines	SP			
AS ABOVE			Z	Clayey sand, mf. moist, low-med plas		-sc		
2.2m			A + + + + + + + + + + + + + + + + + + +					
Execution Method Make. Type Operator Commenced	170'- H 100'- 1 200'- 2 17-00'-	ample Hybry Mader Matri	tely weathers weathered utely weather y weathered	() magns Laboratory	ENGINEERI Lagged GM.DD. Drawn Checked		Det	

NORTHERN TERRITORY SEOLOSICAL SURVEY CENTRAL ENGINEERING SERVICES

HOLE NO.

AH 64

Page of

GEOLOGICAL LOG
PROJECT DARWIN-ALICE SPRINGS RAIL
FEATURE MATERIALS SEARCH COORDINATES
FEATURE MATERIALS SEARCH COORDINATES

DIP.....

ACATION WEST OF LAKE WOODS SYSTEM

HOLE SIZE 150mm	то:		4	
GEOLOGICAL DESCRIPTION Types of deposit or material, minoral composition, particle shape, computation, asbur, structures	DEFINE OF MEANING STATES LOS	DESCRIPTION AND ENGINEERING Group name, general maximum size, in ally mainture and density, pleaficity, field heat data	PROPERTIES OF SOIL SAMPLE TE SYMBOL NUMBER	are 85 8
AEOLIAN SAND Lt. orange brown		Sand, mf.gr., dry non plastic	SP	-
Weakly cemented	2			
				-
5 . 0n		END HOLE		-
Escavation Method Metho. Type Coereter	WEATHERING. GW- Completely weathered HW- Negley weathered NW- Mederately weathere	@ Soil Consolitation System: Unified.	ENGINEERING GEOLOGY.	Date

CENTRAL ENGINEERING SERVICES

HOLE NO. AH 65

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GEOLOGICAL LOG

PROJECT DARWIN-ALICE SPRINGS RAIL X.
PEATURE MATERIALS SEARCH COORDINATES VSEE PLAN

LOCATION WEST, OF LAKE WOODSSYSTEM.....

DIP......

BEARING......

HOLE SIZE 50mm TO: TO: TO: DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL SECLOSICAL DESCRIPTION SYMBOL NUMBER SP Sand, f.gr., dry, COLLUVIAL SAND non plastic Yellow brown COLLUVIAL CLAYS Silty sand, low plas. Lt. brown 20% f.-m.gr. sand END HOLE - REFUSAL 4.6m ENGINEERING GEOLOGY. om: Unified. HW- Highly weathered MW- Mederately weathered SW-Slightly weathered) means Labo Frat - Fresh, with limonite stained joints

NORTHERN TERRITORY GEOLOGICAL SURVEY AH 66 CENTRAL ENGINEERING SERVICES PROJECT DARWIN-ALICE SPRINGS RAIL FEATURE MATERIALS SEARCH COORDINATES SEE PLAN. FEATURE MATERIALS SEARCH CO-ORDINATES SEE PLAN. LOCATION WEST OF LAKE WOODS SYSTEM DIP...... DEARING............ HOLE SIZE 150mm TO: TO: TO: DATUM....... DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL SECLOSICAL DESCRIPTION SYMBOL NUMBER SP Sand, m.-f.gr., dry, AEOLIAN SAND non plastic Orange brown to red brown END HOLE 5.0m ENGINEERING GEOLOGY. & Sail Classificatio CW-Completely weethered System: Unified. HW-Highly weathered MW-Mederately weathered (___) means Laboratory GM.OD SW- Slightly was Fr#t-- Fresh, with limonite stained joints

HOLE NO.

CENTRAL ENGINEERING SERVICES
GEOLOGICAL LOG

HOLE NO. AH 67

Page of

PROJECT DARWIN-ALICE SPRINGS RAIL COORDINATES	YSEE PLAN
WEST OF LAKE WOODS	

Checked

BEARING.....

GEOLOGICAL DESCRIPTION			E PRAFFIE	DESCRIPTION AND ENGINEERING	PROPERTI	ES OF SO	IL.	85.5
deposit or material, mineral composition, , a chape, comentation, colour, structures	ZZZ		LOS	Group name, general maximum size, in aire meisture and density, plasticity, field test date	SYMBOL	SAMPLE NUMBER	1 6818	
	fff	Π						Π
TAN CAND			П	Sand, mf.gr., dry	SP			F
COLIAN SAND			Ц		,,,,			
d brown			#	non plastic				-
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5.Om				END HOLE				
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tevetion Method	cw-c	ample	staly weathered	System: Unified.	peged	4 05(AT)	or. Date	
· · · · · · · · · · · · · · · · · · ·	CW-C	emple tighty Moder		System: Unified.	gord GM. DD			

PrSt-Freeh, with limenite stained joints. Fr -- Freeh

HOLE NO. NORTHERN TERRITORY GEOLOGICAL SURVEY AII 68 CENTRAL ENGINEERING SERVICES GEOLOGICAL LOG Page PROJECT DARWIN-ALICE SPRINGS RAIL * FEATURE MATERIALS SEARCH COORDINATES See plan DIP..... LOCATION WEST OF LAKE WOODS SYSTEM HOLE SIZE 150mm_{TO:} TO: TO: DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL SECLOSICAL DESCRIPTION Sand, m.-f.gr., dry, SPAEOLIAN SAND non plastic Orange brown to red brown Weakly cemented SND<u>HOLD</u> WEATHERING. ENGINEERING GEOLOGY. GM.00 SW- Slightly worthored

Cheched

AEOLIAN SAND Red brown Weakly comented Weakly comented DESCRIPTION AND ENGINEER TOWN AND ENGINEER TOWN AND ENGINEER TOWN AND ENGINEER TESTS AEOLIAN SAND Red brown DESCRIPTION AND ENGINEER TESTS AND SAND, Mf.gr., dry OP OF OF OF OF OF OF OF OF OF OF OF OF OF	LOCATION WEST OF LAKE	GEOLOGICAL SPRINGS RAIL X ARCH COORDINATES Y SEE WOODSEYSTEM	PLAN DIP	Page of ELEVATION
Red brown non plastic 2		MEATHER OF MAPRIC DES	SCRIPTION AND ENGINEERING P	
Weakly comented				9TC
5.0m UND HOLE		2- 	D HOLE	
Excavation Method	Escavation Method	WEATHERING.	S. Sett StreetStreeties EN	NGINEERING GEOLOGY.

PrSt - Fresh, with limenite stained joints Fr - Fresh

HOLE NO. NORTHERN TERRITORY GEOLOGICAL SURVEY AH 71 CENTRAL ENGINEERING SERVICES GEOLOGICAL LOG FEATURE MATERIALS SEARCH DIP...... LOCATION WEST OF LAKE WOODS DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL GEOLOGICAL DESCRIPTION SYMBOL NUMBER Sand, m.-f.gr., dry, SP non plastic AUOLIAN SAND Red brown 5.0m END HOLD ENGINEERING GEOLOGY. m : Unified. Date (...) meens Laboratory SW- Slightly wes Pr# - Fresh, with lin

CENTRAL ENGINEERING SERVICES

HOLE NO. AH 72

GEOLOGICAL LOG

PROJECT DARWIN-ALICE SPRINGS RAIL X
FEATURE MATERIALS SEARCH COORDINATES SET PLAN

LOCATION WEST, OF, LAKE WOODS SYSTEM

DIP......

BEARING.......

DATUM............ DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL GEOLOGICAL DESCRIPTION SAMPLE TESTS Sand, m.-f.gr dry, non plastic SP AEOLIAN SAND Red brown Low plasticity Weakly cemented 5.0m END HOLE ENGINEERING GEOLOGY. tom: Unified. HW- Highly weathered MW- Mederately weathered GM.DD. SW- Slightly weathered

Fr91- Fresh, with lim

CENTRAL ENGINEERING SERVICES

HOLE NO. AH 73

GEOLOGICAL LOG

PROJECT DARWIN-ALICE SPRINGS RAIL MATURIALS SPARCH COORDINATES SEE PLAN

DIP...... BEARING.....

LOCATION WEST OF LAKE WOODSISTEM

DATUM..... DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL SECLOSICAL DESCRIPTION SYMBOL" NUMBER Group name, general meximum size, in situ moisture and density, pleasicity, field test data LOS Gand, m.-f.gr., dry, non plactic SPAEOLIAN SAND Red brown low plasticity Weakly cemented END HOLE 3.9m WEATHERING. ENGINEERING GEOLOGY. & Self Classification System: Unified. Logged ...) means Laboratory SW-Stightly weathered Pr9t-Fresh, with limenite stained joi

CENTRAL ENGINEERING SERVICES

HOLE NO.

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GEOLOGICAL LOG PROJECT DARWIN-ALICE, SPRINGS RAIL X. SEE PLAN.

BEARING......

PEATURE MATERIALS SEARCH COORDINATES WEEE PLAN LOCATION STATE OF LAKE WOODS SYSTEM

HOLE SIZE 1,50mm to:	T	0:		DATUM.		 	b-
GEOLOGICAL DESCRIPTION type of degent or material, minoral composition, perficts shape, commission, edear, structures	CHATHER ING	DAAPHIC LOS	DESCRIPTION AND ENGI Group name, general maximum in allu moisture and deneity, plea light feet date		ROPERTIE BROUP SYMBOL		E L
AEOLIAN SAND Red brown		2+ 2+ 3+	Sand, mf.gr., non plastic		SP		
Weakly cemented			low plasticity,	, mois			
Excevation Method	HW- Highly MW- Mode SW- Slight	letely weathered y weathered wately weathere ity weathered h, with limonite	() means Leberstory Clessification.	Les Gr	IGINEERIN Pood M, QO own	 Date	

CENTRAL ENGINEERING SERVICES

HOLE NO.

AH75 Page

GEOLOGICAL LOG

PROJECTDARWIN-ALICH SPRINGS RAIL X
FEATURE MATERIALS SEARCH COORDINATES SEE PLAN

SURFACE ELEVATION......m. DIP..... BEARING.....

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LOCATION WEST OF LAKE WOODSTYSTEM

HOLE SIZE 1 50mm TO: TO: TO: SECLOSICAL DESCRIPTION DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL SYMBOL SAMPLE TESTS Group name, general menimum size, in situ meisture and density, plasticity, field test date Sand, M.-f.gr., dry, non plastic ABOLIAN SAND SP Red brown Weakly comented Moist, low plasticity Эm MD HOLD ENGINEERING GEOLOGY. 4 Sail Classification GW- Completely weeth System: Unified. Date HW-Highly weathered (....) means Laborat Classification. SW- Slightly weathered

PrSt - Fresh, with limonite stained joints

rywanie e z walande	COMPRAI. DMG	TORY GEOLOGICAL SURVEY JMYTTRING OF THE COMP OGICAL LOG TO X	URFACE ÉLEVÂTIO	HOLE NO. AH 76 Page of N
PROJECT DARTIZ-ALIC FEATURE NATURE ALIC LOCATION	MARCH COORDINAT K节 WOODS	TES YSTEP PIAN	PEARING	
HOLE SIZE 150 MTO:	DESCRIPTION DEPTH	DESCRIPTION AND ENGINE Group name, general maximum sizes and descript, placetic field lost date.	ERING PROPERTIES	OF SOIL.
AUOLIAN SAMB Red brown		Mand, mf.gr., Bry, non plastic	-313	-
				-
				 -
		moist, low olasticity		
Excevation Method	CM - Compressory was		ENGINEERI Logged G-1, DD	NG GEOLOGY.
Type Operator Commenced Completed	MW - Medicately week	othered Classification.	Drawn	

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HOLE NO. NORTHERN TERRITORY GEOLOGICAL SURVEY AH 69 CENTRAL ENGINEERING SERVICES Page GEOLOGICAL LOG PROJECTARWIN-ALICE SPRINGS RAIL FEATURE MATERIALS SWARCH COORDINATES SEE PLAN DIP..... LOCATION WEST OF LAKE WOODS SYSTEM BEARING...... HOLE SIZE 150mmTO: TO: TO: DATUM..... DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL DESCRIPTION GEOLOGICAL DESCRIPTION SYMBOL NUMBER LOG SP Sand, f.gr., dry, AEOLIAN SAND non plastic Yellow brown Clayey sand, m.-f.gr. Scdry, low med. planticity ABOLIAN SAND Brown Sand, m.-f.gr., dry, low plasticity \mathcal{F} ACOLIAN SAND Red brown Weakly cemented END HOLD 4.Om

WEATHERING.
CW-Completely weethered
HW-Highly weethered
MW-Mederately weethered
SW-Slightly weethered

PrSt - Fresh, with limenite stained joints

& Self Classification System: Unified. (___) means Laboratory Classification. ENGINEERING GEOLOGY,
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GMLOD
Drawn
Checked

	NORTHERN TERRITORY GEOLOGICAL SURVEY	AH 83
PROJECT Darwin-Alice FEATURE Materials Se	GEOLOGICAL LOG Springs Rail Xm. SURFACE ELEVA	itionm.
FEATURE Materials Se	arch CO-ORDINATES Y DIP DIP	
LOCATION West of Lake	Woodsystem BEARING	
HOLE SIZE 165mmo		
GEOLOGICAL DESCRIPTION Type of deposit or material, mineral composition, particle shape, cementation, colour, structures	DESCRIPTION AND ENGINEERING PROPERT BRAPHIC DESCRIPTION AND ENGINEERING PROPERT GROUP, In situ moisture and density, plasticity, SYMBOL field test date	SAMPLE TESTS DE LE
Aeolian Sand	Sand, mf.gr.,	
	dry, non plastic SP	
Red brown		
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		1 -
		1 L
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		1 Г
	End of Hole	
Excovation Method	CW- Completely weathered System: Unified. Logged	IG GEOLOGY Date
Type	MW — Moderately weathered Classification.	
Commenced	Fr St - Fresh, with limonite stained joints Drawn	

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	AH 84				
	GEOLOG	ICAL LOG		<u> </u>	of
PROJECT Darwin-Alice	Springs Rail	Xm SUR		ION	1
FEATUREMAterials Sea LOCATIONWest of Lake	ren	Y.,			
HOLE SIZE 165mmTo					
ATOLOGICAL DESCRIPTION	DEGREE OF P	DESCRIPTION AND ENGINEERI	NG PROPERTIE	S OF SOIL	SE 5
Type of deposit or material, mineral composition, particle shape, comentation, colour, structures	WEATHER THAN DEBTHE	Group name, general maximum size, in situ moisture and density, plasticity, field test date	SYMBOL.	SAMPLE TESTS NUMBER	GRO WAN LEVE
Aeolian Sand		Sand, mf.gr., d	ry SP		
Red brown		Non plastic.			
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]]]]]]5	End of Hole			
Excavation Method Make	WEATHERING. CW— Completely weathered	Soil Classification System: Unified.	ENGINEERIN Logged	G GEOLOGY. Dat	e
Type Operator	HW- Highly weathered MW- Moderately weathered SW- Slightly weathered	() means Laboratory Classification.			
Commenced Completed	FrSt-Fresh, with limonite st Fr Fresh	gined joints	Drawn Checked		

HOLE NO.

ſ	NORTHERN TERRI	TORY GEOLOGICAL SURVEY	<u> </u>	HOLE NO.
	GEOL C	201041 100		AH 85
PROJECT Darwin-Alic	e Springs Rai	X	SURFACE ELEVATI	Page of
FEATURE Materials S	earch co-ordinate	ES Y	DIP	
LOCATION West of Lak			BEARING	
HOLE SIZE 65mm TO	DEGREE OF 12	DESCRIPTION AND ENGINE	DATUM	1.
GEOLOGICAL DESCRIPTION Type of deposit or material, mineral composition particle shape, cementation, colour, structures	WEATHERING E GRAPHIC	DESCRIPTION AND ENGINE Group name, general maximum siz- in situ moisture and density, plastici field test date		S OF SOIL 25 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
particle shape, cementation, colour, structure	On あるまま metreeU LOG	field test date	SYMBOL SYMBOL	NUMBER O-W
Aeolian Sand		Sand, mf.gr.,	dry SP	
Red brown		Non Plastic.		
	1			-
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	6+			,
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		Low Plasticity	ن P	
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Weakly cemented		I		
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	1111111 1	Í		
	++++++	and of Hole 4.6m		
]]]]]]]]	i		
Excavation Method	WEATHERING.			
Make	CW— Completely weathered HW— Highly weathered	 Soil Classification System: Unified. 	ENGINEERING G	GEOLOGY. Date
Type Operator	MW— Moderately weathered SW— Slightly weathered	() means Laboratory Classification.		
ommenced FrSt+ Fresh, with limonite sto		ined joints	Drawn Checked	

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NORTHERN TERRITORY GEOLOGICAL SURVEY T 4 CENTRAL ENGINEERING SERVICES GEOLOGICAL LOG PROJECT DARWIN-ALICE SPRINGS BATL X FEATURE MATERIALS SEARCH COORDINATES FIG 11 DIP.,..... LOCATION 68km SYSTEM BEARING............. DEGREE OF GRAPHIC DEPTHE LOG DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL GEOLOGICAL DESCRIPTION GROUP SAMPLE TESTS Group name, general maximum size, in situ moisture and density, plasticity, field test data Type of deposit or material, mineral composition, あるままま particle shape, cementation, colour, structures 上近点主立 SP AEOLIAN SAND SAND, m.-f.gr. dry, non plastic Orange brown, loose to 0.3m then dense open even texture, surface organic matter. AEOLIAN SAND SP SAND, m.-f.gr. dry (moist on joints), 10-20% silt, minor low plastic fines. Mottled orange brnred brn-Lt. brn-grey dense to v.dense. uneven texture, minor lamination and vertical jointing 5.Om END HOLE-STRATA CONT D Excavation Method EXCAVATOR WEATHERING. ENGINEERING GEOLOGY. & Soil Classification CW- Completely weathered System: Unified. Logged Date HW-Highly weathered (___) means Laboratory GM ... MW- Mederately weathered Classification. SW- Slightly weathered FrSt-Freeh, with limonite stained joints Fr - Fresh

HOLE NO.

NORTHERN TERRITORY GEOLOGICAL SURVEY T 5 CENTRAL ENGINEERING SERVICES Page GEOLOGICAL LOG PROJECT DARWIN-ALICE SPRINGS RAIL FEATURE MATERIALS SEARCH COORDINATES S RAIL x m. m. roordinates yFIG. 11 m. DIP..... LOCATION 68km BEARING....... DATUM....... DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL DEGREE OF GRAPHIC DEPTHEY LOG GEOLOGICAL DESCRIPTION GROUP SAMPLE TESTS Group name, general maximum size, in situ maisture and density, plasticity, field test date Type of deposit or material, mineral composition, いるままま particle shape, comentation, colour, structures SP SAND, m.-f.gr. dry AEOLIAN SAND non plastic Brown to orange brown, loose with organic matter to o.3m, then dense open and even texture COLLUVIAL SAND SAND, f.gr., dry, SP non plastic Mottled red brnorange brn-brn-grey dense to v.dense, weakly cemented (low strength), vertical and horizontal joints COLLUVIAL SAND SILTY SAND, f.gr. Lt. brown-red brown dry, non plastic v. dense. END HOLE-STRATA CONT 5.0m Excavation Method EXCAVATOR WEATHERING. ENGINEERING GEOLOGY. Soil Classification CW- Completely weathered System: Unified. Logged HW- Highly weathered (...) means Laboratory GM MW- Moderately weathered Classification. SW-Slightly weathered FrSt-Fresh, with limonite stained joints

Fr -- Fresh

HOLE NO.

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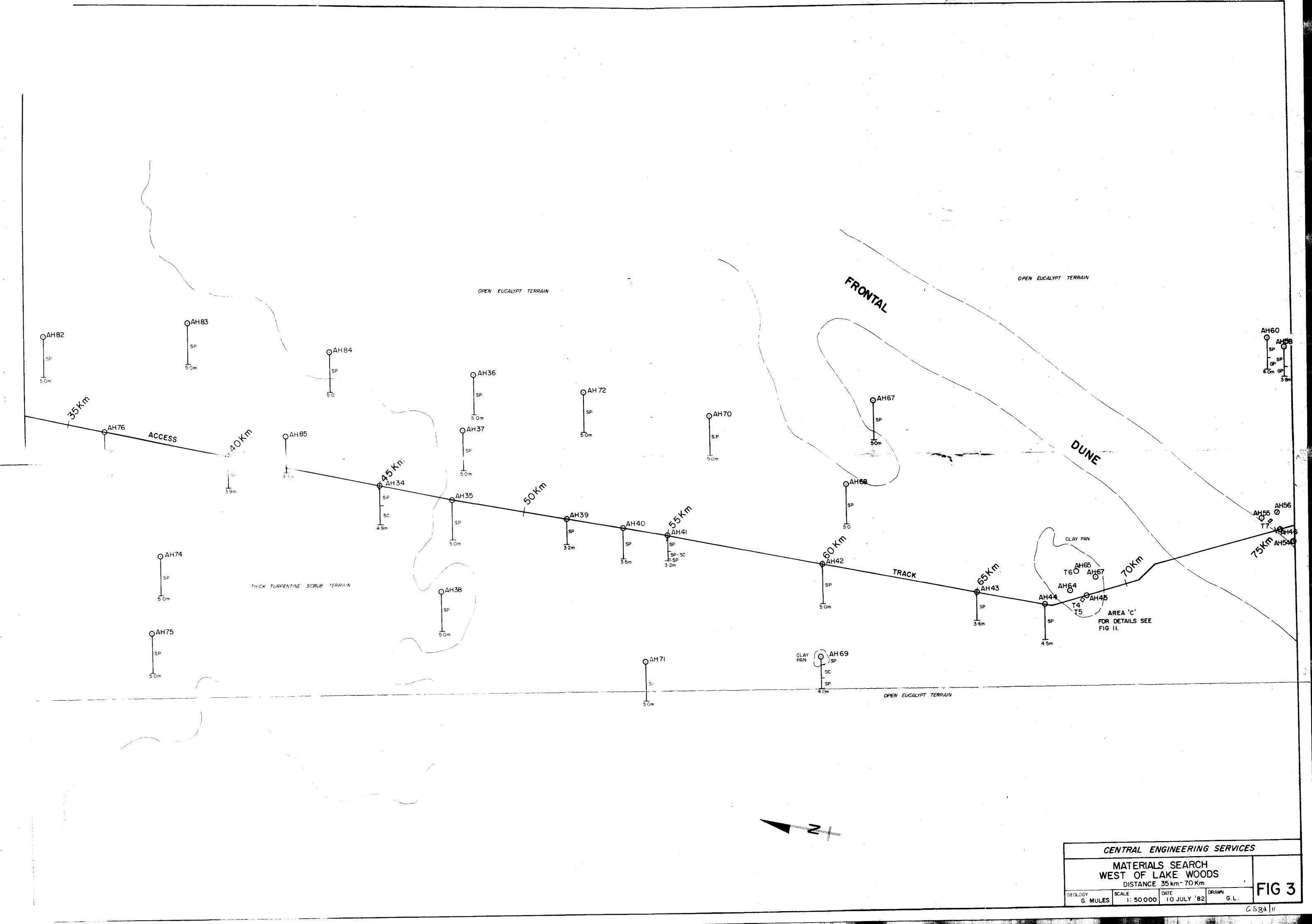
CENTRAL ENGINEERING SERVICES

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HOLE	NO.
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PROJECT DARWIN-ALICE FEATURE MATERIALS SE	SPRINGS RAIL		RFACE ELEVATION
LOCATION 68km		.,,,,,	ARING
HOLE SIZETO:		TO: DAT	'UM
	DEGREE OF	DESCRIPTION AND ENGINEER Group name, general maximum size, in situ moisture and deneity, plasticity, field test date	
AEOLIAN SAND Lt. brown, loose, open even texture, organic matter.		SAND, mf.gr., dr non plastic	(SM)
Yellow brown, med. dense to dense, open even texture.	2	SILTY SAND, f.gr., dry, minor low plastic fines	SM-SP
COLLUVIAL SAND Mottles yell. brn- red brn-brn-grey, dense to v. dense, weakly cemented (1c strength), uneven texture.		SILTY SAND, f.gr. dry, low plastici	ty
Excavation Method . EXCAVATO Make. Type Operator. Commenced. Completed	WEATHERING. CW- Completely weathered HW- Highly weathered MW- Moderately weathere SW- Slightly weathered FrSt- Fresh, with limonite Fr - Fresh	d Cleenification.	ENGINEERING GEOLOGY. Logged Date GM Drawn Checked



(NORTHERN TERRITORY SECLOSICAL SURVI NTRAL ENGINEERING SERVI	CES AH 46
LECATION WEST OF LAKE	PRINGS RAIL CH COORDINATES SEE PLAN	SURFACE ELEVATION
HOLE SIZE TO:TO:	TO: TO: OBSCRIPTION AND	PENGINEERING PROPERTIES OF SOIL.
AEOLIAN SAND Orange brown	Sand, mf.gr non plastic	o, dry SP
AEOLIAN SAND Red brown	AS ABOVE Low plastic	sity
	Clayey sand mf.gr., 1	el; med.
CALCRETE SANDS	Gravel, 60% max size 30m	nm. 15% VISCIII
CALCRETE GRAVEL 2.1m	med. plastic	city fine GP-GW -
	3-4-4-5	
Execution Method Natio Type Generator Commenced Commenced	EATHERING. W- Completely weethered W- Highly weethered W- Suderately weethered W- Sightly weethered W- Sightly weethered W- Fresh, with limenite steined joints y - Fresh	L Lagged Date

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CENTRAL ENGINEERING SERVICES

HOLE NO.

Page

GEOLOGICAL LOG

PROJECT DARWIN-ALICE SPRINGS RAIL X MATERIALS SEARCH COORDINATES VSEE PLAN

DIP.......

LOCATION WEST OF LAKE WOODSYSTEM

BEARING...... DATUM.....

HOLE SIZETO	_			T			DESC	RIPTION AND ENGINE	FRING P	ROPERTIE	s of sol	L	es ≀
GEOLOGICAL DESCRIPTION	DEGI WEAT		t IN	Þ		LOS	Group ne in situ mei	me, general maximum siz sture and density, plastic field test data		SYMBOL.	SAMPLE NUMBER	TESTS	
AEOLIAN SAND Orange brown					+			mf.gr., o lastic	dry	SP			
AS ABOVE					/ / / -			BOVE plasticity		SP			
AS ABOVE					2	-	noist,	sand, m.f. low med.	gr.	SP- SC			-
CALCRETE SAND Lt. brown					-		Clayey f-m.gr ned.r	sand, 15- c. gavels, plasticity	20% l ow-	sc			
CALCRETS GRAVES Lt. brown - white					3.		Jandy fc.g	gravel, 50; gr. max siz , 15% med.	% e	G₩*G			
3.6	?m				4.		END	HOLE - REF	USAL				
Excevation Method		EAT			5			Soil Classification	F.	IGINEERIN	G GFOLO	OGY.	

CW- Completely weathered HW- Highly weathered MW- Mederately weathered SW- Slightly weathered

Fr - Fresh

Frat - Fresh, with limonite stained joints

System: Unified. (___) means Laboratory

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CENTRAL ENGINEERING SERVICES

GEOLOGICAL LOG

PROJECT DARWIN-ALICE SPRINGS RAIL X.
PEATURE MATERIALS SEARCH COORDINATES SEE PLAN

LOCATION . WEST OF LAKE WOODSYSTEM

DIP......

BEARING......

HOLE NO.

AH 48

DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL SYMBOL" NUMBER GEOLOGICAL DESCRIPTION Sand, m.-f.gr., dry, non plastic to low plasticity SP AEOLIAN SAND Lt. orange brown Clayey sand, low-med SP-AEOLIAN SAND plasticity Sandy gravel, 30% m.gr. max size 20mm, Red brown 60% silty sand; low plas GP CALCRETE GRAVEL END HOLE - REFUSAL 3.1m ENGINEERING GEOLOGY. GA .00

CENTRAL ENGINEERING SERVICES

HOLE NO. AH 49

í	æ	FOI	OG	ICA	L	LOG

PROJECT DARWIN-ALICE SPRINGS RAIL X
PEATURE MATERIALS SEARCH COORDINATES SE

SEE PLAN

LOCATION WEST OF LAKE WOODSISTEM

SEARING.....

GA.00

DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL GEOLOGICAL DESCRIPTION SP Sand, m.-f.gr., dry AEOLIAN SAND becomming moist, non plastic Orange brown Clayey sand, m.-f.gr SP-moist, low-med SC AS ABOVE plasticity Sandy gravel, 60% CALCRETE GRAVEL m.-c.gr. 30% silty GM-GP Lt. brown - white sand; minor low plasticity fines. END HOLE - REFUSAL 3.0m ENGINEERING GEOLOGY.

CENTRAL ENGINEERING SERVICES

HOLE NO. AH 50

GEOLOGICAL LOG

PROJECT DARWIN-ALICE SPRINGS RAIL X
PEATURE MATERIALS SEARCH COORDINATES VSEE PLAN

LOCATION WEST OF LAKE WOODS

DIP.....

HOLE SIZE	T	0:	TÖ:			
OECLOSICAL DESCRIPTION Type of deposit or material, mineral composition, particle plages, competition, colour, structures	PARTY.	LOS	DESCRIPTION AND ENGINEERING Graph name, general maximum plan, in also melatyre and density, provincity, [add last data	PROPERTIE SYMBOL	S OF SOIL SAMPLE TESTS NUMBER	
AEOLIAN SAND Orange brown			Sand, mf.gr., dry non plastic	, SP		-
CALCRETE GRAVEL Lt. brown - white			Sandy gravel, mc.gr. max size 40mm; non plastic	GP		-
2.Om		3	END HOLE - REFUSAL			
Excevation Method Make	1007 — 144g0ni 1697 — 1694 1697 — 1694	HHG. History weathered by weathered wrately weathered on, with Hmenite	System : Unified. () means Leberatory Clessification.	ENGINEERIN Legged PMLOO Drawn	IG GEOLOGY. Del	

CENTRAL ENGINEERING SERVICES

HOLE NO. AH 51

DIP......

Date

Page of

GEOLOGICAL LOG

PROJECT DARWIN-ALICE SPRINGS RAIL X SEE PLAN

LOCATION WEST OF LAKE HOLE SIZE 150mm _{to}			то.	# <u></u>	TO :					T.
GEOLOGICAL DESCRIPTION of deposit or motorial, minoral composition, ritials chape, comentation, colour, structures	COOR	HEEL OF		LOS tre 3	DESCRIPTION AND ENG	MNEERING P	ROPERTIE SROUP, SYMBOL	SAMPLE NUMBER	TESTS	MATER .
AEOLIAN SAND Orange brown					Sand, mf.gr., non plastic	, dry,	SP			-
CALCRETE GRAVELS				+	Sandy gravel		GР			
1.3m				3	END HOLE - R	EFUSAL				

CW- Completely weethered

HW- Highly weathered MW- Mederately weathered SW-Slightly weathered

Fr - Fresh

FrSt-Fresh, with limenite stained joints

otem: Unified.

Cleasification.

HOLE NO. NORTHERN TERRITORY GEOLOGICAL SURVEY AH 52 CENTRAL ENGINEERING SERVICES PROJECT DARWIN-ALICE SPRINGS RATL X FEATURE MATERIALS SEARCH GEOLOGICAL LOG COORDINATES YSEE PLAN DIP..... FEATURE MATERIALS .. SEARCH LOCATION WEST OF LAKE WOODS SYSTEM BEARING...... DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL GEOLOGICAL DESCRIPTION SP Sand, m.-f.gr. dry AFOLIAN SAND non plastic Orange brown CALCRETE GRAVEL $G\Gamma$ Sandy gravel Lt. brown - white END HOLE - REFUSAL ENGINEERING GEOLOGY.

Fr St - Fresh, with limonite stained joints

GM.00

CENTRAL ENGINEERING SERVICES

HOLE NO. AH 53

Page of

	G	EOI	LOG	ICAL	LOG

DIP......

PROJECT DARWIN-ALICE SPRINGS RAIL X m. FEATURE MATERIALS SEARCH COORDINATES VSEE PLAM VEST OF LAKE WOODS SYSTEM HOLE SIZE 150mm TO: TO: BEARING....... DATUM.....

GEOLOGICAL DESCRIPTION	DESCRIPTION OF	THE PARTY OF	DESCRIPTION AND ENGINEERING			25
po of deposit or material, mineral composition, pritate chape, comentation, action, biructures	EASE.	LOG	Group name, general maximum plus, in also moisture and density, plasticity, [intel test data	SYMBOL MUMB	ER TESTS	8
AEOLIAN SAND Lt. orango brown			Sand, mf.gr., dry non plastic	SP		
CALCRETE GRAVEL Lt. brown - white			Bandy gravel	GP		
1.6m		2	END HOLE - REFUSAL			
						-
		3				- -
i		4				
						+
						-

Escavetien Method	WEATHERING.
Molio Type Operator Commenced	GW— Completely weathered
Tues	HW- Highly weathered
	MW- Moderately weathered
Operator	SW— Slightly wosthered
Commenced	FrSt - Fresh, with limonite stained joints
Commission	Fr — Frank

System: Unified. () magne Laboratory

Date GA.00 ...

CENTRAL ENGINEERING SERVICES

HOLE NO. AH 54

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PROJECT DARWIN-ALICE SPRINGS RAIL X
PRATURE MATERIALS SEARCH COORDINATES VSEE PLAN

LOCATION WEST OF LAKE WOODS

EARING.....

HOLE SIZE 150mm _{ro:}	1	no:	TO: DATUM			
GEGLOSICAL BESCRIPTION	SECTION OF	- To LOO	DESCRIPTION AND ENGINEERING for the money come, present manifestation state, in the moletype and descrip, planticity,		S OF SOIL SAMPLE TESTS NUMBER	
pertials shape, comunication, calcur, structures		3		STREET		[]
						 -
AEOLIAN SAND		H	Sand, mf.gr., dry	SP		1 1
Orange brown		+	non plastic			
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		1'#				
		1 1				-
		l H				
		1				
		1 #				
						
						-
		H H				
	++++	34 -				+
			moist, low plastic	Lty SP		_
3.4m			END HOLE - AUGERS JAMMED			
		П Д	O APIPIED			-
		ll H				
		4				Γ
						-
		II II				
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	ЩЩ	المال			NO 050 000	
Essevation Method		mme. glately weathers: hly weathers!	d ton Crestmann 1	Lagged GM-DD	NG GEOLDGY. De	
Type	MW- No	derately weather http://www.thered	Cillani (aprilani)			
Commenced	Pres-Pre	och, with limenite oh	· second period	Checked		

CENTRAL ENGINEERING SERVICES

HOLE NO. AH 55

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GEOLOGICAL LOG	Lade o
DARWIN-ALICE SPRINGS RAIL xm	SURFACE ELEVATION
PROJECT DARWIN-ALICE SPRINGS RAIL X PEATURE MATERIALS SEARCH COORDINATES USEE PLAN	DIP
LICCATION WEST OF LAKE WOODSPITTEN	BEARING
MONE SAZE 150mm70:	DATUM

GEOLOGICAL DESCRIPTION THE of deposit or motorial, mineral composition, partials shape, committee, saleur, structures	MEATINGTON		DESCRIPTION AND ENGINEERING	enoup.	S OF SOIL SAMPLE TESTS NUMBER	
AEOLIAN SAND			Silty, sand, f.gr., dry non plastic	SM		_
AEOLIAN SAND Red brown		/	Sand mf.gr., dry non plastic	SP		-
CALCRETE GRAVELS Lt. brown - white			Sandy gravels, fm.gr., max. size 15mm minor low plasticity fines	G₽		1
2.0m		3	END HOLE - REFUSAL			

© Soil Classification System: Unified. (...) means Laboratory Classification. ENGINEERING GEOLOGY.
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CENTRAL ENGINEERING SERVICES

HOLE NO. AFI 56

PROJECT DARWIN-ALICE SPRINGS RAIL X
PEATURE MATERIALS SHARCH COORDINATES SEE PLAN

DIP.......

LOCATION WEST OF LAKE WOODSEVETEN

HOLE SIZE 150mmro: TO: TO:

BEARING...........

OCCLOSICAL DESCRIPTION Type of deposit or meterial, inhered composition portion chaps, comentation, attent, structures	- 1311)	LOS	DESCRIPTION AND ENGINEERS in also makes and descript, placeficity,		OF SOIL AMPLE TESTS UMBER	25 P
AEOLIAN SAND Orange brown			Sand, mf.gr., dry, non plastic	SP		-
CALCRETE CLAYS Brown			Sandy clay, med. plasticity, 30% mf.gr., sand	CL		
CALCRETE GRAVEL Brown - white		2-	Sandy gravel	GW- GP		-
2.5m		3	END HOLE - REFUSA			
Experien Mathed Nate Type Operator Commenced	MW - Might MW - Made SW - Slight	Med. Jointy mosthered y weathered Hy weathered th, with Hannita t	Citation in the citation in th	ENGINEERING (Legard GM_DD Drawn	EOLOGY. Date	

CENTRAL ENGINEERING SERVICES
GEOLOGICAL LOG

HOLE NO.

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PROJECT DARWIN-ALICE SPRINGS RAIL X SEE PLAN FEATURE MATERIALS SEARCH COORDINATES USEE PLAN WEST OF LAKE WOODS

DIP......

DATUM......

HOLE SIZE 150mm TO: TO: TO:

DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL OFOLOGICAL DESCRIPTION SYMBOL NUMBER Sand, m.-f.gr., dry, SP AFOLIAN SAND non plastic Orange brown Clayey sand, m.-f.gr. SP-moist, med. plasticity SC AS ABOVE clayey sand med plas. SC Brown CALCRETE GRAVELS GPSandy gravel, f.-m. gr., max. size 20mm, non plastic Lt. brown - white END HOLE - RUFUSAL **少。1 m** ENGINEERING GEOLOGY.

Excevation N	lethod	 	 	
Make		 	 	
Туре		 	 	
Operator,		 	 	
Commenced		 	 	

GM DD

HOLE NO. AH 58

OCOLOGICAL DESCRIPTION of deposit or meterial, interest composition, lists shape, committellin, saleur, structures	HATTER OF LOS	DESCRIPTION AND ENGINEERING (Group name, so and descript, prostlerly, in also moisture and descript, prostlerly, field that data	PROPERTIES OF SOIL OROUP SAMPLE TESTS SYMBOL HUMBER
PROJECT DARWIN-ALICE PEATURE MATERIALS S LOCATION VEST OF LAKE HOLE SIZE 150mm	EARCH WOODS	YSEE PLAN. DIP	E ELEVATION
	GEOLOG	MERING SERVICES	Page o

GEOLOGICAL DESCRIPTION	-	DESCRIPTION	AND ENGINEERING PROF	PERTIES OF SOIL	1 3
Type of deposit or motorial, minoral composition,	2. 2. 2. 2	LOB in ohe moisture and	of meetinem slep, density, planticity, SY1	HOUP SAMPLE TESTS	
AEOLIAN SAND Orange brown		Sand, mf non flast		SP	-
Weakly comented					1
•	z.				-
CALCRUTH GRAVEL Lt. brown - white	3.	Sandy grav Low to ver strength 4 fragments, 10mm.	y high	GP	-
3.8m	-	END HOLE	- REFUSAL		-
	4				-
Execution Mothod	WEATHERING. 00- Completely w	- Chairmi Aim	fied. Langue	EERING GEOLOGY.	<u></u>

MW - Mederately weathered SW - Slightly weathered PrSI - Fresh, with limenite stained joints Fr -- Fresh

Classification.

CENTRAL ENGINEERING SERVICES

HOLE NO. AH 59

PROJECT DARWIN-ALICE SPRINGS RAIL
MATERIALS SEARCH COORDINATES SHE PLAN
FEATURE DIP..... LOCATION WEST OF LAKE WOODS SYSTEM
HOLE SIZE 150mm TO: TO: TO: BEARING..... DATUM.....

SECLOSICAL DESCRIPTION	DESCRIPTION OF	PAAPIGE	DESCRIPTION AND ENGINEERIN	G PROPERTIE		
lype of depent or material, mineral composition, particle chape, comentation, colour, structures	· SALE		Group name, general maximum size, in also matching and density, plasticity, (init had date	SYMBOL.	SAMPLE TESTS MANGER	
AEOLIAN SAND Brown: to orange brown		2	Sand, mf.gr., dry non plastic			
CALCRETE GRAVEL Lt. brown - white		3-	Sandy gravel, fc.gr., max size 30mm, MW-SW low - high strength fragn	GW nents		
l ₊ ■ Om		5	END HOLE - REFUSAL			
Essevation Method Metho Type Operator Commenced	WEATHERING GW - Complete HW - Highly we HW - Mederale SW - Slightly t Pr St - Proph, t	ly woothered sellhered sly weethered wasthered	System: Unified. () means Laboratory Classification.	ENGINEERING Logged FM.DD Drawn	GEOLOGY.	

CENTRAL ENGINEERING SERVICES

HOLE NO. AH 60

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GE	OLOGI	CAL	LOG

PROJECT DARWIN-ALICE SPRINGS RAIL X
PEATURE MATERIALS SEARCH COORDINATES SEE PLAN
LOCATION WEST OF LAKE WOODS
HOLE SIZE 150 MM: TO:

DIP......

BEARING.....

HOLE SIZE 150 MB:		. 10:	<u> </u>	DATUM.	PROPERTIE	s of so	L	ès a
GEOLOGICAL DESCRIPTION of of Committee of Co	A LARL		Loo	Group name, general maximum slot, in the melature and density, planticity, field but details.	SYMBOL.	SAMPLE SUMBER	TESTS	335
AEOLIAN SAND Orange brown			 	Sand, mf.gr., dry, non plastic	, SP			
Weakly cemented			+ + + + 2 +					
CALCRUTE GRAVES Lt. brown - white			3	Sandy gravel, mc.gr., max. size 35mm, MW-SQ high strength fragments	GP			
4 • Om				END HOLE				
Encovation Method Natio Type Operator Commenced	0W-0 HW-H HW-1	tighty w Moderw Hightly	sly weathers sothered toly weather weathered	d System : Unified. () means Leberatory Classification.	ENGINEERI Lagged 24.09		DGY.	

CENTRAL ENGINEERING SERVICES

AH 61

DARWIN-ALICE SPRINGS RAIL MATERIALS SEARCH COORDINATES SEE PLAN

MEST OF LAKE WOODS SYSTEM

GEOLOGICAL SESCRIPTION		5.5	4		3	DESCRIPTION AND ENGINEERING F	MOPERTH show symbol	B OF SOI [SAMPLE]	L 78076	
totale speker in maninally marries contrologues?	料	H	4		1-	in one matter, and desiry, planting,	SAMOOF.	MMGER		7-5
AEOLIAN SAND Orange brown						Sand, mf.gr., dry becoming moist, non plastic to low plasticity	SP			-
				/-						-
AS ABOVE				2		Clayey sand, mf.gr moist, low-med plas.	SP-S	SC .		
AS ABOVE Weakly cemented				.		Sand, mf.gr., dry, low plasticity	SP			P -
3.7m		•		4		END HOLE - REFUSAL				
Emination Method Online Type Country				16. 100, 1 100, 1 100, 1	II.	© Gulf Charactication Spoten: Molifold. () engone Laboratory Charactication.	LOD	• •E0L04	PY.	1

NORTHERN TERRITORY GEOLOGICAL SURVEY AH 62 CENTRAL ENGINEERING SERVICES Page of GEOLOGICAL LOG PROJECT DARWIN-ALICH SPRINGS RAIL X FEATURE MATERIALS SEARCH CO-ORDINATES STATE PLAN LOCATION SYSTEM DIP..... BEARING..... HOLE SIZE 150mmTO: TO: TO: DATUM..... DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL DEGREE OF GEOLOGICAL DESCRIPTION SYMBOL NUMBER Group nome, general meximum size, in situ moisture and density, plasticity, field test date. Type of deposit or motorial, mineral composition, 2 2 3 matrices 1,06 ABOLIAN SAND SPSand, m.-f.gr., dry, non plasticity Brown to orange brown low plasticity Silty gravels, low CALCRETE GRAVEL strength C"-H" GMLt. brown - white becoming MW-SW END HOLE 5.Om ENGINEERING GEOLOGY. WEATHERING. & Sail Classification **CW**- Completely weathered System: Unified. () meens Loboratory CM DO MW- Mederately weathered Clessification. SW- Slightly weathered Drawn FrSt-Fresh, with limenite stained joints Fr -- Frash Checked.........

HOLE NO.

CENTRAL ENGINEERING SERVICES

HOLE NO.

Page of

AH 63

GEOLOGICAL LOG

PROJECTDARWIN-ALICE SPRINGS RAIL
FEATURE MATERIALS SEARCH CO-ORDINATES

DIP.....

LOCATION WEST, OF LAKE WOODS

BEARING......

GADO

Checked......

HOLE SIZE 150mm TO: DATUM......... DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL SECLOSICAL DESCRIPTION SYMBOL NUMBER LOG Sand, m.gr., dry AEOLIAN SAND SPnon plastic Lt. Brown CALCRETE CLAYS Silty clay, med CLplasticity, 30% m.gr., sand, dry. Lt. brown CALCRETE GRAVEL Silty gravel, f.-c.gr GMmax. size 35mm, Lt. brown - white high strength. 4.0m END HOLE ENGINEERING GEOLOGY. GW- Completely week m: Unified.

NORTHERN TERRITORY SECLOSICAL SURVEY CENTRAL ENGINEERING SERVICES

HOLE NO. AH 86

GFO	t og:	ICAL.	LOG

FEATURE, MATERIALS SEARCH.		COORDINATE	Y	DIP	
LOCATION LVEST OF LAXENCODS.				BEARING	
HOLE SIZE 165 mm., YO:		. 10:	DESCRIPTION AND ENGIN		
GEOLOGICAL DESCRIPTION upo of degual or motorial, minoral composition, services charge, constraints, octoor, structures	WEATHER	LOG	Group name, general manimum of a situ maisture and density, place	ios. SHOUP	SAMPLE TESTS BEE
gritals shape, comunicities, colour, structures		4	field teet date	7	
		ll H I			
AEOLIAN SAND			SAND mf.gr.,	dry, SP	-
Lt. orange brown			non plastic		
		+			
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			_		-
		H	minor plastic fi	nes	
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0	11111	ПЦ	CDAVEL m o or	GP-	
CALCRETE GRAVEL Lt. brn -white	11111	11 #	GRAVEL me.gr	, ,	\ \
20, 21,		II H	minor plastic		
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4.Om	11111		END HOLE		
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Execution Muthed AUG.E.R	WEATH	5 ame		ENGINEERIN	a escuesy
Moho	CW- CH	nplotoly weathered My weathered	& Soil Cleanification Bystom: Unified.	Logged	G GEOLDEY. Date
Туре	MW- M	derotely weathers	() mount Laboratory Classification.	GA.DD.	
Operator	98-94	philip washered		Drewn	

NORTHERN TERRITORY SEOLOGICAL SURVEY CENTRAL ENGINEERING SERVICES

HOLE NO. AH 87

Page of

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PROJECT. DARWIN-ALICE SPRINGS RAILWAY FEATURE. MATERIALS. SEARCH.

Fr -- Fresh

LOCATION . WEST, OF .LAKEWOODS SYSTEM DIP..... BEARING.....

HOLE SIZE 165 mm . TO:	<u></u>			. T(): <u></u>							
GEOLOGICAL DESCRIPTION of deposit or material, mineral samposition, ritals shape, committee, esteur, structures	1.	A THE				LOS	DESCRIPTION AND ENGINEERING P Group name, general maximum size, in situ meistyre and density, plasticity, find, test data	SYMBOL	SAMPLE NUMBER	TESTS	STATE OF THE PARTY	
AEOLIAN SAND Lt. orange brown							SAND, mf.gr.,dry, non plastic	SP			-	
					/		minor plastic fines				-	
CALCRETE GRAVEL Brown-white					+		GRAVEL, m.gr., max. size 20mm,	GP				
					7		non plastic				F	
											F	
					3							
					H						-	
4.Om				H			END HOLE					
					 							
Excevetion MethodA.U.G.E.R	CT		Com	p ie	AS No.		4 440 01440	SINEERING	GEOLOG	BY. Date		

HOLE NO. NORTHERN TERRITORY GEOLOGICAL SURVEY 88 HA CENTRAL ENGINEERING SERVICES GEOLOGICAL LOG Page of PROJECT DARWIN-ALICE SPRINGS RAILWAY CO-ORDINATES SURFACE ELEVATION......m. FEATURE MATERIALS SEARCH DIP..... LOCATIONWEST OF LOCKWOODS... SYSTEM BEARING..... HOLE SIZE 165 mm TO: TO: DATUM..... CEONEE OF WEATHERING GEOLOGICAL DESCRIPTION DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL SYMBOL NUMBER Group name, general maximum size, in situ moisture and density, pigaticity, field test date LOG Type of deposit or meterial, minoral composition, Lines was perficte chape, comentation, actour, structures Lines 2. AEOLIAN SAND SAND m.-f.gr., dry, SPLt. orange brown non plastic CALCRETE GRAVEL GRAVEL m.-c.gr., GPBrown-white max. size 20mm, non plastic 3.0m END HOLE

	5			
Excevation Method . A.U.G.E.R		& Soil Classification System: Unified. () means Laboratory Classification.	ENGINEERING GI	EOLOGY. Date
Commenced	SW - Signity weathered FrSt - Fresh, with limonite stained joint Fr - Fresh	•	1	

NORTHERN TERRITORY GEOLOGICAL SURVEY HOLE NO. CENTRAL ENGINEERING SERVICES AH 90 GEOLOGICAL LOG Page SURFACE ELEVATION.....m. FEATURE MATERIALS SEARCH ... DIP..... LOCATION WEST, OF LAKEWOODS. **SYSTEM** BEARING..... DATUM..... DEGREE OF WEATHER ING GEOLOGICAL DESCRIPTION EGRAPHIC DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL Type of deposit or meterial, mineral composition, particle shape, comentation, colour, structures GROUP SAMPLE TESTS Group name, general maximum size, in situ moisture and density, plasticity, field test date LOG AEOLIAN SAND SAND m.of.gr., dry, SPOrange brown non plastic low plasticity AEOLIAN AND CLAYEY SAND, SCRESIDUAL SAND m.-f.gr.,Dk. orange browmed-low plasticity brown fines, moist CALCRETE GRAVEL GRAVEL c.gr. GP-Brown-white max. size 30mm, GC med-high strength med. plastic fines particles 3.7m END HOLE

WEATHERING. ENGINEERING GEOLOGY. Seil Classification CW- Completely weathered System: Unified. Logged GM DD HW-Highly weathered (...) meens Laboratory MW- Moderately weathered Operator. Classification. SW- Slightly weathered FrSt-Freeh, with limonite stained joints Drawn

Checked

Fr - Fresh

NORTHERN TERRITORY GEOLOGICAL SURVEY CENTRAL ENGINEERING SERVICES

HOLE NO. AH 91

GEOLOGICAL LOG								
PROJECT DARWIN-ALLICE SPRINGS RAI FEATURE MATERIALS SEARCH	LWAY COOPDINATES	X , m .	SURFACE ELEVATIONm.					
FEATURE MATERIALS SEARCH	COUNDINATES	Y m.	DIP					
LOCATION WEST, OF LAKEWOODS.	SYSTEM		BEARING					
HOLE SIZE 165 mm TO:	ŤO:	TO:	DATUM					

GEOLOGICAL DESCRIPTION	DEGREE OF WEATHERIN	2 GRAPHIC	DESCRIPTION AND ENGINEERING F	PROPERTIES OF SOI	L	25
po of deposit or material, mineral composition, orticle shape, comentation, colour, structures	weatherin LEASE	DEPTIED LOG	Group name, general maximum size, in situ moisture and density, plasticity, field test date	GROUP SAMPLE NUMBER	TESTS	BIE
AEOLIAN SAND Orange brown to			SAND mf.gr., dry, non plastic moist low plasticity	SP		-
dk. orange brown			morbe for pidociercy			_
AEOLIAN SAND Red brown		2	as above low-med plasticity	SC		-
CALCRETE GRAVEL Brown-white			GRAVEL, c.gr., max. size 30mm, med. plastic fines	GP- GC		
		3				
3.1m		+	END HOLE			
						-

Excavation I	M	۲	t	ĸ	×	ł			ŀ	1	U	ļ	G		Ľ	ŀ	₹			
Make																			,	
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Operator,									,				,	,	,			,		
Commenced																				
Completed .					,	,		,					,					,		

WEATHERING.
CW—Completely weathered
HW—Highly weathered
NW—Moderately weathered
SW—Slightly weathered
Fr3t—Freeh, with limonite stained joints
Fr — Freeh

4 Soil Classification System: Unified. (__) means Laboratory Classification.

Logged Date
GM.DD.

Drawn
Checked

NORTHERN TERRITORY GEOLOGICAL SURVEY AH 92 CENTRAL ENGINEERING SERVICES GEOLOGICAL LOG Page PROJECT DARWIN-ALICE SPRINGS RAILWAY CO-ORDINATES DIP....... FEATURE MATERIALS SEARCH BEARING..... LOCATION WEST OF LAKEWOODS DATUM.... DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL DEGREE OF GEOLOGICAL DESCRIPTION SYMBOL" NUMBER Group name, general maximum size, in situ moisture and density, plasticity, field test date LOS L. E. R. S. C. Type of deposit er meterial, mineral composition, particle shape, comentation, colour, structures SP SAND m.-f.gr., dry. AEOLIAN SAND non plastic Orange brown GM-GRAVEL f.-m.gr., CALCRETE GRAVEL GP max. size 10mm, Brown-white, low low plastic strength (10% silty fines high strength) particles END HOLE 5.0m Excevation Method . .A.U.G.E.R. WEATHERING. ENGINEERING GEOLOGY. @ Sail Classification CW- Completely weathered System: Unified. Date Logged HW- Highly weathered MW- Mederately weathered (___) means Laboratory GM.DD. Operator,...... SW- Slightly weethered FrSt-Fresh, with limonite stained joints

Fr - Fronh

HOLE NO.

Checked..............

HOLE NO. NORTHERN TERRITORY GEOLOGICAL SURVEY CENTRAL ENGINEERING SERVICES AH 93 Page GEOLOGICAL LOG CO-ORDINATES X.....m. PROJECT DARWIN-ALICE SPRINGS RAILWAY DIP...... FEATURE MATERIALS SEARCH ... BEARING..... LOCATION WEST, OF LAKEWOODS. DATUM....... DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL SEPTHIS LOG DEGREE OF WEATHERING GEOLOGICAL DESCRIPTION GROUP SAMPLE TESTS Group name, general maximum size, in situ moisture and density, plasticity, field test date Type of desceit or material, mineral composition, の多多多面particle shape, cementation, colour, structures 上上八百五十十 GRAVEL 50% IRONSTONE-CALCRETE GW m.-c.gr., max. GRAVELS Brown, low-med. size 40mm, minor low plastic fines strength GP-Gravel 60% m.gr., GCas above max. size 20mm, med.-high strength med. plastic fines SILTY GRAVEL GM CALCRETE GRAVEL Brown-white, high strength END HOLE 2.6m WEATHERING. ENGINEERING GEOLOGY. Excavation Method ... AUGER Soil Classification CW-Completely weathered System: Unified. Logged G.M.DD Date HW— Highly weathered () means Laboratory Туре , MW- Moderately weathered Classification. SW-Slightly weathered Drawn

FrSt-Fresh, with limonite stained joints

Checked

Fr -- Fresh

Commenced

NORTHERN TERRITORY GEOLOGICAL SURVEY AH 94 CENTRAL ENGINEERING SERVICES Page GEOLOGICAL LOG PROJECT DARWIN-ALICE SPRINGS RAILWAY COORDINATES FEATURE MATERIALS SEARCH . DIP...... BEARING...... LOCATION .. WEST, OF LAKEWOODS **SYSTEM** DATUM..... Type of deposit or meterial, mineral composition, particle shape, cementation, colour, structures DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL GROUP SAMPLE TESTS Group name, general maximum size, in situ moisture and density, plasticity, field test date SPSAND, m.-f.gr., dry AEOLIAN SAND low plastic fines GRAVEL 30-40% GC CALCRETE GRAVEL Brown-white mf.-m.gr., max. size 20mm, 10-20% low-med. plastic END HOLE 4.0m WEATHERING. Excavation Method . . AUG.E.R. . . . ENGINEERING GEOLOGY. **& Soil Classification** CW-Completely weathered System: Unified. Logged Date HW-Highly weathered (...) means Laboratory GMDD MW- Moderately weathered Clessification. Operator, SW- Slightly weathered Drawn . . . FrSt-Fresh, with limonite stained joints Fr - Fresh Checked . .

HOLE NO.

CENTRAL ENGINEERING SERVICES

HOLE NO. AH 95

		GEOLO	GICAL LOG			Pa	
PROJECT DARWIN-ALICE SPRI	INGS RA	LLWAY CO-ORDINATE	ES			ON	
FEATURE MATERIALS SEARCH							
LOCATION WEST OF LAKEWOODS							
HOLE SIZE 165 mm. TO:		TO:					1, (
GEOLOGICAL DESCRIPTION	DEGREE OF	E STAPPE	DESCRIPTION AND ENGINEE Group name, general maximum size		ROPERTIE:	S OF SOIL SAMPLE 1 NUMBER	TESTS DES
Type of deposit or material, mineral composition particle shape, comentation, colour, structures		restreet.	Group name, general maximum size in situ moisture and density, plasticit field test date	7.	SYMBOL	NUMBER	- P-9
	11111	i H				1	
A POLITANI CAND			SAND, mf.gr.,	drv	SP	1	<u> </u>
AEOLIAN SAND Orange brown		H	minor plastic	ury,			
Orange brown		1 44	fines	l			F
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	11111	1 4		l			
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RESIDUAL SAND		ПН	CLAYEY SAND, mf		SC		
Lt. brown			dry, low plastic	:	ľ]	Γ
			fines				Ĺ
CALCRETE SANDS	1111		CLAYEY SAND		SC		
Brown, low-med			fc.gr.,				L
strength particles	s	Π	5-10% m.gr. gr	ave1		}	
			max size 20mm, low-med. plasti	i c			L
			fines				
							L
5.0m		5	END HOLE	 			
Excevation Method . AUGER	WEATHER	ting. plotoly weathered	4 Sail Classification	1		GEOLOGY	
Make	HW-High	ly weathered	() means Laboratory	1000 GA	M. DD		Date
Operator	SW-Sligi	lerately weathered	Classification.	1			
Commenced	Fr81 - Fre	eh, with limonite : h	steined joints				

HOLE NO. NORTHERN TERRITORY GEOLOGICAL SURVEY T 7 CENTRAL ENGINEERING SERVICES Page GEOLOGICAL LOG PROJECT DARWIN-ALICE SPRINGS RAIL X MATERIALS SEARCH COORDINATES FIG. 12 M DIP........ BEARING...... LOCATION 75km DATUM DEPTHE LOG DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL DEGREE OF GEOLOGICAL DESCRIPTION GROUP SAMPLE TESTS Group name, general maximum size, in situ moisture and density, plasticity, field test date Type of deposit or material, mineral composition, 「あままる」 perticle shape, comentation, colour, structures 上上八五二十 AEOLIAN SAND SAND, m.f.gr., dry Red brown, loose open even texture, organic noń plastic matter. SILTY SAND, f.gr MESIDUAL SAND slightly moist, low Mottled lt. brn-red plasticity brn, med. dense, open even texture. SILTY GRAVEL 50-60% CALCRETE GRAVEL f.c.gr. max size 30mm Mottled red brn-20-30% silty non plastic white dense with fine. rounded low=high Increase percent and strength, CW-SW strength of gravel nodular calcrete. with depth) SILTY GRAVEL 70-80% f CALCRETE GRAVEL c.gr. max size 60mm GM Mottled brn-orange 10-20% silty non plas brn-white, dense to fines SILTY GRAVEL 60% f.-c gr. 30% med strength; 10% high strength cobbles; 20% silty GMv.dense with rounded to sub-angular lowv.high strength HW-SW nodular calcrete sand; nón plas. END HOLE - REFUSAL 2.9mSTRATA CONTINUING

Excavation	N	k	rt	h	ø	1	,	В	J	4	(7	K	Н	(,	.]			
Make								,											,	
Туре	,	,																		
Operator.		,							,									,		
Commence	d																		,	,

WEATHERING.
CW— Completely weathered
HW— Highly weathered
WW— Moderately weathered
SW— Slightly weathered
FrSt—Fresh, with limonite stained joints

Fr - Fresh

Real Classification
 System: Unified.
 (...) means Laboratory
 Classification.

ENGINEERING GEOLOGY.

Logged Date

G.M.

Drawn

Checked

HOLE NO. NORTHERN TERRITORY GEOLOGICAL SURVEY CENTRAL ENGINEERING SERVICES GEOLOGICAL LOG Page PROJECT DARWIN-ALICE SPRINGS RAIL X FEATURE MATERIALS SEARCH COORDINATES FIG. 13 m. DIP..... LOCATION 80km BEARING...... SYSTEM DATUM..... DEPTHE LOS DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL DEGREE OF GEOLOGICAL DESCRIPTION GROUP SAMPLE TESTS Group name, general maximum size, in ellu moisture and density, plasticity, field test date Type of deposit or material, mineral composition, 多多を言う porticle shape, comentation, colour, structures SP AEOLIAN SAND SAND, m.-f.gr., dry non plastic Brown, loose, open even texture, organi SP AEOLIAN SAND SAND, m.-f.gr., dry 20% silt; minor low Motiled lt brnorange brn-red brn. plastic fines med. dense to dense open even texture, vertical jointing CALCRETE GRAVEL SILTY GRAVEL, 30-40% f.-m.gr., max size GM-Mottled brn-yell brh 20mm 20-30% silt; 10-GP orange brn-white, 20% f.gr., sand, non dense to v.dense with plastic subangular, medhigh strength calcrete nodules #RAVEL, 60-70% f.-m.gr. 20-30% CALCRETE IRONSTONE m.-f.gr. sand, minor As above except brn silt, non plastic lt brn rounded BP+GW nodules 2.0mEND HOLE STRATA CONTINUING Excavation Method . BACKHOF .. ENGINEERING GEOLOGY. Soil Classification CW- Completely weathered System: Unified. Logged HW- Highly weathered ...) means Laboratory

MW- Moderately weathered

FrSt-Fresh, with limonite stained joints

SW- Slightly weathered

Fr - Fresh

G.M

Drawn . . .

Classification.

HOLE NO. MORTHERN TERRITORY GEOLOGICAL SURVEY GEOLOGICAL LOG FEATURE MA TERTALS SEARCH LOCATION 80km **SEARING..............** DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL SECLOSICAL DESCRIPTION MEATHERIN SYMBOL NUMBER Group name, general maximum size, in situ mainture and density, pleasicity, field test date LDB SP SAND, m.-f.gr., dry AEOLIAN SAND (sc) non plastic Brown-orange brown, med. dense-dense (lnose to 0.3m) open even texture. low plasticity SILTY SAND, f.gr., SM RESIDUAL SAND dry, minor low Brown-yell brown plasticity dense, even texture SILTY GRAVEL, 50% GM-f.-c.gr; 20% f.gr. sand GP 20-30% silt; minor CALCRETE GRAVEL Mottled brown-white dense-v. dense with low plasticity fines angular med.-high strength MW calcret nodules. END HOLE 3.2m STRATA CONTINUING Excevation Method . BACKHOE .. ENGINEERING GEOLOGY. & Sell Classification **GW-- Completely weathered** System: Unified. Date HW- Highly weathered MW- Mederately weathered () means Laboratory SW- Slightly weathered

FrSt-Fresh, with limenite stained joints

Fr -- Frank

HOLE NO. NORTHERN TERRITORY SECLOSICAL SURVEY T10 CENTRAL ENGINEERING SERVICES PROJECT DARWIN-ALICE SPRINGS RAIL X PEATURE MATERIALS SEARCH CO-ORDINATES Y FIG. 14. Page DIP....... LOCATION 90km SYSTEM BEARING HOLE SIZETO:.......TO:....... DATUM..... GEOLOGICAL DESCRIPTION DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL SYNBOL SAMPLE TESTS LOS AEOLIAN SAND SAND, m.-f.gr. dry SP RED BRN. LOOSE OPEN non plastic CALCRETE IRONSTONE SANDY GRAVEL, 60% GPf.-m.gr., max. size 20mm, 20-30% m.-f.gr. Red brn, med. dense GW with well rounded med.-high strength sand, non plastic ironstone nodules CALCRETE GRAVELS GRAVEL, 70-80% f.-c.gr. GP max. size 20mm, minor Brn-grey-white, dense mix of calcrete and cobbles to 130mm: 10% ironstone nodules f.gr. sand; non med.-high strength plastic CALCRETE GRAVELS GRAVEL, 60% f.-c.kr 0% f.gr. sand; 20-30% silt; minor Mott. brn-yell. brn white, med. densedense with med- v. low plastic fines high strength nodules GM-GW 2.2m END HOLE - REFUSAL STRATA CONTINUING

Excevation Method BACKHOE

Make.
Type.
Operator.
Commenced

WEATHERING.

GW-Completely weathered

NW-Highly weathered

NW-Siderately weathered

SW-Siderately weathered

Fr - Fresh

PrSt-Fresh, with timenite stained joints

& Soll Classification System: Unified. (....) means Laboratory Classification. ENGINEERING GEOLOGY.
Lagged Date
G-M.
Drawn
Checked

CENTRAL ENGINEERING SERVICES

HOLE NO.

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Page

PROJECT DARWIN-ALICE SPRINGS RAIL X
PROJECT DARWIN-ALICE SPRINGS RAIL X
FIG. 15 GEOLOGICAL LOG

SURFACE ELEVATION.....m. DIP.....

LOCATION . 9.8km HOLE SIZE......TO:........TO:............TO:......

SYSTEM

BEARING..... DATUM......

GEOLOGICAL DESCRIPTION	DEGREE O	F 19	GRAPHIC	DESCRIPTION AND ENGINEERING I	PROPERTIE	S OF SO	L TESTS	100 110 100 100 100 100 100 100 100 100
Type of deposit or material, mineral composition, particle shape, comentation, colour, structures		- Marine	roe	Group name, general maximum size, in ellu moisture and deneity, plasficity, field test date	GROUP ME SYMBOL	NUMBER		5 ≱2j
AEOLIAN SAND Brown to orange brn med. dense to dense (loose to 0.3m), op even texture				SAND, mf.gr., dry minor, low plastic fines from 0.3m	SP (SC)			
CALCRETE IRONSTONE Brown, very dense with well rounded high strength ironstone nodules		2		GRAVEL, 70-80% fc.gr., max. size 40mm, 10-15% silt, minor, low plastic fines.	GW			
		3		Minor calcrete nodule	5.			-
3. 0i				END HOLE STRATA CONTINUING				 - -
		4			:			_
		1 1						
Execution Method BACKROW	WEATHER	5				1	<u> </u>	<u> </u>

Excavation	Method	BACKHO.
Make		
Type		

Operator... CW- Completely weathered

Fr - Fresh

HW- Highly weathered MW- Moderately weathered SW- Slightly weathered FrSt-Fresh, with limonite stained joints

* Soil Classification System: Unified. (...) means Laboratory Cleanification.

ENGINEERING GEOLOGY. Date GM

CENTRAL ENGINEERING SERVICES

HOLE NO.

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GEOLOGICAL LOG
PROJECT DARWIN-ALICE SPRINGS RAIL X Page of X....,...,.m. CO-ORDINATES FEATURE.MATERIALS.SEARCH Y.FIG ... 15m. DIP..... LOCATION 98km BEARING..... SYSTEM

HOLE SIZETO:		L	OFFICIAL AND FACILIFERING	MANAGERIES OF CO	, b. £
GEOLOGICAL DESCRIPTION Type of deposit or material, mineral composition, particle shape, comentation, colour, structures	DEGREE OF WEATHERING かみままれ	DEPTHO LOG	DESCRIPTION AND ENGINEERING F Group name, general maximum size, in situ moisture and density, plasticity, field test date	GROUP SAMPLE NUMBER	TESTS DE DE DE DE DE DE DE DE DE DE DE DE DE
AEOLIAN DAND Red brn-brown, med. dense-dense, open even texture.			SAND, mf.gr., dry, minor, low plastic fines	SP	1
CALCRETE GRAVEL Brown-white, dense- v. dense with round to sub angular, low high strength HW-SW calcrete nodules	ed •-	2	SILTY GRAVEL, 60-70° fc.gr., max. size 50mm, 10-20% mf.gr. silty sand, minor low plastic fines.	GM- GT	
2.4m		3 + + + + + + + + + + + + + + + + + + +	END HOLE STRATA CONTINUING		
Excavation Method BACKHOE	WEATHER	5		INSERING GEOLOG	

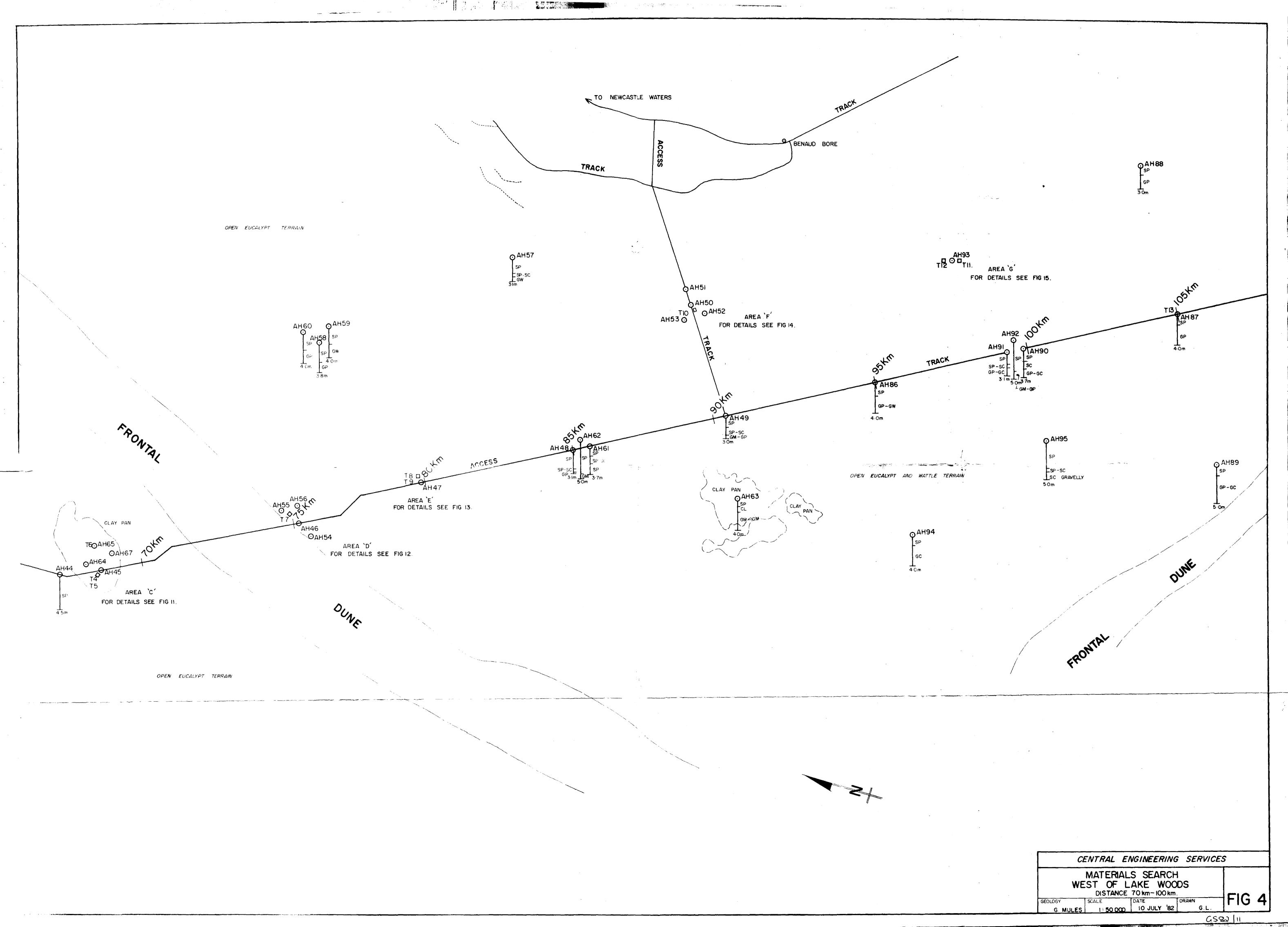
Excavation	Method	BACKHOE
Make		
Туре		

GW- Completely weathered HW— Highly weathered MW— Moderately weathered SW— Slightly weathered Fr3t-Fresh, with limonite stained joints
Fr -- Fresh

4 Soil Classification System: Unified. (__) means Laboratory Classification.

ENGINEERING GEOLOGY. Date GM. Drawn ...

C	NORTHERN TERRITORY GEOLOGICAL SURVEY INTRAL ENGINEERING SERVICES	T 13
	GEOLOGICAL LOG	Page of
PROJECT DARWIN-ALICE S FEATURE MATERIALS SE		SURFACE ELEVATION
LOCATION 105km	thon,	BEARING
		MUTAC
GEOLOGICAL DESCRIPTION Type of deposit or material, mineral composition, particle shape, cementation, colour, structures	WEATHERING PETTER Group name general maximum size	ERING PROPERTIES OF SOIL
AEOLIAN SAND Brown, mcd. dense to	GAND, mf.gr., di	ry, SP
dense weakly cemented, open even texture		
motined red brn-yel	TIMEV SPAVEL 50% gr. max size 100	
CALCRETE GRAVELS BRN-white, dense to	40-50% sandy silt low plastic	, GM+GW
7	STRATA CONTINUIN	G
Excavation Method BAQKSLOE Make Type Operator	WEATHERING. CW—Completely weathered HW—Highly weathered MW— Moderately weathered SW—Slightly weathered Classification System: Unified. () means Laboratory Classification.	ENGINEERING GEOLOGY. Logged Date GM. DD.
Commenced	Fr\$t-Fresh, with limonite stained joints Fr — Fresh	Checked,



NORTHERN TERRITORY GEOLOGICAL SURVEY CENTRAL ENGINEERING SERVICES AH 89 GEOLOGICAL LOG Page SURFACE ELEVATION.....m. FEATURE MATERIALS SEARCH. DIP..... LOCATION . WEST, OF LAKEWOODS SYSTEM BEARING..... DATUM.... DEPTINE LOG DEGREE OF WEATHERING GEOLOGICAL DESCRIPTION DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL Group name, general maximum size, in situ maisture and density, plasticity, field test date GROUP SAMPLE TESTS AEOLIAN SAND SAND m.-f.gr., dry SP Lt. brown non plastic minor low plasticity CALCRETE GRAVEL GRAVEL m.gr., max. GP-Brown. size 15mm, 15-20%GClow strength low-med plastic HW fragments fines END HOLE Excavation Method . A LI G.E.R. . . . WEATHERING. ENGINEERING GEOLOGY. Soil Classification CW- Completely weathered System: Unified. ogged HW-Highly weathered (....) means Laboratory GM.DD. MW- Moderately weathered Operator..... SW- Slightly weathered Classification. Commenced FrSt-Fresh, with limonite steined joints Drawn Fr -- Frash

HOLE NO.

HOLE NO. NORTHERN TERRITORY GEOLOGICAL SURVEY AH 96 CENTRAL ENGINEERING SERVICES Page of GEOLOGICAL LOG FEATURE MATERIALS SEARCH. DIP..... BEARING...... LOCATION . WEST. OF LAKEWOODS DATUM..... DEGREE OF WEATHERING DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL EGRAPHIC DEPTHE LOG GEOLOGICAL DESCRIPTION GROUP SAMPLE TESTS Group name, general meximum size, in situ moisture and density, plasticity, field test date Type of deposit or material, mineral composition, particle shape, comentation, colour, structures L.E.A.S.E.A SPSAND, m.-f.gr., dry. AEOLIAN SAND minor low plastic Orange brown fines GRAVEL 20-30%, CALCRETE GRAVEL GP f.-m.gr., Brown-white, max. size 15mm med.-high strength 10% low plastic particles fines END HOLE 3.0m

WEATHERING.
CW—Completely weathered
MW—Highly weathered
MW— Moderately weathered
SW—Slightly weathered

Fr - Fresh

FrSt-Fresh, with limonite stained joints

& Seil Classification System: Unified. (...) means Laboratory Classification. ENGINEERING GEOLOGY.

Logged

GM-DD

Date

CENTRAL ENGINEERING SERVICES

HOLE NO. AH 97

11 97

	GEOLOGICAL LOG	Pa gé (
PROJECT DARWIN-ALICE SECTION	GS RALWAY Xm.	SURFACE ELEVATIONm.
FEATURE MATERIALS SEARCH	Y,	DIP
LOCATION WEST, OF LAKEWOODS	SYSTEM	BEARING
HOLE SIZE 165 mm . TO:	TO:	DATUM,

GEOLOGICAL DESCRIPTION	DEGREE OF	2	GRAPHIC	DESCRIPTION AND ENGINEERING						
ype of deposit or material, mineral composition, particle shape, comentation, colour, structures	r 283.3	DEPTHE?	LOG	Group name, general maximum size, in situ moisture and density, plasticity, field test date	SYMBOL.	SAMPLE NUMBER	rests	SHO MAN		
AEOLIAN: SAND Orange brown				SAND mf.gr., dry. non plastic	SP			-		
		/-	·	low plasticity						
AEOLIAN SAND Orange brown		2		CLAYEY SAND, m-f.gr, 5% gravel, max size 15mm, moist, low- med. plasticity	SC					
RESIDUAL CLAY		3		SANDY CLAY low- med. plasticity, 30-40% sand, minor gravel, moist	CL					
3.5m		4		END HOLE						
		5								

Excavation	٨	k	1	h	×	j		į	١	Į	J.	C	1	F	1	₹	,			
Make				,			,	,	ì	Ţ			,	,						
Туре																				
Operator.																				

WEATHERING.
CW—Completely weathered
HW—Highly weathered
MW—Moderately weathered
SW—Slightly weathered
FrSt—Fresh, with limonite stained joints
Fr — Fresh

& Soil Classification System: Unified. (__) means Laboratory Classification.

ENGINEERING GEOLOGY,
Logged Date
GM. DD

Drawn
Checked

HOLE NO. NORTHERN TERRITORY GEOLOGICAL SURVEY AH 98 CENTRAL ENGINEERING SERVICES Page of GEOLOGICAL LOG PROJECT DARWIN-ALICE SPRINGS RAILWAY CO-ORDINATES X......m. DIP..... FEATURE MATERIAL SEARCH ... BEARING...... LOCATION WEST, OF LAKESWOOD. DATUM...... E GRAPHIC DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL DEGREE OF GEOLOGICAL DESCRIPTION GROUP SAMPLE TESTS Group name, general maximum size, in situ moisture and density, plasticity, field test date DEPTHE LOG Type of deposit or material, mineral composition, particle shape, cementation, colour, structures によれる SILTY SAND, m.f.gr. SMAEOLIAN SAND Lt. brown dry, non plastic AEOLIAN SAND CLAYEY SAND, f.-m.gr SC5-10% f.-m. gr. gravel, 20% med. Lt. brown with well rounded, low 20% med. plastic strength nodules fines RESIDUAL CLAYS CLAY med plastic CL5-10%m.-c.gr.Brown with minor gravel to 25mm high strength gravel to 25mm, calerete nodules moist END HOLE 5.0m Excavation Method . AUGER . . . WEATHERING. ENGINEERING GEOLOGY. **▲** Soil Classification CW-Completely weathered System: Unified. Date Logged HW-Highly weathered () means Laboratory Туре

MW- Moderately weathered

FrSt-Fresh, with limonite stained joints

SW- Slightly weathered

Fr - Fresh

Completed

Classification.

Drawn

Checked

CENTRAL ENGINEERING SERVICES

HOLE NO. AH 99

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SURFACE ELEVATION......m.
DIP......

LOCATION WEST OF LAKE WOODSSYSTEM

BEARING.....

HOLE SIZE 65mm TO: TO: TO: DATUM..... COUNTE OF DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL GEOLOGICAL DESCRIPTION SYMBOL NUMBER Group name, general maximum size, in aitu meistura and density, plasticity, field test data LOS AEOLIAN SAND Silty sand, f.gr., dry SM non plastic Lt. brown SP AS ABOVE Sand m.-f.gr., dry low plastic fines Sandy clay, med. plasticity, 20-30% CL RESIDUAL CLAYS m.-f.gr. sand, 5% Brown with high str+ gravel to 20mm moist ength calcrete nodules 5.0 END HOLE Excavation Method ... AUGER ... WEATHERING. ENGINEERING GEOLOGY. Seil Classification CW- Completely weathered System: Unified. Logged Date HW- Highly weathered (....) meens Laboratory GMDD MW- Mederately weathered Classification. SW- Slightly weathered FrSt-Fresh, with limonite stained joints

HOLE NO. NORTHERN TERRITORY GEOLOGICAL SURVEY AH100 CENTRAL ENGINEERING SERVICES GEOLOGICAL LOG Page Darwin - Alice CO-ORDINATES X.....m. PROJECT...Springs..Rail FEATURE Material Search DIP...... LOCATION . West . o.f. . Lake Wood gystem BEARING..... HOLE SIZE 165mmTo: To: To: DATUM....... COMME OF DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL GEOLOGICAL DESCRIPTION STANDLE NUMBER Group name, general maximum size, in offer moisture and density, plasticity, field test date LOS AEOLIAN SAND SAND, m.-f.gr., dry non plastic. Orange brown low plasticity CEMENTED SAND GRAVEL CLAYEY GRAVEL 30-40% GP-Brown with weakly gravels, max.size 25mm GC 40-50% sand, low-med_plasticity. cemented sand nodul 3.1m END HOLE Excevetion Method .. AUGER WEATHERING. ENGINEERING GEOLOGY. R Sail Classification CW- Completely weethered m: Unified. Located Date

HW-Highly weathered

Fr — Freeh

SW- Slightly weathered

MW- Mederately weathered

FrSt-Fresh, with limonite stained joints

...) meene Laborati

Classification.

GMD9

HOLE NO. NORTHERN TERRITORY GEOLOGICAL SURVEY AH 101 CENTRAL ENGINEERING SERVICES GEOLOGICAL LOG PROJECT DARWIN-ALICE SPRINGS RAIL X FEATURE MATERIALS SEARCH COORDINATES SEE PLAN M DIP..... LOCATION WEST OF LAKE WOODSSYSTEM BEARING..... DATUM...... DEGREE OF WEATHERING DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL EGRAPHIC DEPTHEY LOG GEOLOGICAL DESCRIPTION GROUP SAMPLE TESTS Group name, general maximum size, in situ moisture and density, plasticity, field test date Silty clay, low ML-plastic, S-10% gravel CL RESIDUAL CLAY max. size 15mm, 10% Brown with minor high strength calcrete f.gr. sand nodules 5. On END HOLE Excavation Method AUGER WEATHERING. ENGINEERING GEOLOGY.

Operator....

CW- Completely weathered HW-Highly weathered MW- Moderately weathered SW- Slightly weathered

FrSt - Fresh, with limonite stained joints

Soil Classification System: Unified. ...) means Laboratory Classification.

Logged GM.DD.

Checked.

CENTRAL ENGINEERING SERVICES
GEOLOGICAL LOG

HOLE NO. AH 102

Page of

PROJECT DARWIN-ALICE SPRINGS RAIL X
FEATURE MATERIALS SEARCH CO-ORDINATES SEE PLAN

SURFACE ELEVATION.....m.

LOCATION WEST OF LAKE WOODS

DIP......BEARING.....

HOLE SIZE 165mm To: To: DATUM..... DEGREE OF WEATHERING GEOLOGICAL DESCRIPTION DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL DEPTHE LOG SYMBOL NUMBER Group name, general maximum size, in situ maisture and density, plasticity, field test date Type of deposit or material, mineral composition, particle shape, comentation, colour, structures AEOLIAN SAND Sand m.-f.gr., dry to SP moist to med. plastic Orange brown RESIDUAL CLAY Sandy clay SC-CLDk. brown Clayey sand, m.-f.gr. 10-15% m.-c.gr. gravel max. size 30mm, med. RESIDUAL CLAYEY SAND Yellow brown with med.-high strength calcrete nodules plasticity 3.5mEND HOLE Excavation Method AUGER..... WEATHERING ENGINEERING GEOLOGY. 4 Soil Classification CW- Completely weathered System: Unified Logged HW-Highly weathered Date Туре (....) means Laboratory MW- Moderately weathered GMOD. Classification. Operator.... SW- Slightly weathered Commenced Drawn FrSt-Fresh, with limonite stained joints Fr - Fresh

CENTRAL ENGINEERING SERVICES

HOLE NO. AH 103

Page of

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G	EOL	OGICAL L	_OG

PROJECT DARWIN-ALICE SPRINGS RAIL X M
FEATURE MATERIALS SEARCH COORDINATES YSEE PLAN

SURFACE ELEVATION......m.

LOCATIONWEST OF LAKE WOODSSYSTEM

HOLE SIZE 165mmo:

DIP..... BEARING..... DATUM

GEOLOGICAL DESCRIPTION Type of deposit or meterial, mineral composition, particle shape, cementation, colour, structures	DEGRE WEATH	HER ING	4 2	GRAPHIC LOG	DESCRIPTION AND ENGINE Group name, general maximum size in situ moisture and density, plasticitield test date.		PROPERTIE GROUP SYMBOL			GROUND- WATER LEVELO
AEOLIAN SAND Orange brown					Sand m.f.gr., dry non plastic	7	SP			
CALCRETE GRAVEL Lt. brown-white with high strength calcrete nodules			3		Clayey gravel 60-70% fc.gr. g max. size 35mm, m plastic clays	;rav	GC e1			
4.Om			5		END HOLE				:	
Make	HW-Hi MW-N SW-SI	omplet lighly v Wodera lightly Fresh,	tely weat weathere stely wea r weather	d Sthered red		ENGI Logge GAL Draw	DO	GEOLOGY	Date	

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P04

Page

CENTRAL	ENGINEE	RING	SERV	ICES

GEOLOGICAL LOG

PROJECTDARWIN-ALICE SF	RINGS RAIL	Xm
FEATURE MATERIALS SEAF	RCH CO-ORDINATES	YSEE PLAN
LOCATION WEST .OF LAKE	WOOD STYSTEM	

HOLE SIZE 165mmro. To: To:

DIP.,..... BEARING....

DATUM.....

Checked

GEOLOGICAL DESCRIPTION	DEGREE OF	F V	BRAPHIC	DESCRIPTION AND ENGINEERING	PROPERTIE	S OF SOIL		£ 31
man at Assessit or material minoral compactition	WEATHERIN	DEPTH	LOS	Group name, general maximum size, in situ moisture and density, plasticity, field test date	SYMBOL	SAMPLE T	ESTS	SROUND WATER LEVELDS
AEOLIAN SAND Lt. brown			-	Sand mf.gr., dry, non plastic	SP			-
								-
		2.		low plasticity				-
CALCRETE GRAVEL Lt. brown-white with high strength calcrete nodules.				Clayey Gravel 60-70% fc.gr. gravel, max size 39 med. plastic clay	GC 5mm			-
		J.	 					-
4 • On	2		<u> </u>	END HOLE				
Excavation Method AUGER Make Type Operator	HW-Hig MW-M	inplately ghly west	y weathers	System: Unitied.	ENGINEERIN Logged GA DD	NG GEOLOGY	Date	

FrSt-Fresh, with limonite stained joints

Fr - Fresh

NORTHERN TERRITORY GEOLOGICAL SURVEY CENTRAL ENGINEERING SERVICES

HOLE NO. AH 105

Page of

GEOLOGICAL LOG

FEATURE MATERIALS SEARCH COORDINATES V SEE PLAN LOCATION WEST OF LAKE WOODS SYSTEM HOLE SIZE 165mm TO: TO:

DIP......

BEARING..... DATUM......

GEOLOGICAL DESCRIPTION Type of deposit or material, mineral composition, porticle shape, comentation, colour, structures	MENINERINA TO THE PARTY OF THE	LOS DESCRIPTION AND ENGINEERING Group name, general maximum size, in situ meisture and density, plasticity, field test date.	PROPERTIES OF SOIL SHOUP SAMPLE TESTS SYMBOL NUMBER	SHOUND WATER
AEOLIAN SAND Orange brown		Sand mf.gr., dry, non plastic	SP	
CALCRETE GRAVEL Brown with high strength calcrete nodules	2	Gravel 60% m.gr. with 20-30% mf.gr. sand low plastic fines	th GP	-
3.Om	5	END HOLE		-
Excavation Method AUGER Make Type Operator	WEATHERING. CW- Completely weather HW- Highly weathered MW- Mederately weath SW- Slightly weathere	System: Unified. (BINEERING GEOLOGY. ged Date 1. O D,	

Excavation	ħ	٩	H	k	×	1	ļ	ļ	Ļ	יָי	ب	ļ	Ļ	ļ	1				
Meke																	,	٠	
Туре	,														,				
Operator.																,	,	,	
Commence	d					,	,						,						,

Fr91- Fresh, with limonite stained joints

Fr - Fresh

CENTRAL ENGINEERING SERVICES

HOLE NO. AH 106

Page of

GEOLOGICAL LOG PROJECT DARWIN-ALICE SPRINGS RAIL X
FEATURE MATERIALS SEARCH COORDINATES SEE PLAN

DIP....... BEARING.....

LOCATION WEST OF LAKE WOODSsystem OLE SIZE 165mm

DATUM.

GEOLOGICAL DESCRIPTION Type of degrait or material, mineral composition, particle shape, camentation, colour, structures	DEGREE OF WEATHERING	Prantie Printing	DESCRIPTION AND ENGINEERIF Group name, general maximum size, in situ moisture and density, plasticity, field test date	GROUP SYMBOL	ES OF SOIL SAMPLE TESTS NUMBER	GROOND WATER
AEOLIAN SAND			Sand mf.gr., dry non plastic	SP		-
Orange brown						
						-
		 				-
AS ABOVE		2	AS ABOVE	sc		-
			med. plasticity			
		3				
SANDY CLAY Brown with minor cemented sand			Sandy clay, low-med plasticity, 5-10% gravel.	cL		
nodules of low strength		†				-
)		4				
4.1			END HOLE			
		5				
Excavation Method .AUGER Make Type Operator. Commenced	HW— Highl MW— Mode SW— Sligh	tine, sletely weathered ly weathered lerately weathered tily weathered eh, with limonite s	Classification.	ENGINEERING Logged SM. DD	G GEOLOGY. Date	

HOLE NO. NORTHERN TERRITORY GEOLOGICAL SURVEY AH107 CENTRAL ENGINEERING SERVICES GEOLOGICAL LOG Page Darwin - Alice CO-ORDINATES X.....m. PROJECT .. Sp.rings .. Rail FEATURE Material Search DIP....... LOCATION West of Lake Woodsystem BEARING..... OEGREE OF EGRAPHIC MEATHERING DEPTHS LOG DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL GEOLOGICAL DESCRIPTION GROUP SAMPLE TESTS Group name, general maximum size, in situ moieture and density, plasticity, field test date Type of deposit or meterial, mineral composition, 万多多多 particle shape, cementation, colour, structures 中心内层之 SAND, m.-f.gr., dry, AROLIAN SAND non plastic. Crange brown SAND, m.-f.gr., moist, lew-med. plasticity. SCAEOLIAN SAND Grange brown GRAVELLY SAND, ARCLIAN SAND GC m.-f.gr., moist,max. size gravel 7mm, low plastic Crange brown with cemented sand nodules END HOLE 3.2mi Excavation Method ... AD GIVE ... WEATHERING. ENGINEERING GEOLOGY. & Soil Classification **CW**- Completely weathered System: Unified HW- Highly weathered () means Laboratory MW- Moderately weathered

Classification.

Drawn

Checked,

SW- Slightly weathered

Fr - Fresh

FrSt-Fresh, with limonite stained joints

Commenced ...

Completed . . .

HOLE NO. NORTHERN TERRITORY GEOLOGICAL SURVEY 801HA CENTRAL ENGINEERING SERVICES GEOLOGICAL LOG Darwin - Alice CO-ORDINATES X.....m. PROJECT Springs Rail FEATURE, Material .. Search DIP....... LOCATION West of Lake Woodsystem BEARING...... HOLE SIZE 1.65mm TO: TO: TO: DATUM............... DEBNEE OF DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL GEOLOGICAL DESCRIPTION NA FRED GROUP SAMPLE TESTS Group name, general maximum size, in situ moisture and density, plasticity, field test date LOS SAND, m.-f.gr., dry non plactic. SE AECLIAN SAND Crange brown moint. 'w electicity Ped brown 3.6mEND FOLE

Excavation Method ... AU.C.E.R WEATHERING. ENGINEERING GEOLOGY. * Soil Classification CW- Completely weathered System: Unified. Logged Date HW- Highly weathered (__) means Laboratory DD MW- Moderately weathered Classification. SW- Slightly weathered Drawn ... FrSt-Fresh, with limonite stained joints Commenced Fr - Fresh Checked.....

HOLE NO. NORTHERN TERRITORY GEOLOGICAL SURVEY **AH109** CENTRAL ENGINEERING SERVICES GEOLOGICAL LOG Page Darwin - Alice CO-ORDINATES X.....m. PROJECT Springs Rail FEATURE Material Search DIP........ LOCATION West of Lake Woodssystem BEARING..... DATUM...... DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL CHATHER OF GEOLOGICAL DESCRIPTION SYMBOL NUMBER Group name, general meximum size, in situ moisture and density, plasticity, field test date LOG SAND, m.-f.gr., dry, non plastic. SPAFOLIAN SAND Orange brown 3.8mEND HOLE Excevation Method . AU.G.ER..... WEATHERING. ENGINEERING GEOLOGY. & Seil Classification CW-Completely weathered System: Unified. Date HW- Highly weathered MW- Mederately weathered DO () meens Loboratory

Classification.

Drawn . .

Checked............

SW- Slightly weathered

Fr - Frash

Fr31 - Fresh, with limonite stained joints

HOLE NO.

GEOLOGICAL DESCRIPTION	DEGREE OF		DESCRIPTION AND EN	GINEERING PROPERTIES OF	FSOIL
HOLE SIZE 1.65mm To			TO:	DATUM	
LOCATION West of Lal				BEARING	• • • • • • • • • • • • • • • • • • • •
FEATURE Material S	earch ~	OORDINATES	Y	DIP	
PROJECT Gprings.Ra			Ym.	SURFACE ELEVATION.	
Darwin - Al	lice 🤇	BEOLOG	ICAL LOG		Page o
			EERING SERVICE	is L	AHIIO

GEOLOGICAL DESCRIPTION Type of deposit or material, mineral composition, particle shape, computation, select, structures	ORGANIZE OF MEATHER HOS DEPTHS	DESCRIPTION AND ENGINEERING Group name, general maximum size, in situ moisture and density, pleasicity, find test data	PROPERTIES OF SOIL
AEOLIAN SAND Crange brown		SAND, mf.gr., dry minor low plastic.	SP -
AECLIAN SAND Dk. brown-yellow brown with weakly cemented sand nodule	3	GRAVELLY SAND, fc.gr., moist, 15-20% gravel to 20 low-med. plasticity	sc mm,
3.1m	WEATHERING.	END HOLE	IGINEERING GEOLOGY.

Excavation	Method	AUGMR
Make		
Type		
Operator		

HW- Highly weathered MW- Mederately weathered SW- Slightly weathered Fr3t - Fresh, with limonite stained joiMs Fr -- Fresh

System: Unified.
(...) means Laboratory
Classification.

Date Logged Drawn

HOLE NO. NORTHERN TERRITORY GEOLOGICAL SURVEY AH111 CENTRAL ENGINEERING SERVICES GEOLOGICAL LOG Page Darwin - Alice CO-ORDINATES X.....m. PROJECT Springs Rail FEATURE Material Search DIP....... LOCATION West of Lake Woodsystem BEARING...... DATUM..... DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL SECLOSICAL DESCRIPTION SYMBOL NUMBER Group name, general maximum size, in situ moisture and density, plasticity, field test date Type of departs or motorial, minoral composition, LOS AEOLIAN SAND SILTY SAND, f.gr., SMdry, non plastic. Brown - grey SAND, m.-f.gr., SP AECLIAN SAND dry, minor plastic Lt. brown fines.

AEOLIAN SAND
Orange brown with
weakly cemented
sand nodules.

SAND, m.-f.gr.,
moist, low-med.
plasticity.

END HOLE

Beil Classification

Hom: Unified.

...) meens Laboratory

ENGINEERING GEOLOGY.

Date

Logged

DD

Drawn . . .

Excevation Method ... AUGER

WEATHERING.

CW-Completely weathered

MW- Mederately weathered SW- Slightly weathered

FrSt - Fresh, with limonite stained joints

HW- Highly weathered

HOLË NO. NORTHERN TERRITORY GEOLOGICAL SURVEY CENTRAL ENGINEERING SERVICES GEOLOGICAL LOG Page Darwin - Alice CO-ORDINATES X....m. SURFACE ELEVATION......m. PROJECT .. Springs .. Rail FEATURE Material Search DIP.,..... LOCATION West of Lake Woodspystem BEARING........... DATUM...... MEATHER OF DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL SECLOSICAL DESCRIPTION SYMBOL NUMBER Type of deposit or motorial, minoral composition, \$2.55.55 porticle chape, comentation, colour, structures LOS SAND, m.-f.gr., dry, SP AEOLIAN SAND minor plasticity Orange brown GRAVELLY SAND. AEOLIAN SAND m.-f.gr., 30-50% GC Brown with weakly cemented sand nodules low-med. strength gravel, max. size 20mm, med. plasticity minor gravels 3.0m END HOLE

	5			
Excevation Method AUGER	WEATHERING. CW—Completely weathered HW—Highly weathered MW—Medicately weathered SW—Slightly weathered PrSt—Freeh, with limenite stained joint Fr—Freeh	& Soil Cleanitieation System: Unified. () means Laboratory Cleanification.	ENGINEERING Logged D.D. Drawn Checked	GEOLOGY. Date
Completed	Fr - Franh		Checked,	

	NORT	HERN TERRIT	ORY GEOLOGICAL SURVEY			HOLE	NO.	
	CENTR	RAL ENGI	NEERING SERVICES			AF	1113	
Darwin - Ali	ce	GEOLO	GICAL LOG			P	age o	A
PROJECT Springs Rail	,		Xm.	SURFAC	E ELEVAT	ION	 .	
FEATURE Material Sea	rch	CO-ORDINATE	.S Y	DIP				
LOCATION West of Lake	Wood	SYSTEM		BEARIN	3			
HOLE SIZE 1.65mm TO:		то:	TO:	DATUM.				
GEOLOGICAL DESCRIPTION of deposit or material, mineral composition, ticle shape, comentation, colour, structures	COUNTY OF WEATHER ING	DEPTH BRAPHIC	DESCRIPTION AND ENGING Group name, general maximum a in situ meisture and density, pleat field test date		ROPERTIE SROUP SYMBOL			
EOLIAN SAND range brown			SAND, mf.gr., minor low plast fines	dry,	SP			

AEOLIAN SAND Orange brown			SAND,mf.gr., dry, minor low plastic fines	SP'		-
AEOLIAN SAND Brown		+	CLAYEY SAND, mf.gr. moist, low-med. plasticity.	,sc		-
RESIDUAL CLAYS Red brown - lt. brow with high strength calcrete nodules.	S	3	GRAVELLY CLAYS, med. plasticity, 15-25% gravels, max. size 35mm, 15% mf.gr. sand.	C1,		-
CALCRETE GRAVEL Lt. brown-white with high strength calcre nodules		3	CLAYEY GRAVEL 50-60% c.gr., max. size 40mm. med. plastic fines and silt.	GF− GC		
4 • 3m		4	END HOLE			-

Excavation	N	ŀ	11	×	×	ı		Α	Į	J	(ì	i		Ļ	2			
Make				,															,
Туре											,								
Operator, .																			
Commence	đ			,										,			,	,	
Completed																			

WEATHERING.
CW—Completely weathered
HW—Highly weathered
NW— Mederately weathered
SW—Slightly weathered
Fr31—Freeh, with limonite stained joints
Fr — Freeh

& Seil Classification System: Unified. { ...} means Laboratory Classification. ENGINEERING GEOLOGY.

Logged Date

DD.

Drawn

Checked

HOLE NO. NORTHERN TERRITORY GEOLOGICAL SURVEY AH114 KAL ENGINEERING SERVICES Page GEOLOGICAL LOG Darwin - Alice CO-ORDINATES X.....m. PROJECT Springs Rail FEATURE Material Search DIP..... LOCATION West of Lake Woodsystem..... DATUM...... DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL DEGREE OF BORAFFIE GEOLOGICAL DESCRIPTION SYMBOL NUMBER Group name, general maximum size, in situ moisture and density, plasticity, field test date Type of deposit or material, mineral composition, あままま particle shape, committeen, colour, structures LOG SAND, m.-f.gr., dry to moist, low AEOLIAN SAND Orange brown with plasticity 20% gravel, max. size 10mm. weakly cemented sand nodules. GRAVELLY CLAY SAND, GP-AEOLIAN SAND m.-f.gr., 30-40%GCDk. brown with m.gr. gravel, lowweakly cemented med. plasticity. sand nodules. CLAYEY GRAVEL.50-60% GP-CALCRETE GRAVEL m.-c.gr., low plastic GC Lt. brown-white with fines, minor sand. high strength calcrete nodules. END HOLE 4.0m WEATHERING. Excavation Method . AU.G.E.R..... ENGINEERING GEOLOGY. & Soil Classification CW- Completely weathered System: Unified. Logged HW- Highly weathered (___) means Laboratory DD.GM MW- Moderately weathered Classification.

SW- Slightly weathered

Fr - Fresh

Fråt – Freeh, with limonite stained joints

Operator,

HOLE NO. NORTHERN TERRITORY GEOLOGICAL SURVEY AH115 CENTRAL ENGINEERING SERVICES Page of GEOLOGICAL LOG Darwin - Alice SURFACE ELEVATION......m. PROJECT. Springs. Rail FEATURE Material Search DIP..... LOCATION West of Lake Woodsystem BEARING..... DATUM........ GRAPHIC DEPTHE? LOS DEGREE OF DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL GEOLOGICAL DESCRIPTION GROUP SAMPLE SYMBOL NUMBER Group name, general maximum size, in situ moisture and density, plasticity, field test date Type of deposit or material, mineral composition, 533333 perticle shape, comentation, colour, structures 4,17,4550 SP SAND, m.-f.gr., dry AEOLIAN SAND non plastic. Crange brown GRAVELLY SAND, AEOLIAN SAND m.-f.gr., 50% m.-c.gr.,Orange brown with gravel, non plastic. weakly cemented sand nodules CLAY, med. plasticity CL-20% silt, 10-15% RESIDUAL CLAY Brown with calcrete gravel. CALCRETE GRAVEL CLAYEY GRAVEL. G1 f.-m.gr., max. size 40mm, 10% sand, low-med. plastic fines. Lt. brown-white with GC high strength calcret nodules. END HOLE 4 . Om

Excavation Method , AUGER		& Soil Classification	ENGINEERING GEOLOGY.								
Make	CW- Completely weathered HW- Mighly weathered	System: Unified.	Logg	ed		Date					
TypeOperator,	MW- Moderately weathered	() means Laboratory Classification.	DD.	GM							
Commenced	SW - Slightly weathered Fr St - Fresh, with limonite stained join		Drav	vn ,							
Completed		•	Chec	ked							

HOLE NO. NORTHERN TERRITORY GEOLOGICAL SURVEY CENTRAL ENGINEERING SERVICES AH116 Page GEOLOGICAL LOG Darwin - Alice CO-ORDINATES X.....m. PROJECT .. Springs .. Rail FEATURE Material Search DIP..... LOCATION West of Lake Woodsystem BEARING..... DATUM..... DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL GEOLOGICAL DESCRIPTION SYMBOL NUMBER LOS AEOLIAN SAND SAND. m.-f.gr. dry. SP

ABOLIAN SAND Crange brown with weakly cemented sand nodules. SAND, mf.gr., moist, 10-20% gravel, low- med. plasticity. SILTY CLAY, med. plasticity, 20% sand, 30-40% silt. CALCRITE GRAVEI It. brown-white with high strength calcrete nodules. SILTY CLAY, med. plasticity, 20% sand, 30-40% silt. CLAYEN GRAVEL, 50% fc.gr., max. size 40mm, med plastic fines and silt, moist.	Escavation MethodAU.G.E.R Make Type Operator Commenced Completed	WEATHERING. CW—Completely weathered HW—Highly weathered NW— Mederately weathered SW—Slightly weathered FrSt—Fresh, with limonite at Fr — Fresh	System: Unified. () meens Laboratory Classification.		GEOLOGY. Date	
CALCRETE GRAVEL high strength calcrete nodules. 10-20% gravel, low-med. plasticity. SILTY CLAY, med. plasticity, 20% sand, 30-40% silt. CLAYEY GRAVEL, 50% GP-fc.gr., max. size GC 40mm, med plastic fines and silt,	·	5	END HOLE			-
CALCRETE GRAVEL high strength calcrete nodules. 10-20% gravel, low-med. plasticity. SILTY CLAY, med. plasticity, 20% sand, 30-40% silt. CLAYEY GRAVEL, 50% GP-fc.gr., max. size GC 40mm, med plastic fines and silt,						
Orange brown with weakly cemented sand nodules. RESIDUAL CLAYS Brown 10-20% gravel, low-med. plasticity. SC Med. plasticity. SC Med. plasticity. CL plasticity, 20% sand.	Lt. brown-white with high strength calcre		fc.gr., max. size 40mm, med plastic fines and silt,			-
Orange brown with			SILTY CLAY, med. plasticity, 20% san 30-40% silt.	CI,		-
	Orange brown with weakly cemented sand	2	10-20% gravel, low-	ist, - SC		
						-

NORTHERN TERRITORY SECLOSICAL SURVEY

CENTRAL ENGINEERING SERVICES

HOL	£	T.
T	1	5

GEOLOGICAL LOG

PROJECTDARWIN-ALICE SPRINGS RAIL X
PEATUREMATERIALS SEARCH COORDINATES FIG 16 m.
LOCATION 115km SYSTEM

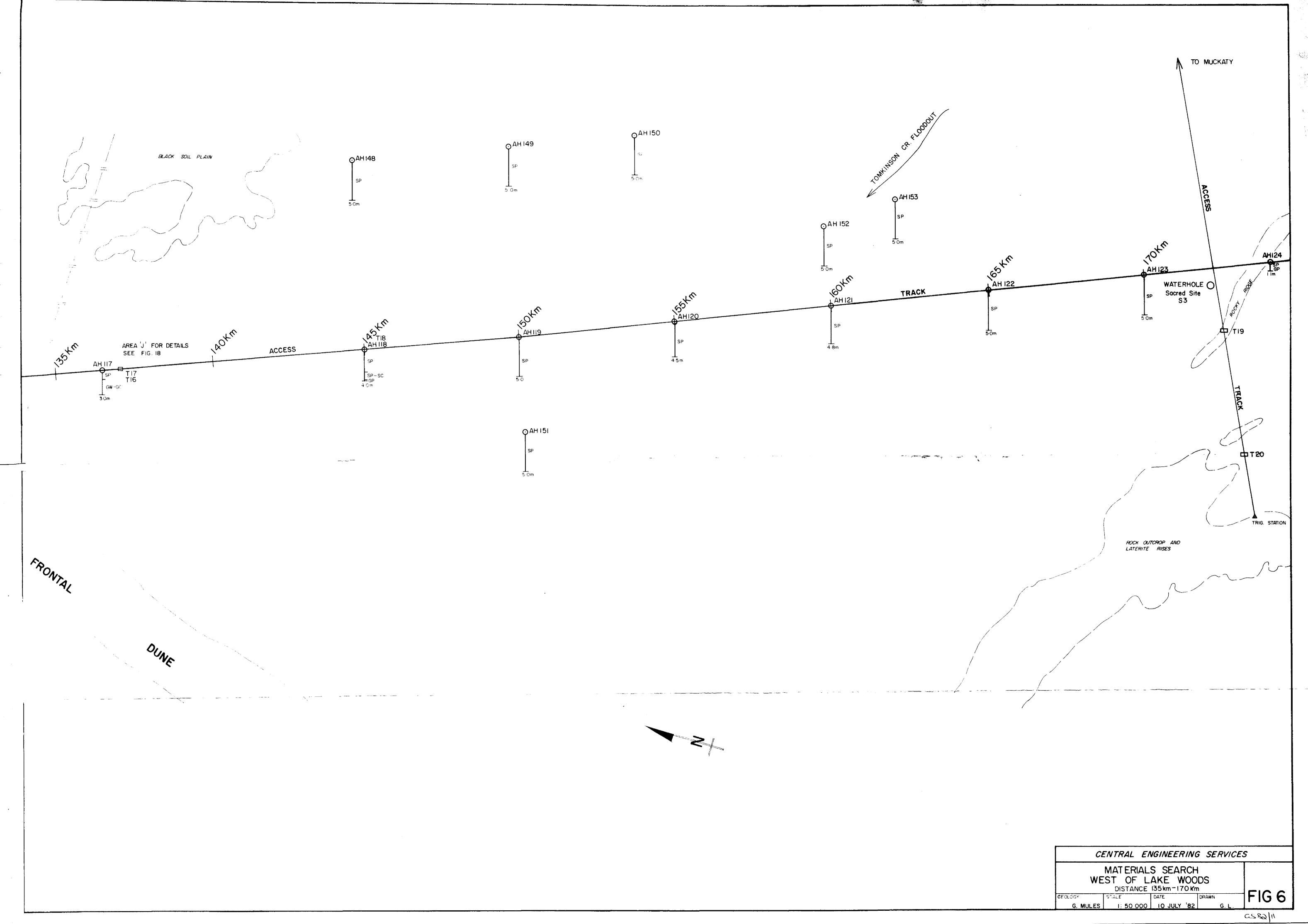
DIP.....

SYSTEM

BEARING......

HOLE SIZETO:		· · · · · ⁷	<u>ro:</u>		TO:	M			
GEOLOGICAL DESCRIPTION Type of deposit or material, integral composition, particle chaps, commistion, esteur, structures	MEATING LEE	, SS		LOS	DESCRIPTION AND ENGINEERING Group name, general maximum plos, in one mainty and density, plosticity, field test data		ES OF SO SAMPLE NUMBER	IL TESTS	
AEOLIAN SAND Brown-red brown, med. dense (loose t O.4m) open even texture.			4 + + + + + + + + + + + + + + + + + + +		SAND, mf.gr., dry non plastic	SP			
CALCRETE GRAVELS Brown-white, dense. with angular high strength calcrete nodules					GRAVEL, fc.gr max. size 100mm; 15- 20% m.gr. sand, 10- 15% silty non plast fines	•			
1.7m			2	4	END HOLE STRATA CONTINUING				- - -
			 	•					-
			3						 - -
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				1					-
									- -
Excevelier Method . BACKHOE		mply	NO. otaly was weathers			NGINÉERING	GEOLOG	Y. Date	

SW- Slightly weathered Pr St - Fresh, with lie



HOLË NO. NORTHERN TERRITORY GEOLOGICAL SURVEY AHJ17 CENTRAL ENGINEERING SERVICES Page GEOLOGICAL LOG Darwin - Alice CO-ORDINATES X.....m. PROJECT Springs Rail FEATURE. Material Search LOCATION West of Lake Woodsystem BEARING..... DATUM...... HOLE SIZE 165mm TO: TO: TO: DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL DEGREE OF SYMBOL NUMBER GEOLOGICAL DESCRIPTION Group name, general maximum size, in aitu moisture and density, plasficity, field test date LOS SE SAND, m.-f.gr., dry, AEOLIAN SAND non plastic to Orange brown-red low plastic. brown GW-CLAYEY GRAVET. CALCRETE GRAVEL 60-70% m.-x.gr., max. GC size 50mm, 20% sand, med. plastic fines. Brown white with high strength calcrete nodules. END HOLE 3.0m WEATHERING. ENGINEERING GEOLOGY. Excevation Method ... AU.G.E.R... A Sail Classification CW- Completely weathered System: Unified. Date HW- Highly weathered (___) means Laboratory *DD.GM*

MW- Mederately weathered

FrSt-Fresh, with limonite stained joints

SW- Slightly weathered

Operator.........

Classification.

NORTHERN TERRITORY GEOLOGICAL SURVEY

CENTRAL ENGINEERING SERVICES

HOLE NO.

AH118 Page of

	Darwin		Alice	
PROJECT,	Springs.	; T	Rail	

FEATURE Material Search

GEOLOGICAL LOG

CO-ORDINATES X.....m.

SURFACE ELEVATION......m.
DIP.....

LOCATION West of Lake Woodsystem

BEARING.....

HOLE SIZE 65mm. TO:	то):	TO:	ATUM.		 • • • •	
GEOLOGICAL DESCRIPTION Type of deposit or material, mineral composition, particle shape, commutation, esteur, structures	DEGREE OF WEATHERING	BPTHE LOS	DESCRIPTION AND ENGINE Group name, general maximum size in situ moisture and density, plastici field test data		PROPERTIE		SACTER WATER
AEOLIAN SAND Orange brown to red brown			SAND mf.gr., determinent, non plate to low plasticit.	ry esti	នា c		
		2-					
		او					
AECLIAN SAND Red brown with weakly cemented sand nodules.		H H H H	CLAYEY SAND, mf.gr., 10% gr. moist, low-med. plasticity.	avel	5C		
QUARTZITE GRAVEL		4	SANDY GRAVEL		GΡ		
4•Om		5	END HOLE				
Operater Commenced	WEATHERING GW-Complete HW-Highly we MW-Moderate SW-Slightly v FrSt-Freeh, v Fr-Freeh	ly weethered lethered bly weethered	& Sell Clessification System: Unified, () meens Leboratory Clessification, sined joints	EM.	ineering pol pol m	 Date	

NORTHERN TERRITORY GEOLOGICAL SURVEY

CENTRAL ENGINEERING SERVICES

HOLE NO.

AH110 Page of

Darwin - Alice

GEOLOGICAL LOG

CO-ORDINATES

PROJECT Springs Rail FEATURE Material Search

DIP.....

LOCATION .West of Lake Woodsystem

GEOLOGICAL DESCRIPTION	DEGREE OF	ESTAPING	DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL				
Type of deposit or material, mineral composition, particle chape, comentation, colour, structures	-23.27	DEFTINE LOS	Group name, general maximum size, in situ moisture and density, plasticity, field test date	SYMBOL NUMBER	STS 5		
AEOLIAN SAND Crange brown		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	SAND, mf.gr., dry minor low plastic.	SP			
AECLIAN SAND Dk. brown-yellow brown with weakly cemented sand nodule	6	2-	GRAVELLY SAND, fc.gr., moist, 15-20% gravel to 20m low-med. plasticity.	SC			
3.1m		A	END HOLE		-		

NORTHERN TERRITORY SEOLOSICAL SURVEY

CENTRAL ENGINEERING SERVICES

HOLE NO. AH119

Darwin - Alice	GEOLOGICAL LOG	Page
PROJECT Springs Rail	X	SURFACE ELEVATION
FEATURE Material Search	CO-ORDINATES Xm.	DIP
LOCATION West of Lake Wood	SEYSTEM	BEARING

AEOLIAN SAND Orange brown to red brown	100	DESCRIPTION AND ENGINEERING draw name, general meximum slop, in alla melature and desaity, planticity, [last test days.]	PROPERTIES OF SOIL.	
Orange brown to				
	2	SAND, mf.gr. dry, non plastic to low plastic fines, mino gravels.	SP	
5. Or	8	END HOLE	HOMEENING GEOLOGY.	

Excevation	Mathed	AUGER
Muho		
Туре		
Operator, .		
Commence	4	

NW— Completely was thered NW— Highly wealthered NW— Moderately wealthered NG— Michaele meethered & Sult Classification System: Unified. (...) means Laboratory Classification.

perd Date
4.00

NORTHERN TERRITORY GEOLOGICAL SURVEY 0S1HA CENTRAL ENGINEERING SERVICES GEOLOGICAL LOG Darwin - Alice PROJECT .. Springs .. Rail CO-ORDINATES FEATURE Material Search DIP...... LICATION West of Lake Woodsystem DEARING..... DATUM..... DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL SECLOSICAL DESCRIPTION SYMBOL NUMBER SPSAND, m.-f.gr., dry S to moist, non plastic. AEOLIAN SAND Orange brown Minor cemented sand nodules. END HOLE 4.5m ENGINEERING GEOLOGY. m: Unified. Date HW- Highly weathered MW- Mederately weeth (...) means Labor GM.DD.

HOLE NO.

1S1HA CENTRAL ENGINEERING SERVICES GEOLOGICAL LOG Darwin - Alice CO-ORDINATES X.....m. PROJECT Springs Rail FEATURE Material Search DIP..... LOCATION West of Lake Woods BEARING.....**.........................** DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL SECLOSICAL DESCRIPTION SYMBOL NUMBER SAND, m.-f.gr., dry, AEOLIAN SAND non plastic. Orange brown minor plastic fines END HOLE 4.8m tion Muthod ... AUGER ... ENGINEERING GEOLOGY.

NORTHERN TERRITORY GEOLOGICAL SURVEY

HOLE NO.

HOLE NO. NORTHERN TERRITORY SECLOSICAL SURVEY CENTRAL ENGINEERING SERVICES SS1HA GEOLOGICAL LOS Darwin - Alice CO-ORDINATES X......m. PROJECT. Springs. Rail PEATURE Material Search DIP........ LOCATION .West .o.f. Lake Woodsveren BEARING..... DATUM...... DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL SECLOSICAL DESCRIPTION AEOLIAN SAND SAND, m.-f.gr., dry Sto moist, non plastic. Orange brown 5.0m END HOLE

Excevenien Method AUGER

Notice
Type
Covereday

PEATH**ERING.** FW— Completely was

W- Compressy washered
W- Moderately weathered
W- Moderately weathered

© Boll Classification System: Unified. (....) meáns Laboratory Classification.

Append D

ENGINEERING GEOLOGY.

CENTRAL ENGINEERING SERVICES SEOLOGICAL LOS Darwin - Alice CO-ORDINATES PROJECT Springs Rail PEATURE Material Search DIP..... LOCATION West of Lake Woodsystem GEOLOGICAL DESCRIPTION SAND, m.-f.gr.,dry, non plastic. SP AEOLIAN SAND Orange brown 5.0m END HOLE ENGINEERING GEOLOGY.

NORTHERN TERRITORY GEOLOGICAL SURVEY

HOLE NO. NORTHERN TERRITORY GEOLOGICAL SURVEY AH 148 CENTRAL ENGINEERING SERVICES GEOLOGICAL LOG PROJECT DARWIN-ALICE SPRINGS RAILWAY CO-ORDINATES X..,.....m. Y. m. DIP..... FEATURE MATERIALS SEARCH ... LOCATION WEST OF LAKEWOODS. SYSTEM BEARING..... DATUM.......... DEGREE OF WEATHERING DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL GEOLOGICAL DESCRIPTION GROUP SAMPLE TESTS Group name, general maximum size, in altu moisture and density, plasticity, field test date LOS AEOLIAN SAND SAND, m.-f.gr., dry SP non plastic Orange brown-red brown Minor cemented nodules END HOLE WEATHERING. Excavation Method . . . AUGE R. ENGINEERING GEOLOGY. & Seil Cleasification CW- Completely weathered System: Unified. HW- Highly weathered (....) means Laboratory MW- Mederately weathered SW- Slightly weathered Classification.

FrSt-Fresh, with limonite stained joints

Fr - Fresh

Commenced

Drawn

HOLE NO. NORTHERN TERRITORY GEOLOGICAL SURVEY CENTRAL ENGINEERING SERVICES AH 149 GEOLOGICAL LOG SURFACE ELEVATION......m. FEATURE MATERIALS SEARCH ... DIP..... LOCATION WEST OF LAKEWOODS SYSTEM BEARING...... DATUM..... DEPTHO LOG DEGREE OF WEATHERING DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL GEOLOGICAL DESCRIPTION GROUP SAMPLE TESTS Group name, general maximum size, in situ moisture and density, plasticity, field test date Type of deposit or material, mineral composition, あきまき particle shape, cementation, colour, structures AEOLIAN SAND SAND m.-f.gr., dry, SPOrange brownnon plastic red brown Minor cemented nodules END HOLE Excavation Method . . . AUGER WEATHERING. ENGINEERING GEOLOGY. Soil Classification CW- Completely weathered System: Unified. Logged HW- Highly weathered Туре

(...) means Laboratory

Classification.

MW- Moderately weathered

FrSt-Fresh, with limonite stained joints

SW-Slightly weathered

Fr - Fresh

Operator.......

D. D

Checked....

NORTHERN TERRITORY GEOLOGICAL SURVEY AH 150 CENTRAL ENGINEERING SERVICES Page GEOLOGICAL LOG PROJECT DARWIN-ALICE SPRINGS RAILWAY CO-ORDINATES DIP..... FEATURE MATERIALS SEARCH BEARING...... LOCATION WEST OF LAKEWOODS SYSTEM DATUM....... DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL DEGREE OF BRAPHIC WEATHER ING DEPTH LOG GEOLOGICAL DESCRIPTION GROUP SAMPLE TESTS Group name, general maximum size, in situ maisture and density, plasticity, field test date Type of deposit or material, mineral composition, particle shape, cementation, colour, structures SP SAND m.-f.gr, dry AEOLIAN SAND non plastic Yellow brown END HOLE 5.0m ENGINEERING GEOLOGY. Excavation Method ... AUGER. WEATHERING. **A** Soit Classification CW- Completely weathered Date System: Unified. Logged HW-Highly weathered (...) means Laboratory DO MW- Moderately weathered Classification. SW- Slightly weathered Operator, . . . Drawn . . . FrSt-Fresh, with limonite stained joints Commenced Checked . . Fr - Fresh

HOLE NO.

HOLE NO. NORTHERN TERRITORY GEOLOGICAL SURVEY AH 151 CENTRAL ENGINEERING SERVICES Page GEOLOGICAL LOG SURFACE ELEVATION.......m. FEATURE MATERIALS SEARCH ... DIP....... LOCATION WEST OF LAKEWOODS. SYSTEM BEARING..... DATUM..... DEGREE OF WEATHERING DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL GEOLOGICAL DESCRIPTION MAPHIC GROUP SAMPLE TESTS Group name, general maximum size, in situ moisture and density, plasticity, field test date Type of deposit or material, mineral composition, Seggaraporticle shape, comentation, colour, structures LOG SP SAND m.-f.gr., dry, AEOLIAN SAND non plastic Yellow brown

WEATHERING.

Fr - Fresh

GW-Completely weathered HW-Highty weathered MW-Mederately weathered SW-Slightly weathered FrSt-Freeh, with limonite stained joints

4: Sell Classification System: Unified. (....) means Laboratory Classification

END HOLE

ENGINEERING GEOLOGY.

Logged Date

OO

Drawn

Checked

HOLE NO. NORTHERN TERRITORY GEOLOGICAL SURVEY AH 152 CENTRAL ENGINEERING SERVICES Page GEOLOGICAL LOG CO-ORDINATES X.....m. PROJECT DARWIN-ALICE SPRINGS RAILWAY DIP...... FEATURE MATERIALS SEARCH .. BEARING.... LOCATION . WEST, OF LAKEWOODS SYSTEM DATUM...... E GRAPHIC DEPTHO LOG DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL DEGREE OF WEATHERING GEOLOGICAL DESCRIPTION GROUP SAMPLE TESTS Group name, general maximum size, in eitu moisture and deneity, plasticity, field test date Type of deposit or material, mineral composition, particle shape, comentation, colour, structures SPSAND m.-f.gr., dry, AEOLIAN SAND non plastic Red brown END HOLE 5.0m WEATHERING. Excavation Method ... A.U.G.E.R... ENGINEERING GEOLOGY. Soil Classification CW- Completely weathered System: Unified. Logged HW-Highly weathered (___) means Laboratory **P.D.**.... MW- Moderately weathered Classification. Operator...... SW- Slightly weathered FrSt—Fresh, with timonite stained joints Fr — Fresh

HOLE NO. NORTHERN TERRITORY GEOLOGICAL SURVEY AH 153 CENTRAL ENGINEERING SERVICES Page of GEOLOGICAL LOG FEATURE MATERIALS SEARCH . DIP..... LOCATION , WEST, OF LAKEWOODS SYSTEM BEARING..... DATUM........... DEGREE OF BRAPHIC ENGLISHED LOG DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL GEOLOGICAL DESCRIPTION GROUP SAMPLE TESTS Group name, general maximum size, in situ maisture and density, plasticity, field lost date Type of deposit or material, mineral composition particle shape, comentation, colour, structures SAND m.-f.gr., dry, SP AEOLIAN SAND non plastic Red brown END HOLE Excavation Method . . A LI G.E.R. . . WEATHERING. ENGINEERING GEOLOGY. Soil Classification **CW**- Completely weathered System: Unified. Logged HW- Highly weathered (....) means Laboratory Туре *DD* MW- Moderately weathered Classification.

SW- Slightly weathered

Fr - Fresh

FrSt-Fresh, with limonite stained joints

NORTHERN TERRITORY GEOLOGICAL SURVEY

SYSTEM

CENTRAL ENGINEERING SERVICES

HOLE NO.

Page of

GM.

(___) means Laboratory

Classification.

GEOLOGICAL LOG PROJECT DARWIN-ALICE SPRINGS RAIL x m
FEATURE MATERIALS SEARCH CO-ORDINATES Y FIG 17

SURFACE ELEVATION............m. DIP.......

LOCATION1.37km.....

BEARING......

GEOLOGICAL DESCRIPTION provide departs or motivation instantic constraints. AEOLIAN SAND Brown-red brown med dense (loose to C.Im), even open texture. GRAVEL 60-70%, fc.gr. max. size 40mm; 10% silt; 5% low plasticity fines GRAVEL GRAVEL GRAVEL, SP GRAVEL 60-70%, fc.gr. max. size 60mm, 70% cobbles, including strength nodules 2.8m CALCRETE GRAVEL ACALCRETE GRAVEL Lt. brown-grey-white med. dense-dense with rounded-sub- angular, medv. high strength nodules 2.8m CALCRETE GRAVEL STRATA CONTINUING	AEOLIAN SAND Brown-red brown meddense (loose to 0.4m), even open texture. CALCRETE GRAVEL Mottled brown-whit med, dense to dens with rounded to su	d	WEAT OF	THE ACT	R MA	zd.	EPTINGS wheels	LOG	Group name, general maximin situ maisture and density, field test date SAND, M.*F.G. minor, low pla	num size, planticity, R., DRY	SYMBOL*	SAMPLE NUMBER	TESTS	E STAN
Brown-red brown med dense (loose to 0.4m), even open texture. CALCRETE GRAVEL Mottled brown-white med. dense to dense with rounded to sub angular, low-v.high strength weathered nodules CALCRETE GRAVEL Lt. brown-grey-white med. dense-dense with rounded-sub-angular, medv. high strength nodules CALCRETE GRAVEL CLAYEY GRAVEL, 50% GC-GW fc.gr max. size 60mm, 70% cobbles, 10-15% fc.gr max. size 60mm, 70% cobbles, 10-15% fc.gr sand, 10-15% low plastic fines minor; low plastic fines	Brown-red brown medense (loose to 0.4m), even open texture. CALCRETE GRAVEL Mottled brown-whit med. dense to dense with rounded to su								minor, low pla	R., DRY	SP			
Mottled brown-white med. dense to dense with rounded to sub angular, low-v.high strength weathered nodules CALCRETE GRAVEL Lt. brown-grey-white med. dense-dense with rounded-sub-angular, medv. high strength nodules CALCRETE GRAVEL 2	Mottled brown-whit med. dense to dens with rounded to su	_	††		Н		#		fines	U				
Lt. brown-grey-white med. dense-dense 60mm, 70% cobbles, 10-15% fc.gr. sand, 10-15% forc.gr. sand, 10-15% low plastic fine, minor sitts	strength weathered	e b h					/-		fc.gr. max. 40mm; 10% sil	size t; 5%				
	Lt. brown-grey-whi med. dense-dense with rounded-sub-angular, medv.						2		fc.gr max. s 60mm, 70% cob 10-15% fc.gr 10-15% low pla	ize bles, . sand, stic	1			
	2.8m						3			JING				

HW- Highly weathered MW- Moderately weathered

FrSt-Fresh, with limonite stained joints

SW- Slightly weathered

Fr - Fresh

Operator.....

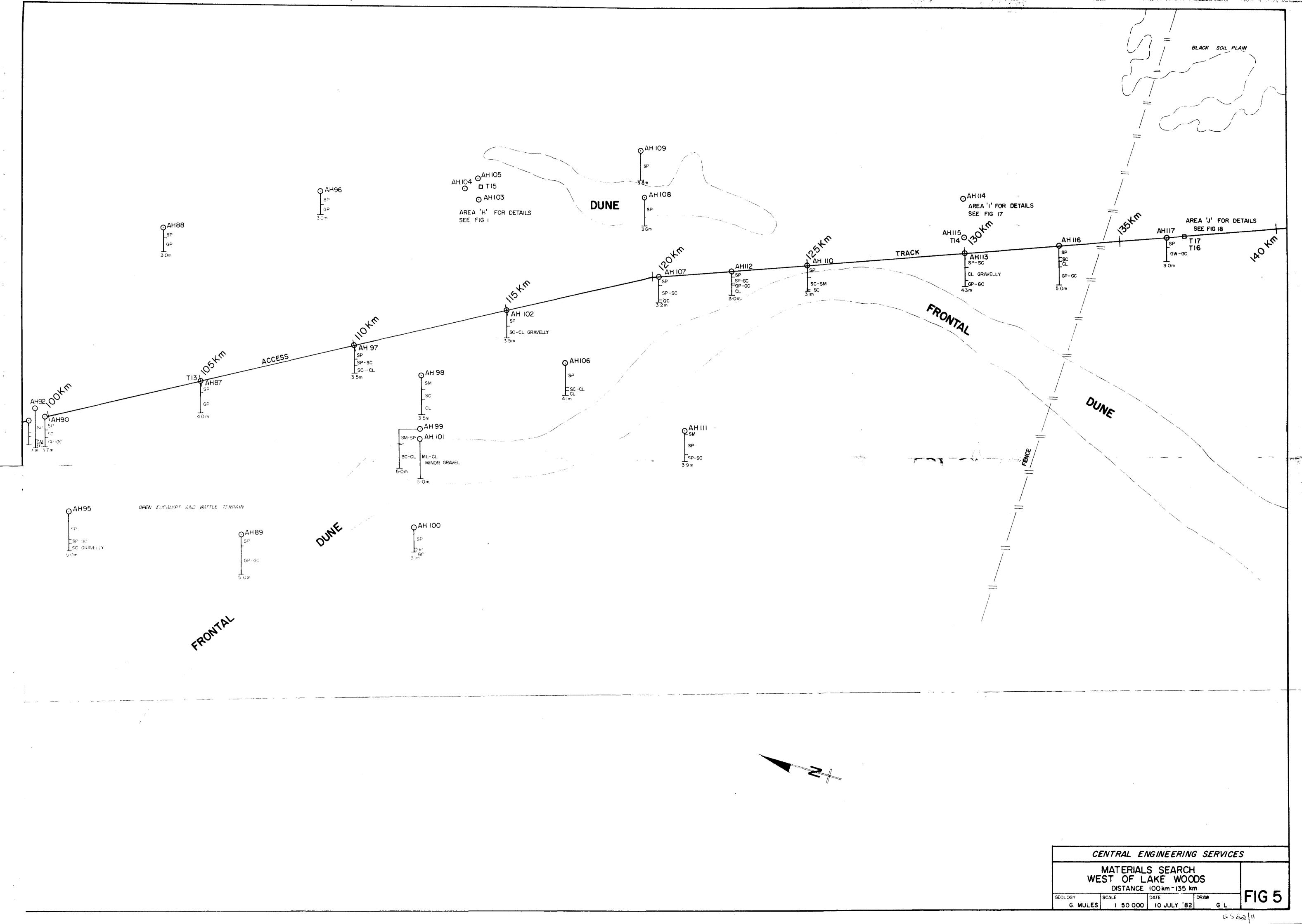
HOLE NO. NORTHERN TERRITORY GEOLOGICAL SURVEY CENTRAL ENGINEERING SERVICES T 17 Page GEOLOGICAL LOG FEATURE MATERIALS SEARCH DIP....... LOCATION1.38km..... SYSTEM BEARING..... DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL DEGREE OF GEOLOGICAL DESCRIPTION GRAPHIC GROUP SAMPLE TESTS DEPTHEN LOG Group name, general maximum size, in situ moisture and density, plasticity, field test date Type of deposit or material, mineral composition, あるまと particle shape, comentation, colour, structures によかえまし SC CLAYEY SAND, m.-f.gr. AEOLIAN SAND dry, low plasticity Red brown, dense even texture. GP-GW CALCRETE GRAVELS GRAVEL, f.-c.gr., low plastic fines Mottled red brownwhite with roundedsubangular, high to v. high strength nodules. END HOLE 1.7m STRATA CONTINUING Excavation MethodBACKHOE WEATHERING. ENGINEERING GEOLOGY. **& Soil Classification** CW- Completely weathered System: Unified Logged HW-Highly weathered (....) means Laboratory D.D MW- Moderately weathered Classification. Operator..... SW- Slightly weathered Drawn ... FrSt-Fresh, with limonite stained joints

Checked.

Fr - Fresh

HOLE NO. NORTHERN TERRITORY GEOLOGICAL SURVEY T 18 CENTRAL ENGINEERING SERVICES Page of GEOLOGICAL LOG PROJECT DARWIN-ALICE SPRINGS RAIL X MATERIALS SEARCH CO-ORDINATES DIP...... LOCATION 145km SYSTEM **BEARING.,,............** DATUM...... DEGREE OF WEATHERING DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL GEOLOGICAL DESCRIPTION GRAPHIC GROUP SAMPLE TESTS Group name, general maximum size, in situ moisture and density, plasticity, field test data LOG Type of deposit or meterial, mineral composition, . 苏美宝宝 particle shape, comentation, colour, structures 中心内面工作 SAND m.-f.gr., dry SP AEOLIAN SAND non plastic Orange brown, med. dense (loose to 0.4m) onen even texture CLAYEY SAND, m.-f.gr., AEOLIAN SAND moist, 15% low plas. Red brn, med, dense CLAY low-med plas. RESIDUAL CLAY 10-15% sand; 5-10% Yell. brn, med. dens high strength gravel, dense, uneven textur with minor quartzit max size 40mm END HOLE STRATA CONTINUING WEATHERING. Excavation Method BACKHOE.... ENGINEERING GEOLOGY. & Soil Classification CW-Completely weathered System: Unified. Date Logged HW- Highly weathered (__) means Laboratory GM MW- Moderately weathered Classification. Operator, SW- Slightly westhered Drawn . . . Commenced FrSt-Fresh, with limonite stained joints

Fr -- Fresh



NORTHERN TERRITORY SECLOSICAL SURVEY AH124 CENTRAL ENGINEERING SERVICES GEOLOGICAL LOG Darwin - Alice CO-ORDINATES X.....m. PROJECT Springs Rail FEATURE Material Search DIP..... LOCATION West or Lake Woodsystem BEARING..... HOLE SIZE 16.5mm to: To: DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL SECLOSICAL DESCRIPTION SYMBOL NUMBER Group name, general manimum pine, in situ moleture and density, planticity, field test data LOS Type of deposit or motorial, minoral composition, Apply 3 perfects shape, compatation, action, structures SAND, m.-f.gr., dry minor plastic fines. SPRESIDUAL SAND Grey brown GRAVEL, max. size RESIDUAL GRAVEL Lt. brown with sandstone and chert particles HW-M 35mm, v.high strength. END HOLE ENGINEERING GEOLOGY. h Sail Classification CW- Completely weathered tom: Unified. HW- Highly weathered MW- Mederately weathered) magne Labore GN.00. SW- Slightly we Fr - Frash

HOLE NO.

HOLE NO. NORTHERN TERRITORY GEOLOGICAL SURVEY CENTRAL ENGINEERING SERVICES GEOLOGICAL LOG Darwin - Alice CO-ORDINATES X.....m. PROJECT. Springs Rail FEATURE Material Search DIP..... LOCATION . West .o.r. Lake Woodsystem BEARING..... DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL GEOLOGICAL DESCRIPTION SYMBOL HUMBER LOB SAND, m.-f.gr., dry, AEOLIAN SAND SP non plastic. Orange brown 5.0m END HOLE WEATHERING. ENGINEERING GEOLOGY. CW- Completely weathered System: Unified. HW- Highly wedthered MW- Mederately weathered Date GALDO. SW- Slightly weathered PrSt - Fresh, with lir

NORTHERN TERRITORY SECLOSICAL SURVEY

CENTRAL ENGINEERING SERVICES

HOLE NO. AH126

Darwin - Alice

GEOLOGICAL LOG

PROJECT Springs Rail

FEATURE Material Search

CO-ORDINATES X.....m.

DIP........

LOCATION West of Lake Woodsystem

BEARING...... DATUM

GEOLOGICAL DESCRIPTION pp of deposit or material, mineral composition, protein shape, composition, colour, structures	NEATHER OF	BRAPHIC LOS	DESCRIPTION AND ENGINEERING Group name, general maximum size, in ally meisture and density, plasticity, in ally laid test data.	PROPERTIE	ES OF SOIL SAMPLE TESTS NUMBER	WATER
ppe of deposit or motorial, mineral composition,			SAND, mf.gr., dry non plastic.	SYMBOL.	SAMPLE TESTS HUMBER	
						-
5 . Om						-

SW- Slightly weathered

FrSt -- Fresh, with limenite stained ja

GM.DO Checked . . .

		ORY GEOLOGICAL SURVEY NEERING SERVICES		HOLE NO. AH127
Darwin - Al		GICAL LOG		Page of
PROJECT Springs Rail FEATURE Material Sec	l arch co-ondinate	(S	JRFACE ELEVATIO	
LOCATION . West . o.f. Lake		• • • • • • • • • • • • • • • • • • • •	EARING	
HOLE SIZE 165mm TO:	1 1 1 1		ATUM	·
GEOLOGICAL DESCRIPTION Type of deposit or material, minoral composition, particle shape, computation, scient, structures	WE ATTRETTED DEPTH LOS	DESCRIPTION AND ENGINEE Organ name, general meximum size in afte meisture and density, plasticit field test data		OF SOIL AMPLE TESTS DE
AEOLIAN SAND Orange brown		SAND, mf.gr., on plastic.	dry,	
				-
		OND WOLF		
5. Om Excevetion MethodAUGER	WEATHERING.	END HOLE	ENGINEERING GI	FOX ONLY
Make	GW- Completely weathered HW- Highly weathered MW- Mederately weathered SW- Slightly weathered	G Soil Classification System: Unified. () means Leberatory Classification.	Lagged DO.GM	Dete
Commenced Completed	PrSt - Fresh, with limenite ste Fr - Fresh	nined jaints		

NORTHERN TERRITORY GEOLOGICAL SURVEY

CENTRAL ENGINEERING SERVICES

HOLE NO.

AH1	28
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Page of

Darwin - Alice PROJECT ... Springs .. Rail

GEOLOGICAL LOG

FEATURE Material Search LOCATION West of Lake Wood System

CO-ORDINATES X.....m.

DIP....... BEARING......

HOLE SIZE 165mmm:

DATUM

	DEGREE OF WEATHERING	DE THE LOS	DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL Group name, general maximum size, in offer moisture and density, plasticity, in offer moisture and density			TESTS	To the
AEOLIAN SAND Orange brown	GEORGE OF WEATHER HAD A SELECTION OF THE		DESCRIPTION AND ENGINEERS drup name, general maximum size, in offu moioture and density, pleaticity, field test ests SAND, m f.gr., dr. non plastic.	SYMBOL.	S OF SOIL SAMPLE HUMBER	TESTS	
•							
		الحما	END HOLE AT 6.0m				

Excevation	Method	ιΑψ.₩ Κ
Make		
Туре		

SW- Slightly weathered PrSt - Fresh, with limenity stained joints Fr -- Fresh

2 Soil Classification System: Unified. (....) means Laboratory

Date GM.DD ... Drawn

NORTHERN TERRITORY GEOLOGICAL SURVEY

CENTRAL ENGINEERING SERVICES

HOLE NO.

AH129

Darwin - Alice	GEOLOG	ICAL LOG	Page			
PROJECT Springs Rail X SURFACE ELEVATION	SURFACE ELEVATION					
FEATURE Material Search	COUNDINALES	Ym.	DIP			
LOCATION . West . of . Lake Wpo	d system		BEARING			
HOLE HIZE 165mmm	Tin:	TO:	DATUM			

HOLE SIZE 165mmTo:	T	го:					
GEOLOGICAL DESCRIPTION Type of deposit or meterial, mineral composition, particle shape, comentation, solour, structures	CHAMEE OF MEATHER HAS A LA LA	DEPTH LOS	DESCRIPTION AND ENGINEERING Group name, general maximum size, in situ mainture and density, planticity, field test date	G PROPERTIE	SAMPLE NUMBER	TESTS	
AEOLIAN SAND Orange brown			SAND, f.gr., moist non plastic	t SP			_
		4					
·							
							-
Lt. brown			dry	SP			_
		3					- -
3.5m			END HOLE				-
							
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							-
Excevation Method . AUGER	WEATHERN CW- Comple HW- Highly	lately weathered	System: Unified.	ENGINEERING Logged	3 GEOLOG	Y. Date	1
Type	MW- Meder SW- Slighti	rately weathered ily weathered h, with limonite of	Classification.	Grando			

NORTHERN TERRITORY GEOLOGICAL SURVEY CENTRAL ENGINEERING SERVICES. GEOLOGICAL LOG Page Darwin - Alice PROJECT. Springs. Rail SURFACE ELEVATION.....m. FEATURE Material Search DIP.,.,.... LOCATION .West .o.f. Lake Woodsystem BEARING..... DATUM................. DEGREE OF WEATHERING GEOLOGICAL DESCRIPTION GRAPHIC DEPTHS LOG DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL GROUP SAMPLE TESTS Group name, general maximum size, in situ moisture and density, plasticity, field test date Type of deposit or material, mineral composition, のままま particle shape, cementation, colour, structures SPAECLIAN SAND SAND, m.-f.gr., ary becoming moist, Orange brown non plastic. gravelly, low plastic GP Iron atone nodules CLAY SILTY CLAY, lowmrd. planticity. Lt. brown CLmeist. 3.5 mEND HOLD WEATHERING. Excavation Method ... AUDER ENGINEERING GEOLOGY. **★** Soil Classification **CW-Completely weathered** Make..... System: Unified. Logged Date HW-Highly weathered () means Laboratory Type DD MW- Moderately weathered Classification Operator SW- Slightly weathered Drawn ... FrSt-Fresh, with limonite stained joints Commenced Fr - Fresh

HOLE NO.

Checked

NORTHERN TERRITORY GEOLOGICAL SURVEY

CENTRAL ENGINEERING SERVICES

HOLE NO. AH144

Page of

Darwin	_	Alice	
 C		1-27	

GEOLOGICAL LOG

	Darwin - Alice	
PROJECT	Springs Rail	

CO-ORDINATES X.....m.

FEATURE Material Search

DIP.....

LOCATION . West of Lake Wood BYSTEM

BEARING.....

HOLE SIZE 165mmmo:	COUNTY OF		DESCRIPTION AND ENGINEERS	JM	ES OF SOIL	ès
GEOLOGICAL DESCRIPTION pe of deposit or material, wherei composition, article shape, commetten, colour, structures	WEATHER HOS	LOS LOS	Group name, general maximum size, in situ moisture and demoty, pleasicity, field test data	SYMBOL*	SAMPLE TESTS NUMBER	Ba
AEOLIAN SAND Orange brown			SAND, mf.gr., dry becoming mois non plastic.	t, SP		-
		+	•			
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						-
		+				
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		+				
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						-
		$\frac{1}{4}$				-
		#	·			
5.0m			END HOLE			
Excevation Method .AUGER	WEATHERING CW- Complete HW- Highly w MW- Mederal	ly weathered suthered	& Soil Classification System: Unified. () means Laboratory Classification.	ENGINEERIN Logged D.D.	G GEOLOGY. Date	

Checked

PrSt - Fresh, with limonite stained joints Fr -- Fresh

		TORY GEOLOGICAL SURVEY		HOLE NO.	
		INEERING SERVICES		AH145	3-1
Darwin - Al	-	GICAL LOG		•	of
PROJECT Springs Rai FEATURE Material Se	i arch CO-ORDINATE	Xm. Es	SURFACE ELEVATIO		
FEATURE, MARCHINAL DE	ar cu		DIP		
LOCATION . West. of . Lak			BEARING		
HOLE SIZE 165mmTO			DATUM		ı
GEOLOGICAL DESCRIPTION The of deposit or material, mineral composition.	DEGREE OF BORAPHO	DESCRIPTION AND ENGINE Group name, general maximum siz			BE SE
pe of deposit or material, mineral composition, article shape, comentation, colour, structures	正正元至王河 merred U	Group name, general maximum si in situ moisture and density, plastic field test date	SYMBOL" N	AMPLE TESTS	5 ≇ €
LATERITE GRAVEL		SILTY GRAVEL, m.	c. GM		
Brown with rounded	<u> </u>	gr., max. size	30mm		┝
laterite nodules.		minor low plast:	icity.		
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1.5m		END HOLE			
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cavation MethodAUGAR	WEATHERING.		ENGINESS:::0 35	.O. O. O. V	
lake	CW— Completely weathered HW— Highly weathered	 Soil Classification System: Unified. 	ENGINEERING GE	OLOGY. Date	
,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	MW— Moderately weathered SW— Slightly weathered) means Laboratory Classification. 	DD	+/· * 	
Commenced	FrSt-Fresh, with limonite stai	ined joints	ŀ		
Completed . ,	Fr — Fresh		Checked		

HOLE NO. NORTHERN TERRITORY GEOLOGICAL SURVEY AH 154 CENTRAL ENGINEERING SERVICES Page of GEOLOGICAL LOG PROJECT DARWIN-ALICE SPRINGS RAILWAY CO-ORDINATES DIP..... FEATURE MATERIALS SEARCH ... LOCATION WEST OF LAKEWOODS BEARING..... **SYSTEM** DATUM...... EGRAPHIC DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL DEGREE OF WEATHERING GEOLOGICAL DESCRIPTION GROUP SAMPLE TESTS Group name, general maximum size, in situ moisture and density, plasticity, field test date Type of deposit or material, mineral composition, particle shape, comentation, colour, structures SAND m.-f.gr., dry, SP AEOLIAN SAND non plastic Yellow brown END HOLE 4.0m Excavation Method ...AUGER WEATHERING. ENGINEERING GEOLOGY. & Soil Classification CW- Completely weathered System: Unified. Logged Date HW-Highly weathered () means Laboratory DD MW- Moderately weathered Classification. Operator, SW- Slightly weathered FrSt-Freeh, with limonite stained joints Fr - Fresh

HOLE NO. NORTHERN TERRITORY GEOLOGICAL SURVEY AH 155 CENTRAL ENGINEERING SERVICES GEOLOGICAL LOG PROJECT. DARWIN-ALICE SPRINGS RAILWAY CO-ORDINATES SURFACE ELEVATION......m. FEATURE MATERIALS SEARCH DIP....... LOCATION WEST OF LAKEWOODS. SYSTEM BEARING..... DATUM.... DEPTHY LOG DEGREE OF DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL GEOLOGICAL DESCRIPTION GROUP SAMPLE TESTS Group name, general maximum size, in situ moisture and density, plasticity, field test date Type of deposit or material, mineral composition, particle shape, cementation, colour, structures RESIDUAL GRAVEL GRAVEL max. size 75mm GPm.f.gr. sand, minor Brown with low plastic fines ironstone and chert Tragments END HOLE - REFUSAL 0.5m

				1
Excavation Method A.U.G.E.R Make Type Operator. Commenced Completed	& Soil Classification System: Unified. () means Loboratory Classification. nts	0	GEOLOGY. Date	

HOLE NO. NORTHERN TERRITORY GEOLOGICAL SURVEY AH 156 CENTRAL ENGINEERING SERVICES Page of GEOLOGICAL LOG DIP....... FEATURE MATERIALS SEARCH... LOCATION WEST OF LAKEWOODS ... SYSTEM BEARING..... DATUM....... DEGREE OF WEATHERING DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL DEPTHE LOG GEOLOGICAL DESCRIPTION GROUP SAMPLE TESTS Group name, general maximum size, in situ moisture and density, plasticity, field test date Type of deposit or material, mineral composition, あままま particle shape, comentation, colour, structures GRAVEL max. size RESIDUAL GRAVELS GP75mm m.-fr.gr. Brown with sand, minor low ironstone and plastic fines chert fragments END HOLE-REFUSAL 0.5mExcavation Method ..AUGER..... WEATHERING. ENGINEERING GEOLOGY. & Soil Classification CW-Completely weathered System: Unified. Logged HW-Highly weathered () means Laboratory DD...... MW- Moderately weathered Classification. Operator..... SW- Slightly weathered

FrSt-Fresh, with limonite stained joints

Fr - Fresh

HOLE NO. NORTHERN TERRITORY GEOLOGICAL SURVEY AH 157 CENTRAL ENGINEERING SERVICES GEOLOGICAL LOG Page of PROJECT DARWIN-ALICE SPRINGS RAILWAY CO-ORDINATES Y. m. FEATURE MATERIALS SEARCH ... DIP....... LOCATION WEST OF LAKEWOODS. SYSTEM BEARING..... DATUM...... DEGREE OF WEATHERING DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL EGRAPHIC DEPTHE LOG metreel GEOLOGICAL DESCRIPTION GROUP SAMPLE TESTS Group name, general maximum size, in situ moisture and density, plasticity, field test date Type of deposit or material, mineral composition, あままま particle shape, cementation, colour, structures SANDY GRAVEL, GWLATERITE GRAVEL with m.-f.gr., Red brown with sand, dry, non rounded laterite fragments. plastic END HOLE-REFUSAL 0.7mExcavation Method . AUGER..... WEATHERING. ENGINEERING GEOLOGY. Soil Classification CW-Completely weathered System: Unified. Logged Date HW-Highly weathered (...) means Laboratory DD MW- Moderately weathered Classification. SW- Slightly weathered FrSt-Fresh, with limonite stained joints Fr - Fresh Checked...

HOLE NO. NORTHERN TERRITORY GEOLOGICAL SURVEY CENTRAL ENGINEERING SERVICES AH163 GEOLOGICAL LOG Page of Darwin - Alice CO-ORDINATES X.....m. PROJECT Springs Rail SURFACE ELEVATION.....m. FEATURE Material Search DIP....... LOCATION West of Lake Woodsystem BEARING..... HOLE SIZE 165mm TO: TO: DATUM..... DEGREE OF WEATHERING DEPTHE LOG DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL GEOLOGICAL DESCRIPTION GROUP SAMPLE TESTS Type of deposit or material, mineral composition, あままま particle shape, comentation, colour, structures Group name, general maximum size, in situ moisture and density, plasticity, field test date GRAVELLY SAND GRAVELLY SAND SP m.-f.gr., 10-20% gravel, low plasticity Brown with laterite nodules LATERITE GRAVEL SANDY GRAVEL, GW low plasticity Brown

									i
3.Om				**************************************	END HOLE				
Excavation Method AUGER Make Type	CW HW MW SW Fr S	WEATHERING. CW-Completely weathered HW-Highly weathered MW- Moderately weathered SW-Slightly weathered FrSt-Freeh, with limonite stained joints Fr - Freeh			Logged Drawn	ERING GE	 Date	. , ,	

NORTHERN TERRITORY GEOLOGICAL SURVEY CENTRAL ENGINEERING SERVICES GEOLOGICAL LOG						T 19		
								of
PROJECT DARWIN-ALICE FEATURE MATERIALS SE		NGS RAII	ES		E ELEVATIO			
LOCATION 172km	, mon	SYSTEM						
HOLE SIZETO:	· 							
GEOLOGICAL DESCRIPTION Type of deposit or material, mineral composition, particle shape, comentation, colour, structures	DEGREE OF WEATHERING いたのとまた	SE GRAPHIC DEPTHE LOG metres C	DESCRIPTION AND ENGIN Group name, general maximum s in situ moisture and demaity, pigsto field test date		PROPERTIES GROUP SYMBOL			GROUND WATER LEVELD
AEOLIAN SAND			SAND, mf.gr.,	d r y	SP			_
Grey-orange brown, v. loose-loose, eve	h	<u> </u>	non plastic					_
texture								
		/						-
								-
1.6			END HOLE- REFUS	2 A T				_
1.00		$H \mid H \mid$	BASE OF HOLE ON	J				-
		2	CEMENTED LATERI	LTE				
		1						-
		+						-
								-
		3						
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							}	-
		#						
		5						
Make		tely weathered	4: Soil Classification System: Unified,	ENGINEERING GEOLOGY. Logged Date				
0	HW— Highly : MW— Modere SW— Slightly	stely weathered	() means Laboratory Classification.	G A	4		Date	
	lined joints		Drawn					

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<u>‡</u>

HOLE NO. NORTHERN TERRITORY GEOLOGICAL SURVEY T 20 CENTRAL ENGINEERING SERVICES GEOLOGICAL LOG FEATURE MATERIALS SEARCH DIP...... LOCATION 172km BEARING..... DATUM...... HOLE SIZE......TO:......TO:......TO:......TO:...... DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL GEOLOGICAL DESCRIPTION GRAPHIC GROUP SAMPLE TESTS Group name, general meximum size, in situ meisture and density, plasticity, field test date Type of deposit or material, mineral composition, あままる particle shape, comentation, colour, structures LOG SP AEOLIAN SAND, lt brh SAND, m.-f.gr., dry loose, even texture non plastic GRAVEL 70% f.-c.gr. GW COLLUVIAL GRAVES max size 100mm 2Ō% Brn. dense, the ven sand, 10% silt, non texture with Laterite gravels and quartzite plastic GW GRAVEL 60% f.-c.gr with high proportion AS ABOVE of med. strength quartzite cobbles; 20% sand, non plastic END HOLE 2.0m STRATA CONTINUING

Excavation	Method	BACKHOE
Make		
Туре		

CW— Completely weathered
HW— Highly weathered
MW— Moderately weathered
SW— Slightly weathered
Frst— Fresh, with limonite stained joints

WEATHERING.

Fr - Fresh

& Soil Classification
System: Unified.
(....) means Laboratory
Classification.

ENGINEERING GEOLOGY.

Logged Date

M

Drawn

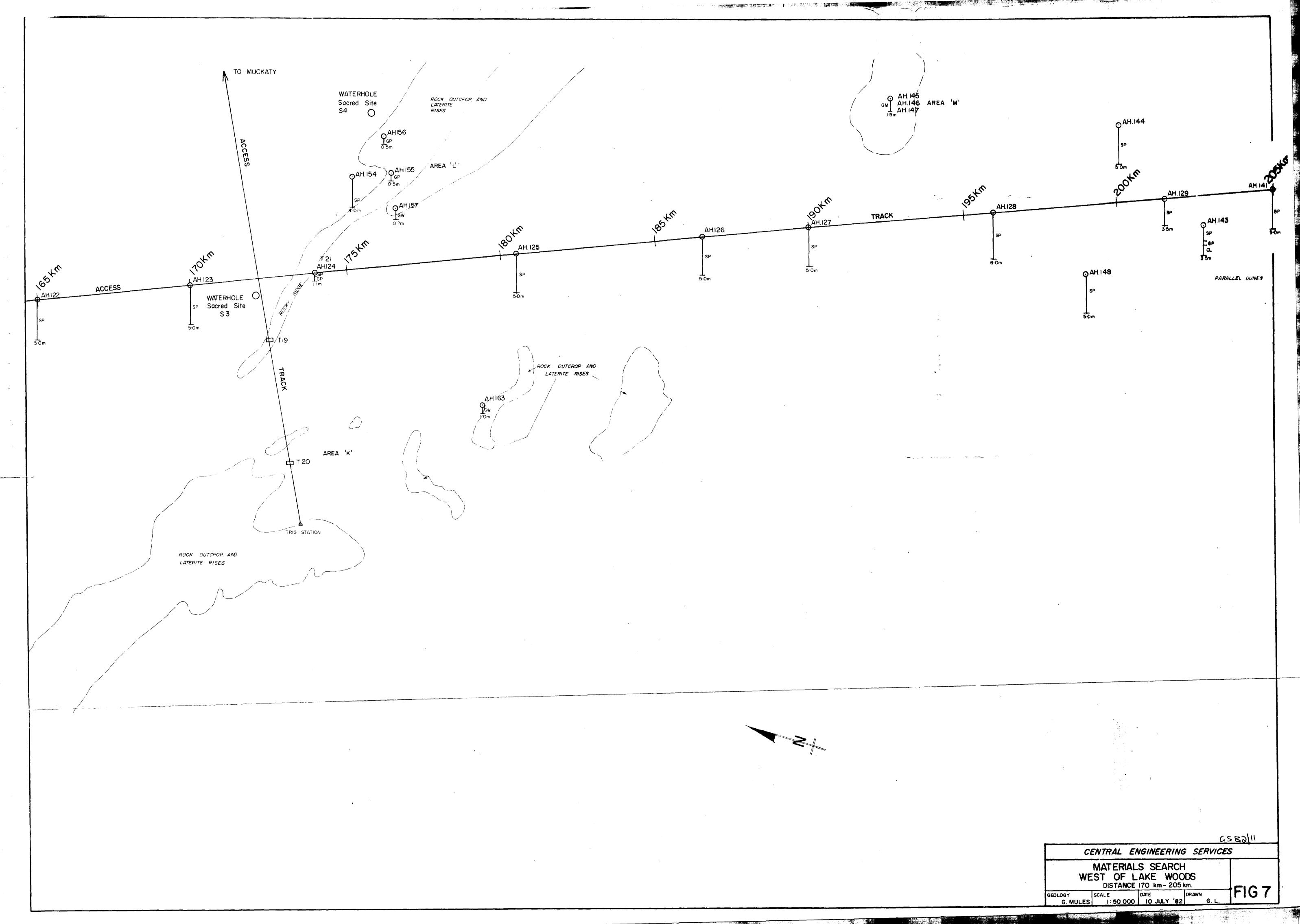
Checked

NORTHERN TERRITORY GEOLOGICAL SURVEY T 21 CENTRAL ENGINEERING SERVICES GEOLOGICAL LOG Page SURFACE ELEVATION.....m. FEATURE MATERIALS SEARCH CO-ORDINATES DIP..... SYSTEM BEARING..... DATUM..... DEGREE OF WEATHERING BRAPHIC DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL GEOLOGICAL DESCRIPTION GROUP SAMPLE TESTS Group name, general maximum size, in situ moisture and density, plasticity, field test data Type of deposit or material, mineral composition, particle shape, comentation, colour, structures LOS SILTY SAND m.-f.gr. SAND SM-Grey, loose even dry, minor gravel. SP texture mon plastic WEATHERED CONGLOMERAME GRAVEL 70% f.-c.gr. GWGrey, med dense-dense max size 100mm, with low-high strength 30% silty sand cherty fragments 1.0m END HOLE- REFUSAL Excavation MethodBACKHOE WEATHERING ENGINEERING GEOLOGY. 4 Soil Classification CW- Completely weathered Make..... System: Unified. Logged HW- Highly waathered Type (....) means Laboratory MW- Moderately weathered <u>.G</u>M... Classification. SW- Slightly weathered Commenced . . Drawn . . . FrSt-Fresh, with limonite stained joints Fr - Fresh

Completed

HOLE NO.

Checked



NORTHERN TERRITORY GEOLOGICAL SURVEY HOLE NO. CENTRAL ENGINEERING SERVICES AE 130 GEOLOGICAL LOG Darwin - Alice Page CO-ORDINATES X.....m. PROJECT .. Springs .. kail SURFACE ELEVATION.....m. FEATURE. Material Search Y. m. DIP..... LOCATION West of Lake Wood System BEARING..... HOLE SIZE 165mmTo: To: To: DATUM..... DEGREE OF WEATHERING GEOLOGICAL DESCRIPTION DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL Type of deposit or material, mineral composition, カッション particle shape, comentation, colour, structures にんちょうし Group name, general meximum size, in situ maisture and density, plasticity, field test date GROUP SAMPLE TESTS LOG AECLIAN SAND SAND, m.-f.gr., dry SFCrange brown becoming moist. red brown non plastic to minor low plasticity. CLAYS GRAVELLY CLAYS CLBrown with low-med. plasticity. ironstone HW gravels 10-40% low strength ironstone gravels, sandy. IRONSTONE GRAVEL CLAYEY GRAVEL 80% Brown with HW m.gr., av. size lOmm,GC ironstone particles low-med. plasticity of low-med. strength END HOLE Excavation Method . . AUGER WEATHERING ENGINEERING GEOLOGY. & Soil Classification CW- Completely weathered System: Unified. Logged HW-Highly weathered Date (...) means Laboratory MW- Mederately weathered SW- Slightly weathered DD. Operator Classification. FrSt-Fresh, with limonite stained joints Fr - Fresh

CENTRAL ENGINEERING SERVICES

HOLE NO. AH131

Darwin - Alice	GEOLOG	ICAL LOG	Page o
PROJECT Springs Rail	COOPDINATES	Xm. Ym.	SURFACE ELEVATIONm.
			DIP
LOCATION West of Lake Wood	d Bystem		BEARING

GEOLOGICAL DESCRIPTION Type of deposit or material, mineral composition, particle shape, comentation, colour, structures	DEGREE OF BRAPHIC BRAPHIC LOG	DESCRIPTION AND ENGINEE Group name, general maximum size in situ moisture and density, plasticit field test date		ES OF SOIL SAMPLE TESTS NUMBER	MATER
AEOLIAN SAND Orange brown		SAND, mf.gr., non plastic.			
LATERITE GRAVEL		SANDY GRAVEL, mf.gr., max. s: 10mm, minor low plasticity.	ize GM		
2.Om	3	END HOLE			
Meke. Type Operator Commenced	WEATHERING. CW- Completely weathered HW- Highly weathered SW- Slightly weathered Fr31- Freeh, with limonite ste Fr - Freeh	& Seil Clessification System: Unified. () meens Laboratory Clessification.		GEOLOGY. Date	

HOLE NO. NORTHERN TERRITORY GEOLOGICAL SURVEY CENTRAL ENGINEERING SERVICES AH132 GEOLOGICAL LOG Darwin - Alice CO-ORDINATES X.....m. PROJECT. Springs Rail SURFACE ELEVATION.......m. FEATURE Material Search DIP...... LOCATION . West of Lake Woodsystem BEARING..... HOLE SIZE 165mm to: _______ to: _______ DATUM...... DEGREE OF WEATHERING DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL SEOLOGICAL DESCRIPTION STANDOL SAMPLE TESTS Group neme, general maximum size, in situ moisture and density, plasticity, field test data Type of deposit or material, mineral composition, 表面表面 porticle chape, comentation, colour, structures LOS CEMENTED SURFACE UNABLE TO PENETRATE LATERITE

Excavation Nethod .AUGER.

Make.

Type.

Operator.

Commenced ...

Completed ...

Completed ...

Excavation Nethod .AUGER.

WEATHERING.

GW- Completely weethered ...

System: Unitied.

(...) means Laboratory ...

Classification.

Classification.

Drawn ...

Completed ...

Checked ...

HOLE NO. NORTHERN TERRITORY GEOLOGICAL SURVEY CENTRAL ENGINEERING SERVICES AP 133 Page of GEOLOGICAL LOG Darwin - Alice CO-ORDINATES X m. PROJECT. Springs Rail FEATURE Material Search DIP..... LOCATION West of Lake Woodsystem.... BEARING, DATUM....... DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL DEGREE OF WEATHERING GEOLOGICAL DESCRIPTION E GRAPHIC Group name, general maximum size, in situ moisture and density, plasticity, field test date SAND, m. - F. Fr., dry, GROUP SAMPLE | TESTS LOG Type of deposit or material, mineral composition, particle shape, comentation, colour, structures AEGLIAN SAND non plastic. Orange brown SANDY GRAVEL, GE LATERITE GRAVEL m.-f.gr., minor low ; lastic fines, dry. ETT HOLD. 3.8m 2 Excavation Method . . . A.U.G.E.B. . . . ENGINEERING GEOLOGY. Soil Classification CW- Completely weathered System: Unified. Logged HW-Highly weathered (....) means Laboratory Type DD.

MW- Moderately weathered

FrSt - Fresh, with limonite stained joints

SW- Slightly weathered

Commenced ...

Classification.

Checked . .

CENTRAL ENGINEERING SERVICES

HOLE NO.

AH134

Darwin - Alice

GEOLOGICAL LOG

Page of

PROJECT .. Springs . Rail

CO-ORDINATES X.....m.

SURFACE ELEVATION.....m. DIP......

FEATURE Material Search

LOCATION West of Lake Woodsystem..... BEARING..... HOLE SIZE 165mm TO: TO: DATUM............... DEGREE OF WEATHERING E GRAPHIC DEPTHEY LOG DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL GEOLOGICAL DESCRIPTION GROUP SAMPLE | TESTS Group name, general maximum size, in situ moisture and deneity, plasticity, field test date Type of deposit or material, mineral composition, あきまき particle shape, comentation, colour, structures AFOLLAN SAND SAND, m.-f.gr., SPmoist, non plastic. Orange brown SANDY GRAVEI, LATERITE GRAVEL GW m.-f.gr., moist, Brown minor low plasticity. END HOLE 4.0m Excavation Method ... AUGER ... ENGINEERING GEOLOGY. 4 Sail Classification CW- Completely weathered System: Unified. Logged HW-Highly weathered () means Laboratory DD MW— Moderately weathered SW— Slightly weathered Classification. Operator..... Drawn FrSt-Fresh, with limonite stained joints Checked.

HOLE NO. NORTHERN TERRITORY GEOLOGICAL SURVEY CENTRAL ENGINEERING SERVICES GEOLOGICAL LOG Darwin - Alice Page CO-ORDINATES X.....m. PROJECT .. Springs . Rail SURFACE ELEVATION.....m. FEATURE Material Search Y. m. DIP..... BEARING..... HOLE SIZE 165mm TO: TO: TO: DATUM...... DEGREE OF WEATHERING DEPTHE LOG GEOLOGICAL DESCRIPTION DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL GROUP SAMPLE TESTS Type of deposit or material, mineral composition, あままま particle shape, cementation, colour, structures Group name, general maximum size, in situ maisture and density, plasticity, field test date AEOLIAN SAND SAND, m.-f.gr., moist.SP Orange brown non plastic. NODULAR GRAVEL SANDY GRAVEL Brown-white with m.-f.gr, minor low nodules possibly plasticity. calcrete. GRAVELLY CLAY GRAVELLY CLAY low CLBrown with weathered plasticity, 20% nodules weathered gravels. 4.5mEND HOLE Excavation Method ... AUGER.... ENGINEERING GEOLOGY. 4 Soil Classification Make..... CW- Completely weathered System: Unified. Logged Date HW-Highly weathered (___) means Laboratory MW- Moderately weathered DD.... Classification. SW-Slightly weathered Commenced . . FrSt-Fresh, with limonite stained joints Fr -- Fresh

HOLE NO. NORTHERN TERRITORY GEOLOGICAL SURVEY AH136 CENTRAL ENGINEERING SERVICES Page GEOLOGICAL LOG Darwin - Alice CO-ORDINATES X....m. PROJECT Springs Rail FEATURE Material Search DIP.,..... LOCATION .West .o.f. Lake Woodsystem BEARING...... HOLE SIZE 165mm TO: TO: DATUM...... DEGREE OF WEATHERING DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL GRAPHIC GEOLOGICAL DESCRIPTION GROUP SAMPLE TESTS Group name, general maximum size, in situ maisture and density, plasticity, field test date Type of deposit or material, mineral composition, particle shape, comentation, colour, structures LOG SAND, m.-f.gr., dry SP AEOLIAN SAND becoming moist, non plastic.

5.On	n IIII H EN D	HOTE:		
Excavation Method AUGER Make Type Operator Commenced Completed	WEATHERING. CW—Completely weathered HW—Highly weathered MW— Moderately weathered SW—Slightly weathered FrSt—Fresh, with limonite stained joint Fr — Fresh	& Soil Classification System: Unified. () means Laboratory Classification.	Charles	EOLOGY. Date

HOLE NO. NORTHERN TERRITORY GEOLOGICAL SURVEY CENTRAL ENGINEERING SERVICES GEOLOGICAL LOG Darwin - Alice Page of PROJECT Springs Rail $\label{eq:co-ordinates} \text{CO-ORDINATES} \begin{array}{c} X, \dots, m. \\ Y, \dots, m. \end{array}$ SURFACE ELEVATION.....m. FEATURE Material Search DIP..... LOCATION West of Lake Woodssystem..... BEARING..... HOLE SIZE 65mm TO: TO: DATUM...... DEGREE OF WEATHERING DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL GEOLOGICAL DESCRIPTION GRAPHIC GROUP SAMPLE TESTS Group name, general maximum size, in situ moisture and density, plasticity, field test date Type of deposit or meterial, mineral composition, スメラミュ particle shape, comentation, colour, structures LOG LATERITE GRAVEL GRAVELIE SAND. Brown m.-f.gr., 30-40% SFgravel, non plastic. 1.0m WY'S ROLL Excavation Method ... AUGRR..... WEATHERING. ENGINEERING GEOLOGY. & Soil Classification Make...... CW~ Completely weathered System: Unified, Logged Date HW- Highly weathered (_,) means Laboratory MW— Moderately weathered SW— Slightly weathered Operator.... Classification. FrSt-Fresh, with limonite stained joints Fr - Fresh Drawn . . . Completed

NORTHERN TERRITORY GEOLOGICAL SURVEY HOLE NO. CENTRAL ENGINEERING SERVICES AH138 GEOLOGICAL LOG Darwin - Alice Page CO-ORDINATES X.....m. PROJECT Springs Rail SURFACE ELEVATION......m. FEATURE Material Search DIP..... BEARING..... DATUM..... DEGREE OF WEATHERING GEOLOGICAL DESCRIPTION DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL Group name, general maximum size, in situ moisture and density, plasticity, field test date GROUP SAMPLE TESTS Type of deposit or material, mineral composition, particle shape, comentation, colour, structures LOG LATERITE GRAVEL GRAVELLY SAND, SW-Brown m.-f.gr., 30-40% gravels, non plastic SFas above SANDY GRAVEL. m.-f.gr., non plastic. 1.5mEND HOLE Excavation Method AUGER ... WEATHERING. ENGINEERING GEOLOGY, Soil Classification CW- Completely weathered System: Unified. HW-Highly weathered Logged (....) means Laboratory MW- Moderately weathered D.D. Classification. SW-Slightly weathered FrSt-Fresh, with limonite stained joints Fr - Fresh

CENTRAL ENGINEERING SERVICES

HOLE NO. AH139

Darwin - Alice

GEOLOGICAL LOG

Page	of

PROJECT. Springs . Rail FEATURE Material Search CO-ORDINATES X.....m. Y. m.

SURFACE ELEVATION.........m. DIP.......

BEARING......

LOCATION . West . of . Lake Woodsystem HOLE SIZE 165mm to: To: To: DATUM....................

DEGREE OF WEATHERING DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL GEOLOGICAL DESCRIPTION BORAPHIC GROUP SAMPLE TESTS Group name, general maximum size, in situ maisture and deneity, plasticity, field test date LOG Type of deposit or material, mineral composition, perticle shape, comentation, colour, structures AEOLIAN SAND SAND, m.-f.gr., dry SFnon plastic. Orange brown LATERITE GRAVEL SANDY GRAVEL. GW Brown f.-c.gr., non plastic. 4.0m END HOLE Excavation Method ...AUGER..... ENGINEERING GEOLOGY. & Soil Classification CW- Completely weathered System: Unified. Logged Date HW- Highly weathered Туре....... (___) means Laboratory DD MW— Moderately weathered SW— Slightly weathered Classification. Operator..... Drawn FrSt-Fresh, with limonite stained joints Checked . . .

HOLE NO. NORTHERN TERRITORY GEOLOGICAL SURVEY AH 140 CENTRAL ENGINEERING SERVICES Page of GEOLOGICAL LOG PROJECT DARWIN-ALICE SPRINGS RATIWAY CO-ORDINATES X m. SURFACE ELEVATION......m. FEATURE, MATERIALS, SEARCH... DIP...... LOCATION WEST, OF LAKEWOODS. BEARING.....

HOLE SIZETO:	7		DESCRIPTION AND ENGINEERING	PROPERTIE	S OF SOIL	è.
GEOLOGICAL DESCRIPTION of deposit or material, mineral composition ricia shape, commercian, colour, structures	DEGREE OF	DEPTINE LOG	Group name, general meximum size, in situ moisture and density, plasticity, field test date	SYMBOL*	SAMPLE YESTS NUMBER	WATE
AEOLIAN SAND Red brown			SAND mf.gr.,dry non plastic	, SP		
		2				
		3				
				ı	1 1	- 1

HW-Highly weathered MW- Moderately weathered SW-Slightly weathered (....) means Laboratory ρD. Classification. Drawn ... FrSt-Freeh, with limonite stained joints Fr — Freeh Checked, . . .

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CENTRAL ENGINEERING SERVICES

HOLE NO.

AH141

D	GEOLOGICAL LOG	Page o
Darwin - Alice	·· · -	SURFACE ELEVATIONm.
FEATURE Material Search	CO-ORDINATES X	DIP
LOCATION . West of Lake Woo	d gystem	BEARING
HOLE SIZE 165mmTo:	TO:	DATUM

HOLE SIZE 165mm to	TO:		TO:	TUM				
GEOLOGICAL DESCRIPTION	DEGREE OF WEATHERING	PORAPHIC	DESCRIPTION AND ENGINEERING PROPERTIES OF		S OF SO	L	85.5	
Type of deposit or material, mineral composition, particle shape, comentation, colour, structures	L. T. R. E. E. C. Medical	C LOG	Group name, general maximum size, in situ moisture and density, plasticity field test date	.	GROUP 4	SAMPLE NUMBER	TESTS	CEVE O
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CENTRAL ENGINEERING SERVICES

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FEATURE Material Search

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NORTHERN TERRITORY GEOLOGICAL SURVEY HOLE NO. CENTRAL ENGINEERING SERVICES AH 159 GEOLOGICAL LOG Page of SURFACE ELEVATION.....m. FEATURE MATERIALS SEARCH DIP..... LOCATION WEST OF LAKEWOODS. SYSTEM BEARING..... DATUM...... DEGREE OF WEATHERING GEOLOGICAL DESCRIPTION DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL Type of deposit or material, mineral composition, スラミュラ particle shape, cementation, colour, structures GROUP SAMPLE TESTS Group name, general maximum size, in situ moisture and density, plasticity, field test date LOG AEOLIAN SAND SAND, m.-f.gr.,dry, SP Red brown non plastic END HOLE Excavation Method A.U.G.E.R. . WEATHERING. ENGINEERING GEOLOGY. 4 Soil Classification CW- Completely weathered System: Unified. Logged Date HW-Highly weathered Туре

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FrSt-Fresh, with limonite stained joints

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Fr - Fresh

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CENTRAL ENGINEERING SERVICES

HOLE NO.

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		<u> </u>				
LATERITE GRAVEL Orange brown with high strength lateri particles	te	3 -	SANDY GRAVEL, mf.gr., dry, v.l. plasticity	GP- ow GW		-
3•5m			END HOLE STRATA CONTINUING			
		 				
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Excavation Method . R.A.C.K.H.O.E]	WEATHERIN	5				
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HOLE NO. NORTHERN TERRITORY GEOLOGICAL SURVEY T24 CENTRAL ENGINEERING SERVICES Page GEOLOGICAL LOG Darwin - Alice SURFACE ELEVATION......m. PROJECT Springs Rail FEATURE Material Search DIP....... LOCATION 231.6. km..... BEARING...... HOLE SIZE TO: TO: TO: DATUM...... GEOLOGICAL DESCRIPTION Type of deposit or meterial, mineral composition, particle shape, comentation, colour, structures DEPTION DEPTION DEPTION LOG DESCRIPTION AND ENGINEERING PROPERTIES OF SOIL GRAPHIC GROUP SAMPLE TESTS Group name, general maximum size, in situ moisture and density, plasticity, field test date SF SAND, m.-f.gr., AEOLIAN SAND dry, minor low Orange brown plasticity SANDY GRAVEL, LATERITE GRAVELS GT -Moist, minor low Brown with high GW strength laterite plasticity particles. 3.1mEND HOLE STRATA CONTINUING

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Excavation Method EACKHOE Aake Operator Commenced Completed	WEATHERING. CW- Completely weathered HW- Highly weathered MW- Moderately weathered	& Sail Classification System: Unified. () means Laboratory Classification.	ENGINEERING GEOLOGY. Logged Date		
	SW—Slightly weathered FrSt—Fresh, with limonite stained joints Fr—Fresh		Drawn		

CENTRAL ENGINEERING SERVICES

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Darwin - Alice PROJECT .. Springs .. Rail FEATURE Material Search GEOLOGICAL LOG

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Classification.

SW- Slightly weathered

FrSt-Fresh, with limonite stained joints

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LATERITE GRAVEL Brown		SANDY GRAVEL, mg.gr., low plasticity.	GW	-
STRATIFIELD LATERIT Brown weakly cement and weathered particles		SANDY GRAVEL, mf.gr., low plasticity	GW	-
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Excavation Method BACKHOE

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Type

Operator

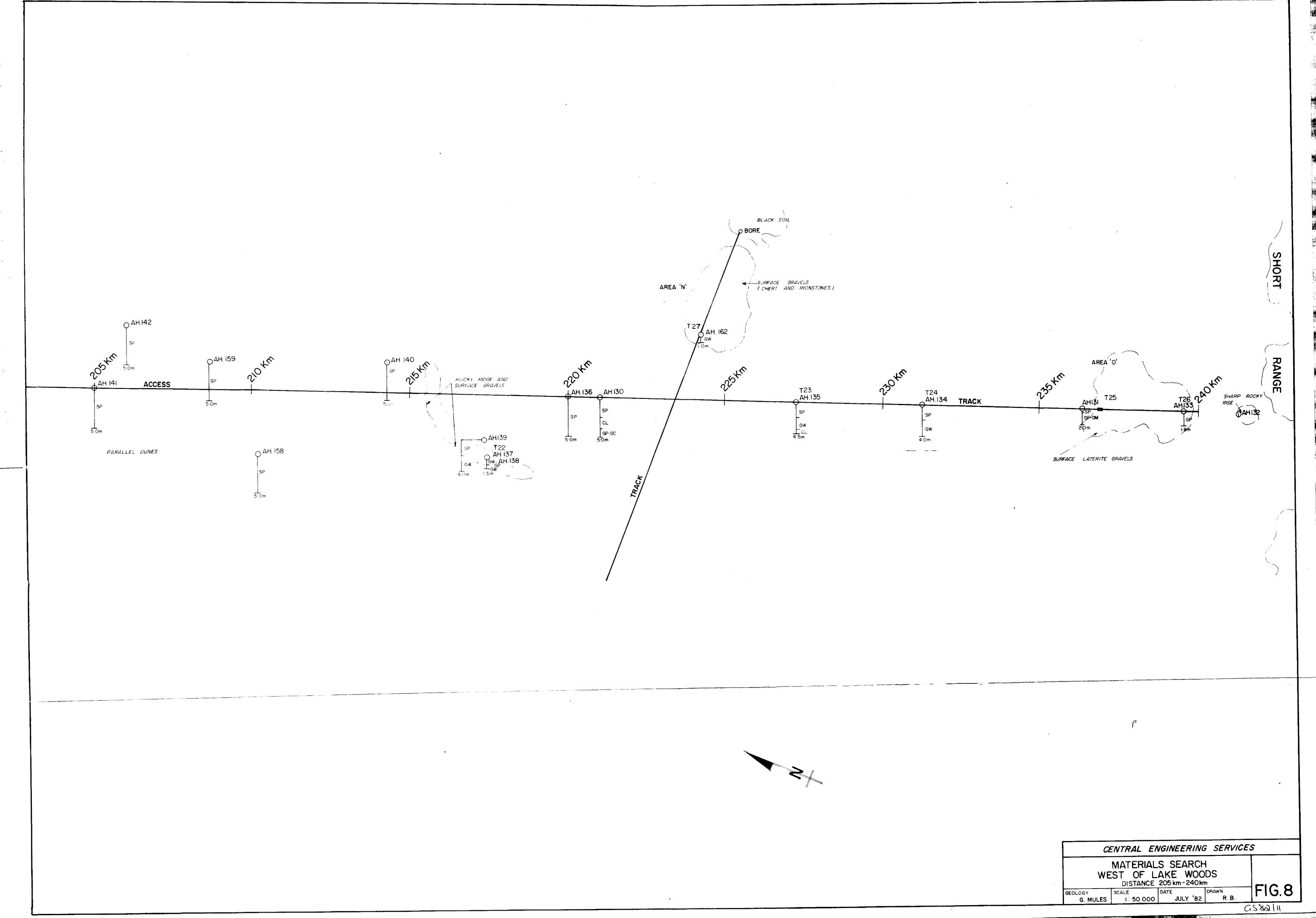
WEATHERING.
CW— Completely weathered
HW— Highly weathered
NW— Moderately weathered
SW— Slightly weathered
Fr8t— Freeh, with limonite steined joints

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DETAILED MATERIALS
INVESTIGATION FOR A
RAILWAY CORRIDOR
WEST OF LAKE WOODS,
NORTHERN TERRITORY.
VOLUME 1



CENTRAL ENGINEERING SERVICES

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ENGINEERING GEOLOGIST



GREG MULES

FOR
DEPARTMENT OF MINES
AND ENERGY.

Australian National

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- 2.0 REGIONAL SETTING
 - 2.1 Physiography
 - 2.2 Geology
- 3.0 INVESTIGATION TECHNIQUES
 - 3.1 Approach
 - 3.2 Method of Investigation
- 4.0 RESULTS OF INVESTIGATION
 - 4.1 Presentation
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 - 4.3 Borrow Areas
- 5.0 CONCLUSIONS AND RECOMMENDATIONS

VOLUME 2 : LOGS AND PLANS

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AREA 'F'

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FIG. 14.

FIG. 15.

FIG. 16.

FIG. 17.

FIG. 18.

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1.0 INTRODUCTION

At the request of the Geological Survey of the Northern Territory a materials search within a 15 km corridor west of Lake Woods, was commenced on 10th May, 1982. The Geological Survey was acting on behalf of Australian National Railways, the design and construction authority for the Darwin to Alice Springs Railway.

The search was to determine the availability of near-surface gravels which might be suitable as a selectfill zone for a railway enbankment constructed of surface sandy material. Available quantities were to be determined with some degree of certainty and representative bulk samples were required for testing.

The Geological Survey provided aerial photos at scale 1:50,000 from which a photomosaic was prepared. Also available were images from Landsat at scale 1:250,000, aerial photo interpretation maps (Mules, 1982) and a report on previous investigation (Soiltech, 1982).

This report presents the results of a 7 week field programme and tests carried out on 8 bulk samples.

2.0 REGIONAL SETTING

2.1 Physiography

The investigated corridor is some 240 km in length extending from the northern boundary of Newcastle Waters Station to the Short Range, and passing 25 km west of Lake Woods, Elliot . It lies within the sand dune terrain of the Tanami Desert which has encroached on black soil plains to the east and low rocky outcrop to the south and north, Fig. 1.

West of Lake Woods a dominating broad frontal dune transects the project area from west to north-east parallel to the Lake and is suggested to represent a paleo-shoreline of a lake which has since retreated to the east. (B.M.R., NEWCASTLE WATERS).

North of the dune, wind blown sand has piled into a gently undulating terrain covered by thick mulga scrub.

South of the dune, low longitudinal dunes and irregular transverse dunes are covered by wattle, eucalypts and spinifex. Low gravelly rises and rocky ridges outcrop further south on the flanks of the Ashburton and Short Ranges.

Black soil plains border Lake Woods and occur patchily on the eastern margin of the corridor and support growths of Mitchell and Flinders grass.

2.2 Geology

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The area has been mapped at scale 1:250 000 by workers of the Bureau of Mineral Resources (B.M.R.) with results and explanatory notes being published as the NEWCASTLE WATERS, SOUTH LAKE WOODS AND TENNANT CREEK sheets. These results have been condensed onto a composite sheet at scale 1:1,000,000 for the B.M.R. report on the WISO BASIN. A section of that sheet is presented as Fig. 1 of this report and was compiled by the Geological Survey.

This work shows the surface geology of the project area to be

predominantly superficial deposits of Quarternary aeolian sands (Qs) with isolated clay pans (Ql). In the southern section, distinctive outcrops of rocks of Proterozoic and Palaeozoic age have been mapped. Specifically these are sandstones, siltstones and conglomerates of the Tomkinson Creek Beds (Pt), the fossiliferous siltstones, cherts, silicified limestone and sandstones of the Gum Ridge Formation and tholeitic basalt, minor sandstone and breccia of the Helen Springs Volcanics.

The results of the present investigation and of previous aerial photo interpretation (Mules, 1982), support the B.M.R. mapping but adds more detail in the southern section where further outcrop and low gravelly rises have been identified, Figs. 6-8. Here extensive surface laterite gravels and isolated outcrops of rocks of the Tomkinson Creek Beds occur in sections previously mapped as aeolian sand.

Some areas in the north, previously identified as gravelly rises were remapped as distinctly coloured clayey sands.

Black soil plains (Czb) marginal to Lake Woods were noted to be covered by patchy superficial deposits of ironstone and sandstone gravels and cobbles.

3.0 INVESTIGATION TECHNIQUES

3.1 Approach

In the absence of surface expression of near-surface gravels a sample grid of approximately 5 km was decided upon. North of the dune previous investigations indicated no gravels within a depth of 3 m (Soiltech, 1982). Landsat images suggested calcrete at shallow depths south of the dune. This was supported by previous investigations. Areas to the south, where rock outcrops or is covered by a thin layer of sand, were outlined from Landsat images and aerial photo interpretation.

All targets were marked onto the aerial photo mosaic and tied into the sampling grid. Scout auger drilling to 5 m depth was carried out at these nominated sample points. Where substantial gravel stata were intercepted within potentially economic depths a surrounding pattern of a further 2 or 3 holes was drilled at 500 m spacings. Areas which continue to hold promise were then trenched using either excavator or backhoe to obtain a geological log and representative bulk sample of the strata.

Where gravels were abundant, such areas were explored approximately every 10 km to prove a minimum of 20,000 cu. metres in each area.

3.2 Method of Investigation

Surveying

The access track and all connecting tracks were accurately plotted onto the aerial photomosaics during a light aircraft reconnaissance.

From its northern end the track was pegged at 5 km intervals measured on a vehicle odometer. Auger locations marked on the aerial photos were measured for distance and bearings from known points on the track. Appropriate compass bearings were sighted and the required distance of traverse measured on a vehicle odometer.

Plotted locations of auger holes and trenches are considered accurate to within 300 m. In places, accuracy was improved where features were

clearly recognized on the aerial photos or where holes were located on the access track.

Scout Augering

Using an hydraulic drive Proline auger mounted on a Toyota four wheel drive fitted with puncture-proof types, the scout programme as outlined in Section 3.1, continued throughout the field period.

Holes of 165 mm diameter were drilled to 5 m depth or refusal. Some holes were continued to a depth of 6 metres. Each change of strata was measured, described and given a visual classification. No samples were taken during scout augering.

Trenching

Using a tracked John Deere 690 excavator and a John Deere 400 backhoe, a logging and sampling programme was undertaken in the last 3 weeks of the field period. At selected areas a trench was excavated to a depth that proved sufficient quantities of suitable gravel or to refusal. One or two holes were excavated in each area.

A log was made of the trenches and bulk samples selected to allow testing to provide results representative of materials within the region.

Testing

Testing was undertaken on 4 sand and 7 gravel samples in compliance with ASA standards and included Mechanical Analysis, determination of Atterberg Limits, Linear Shrinkage and Compaction Tests of 4 of the gravel samples.

Results are presented on standard forms in Vol. 1 of this report.

Tested soils have been classified in accordance with the Unified Soils Classification while more detailed descriptions are available from the relevant trench log or auger hole.

4.0 INVESTIGATION RESULTS

4.1 Presentation

The results of the investigation are presented as a combination of plans, logs, test results and area descriptions.

Plans at aerial photo scale show auger hole and trench locations and summarize visual classifications of intersected strata. These are presented in Vol. 2 as Figs. 2-8.

Logs of auger holes and trenches are presented in Vol. 2 as are results of tests carried out on representative sand and gravel samples.

Descriptions of selected areas proven to feasibility stage are presented in Section 4.3 and include plans of the investigation programme (Figs. 9-18).

4.2 Stratigraphy and Distribution

The distribution of shallow stratigraphic types can be conveniently divided into three sections. The northern section extends from 00 km to 75 km, the central section from 75 km to 140 km and the southern section from 140 km to 240 km and are described below.

The irregular dune terrain in the north typically has silty surface sands with sands of increased clay content and in situ density to depths greater than 5 m. The sequence thins to the north where, in places, calcrete and laterite strata occur at 3 to 5 metres depth. At the northern most end, rock and laterite gravels outcrop outside the project area.

The central section is confined by the frontal dune on the west and the black soil plains associated with Lake Woods on the east. The stratigraphic sequence is typically of loose surface sand grading into clayey sands above an apparently continuous deposit of weathered calcrete gravels. The upper surface of the calcrete layer is weathered to varying degrees, producing silty clays. Less weathered calcrete at depth, produce silty gravels with high strength particles.

Isolated occurrences of surface calcrete-ironstone gravel grade into nodular calcrete deposits showing varying degrees of weathering.

Approaching the southern area at 120 km, a typical stratigraphic section is of aeolian sand with an increasing (with depth) clay content and the development of weakly cemented ironstone nodules. Below this is a calcrete deposit with a highly weathered upper surface producing silty clays grading into high strength silty gravels.

The northern boundary of the southern section is marked by the appearance of dune sand covering weathered rock and corresponds with the southern-most occurrence of calcretes. The dune sand is generally uniform in nature to depths of 5 metres. Some increase in in situ density and clay content with depth, was noted in places.

Where rock outcrops, slopes may be covered by rocky gravel scree or nodular laterite gravels. The deposits are typically thin, grading into high strength rock or cemented laterite. Between rock outcrops, colluvial deposits of a sand, laterite and rocky gravel mix were noted. Such areas predominate south of a Trigonometric Station at 172 km.

4.2 Borrow Areas

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Plans at scale 1:10,000 are presented for each selected area, showing the investigation programme and summarizing the results.

Average depths to the top of the gravel deposits are indicated, as are assumed minimum thicknesses. The latter are usually taken as the maximum intersection obtained and assumes a near horizontal upper surface to the gravels.

Potential volumes have been calculated. The location of the areas are indicated by bearings and distances from points along access tracks.

AREA 'A' - DISTANCE 7 KILOMETERS

A very gently sloping area with no significant airphoto pattern. Prominent occurrence of patches of a medium height, small leafed mulga within the area.

Area 'A' is located 2.4 km west of the 7.2 km distance along the access track and is indicated on Fig. 2. Details of the investigation programme and summary results are shown on Fig. 9.

An area of 1,625,000 sq. m. was proven to feasibility stage with four auger holes (AH 10 \pm 13) and one trench (T1). With an average depth of 3.0 m of overburden and assuming a continuous gravel layer at least 2 m thick, the area could produce 3,250,000 cu. m. of gravelly material.

The gravels are a mix of silty sand and low to high strength weathered calcrete nodules grading into calcretes with nodules of a predominantly high strength. Some cemented sand concretions of low strength are present. Only minor low plasticity fines are indicated however breakdown of weathered calcrete may increase the percentage of fines.

Overburden consists of poorly sorted sands with medium-low plasticity fines and is of generally consistent thickness across the area.

AREA 'B' - DISTANCE 13 KILOMETERS

The area consists of broad depressions covered by light grey silty sand forming a distinct light coloured aerial photo pattern over an area of 2.5 sq. km. A distinctive vegetation association was noted.

Area 'B' is located on the access track at distance 13 km and is indicated on Fig. 2. Details of the investigation programme and summary results are shown on Fig. 10.

An area of 600,000 sq. m. was proven to feasibility stage with three auger holes (AH 23 - 25) and two trenches (T2 and T3). With an average depth of 2.9 m of overburden and assuming a continuous gravel layer at least 2.4 m thick, the area could produce 1,000,000 cu. m. of gravel.

The gravels are a mix of silty sands and low to high strength calcrete nodules grading into weathered calcretes with nodules of a predominantly high strength. Minor low plasticity fines are indicated however breakdown of weathered calcrete may increase the percentage of fines.

Overburden consists of silty sands with minor clays of low plasticity. T3 suggests that overburden may be thinnest in the eastern section of the area.

AREA 'C' - DISTANCE 68 KILOMETERS

This area was originally thought to contain gravels at depth, but follow-up trenching has proven unproductive. The intersection of dense material during scout augering suggested calcrete gravels may be present. The aerial photo pattern and the topography suggested a large area where groundwater levels are seasonally shallow. This was thought an ideal environment for calcrete deposition and with the prospect of finding gravels on the northern side of the steep dune a total of 3 trenches were excavated in this area (T4, T5, T6). These intersected dense to very dense mottled silty sands which may represent completely weathered calcretes but no high strength gravels were located. The investigation in this area is summarized in Fig. 11.

AREA 'D' - DISTANCE 75 KILOMETERS

Located at the windward toe of the frontal dune, the area comprises a series of low parallel dunes and interdune depressions. Typical vegetation is spinifex and scattered eucalypt trees.

Area D is located at 75 km on the eastern side of the track and is indicated on Fig. 3. Details of the investigation programme and summary results are shown on Fig. 12.

An area of 1 sq. km was proven to feasibility stage with four auger holes (AH 46, AH 54 - 56) and a backhoe trench (T7). With an average depth of 1.4 m of overburden and assuming a minimum thickness of 1.8 m, the area could produce 1,800,000 cu. m. of gravel.

The calcrete gravels are weathered at the top of the deposit producing a silty gravel with low strength nodules. Below 2.0 m however a less weathered material of higher strength is encountered with 30-40% of the gravel fraction being of medium strength or stronger.

Overburden consists of loose to medium dense sand grading into the silty weathered calcrete. Depths of overburden are considerably increased over low dunes (AH 54).

AREA 'E' - DISTANCE 80 KILOMETERS

A very gently undulating sandy terrain dominated by a spinifex and scattered eucalypt vegetation.

Area E is located on the track at 80 km and is indicated on Fig. 4. Details of the investigation programme and summary results are shown on Fig. 13.

An area of 80,000 sq. m. was proven to feasibility stage by one auger hole (AH 47) and two backhoe trenches (T8 and T9). With an average depth of 2.2 m of overburden and assuming a continuous gravel layer of 1.7 m minimum thickness, the area could produce 136,000 cu. m. of gravels.

The deposit is a silty gravel of medium to high strength nodular calcrete. There is little plasticity, as most of the fines are silts derived from the weathering of calcrete. The degree of weathering decreases with depth.

Overburden consists of loose to medium dense sand grading into silty sand above the gravel deposit. Thickness of sand overburden is uniform however depths to suitable gravel material may vary across the area.

AREA 'F' - DISTANCE 90 KILOMETERS

A flat terrain of spinifex and scattered eucalypt vegetation. Patches of medium grained surface gravels occur in this area and, increasingly so, to the east.

Area F is located 3.3 km east of the 90 km mark on the access track from Benaud Bore and is indicated on Fig. 4. Details of the investigation programme and summary results are shown on Fig. 14.

An area of 1 sq. km was proven to feasibility stage with 4 auger holes (AH 50 - 53) and one backhoe trench (T10). With an average depth of 0.9 m of overburden and assuming a continuous gravel layer of 1.9 m minimum thickness, this area could produce 1,900,000 cu. m. of gravelly material.

In general, the gravels are of medium to high strength weathered calcrete nodules with non-plastic sand and silt fines. In places, sandy surface gravels occur as medium to high strength nodular iron-stone considered to be derived from the underlying calcrete.

Overburden is thin consisting of loose to medium dense aeolian sand.

AREA 'G' - DISTANCE 98 KILOMETERS

A low ridge of surface gravels, sparsely grassed and supporting isolated eucalypt trees, is distinguishable on aerial photos from more densely vegetated surrounds.

Area G is located 4.6 km from the 95 km mark of the access track on a bearing of 110^{0} and is indicated on Fig. 4. Details of the investigation programme and summary results are shown on Fig. 15.

An area of 70,000 sq. m was proven to feasibility stage with one auger hole (AH 93) and two trenches (TII and TI2). With an average depth of 0.8 m of overburden and assuming a continuous layer of 2.6 m minimum thickness, this area could produce 1,820,000 cu. m. of gravelly material.

Surface and near surface sandy gravels are typically of medium to high strength nodular ironstone derived from high strength silty calcrete gravels at depth.

Overburden, where present, is of loose to dense aeolian sand.

Approximate area of surface gravels is 10,500 sq. m. Further similar deposits may be present on a north-south strike along this low ridge.

AREA 'H' - DISTANCE 115 KILOMETERS

A flat terrain of spinifex and scattered eucalypt trees with no significant aerial photo pattern.

Area H is located 3.4 km on a bearing of 067° from 115 km on the access track and is indicated on Fig. 5. Details of the investigation programme and summary results are shown on Fig. 16.

An area of 570,000 sq. m. was proven to feasibility stage with 3 auger holes (AH 103 - 105) and one backhoe trench (T15). With an average depth of 1.4 m of overburden and assuming a continuous gravel layer of 2.2 m minimum thickness, this area could produce 1,254,000 cu. m. of gravelly material.

The gravel is high to very high strength nodular calcrete with a percentage of silty sand and minor plastic fines.

Overburden is of loose to medium dense aeolian sand.

AREA 'I' - DISTANCE 130 KILOMETERS

A gently undulating dune terrain with patchy wattle growth and regrowth and isolated eucalypt trees, this area shows no significant aerial photo pattern.

Area I is located at 130 km on the access track and is indicated on Fig. 5. The investigation programme and summary results are shown on Fig. 17.

An area of 200,000 sq. m. was proven to feasibility stage with 3 auger holes (AH 113 - 115) and one backhoe trench (T14). With an average depth of 3.1 m of overburden and assuming a minimum gravel thickness of 1.2 m, this area could produce 240,000 cu. m. of gravel.

The stratigraphy appears consistent across the area with a surface layer of aeolian sand grading into a gravel of well rounded cemented sand nodules of low strength. Below this is a silty clay presumably developed from the weathering of high strength nodular calcrete gravels which occur deeper.

AREA 'J' - DISTANCE 137 KILOMETERS

A gently undulating dune terrain with patchy wattle and scattered eucalypt trees, this area also shows no significant aerial photo pattern.

Area J is located at 137 km on the access track and is indicated on Fig. 6 while the investigation programme and summary results are shown on Fig. 18. This is the most southerly intersection of calcrete gravels encountered during the investigation programme.

An area of 200,000 sq. m. was proven to feasibility stage with one auger hole (AH 117) and two trenches (T16 and T17). With an average depth of 1.0 m of overburden and assuming a minimum gravel thickness of 2.0 m this area could produce 400,000 cu. m. of gravelly material.

Beneath a layer of aeolian sand are nodular calcrete gravels of high strength, well graded and containing a high proportion of silty and low plastic fines.

AREA 'K' - DISTANCE 172 KILOMETERS

A distinctive trough between outcropping rock, the area supports stunted wattle and eucalypt and open grass with surface gravels. Surrounding terrain is sandy with tall wattle and eucalypt.

Area K is located 6 km west from the access track along the track towards the Trig. Station and is indicated on Fig. 7.

An area of 70,000 sq. m. of surface gravels was proven to feasibility stage with one backhoe trench (T20). A depth of 2 m of gravel was proven showing this area could produce up to 140,000 cu. m. of material.

The gravels are typically a mixture of colluvial pisolitic laterite gravels and angular quartzite cobbles of low to high strength.

Nearby rocky ridges demonstrate the abundance of in situ laterite and residual gravels, particularly on lower slopes. However, the natural sorting and mixing found in colluvial deposits make such areas better prospects for suitable gravels.

AREA 'L' - DISTANCE 177 KILOMETERS

Low rocky ridges and laterite rises covered by spinifex and grass with scattered eucalypt trees. The area forms two distinctive aerial photo patterns with a sharp boundary separating the Gum Ridge Formation and the Helen Springs Volcanics.

Located 1.8 km from 177 km on bearing 068⁰ the area is shown on Fig. 7. A surface extent in excess of 2 sq. km was observed and proven to feasibility stage with three auger holes (AH 155 - 157) A depth of 0.5 m was drilled to refusal indicating this area could produce in excess of 1,000,000 cu. m. With deep ripping this volume could be greatly increased.

The gravel is of high strength material of either lateritic or residual origin with low percentages of sandy fines with little plasticity. Pisolitic laterites appear to have developed in the Helen Springs Volcanics (AH 157) while angular chert, quartzite and ironstone gravels occur on the Gum Ridge Formation (Ah 155 - 156). Some reworking of the gravels is expected and colluvial deposits are likely to occur between the low gravelly rises.

AREA 'M' - DISTANCE 192.5 KILOMETERS

A low rise of surface gravels with spinifex and isolated eucalypts, the area was developed to feasibility stage with three auger holes 250 m apart (AH145 - 147). The area is shown on Fig. 7 and extends for in excess of 2 sq. km. With laterite gravels from the surface to 1.5 m, this area could provide in excess of 3,000,000 cu. m. of gravelly material.

The gravels, from the surface, are medium to high strength silty laterites with minor low plasticity fines.

AREA 'N' - DISTANCE 225 KILOMETERS

An extensive deposit of surface rocky gravels occurs along the track approaching a bore and black soil plains. The area was proven to feasibility stage with one auger hole (AH 162) and one trench (T27).

In excess of 2 sq. km and with a depth of 1.5 m the area could provide more than 3,000,000 cu. m. of gravelly material. The area is shown in Fig. 8.

The gravels consist of residual cherts and ironstone particles of high strength with a percentage of sand with minor plastic fines. Some larger cobbles are present.

AREA 'O' - DISTANCE 238 KILOMETERS

A low gravelly rise covered by wattle and spinifex forming a distinctive aerial photo pattern.

Area 0 is located predominantly east of distance 236 to 240 km flanking the Short Range and is indicated in Fig. 8.

An area in excess of 2.0 sq. km was noted on the ground and can be seen from aerial photos.

The area was proven to feasibility stage with two trenches (T25-26) and one auger hole (AH 133). . With a maximum intersection of 2 m from the surface, the area could produce in excess of 4,000,000 cu. m. of lateritic gravels.

The deposit grades from loose sandy gravels to a cemented laterite gravel which breaks out with difficulty. Break-down of sandy horizons produces a fine fraction of low plasticity.

5.0 CONCLUSIONS AND RECOMMENDATIONS

The results of the investigation demonstrate the general availability of high strength gravels within the corridor of study.

Deep, subsurface, calcrete gravels are available as far south as the 14 km distance. South of this and extending to the windward toe of the frontal dune at 75 km, a thick deposit of aeolian sand provides no prospect of suitable deposits of gravelly material.

South of the frontal dune, apparently continuous shallow subsurface and isolated surface calcrete occurs to 140 km. The degree of weathering of the calcretes is variable across the area and hence quality may be patchy. However, results indicated that deposits of high strength gravels were generally shallower in the eastern section of the corridor, bordering Lake Woods.

Beyond the calcretes to the Trig. Station at 172 km, a blanket of dune sand covers residual gravels at uneconomic depths.

Numerous laterite and residual gravels occur south from the Trig. Station and, in places, colluvial deposits of naturally mixed sand and gravel are available.

One section of thick dune sand occurs between 195 and 210 km, however surrounding surface deposits of gravel are abundant.

The quality of gravelly deposits varies throughout the project area both in particle gradings and strength as well as origin and composition.

The northern calcretes and those south of the frontal dune appear to be ancient deposits beneath a layer of aeolian sand and are presently undergoing degradation by chemical weathering. The high degree of weathering has reduced the particle strength and increased the percentage of fines in the upper layer of all calcrete deposits. Break down of weathered particles by wetting and mechanical impact was noted during testing. Less weathered calcretes develop gravels with high strength, coarse grained particles and low percent fines. Mixing of the entire calcrete strata should, in general, produce a graded gravel with low plastic fines which could be suitable as a protective selectfill.

The southern laterite and residual gravels are thin but occur extensively on the surface. They consist of medium to very high strength particles ranging from fine gravels to cobbles. Some breakdown of sandy laterites was noted during testing but plasticity and linear shrinkage are generally low (Lab. No. 158 and 160).

Deep ripping within these deposits will greatly increase the available volume and would be likely to produce gravels of increased particle strength but reduced fines.

The surface sandy material which is ubiquitous throughout the project area is a medium to fine grained, non plastic sand easilly worked and compacted. Plasticity generally increases with depth however, and below 1.5 m is a clay sand which has a moderately high shrinkage and may be difficult to work due to its sticky nature.

Except in the case of dune sands, the loose surface material was generally thin being underlain by medium dense to dense sands with considerable bearing capacity. Dune sands were noted to be very loose to medium dense where encountered.

Further investigations should attempt to more clearly define the physical characteristics of the various gravel types revealed by this study. In particular attempts could be made to test strata mixtures to obtain an optimal combination for the various stratigraphic sequences. The clayey sands may need to be mixed with silty surface sands and the upper weathered calcretes with deeper sections of the deposits in order to obtain materials which best satisfy design and construction specifications.

Borrow areas could be sampled in greater detail to more clearly define quantities, and variations in overburden depth. This is particularly so for the calcretes south of the dune where low sand dunes and a variable degree of weathering combine with an apparent thinning of overburden to the east to give scope for optimizing the economic recovery of gravel from that area by more detailed investigations.

The investigation has highlighted the value of using a buckettype excavator in support of a scout augering programme to allow an appreciation of the in situ nature of the deposits. Auger samples were sometimes proven unrepresentative of the in situ material and at times were unable to penetrate the upper surface of the calcrete gravels. The excavator trenches also gave an appreciation of the break-out effort required during excavation and of the workability of the excavated material.

REFERENCES

TENNANT CREEK, Explanatory notes, 1:250,000

Geological Series, B.M.R., 1978.

NEWCASTLE WATERS, Explanatory notes, 1:250,000 Geological Series, B.M.R. 1969.

SOUTH LAKE WOODS, Explanatory notes, 1:250,000 Geological Series, B.M.R.

MULES, G.J., Katherine - Tennant Creek Terrain Appraisal, 1982.

SOILTECH, Report on High Strength Embankment Material for Possible Railway Routes West of Lake Woods, Northern Territory, 1982.

PO Box 3370

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CENTRAL ENGINEERING SERVICES

51 Railway Terrace. Alice Springs N.T. ph. 525755 524092

REPORT OF FIELD DENSITY TEST RESULTS

10 Dept. of Mines & Energy

REPORT No:

820071

ATTENTION: R. Hindrichs

1. in accordance with your request dated

signed by

Field Density tests have

been carried out in accordance with AS 1289 83.1 using the sand replacement method 5 and case apparatus.

The density sand used passed 1.18mm and was retained on 600 mm sieves. Compaction testing was done to AS 1289 81.1 f 82.1. Dry density rotio was calculated to AS 1289 84.1..

2. The following information was supplied in connection with the samples.

CONTRACT NO:81/124

CONTRACTOR : Central Engineering

FEATURE: Materials Investigation

SAMPLED BY: D.D. & G.M

PROJECT: Lake Woods Corridor

LOCATION: a sketch is is not attached

DIAMETER OF HOLES:

(m m)

DATE SAMPLED:

3. The test results and details of locations are shown below.

Laboratory Reference No	CE82	157	158	159	160				
Project Reference No.						<u></u>			
Chainage									
Offset from centre-lin	ne (m)						ļ		
(5) sub 9 Material type (8) base o (F) fill	rade ourse								
Position from surface	(mm)								-
Stondard Modified Maxim Dry Density (Pd)	1um (t/m³)	2.36	1.77	1.98	2.14				
SSESSITE Modified Optime Moisture Content(wo)	ium (%)	8.0	3.0	12.0	8.0				
Field Dry Density(ft)	(t/m³)								
Moisture Content in Laboratory(#4)	(%)							-	
Moisture Variation (# _v)	(%)								<u> </u>
Dry Density Ratio(8 ₀)	(%)								

REMARKS

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Checked by

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for O.I.C. Materials Laboratory

2/8/1882

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524092

REPORT OF TEST RESULTS ON SOILS

Dept. of Mines & Energy

Report No.:

820071

Attention: R. Hinrichs

1. In accordance with your request dated

and signed by

the following tests have

been carried out to the methods specified by AS 1289-1977

2. The following information was supplied in connection with the samples

CONTRACT NO.: 81/124

PROJECT: Lake Woods Corridor

CONTRACTOR: Central Engineering FEATURE: Materials Investigation

LOCATION: Various MATERIAL TYPE: Various

SAMPLED BY: D.D. & G.M.

DATE SAMPLED:

3. Test results are set out below-

Laboratory Re	eference No.	C.E.82	157	158	159	160		ļ
Suppliers No.			T2	AH156	Т3	AH133		ļ
Chainage	Depth	m	5-3	-0.5		80 <u>2-1</u>	<u>.8</u>	<u> </u>
Repth	Chainage	Km	13	175	13	137		
		75·0 mm						
		63-0mm	100	100				<u> </u>
		37·5 mm	97	99	100			<u> </u>
		26·5 mm	92	94	97			<u> </u>
		19.0 mm	83	83	94	100		
441		13·2 mm	68	6 8	91	95		<u> </u>
Mechanical Analysis Percentage Passing		9-50 mm	55	57	89	87		
		6·70mm	43	50	87	75		<u> </u>
		4·75 mm	36	45	85	65		
A.S.Sieve	2·36mm	29	38	80	54			
	1·1 8mm	26	36	77	48 42			
		600µm	24	36	74	42		
		4 2 5µm	22	36	72	39		
		300µm	20	34_	67	34	<u> </u>	
		2 12µm						
		150µm	15	23	42	23		
		75µm	11	13	27	11		
Dust Ratio (7	/5 /425µm) %		48	37	38	29	<u> </u>	
	t (Standard 75% Berdiar) Me	ithod)	29	NO	31	NO		
Plastic Limi			15	NO	13	NO	ļ	_
Plasticity In			14	NP	18	NP	 _	
Linear Shrin	kage (%on 250mm mould)	7.0	0.5	8.0	1.5	 	
Determinatio	n of Soil Particle Density	ssing/ tained 2-36 mm/Combined				 	 	
Unified Soils Classification			GW-GC	GM	SC	SW-SM	-	
				1			<u> </u>	<u> </u>

REMARKS: All samples well-by sleved

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Prepared by K. McP.

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for OIC Materials Laboratory

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CENTRAL ENGINEERING SERVICES

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REPORT OF TEST RESULTS ON SOILS

Dept. of Mines & Energy

Report No.:

820071

Attention: R. Hinrichs

and signed by 1. In accordance with your request dated

the following tests have

been carried out to the methods specified by AS 1209-1977

2. The following information was supplied an connection with the samples

CONTRACT NO.: 81/124

PROJECT: Lake Woods Corridor

CONTRACTOR: Central Engineering

LOCATION: Various

FEATURE: Materials Investigation

Various Sand, Sand/clay MATERIAL TYPE:

SAMPLED BY: D.D. & G.M.

DATE SAMPLED:

3. Test results are set out below-

Laboratory Reference No.	C.E.82	161	162	163	164		
Suppliers No.		T 1	T11	Т6	Т9		
Chainage	km	7.2	98	75	80		
Depth	m I	.6− 3	0.3-1.	50-0.3	0.3-1.	5	
	75·0 mm						
	63-0mm						
	37.5 mm						ļ
	26·5 mm						
	19·0 mm			,,,,,			
Mechanical Analysis	13-2 mm						
Mechanical Analysis	9·50mm						<u> </u>
Percentage Passing	6·70mm						<u> </u>
Larcationa tossing	4·75 mm				<u> </u>	ļ	
A.S.Sieve	2·36 m m		100		100	<u> </u>	<u> </u>
W'772.6A.6	1·1 8mm	100	99		99		<u> </u>
	600µm	99	90	100	97	<u> </u>	ļ
	4 2 5µm	98_	80	98	92		
	300дт	92	69	91	82		
	212µm		<u> </u>			 	
	150µm	57_	45	47	51	 	
	75µm	- 39	25	34	28		
Dust Ratio (75/425µm)%		40	31	35_	30	 	
Liquid Limit(Standard/Subsidiary Metho	d)	30	27_	N.O.	23	 	
Plastic Limit		10	11	N.O.	10	 	+
Plasticity Index		20	16	N.P.	13=	 	+
Linear Shrinkage (%on 250mm mould)		9.0	8.0	0.5	5.5		
Determination of Soil Particle Density Retains	42-36mm/Combined			_	 	-	+
		ļ		 	 		
			1	<u> </u>	1		

REMARKS: All samples wer Mry stated

Prepared by: K. McP. Checked by:

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for OIC Materials Laboratory 2/9/1982

Distribution:

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CEMTRAL ENGINEERING SERVICES

\$kxBailmayxxTextex Alice Springs N.T. ph. \$2\$7\$5 524092

REPORT OF TEST RESULTS ON SOILS

Dept. of Mines & Energy

Report Na.:

×201171

Attention: R. Hinrichs

I. In accordance with your request dated

and signed by

the following tests have

been carried out to the methods specified by AS 1209-1977

2. The following information was supplied in connection with the samples

CONTRACT NO.: 81/124

PROJECT: Lake Woods Corridor

CONTRACTOR: Central Engineering FEATURE: Materials Investigation

LOCATION: Various

MATERIAL TYPE: Vario

Various Sand, Land/cla

SAMPLED BY: D.D. & G.M.

DATE SAMPLED:

3. Test results are set out ba'ow-

Laboratory Reference No.	L.82	161	162	163	164		<u> </u>
Suppliers No.		T 1	T11	T6	19		<u> </u>
Chainage	km	7.2	98	75	80		
Depth	m	1.6-3	0 <u>.3-1</u> .	50-0-3	0.3-1	5	
	75·0 mm						<u> </u>
	63-0mm						
	37·5 mm						↓
	26·5 mm						
	19·0 mm						
Mechanical Analysis	13·2 mm						
Mechanical Amerysis	9·50 mm			İ	<u> </u>		
Percentage Passing	6-70mm						
secounds torsing	4.75mm						
A.S.Sieve	2:36mm		100	·	100		
A.3.5.6VB	1-1 8mm	100	99		99		
	600дт	99	90	100	97		
	4 2 5µm	98	80	98	92	.,,	
	300дт	92	69	91	82		
	212µm				<u> </u>		
	150µm	57	45	47	51	<u> </u>	
	75µm	1	25	34	28		
Dust Ratio (75/425µm)%		40_	31_	35	30		
Liquid Limit(Standard/Subsidiary Method	1)	30	27	N.O.			
Plastic Limit		10	11	N.U.	10	ļ	+-
Plasticity Index		20	16	N.P.	13	 	
Linear Shrinkage (%on 250mm mould)		9.0	8.0	0.5	5.5	1	
Determination of Soil Particle Density Retains	42-36 mm/Combined		<u> </u>		 		
							
				<u> </u>		<u> </u>	i

REMARKS: All samples wet Mry sloved

Prepared by: K. McP.

Distribution:

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K. Mc Phance

for OIC Materials Laboratory
2/4/1982

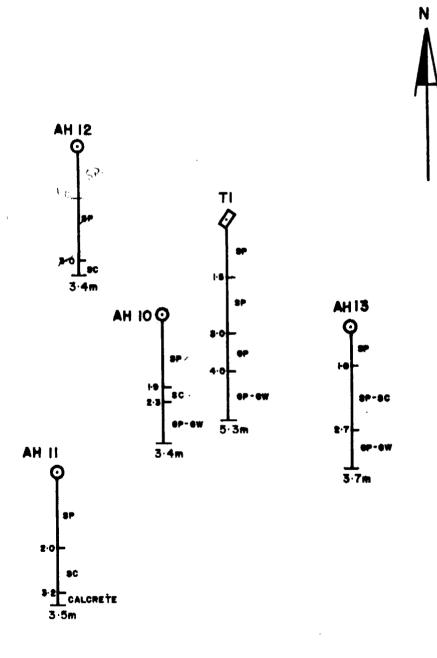
AREA = 1625 000m²

AVERAGE DEPTH = 3.0m

MINIMUM THICKNESS = 2.0m

VOLUME = 3 250 000m³

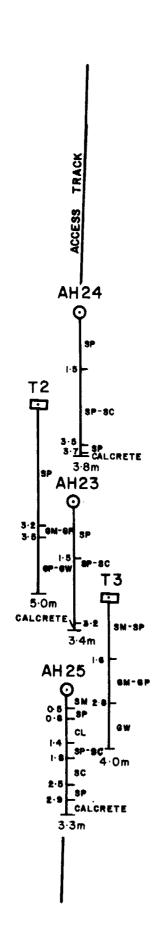
LOCATION = FROM 7.2 Km ON TRACK, BEARING 274° FOR 2.4 Km



AREA 'A'

FIG 9

SCALE 1:10000



AREA = 600 000 m²
AVERAGE DEPTH = 2.9 m
MINIMUM THICKNESS = 2.4 m
VOLUME = 1 440 000 m³

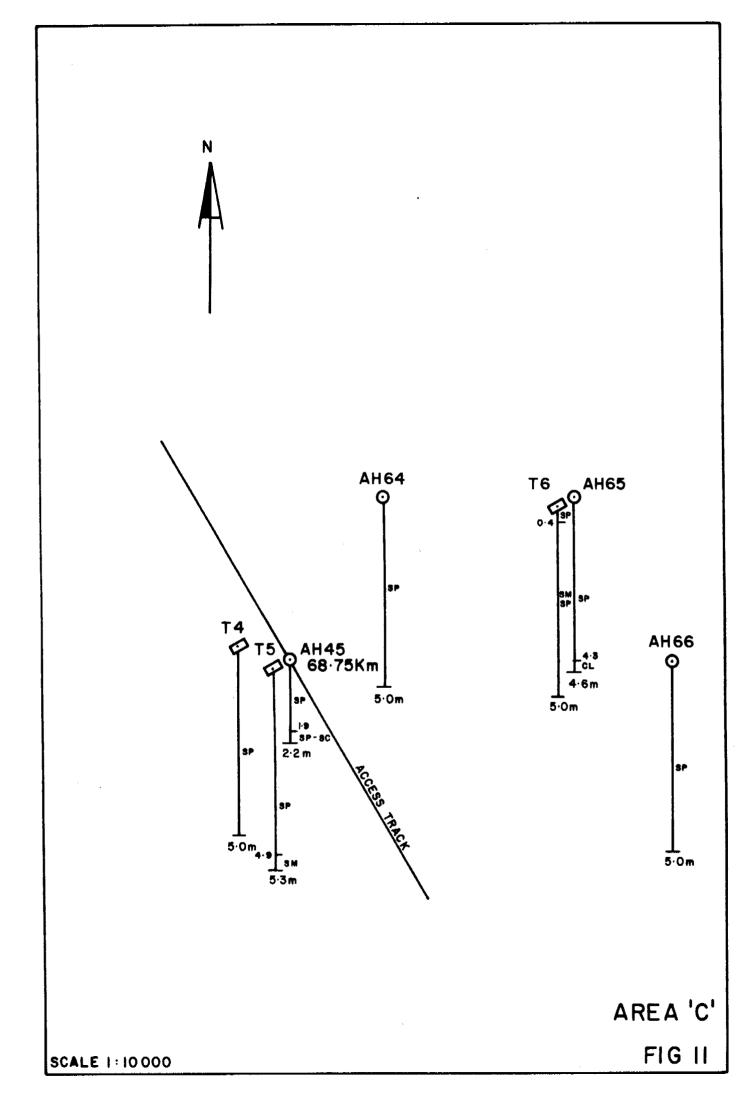
LOCATION = 13 Km ON TRACK

N A

AREA 'B'

FIG 10

SCALE 1:10000

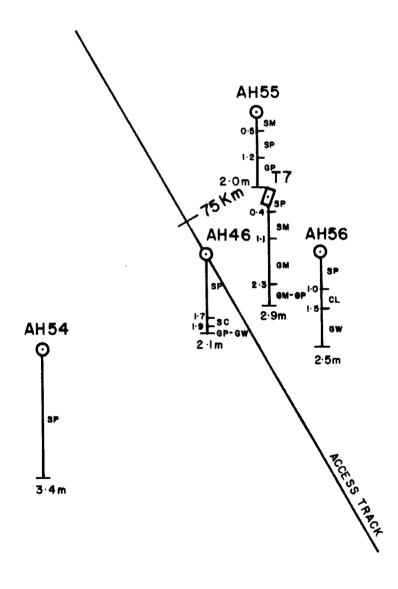




AREA = 1000 000 m²
AVE RAGE DEPTH = 1.4 m

MINIMUM THICKNESS = I-8 m VOLUME = I 800 000 m³

LOCATION = 75 Km ON TRACK



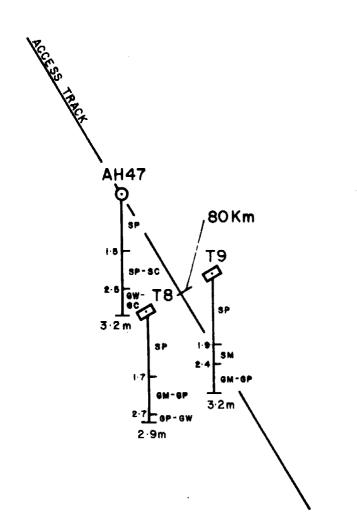
AREA 'D'

FIG 12

SCALE 1:10000

AREA = 80 000m²
AVERAGE DEPTH = 2·2 m
MINIMUM THICKNESS = 1·7m
VOLUME = 136 000 m³

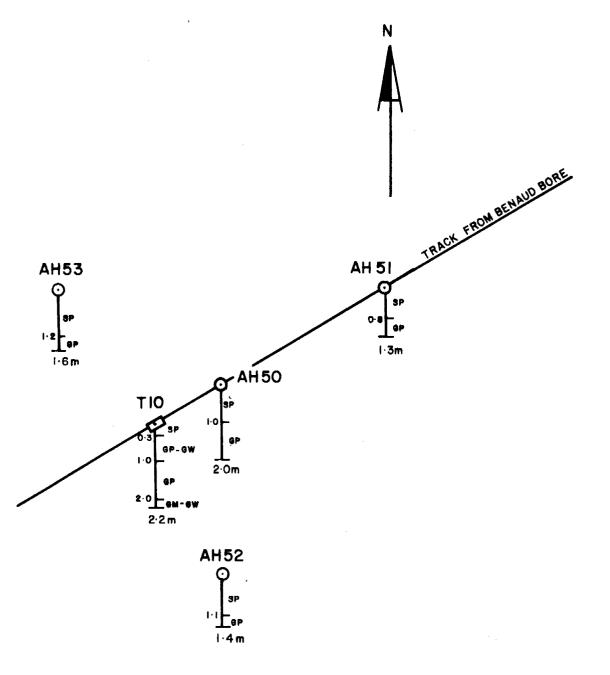
LOCATION = 80 Km ON TRACK



AREA 'E'

AREA = 1000 000m²
AVERAGE DEPTH = 0.9m
MINIMUM THICKNESS = 1.9m
VOLUME = 1900 000m³

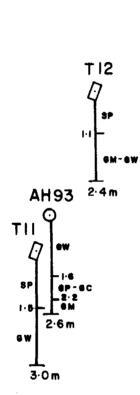
LOCATION = 3.3 Km EAST OF 90 Km ON TRACK TO BENAUD BORE



AREA 'F'

AREA = 70 000 m²
AVERAGE DEPTH = 0.8 m
MINIMUM THICKNESS = 2.6 m
VOLUME = 182 000 m³

LOCATION = FROM 95 Km ON MAIN TRACK BEARING 110° FOR 4.6 Km

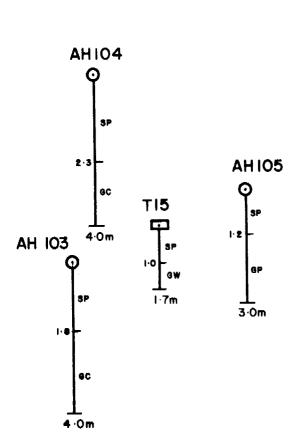


AREA 'G'

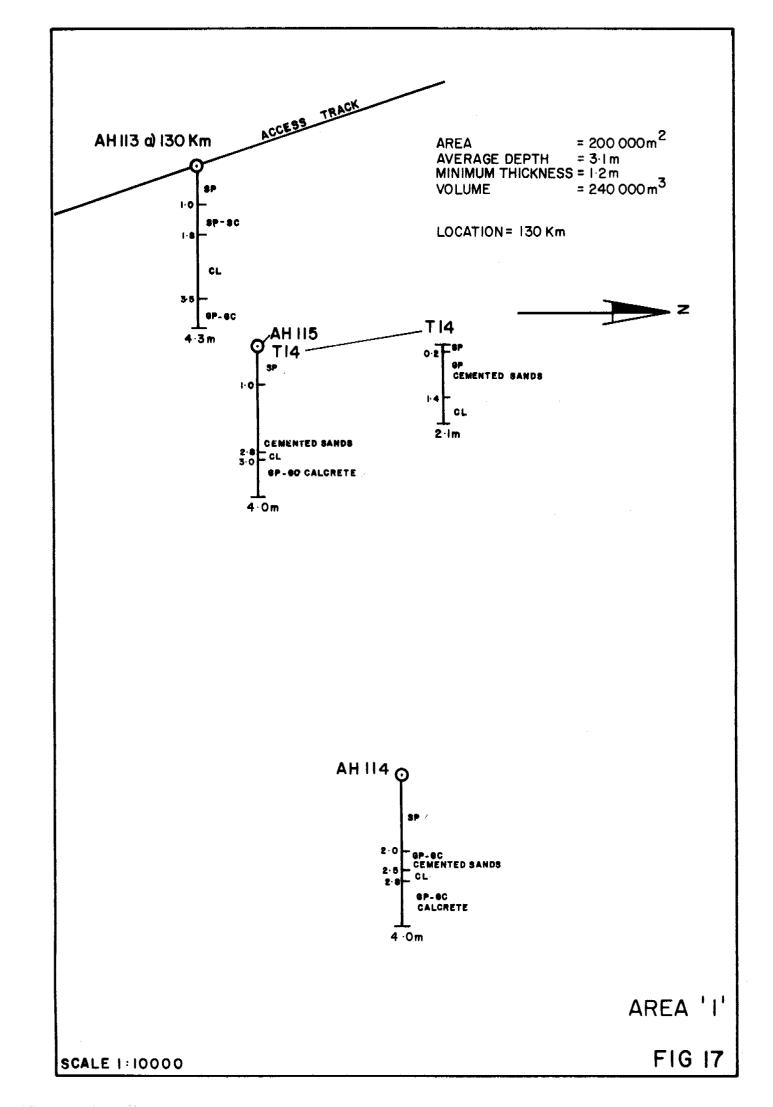
AREA = 570 000 m²
AVERAGE DEPTH = 1.4 m
MINIMUM THICKNESS = 2.2 m
VOLUME = 1254 000 m³

LOCATION = FROM 115 Km ON TRACK
BEARING 67° FOR 3.4 Km

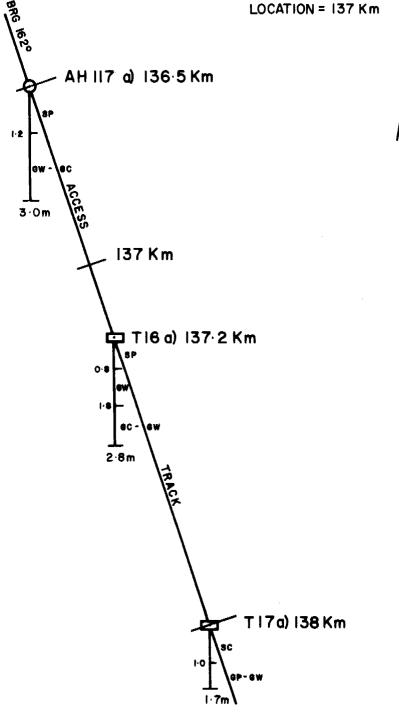




AREA 'H'



= 200 000 m² AREA AVERAGE DEPTH =I·Om MINIMUM THICKNESS = 2.0m $= 400000 \,\mathrm{m}^3$ VOLUME



AREA