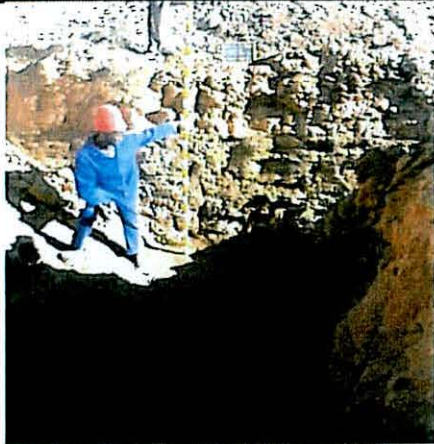




SUMMARY OF BORROW PIT RESULTS - REP COM 8

Client:	Aurecon	BP No:	4	GPS (X):	6514518.39
Project Name:	R27 W/Cape Border to Calvinia	TP No:	1	GPS (Y):	34J 361775.39
Project No:	106547	Section:	Section 8	Date:	
Job No:		Chainage:	Km 45.0	Test Methods:	TMH1 A1-A5 / A7 / A8
		Position:	RHS		



SAMPLE DESCRIPTION	Layer 1	Layer 2	Layer 3	Layer 4	Layer 5	Layer 6
Depth (mm)	0 - 600	600 - 1900				
		1900 > Refusal				
Lab No		1/327				

DESCRIPTIONS	
Layer 1	TOPSOIL
Layer 2	Br weath. Fine med dense to v dense Dolorite gravel
Layer 3	
Layer 4	
Layer 5	
Layer 6	

GRADING ANALYSIS						
% Passing Sieve	63.0 mm	No Sample				
	53.0 mm		100			
	37.5 mm		93			
	26.5 mm		84			
	19.0 mm		84			
	13.2 mm		80			
	4.75 mm		67			
	2.00 mm		47			
	0.425 mm		16			
0.075 mm	5					

GRADING MODULUS	
GM	2.32

ATTERBERG LIMITS	
Liquid Limit	
Plasticity Index	NP
Linear Shrinkage	0.0

MDD / OMC & CBR ANALYSIS	
Maximum Dry Density	2249
Optimum Moisture Content	6.5
In-situ Moisture Content	
In-situ Density (%)	
CBR @ 90%	36
CBR @ 93%	57
CBR @ 95%	76
CBR @ 98%	101
CBR @ 100%	122
% Swell (Max)	0.0

MATERIAL CLASSIFICATION	
COLTO Classification	G5

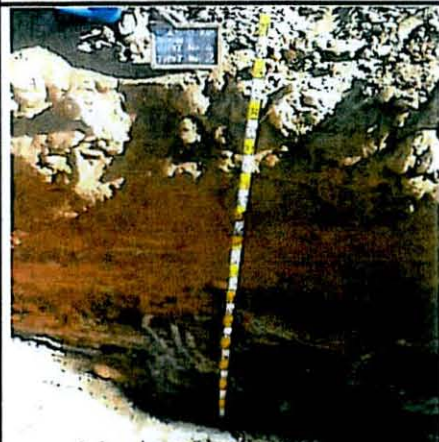
Remarks:

Everything possible is done to ensure that tests are representative and are performed accurately, and that reports and conclusions are quoted correctly. Geostrada or its officials can in no way be held liable for consequential damage or loss due to any errors in carrying out the tests, nor for any erroneous statement or opinion contained in a report based on such tests. If a test report is published or reproduced by the client, it will be done in full, without any omission.



SUMMARY OF BORROW PIT RESULTS - REP COM 8

Client:	Aurecon	BP No:	4	GPS (X):	6514516.95
Project Name:	R27 W/Cape Border to Calvinia	TP No:	2	GPS (Y):	34J 361859.97
Project No:	106547	Section:	Section 8	Date:	
Job No:		Chainage:	Km 45.0	Test Methods:	TMH1 A1-A5 / A7 / A8
		Position:	RHS		



SAMPLE DESCRIPTION	Layer 1	Layer 2	Layer 3	Layer 4	Layer 5	Layer 6
Depth (mm)	0 - 1200	1200 - 2300				
		2300 > Refusal				
Lab No		1/328				

DESCRIPTIONS

Layer Description	Layer 1	Layer 2	Layer 3	Layer 4	Layer 5	Layer 6
	TOPSOIL	Br weath. Fine med dense to v dense Dolorite gravel going over to soft rock dolorite				

GRADING ANALYSIS

% Passing Sieve						
	63.0 mm	No Sample	86			
53.0 mm	84					
37.5 mm	79					
26.5 mm	72					
19.0 mm	66					
13.2 mm	61					
4.75 mm	39					
2.00 mm	24					
0.425 mm	11					
0.075 mm	5					

GRADING MODULUS

GM	2.60			
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ATTERBERG LIMITS

	19			
	7			
	2.5			

Maximum Dry Density				
Optimum Moisture Content				
In-situ Moisture Content				
In-situ Density (%)				
CBR @ 90%				
CBR @ 93%				
CBR @ 95%				
CBR @ 98%				
CBR @ 100%				
% Swell (Max)				

MATERIAL CLASSIFICATION

COLTO Classification				
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Remarks.



SUMMARY OF BORROW PIT RESULTS - REP COM 8

Client:	Aurecon	BP No:	4	GPS (X):	6514517.13
Project Name:	R27 W/Cape Border to Calvinia	TP No:	3	GPS (Y):	34J 361944.72
Project No:	106547	Section:	Section 8	Date:	
Job No:		Chainage:	Km 45.0	Test Methods:	TMH1 A1-A5 / A7 / A8
		Position:	RHS		



SAMPLE DESCRIPTION	Layer 1	Layer 2	Layer 3	Layer 4	Layer 5	Layer 6
Depth (mm)	0 - 300	300 - 3300				
		3300 > Too Dense				
Lab No		1/329				

DESCRIPTIONS

Layer Description	Layer 1	Layer 2	Layer 3	Layer 4	Layer 5	Layer 6
	TOPSOIL					
		Br weath. Fine med dense to dense Dolorite gravel & slight Boulders				

GRADING ANALYSIS

% Passing Sieve						
	63.0 mm	No Sample	100			
53.0 mm	93					
37.5 mm	88					
26.5 mm	84					
19.0 mm	81					
13.2 mm	78					
4.75 mm	50					
2.00 mm	45					
0.425 mm	11					
0.075 mm	3					

GRADING MODULUS

GM		2.41			
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ATTERBERG LIMITS

Liquid Limit					
Plasticity Index		NP			
Linear Shrinkage		0.0			

MDD / OMC & CBR ANALYSIS

Maximum Dry Density		2055			
Optimum Moisture Content		8.8			
In-situ Moisture Content					
In-situ Density (%)					
CBR @ 90%		18			
CBR @ 93%		21			
CBR @ 95%		23			
CBR @ 98%		41			
CBR @ 100%		66			
% Swell (Max)		0.1			

MATERIAL CLASSIFICATION

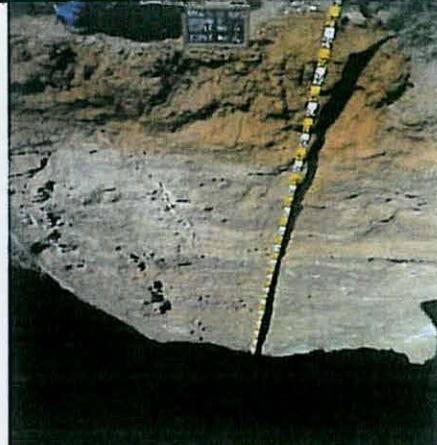
COLTO Classification		G7			
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Remarks:



SUMMARY OF BORROW PIT RESULTS - REP COM 8

Client:	Aurecon	BP No:	4		
Project Name:	R27 W/Cape Border to Calvinia	TP No:	4	GPS (X):	6514516.69
Project No:	106547	Section:	Section 8	GPS (Y):	34J 362026.88
Job No:		Chainage:	Km 45.0	Date:	
		Position:	RHS	Test Methods:	TMH1 A1-A5 / A7 / A8



SAMPLE DESCRIPTION	Layer 1	Layer 2	Layer 3	Layer 4	Layer 5	Layer 6
Depth (mm)	0 - 500	500 - 3600				
		3600 > Too Dense				
Lab No		1/330				

DESCRIPTIONS

Layer Description	Layer 1	Layer 2	Layer 3	Layer 4	Layer 5	Layer 6
	TOPSOIL					
		Br weath. Fine med dense to dense Dolorite gravel & slight Boulders				

GRADING ANALYSIS

% Passing Sieve						
	63.0 mm	No Sample	89			
53.0 mm	87					
37.5 mm	85					
26.5 mm	81					
19.0 mm	79					
13.2 mm	75					
4.75 mm	63					
2.00 mm	47					
0.425 mm	17					
0.075 mm	5					

GRADING MODULUS

GM		2.31			
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ATTERBERG LIMITS

Liquid Limit					
Plasticity Index		NP			
Linear Shrinkage		0.0			

MDD / OMC & CBR ANALYSIS

Maximum Dry Density					
Optimum Moisture Content					
In-situ Moisture Content					
In-situ Density (%)					
CBR @ 90%					
CBR @ 93%					
CBR @ 95%					
CBR @ 98%					
CBR @ 100%					
% Swell (Max)					

MATERIAL CLASSIFICATION

COLTO Classification					
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Remarks:

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SUMMARY OF BORROW PIT RESULTS - REP COM 8

Client:	Aurecon	BP No:	4	GPS (X):	6514430.82
Project Name:	R27 W/Cape Border to Calvinia	TP No:	5	GPS (Y):	34J 362025.52
Project No:	106547	Section:	Section 8	Date:	
Job No:		Chainage:	Km 45.0	Test Methods:	TMH1 A1-A5 / A7 / A8
		Position:	RHS		



SAMPLE DESCRIPTION	Layer 1	Layer 2	Layer 3	Layer 4	Layer 5	Layer 6
Depth (mm)	0 - 700	700 - 4300				
		4300 > Too Dense				
Lab No		1/331				

DESCRIPTIONS

Layer Description	Layer 1	Layer 2	Layer 3	Layer 4	Layer 5	Layer 6
	TOPSOIL					
		Br weath. Sl. Calcareous med dense to dense fine Dolomite gravel				

GRADING ANALYSIS

% Passing Sieve	Sieve Size		No Sample	Grading Data						
	mm	mm		100						
	63.0	mm								
	53.0	mm		100						
	37.5	mm		91						
	26.5	mm		87						
	19.0	mm		83						
	13.2	mm		80						
	4.75	mm		71						
	2.00	mm		54						
	0.425	mm		19						
	0.075	mm		6						

GRADING MODULUS

GM		2.21			
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ATTERBERG LIMITS

Liquid Limit					
Plasticity Index		NP			
Linear Shrinkage		0.0			

MDD / OMC & CBR ANALYSIS

Maximum Dry Density		1987			
Optimum Moisture Content		9.4			
In-situ Moisture Content					
In-situ Density (%)					
CBR @ 90%		19			
CBR @ 93%		29			
CBR @ 95%		40			
CBR @ 98%		61			
CBR @ 100%		82			
% Swell (Max)		0.1			

MATERIAL CLASSIFICATION

COLTO Classification		G6			
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Remarks:



SUMMARY OF BORROW PIT RESULTS - REP COM 8

Client:	Aurecon	BP No:	4	
Project Name:	R27 W/Cape Border to Calvinia	TP No:	6	GPS (X): 6514436.44
Project No:	106547	Section:	Section 8	GPS (Y): 34J 361945.7
Job No:		Chainage:	Km 45.0	Date:
		Position:	RHS	Test Methods: TMH1 A1-A5 / A7 / A8



SAMPLE DESCRIPTION	Layer 1	Layer 2	Layer 3	Layer 4	Layer 5	Layer 6
Depth (mm)	0 - 800	800 - 3200				
Lab No		3200 > Too Dense				

DESCRIPTIONS	
Layer 1	TOPSOIL
Layer 2	Br weath. Sl. Calcareous med dense to dense fine Dolomite gravel
Layer 3	
Layer 4	
Layer 5	
Layer 6	

GRADING ANALYSIS						
% Passing Sieve	63.0 mm	No Sample	84			
	53.0 mm		76			
	37.5 mm		73			
	26.5 mm		69			
	19.0 mm		64			
	13.2 mm		60			
	4.75 mm		49			
	2.00 mm		36			
	0.425 mm		13			
0.075 mm	4					

GRADING MODULUS	
GM	2.47

ATTERBERG LIMITS	
Liquid Limit	26
Plasticity Index	8
Linear Shrinkage	3.0

MDD / OMC & CBR ANALYSIS	
Maximum Dry Density	
Optimum Moisture Content	
In-situ Moisture Content	
In-situ Density (%)	
CBR @ 90%	
CBR @ 93%	
CBR @ 95%	
CBR @ 98%	
CBR @ 100%	
% Swell (Max)	

MATERIAL CLASSIFICATION	
COLTO Classification	

Remarks:

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SUMMARY OF BORROW PIT RESULTS - REP COM 8

Client:	Aurecon	BP No:	4	GPS (X):	6514434.54
Project Name:	R27 W/Cape Border to Calvinia	TP No:	7	GPS (Y):	34J 361860.65
Project No:	106547	Section:	Section 8	Date:	
Job No:		Chainage:	Km 45.0	Test Methods:	TMH1 A1-A5 / A7 / A8
		Position:	RHS		



SAMPLE DESCRIPTION	Layer 1	Layer 2	Layer 3	Layer 4	Layer 5	Layer 6
Depth (mm)	0 - 100	100 - 2200				
Lab No		2200 > Too Dense 1/333 A				

DESCRIPTIONS

Layer Description	Layer 1	Layer 2	Layer 3	Layer 4	Layer 5	Layer 6
	TOPSOIL	Br weath. Fine med dense to dense Dolorite gravel				

GRADING ANALYSIS

% Passing Sieve	No Sample					
	63.0 mm		100			
53.0 mm		100				
37.5 mm		100				
26.5 mm		95				
19.0 mm		91				
13.2 mm		85				
4.75 mm		70				
2.00 mm		51				
0.425 mm		17				
0.075 mm		4				

GRADING MODULUS

GM		2.28			
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ATTERBERG LIMITS

Liquid Limit					
Plasticity Index		NP			
Linear Shrinkage		0.0			

MDD / OMC & CBR ANALYSIS

Maximum Dry Density		2235			
Optimum Moisture Content		8.1			
In-situ Moisture Content					
In-situ Density (%)					
CBR @ 90%		18			
CBR @ 93%		23			
CBR @ 95%		28			
CBR @ 98%		46			
CBR @ 100%		66			
% Swell (Max)		0.0			

MATERIAL CLASSIFICATION

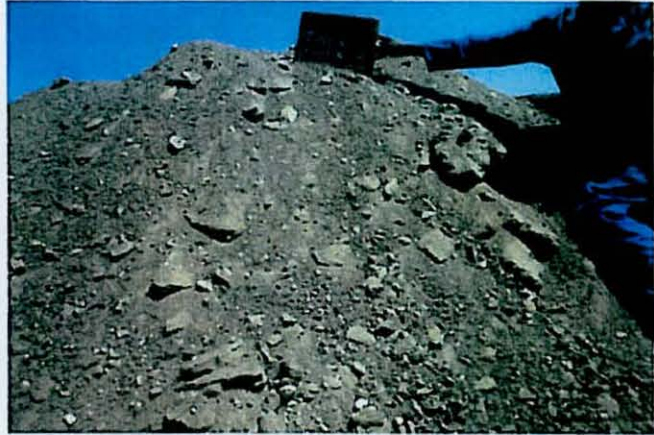
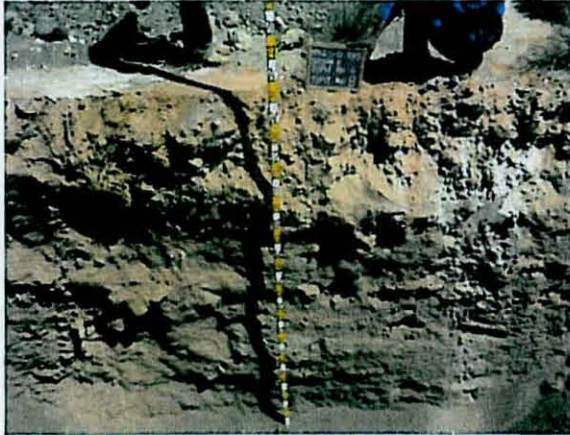
COLTO Classification		G6			
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Remarks:



SUMMARY OF BORROW PIT RESULTS - REP COM 8

Client:	Aurecon	BP No:	4
Project Name:	R27 W/Cape Border to Calvinia	TP No:	8
Project No:	106547	Section:	Section 8
Job No:		Chainage:	Km 45.0
		Position:	RHS
		GPS (X):	6514436.33
		GPS (Y):	34J 361781.81
		Date:	
		Test Methods:	TMH1 A1-A5 / A7 / A8



SAMPLE DESCRIPTION	Layer 1	Layer 2	Layer 3	Layer 4	Layer 5	Layer 6
Depth (mm)	0 - 800	800 - 2500				
		2500 > Refusal				
Lab No		1/334				

DESCRIPTIONS		
Layer Description	Layer 1	TOPSOIL
	Layer 2	Br weath. Sl. Calcareous med dense to v dense fine Dolomite gravel
	Layer 3	
	Layer 4	
	Layer 5	
	Layer 6	

GRADING ANALYSIS			
% Passing Sieve	63.0 mm	No Sample	
	53.0 mm		100
	37.5 mm		97
	26.5 mm		93
	19.0 mm		89
	13.2 mm		86
	4.75 mm		81
	2.00 mm		63
	0.425 mm		21
	0.075 mm		5

GRADING MODULUS			
GM		2.11	

ATTERBERG LIMITS			
Liquid Limit			
Plasticity Index		NP	
Linear Shrinkage		0.0	

MDD / OMC & CBR ANALYSIS			
Maximum Dry Density			
Optimum Moisture Content			
In-situ Moisture Content			
In-situ Density (%)			
CBR @ 90%			
CBR @ 93%			
CBR @ 95%			
CBR @ 98%			
CBR @ 100%			
% Swell (Max)			

MATERIAL CLASSIFICATION			
COLTO Classification			

Remarks:

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SUMMARY OF BORROW PIT RESULTS - REP COM 8

Client:	Aurecon	BP No:	4	GPS (X):	6514379.5
Project Name:	R27 W/Cape Border to Calvinia	TP No:	9	GPS (Y):	34J 361776.05
Project No:	106547	Section:	Section 8	Date:	
Job No:		Chainage:	Km 45.0	Test Methods:	TMH1 A1-A5 / A7 / A8
		Position:	RHS		



SAMPLE DESCRIPTION	Layer 1	Layer 2	Layer 3	Layer 4	Layer 5	Layer 6
Depth (mm)	0 - 700	700 - 3300				
		3300 > Refusal				
Lab No		1/335				

DESCRIPTIONS

Layer Description	Layer 1	Layer 2	Layer 3	Layer 4	Layer 5	Layer 6
	TOPSOIL	Br weath. med dense to v dense fine Dolorite gravel				

GRADING ANALYSIS

% Passing Sieve	Sieve Size		No Sample	Layer 1	Layer 2	Layer 3	Layer 4	Layer 5	Layer 6
	mm	mm							
	63.0								
	53.0								
	37.5		100						
	26.5		91						
	19.0		84						
	13.2		79						
	4.75		65						
	2.00		48						
	0.425		15						
	0.075		4						

GRADING MODULUS

GM		2.33							
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ATTERBERG LIMITS

Liquid Limit									
Plasticity Index			NP						
Linear Shrinkage			0.0						

MDD / OMC & CBR ANALYSIS

Maximum Dry Density		2196							
Optimum Moisture Content		8.4							
In-situ Moisture Content									
In-situ Density (%)									
CBR @ 90%		22							
CBR @ 93%		38							
CBR @ 95%		47							
CBR @ 98%		52							
CBR @ 100%		56							
% Swell (Max)		0.0							

MATERIAL CLASSIFICATION

COLTO Classification		G5							
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Remarks:



SUMMARY OF BORROW PIT RESULTS - REP COM 8

Client: Aurecon	BP No: 4	GPS (X): 6514382.79
Project Name: R27 W/Cape Border to Calvinia	TP No: 10	GPS (Y): 34J 361861.04
Project No: 106547	Section: Section 8	Date:
Job No:	Chainage: Km 45.0	Test Methods: TMH1 A1-A5 / A7 / A8
	Position: RHS	



SAMPLE DESCRIPTION	Layer 1	Layer 2	Layer 3	Layer 4	Layer 5	Layer 6
Depth (mm)	0 - 600	600 - 3400				
Lab No		3400 > Refusal				

DESCRIPTIONS	
Layer 1	TOPSOIL
Layer 2	Br weath. med dense to v dense fine Dolorite gravel
Layer 3	
Layer 4	
Layer 5	
Layer 6	

GRADING ANALYSIS						
% Passing Sieve	63.0 mm	No Sample	100			
	53.0 mm		100			
	37.5 mm		89			
	26.5 mm		80			
	19.0 mm		74			
	13.2 mm		70			
	4.75 mm		53			
	2.00 mm		33			
	0.425 mm		11			
0.075 mm	3					

GRADING MODULUS	
GM	2.53

ATTERBERG LIMITS	
Liquid Limit	
Plasticity Index	NP
Linear Shrinkage	0.0

MDD / OMC & CBR ANALYSIS	
Maximum Dry Density	
Optimum Moisture Content	
In-situ Moisture Content	
In-situ Density (%)	
CBR @ 90%	
CBR @ 93%	
CBR @ 95%	
CBR @ 98%	
CBR @ 100%	
% Swell (Max)	

MATERIAL CLASSIFICATION	
COLTO Classification	

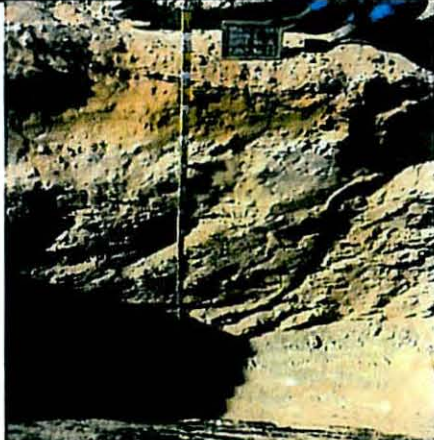
Remarks:

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SUMMARY OF BORROW PIT RESULTS - REP COM 8

Client:	Aurecon	BP No:	4		
Project Name:	R27 W/Cape Border to Calvinia	TP No:	11	GPS (X):	6514380.94
Project No:	106547	Section:	Section 8	GPS (Y):	34J 361943.49
Job No:		Chainage:	Km 45.0	Date:	
		Position:	RHS	Test Methods:	TMH1 A1-A5 / A7 / A8



SAMPLE DESCRIPTION	Layer 1	Layer 2	Layer 3	Layer 4	Layer 5	Layer 6
Depth (mm)	0 - 500	500 - 2900				
Lab No		2900 > Too Dense 1/337 A				

DESCRIPTIONS

Layer Description	Layer 1	Layer 2	Layer 3	Layer 4	Layer 5	Layer 6
	TOPSOIL	Br weath. med dense to v dense fine Dolorite gravel				

GRADING ANALYSIS

% Passing Sieve	Sieve Size		No Sample	Layer 1	Layer 2	Layer 3	Layer 4	Layer 5	Layer 6
	mm	mm							
	63.0								
	53.0								
	37.5		100						
	26.5		92						
	19.0		91						
	13.2		87						
	4.75		68						
	2.00		45						
	0.425		14						
	0.075		4						

GRADING MODULUS

GM		2.37							
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ATTERBERG LIMITS

Liquid Limit									
Plasticity Index		NP							
Linear Shrinkage		0.0							

MDD / OMC & CBR ANALYSIS

Maximum Dry Density		2124							
Optimum Moisture Content		8.5							
In-situ Moisture Content									
In-situ Density (%)									
CBR @ 90%		19							
CBR @ 93%		28							
CBR @ 95%		37							
CBR @ 98%		52							
CBR @ 100%		66							
% Swell (Max)		0.0							

MATERIAL CLASSIFICATION

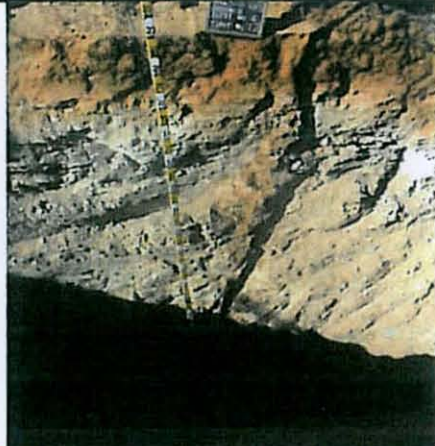
COLTO Classification		G6							
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Remarks:



SUMMARY OF BORROW PIT RESULTS - REP COM 8

Client:	Aurecon	BP No:	4	GPS (X):	6514374.64
Project Name:	R27 W/Cape Border to Calvinia	TP No:	12	GPS (Y):	34J 362024.18
Project No:	106547	Section:	Section 8	Date:	
Job No:		Chainage:	Km 45.0	Test Methods:	TMH1 A1-A5 / A7 / A8
		Position:	RHS		



SAMPLE DESCRIPTION	Layer 1	Layer 2	Layer 3	Layer 4	Layer 5	Layer 6
Depth (mm)	0 - 500	500 - 3200				
		3200 > Too Dense				
Lab No		1/338				

DESCRIPTIONS	
Layer 1	TOPSOIL
Layer 2	Br weath. med dense to v dense fine Dolorite gravel
Layer 3	
Layer 4	
Layer 5	
Layer 6	

GRADING ANALYSIS						
% Passing Sieve	63.0 mm	No Sample	85			
	53.0 mm		7			
	37.5 mm		85			
	28.5 mm		84			
	19.0 mm		71			
	13.2 mm		67			
	4.75 mm		55			
	2.00 mm		40			
	0.425 mm		16			
0.075 mm	6					

GRADING MODULUS	
GM	2.38

ATTERBERG LIMITS	
Liquid Limit	23
Plasticity Index	6
Linear Shrinkage	2.0

MDD / OMC & CBR ANALYSIS	
Maximum Dry Density	
Optimum Moisture Content	
In-situ Moisture Content	
In-situ Density (%)	
CBR @ 90%	
CBR @ 93%	
CBR @ 95%	
CBR @ 98%	
CBR @ 100%	
% Swell (Max)	

MATERIAL CLASSIFICATION	
COLTO Classification	

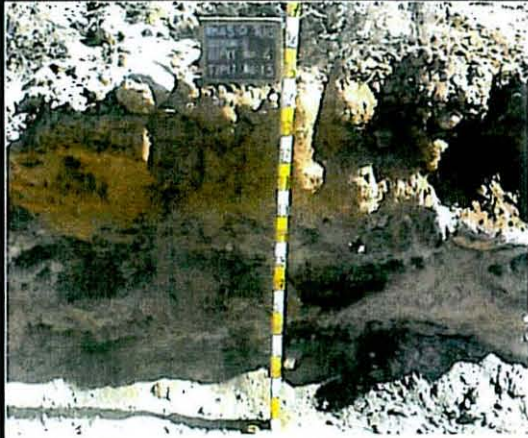
Remarks:

Everything possible is done to ensure that tests are representative and are performed accurately, and that reports and conclusions are quoted correctly. Geostrada or its officials can in no way be held liable for consequential damage or loss due to any errors in carrying out the tests, nor for any erroneous statement or opinion contained in a report based on such tests. If a test report is published or reproduced by the client, it will be done in full, without any omission.



SUMMARY OF BORROW PIT RESULTS - REP COM 8

Client:	Aurecon	BP No:	4		
Project Name:	R27 W/Cape Border to Calvinia	TP No:	13	GPS (X):	6514385.43
Project No:	106547	Section:	Section 8	GPS (Y):	34J 361700.7
Job No:		Chainage:	Km 45.0	Date:	
		Position:	RHS	Test Methods:	TMH1 A1-A5 / A7 / A8



SAMPLE DESCRIPTION	Layer 1	Layer 2	Layer 3	Layer 4	Layer 5	Layer 6
Depth (mm)	0 - 700	700 - 1400				
		1400 > Refusal				
Lab No						

DESCRIPTIONS

Layer Description	Layer 1	Layer 2	Layer 3	Layer 4	Layer 5	Layer 6
	TOPSOIL	Br weath. med dense to v dense fine Dolorite gravel, Boulders & Rocks				

GRADING ANALYSIS

% Passing Sieve	Sieve Size		No Samples Taken - Unsuccessful Tpit			
	mm	mm				
	63.0					
	53.0					
	37.5					
	26.5					
	19.0					
	13.2					
	4.75					
	2.00					
	0.425					
	0.075					

GRADING MODULUS

GM					
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ATTERBERG LIMITS

Liquid Limit				
Plasticity Index				
Linear Shrinkage				

MDD / OMC & CBR ANALYSIS

Maximum Dry Density				
Optimum Moisture Content				
In-situ Moisture Content				
In-situ Density (%)				
CBR @ 90%				
CBR @ 93%				
CBR @ 95%				
CBR @ 98%				
CBR @ 100%				
% Swell (Max)				

MATERIAL CLASSIFICATION

COLTO Classification				
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Remarks: No Samples Taken



SUMMARY OF BORROW PIT RESULTS - REP COM 8

Client:	Aurecon	BP No:	4	
Project Name:	R27 W/Cape Border to Calvinia	TP No:	14	GPS (X): 6514437.75
Project No:	105547	Section:	Section 8	GPS (Y): 34J 361700.05
Job No:		Chainage:	Km 45.0	Date:
		Position:	RHS	Test Methods: TM-H1 A1-A5 / A7 / A8



SAMPLE DESCRIPTION	Layer 1	Layer 2	Layer 3	Layer 4	Layer 5	Layer 6
Depth (mm)	0 - 800	800 - 1300				
		1300 > Refusal				
Lab No						

DESCRIPTIONS	
Layer 1	TOPSOIL
Layer 2	Br weath. med dense to v dense fine Dolorite gravel, Boulders & Rocks
Layer 3	
Layer 4	
Layer 5	
Layer 6	

GRADING ANALYSIS						
% Passing Sieve	63.0 mm	No Samples Taken - Unsuccessful Tpit				
	53.0 mm					
	37.5 mm					
	26.5 mm					
	19.0 mm					
	13.2 mm					
	4.75 mm					
	2.00 mm					
	0.425 mm					
0.075 mm						

GRADING MODULUS	
GM	

ATTERBERG LIMITS	
Liquid Limit	
Plasticity Index	
Linear Shrinkage	

MDD / OMC & CBR ANALYSIS	
Maximum Dry Density	
Optimum Moisture Content	
In-situ Moisture Content	
In-situ Density (%)	
CBR @ 90%	
CBR @ 93%	
CBR @ 95%	
CBR @ 98%	
CBR @ 100%	
% Swell (Max)	

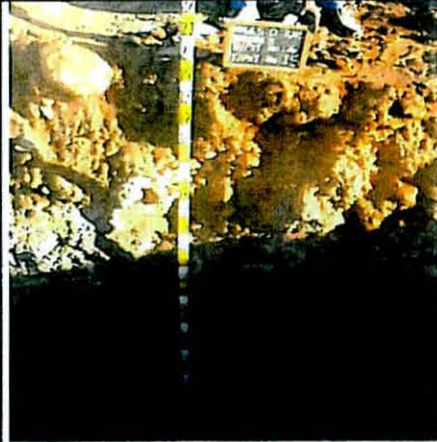
MATERIAL CLASSIFICATION	
COLTO Classification	

Remarks:



SUMMARY OF BORROW PIT RESULTS - REP COM 8

Client:	Aurecon	BP No:	4		
Project Name:	R27 W/Cape Border to Calvinia	TP No:	15	GPS (X):	6514371.92
Project No:	106547	Section:	Section 8	GPS (Y):	34J 362107.78
Job No:		Chainage:	Km 45.0	Date:	
		Position:	RHS	Test Methods:	TMH1 A1-A5 / A7 / A8



SAMPLE DESCRIPTION	Layer 1	Layer 2	Layer 3	Layer 4	Layer 5	Layer 6
Depth (mm)	0 - 400	400 - 1900				
		1900 > Refusal				
Lab No		1/339				

DESCRIPTIONS

Layer Description	Layer 1	Layer 2	Layer 3	Layer 4	Layer 5	Layer 6
	TOPSOIL	Br weath. med dense to v dense fine to oversize Dolorite gravel & Boulders				

GRADING ANALYSIS

% Passing Sieve						
	63.0 mm	No Sample	100			
53.0 mm	100					
37.5 mm	100					
26.5 mm	87					
19.0 mm	84					
13.2 mm	80					
4.75 mm	77					
2.00 mm	62					
0.425 mm	20					
0.075 mm	5					

GRADING MODULUS

GM		2.13			
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ATTERBERG LIMITS

Liquid Limit					
Plasticity Index		NP			
Linear Shrinkage		0.0			

MDD / OMC & CBR ANALYSIS

Maximum Dry Density		2152			
Optimum Moisture Content		6.8			
In-situ Moisture Content					
In-situ Density (%)					
CBR @ 90%		10			
CBR @ 93%		18			
CBR @ 95%		25			
CBR @ 98%		32			
CBR @ 100%		37			
% Swell (Max)		0.0			

MATERIAL CLASSIFICATION

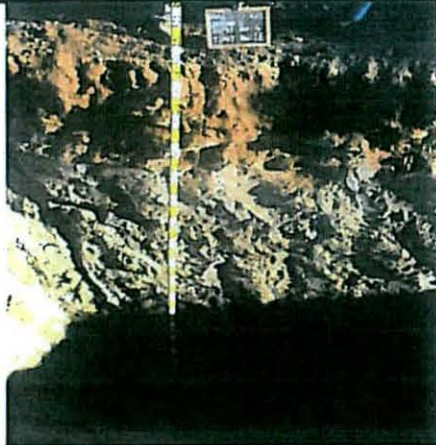
COLTO Classification		G6			
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Remarks:



SUMMARY OF BORROW PIT RESULTS - REP COM 8

Client:	Aurecon	BP No:	4	GPS (X):	6514432.13
Project Name:	R27 W/Cape Border to Calvinia	TP No:	16	GPS (Y):	34J 362110.68
Project No:	106547	Section:	Section 8	Date:	
Job No:		Chainage:	Km 45.0	Test Methods:	TMH1 A1-A5 / A7 / A8
		Position:	RHS		



SAMPLE DESCRIPTION	Layer 1	Layer 2	Layer 3	Layer 4	Layer 5	Layer 6
Depth (mm)	0 - 500	500 - 2900				
		2900 > Refusal				
Lab No		1/340				

DESCRIPTIONS

Layer Description	Layer 1	Layer 2	Layer 3	Layer 4	Layer 5	Layer 6
	TOPSOIL					
		Br weath. Med dense to dense fine Dolorite gravel				

GRADING ANALYSIS

% Passing Sieve						
	63.0 mm	No Sample	85			
53.0 mm	83					
37.5 mm	78					
26.5 mm	75					
19.0 mm	71					
13.2 mm	69					
4.75 mm	54					
2.00 mm	36					
0.425 mm	13					
0.075 mm	5					

GRADING MODULUS

GM		2.46			
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ATTERBERG LIMITS

Liquid Limit					
Plasticity Index		NP			
Linear Shrinkage		0.0			

MDD / OMC & CBR ANALYSIS

Maximum Dry Density					
Optimum Moisture Content					
In-situ Moisture Content					
In-situ Density (%)					
CBR @ 90%					
CBR @ 93%					
CBR @ 95%					
CBR @ 98%					
CBR @ 100%					
% Swell (Max)					

MATERIAL CLASSIFICATION

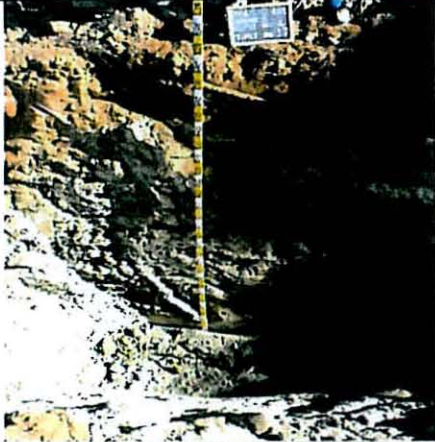
COLTO Classification					
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Remarks:



SUMMARY OF BORROW PIT RESULTS - REP COM 8

Client:	Aurecon	BP No:	4	GPS (X):	6514517.76
Project Name:	R27 W/Cape Border to Calvinia	TP No:	17	GPS (Y):	34J 362115.37
Project No:	106547	Section:	Section 8	Date:	
Job No:		Chainage:	Km 45.0	Test Methods:	TMH1 A1-A5 / A7 / A8
		Position:	RHS		



SAMPLE DESCRIPTION	Layer 1	Layer 2	Layer 3	Layer 4	Layer 5	Layer 6
Depth (mm)	0 - 500	500 - 2600				
		2600 > Refusal				
Lab No		1/341				

DESCRIPTIONS

Layer Description	Layer 1	Layer 2	Layer 3	Layer 4	Layer 5	Layer 6
	TOPSOIL	Br weath. Med dense to dense fine Dolorite gravel				

GRADING ANALYSIS

% Passing Sieve	No Sample					
	63.0 mm					
53.0 mm			100			
37.5 mm			91			
26.5 mm			90			
19.0 mm			84			
13.2 mm			79			
4.75 mm			67			
2.00 mm			45			
0.425 mm			13			
0.075 mm			3			

GRADING MODULUS

GM		2.39			
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ATTERBERG LIMITS

Liquid Limit				
Plasticity Index		NP		
Linear Shrinkage		0.0		

MDD / OMC & CBR ANALYSIS

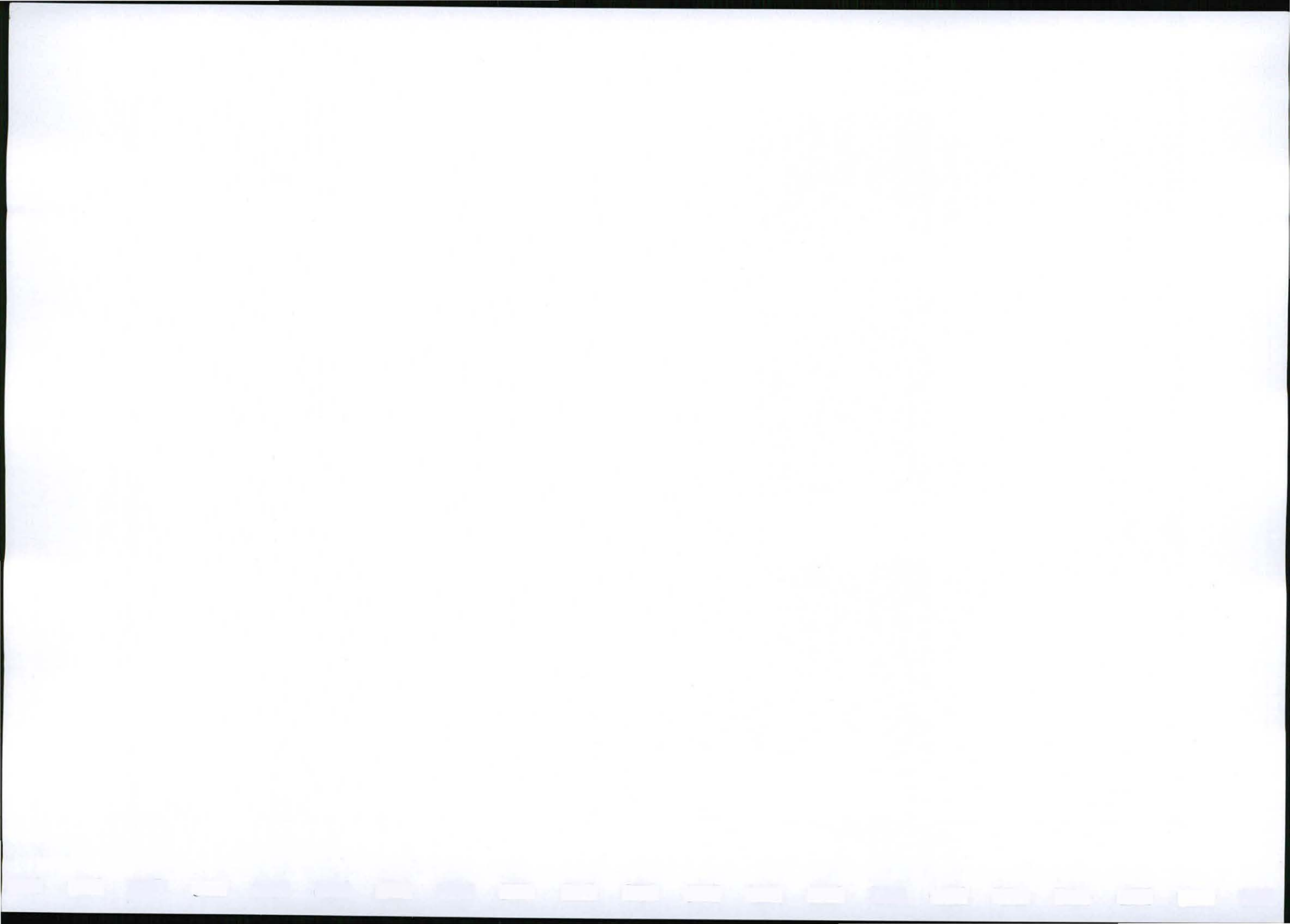
Maximum Dry Density		2134		
Optimum Moisture Content		7.1		
In-situ Moisture Content				
In-situ Density (%)				
CBR @ 90%		15		
CBR @ 93%		22		
CBR @ 95%		29		
CBR @ 98%		31		
CBR @ 100%		32		
% Swell (Max)		0.0		

MATERIAL CLASSIFICATION

COLTO Classification		G6		
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Remarks:

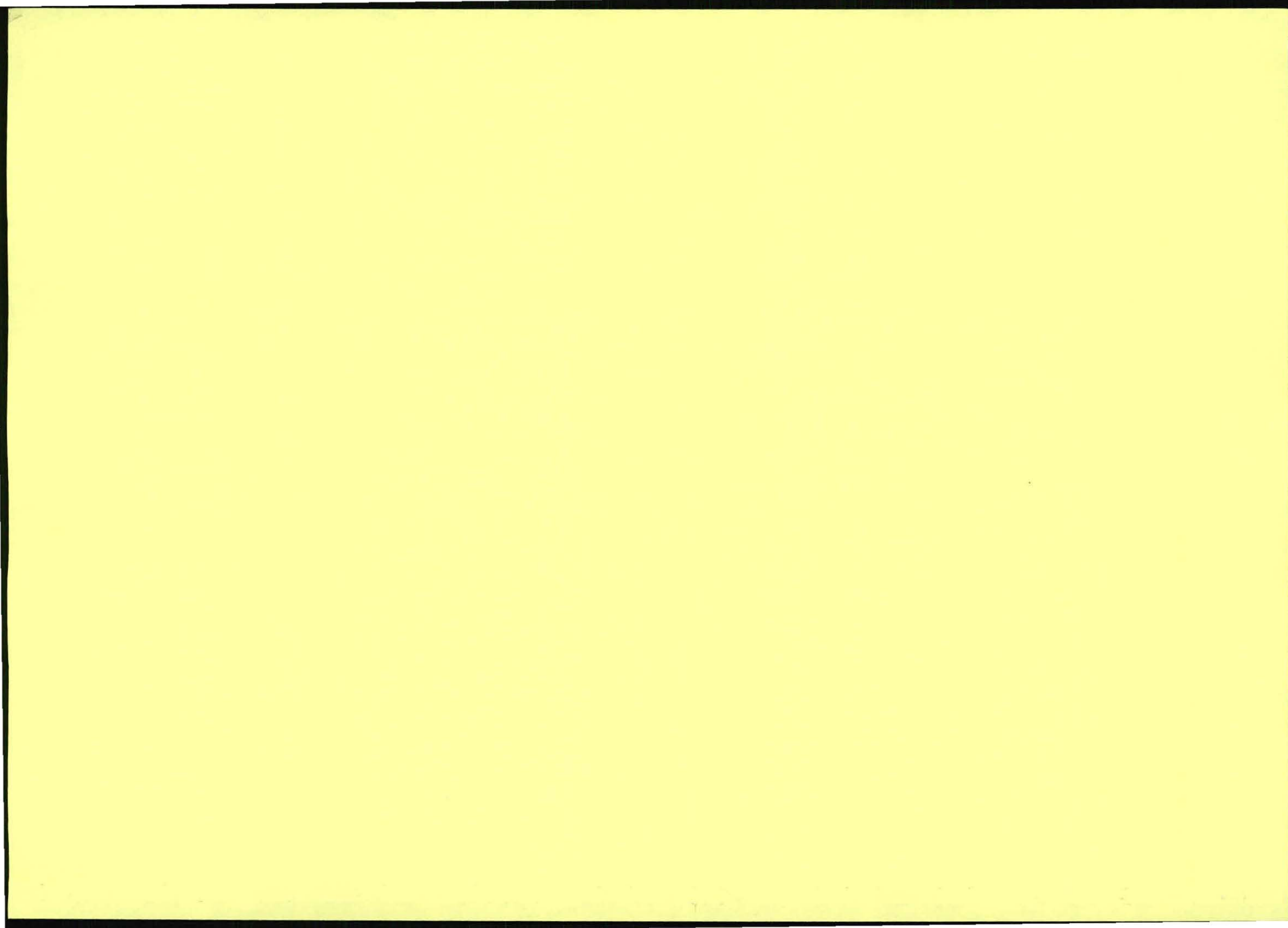
Everything possible is done to ensure that tests are representative and are performed accurately, and that reports and conclusions are quoted correctly. Geostrada or its officials can in no way be held liable for consequential damage or loss due to any errors in carrying out the tests, nor for any erroneous statement or opinion contained in a report based on such tests. If a test report is published or reproduced by the client, it will be done in full without any omission.



APPENDIX C2.2:

LANDOWNER ACKNOWLEDGEMENT FORM AND COMMENTS:

BORROWPIT BP 27-8 KM 45.0 RHS 0.2





VOORGESTELDE LEENGROEWE VIR DIE VERSTERKING VAN
DIE R27 GEDEELTE 7 & 8 TUSSEN DIE WES-/NOORD-KAAP
GRENS (KM 40.0) EN CALVINIA (KM 70.0)
BENUTTING VAN LEENGROEWE

PROPOSED BORROWPITS FOR THE STRENGTHENING OF THE
R27 SECTIONS 7 & 8 BETWEEN THE WESTERN/NORTHERN
CAPE BORDER (KM 40.0) AND CALVINIA (KM 70.0)
UTILISATION OF BORROWPITS

LEENGROEF NO. / BORROW PIT NO.	BP R27-8 km 45.0 RHS 0.2
GEREGISTREERDE PLAAS NAAM / REGISTERED FARM NAME	DOEGA
GEREGISTREERDE EIENAAR / REGISTERED OWNER	J.S. Muller

Ek bevestig dat ek verwittig is van SANRAL se voorneme om 'n voorgestelde leengroef op my eiendom te benut, soos aangedui op die aangehegte plan, vir die versterking van Gedeeltes 7 & 8 van die R27 tussen die Wes-/Noord-Kaap grens en Calvinia; en dat ek bewus is van die ligging en omvang van die gebied en dat toegang oor my eiendom benodig mag word.

I acknowledge that I have been informed of SANRAL's intention to utilise a proposed borrow pit on my property indicated on the attached plan for the strengthening of Section 7 & 8 of the R27 between the Western/Northern Cape border and Calvinia; and that I am aware of the location and extent of the area and that access to the area may be required across my property.

HANDTEKENING VAN EIENAAR OF GEDELEGEERDE VERTEENWOORDIGER / SIGNATURE
OF OWNER OR DELEGATED REPRESENTATIVE

STATUS INDIEN NIE GEREGISTREEDE EIENAAR NIE / STATUS IF NOT REGISTERED
OWNER.....

DATUM/ DATE..... 25/06/2011

NAAM/ NAME..... J.S. Muller

POSADRES/ POSTAL ADDRESS..... Posbus 235 Calvinia 8190

TELEFOONNOMMER/ TELEPHONE NUMBER..... 027-3412165

FAKSNOMMER/ FAX NUMBER.....

E-POSADRES/ E-MAIL ADDRESS..... doega@hantam.co.za

PROPERTY REPORT

11/12/2009

REGISTRATION OF RIGHT OF WAY SERVITUDE

Property Description :	Portion 1 of the Farm Buffelsfontein Nr 773, Northern Cape Province, <i>Size of property in Ha:</i> 4386.3935 Ha <i>Title Deed No of Property:</i> T103780/2003
Owner Details:	<i>Name:</i> Jacobus Stefanus Muller <i>Identity Number:</i> 6709135131084 <i>Contact details of owner/representative:</i> Jacobus Stefanus Muller PO Box 235 Calvinia 8190 Tel: (027) 341 1872 Fax: Cell: Email: <i>Owners Representative:</i> None
Type Of Land	Agricultural
Required Area and Use	8.804 Ha Borrow Pit
Improvements affected by acquisition	1) Grazing land (sheep) 2) Existing access track to abandoned borrow pit 3) Standard stock fencing
Occupants	None on the area earmarked for expropriation.
Rights on Property	None indicated on Title Deed drawn on 4 th May 2011
Access to Property	Property access by the land owner will not be affected. The borrow pit borders on the R27 and will gain direct access to the R27 through an existing gate on the road reserve fence.

Regstelling:
Gedeelte 1 (Daegab) van die plaas
Buffelskopfontein NR 773

Leengraaf BPR 27. 8km 45.0 RHS 0.2 op die plus Dreyer

NEE / NO

JA / YES

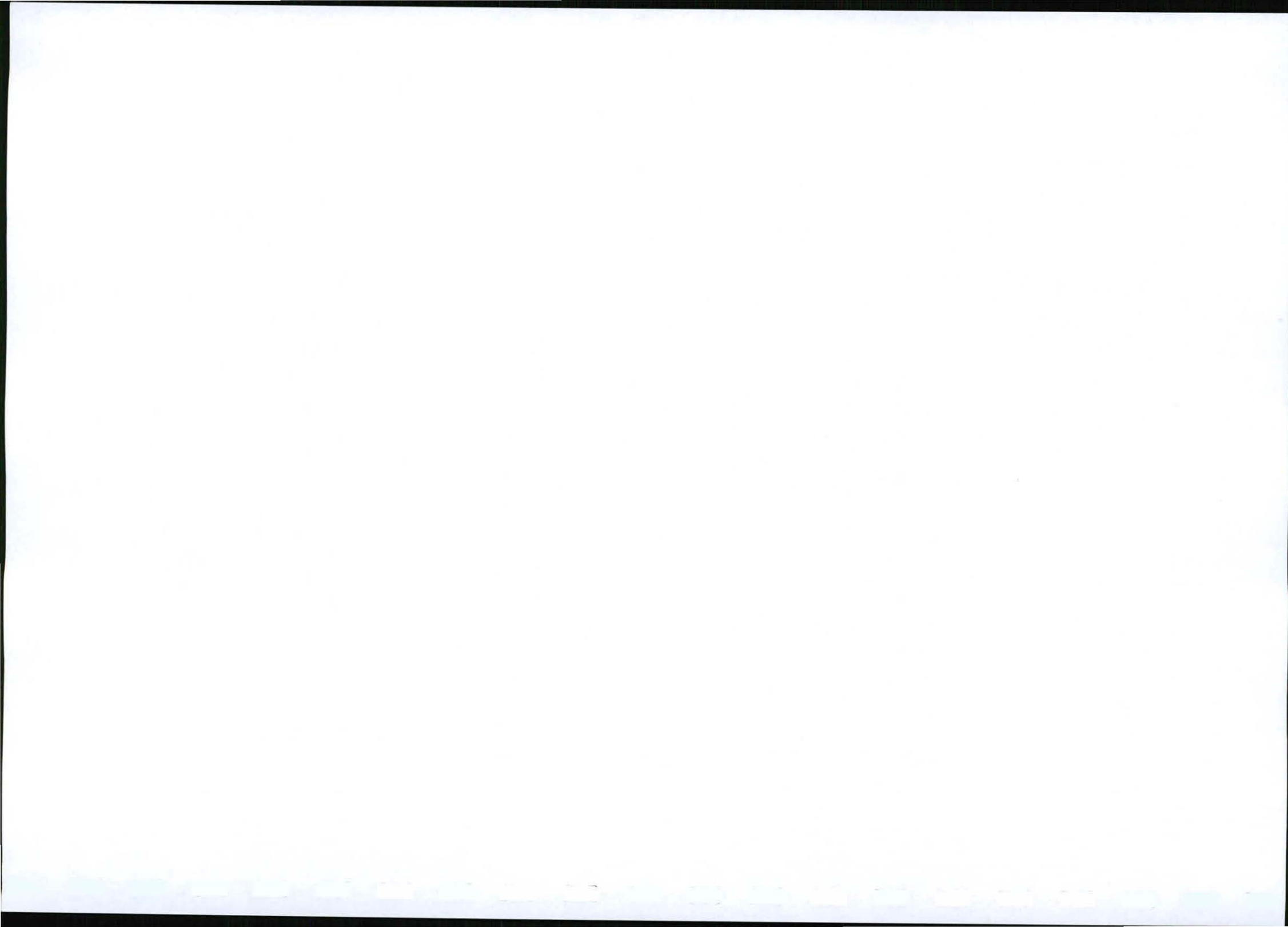
KOMMENTAAR/ COMMENT

Ek was in gesprek met Mr. Swanepeel wat die teets-
grate geëien het. Ek het vir hom gevra dat ek nie graag
sou wou hê dat die leengraaf verder na die suide-
kant, wat 'n gedeelte weiveld insluit, met gebruik word
nie. Dit is vir my onduidelik op die lugfoto hoe ver die
graaf na die suidekant benut gaan word. Dit is nie 'n
probleem as die bestaande graaf uitgebrei word na die
ooste- en westekant nie, m.a.w. al lank die pad (R27)
Ek het ook aan hom gevra dat aan die oorkant
van die pad (R27) m.a.w. noordekant, lê 'n soke
kamp van my, wat ek nie benut as weiveld nie.
Dit is 'n moontlikheid dat die grond uitgekoop kan word
vir 'n toekomstige leengraaf, of ook aangewend kan
word. Hy het aangedui dat daar nie tyd was om
teetsgrate en grondmonsters van die gedeelte te neem nie.
Die kamp is reeds toege-span en is van geen nut vir
my nie. Die bestaande leengraaf of enige bykomende
uitgrawings moet asb. toege-span word, aangesien ek
die gedeelte sander as weiding vir vee gebruik.
Dit is voorlopige opmerkings, ons moet nog sander dit
prent.

Please forward to / Stuur asseblief aan:

CCA ENVIRONMENTAL (PTY) LTD
Unit 35, Roeland Square, Cape Town, 8001
PO Box 10145, Caledon Square, 7905
T: (021) 461 1118 F: (021) 461 1120
Email: ena@ccaenvironmental.co.za

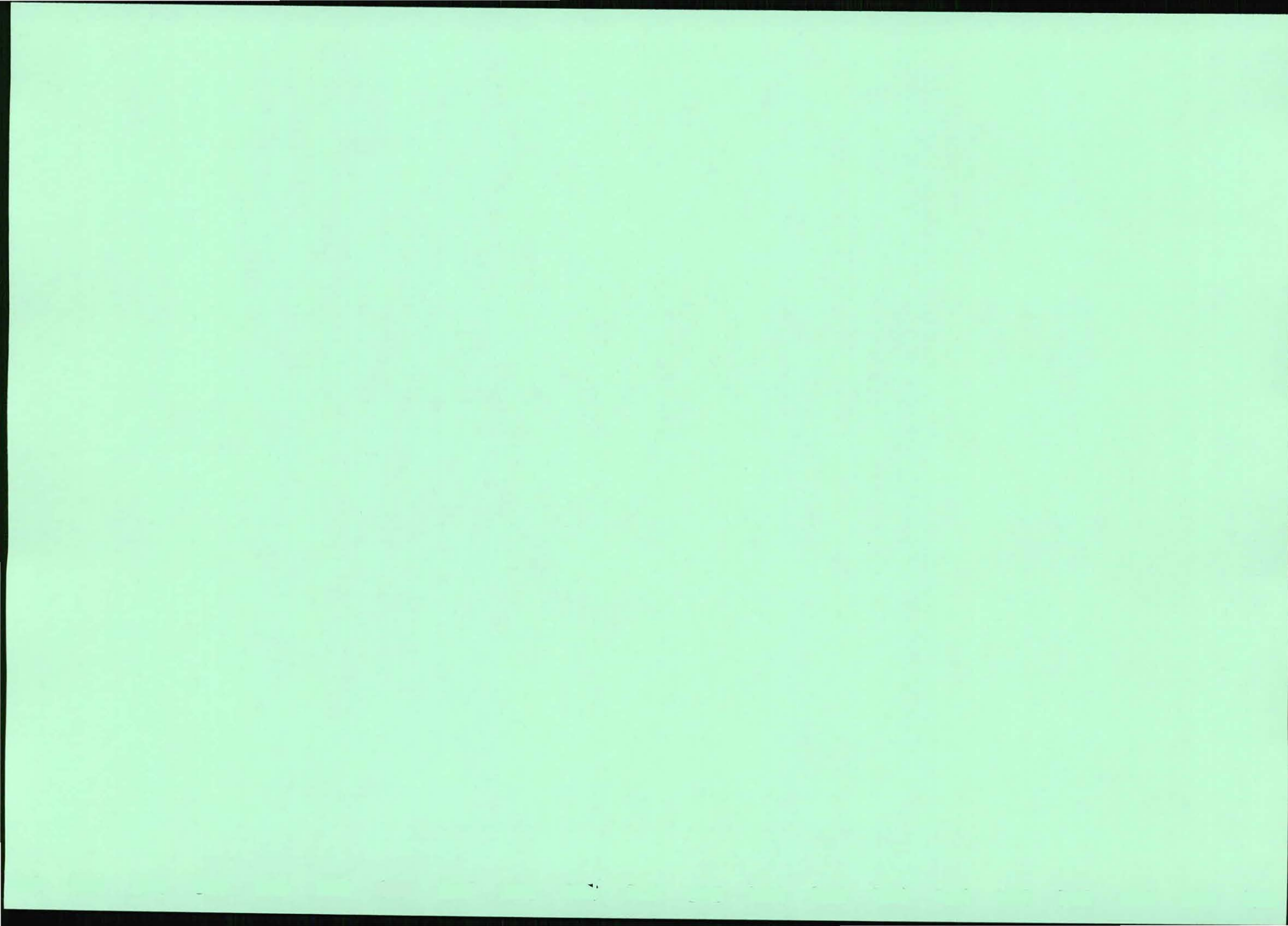
ENVIRONMENTAL



PART C3:

INDIVIDUAL BORROWPITS:

BORROWPIT BP 27-8 KM 61.6 RHS 1.0



PART C: INDIVIDUAL BORROWPITS

C3 BORROWPIT BP R27-8 KM 61.6 RHS 1.0

C3.1 PART 1: BRIEF PROJECT DESCRIPTION

C3.1.1 Mine owner and mine manager / Responsible person

A contractor is still to be appointed by SANRAL to undertake the excavation of BP R27-8 km 61.6 RHS 1.0. This borrowpit is planned as a strategic borrowpit for the supply of material for the proposed strengthening (partial reconstruction) of the R27 Sections 7 and 8 between the Western/Northern Cape border (km 40.0) and Calvinia (km 70.0).

C3.1.2 Name and address of the applicant for prospecting permit or mining authorisation

Applicant: South African National Roads Agency Limited
Contact person: Mr D Wilson
Address: Private Bag X19, Bellville, 7530
Telephone: (021) 957 4600

C3.1.3 Name and address of the owner of the land and the title deed description

Farm name: Remainder of Portion 1 of the Farm Enkelde Wilgenboom 768, Northern Cape Province
Landowner: Glen Dana (Pty) Ltd.
Contact person: Mr Johann Strauss
Address: PO Box 164, Calvinia, 8190
Telephone: 027 341 2162 / 083 231 1872
Title deed information: Title Deed No of Property: T002903/2005
Size of the property: 1529.3518 ha

No mineral rights are indicated on the Deed of Transfer.

C3.1.4 Regional setting

BP R27-8 km 61.6 RHS 6.2 is an extension of an existing borrow area located on the Remainder of Portion 1 of the Farm Enkelde Wilgenboom 768 in the Hantam Local Municipality, which forms part of the Namakwa District Municipality in the Northern Cape Province. It is situated approximately 7 km south-west of Calvinia near the Calvinia Airfield, approximately 1 km from the R27 (see Figure A2 on page A6 and Figures C3.1 to C3.6 on pages C3-8 to C3-11). Co-ordinates of the proposed borrowpit area, including the access road, are presented in Table C3.1 below.

Table C3.1: Borrowpit co-ordinates (System WGS 84 Lo 19°)

Point	"-Y"	"+X"
R 310	68,393.23	3,486,697.76
R 309	68,394.09	3,486,700.32
R 308	68,334.38	3,486,737.37

R 307	68,255.99	3,486,761.46
A	68,282.27	3,486,991.21
B	68,240.91	3,487,174.87
C	68,080.03	3,487,368.79
D	68,074.39	3,487,591.54
E	68,142.82	3,487,614.93
F	68,003.67	3,488,230.10
G	67,786.70	3,488,098.85
H	68,052.50	3,487,590.68
J	68,064.16	3,487,344.65
K	68,230.31	3,487,159.02
L	68,262.17	3,487,018.92
M	68,235.85	3,486,751.71
R306	68,251.01	3,486,747.40

C3.2 PART 2: DESCRIPTION OF THE PRE-MINING ENVIRONMENT SPECIFIC TO BP R27-8 KM 61.6 RHS 1.0

C3.2.1 Climate

A general description of the climate is presented in Section B3.1.1.

C3.2.2 Topography

A general description of the topography is presented in Section B3.1.2. The natural topography is an undulating plain but the existing borrow area has been excavated into a small rise (see Figures C3.4 to C3.6).

C3.2.3 Geology

A general description of the geology is presented in Section B3.1.3. The geology at the proposed borrowpit site is weathered dolerite and calcrete.

C3.2.4 Soil

Based on the trial hole profiles (see Appendix C3.1), the subsoils typically comprise dolerite gravel and boulders. Machinery refusal was obtained at depths varying from 1.9 m to 2.6 m. Topsoil varies from 100 mm to 700 mm in thickness.

C3.2.4 Pre-mining land capability and land use

The proposed site is an extension of an existing borrow area approximately 1 km south of the R27 and 1 km southwest of the Calvinia Airfield. The surrounding land is used for livestock grazing. No residents live near the site. (see Figures C3.4 to C3.6).

C3.2.5 Vegetation

A general description of the vegetation in the area is presented in Section B3.1.4. Vegetation in the existing borrow area has been previously disturbed. The vegetation that would be impacted by the proposed southwards and south-eastwards extension of the borrowpit is low succulent Hantam Karoo shrubland of the Calvinia Mosaic, more specifically the *Eriocephalus ericoides* – *Pteronia glomerata* Roggeveld Karoo (see Figures C3.4 to 3.6) (see Appendix 4).

C3.2.7 Fauna

No faunal species were seen on site.

C3.2.8 Hydrology

As the closest farm dam is situated approximately 850 m north-west of the proposed borrowpit site, it is not expected that the operation would affect surface water sources.

C3.2.9 Geohydrology

No ground water was found in the trial pit holes with depths up to 4.8 m.

C3.2.10 Air quality

The air quality in the study area is relatively good. No local residents live in close proximity to the borrowpit site. Although the borrowpit site is situated some distance from the R27, dust generated by haul vehicles along the access road could affect traffic along the R27.

C3.2.11 Noise

Due to its location some distance (1 km) from the R27, the site is exposed to minimal noise from traffic along the road. No local residents live in close proximity to the borrowpit site.

C3.2.12 Archaeology and heritage

A general description of the heritage environment and archaeology of the area is presented in Section B3.2.

During the heritage investigation, outcrops of black dolerite without engravings were observed, as well as an ephemeral scatter of patinated hornfels, including one notched piece and a retouched piece. However overall less or approximately one occurrence per 10 m² was found at the proposed borrowpit site. The material is considered to be typical and found elsewhere and therefore not regarded as significant. No known human graves are located in the area (see Appendix 5).

C3.2.13 Sensitive landscape

No sensitive landscapes were identified that could be affected by the proposed borrowpit.

C3.2.14 Visual aspects

If this proposed site were utilised, the existing borrow area would be extended south- and south-eastwards into the surrounding area that is already disturbed. At a distance of one kilometre from the R27 on a relatively flat landscape, it would not be readily visible to passing traffic.

C3.2.15 Regional socio-economic environment

See information provided in Section B3.3.

C3.2.16 Interested and Affected Parties

The public participation process undertaken as part of the EMP is presented in detail in Section A3.2.2. It should be noted that a notification letter was sent to the representative of the landowner, Mr Johann Strauss, informing him of the proposed project and that a borrowpit had been identified on the property. An initial response was received from Claassen Stone, Chartered Accountants, on behalf of Mr J Strauss, representative of the landowner (Glen Dana Pty Ltd) (see Appendix C3.2). Mr Strauss subsequently completed an acknowledgement form (see Appendix C3.2) to indicate that he was notified of the location and extent of the area and that access to the area may be required across the property, as well as to raise any issues of concern. The comments contained in these two responses are presented in table C3.2 below.

Table C3.2: I&AP Comments and Responses

I&AP	Comment	Response
Claassen Stone, on behalf of Mr J Strauss	Mr Strauss would like to undertake a site inspection together with representatives of both organizations in order to clarify some uncertainties before he is prepared to sign any documentation between the company SANRAL and CCA Environmental (CCA).	CCA contacted Mr Strauss in response to the letter. He agreed that it would be in order to refer his enquiries, which pertained to site access issues, to the design engineer for clarification. The latter met Mr Strauss on site on 6 July 2011. Mr Strauss subsequently submitted an acknowledgement form, including written comments.
Mr J Strauss, on behalf of the landowner	A gate must be provided to allow the farmer access across the new borrowpit access road.	The design engineer has included this request in the mine plan for the borrowpit.
	The access road fence would split the grazing camp and isolate a portion from a water source. To address this, an old concrete dam would have to be lined / waterproofed and the windmill repaired.	The design engineer has noted this request and will ensure that it is presented to SANRAL to consider during the BP expropriation process.
	Dust generated during the construction should be minimised by watering the access road.	Dust control as suggested is addressed in this EMP.

C3.3 PART 3: MOTIVATION FOR THE PROPOSED PROJECT**C3.3.1 Benefits of the project**

The motivation for and potential benefits arising as a result of the project are presented in Section B1.

C3.3.2 Consideration of alternatives

The assessment of alternatives is presented in detail in Section B2. Borrowpit BP R27-8 km 61.6 RHS 1.0 has been identified as a preferred borrowpit.

C3.4 PART 4: DETAILED DESCRIPTION OF THE PROPOSED PROJECT

C3.4.1 Surface infrastructure

There would be no permanent surface infrastructure for the proposed borrow area. A temporary access road would be constructed to link the borrowpit area via the existing R27 to the road construction areas. The access road and boundaries of the proposed borrowpit would be fenced and a gate installed at the entrance point along the R27 to control access. A gate would also be installed in the access road fence to enable the farmer to herd livestock across this road if necessary in order to reach grazing on the opposite side.

C3.4.2 Waste management

Material that is not suitable for the road rehabilitation project would be stockpiled and used to reshape the area during rehabilitation. Any domestic waste would be collected in a waste bin and disposed of at a municipal waste site.

C3.4.3 Water management

The borrowpit is located in a dry, low rainfall area with low risk of runoff accumulating in the proposed excavation for extended periods. The natural topography of the area is relatively flat, but a small rise has been created at the proposed site which slopes slightly towards the north-east. It is proposed that the floor of the borrowpit be sloped westwards to limit ponding, as indicated in the borrowpit layout plan (see Figure C3.2).

The water requirements for the proposed borrowpit operations are expected to be minimal (e.g. dust suppression on the borrowpit area). It is envisaged that municipal water sources supplemented by four existing boreholes on privately owned farms would be used to supply the total monthly water use requirements for the road upgrade project.

C3.4.4 Transport

This would consist of haul vehicles transporting the road building material from the borrowpit to the area of the road under construction. A temporary access road is not required due to the close proximity of the site to the R27.

C3.4.5 BORROWPIT LAYOUT AND DEVELOPMENT

The proposed site layout plan is presented in Figure C3.2.

The total area to be temporarily expropriated, including the access road, is 12.226 ha, while the proposed mined borrow area would be approximately 4.765 ha in extent, with an excavation depth not exceeding 3.5 m. Excavation side slopes of approximately 1:3 (vertical to horizontal) would be provided.

Prior to commencement of the operation, invasive vegetation would be cleared from the site. Topsoil is to be stripped to a maximum depth of 300 mm and stockpiled in the areas indicated on the layout plan to a

height not exceeding 2 m (see Figure C3.2). In order to assist rehabilitation of the borrowpit area at the end of construction, topsoil would be spread along the area.

The road building material would be excavated by means of ripping and loading with an excavator onto haul vehicles. Harder dolerite boulders would be broken down by a crusher before use. Material would then be transported to the location of the road under construction.

The borrowpit details are summarized in Table C3.3 below:

Table C3.3: Borrowpit details

Total borrowpit area, including access road	12.226 ha
Borrowpit area to be mined	4.765 ha
Maximum depth	3.5 m
Material type	Road base and subbase material
Volume of material	130 100 m ³

C3.5 PART 5: ENVIRONMENTAL IMPACT ASSESSMENT

This section provides an assessment summary table of the impacts that would result from the development of Borrowpit BP R27-8 km 61.6 RHS 1.0. Mitigation measures are proposed that would ameliorate negative impacts or enhance potential benefits. Impacts were assessed according to pre-defined rating scales as shown in Appendix 2, which are based on criteria set out in the EIA Regulations Guideline Document (Department of Environmental Affairs and Tourism, 1998).

The impacts arising from the borrowpit development are presented in Table C3.4

C3.6 PART 6: ENVIRONMENTAL MANAGEMENT PROGRAMME

A generic EMP is presented in Section D, as it is the same for all three borrowpits.

Table C3.4: Impacts arising from the proposed development of Borrowpit BP 27-8 km 61.6 RHS 1.0

Environmental Aspect	Extent	Duration	Intensity	Probability	Confidence	Significance (before mitigation)	Proposed mitigation	Significance (after mitigation)
Geology	Local	Permanent	Low	Definite	Medium	Low	-	LOW
Topography	Local	Permanent	Low	Definite	Medium	Low	The borrowpit would be finished off so that the slopes are no steeper than 1:3. The slope changes must be finished off so that flowing curves that blend with the surrounding landscapes are formed in preference to sharp angles.	VERY LOW
Soils	Local	Short-term	Medium	Highly probable	High	Very Low	Stockpile topsoil and utilise during rehabilitation.	VERY LOW
Land capability	Local	Short-term	Medium	Probable	High	Very Low	<ul style="list-style-type: none"> Demarcation and fencing of borrowpit site and access road. Identification of no-go areas. Land disturbed shall be rehabilitated. 	VERY LOW
Land use	Local	Short-term	Low	Definite	High	Very Low	Land disturbed shall be rehabilitated.	VERY LOW
Natural vegetation	Local	Short to Medium term	Low	Definite	High	Very Low	<ul style="list-style-type: none"> Land disturbed shall be rehabilitated. The area should not be grazed until it has stabilised. 	VERY LOW
Animal life	Local	Short-term	Low	Probable	High	Very Low	Land disturbed shall be rehabilitated.	VERY LOW
Surface water	Local	Short-term	Medium	Improbable	High	Very Low	All machinery and equipment shall be properly maintained, so that leaks do not appear and so that during servicing all oil, grease, etc. is disposed of correctly. The borrowpit shall be shaped so that water drains towards the west to limit ponding.	VERY LOW
Groundwater	Local	Short-term	Low	Improbable	High	Very Low	All machinery and equipment shall be properly maintained, so that leaks do not appear and so that during servicing all oil, grease, etc. is disposed of correctly.	VERY LOW
Air quality	Local	Short-term	Medium to High	Highly probable	High	Low	<ul style="list-style-type: none"> Spray water and/or other dust suppression agents to reduce dust. Retain vegetation cover as long as possible to reduce size of areas where wind could generate dust. Protect excavated material stockpiles against wind erosion. Suitably cover and secure material loads during transportation. Haul vehicles should comply with speed limits. 	VERY LOW
Noise	Local	Short-term	Medium	Highly probable	High	Very Low	The contractor shall be required to be familiar with and adhere to any local by-laws and regulations regarding the generation of noise and hours of operation.	VERY LOW
Archaeology/heritage	Local	Permanent	Very low	Improbable	Medium	Low	Land disturbed shall be rehabilitated.	LOW
Sensitive landscapes	No impact							
Visual aspects	Local	Long-term	Medium	Highly probable	High	Medium	Land disturbed shall be rehabilitated.	LOW
Regional socio-economic: Employment	Local	Short-term	Low	Highly probable	High	Very Low (Positive)	Local labour should be sourced.	VERY LOW (POSITIVE)
Regional socio-economic: Safety	Local	Short-term	High	Highly probable	High	Low	<ul style="list-style-type: none"> The movement of construction vehicles should be limited to daylight hours. The risk associated with the movement of large haulage vehicles should be clearly sign-posted in both directions leading up to the proposed borrowpit. 	LOW



Figure C3.1: Google Earth air photo of proposed Borrowpit BP 27-8 km 61.6 RHS 1.0

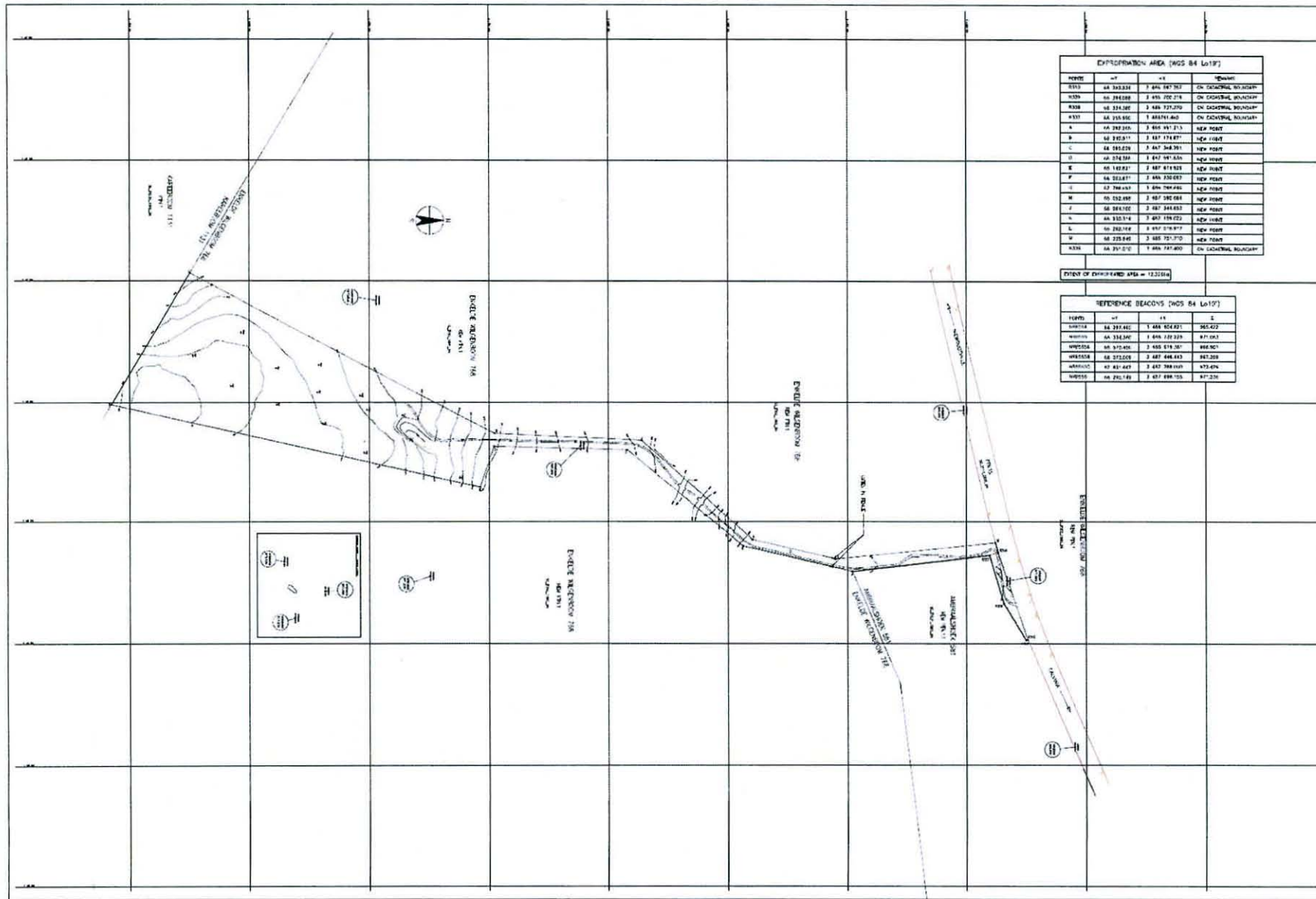


Figure C3.3: Expropriation plan for proposed Borrowpit BP 27-8 km 61.6 RHS 1.0

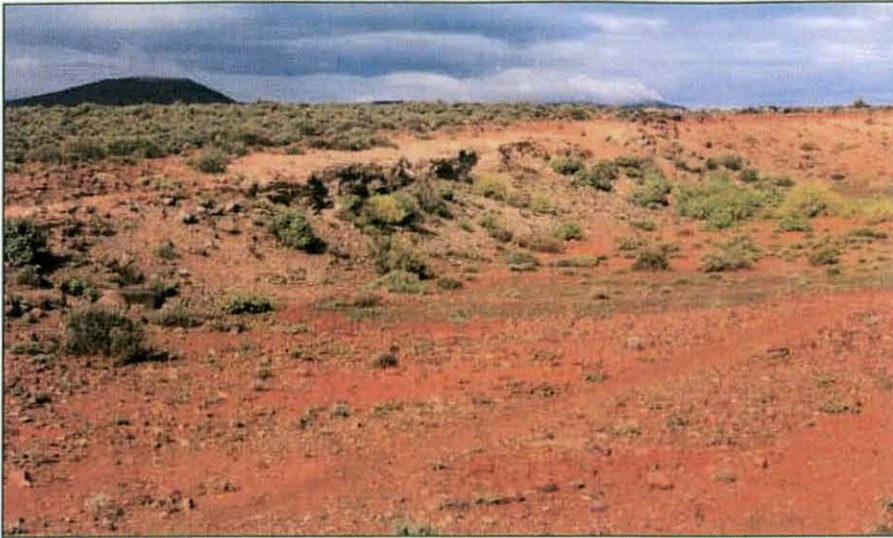


Figure C3.4: BP R27-8 KM 61.6 RHS 1.0: View of existing disturbed area (facing south-east)
(photo provided by Dr D MacDonald)



Figure C3.5: BP R27-8 KM 61.6 RHS 1.0: View of surrounding area (facing south-east)
(photo provided by Dr D MacDonald)

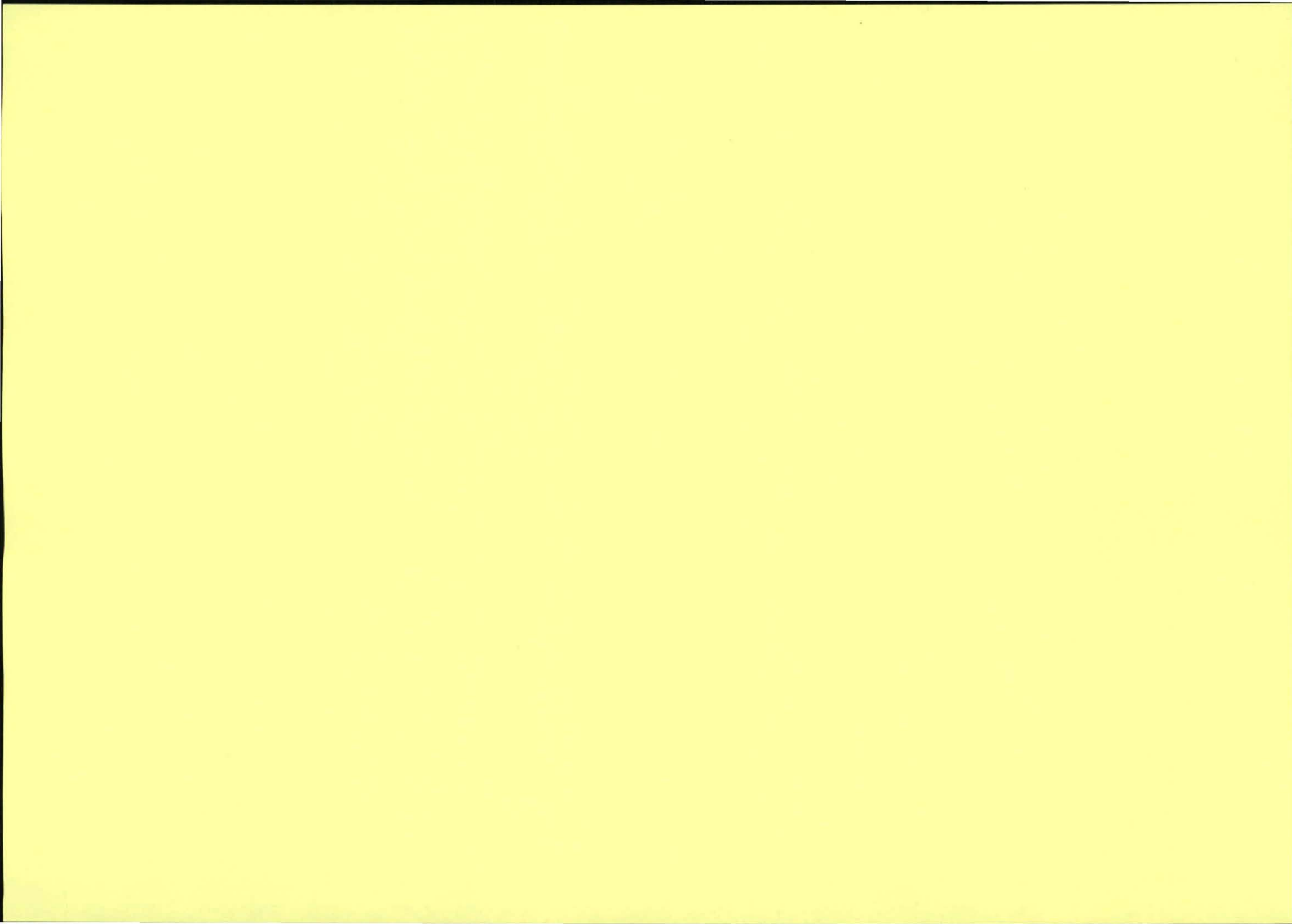


Figure C3.6: BP R27-8 KM 61.6 RHS 1.0: View of eastern edge of the existing borrow area (facing south-east)
(photo provided by Dr D MacDonald)

APPENDIX C3.1:

TRAIL HOLE PROFILE:

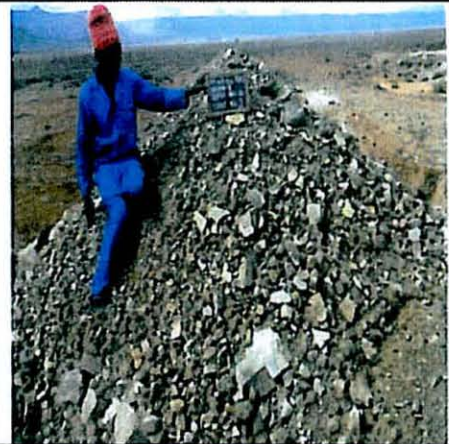
BORROWPIT BP 27-8 KM 61.6 RHS 1.0





SUMMARY OF BORROW PIT RESULTS - REP COM 8

Client: Aurecon	BP No: 6	GPS (X): 6513164.66
Project Name: R27 W/Cape Border to Calvinia	TP No: 1	GPS (Y): 34J378082.73
Project No: 106547	Section: Section 8	Date:
Job No:	Chainage: Km 61.64	Test Methods: TMH1 A1-A6 / A7 / A8
	Position: RHS	



SAMPLE DESCRIPTION	Layer 1	Layer 2	Layer 3	Layer 4	Layer 5	Layer 6
Depth (mm)	0 - 200	200 - 500	500 - 3600			
Lab No			1/351			

DESCRIPTIONS

Layer Description	Layer 1	Layer 2	Layer 3	Layer 4	Layer 5	Layer 6
	TOPSOIL					
		Br weath med dense Shale gravel				
		Br clayey med dense Dolorite gravel				

GRADING ANALYSIS

% Passing Sieve	Layer 1		Layer 2		Layer 3		Layer 4		Layer 5		Layer 6	
	63.0 mm											
53.0 mm												
37.5 mm												
26.5 mm												
19.0 mm												
13.2 mm												
4.75 mm												
2.00 mm												
0.425 mm												
0.075 mm												

GRADING MODULUS

GM			2.50			
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ATTERBERG LIMITS

Liquid Limit			31			
Plasticity Index			15			
Linear Shrinkage			6.0			

MDD / OMC & CBR ANALYSIS

Maximum Dry Density						
Optimum Moisture Content						
In-situ Moisture Content						
In-situ Density (%)						
CBR @ 90%						
CBR @ 93%						
CBR @ 95%						
CBR @ 98%						
CBR @ 100%						
% Swell (Max)						

MATERIAL CLASSIFICATION

COLTO Classification						
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Remarks:



SUMMARY OF BORROW PIT RESULTS - REP COM 8

Client: Aurecon	BP No: 6	GPS (X): 6513100.71
Project Name: R27 W/Cape Border to Calvinia	TP No: 2	GPS (Y): 34J378143.69
Project No: 106547	Section: Section 8	Date:
Job No:	Chainage: Km 61.64	Test Methods: TMH1 A1-A5 / A7 / A8
	Position: RHS	



SAMPLE DESCRIPTION	Layer 1	Layer 2	Layer 3	Layer 4	Layer 5	Layer 6
Depth (mm)	0 - 300	300 - 2000	300 - 2000	2000 > Refusal		
Lab No		1/352 (A)	1/352 (B)			

DESCRIPTIONS

	Layer 1	TOPSOIL
Layer Description	Layer 2	Whitish Br calcareous weath dense to v dense Dolorite - fine gravel to Boulders
	Layer 3	
	Layer 4	
	Layer 5	
	Layer 6	

GRADING ANALYSIS

% Passing Sieve	63.0 mm	No Sample				
	53.0 mm		100			
	37.5 mm		97			
	26.5 mm		88			
	19.0 mm		76	100		
	13.2 mm		69	86		
	4.75 mm		54	58		
	2.00 mm		43	40		
	0.425 mm		16	13		
0.075 mm	3	5				

GRADING MODULUS

GM		2.35	2.42		
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ATTERBERG LIMITS

Liquid Limit					
Plasticity Index		NP	NP		
Linear Shrinkage		0.0	0.0		

MDD / OMC & CBR ANALYSIS

Maximum Dry Density			2240		
Optimum Moisture Content			9.0		
In-situ Moisture Content					
In-situ Density (%)					
CBR @ 90%			22		
CBR @ 93%			30		
CBR @ 95%			37		
CBR @ 98%			58		
CBR @ 100%			79		
% Swell (Max)			0.1		

MATERIAL CLASSIFICATION

COLTO Classification			G6		
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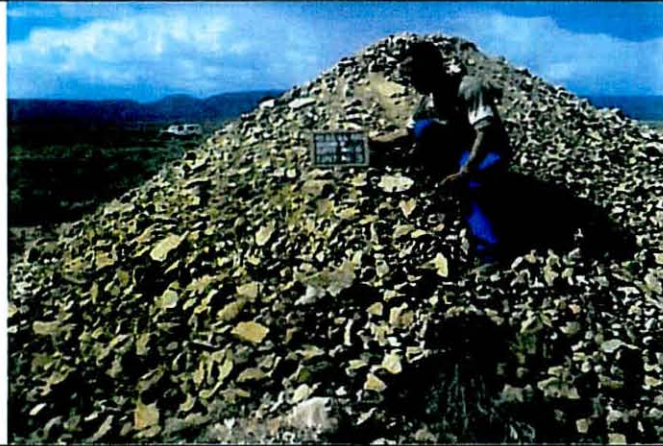
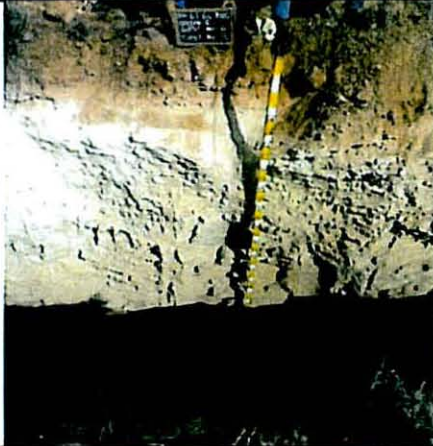
Remarks:

Everything possible is done to ensure that tests are representative and are performed accurately, and that reports and conclusions are quoted correctly. Geostrada or its officials can in no way be held liable for consequential damage or loss due to any errors in carrying out the tests, nor for any erroneous statement or opinion contained in a report based on such tests. If a test report is published or reproduced by the client, it will be done in full, without any omission.



SUMMARY OF BORROW PIT RESULTS - REP COM 8

Client:	Aurecon	BP No:	6	GPS (X):	6513101.05
Project Name:	R27 W/Cape Border to Calvinia	TP No:	3	GPS (Y):	34J378075.26
Project No:	106547	Section:	Section 8	Date:	
Job No:		Chainage:	Km 61.64	Test Methods:	TMH1 A1-A5 / A7 / A8
		Position:	RHS		



SAMPLE DESCRIPTION	Layer 1	Layer 2	Layer 3	Layer 4	Layer 5	Layer 6
Depth (mm)	0 - 700	700 - 4800	700 - 4800			
Lab No	1/353 (A)	1/353 (A)	1/353 (B)			

DESCRIPTIONS

Layer 1	TOPSOIL
Layer 2	Br weath med dense Dolorite gravel
Layer 3	
Layer 4	
Layer 5	
Layer 6	

GRADING ANALYSIS

% Passing Sieve	No Sample					
	63.0 mm					
53.0 mm		100				
37.5 mm		89				
26.5 mm		84				
19.0 mm		70	100			
13.2 mm		58	82			
4.75 mm		39	67			
2.00 mm		29	37			
0.425 mm		12	16			
0.075 mm		9	6			

GRADING MODULUS

GM		2.50	2.41		
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Liquid Limit					
Plasticity Index		NP	NP		
Linear Shrinkage		0.0	0.0		

MDD / OMC & CBR ANALYSIS

Maximum Dry Density		2234		
Optimum Moisture Content		9.5		
In-situ Moisture Content				
In-situ Density (%)				
CBR @ 90%		26		
CBR @ 93%		32		
CBR @ 95%		37		
CBR @ 98%		56		
CBR @ 100%		74		
% Swell (Max)		0.1		

MATERIAL CLASSIFICATION

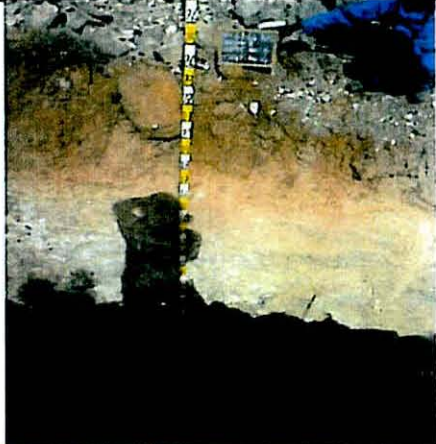
COLTO Classification		G6		
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Remarks:



SUMMARY OF BORROW PIT RESULTS - REP COM 8

Client:	Aurecon	BP No:	6		
Project Name:	R27 W/Cape Border to Calvinia	TP No:	4	GPS (X):	6513026.88
Project No:	106547	Section:	Section 8	GPS (Y):	34J378099.5
Job No:		Chainage:	Km 61.64	Date:	
		Position:	RHS	Test Methods:	TMH1 A1-A5 / A7 / A8



SAMPLE DESCRIPTION	Layer 1	Layer 2	Layer 3	Layer 4	Layer 5	Layer 6
Depth (mm)	0 - 700	700 - 2000				
		2000 > Refusal				
Lab No		1/354				

DESCRIPTIONS

Layer Description	Layer 1	Layer 2	Layer 3	Layer 4	Layer 5	Layer 6
	TOPSOIL	Whitish Br calcareous weath dense to v dense Dolorite - fine gravel to Boulders				

GRADING ANALYSIS

% Passing Sieve	No Sample					
	63.0 mm		55			
53.0 mm		53				
37.5 mm		50				
26.5 mm		45				
19.0 mm		40				
13.2 mm		38				
4.75 mm		32				
2.00 mm		26				
0.425 mm		12				
0.075 mm		5				

GRADING MODULUS

GM	2.57					
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ATTERBERG LIMITS

Liquid Limit	26					
Plasticity Index	11					
Linear Shrinkage	4.0					

MDD / OMC & CBR ANALYSIS

Maximum Dry Density					
Optimum Moisture Content					
In-situ Moisture Content					
In-situ Density (%)					
CBR @ 90%					
CBR @ 93%					
CBR @ 95%					
CBR @ 98%					
CBR @ 100%					
% Swell (Max)					

MATERIAL CLASSIFICATION

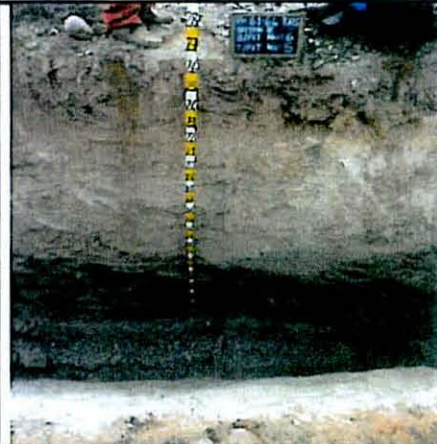
COLTO Classification					
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Remarks:



SUMMARY OF BORROW PIT RESULTS - REP COM 8

Client:	Aurecon	BP No:	6		
Project Name:	R27 W/Cape Border to Calvinia	TP No:	5	GPS (X):	6513021.72
Project No:	106547	Section:	Section 8	GPS (Y):	34J378046.96
Job No:		Chainage:	Km 61.64	Date:	
		Position:	RHS	Test Methods:	TMH1 A1-A5 / A7 / A8



SAMPLE DESCRIPTION	Layer 1	Layer 2	Layer 3	Layer 4	Layer 5	Layer 6
Depth (mm)	0 - 400	400 - 1400	1400 - 2400	2400 > Refusal		
Lab No	1/355					

DESCRIPTIONS

Layer Description	Layer 1	Layer 2	Layer 3	Layer 4	Layer 5	Layer 6
	TOPSOIL	Whitish Br calcareous soil & sl sandy Dolorite med dense	Whitish Br mix calcareous soil & sandy Dolorite gravel - med dense to dense			

GRADING ANALYSIS

% Passing Sieve						
	63.0 mm	No Sample	89			
53.0 mm	82					
37.5 mm	76					
26.5 mm	73					
19.0 mm	70					
13.2 mm	69					
4.75 mm	57					
2.00 mm	48					
0.425 mm	19					
0.075 mm	6					

GRADING MODULUS

GM	2.27
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Liquid Limit	
Plasticity Index	NP
Linear Shrinkage	0.0

MDD / OMC & CBR ANALYSIS

Maximum Dry Density	
Optimum Moisture Content	
In-situ Moisture Content	
In-situ Density (%)	
CBR @ 90%	
CBR @ 93%	
CBR @ 95%	
CBR @ 98%	
CBR @ 100%	
% Swell (Max)	

MATERIAL CLASSIFICATION

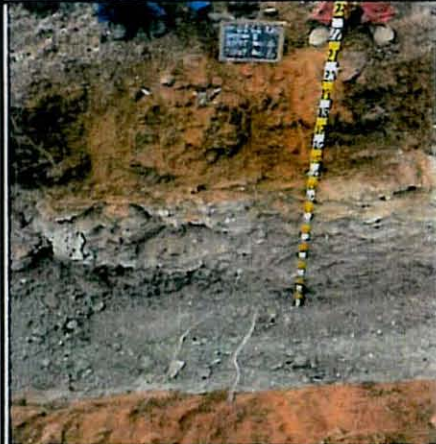
COLTO Classification	
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Remarks:



SUMMARY OF BORROW PIT RESULTS - REP COM 8

Client:	Aurecon	BP No:	6	GPS (X):	6512955.96
Project Name:	R27 W/Cape Border to Calvinia	TP No:	6	GPS (Y):	34J378065.86
Project No:	106547	Section:	Section 8	Date:	
Job No:		Chainage:	Km 61.64	Test Methods:	TMH1 A1-A5 / A7 / A8
		Position:	RHS		



SAMPLE DESCRIPTION	Layer 1	Layer 2	Layer 3	Layer 4	Layer 5	Layer 6
Depth (mm)	0 - 700	700 - 1900				
Lab No		1900 > Refusal				
		1/356				

DESCRIPTIONS

Layer Description	Layer 1	Layer 2	Layer 3	Layer 4	Layer 5	Layer 6
	TOPSOIL					
		Br med dense to v dense fine to coarse Dolorite gravel & Boulders				

GRADING ANALYSIS

% Passing Sieve	No Sample					
	63.0 mm		49			
53.0 mm		47				
37.5 mm		44				
26.5 mm		40				
19.0 mm		36				
13.2 mm		33				
4.75 mm		26				
2.00 mm		22				
0.425 mm		9				
0.075 mm		3				

GRADING MODULUS

GM		2.66			
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ATTERBERG LIMITS

Liquid Limit					
Plasticity Index		NP			
Linear Shrinkage		0.0			

MDD / OMC & CBR ANALYSIS

Maximum Dry Density					
Optimum Moisture Content					
In-situ Moisture Content					
In-situ Density (%)					
CBR @ 90%					
CBR @ 93%					
CBR @ 95%					
CBR @ 98%					
CBR @ 100%					
% Swell (Max)					

MATERIAL CLASSIFICATION

COLTO Classification					
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Remarks:



SUMMARY OF BORROW PIT RESULTS - REP COM 8

Client:	Aurecon	BP No:	6		
Project Name:	R27 W/Cape Border to Calvinia	TP No:	7	GPS (X):	6512954.28
Project No:	106547	Section:	Section 8	GPS (Y):	34J378006.15
Job No:		Chainage:	Km 61.64	Date:	
		Position:	RHS	Test Methods:	TMH1 A1-A5 / A7 / A8



SAMPLE DESCRIPTION	Layer 1	Layer 2	Layer 3	Layer 4	Layer 5	Layer 6
Depth (mm)	0 - 300	300 - 2500	300 - 2500	2500 > Refusal		
Lab No		1/357 (A)	1/357 (B)			

DESCRIPTIONS

Layer Description	Layer 1	Layer 2	Layer 3	Layer 4	Layer 5	Layer 6
	TOPSOIL	Whitish L/Br med dense to v dense fine to coarse Dolorite gravel & slight Boulders				

GRADING ANALYSIS

% Passing Sieve						
	63.0 mm		100			
53.0 mm		83				
37.5 mm		71				
26.5 mm		71				
19.0 mm	No Sample	65	100			
13.2 mm		60	82			
4.75 mm		46	60			
2.00 mm		32	46			
0.425 mm		10	17			
0.075 mm		3	4			

GM		2.55	2.33		
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ATTERBERG LIMITS

Liquid Limit					
Plasticity Index		NP	NP		
Linear Shrinkage		0.0	0.0		

MDD / OMC & CBR ANALYSIS

Maximum Dry Density			2198		
Optimum Moisture Content			10.0		
In-situ Moisture Content					
In-situ Density (%)					
CBR @ 90%			23		
CBR @ 93%			31		
CBR @ 95%			37		
CBR @ 98%			53		
CBR @ 100%			68		
% Swell (Max)			0.1		

MATERIAL CLASSIFICATION

COLTO Classification			G6		
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Remarks:

Everything possible is done to ensure that tests are representative and are performed accurately, and that reports and conclusions are quoted correctly. Geostrada or its officials can in no way be held liable for consequential damage or loss due to any errors in carrying out the tests, nor for any erroneous statement or opinion contained in a report based on such tests. If a test report is published or reproduced by the client, it will be done in full, without any omission.



SUMMARY OF BORROW PIT RESULTS - REP COM 8

Client:	Aurecon	BP No:	6
Project Name:	R27 W/Cape Border to Calvinia	TP No:	8
Project No:	106547	Section:	Section 8
Job No:		Chainage:	Km 61.64
		Position:	RHS
		GPS (X):	6512872.56
		GPS (Y):	34J378038.22
		Date:	
		Test Methods:	TMH1 A1-A5 / A7 / A8



SAMPLE DESCRIPTION	Layer 1	Layer 2	Layer 3	Layer 4	Layer 5	Layer 6
Depth (mm)	0 - 300	300 - 1900	300 - 1900	1900 > Refusal		
Lab No		1/358 (A)	1/358 (B)			

DESCRIPTIONS

Layer Description	Layer 1	TOPSOIL
	Layer 2	Whitish Br mix calcareous soil & fine to coarse Dolorite gravel & slight Boulders
	Layer 3	
	Layer 4	
	Layer 5	
	Layer 6	

GRADING ANALYSIS

% Passing Sieve	63.0 mm	No Sample				
	53.0 mm		100			
	37.5 mm		92			
	26.5 mm		79			
	19.0 mm		71	100		
	13.2 mm		64	86		
	4.75 mm		49	59		
	2.00 mm		39	44		
	0.425 mm		19	22		
0.075 mm	13	12				

GRADING MODULUS

GM	2.29	2.22	
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ATTERBERG LIMITS

Liquid Limit	29	30	
Plasticity Index	12	12	
Linear Shrinkage	5.5	6.0	

MDD / OMC & CBR ANALYSIS

Maximum Dry Density		2238	
Optimum Moisture Content		7.9	
In-situ Moisture Content			
In-situ Density (%)			
CBR @ 90%		9.4	
CBR @ 93%		35	
CBR @ 95%		52	
CBR @ 98%		59	
CBR @ 100%		64	
% Swell (Max)		0.0	

MATERIAL CLASSIFICATION

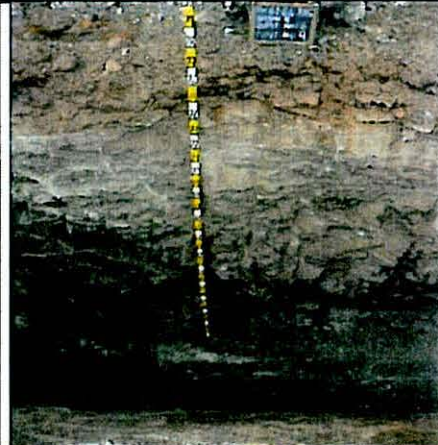
COLTO Classification		G6	
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Remarks:



SUMMARY OF BORROW PIT RESULTS - REP COM 8

Client:	Aurecon	BP No:	6		
Project Name:	R27 W/Cape Border to Calvinia	TP No:	9	GPS (X):	6512892.33
Project No:	106547	Section:	Section 8	GPS (Y):	34J377947
Job No:		Chainage:	Km 61.64	Date:	
		Position:	RHS	Test Methods:	TMH1 A1-A5 / A7 / A8



SAMPLE DESCRIPTION	Layer 1	Layer 2	Layer 3	Layer 4	Layer 5	Layer 6
Depth (mm)	0 - 400	400 - 2600				
		2600 > Refusal				
Lab No		1/359				

DESCRIPTIONS

Layer Description	Layer 1	Layer 2	Layer 3	Layer 4	Layer 5	Layer 6
	TOPSOIL					
		Whitish Br sl calcareous med dense to v dense fine to coarse Dolomite gravel & Boulders				

GRADING ANALYSIS

% Passing Sieve	No Sample					
	63.0 mm		63			
53.0 mm		61				
37.5 mm		58				
26.5 mm		54				
19.0 mm		50				
13.2 mm		48				
4.75 mm		39				
2.00 mm		27				
0.425 mm		10				
0.075 mm		3				

GRADING MODULUS

GM		2.60			
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Liquid Limit					
Plasticity Index		NP			
Linear Shrinkage		0.0			

MDD / OMC & CBR ANALYSIS

Maximum Dry Density					
Optimum Moisture Content					
In-situ Moisture Content					
In-situ Density (%)					
CBR @ 90%					
CBR @ 93%					
CBR @ 95%					
CBR @ 98%					
CBR @ 100%					
% Swell (Max)					

MATERIAL CLASSIFICATION

COLTO Classification					
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Remarks:



SUMMARY OF BORROW PIT RESULTS - REP COM 8

Client:	Aurecon	BP No:	6	GPS (X):	6512810.32
Project Name:	R27 W/Cape Border to Calvinia	TP No:	10	GPS (Y):	34J377992.95
Project No:	106547	Section:	Section 8	Date:	
Job No:		Chainage:	Km 61.64	Test Methods:	TMH1 A1-A5 / A7 / A8
		Position:	RHS		



SAMPLE DESCRIPTION	Layer 1	Layer 2	Layer 3	Layer 4	Layer 5	Layer 6
Depth (mm)	0 - 300	300 - 2200				
		2200 > Refusal				
Lab No		1/360				

DESCRIPTIONS

Layer Description	Layer 1	Layer 2	Layer 3	Layer 4	Layer 5	Layer 6
	TOPSOIL					
		Whitish L/Br mix calcareous soil & fine to coarse Dolorite gravel & slight Boulders				

GRADING ANALYSIS

% Passing Sieve						
	63.0 mm	No Sample	79			
53.0 mm	76					
37.5 mm	61					
26.5 mm	53					
19.0 mm	45					
13.2 mm	37					
4.75 mm	24					
2.00 mm	19					
0.425 mm	9					
0.075 mm	3					

GM

2.69

ATTERBERG LIMITS

Liquid Limit				
Plasticity Index		NP		
Linear Shrinkage		0.0		

MDD / OMC & CBR ANALYSIS

Maximum Dry Density				
Optimum Moisture Content				
In-situ Moisture Content				
In-situ Density (%)				
CBR @ 90%				
CBR @ 93%				
CBR @ 95%				
CBR @ 98%				
CBR @ 100%				
% Swell (Max)				

MATERIAL CLASSIFICATION

COLTO Classification				
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Remarks:



SUMMARY OF BORROW PIT RESULTS - REP COM 8

Client: Aurecon	BP No: 6		
Project Name: R27 W/Cape Border to Calvinia	TP No: 11	GPS (X): 6513171.21	
Project No: 106547	Section: Section 8	GPS (Y): 34J378126.7	
Job No:	Chainage: Km 61.64	Date:	
	Position: RHS	Test Methods: TMH1 A1-A5 / A7 / A8	



SAMPLE DESCRIPTION	Layer 1	Layer 2	Layer 3	Layer 4	Layer 5	Layer 6
Depth (mm)	0 - 2700					
	2700 > Too Dense					
Lab No	1/361					

DESCRIPTIONS

Layer Description	Layer 1	Layer 2	Layer 3	Layer 4	Layer 5	Layer 6
	Br med dense to v dense fine to coarse Dolorite gravel					

GRADING ANALYSIS

% Passing Sieve	63.0 mm	53.0 mm	37.5 mm	26.5 mm	19.0 mm	13.2 mm	4.75 mm	2.00 mm	0.425 mm	0.075 mm
	62	57	48	38	29	26	17	13	6	3

GRADING MODULUS

GM	2.78				
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ATTERBERG LIMITS

Liquid Limit	31				
Plasticity Index	11				
Linear Shrinkage	4.5				

MDD / OMC & CBR ANALYSIS

Maximum Dry Density					
Optimum Moisture Content					
In-situ Moisture Content					
In-situ Density (%)					
CBR @ 90%					
CBR @ 93%					
CBR @ 95%					
CBR @ 98%					
CBR @ 100%					
% Swell (Max)					

MATERIAL CLASSIFICATION

COLTO Classification					
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Remarks:



SUMMARY OF BORROW PIT RESULTS - REP COM 8

Client:	Aurecon	BP No:	6
Project Name:	R27 W/Cape Border to Calvinia	TP No:	12
Project No:	106547	Section:	Section 8
Job No:		Chainage:	Km 61.64
		Position:	RHS
		GPS (X):	6513269.13
		GPS (Y):	34J378185.35
		Date:	
		Test Methods:	TMH1 A1-A5 / A7 / A8



SAMPLE DESCRIPTION	Layer 1	Layer 2	Layer 3	Layer 4	Layer 5	Layer 6
Depth (mm)	0 - 1000	1000 - 3200				
		3200 > Too Dense				
Lab No		1/362				

DESCRIPTIONS

Layer Description	Layer
	Layer 1 TOPSOIL
	Layer 2 Br med dense to dense weath. Dolorite gravel
	Layer 3
	Layer 4
	Layer 5
	Layer 6

GRADING ANALYSIS

% Passing Sieve	Sieve Size (mm)	Sample	Layer 1	Layer 2	Layer 3	Layer 4	Layer 5	Layer 6
	63.0 mm	No Sample		100				
	53.0 mm		100					
	37.5 mm		100					
	26.5 mm		97					
	19.0 mm		90					
	13.2 mm		87					
	4.75 mm		70					
	2.00 mm		58					
	0.425 mm		28					
	0.075 mm	22						

GM

1.92

ATTERBERG LIMITS

Parameter	Layer 1	Layer 2	Layer 3	Layer 4	Layer 5	Layer 6
Liquid Limit						
Plasticity Index		NP				
Linear Shrinkage		0.0				

MDD / OMC & CBR ANALYSIS

Parameter	Layer 1	Layer 2	Layer 3	Layer 4	Layer 5	Layer 6
Maximum Dry Density		2070				
Optimum Moisture Content		11.0				
In-situ Moisture Content						
In-situ Density (%)						
CBR @ 90%		22				
CBR @ 93%		25				
CBR @ 95%		27				
CBR @ 98%		34				
CBR @ 100%		42				
% Swell (Max)		0.1				

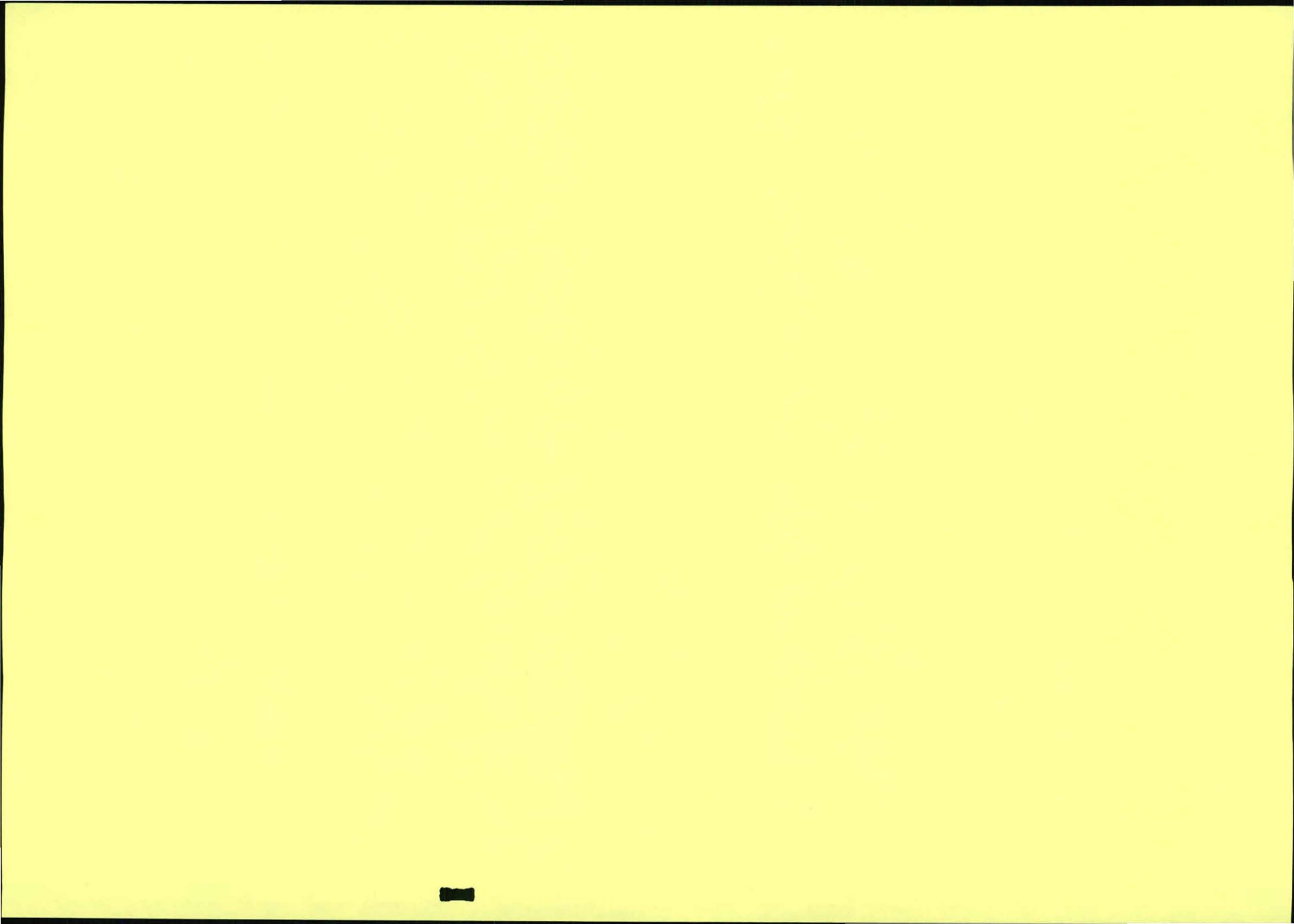
MATERIAL CLASSIFICATION

COLTO Classification	Layer 1	Layer 2	Layer 3	Layer 4	Layer 5	Layer 6
		G6				

Remarks:

APPENDIX C3.2:

**LANDOWNER ACKNOWLEDGEMENT FORM AND COMMENTS:
BORROWPIT BP 27-8 KM 61.6 RHS 1.0**



CLAASSEN STONE

Geoktroiseerde Rekenmeesters (SA)
Geregistreerde Ouditeure

Chartered Accountants (SA)
Registered Auditors

HOOPSTRAAT 19
POSBUS 412
CALVINIA 8190
TELEFOON 027 3411665
FAKS NR. 027 3411908
E-pos: clastone@telkomsa.net

19 HOOP STREET
P.O. BOX 412
CALVINIA 8190
TELEPHONE 027 3411665
FAX NO. 027 3411908
E-mail: clastone@telkomsa.net

24 Junie 2011

CCA Environmental (Pty) Ltd.
Posbus 10145
CALEDON SQUARE
7905

Ons verw./Our Ref.:

DSVN/an

U verw./Your Ref.:

Menere

GLEN DANA (EIENDOMS) BEPERK VERSTERKING VAN DIE R27 – VOORGESTELDE LEENGRAAF

Ek verwys na u skrywe van 15 Junie 2011 aan mnr Johan Strauss, bestuurder van Glen Dana.

In opdrag van mnr Strauss, rig ons 'n versoek dat alvorens hy enige dokumentasie teken tussen die maatskappy SANRAL en CCA Environmental, hy graag saam met verteenwoordigers van beide die organisasies, 'n terreininspeksie wil hou ten einde sekere onduidelikhede uit te klaar.

U kan mnr Strauss direk kontak om 'n reëling vir 'n terreininspeksie te bespreek.

Die uwe
CLAASSEN STONE

PER:



Vennote/Partners:

Calvinia: DS van Niekerk, Hons.-B. Compt., CA(SA) RA
Springbok: HJS Stone, B.Comm., AMC, CFE, CA(SA) RA; JA Coetzee, Hons.-B. Compt., CA(SA) RA
Vredendal: HP Vos, B.Rek. Hons.-B. Compt., CA(SA) RA; JP Coetzee, B.Rek. Hons.-B. Compt., CA(SA) RA



VOORGESTELDE LEENGROEWE VIR DIE VERSTERKING VAN
DIE R27 GEDEELTE 7 & 8 TUSSEN DIE WES-/NOORD-KAAP
GRENS (KM 40.0) EN CALVINIA (KM 70.0)

BENUTTING VAN LEENGROEWE

PROPOSED BORROWPITS FOR THE STRENGTHENING OF THE
R27 SECTIONS 7 & 8 BETWEEN THE WESTERN/NORTHERN
CAPE BORDER (KM 40.0) AND CALVINIA (KM 70.0)

UTILISATION OF BORROWPITS

LEENGROEF NO. / BORROW PIT NO.	BP R27-8 km 61.6 RHS 1.0
GEREGISTREERDE PLAAS NAAM / REGISTERED FARM NAME	Enkelde Wilgenboom Nr 768
GEREGISTREERDE EIENAAR / REGISTERED OWNER	Glen Dana Pty Ltd

Ek bevestig dat ek verwittig is van SANRAL se voorneme om 'n voorgestelde leengroef op my eiendom te benut, soos aangedui op die aangehegte plan, vir die versterking van Gedeeltes 7 & 8 van die R27 tussen die Wes-/Noord-Kaap grens en Calvinia; en dat ek bewus is van die ligging en omvang van die gebied en dat toegang oor my eiendom benodig mag word.

I acknowledge that I have been informed of SANRAL's intention to utilise a proposed borrow pit on my property indicated on the attached plan for the strengthening of Section 7 & 8 of the R27 between the Western/Northern Cape border and Calvinia; and that I am aware of the location and extent of the area and that access to the area may be required across my property.

HANDTEKENING VAN EIENAAR OF GEDELEGEERDE VERTEENWOORDIGER / SIGNATURE OF OWNER OR DELEGATED REPRESENTATIVE

Johann Strauss

STATUS INDIEN NIE GEREGISTREERDE EIENAAR NIE/ STATUS IF NOT REGISTERED OWNER..... ~~N/A~~ * Shareholder / Partner of Glen Dana Pty (Ltd)

DATUM/ DATE..... 6 July 2011

NAAM/ NAME..... Johann Strauss

POSADRES/ POSTAL ADDRESS P.O. Box 164, Calvinia, 8190

TELEFOONNOMMER/ TELEPHONE NUMBER..... 083 ~~6443~~ 231 1872

FAKSNOMMER/ FAX NUMBER..... None

E-POSADRES/ E-MAIL ADDRESS..... plattberg@hantam.co.za

KOMMENTAAR/ COMMENT

NEE / NO

JA / YES

- The access road fence will split the grazing camp and isolate a portion from a water source. To address this, an old concrete dam will need to be lined/waterproofed and the windmill repaired.

- 2 Gate must be provided to enable access by the farmer across the new borrow pit access road.

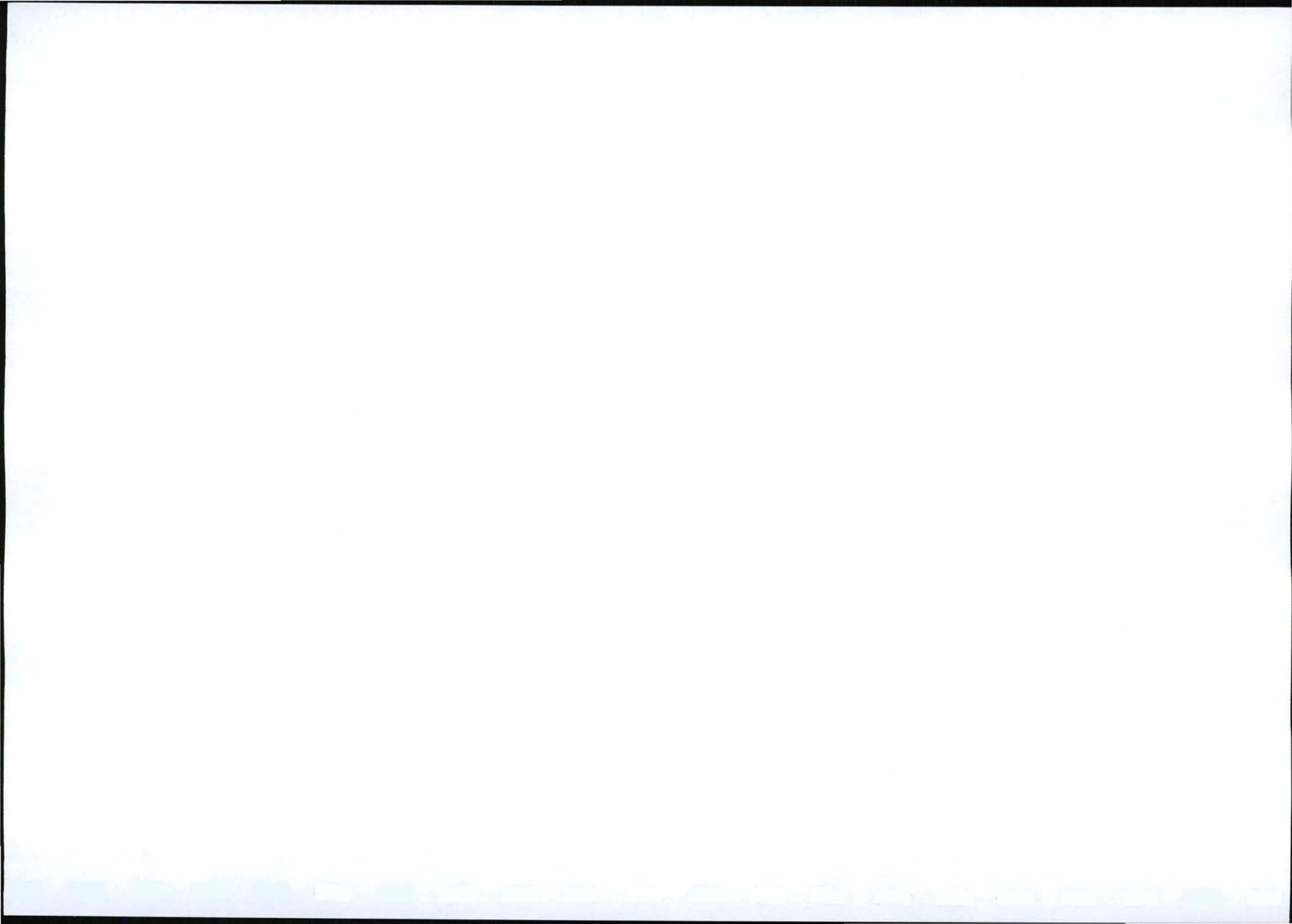
- Dust generated during construction to be minimal by watering the access road.

Please forward to / Stuur asseblief aan:

CCA ENVIRONMENTAL (PTY) LTD
Unit 35, Roeland Square, Cape Town, 8001
PO Box 10145, Caledon Square, 7905
T: (021) 461 1118 F: (021) 461 1120
Email: ena@ccaenvironmental.co.za

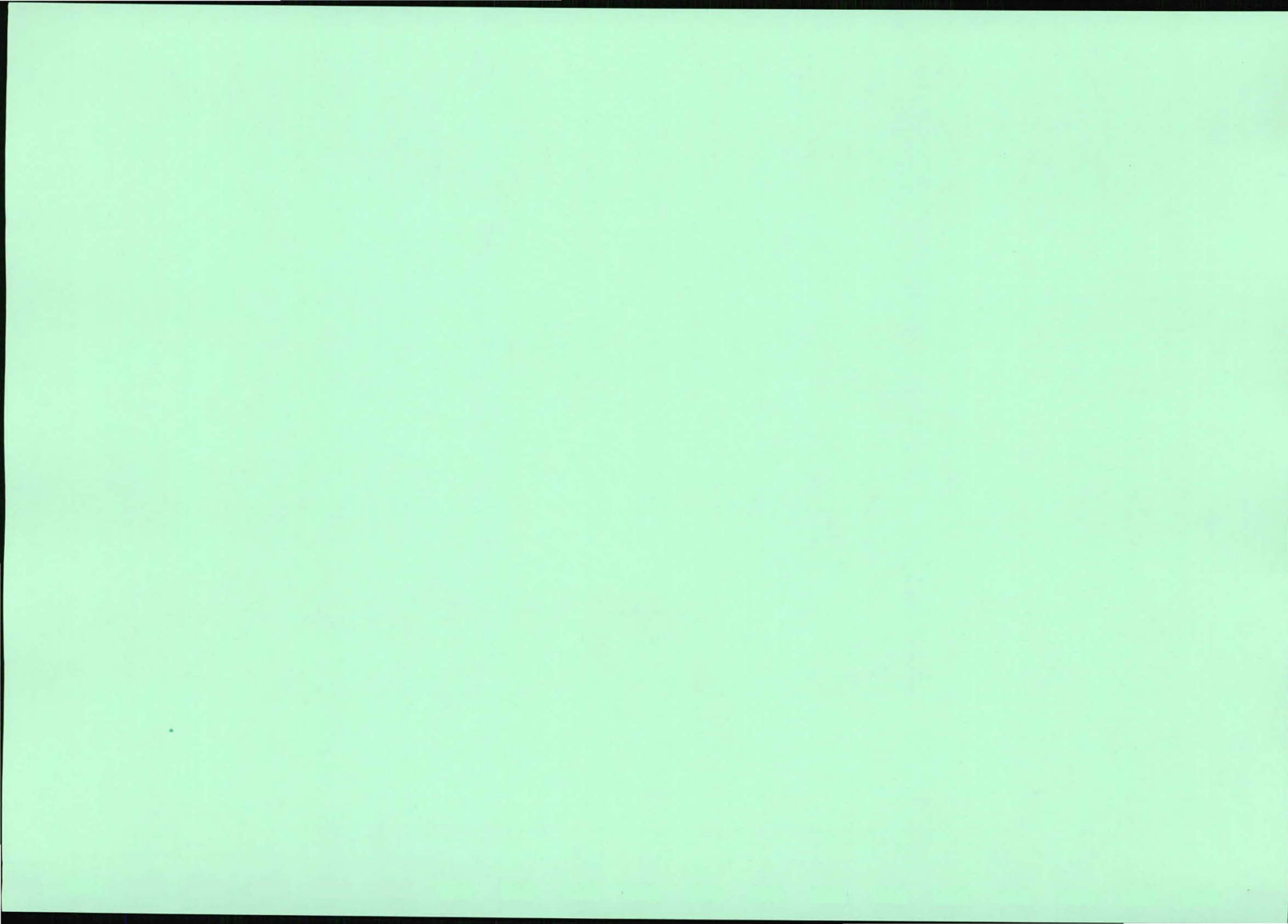
áurecon

cca
ENVIRONMENTAL



PART D:

ENVIRONMENTAL MANAGEMENT PROGRAMME



PART D ENVIRONMENTAL MANAGEMENT PROGRAMME

This section applies to all proposed borrowpits.

D1 ENVIRONMENTAL MANAGEMENT PROGRAMME ADMINISTRATION

D1.1 REPORT AVAILABILITY

Copies of this EMP shall be kept at the construction camp(s) and shall be distributed to all senior contract personnel. All senior personnel shall be required to familiarise themselves with the contents of this document.

D1.2 MANAGEMENT STRUCTURE

The implementation of this EMP requires the involvement of several stakeholders, each fulfilling a different but vital role to ensure sound environmental management during the construction phase. These roles and responsibilities are discussed in detail below. Details of the organisational structure are presented in Figure D1. The structure illustrates the reporting procedures for stakeholders in the implementation of this EMP.

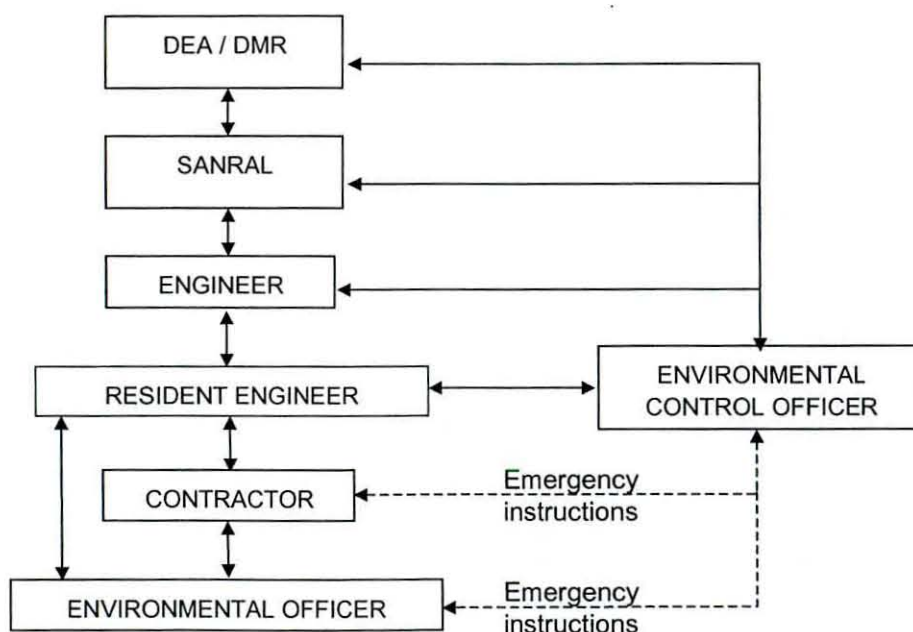


Figure D1: EMP implementation organisational structure

D1.2.1 Department of Environmental Affairs (DEA)

DEA is the designated authority responsible for authorising this EMP. DEA has overall responsibility for ensuring that SANRAL complies with the conditions of its environmental authorisation as well as this EMP.

DEA shall also be responsible for approving any amendments that may be required to the EMP. DEA may also perform random site inspections to check compliance with the EMP.

D1.2.2 Department of Mineral Resources (DMR)

DMR is the designated authority responsible for authorising the borrowpit development and for the associated EMP. DMR would have overall responsibility for ensuring that the Applicant (SANRAL) complies with the conditions of the borrowpit authorisation as well as the associated EMP.

D1.2.3 South African National Roads Agency SOC Limited (SANRAL)

The Applicant is accountable for the potential impacts of activities that are undertaken and is responsible for managing these impacts. SANRAL as the Applicant and Employer therefore has overall environmental responsibility to ensure compliance with the relevant legislation and for the implementation of the EMP and the financial cost of all environmental control measures. SANRAL must ensure that any person acting on their behalf complies with the conditions/specifications contained in this EMP. SANRAL is also responsible for the appointment of the Engineer, Contractor and Environmental Control Officer (ECO).

SANRAL shall address any site problems pertaining to the environment at the request of the Engineer and/or the ECO.

D1.2.3 Engineer

The Engineer shall oversee the planning, design and construction phases of the project. The Engineer shall appoint a Resident Engineer or Engineer's Representative (referred to as the RE) to act as the on-site implementing agent.

The Engineer shall address any site problems pertaining to the environment at the request of the RE and/or the ECO.

D1.2.4 Contractor

The Contractor shall have the following responsibilities:

- To implement all provisions of the EMP. If the Contractor encounters difficulties with specifications, he must discuss alternative approaches with the RE and/or the ECO prior to proceeding.
- To ensure that all staff are familiar with the EMP.
- To monitor and verify that the environmental impacts are kept to a minimum.
- To make personnel aware of environmental problems and ensure they show adequate consideration of the environmental aspects of the project.
- To prepare the required Method Statements (see Section D1.3).
- To report any incidents of non-compliance with the EMP to the RE and the ECO.
- To rehabilitate any sensitive environments damaged due to the Contractor's negligence. This shall be done in accordance with the Engineer's and ECO's specifications.

Failure to comply with the EMP may result in fines (see Section D1.5) and reported non-compliance may result in the Engineer suspending the operation causing the non-compliance.

D1.2.5 Resident Engineer (RE)

The RE would act as SANRAL's on-site implementing agent and has the responsibility to ensure that their responsibilities are executed in compliance with the EMP. Any on-site decisions regarding environmental management are ultimately the responsibility of the Engineer or the RE in accordance with their delegated authorities. The RE shall assist the ECO where necessary and shall have the following responsibilities in terms of the implementation of this EMP:

- Regular site inspections.
- Reviewing and approving the Contractor's Method Statements with input from the ECO where necessary (see Section D1.3).
- Monitoring and verifying that the EMP and Method Statements are adhered to at all times and taking action if specifications are not followed.
- Keeping a photographic record of construction and borrowpit activities on site.
- Assisting the Contractor in finding environmentally responsible solutions to problems with input from the ECO where necessary.
- Recommending to the Engineer the removal of person(s) and/or equipment not complying with the EMP specifications.
- Recommending to the Engineer the issuing of fines for transgressions of the EMP.
- Recommending to the Engineer delaying any construction or borrowpit activity if he/she believes the integrity of the environment has been or is likely to be seriously jeopardised.
- Providing input into the ECO's ongoing internal review of the EMP.
- The RE shall communicate environmental issues to the Environmental Officer.

D1.2.6 Environmental Control Officer (ECO)

The appointment of an Environmental Control Officer (ECO) is required. The ECO will be an independent environmental consultant appointed by the Engineer to act as the representative of the Applicant/Employer to monitor and review the on-site environmental management and implementation of this EMP by the Contractor. The ECO shall undertake regular site inspections, as agreed by the Employer, for the duration of the construction contract.

The ECO's duties shall include, *inter alia*, the following:

- Ensuring the necessary environmental authorisations and permits, if any, have been obtained.
- Advising the Contractor and/or the RE on environmental issues within defined construction and borrow areas.
- Reviewing Method Statements (see Section D1.3).
- Undertaking regular site visits to ensure compliance with the EMP and verifying that environmental impacts are kept to a minimum throughout the contract.
- Completing environmental checklists during site visits.
- Keeping a photographic record of progress on site from an environmental perspective.
- Assisting the Contractor and/or the RE in finding environmentally acceptable solutions to construction problems.

- Recommending additional environmental protection measures should this be necessary.
- Keeping a register of complaints and recording and dealing with any community issues or comments pertaining to contract environment issues.
- Providing a report back on the environmental issues to be tabled at site meetings.
- Ensuring that DEA and/or DMR are informed of work progress on site.
- Reporting any incidents that may have caused damage to the environment or breaches of the EMP to DEA and/or DMR.
- Preparing an environmental audit report at the conclusion of the construction phase.

The ECO shall communicate directly with the RE. Should problems arise on site that cannot be resolved between the ECO and the RE, the ECO shall take the matter up with the Engineer and/or SANRAL. If SANRAL does not respond the ECO shall take the matter up with DEA and/or DMR.

D1.2.7 Environmental Officer (EO)

The Contractor shall appoint, at own cost, a competent individual as its on-site Environmental Officer (EO) to ensure that the EMP is implemented and that all environmental specifications and EMP requirements are met at all times. The EO shall be responsible for monitoring, reviewing and verifying the Contractor's compliance with the EMP. The EO may also act as a Traffic Safety Officer.

The EO's duties in this regard shall include, *inter alia*, the following:

- Daily site inspections.
- Monitoring and verifying that the EMP and Method Statements are adhered to at all times and taking action if specifications are not followed.
- Monitoring and verifying that environmental impacts are kept to a minimum.
- Assisting the RE and ECO in finding environmentally responsible solutions to problems.
- Inspecting the site and surrounding areas on a regular basis with regard to compliance with the EMP.
- Keeping accurate and detailed records of these inspections.
- Reporting any incidents of non-compliance with the EMP to the RE and/or the ECO.
- Keeping a register of complaints on site and recording community comments and issues, and the actions taken in response to these complaints.

D1.3 METHOD STATEMENTS

The Contractor shall submit written Method Statements to the RE and ECO for all environmentally sensitive aspects of the work. As a minimum the following method statements are required:

- Lay-out and establishment of borrowpits (Section D2.2.1)
- Invasive vegetation eradication plan (Section D2.3.1)
- Storage of hazardous substances (Section D2.4.2)
- Solid waste (Section D2.7.2)
- Wastewater (Section D 2.7.3)
- Erosion and sedimentation control (Section D2.8)
- Fire control (Section D2.11)

- Revegetation (Section D3.4.4)

The RE and/or the ECO shall specify any additional Method Statements that may be required.

A Method Statement Control Sheet, signed by the Contractor, must accompany each Method Statement (a pro forma Control Sheet is provided in Appendix D1). Method Statements shall cover applicable details with regard to:

- Construction procedures;
- Materials and equipment to be used;
- Getting equipment to and from site;
- How the equipment/material will be moved while on site;
- How and where material will be stored;
- The containment (or action to be taken if containment is not possible) of leaks or spills of any liquid or material that may occur;
- Timing and location of activities;
- Compliance/non-compliance with the specifications; and
- Any other information deemed necessary by the Engineer/RE/ECO.

Method Statements shall be submitted to the RE and ECO **at least five (5) days prior** to the commencement of operations. It should be noted that Method Statements must contain sufficient information and detail to enable the RE and ECO to apply their minds to the potential impacts of the works on the environment. The Contractor will also need to thoroughly understand what is required of him/her in order to undertake the works.

Work shall not commence until the Engineer has accepted Method Statements. Failure to submit Method Statements may cause the Engineer to order the Contractor to suspend part or all of the works concerned until a Method Statement has been submitted and accepted. Failure to submit Method Statements at least five days prior to commencing the relevant activity may result in a fine (see Section D1.5). Any damage caused to the surrounding environment by work done without prior acceptance shall be rehabilitated at the Contractor's cost.

D1.4 ENVIRONMENTAL AWARENESS TRAINING

Before the commencement of any work on site, the Contractor's site management staff shall attend an environmental awareness-training course, presented by the ECO and RE. The Contractor shall liaise with the ECO prior to the commencement date to fix a date and venue for the course. The Contractor shall provide a suitable venue with facilities, and ensure that the specified employees attend the course.

The information presented at the course shall be communicated by the Contractor to the rest of his employees on the site, to any new employees coming onto site after the initial training course and to his/her suppliers. The presentation shall be conducted, as far as is possible, in the employees' language of choice. As a minimum, training shall include:

- Explanation of the importance of complying with the EMP;
- Discussion of the potential environmental impacts of construction activities;
- Explanation of the management structure of individuals responsible for matters pertaining to the EMP.
- Employees' roles and responsibilities, including emergency preparedness;
- Explanation of the mitigation measures that must be implemented when carrying out their activities;

- Explanation of the specifics of the EMP and its specification; and
- Explanation of the Environmental Do's and Don'ts (see Appendix D2).

The Contractor shall keep records of all environmental training sessions, including names of attendees, dates of their attendance and the information presented to them. Records of environmental training sessions shall be submitted to the ECO.

D1.5 FINES

A system of fines shall be implemented to ensure compliance with the EMP (see Appendix D3). Where the Contractor inflicts non-repairable damage upon the environment or fails to comply with any of the environmental specifications of the EMP the Contractor may be liable to pay a fine. The Contractor is deemed not to have complied with the EMP if:

- There is evidence of contravention of the EMP specifications, including any non-compliance with an approved Method Statement;
- Construction activities take place outside the defined boundaries of the site;
- Environmental damage ensues due to negligence;
- The Contractor fails to comply with corrective or other instructions issued by the RE within a specific time period; and/or
- The Contractor fails to respond adequately to complaints from the public.

If excessive infringement with regard to any of the above is registered, then SANRAL reserves the right to terminate the Contractor's contract.

The system of fines shall be implemented in the following way:

- Fines shall be issued per incident at the discretion of the Engineer.
- Fines shall be issued in addition to any remedial costs incurred as a result of non-compliance with the environmental specifications.
- The Engineer shall inform the Contractor of any contravention, the contravening individual's identity and the amount of the fine, and will deduct the total amount from the amounts due to the Contractor.
- Where there are ranges for fees shown in Appendix C, the amount shall depend on the severity and extent of the damage done to the environment.

Failure by any employee of the Contractor or their Sub-contractors to show adequate consideration to the environmental aspects of the contract shall be considered sufficient cause for the ECO to recommend to the RE to have that employee removed from the site. The ECO may, through the Engineer, also order the removal of equipment that is causing continual environmental damage.

D1.6 INTERNAL REVIEW AND AUDITING

The Contractor and EO shall establish an internal review procedure to monitor the progress and implementation of the EMP.

Where necessary, and upon the recommendation of the RE and/or the ECO, procedures that require modification will be changed to improve the efficiency of the EMP. All significant modifications to the EMP shall be approved by DEA and/or DMR before these changes or adjustments to the EMP are implemented.

Any changes or adjustments to the EMP shall be registered in the daily records of the RE. Adjustment and update of the original EMP document is not required when these *ad hoc* changes are made.

At the conclusion of the project an environmental audit report shall be compiled and submitted to DEA and DMR. This report will be compiled by the ECO, in collaboration with the RE, EO and the Contractor. It will outline the implementation of the EMP, and highlight any problems and issues that arose during the construction period to report, on a formal basis, the lessons learned on this project.

D2 CONSTRUCTION PHASE

D2.1 MANAGEMENT OF CONSTRUCTION SITE

D2.1.1 Location of construction camp

The "Construction Camp" refers to all storage stockpile sites, site offices, container sites and rest areas for workmen.

The construction camp(s) shall be located at an easily accessible point and within an area of low environmental sensitivity. No camp establishment shall be allowed within 32 m or below the 1:10 year flood line (where defined) of any watercourses, floodplains or drainage channels. The Contractor, RE and ECO shall agree on mutually acceptable locations for the establishment of the camp(s). The RE and ECO shall approve the final location of all camps prior to their establishment.

The construction camp shall be demarcated by a fence, the position of which will be agreed by the RE, ECO and the Contractor. Suitable signs must be erected to clearly demarcate these areas. The area outside the construction camp(s) fence is considered to be a No-go area. Undertaking activities in these areas without the RE's or ECO's permission may result in a fine (see Appendix D3).

D2.1.2 Toilet Facilities

The Contractor shall provide suitable sanitary arrangements (e.g. chemical toilets) at each construction site as per building guidelines (SABS 0400). There should be one toilet for every 15 workers on site. Toilet(s) must be easily accessible and shall be secured in order to prevent them from blowing over.

Toilet(s) shall not be sited within watercourses, floodplains or drainage channels, and shall be sited in consultation with the RE and ECO. The Contractor shall consider placing toilet(s) on a trailer so that they can be removed from each site and taken to the construction camp on a daily basis. Alternatively toilets shall be secured in order to prevent them from blowing over.

Toilets shall be chemical and shall be emptied on a regular basis. The Contractor shall ensure that there is no spillage when the chemical toilets are cleaned or during normal operation and that the contents are properly removed from site.

The Contractor shall be responsible for enforcing the use of the facilities. Performing ablutions outside of established toilet facilities is strictly prohibited.

D2.1.3 Eating Areas

The Contractor shall establish eating areas, as agreed with the RE. These areas shall provide adequate temporary shade to ensure that employees do not move off site to eat.

The Contractor shall provide adequate refuse bins at all eating areas to the satisfaction of the RE and shall ensure that all eating areas are cleaned up on a daily basis. Collected waste shall be stored in a central waste area within the construction camp that has been approved by the RE and ECO.

Any cooking of food on site shall be done using gas cookers. Rivers shall not be used for washing of pots and plates.

D2.1.4 Provision of water

The Contractor shall be responsible for ensuring that there is access to clean drinking water for all employees on site. The use of water in rivers as a drinking water supply is strictly forbidden.

If water is stored on site, drinking water and multi-purpose water storage facilities shall be clearly distinguished and demarcated.

D2.1.5 General Aesthetics

All construction areas shall be kept neat and tidy at all times. Different materials and equipment must be kept in designated areas and storing/stockpiling shall be kept orderly.

D2.1.6 Lights

The Contractor shall ensure that any lighting installed on the site for his/her activities does not interfere with road traffic or cause a reasonably avoidable disturbance to the surrounding community.

D2.2 SITE DEMARCATION AND NO-GO AREAS

D2.2.1 Lay-out and establishment of borrowpits

The layout and extent of the borrowpits shall be planned, designed and managed in such a manner that environmental impacts are minimised. Temporary structures and facilities shall be decommissioned to the satisfaction of the ECO and clean-up after construction shall be effectively undertaken.

Care shall be taken to limit the extent of the area disturbed during material removal activities. In this regard, the borrowpit sites and associated activities and infrastructure shall be carefully planned, to ensure that the footprint is kept to a minimum.

Where possible, existing infrastructure or previously disturbed areas shall be utilised for the construction of facilities. Care shall be taken to ensure that the placement of infrastructure does not adversely affect the environment or result in soil erosion.

The borrowpits shall be shaped so that they have slopes no steeper than 1:3 (vertical: horizontal). The slope changes shall be finished off so that flowing curves that blend with the surrounding landscape are formed in preference to sharp angles, to the satisfaction of DMR (see Section D3.2.4).

The borrowpit sites, access points and newly constructed access roads shall be properly demarcated and fenced off. No personnel shall be allowed outside the fenced off area. Vehicle movement shall be limited to defined tracks and areas that will be excavated.

Land disturbed by material removal activities shall be rehabilitated as described in Section D3.

MS1: The Contractor shall submit a Method Statement indicating the location, preparation and layout of borrowpit sites.

D2.2.2 No-go areas

Areas where construction activities (including traffic accommodation) are prohibited are referred to as No-go areas and shall be demarcated to ensure that environmentally sensitive areas are not impacted by the construction activities. In the case of borrow areas, No-go areas include all areas outside of the fenced-off borrowpit site.

Appropriate No-go areas or special features identified by the RE and/or the ECO shall be marked on a site layout plan prior to any works commencing on site. Such No-go areas shall be demarcated by means of droppers and highly visible safety fence (orange plastic) of at least 1.6 m height. The removal, damage or disturbance of flora, fauna, avifauna, outcrops or any other natural features shall be forbidden in all demarcated No-go areas or specified environmentally sensitive areas, unless prior permission has been given by the RE and the ECO. The RE may declare No-go areas at any time during the construction phase as deemed necessary and/or at the request of the ECO.

The Contractor shall be responsible for any clean-up and/or rehabilitation of all areas impacted by construction activities.

D2.3 SITE CLEARING AND EXCAVATION

D2.3.1 Vegetation clearing

Before clearing of vegetation, the Contractor shall ensure that all litter and organic material is removed from the area to be cleared. No vegetation clearing shall take place without the prior approval of the RE.

All invasive (indigenous or exotic) plants and weedy species should be removed from the borrowpit sites prior to construction to inhibit further spread of these species in these areas as a result of the borrowpit activities. Weedy species to be removed and controlled include *Galenia africana* (kraalbos), *Atriplex semibaccata*, *Atriplex lindleyi* subsp. *Inflate* (blasiebrak), *Prosopis glandulosa* (mesquite) and especially *Salsola kali* (Russian tumbleweed; rolbos).

Any existing patches of invasive vegetation shall be removed by manual cutting of plants to ground level or to below the water level. The Contractor shall not use heavy machinery to remove such patches of vegetation.

The Contractor shall compile an invasive vegetation eradication plan to the RE for approval. The plan shall indicate the locations, methods and frequency of invasive vegetation control throughout the duration of the contract, including the defects notification period. It is recommended that the Contractor appoint a Landscaping Contractor/Horticulturalist who will undertake the final rehabilitation of construction and borrowpit areas (see Section D3).

Vegetation clearing shall take place in a phased manner in order to retain vegetation cover as long as possible. This approach is necessary in order to reduce the size of areas where dust can be generated by wind and sediment runoff may take place.

All cut vegetation shall be disposed of off-site at an approved disposal site. Stockpiling of cut vegetation shall only be permitted in areas indicated by the RE and/or the ECO. No cut vegetation shall be burnt on site.

MS2: The Contractor shall submit an invasive vegetation eradication plan, detailing the locations, methods and frequency of invasive vegetation control in relation to each borrowpit.

D2.3.2 Topsoil

For borrowpits topsoil shall be removed up to a depth of 300 mm depending on the actual topsoil present and stockpiled (not exceeding 2 m in height) separately from overburden and other material for use during rehabilitation of the site. The locations of topsoil stockpiles should be clearly indicated on the final site layout plans for borrowpits.

Topsoil stockpiles shall, where necessary, be protected from wind and water erosion by seeding or placement of hay bales or shade cloth screens or covered with hessian or geofabric. Berms or cut-off trenches shall be considered for the prevention of erosion, if necessary. Stockpiles shall not be covered with plastic sheets that may cause it to compost or kill the seed bank. Stockpiles shall not be left for more than eight months before being used for rehabilitation, as soil chemistry and natural processes decline after time, resulting in poor rehabilitation success.

Any topsoil contaminated by hazardous substances shall not be used but shall be disposed of at a landfill site approved by the Department of Water Affairs (DWA).

Material that cannot be used in the proposed road rehabilitation project shall be removed and retained in uncompacted stockpiles. This material shall be used for the reshaping of the area before topsoil is spread during rehabilitation.

D2.3.3 Archaeological material

If any archaeological material, paleontological artefacts or human remains are discovered during earth moving activities, all construction activities must be stopped immediately and the site clearly demarcated. The Contractor must inform the RE and ECO as soon as possible in order to establish relevant procedures for notifying Ngwao Boswa Kapa Bokone (Heritage Northern Cape). Should any unmarked human remains be disturbed, exposed or uncovered during construction or borrowpit operations, these should be reported to the South African Heritage Resources Agency (SAHRA) and Heritage Northern Cape.

The Contractor will be required to abide by the specifications as set out by SAHRA and Heritage Northern Cape or the heritage specialist appointed to investigate the find.

The Contractor may not, without a permit issued by the relevant heritage resources authority, move, destroy, damage, excavate, alter, deface or otherwise disturb archaeological material.

D2.4 MATERIALS HANDLING AND STORAGE

The potential environmental impact of handling, use, storage and disposal of materials used during construction shall be minimised.

D2.4.1 Transportation and handling of material

The Contractor shall ensure that all suppliers and their delivery drivers are aware of procedures and restrictions (e.g. No-go areas) in terms of this EMP.

The Contractor (and suppliers) shall ensure that all materials are appropriately secured to ensure safe passage between destinations. Loads including, but not limited to sand, stone chip, fine vegetation, refuse, paper and cement, shall have appropriate cover to prevent them spilling from the vehicle during transit. The Contractor shall be responsible for any clean-up resulting from the failure by his employees or suppliers to properly secure transported materials. The Contractor shall ensure that these delivery drivers are supervised during offloading.

The movement of construction vehicles should be limited to daylight hours as far as possible. The dangers associated with the movement of large haulage vehicles shall be clearly sign-posted in both directions leading up to the proposed borrow area.

Vehicles leaving borrowpits shall not deposit/shed mud or sand as they drive to the area under construction. Loads shall be covered with a tarpaulin or similar to prevent nuisances to other road users on days when winds are strong.

D2.4.2 Storage of construction materials and hazardous substances

The storage of any materials (e.g. cement, oil, fuel, herbicides, etc.) shall not take place within 32 m of any watercourses, floodplains or drainage channels.

All fuel, oil and other hazardous substances (i.e., fuel, poisons, etc.) shall be confined to demarcated, adequately bunded areas within the construction camp and stored in suitable containers.

Hazard signs indicating the nature of the stored materials shall be displayed on the storage facility or containment structure. Fuel shall be stored in steel tank(s) supplied and maintained by the fuel suppliers. Tank(s) shall be adequately bunded (110% of volume). The floor and wall of the bund area shall be impervious to prevent infiltration of any spilled/leaked fuel, oil or hazardous substance into the soil. Suitable fire fighting equipment shall be supplied and installed by the Contractor in the hazardous substances storage area.

The relevant Material Safety Data Sheets for all hazardous chemical substances (as defined in the Regulations for Hazardous Chemical Substances) shall be submitted to the RE. The Contractor shall have a copy of the Material Safety Data Sheets readily available and ensure that he/she or his/her employees who are required to use such substances are fully conversant with the safe handling precautions, protective equipment to be used and storage precautions to be taken.

The Contractor shall ensure that run-off from any fuel/oil or hazardous substance storage area is contained and does not pollute the ground or enter the streams or watercourses in the project area.

MS3: The Contractor shall submit a Method Statement detailing the location of storage, methods intended for storage of oil, fuel, herbicides, pesticides and other hazardous/poisonous substances. This Method Statement should also detail precautions that shall be implemented to limit spills and leakage of these substances (see Section D2.5. and D2.6).

D2.4.3 Storage of equipment

All plant, construction equipment, vehicles or other items shall be stored within the construction camp, unless prior arrangements have been made with the RE or ECO.

Drip trays shall be provided for stationary plant (such as compressors, pumps, generators, etc.) and for "parked" plant (e.g. mechanised equipment).

D2.5 REFUELLING AND MAINTENANCE

D2.5.1 Refuelling

Where reasonably practical, plant and vehicles shall only be refuelled in a demarcated refuelling/servicing area within the construction camp as agreed to with the RE and ECO. If this is not reasonably practical, then the surface under the temporary refuelling area shall be protected against pollution (e.g. the use of drip trays) to the reasonable satisfaction of the RE and/or the ECO prior to any refuelling activities. No refuelling shall be permitted within 20 m of the watercourses or local drainage channels.

The Contractor shall ensure that there is always a supply of absorbent material readily available to absorb/breakdown spills and where possible is designed to encapsulate minor hydrocarbon spillage. The quantity of such materials shall be able to handle the total volume of the hydrocarbon/hazardous substance stored on site. This material must be accepted by the RE prior to any refuelling or maintenance activities.

D2.5.2 Maintenance

All vehicles and equipment shall be kept in good working order and serviced regularly. Leaking equipment shall be repaired immediately or removed from the site.

Where reasonably practical, maintenance activities shall only be undertaken in a demarcated maintenance area (as agreed to with the RE and ECO). No maintenance activities shall be allowed within 32 m of the watercourses or any local drainage channel, unless this is absolutely necessary.

When servicing equipment, drip trays shall be used to collect the waste oil and other lubricants. All hazardous waste from maintenance activities shall be disposed of as specified in Section D2.7.1.

The washing of equipment shall be restricted to urgent maintenance requirements only. All washing shall be undertaken in the maintenance area, and these areas must be equipped with suitable wastewater collection measures. The use of detergents for washing shall be restricted to low phosphate and nitrate containing, low sudsing-type detergents.

D2.6 ACCIDENTAL LEAKS AND SPILLS

The Contractor shall prevent pollution of surface or groundwater, which could result from their activities. Such pollution could result from the release, accidental or otherwise, of oils, fuels, sewage, etc.

The Contractor shall ensure that his/her employees are aware of the procedure to be followed for dealing with spills and leaks. Any accidental leak and spill of fuel, oil or other hazardous substances is to be reported to the RE or ECO immediately so that the best remediation method can be quickly implemented.

Drip trays shall be used for all pumps, generators, etc. in order to prevent water contamination as a result of fuel spills or leaks. The Contractor shall ensure that the necessary materials and equipment for dealing with spills and leaks is available on site at all times.

In the event of a hydrocarbon spill, the source of the spillage shall be isolated and the spillage contained. The area shall be cordoned off and secured. The Contractor shall ensure that there is always a supply of absorbent material readily available to absorb/breakdown and where possible is designed to encapsulate minor hydrocarbon spillage. The quantity of such materials shall be able to handle the total volume of the hydrocarbon/hazardous substance stored on site. Prior to any refuelling or maintenance activities the RE must accept this material. Hydrocarbon contaminated material/soil shall be collected and stored in a bunded area until future disposal.

The relevant Material Safety Data Sheets (MSDSs) for all hazardous chemical substances (as defined in the Regulations for Hazardous Chemical Substances) shall be on site. Procedures detailed in the MSDSs shall be followed in the event of an emergency situation.

The Contractor shall be liable to arrange for professional service providers to clear the area affected by the spill, if required.

The Contractor shall submit a Method Statement detailing the precautions that shall be implemented to limit spills and leakage of these hydrocarbons and other hazardous substances (see Section D2.5).

D2.7 WASTE MANAGEMENT

D2.7.1 Hydrocarbon and hazardous waste

All hydrocarbon (e.g. fuel, oils and contaminated soil/materials) and other hazardous waste resulting from spills, refuelling and maintenance activities shall be disposed of in a formally licensed hazardous waste site or, where possible, sold to an approved used-oil recycling company. The Contractor shall provide disposal certificates issued by the hazardous waste disposal facility to the RE. In addition, disposal certificates shall be kept at the site office for inspection by any relevant authority.

Used oil, lubricants, cleaning materials, etc. from the maintenance of vehicles and machinery may be collected in holding tanks prior to disposal.

No hydrocarbon and hazardous waste shall be burnt or buried on site. Under no circumstances shall the spoiling or burial of tar or bituminous products be allowed on site. Unused or rejected tar or bituminous products shall be returned to the supplier's production plant.