

## **Appendix 4**

**Holmes and Holmes Pty Ltd**

*Acid Sulphate Soil Investigation  
April 2003*



# RECORD OF BOREHOLE No. 29448

CLIENT: Luke & Company

at BH W17

PROJECT: A.S.S. Assessment, Lake Cathie

Ground level: RL 5.38  
 Drill: Pty. Ltd. MD200 Toyota-mounted

Dia. of boring: 80 mm

Type of boring: continuous solid flight auger

Lining tubes: nil

Date Progress	Sample or Core Recovery		Change of Strata			Description of Strata	Anticipated A.S.S. Potential
	Depth	Type or %	Legend	Depth	Δ = D Level		
3.4.03						Dk. grey clayey Topsoil	No management required
				1.0		CLAY high plasticity Dk grey wet soft	
	Sample 48/1	D		2.0		CLAY high plasticity Grey with yellow-br. mottlings wet soft	
	Sample 48/2	D		3.0		FINE SAND Light grey saturated medium dense	
				4.0		CLAY med. plasticity (residual) yell. br. wet firm	
				5.0		End of Hole	
				6.0			
Key to type of sample			Remarks (Observations on ground-water, etc.)				
U (50) ~ 50 mm. dia. undisturbed sample.							
D ~ disturbed sample:							
N ( ) ~ standard penetration test							
No in brackets gives							
No. of blows/300 mm penetration							



# RECORD OF BOREHOLE No: 29449

CLIENT: Luke & Company

at BH W10

PROJECT: A.S.S. Assessment, Lake Cathie

Ground level:

Airail Pty Ltd MD200 Toyota-mounted

Dia. of boring: 80 mm

Type of boring: continuous solid flight auger

Lining tubes: nil

Date Progress	Samples or Core Recovery		Change of Strata			Description of Strata	Anticipated A.S.S. Potential
	Depth	Type or No.	Legend	Depth	A & D Level		
3-4-03						Dk grey clayey Topsoil	
						CLAYEY SAND Grey-brown, moist, soft	
				-1.0		FINE SAND Grey-brown moist, loose	
				-2.0		FINE SAND Grey moist/wet loose/med. dense	No management required
				-3.0			
				-4.0		Estuarine CLAY Grey wet Soft/firm	High Potential requires management.
				-5.0		End of Hole	
				-6.0			
Key to type of sample			Remarks: (Observations on ground-water, etc.)				
U (50) 50 mm. dia. undisturbed sample.							
D disturbed sample.							
N ( ) standard penetration test.							
No. in brackets gives							
No. of blows/300 mm. penetration							



# RECORD OF BOREHOLE No. 29466

CLIENT: Luke &amp; Company

PROJECT: A.S.S. Assessment, Lake Cathie

Ground level: RL 5.22

Dia. of boring: 80 mm

Drill: Pfy. Ltd. MB200 Toyota - mounted

Type of boring: continuous solid flight auger

Lining tubes: nil

Date Progress	Samples or Core Recovery		Change of Strata			Description of Strata	Anticipated A.S.S. Potential
	Depth	Type or %	Legend	Depth	Δ - D Level		
3.4.03						FINE SAND, v. slightly silty dk. grey moist, loose	No management required
				-1.0		FINE SAND light grey moist/wet loose	
				-2.0		FINE SAND with some intermittent fine gravelly layers, Brown wet, medium dense	
	Sample 66/1	D		-4.0		CLAYEY SAND, fine grained Grey, wet, soft ESTUARINE CLAY, wet, soft	High Potential requires management
				-5.0		End of Hole	
				-6.0			
Key to type of sample			Remarks: (Observations on ground-water, etc.)				
U (50) - 50 mm. dia. undisturbed sample.							
D - disturbed sample.							
N ( ) - standard penetration test.							
No. in brackets given							
No. of blows/300 mm penetration							



# RECORD OF BOREHOLE No. 29472

CLIENT: Luke & Company

PROJECT: A.S.S. Assessment, Lake Cathie

Ground level: RL 5.37

Dia. of boring: 80 mm

Auger: Pty. Ltd. MD200 Toyota mounted

Type of boring: continuous solid flight auger

Lining tubes: nil

Date Progress	Sampling or Core Recovery		Change of Strata			Description of Strata	Anticipated A.S.S. Potential
	Depth	Type or %	Legend	Depth	± D Level		
3.4.03						SILTY SAND, fine grained Dk. grey moist, loose	No management required
				-1.0		SAND, fine grained Light grey-brown moist, becoming wet loose	
				-2.0			
				-3.0		SAND & fine/med gravel	
						FINE SAND Grey-brown saturated, med. dense	
				-4.0		SAND & fine/med. gravel	
						FINE SAND (soft coffee rock) Brown, wet, med. dense	
						CLAYEY SAND Grey saturated, loose	
				-5.0		Estuarine CLAY Wet Soft	
				-6.0			
<p>Key to type of sample</p> <p>U (50) - 50 mm. dia. undisturbed sample.</p> <p>D - disturbed sample.</p> <p>N ( ) - standard penetration test.</p> <p>No. in brackets gives</p> <p>No. of blows/300 mm penetration</p>							High Potential requires management

Remarks: (Observations on ground-water, etc.)



# RECORD OF BOREHOLE No. 29475

CLIENT: Luke & Company

PROJECT: A.S.S. Assessment, Lake Cathie

Ground level: RL 5.27

Dia. of boring: 80 mm

Amil. Pty. Ltd. MD200 Toyota-mounted

Type of boring: continuous solid flight auger

Lining tubes: nil

Date Progress	Samples or Core Recovery		Change of Strata			Description of Strata	Anticipated A.S.S. Potential
	Depth	Type or	Legend	Depth	A.S.D. Level		
3.4.03						FINE SAND, v. slightly silty Grey-brown moist loose	no management required
						FINE SAND, Brown moist, loose	
				-1.0		FINE SAND, Dk yellow moist, loose/med. dense	
				-2.0		FINE SAND Light brown wet loose/medium dense	
				-3.0		FINE SAND, v. slightly silty hard and softer layers Brown wet med. dense (coffee Rabb)	High Potential requires management
	Sample 75/1	D		-4.0		CLAYEY SAND, fine grained Grey-brown soft, wet	
						Estuarine CLAY, wet, soft.	
						End of Hole	
				-5.0			
				-6.0			

## Key to type of sample

U (50) - 50 mm dia. undisturbed sample

D - disturbed sample

N ( ) - standard penetration test

No. in brackets gives

No. of blows/300 mm penetration

## Remarks (Observations on ground-water, etc.)





# RECORD OF BOREHOLE No. 29482

CLIENT: Luke & Company

PROJECT: A.S.S. Assessment, Lake Cathie

Ground level: RL 5.43

Dia. of boring: 80 mm

Aim: Pty Ltd MD200 Toyota-mounted

Type of boring: continuous solid flight auger

Lining tubes: nil

Date Progress	Sampling or Core Recovery		Change of Strata			Description of Strata	Anticipated A.S.S. Potential
	Depth	Type or No.	Legend	Depth	A - D Level		
3-4-03				1.0		FINE SILTY SAND light grey moist loose	
				2.0		FINE SAND dirty white moist becoming wet loose	
				3.0		FINE SAND Grey brown	
				4.0		FINE SAND Brown & Dk. brown (soft "coffee rock") wet medium dense	
				5.0		FINE SAND, Grey saturated loose	
				6.0		Grey estuarine CLAY wet soft	High Potential Requires management
						End of Hole	No management required

Key to type of sample

U (50) - 50 mm. dia. undisturbed sample.

D - disturbed sample.

N I - standard penetration test.

No. in brackets gives

No. of blows/300 mm. penetration

Remarks: (Observations on ground-water, etc.)



# RECORD OF BOREHOLE No. 29484

CLIENT: Luke & Company

PROJECT: A.S.S. Assessment, Lake Cathie

Ground level: RL 5.39

Dia. of boring: 80 mm

Auxiliary: Pty. Ltd. MD200 Toyota mounted

Type of boring: continuous solid flight auger

Lining tubes: nil

Date Progress	Samples or Core Recovery		Change of Strata			Description of Strata	Anticipated A.S.S. Potential
	Depth	Type of %	Legend	Depth	A - D Level		
3.4.03						FINE SILTY SAND Grey moist, loose	
				-1.0		FINE SAND with some layers containing med. & coarse sand Lt. grey moist becoming wet loose	
				-2.0			
				-3.0		FINE SAND (soft "coffee rock") Brown wet medium dense.	
				-4.0		FINE SAND with fine- medium rounded gravel saturated loose	
	Sample 84/1	D		-5.0		Estuarine CLAY Dk. grey soft wet	High Potential management required
						End of Hole	
				-6.0			

## Key to type of sample

U (50) - 50 mm. dia. undisturbed sample.

D - disturbed sample.

N ( ) - standard penetration test.

No. in brackets gives

No. of blows/300 mm. penetration

Remarks: (Observations on ground-water, etc.)





# RECORD OF BOREHOLE No. 294 85 A CLIENT: Luke & Company PROJECT: A.S.S. Assessment, Lake Cathie

Ground level:

Aimil Pty. Ltd. MD200 Toyota mounted

Dia of boring: 80 mm

Type of boring:

continuous solid flight auger

Lining tubes: nil

Daily Progress	Samples or Core Recovery		Change of Strata			Description of Strata	Anticipated A.S.S. Potential
	Depth	Type or %	Legend	Depth	A - D Level		
3.4.03				1.0		SILTY SAND, fine grained Light grey moist loose / medium dense	No management required
				2.0		FINE SAND Light grey wet loose	
				3.0		FINE SAND with a little fine gravel Brown wet medium dense	
	Sample 85A/1	D		4.0		CLAYEY SAND, fine Grey, wet, soft	High Potential requires management
						Estuarine CLAY, grey, wet	
						End of Hole	
				5.0			
				6.0			

Key to type of sample

U (50) - 50 mm. dia. undisturbed sample.

O - disturbed sample.

N ( ) - Standard penetration test.

No. in brackets gives

No. of blows/300 mm. penetration

Remarks: (Observations on ground-water, etc.)



# RECORD OF BOREHOLE No. 29491

CLIENT: Luke & Company

PROJECT: A.S.S. Assessment, Lake Cathie

Ground level: RL 4.64  
 Drill: Pfy. Ltd, MD200, Toyota-mounted

Dia. of boring: 80 mm

Type of boring: continuous solid flight auger

Lining tubes: nil

Date Progress	Sampling or Core-Recovery		Change of Strata			Description of Strata	Anticipated A.S.S. Potential
	Depth	Type or %	Legend	Depth	Δ W D Level		
3-4-03						Grey-br. SAND	
						SANDY CLAY Dk. grey	
						SANDY CLAY Lt. gr-br.	
						FINE SAND	
						Yellow	
				-1.0		wet, loose	
						FINE SAND	
						Grey	
				-2.0		wet, loose/med. dense	
						FINE SAND	
						Dk. brown (soft "coffee rock")	
				-3.0		saturated medium dense	No management required
						SANDY CLAY Grey, wet, soft	
						Estuarine CLAY	High Potential management required
				-4.0		Dk. grey wet, soft	
						End of Hole	
				-5.0			
				-6.0			

## Key to type of sample

- U (ISO) - 50 mm dia. undisturbed sample
- D - disturbed sample
- N ( ) - standard penetration test.
- No. in brackets gives
- No. of blows/300-mm. penetration

Remarks (Observations on ground-water, etc.)



# RECORD OF BOREHOLE No. 294 92

CLIENT: Luke & Company

PROJECT: A.S.S. Assessment, Lake Cathie













Ground level: RL 5.43

Dia. of boring: 80 mm

Air: 1 Pty. Ltd. MD200 Toyota-mounted

Type of boring: continuous solid flight auger

Lining tubes: nil

Date Progress	Samples or Core Recovery		Change of Strata			Description of Strata	Anticipated A.S.S. Potential
	Depth	Type or %	Legend	Depth	S - D Level		
3.4.03						FINE SILTY SAND Black moist loose	
				1.0		FINE SAND Light grey moist, loose	
						FINE SAND Brown, with some layers of soft "coffee rock" moist becoming wet medium dense	
				2.0			
							
				3.0			
							
				4.0			
	Sample 92/1	D				FINE SAND & fine-med. Gravel, sat. loose.	No management required ← High Potential management required
				5.0		Estuarine CLAY Dk. grey soft wet	
							
				6.0			
Key to type of sample			Remarks: (Observations on ground-water, etc.)				
U (50) - 50 mm dia. undisturbed sample.							
D - disturbed sample.							
N ( ) - standard penetration test.							
No. in brackets gives							
No. of blows/300 mm. penetration							



# RECORD OF BOREHOLE No. 29493

CLIENT: Luke & Company

PROJECT: A.S.S. Assessment, Lake Cathie

Ground level: RL 4.94

Dia. of boring: 80 mm

Air: 18.1, 19.1, 20.0, 21.0, 22.0, 23.0, 24.0, 25.0, 26.0, 27.0, 28.0, 29.0, 30.0, 31.0, 32.0, 33.0, 34.0, 35.0, 36.0, 37.0, 38.0, 39.0, 40.0, 41.0, 42.0, 43.0, 44.0, 45.0, 46.0, 47.0, 48.0, 49.0, 50.0, 51.0, 52.0, 53.0, 54.0, 55.0, 56.0, 57.0, 58.0, 59.0, 60.0, 61.0, 62.0, 63.0, 64.0, 65.0, 66.0, 67.0, 68.0, 69.0, 70.0, 71.0, 72.0, 73.0, 74.0, 75.0, 76.0, 77.0, 78.0, 79.0, 80.0, 81.0, 82.0, 83.0, 84.0, 85.0, 86.0, 87.0, 88.0, 89.0, 90.0, 91.0, 92.0, 93.0, 94.0, 95.0, 96.0, 97.0, 98.0, 99.0, 100.0

Type of boring: continuous solid flight auger

Lining tubes: nil

Date Progress	Samples or Core Recovery		Change of Strata			Description of Strata	Anticipated A.S.S. Potential
	Depth	Type or %	Legends	Depth	A & D Level		
3-4-03						FINE SAND Grey moist, loose	no management required
						FINE SAND Yellow-brown moist loose	
				-1.0		FINE SAND Lt. brown moist, loose	
						FINE SAND Grey moist/wet, loose	
				-2.0		FINE SAND, slightly silty Brown & dk. brown wet, medium dense	Moderate Potential requires Management
				-3.0			
	Sample 93/1	D		-4.0		CLAYEY SAND, fine grained Grey-brown Soft, wet	High Potential
						Estuarine CLAY, grey, wet	
				-5.0		End of hole	
				-6.0			

## Key to type of sample

- U (50) - 50 mm dia, undisturbed sample.
- D - disturbed sample.
- N ( ) - standard penetration test.
- No in brackets gives  
No. of blows/300 mm penetration

Remarks: (Observations on ground-water, etc.)



RECORD OF BOREHOLE No. 29496

CLIENT: Luke & Company

CLIENT: Luke & Company  
PROJECT: A.S.S. Assessment, Lake Cathie

Ground level: ..... RL 4.92

Dia of boring: 20 mm

Ground level: .....  
Aerial Pty. Ltd. MD200, Toyota-mounted

Type of boring: continuous solid flight auger

Lining tubes: nil

Type of boring		Continuous solid flight auger		Lining tubes		Anticipated A.S.S. Potential	
Daily Progress	Samples or Core Recovery	Change of Strata				Description of Strata	
		Depth	Type or %	Legend	Depth		
3.4.03						Dark grey clayey Topsoil	no management required
						CLAY, mod. plasticity Grey-brown wet soft	
						SANDY CLAY Grey, wet, soft	
						CLAYEY SAND fine grained Grey wet loose	
						SAND, slightly clayey fine grained Grey-brown, wet, loose	
						CLAY, high plasticity lt. grey, estuarine? v. wet, v. soft	
						CLAY moderate plasticity (residual) Yellow brown wet, soft, becoming firm with depth	High Potential requires management
						End of Hole	

Key to type of sample

U (50) - 50 mm. dia. undisturbed sample.

D - disturbed sample.

N 1 - standard penetration test.

No. in brackets gives

No. of blows/300 mm. penetration

Remarks: (Observations on ground-water, etc.)





# RECORD OF BOREHOLE No. 29498A

CLIENT: Luke & Company o/s 21<sup>m</sup> from 29498 towards 29474  
 PROJECT: A.S.S. Assessment, Lake Cathie

Ground level: estimated RL 5.4

Dia. of boring: 80 mm

Anchor: Pty. 172 WD200, Toyota mounted

Type of boring: continuous solid flight auger

Lining tubes: nil

Date Progress	Samples or Core Recovery		Change of Strata			Description of Strata	Anticipated A.S.S. Potential
	Depth	Type or %	Legend	Depth	A - D Level		
3.4.03				1.0		FINE SAND v. slightly silty Grey moist, loose	No management required
				2.0		FINE SAND Brownish grey moist/wet loose	
				3.0		FINE SAND with some intermittent fine gravelly layers, Light brown-grey wet medium dense	
	Sample 98A/1	D		4.0		CLAY, mod. plasticity Brown, wet, soft	
				5.0		End of Hole	
				6.0			
Key to type of sample			Remarks: (Observations on ground-water, etc.)				
U (50) - 50 mm. dia. undisturbed sample.							
D - disturbed sample.							
N 1 - standard penetration test.							
No in brackets gives							
No. of blows/300 mm penetration							





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931492

25/11/93

Attn: Phil Luke  
Luke and Company

Global at Lake in line

Here is text of report on developmental options - I would be happier if we had a contour plan and perhaps sketch on it preliminary limitations to define areas worthy of more intense investigation.

Also the whole thing needs to be tied into the hydraulics of the area and possibilities for filling flood prone land without adverse effects on hydraulics.

Maybe what we need is a sketch when all these different inputs can be got together.

Regards  
Bill

PS. I am doing site classification of that fill & natural ground section at south west end of site as a separate report so that it can be presented to Council for release of land for sale.

2 mths  
list of