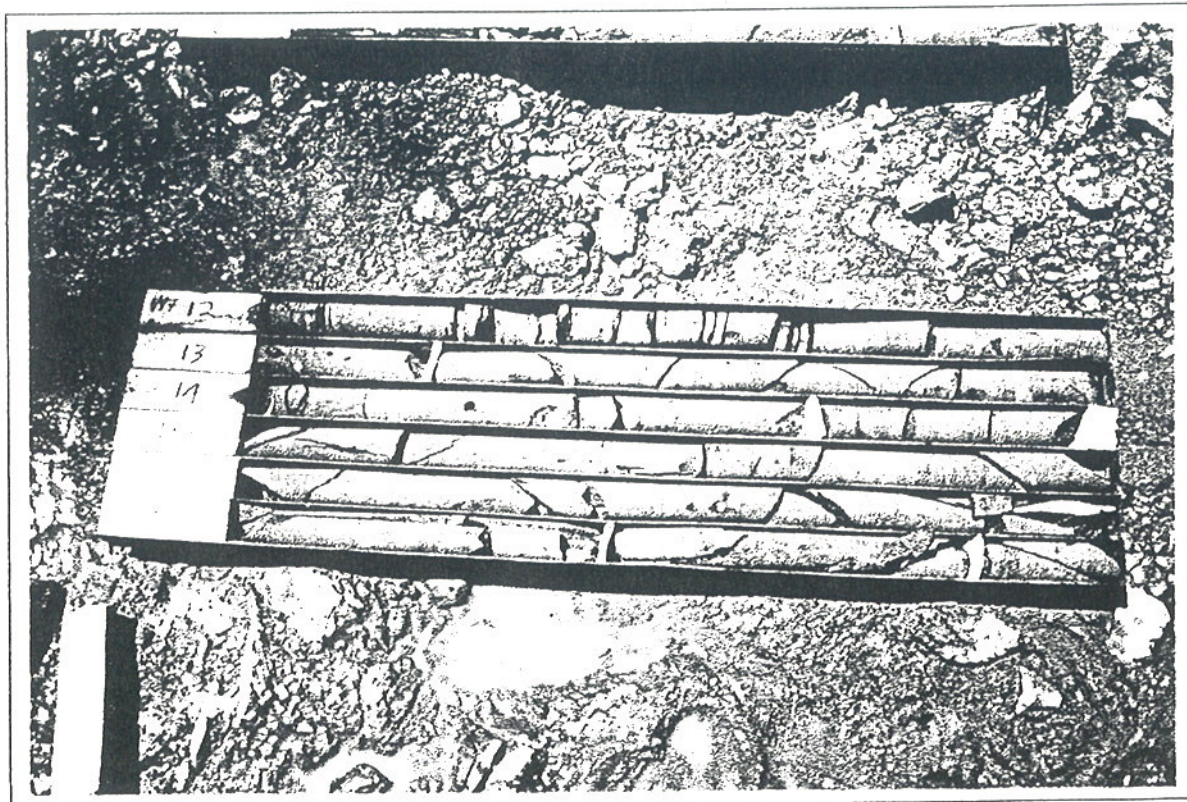


DDH 1/97 - Box 1

6.00 to 12.00 metres

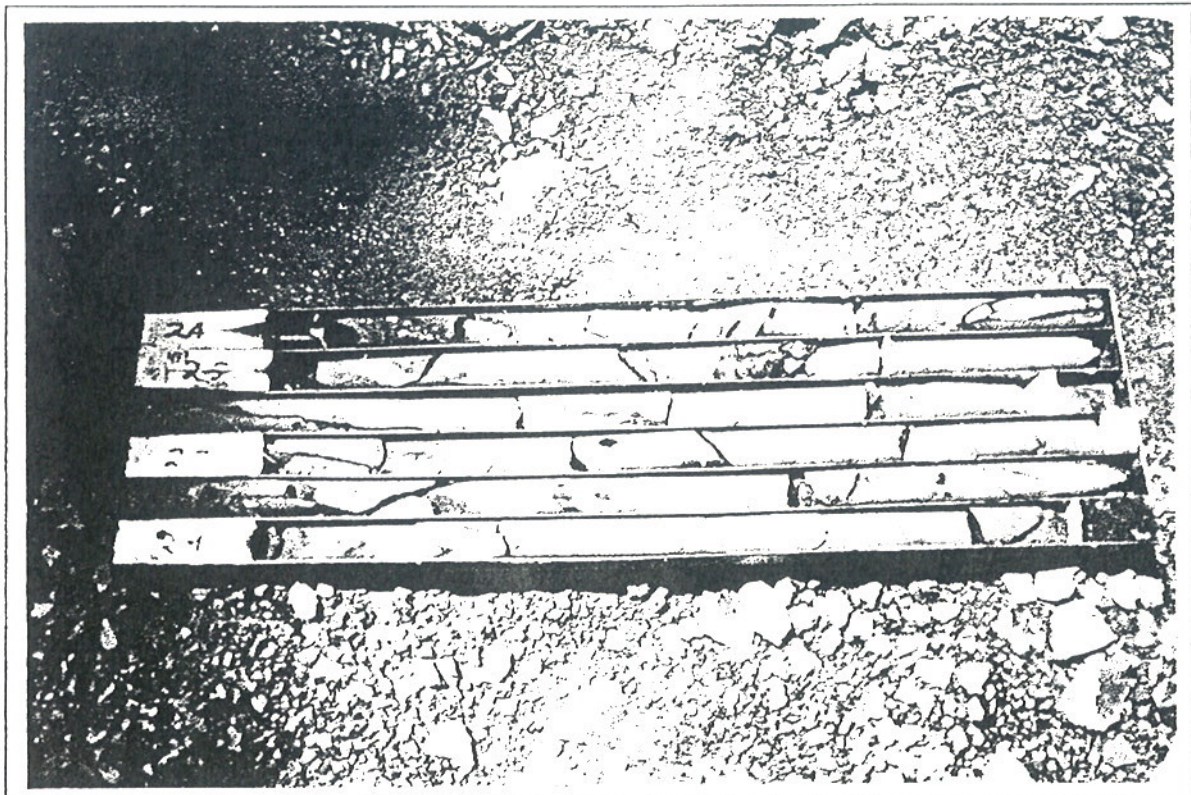


DDH 1/97 - Box 2

12.00 to 18.00 metres



DDH 1/97 - Box 3      18.00 to 24.00 metres



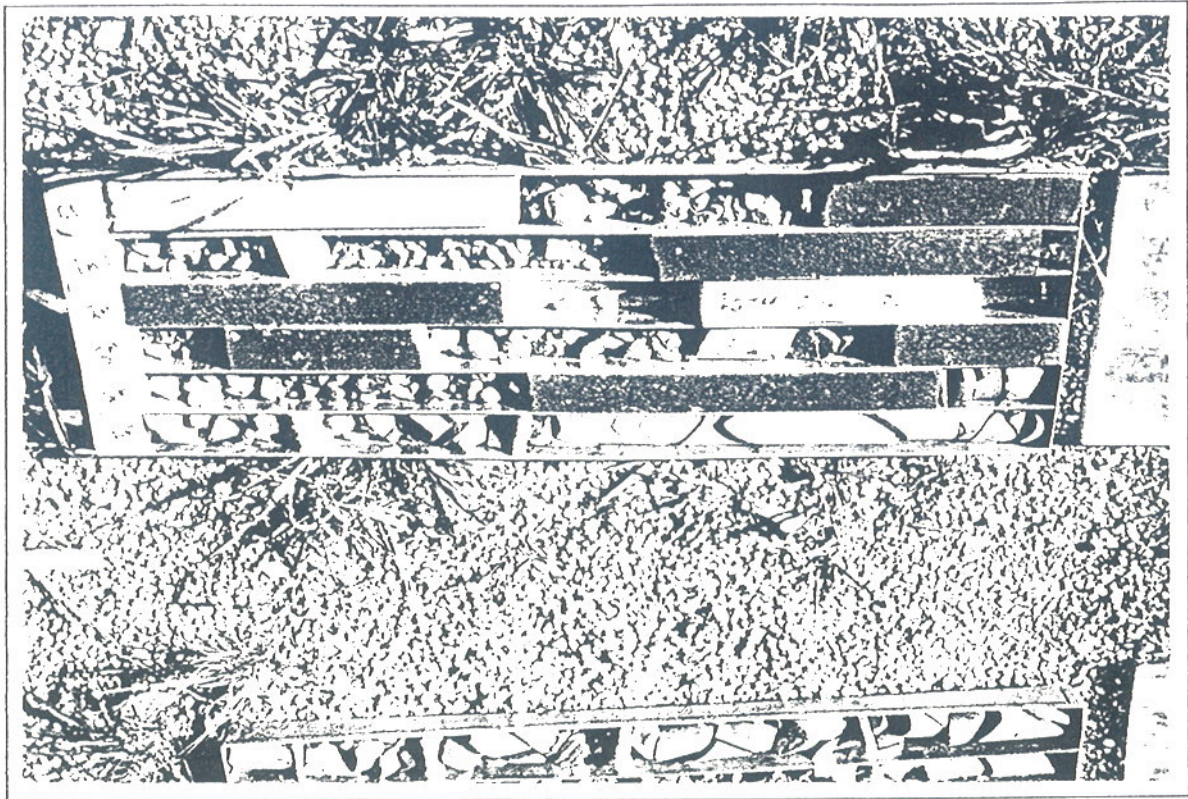
DDH 1/97 - Box 4      24.00 to 30.00 metres

Project: Jandra Quarry - Quarry extension		Drilling Company: Groundtest		Page No: 1		
Locality: Jandra Quarry near Taree		Logged: Ian Stenhouse		Hole No: DDH 2/97 - Into Haul Road		
Co-ordinates 248,752 E, 1,452,757 N		Datum: AHD		Core Size: NQ <sub>3</sub>		
Bearing: 180°		RL Collar: 73.8 metres		Commenced: 11.2.97		
Inclination: 45°		RL Bottom: 52.6 metres		Completed: 17.2.97		
		Length: 30.0 metres				
% Core Recovery	Depth (m)	Drill Time	Weathering	Structure	Symbol	Geological Description
	0					
	-		H.W.	Core Loss: 0 to 0.4, 0.8 to 1.0, 1.6 to 2.4, 3.2 to 3.5, 3.8 to 4.0, 4.45 to 4.9.  Rotary drilled: 2.4 to 3.1.		0 - 5.45 Greywacke: Highly weathered to moderately weathered. Core is limonite stained, moderately strong, rubble.
	1					
	-					
	2					
	-					
	3					
	-					
	4		M.W.			
	-					
	5					
	-					
	6		S W	Highly jointed. Joints per metre: 15 to 20		5.45 to 10.2 Greywacke Slightly weathered, grey to dark greywacke, fine grained, very hard, very strong, limonite on joint planes. 80 to 100% recovery
	-					
	7					
	-					
	8		S W			
	-					
	9					
	-					
	10					
	-					
	11					10.2 to 30.0 Greywacke Fresh, very hard, very strong, Calcite on joint planes, random lithic fragments. Homogeneous massive greywacke.
	-					
	12			Joints cross core axis @ 45°		
	-					
	13					
	-					
	14		Fresh			
	-					
	15					
	-					
	16					
	-					
	17					
	-					
	18					
	-					
	19					
	-					
	20		Fresh			
	-					
	21					
	-					
	22					
	-					
	23					
	-					
	24					
	-					
	25		Fresh			
	-					
	26					

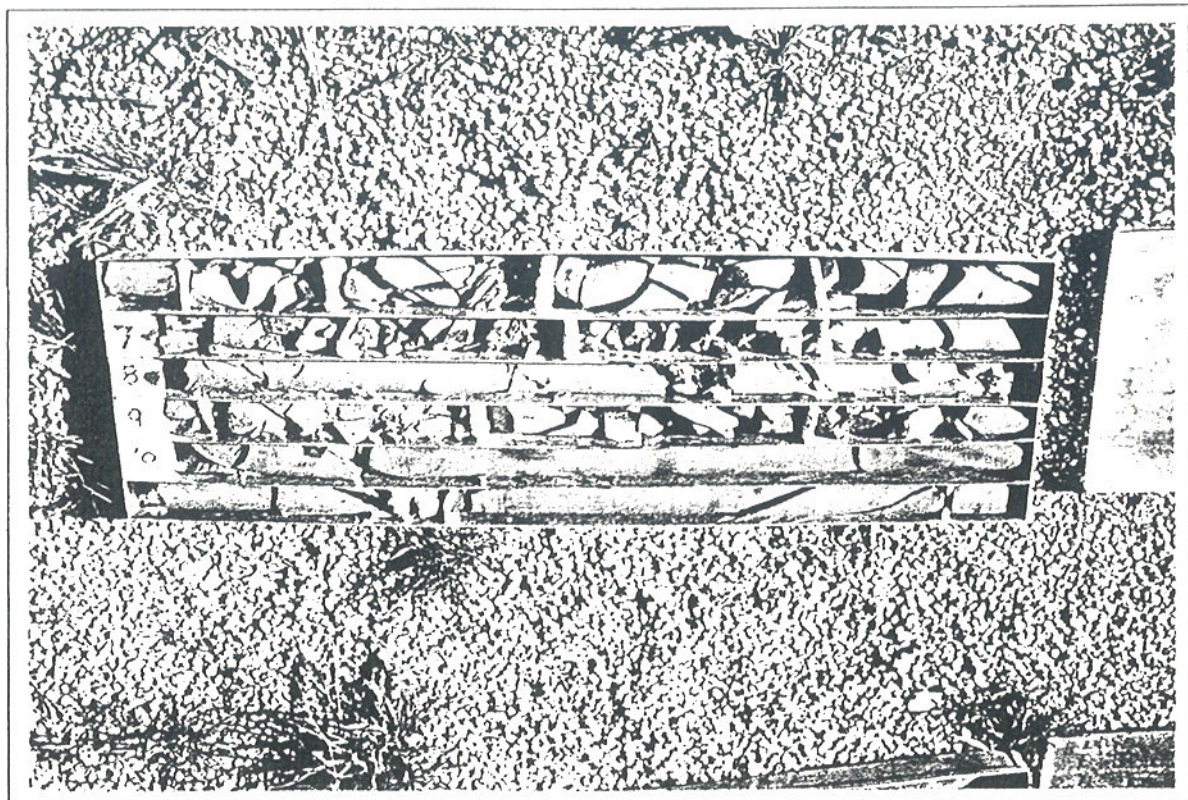
Project: Jandra Quarry - Quarry extension				Hole Number: DDH 2/97		Page No: 2
% Core Recovery	Depth (m)	Drill Time	Weathering	Structure	Symbol	Geological Description
-	27		Fresh	Joints cross core axis @ 45°		<b>10.2 to 30.0 Greywacke:</b> Fresh, very hard, very strong, Calcite on joint planes, random lithic fragments. Homogeneous massive greywacke.
-	28			28.6 to 28.7 sample taken for petrographic analysis.		
-	29		Fresh			
-						
						End of Hole 30.0 metres

Box	Length
Box 1	0 to 6 metres
Box 2	6 to 12 metres
Box 3	12 to 18 metres
Box 4	18 to 24 metres
Box 5	24 to 30 metres

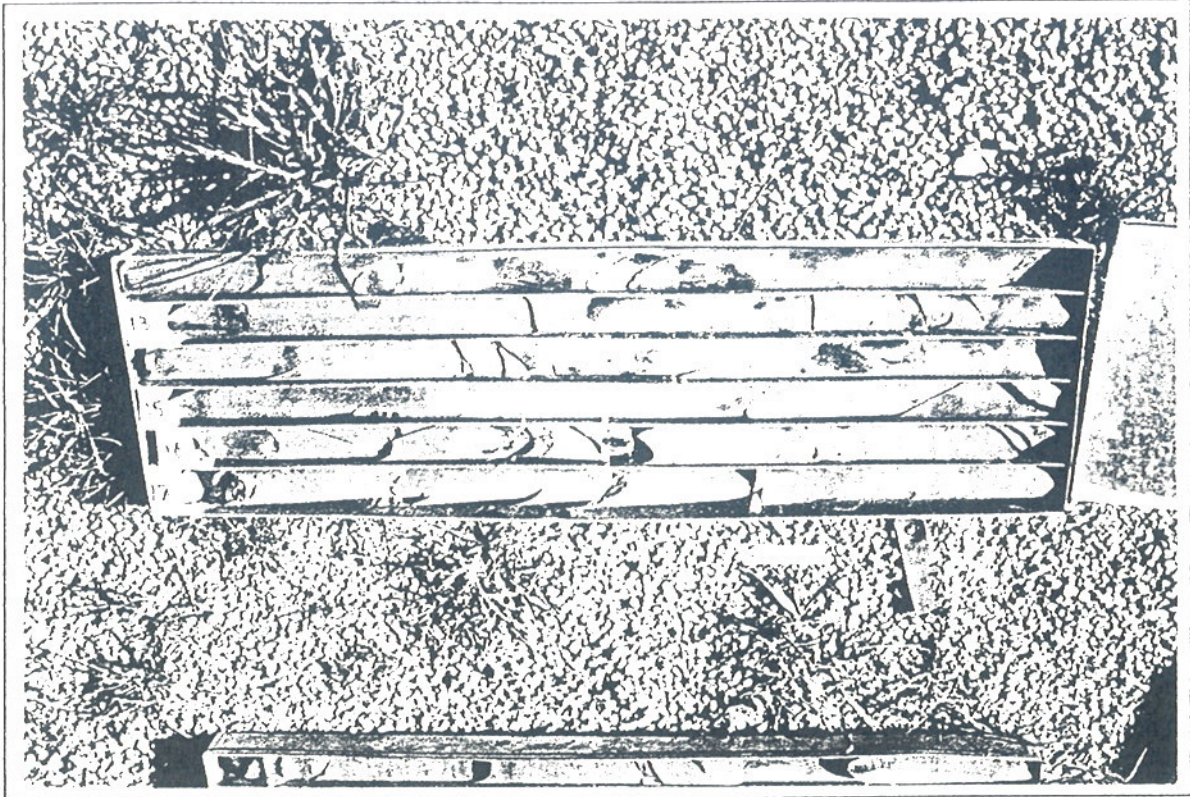
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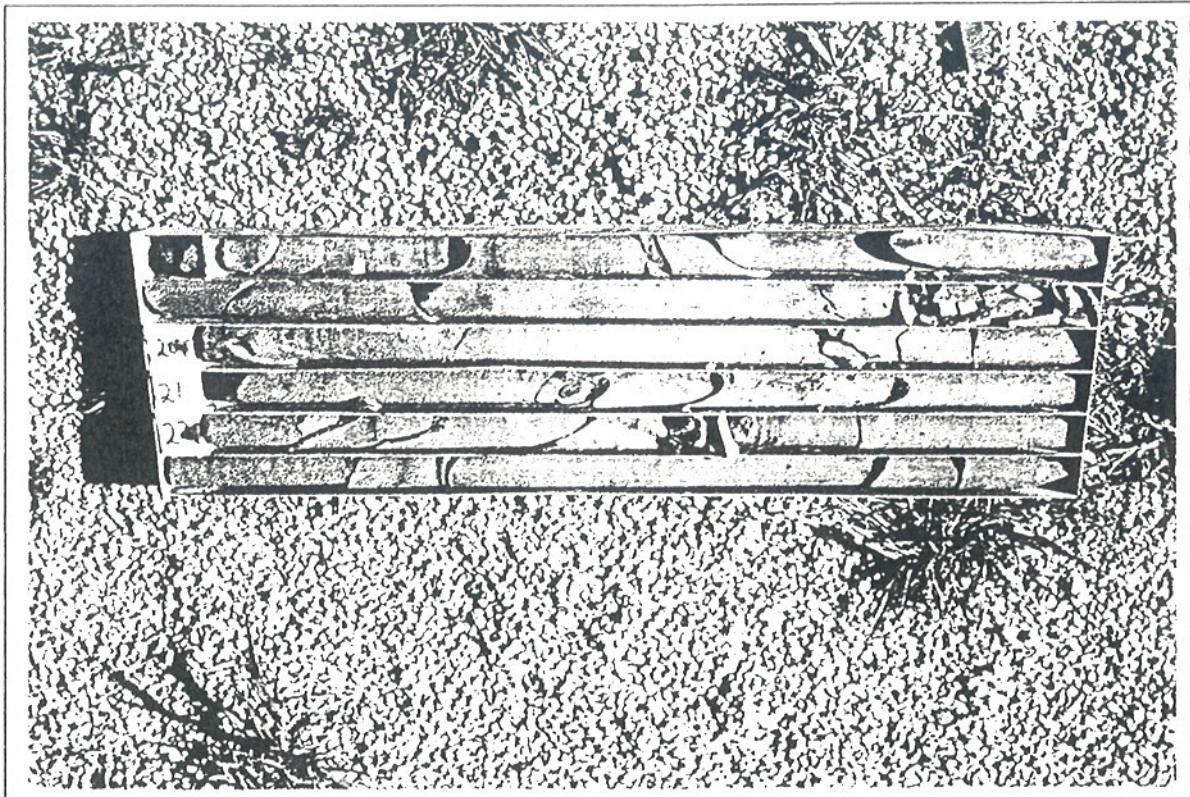
DDH 2/97 - Box 1      0.00 to 6.00 metres



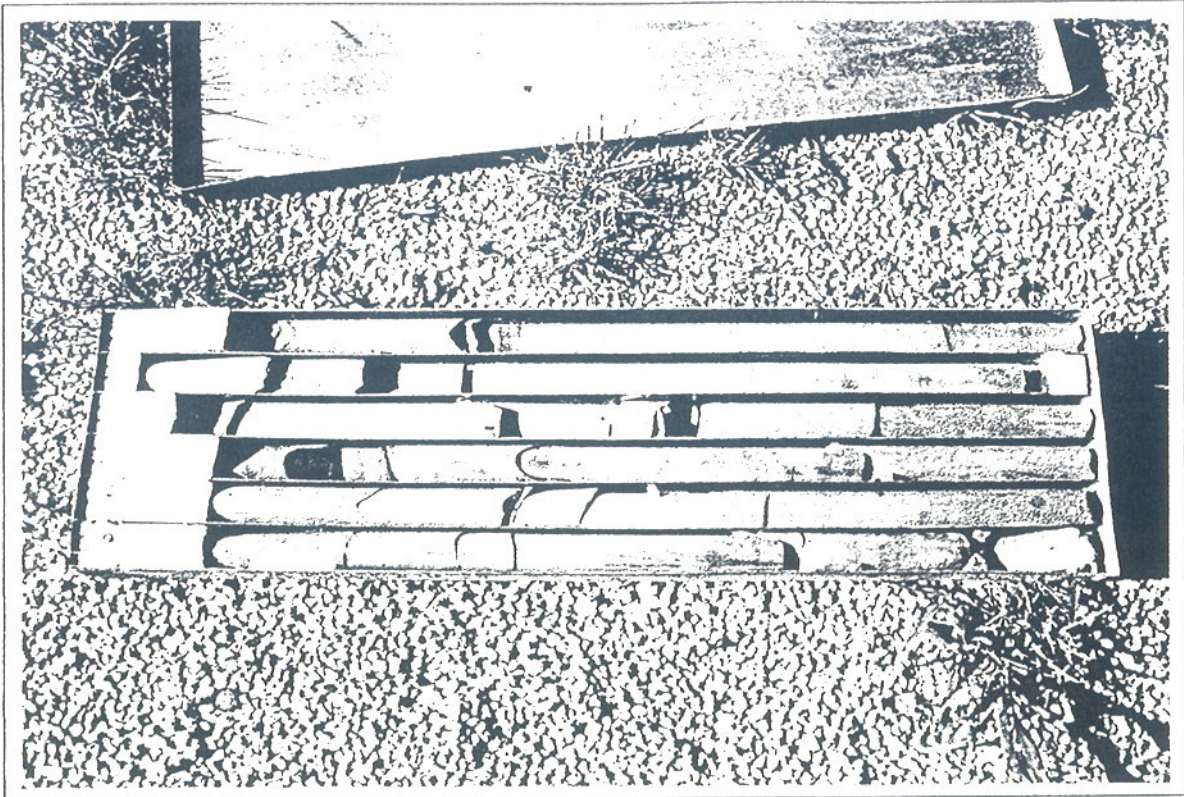
DDH 2/97 - Box 2      6.00 to 12.00 metres



DDH 2/97 - Box 3      12.00 to 18.00 metres



DDH 2/97 - Box 4      18.00 to 24.00 metres



DDH 2/97 - Box 5

24.00 to 30.00 metres

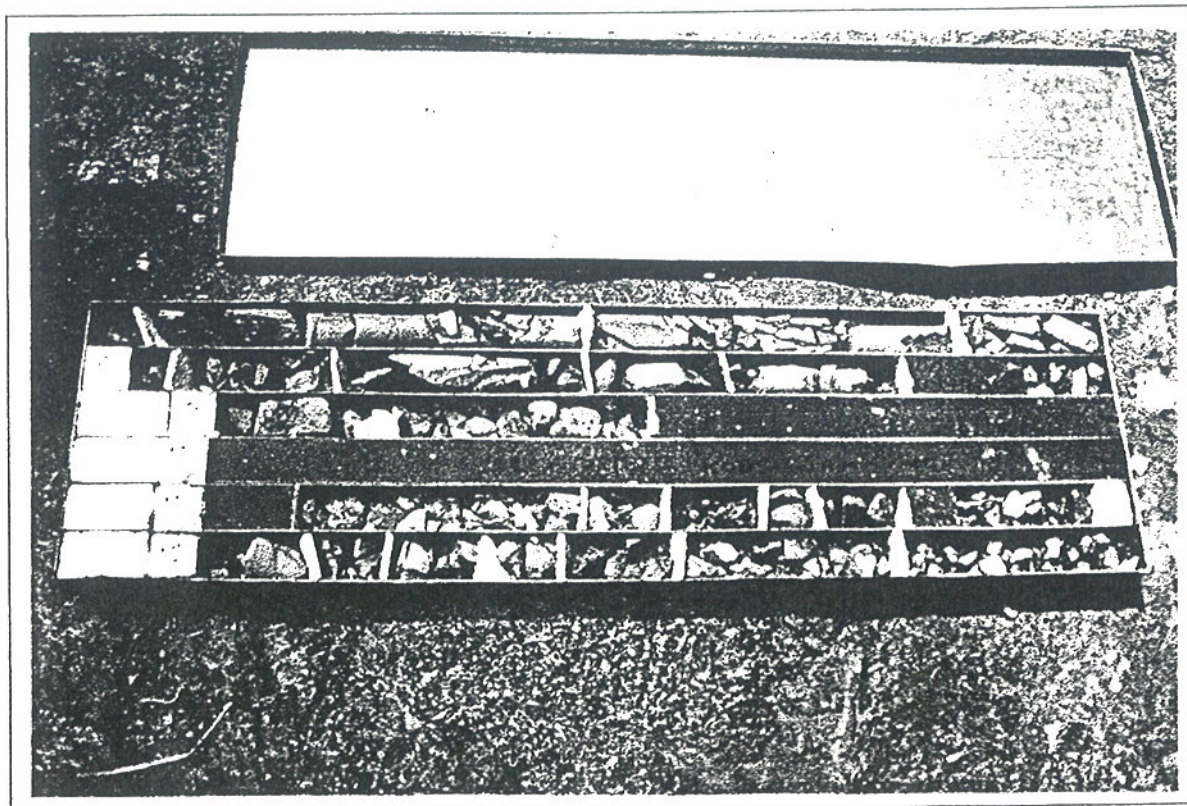
Project: Jandra Quarry - Quarry extension		Drilling Company: Groundtest		Page No: 1		
Locality: Jandra Quarry near Taree		Logged: Ian Stenhouse		Hole No: DDH 3/97		
Co-ordinates 248,868 E, 1,452,632 N		Datum: AHD		Core Size: NQ <sub>3</sub>		
Bearing: Vertical		RL Collar: 90.5 metres		Commenced: 19.2.97		
Inclination: Vertical		RL Bottom: 81.2 metres		Completed: 19.2.97		
		Length: 13.2 metres				
% Core Recovery	Depth (m)	Drill Time	Weathering	Structure	Symbol	Geological Description
	0					0 - 1.7 Core Loss
	-		H W			
	1					
	-					
	2					1.7 - 2.85 Greywacke
	-		S.W	Joints per metre, 10-12		Slightly weathered, light grey, hard, strong.
	3					
	-		M.W	Core highly fractured like rubble.		2.85 - 13.2 Greywacke
	4					Light grey, moderately strong, moderately weathered, limonite on joint planes, minor lithic ceramic fragments
	-			Highly fractured weathered zone		
	5					
	-					
	6					
	-					
	7					
	-					
	8					
	-			Core loss 8.8 to 8.95m.		
	9					
	-					
	10					
	-			9.5 to 11.1 Core loss, rods jamming.		
	11					
	-					
	12					
	-					
	13					
						End of Hole 13.2 metres.

Box	Length
Box 1	0 to 6 metres
Box 2	6 to 12 metres





DDH 3/97 - Box 1      0.00 to 6.00 metres



DDH 3/97 - Box 2      6.00 to 12.00 metres

Project: Jandra Quarry - Quarry extension		Drilling Company: Groundtest		Page No: 1	
Locality: Jandra Quarry near Taree		Logged: Ian Stenhouse		Hole No: DDH 3a/97	
Co-ordinates 248,868 E, 1,452,632 N		Datum: AHD		Core Size: NQ <sub>3</sub>	
Bearing: Vertical		RL Collar: 90.5 metres		Commenced: 20.2.97	
Inclination: Vertical		RL Bottom: 48.7metres		Completed: 22.2.97	
		Depth: 41.8 metres			

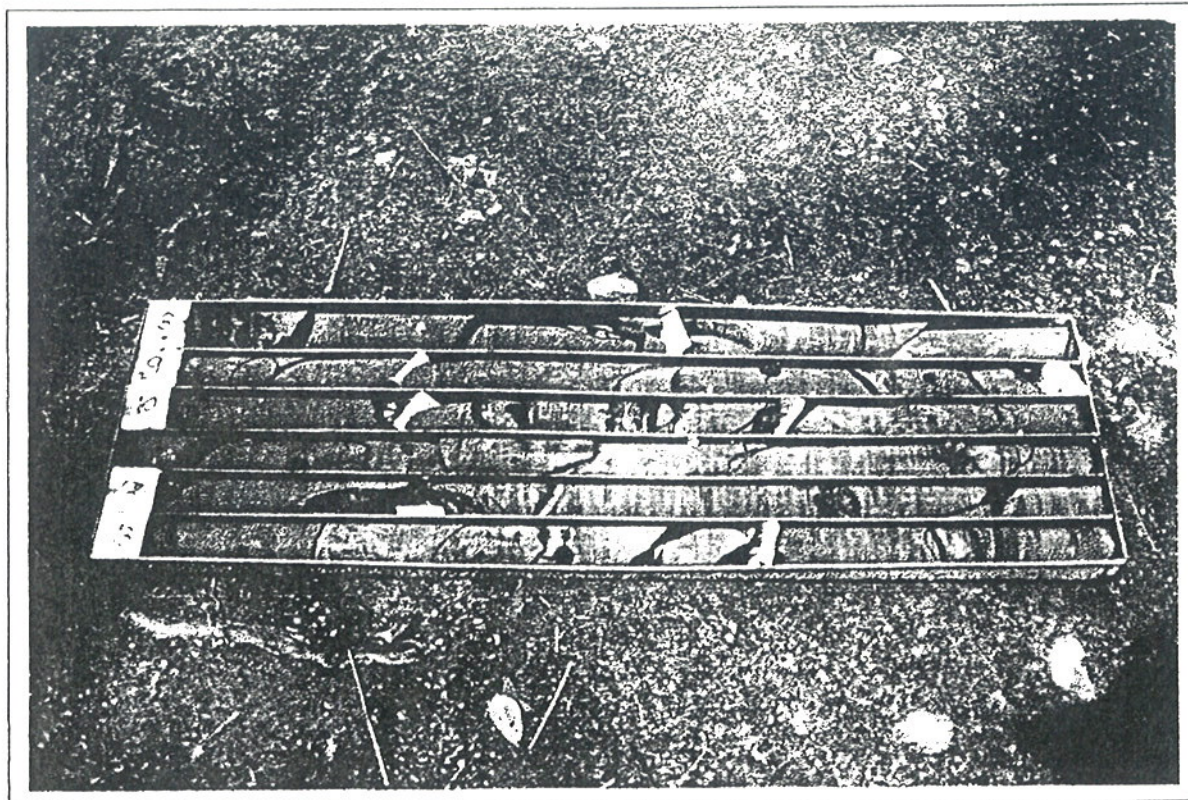
% Core Recovery		Depth (m)	Drill Time	Weathering	Structure	Symbol	Geological Description
		0					0 - 2.2 Core Loss
		-					
		1					
		-					
		2					
		-					
		3		H W	Joints per metre, 15 - 20		2.2 - 3.7 Greywacke Highly weathered, light brown moderately weathered.
		-					
		4					3.9 - 27.1 Greywacke Light grey, moderately strong, slightly weathered, limonite on joint planes, minor lithic granitic fragments , -
		-					
		5		S W	5 - 8 joints per metre		
		-					
		6					
		-					
		7					
		-					
		8					
		-					
		9					
		-					
		10					
		-					
		11					
		-					
		12		S W	5 - 8 joints per metre		
		-					
		13					
		-					
		14					
		-					
		15					
		-					
		16					
		-					
		17					
		-					
		18					
		-					
		19					
		-					
		20					
		-					
		21		S W	5 - 8 joints per metre		
		-					
		22					
		-					
		23					
		-					
		24					
		-					
		25		S W	25.1 to 26.1 core mildly foliated.		
		-					
		26					

Project: Jandra Quarry - Quarry extension				Hole Number: DDH 3a/97		Page No: 2
% Core Recovery	Depth (m)	Drill Time	Weathering	Structure	Symbol	Geological Description
	-		S W			
	27					
	-		Fresh	Joints cross core axis at 30° to vertical and horizontal joints.		27.1 - 41.8 Fresh Greywacke Dark grey, very hard, very strong. Minor pyrite on some joint planes (ic @36.8 metres)
	28					
	-					
	29					
	-					
	30					
	-					
	31					
	-					
	32					
	-					
	33					
	-					
	34		Fresh			
	-					
	35					
	-					
	36					
	-					
	37					
	-					
	38					
	-					
	39					
	-					
	40					
	-		Fresh			
	41					
	-					
						End of Hole 41.8 metres

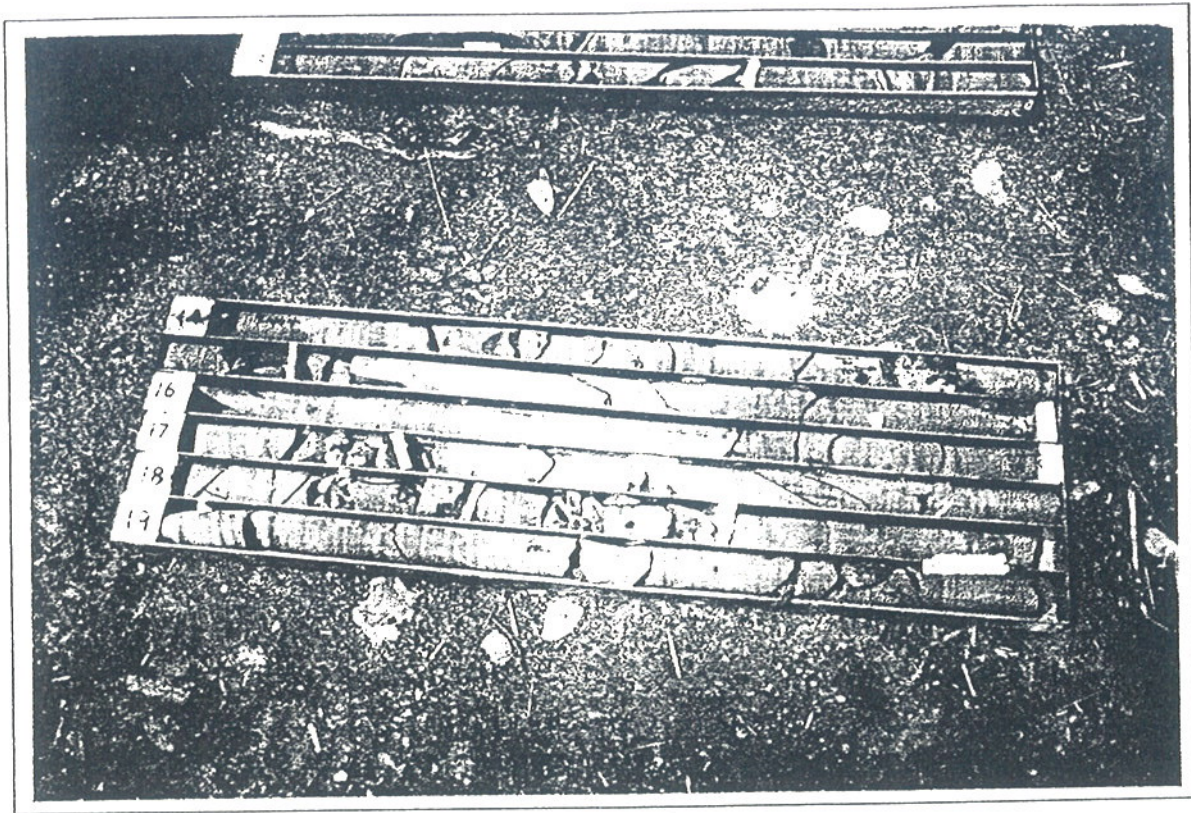
Box	Length
Box 1	2 to 8 metres
Box 2	8 to 14 metres
Box 3	14 to 20 metres
Box 4	20 to 26 metres
Box 5	26 to 32 metres
Box 6	32 to 38 metres
Box 7	38 to 41.8 metres



DDH 3a/97 - Box 1      2.00 to 8.00 metres

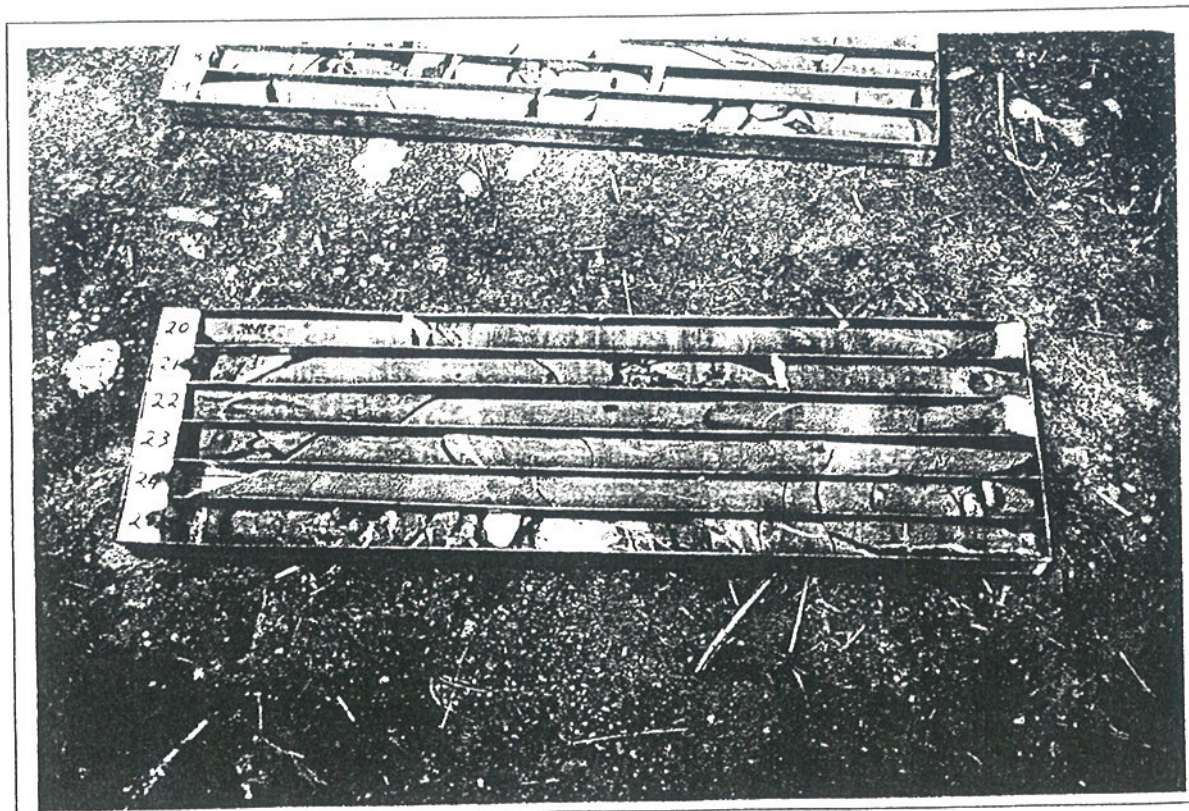


DDH 3a/97 - Box 2      8.00 to 14.00 metres



DDH 3a/97 - Box 3

14.00 to 20.00 metres



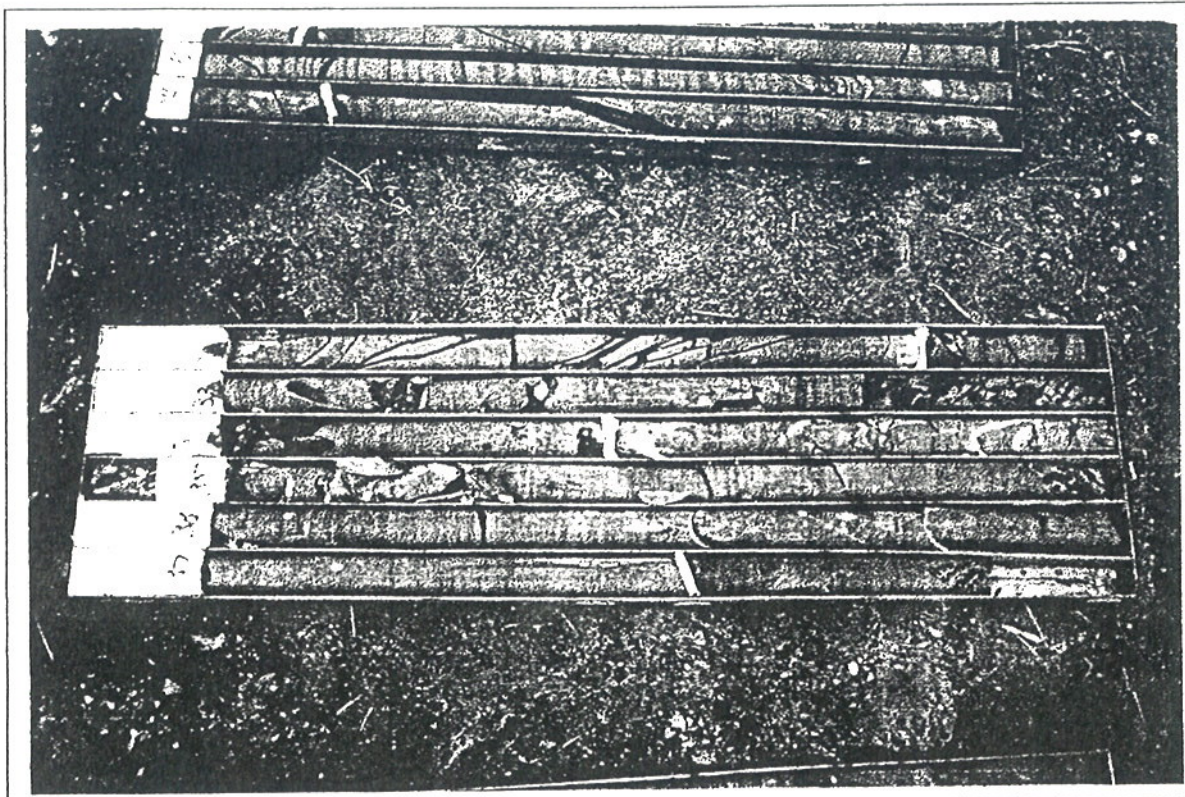
DDH 3a/97 - Box 4

20.00 to 26.00 metres



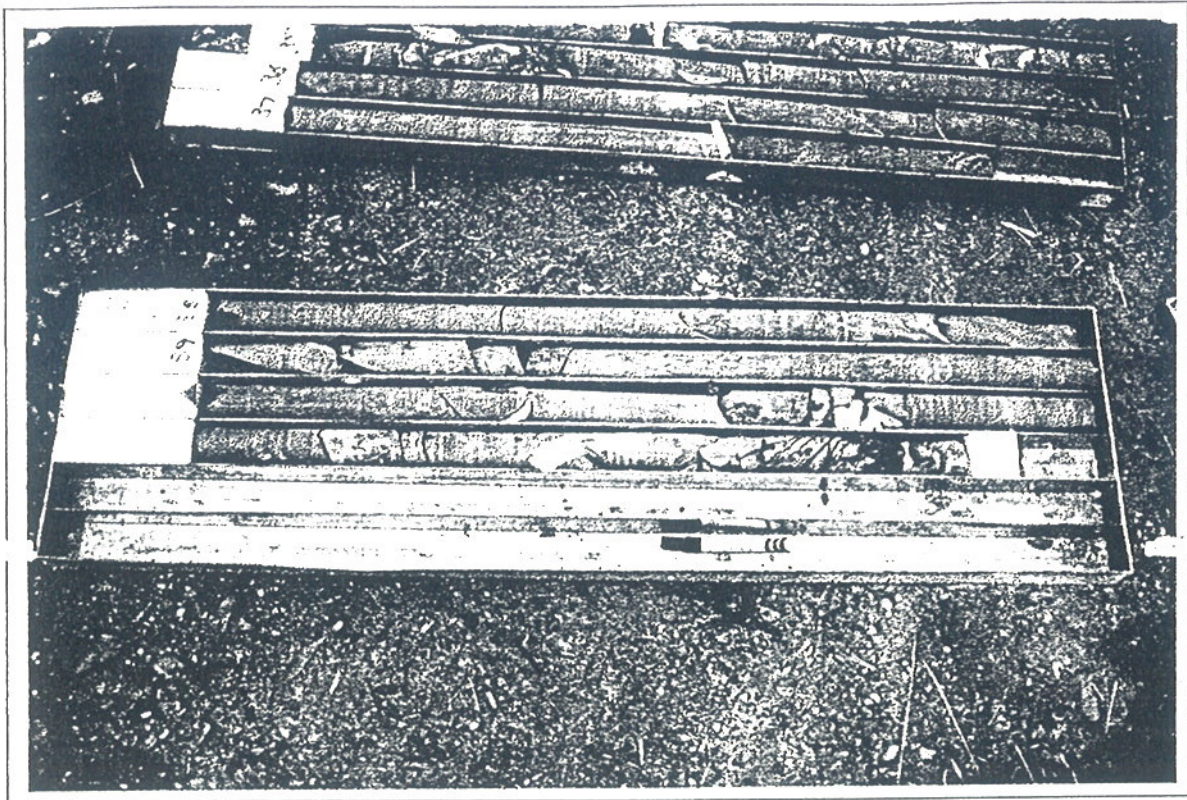
DDH 3a/97 - Box 5

26.00 to 32.00 metres



DDH 3a/97 - Box 6

32.00 to 38.00 metres



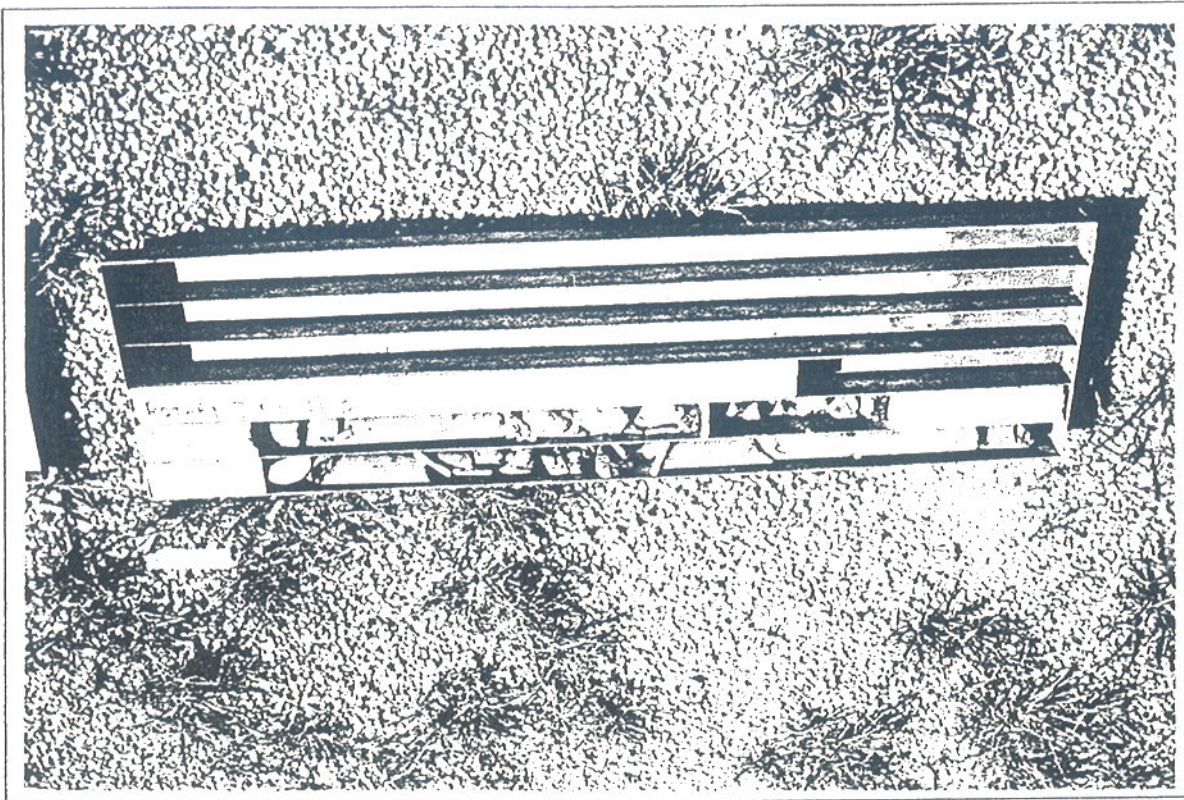
DDH 3a/97 - Box 7

38.00 to 41.80 metres

Project: Jandra Quarry -- Quarry extension		Drilling Company: Groundtest		Page No: 1		
Locality: Jandra Quarry near Taree		Logged: Ian Stenhouse		Hole No: DDH 5/97		
Co-ordinates 248,501 E, 1,452,629 N		Datum: AHD		Core Size: NQ <sub>3</sub>		
Bearing: 175°		RL Collar: 105.1metres		Commenced: 26.2.97		
Inclination: 45°		RL Bottom: 97.1 metres		Completed: 27.2.97		
		Depth: 11.3 metres				
% Core Recovery	Depth (m)	Drill Time	Weath-ering	Structure	Symbol	Geological Description
	0					<b>0 to 6.0 Greywacke</b> Core Loss – Rock Roller Highly jointed moderately strong.
	-		H W	Highly fractured, joints per metre 20 <sup>+</sup> .		
	1					
	-		H W			
	2					
	-					
	3					
	-					
	4					
	-					
	5		M W			
	-					
	6					<b>6.0 to 7.9 Greywacke</b> Moderately weathered, brown moderately strong. Limonite on joint planes.
	-		M W	Highly jointed ≈ 20 30 p/m		
	7					
	-					
	8					<b>7.9 to 11.3 Greywacke</b> Core Loss – Rock Roller Highly jointed moderately strong. Moderately to slightly weathered.
	-					
	9		M W			
	-					
	10		S W			
	-					
	11					
						End of hole at 11.3 metres.

Box	Length
Box 1	6 to 11.3 metres





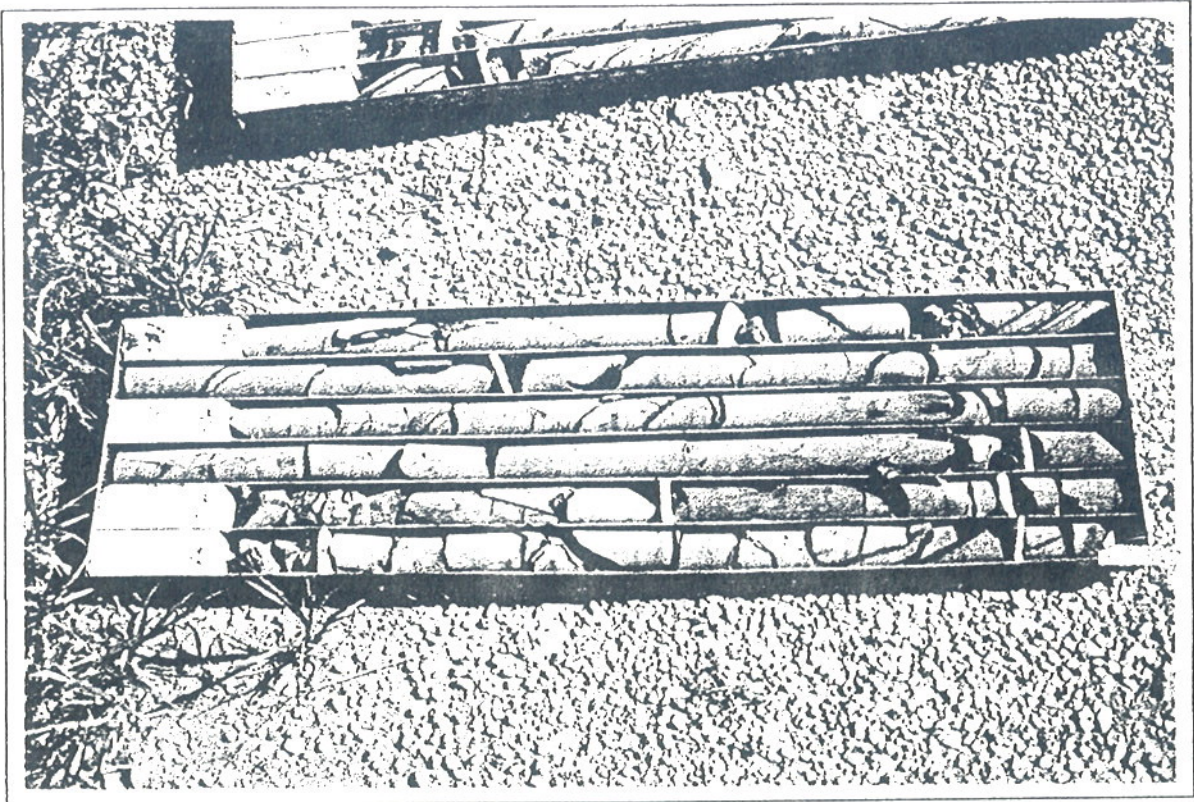
DDH 5/97 - Box 1

0.00 to 11.3 metres

Project: Jandra Quarry – Quarry extension		Drilling Company: Groundtest		Page No: 1			
Locality: Jandra Quarry near Taree		Logged: Ian Stenhouse		Hole No: DDH 5a/97			
Co-ordinates 248,501 E, 1,452,629 N		Datum: AHD		Core Size: NQ <sub>3</sub>			
Bearing: Vertical		RL Collar: 105.1 metres		Commenced: 27.2.97			
Inclination: Vertical		RL Bottom: 69.1 metres		Completed: 28.2.97			
		Depth: 36.0 metres		Drilled south of exiting approved quarry.			
% Core Recovery		Depth (m)	Drill Time	Weathering	Structure	Symbol	Geological Description
		0					
		-		H W	Highly fractured, joints per metre 20 <sup>+</sup> .		<b>0 to 6.0 Greywacke</b> Core Loss – Rock Roller Highly weathered to grading to moderately weathered
		1					
		-					
		2					
		-					
		3		M.W			
		-					
		4					
		-					
		5					
		-					
		6					
		-		S W	Joints cross core axis @ 45° and 65°.		<b>6.0 to 27.8 Greywacke</b> Slightly weathered, light grey to grey core, limonite staining on joint planes. Granitic lithic fragments.
		7					
		-			Joints crossing core axis at about 45° are thought to be bedding planes and are quite dominant.		
		8					
		-					
		9					
		-					
		10					
		-					
		11		S W	Heavy limonite staining in upper two core trays.		6.2 to 6.8 and 7.1 to 7.2 metres moderately weathered zones say 100mm wide grading into slightly weathered core.
		-					
		12					
		-					
		13					
		-					
		14					
		-					
		15			14.5 metres highly fractured zone		
		-					
		16		S W			
		-					
		17					
		-					
		18					
		-					
		19					
		-					
		20			19.4 to 19.8 metres, highly fractures core but not broken, calcite infill along joint these surfaces.		
		-					
		21		S W			
		-					
		22					
		-					
		23					
		-					
		24					
		-					
		25		S W			24.65 to 24.85 metres is a wide joint plane with calcite growth into the void.
		-					
		26					

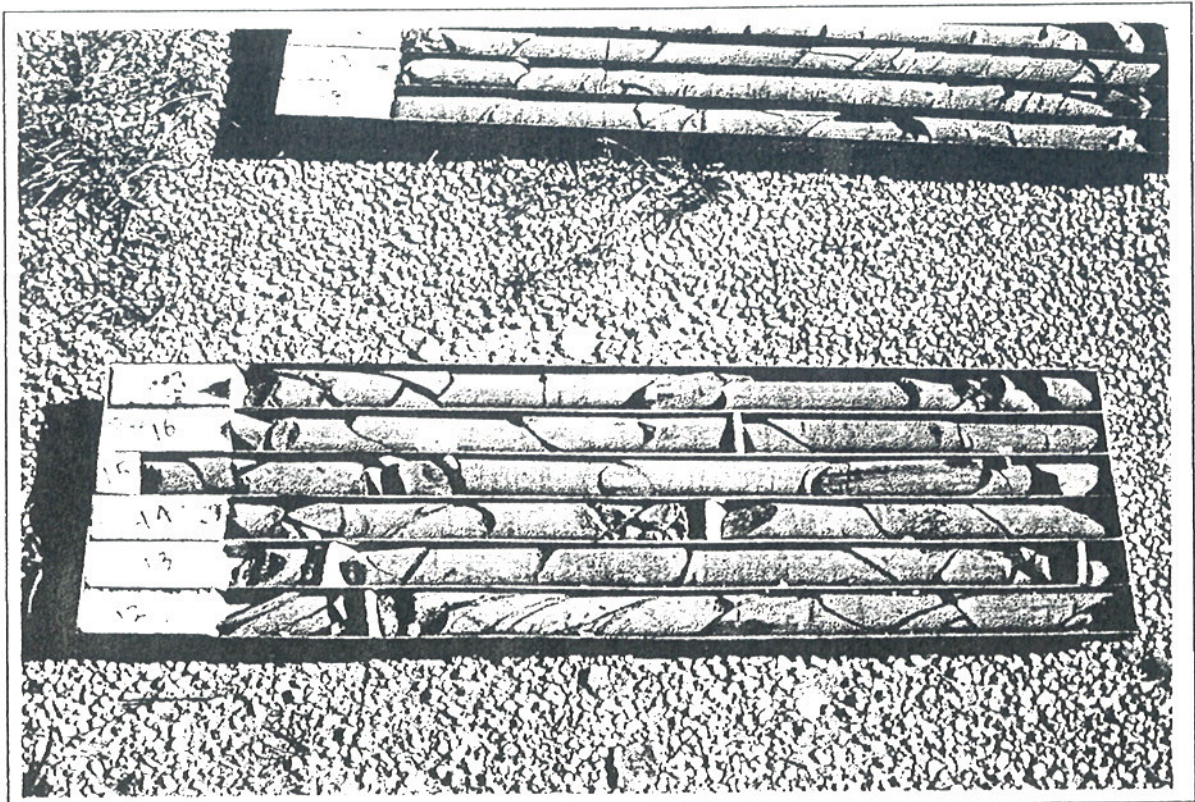
Project: Jandra Quarry Extension				Hole Number: DDH 5a/97		Page No: 2
% Core Recovery	Depth (m)	Drill Time	Weathering	Structure	Symbol	Geological Description
	-		S W			
	27		Fresh	Dominant joints cut core axis $\approx 45^\circ$ .		27.1 to 36.0 Greywacke Fresh, dark grey, very strong, very hard, calcite along joint planes, minor pyrite along some joint planes.
	28					
	29			5 to 10 fractures per metre		30.4 to 30.5 sample taken for petrographic assessment.
	30					
	31		Fresh			
	32					
	33					
	34			34.1 to 34.4 core highly fractured, broken along previously healed fractures		
	35					
	-		Fresh			
						End of Hole 36.0 metres

Box	Length
Box 1	6 to 12 metres
Box 2	12 to 18 metres
Box 3	18 to 24 metres
Box 4	24 to 30 metres
Box 5	30 to 36 metres



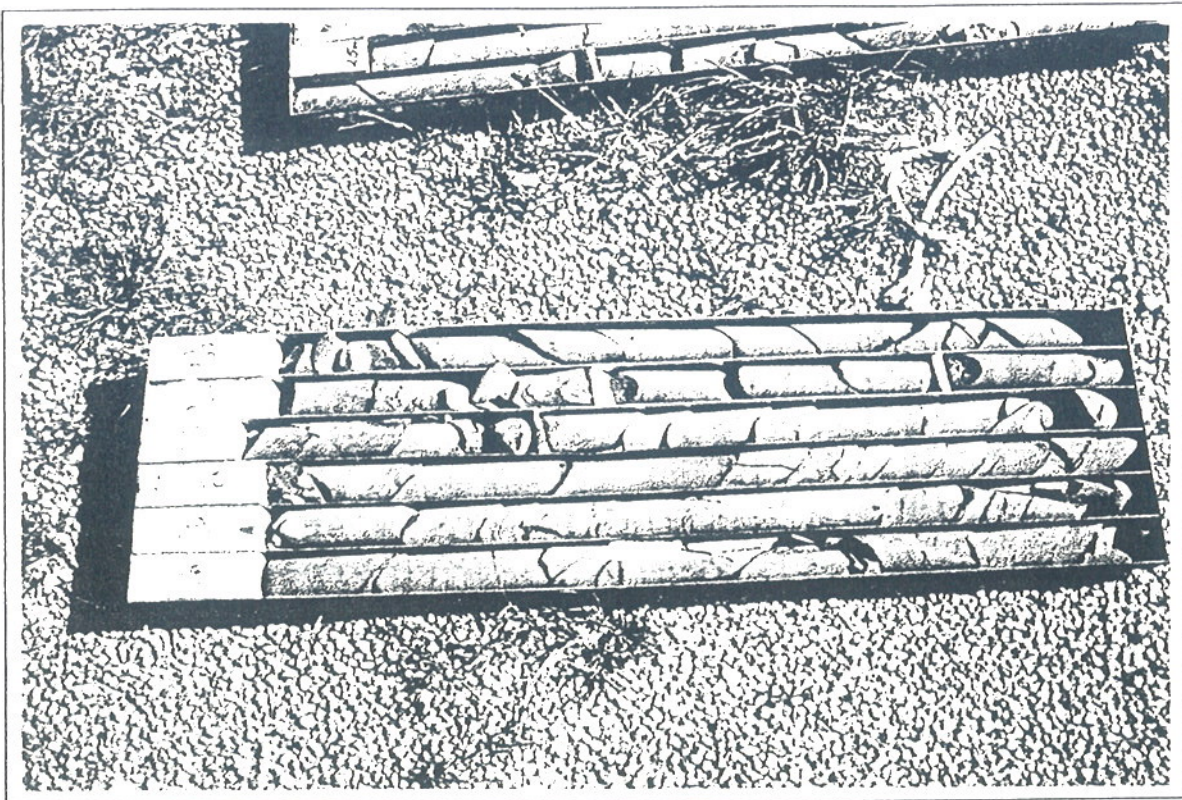
DDH 5a/97 - Box 1

6.00 to 12.00 metres



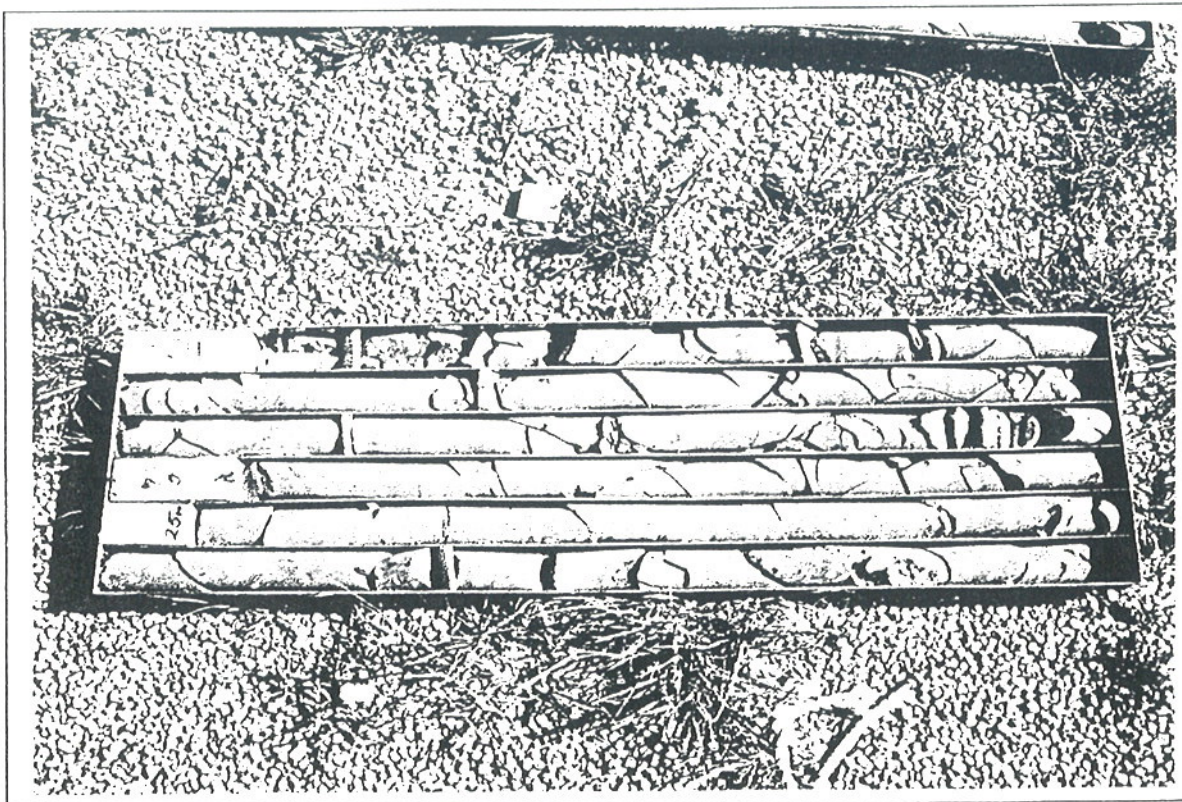
DDH 5a/97 - Box 2

12.00 to 18.00 metres



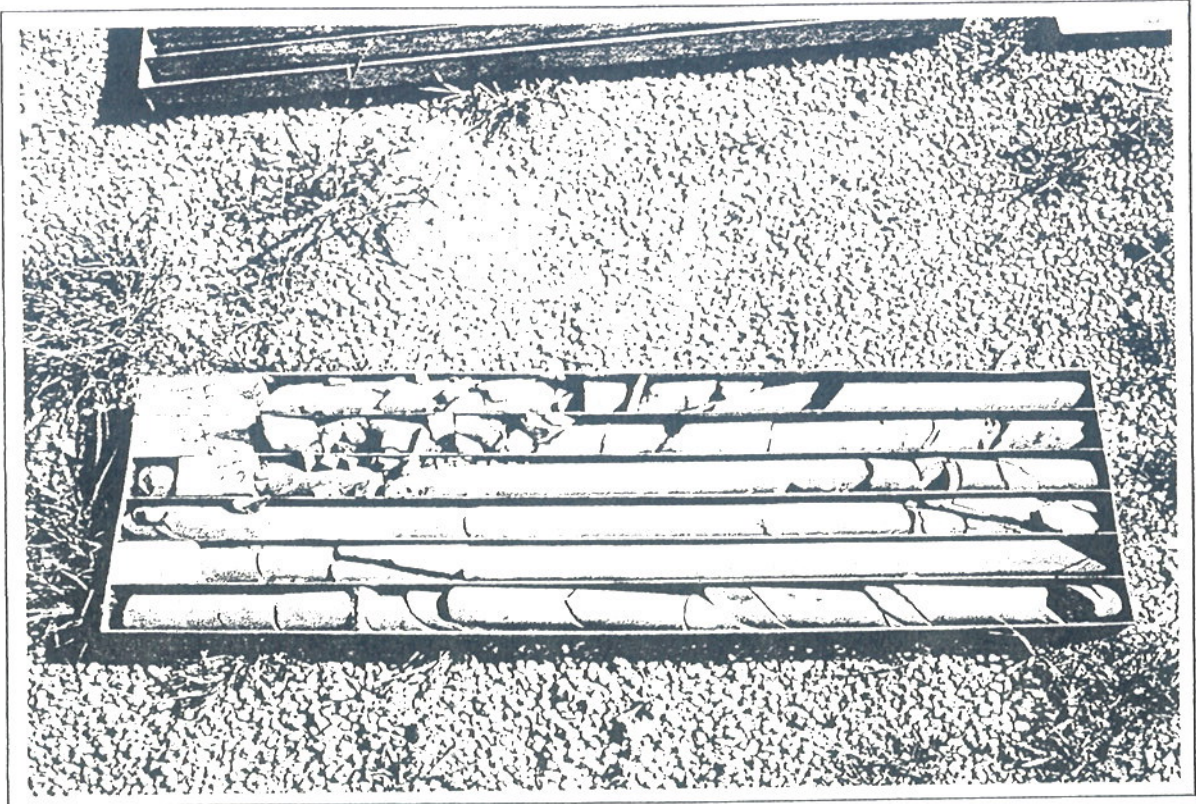
DDH 5a/97 - Box 3

18.00 to 24.00 metres



DDH 5a/97 - Box 4

24.00 to 30.00 metres



DDH 5a/97 - Box 5

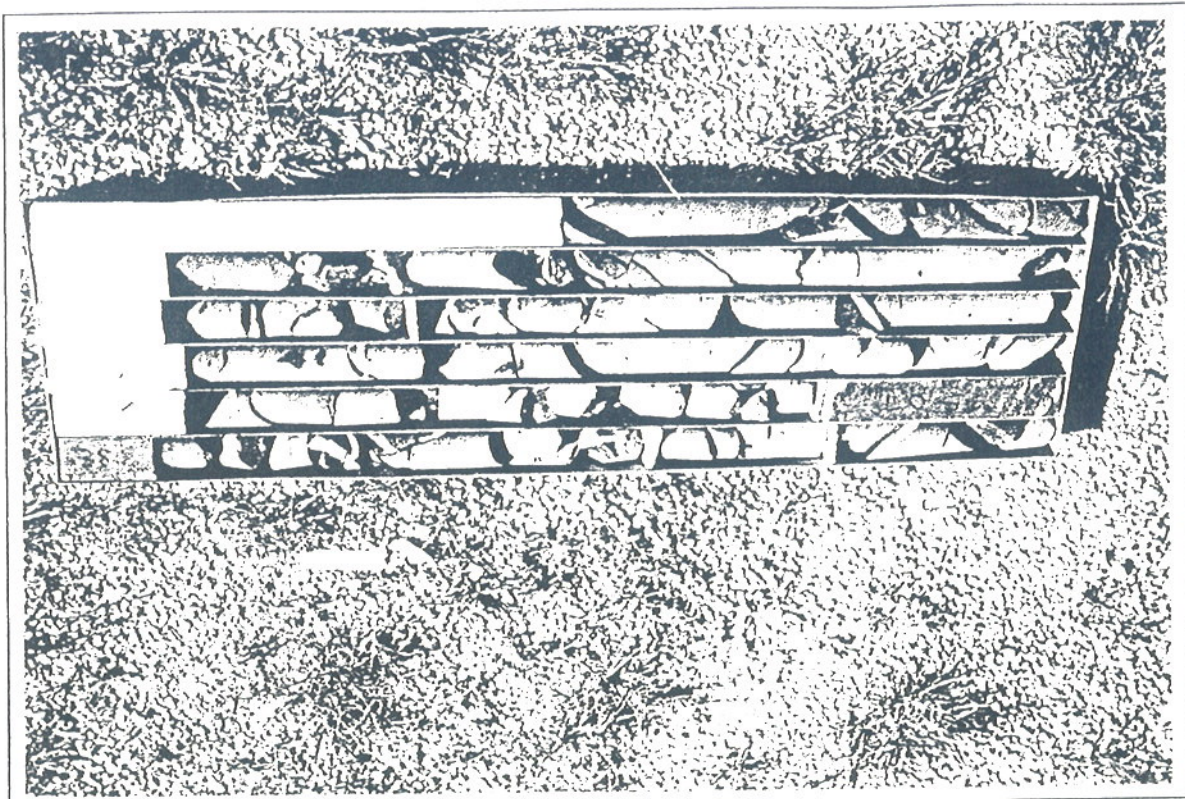
30.00 to 36.00 metres

Project: Jandra Quarry – Quarry extension		Drilling Company: Groundtest		Page No: 1					
Locality: Jandra Quarry near Taree		Logged: Ian Stenhouse		Hole No: DDH 6/97					
Co-ordinates 248,551 E, 1,452,798 N		Datum: AHD		Core Size: NQ <sub>3</sub>					
Bearing: Vertical		RL Collar: 48.7 metres		Commenced: 28.2.97					
Inclination: Vertical		RL Bottom: 18.7 metres		Completed: 3.3.97					
		Depth: 30.0 metres		Drilled into exiting quarry floor.					
% Core Recovery				Depth (m)	Drill Time	Weathering	Structure	Symbol	Geological Description
				0					0 to 3.4 Meta-Sediments Core Loss – Rock Roller Slightly weathered, moderately strong the weak.
				-		S W	Highly fractured, joints per metre 20 <sup>+</sup> .		
				1					
				-					
				2					
				-		S W			
				3					
				-		S W			3.4 to 4.6 Meta-Sediments dark brown, weak to moderately strong, siltstone, overlying rock grading into coarse greywacke.
				4					
				-					
				5			Joints per metre 10 to 15.		
				-					
				6					4.6 to 13.4 Greywacke Slightly weathered, light grey to grey core, limonite staining on joint planes. Granitic lithic fragments.
				-		S W	Joints cross core axis @ 45°. Limonite staining in slightly weathered rock.		
				7					
				-					
				8			Joints per metre 5 to 10.		
				-					
				9					4.6 to 5.0 coarse greywacke, Sandier than the bulk of the greywacke unit.
				-					
				10					
				-					
				11		S W			
				-					
				12					
				-					
				13					
				-					
				14					13.4 to 30.0 Greywacke Fresh, very strong, very hard, calcite along joint planes, minor pyrite on some joint surfaces, becoming slightly coarser towards the base.
				-					
				15					
				-					
				16		Fresh			
				-					
				17			Core quite fractured from 17.7 to 18.5 metres and 22.1 to 23.2 metres.		
				-					
				18					
				-					
				19					
				-					
				20					
				-		Fresh			
				21					
				-					
				22					
				-					
				23					
				-					
				24					24.0 to 24.1 sample taken for petrographic analysis.
				-					
				25		Fresh	Joints per metre 1 to 3.		
				-					
				26					

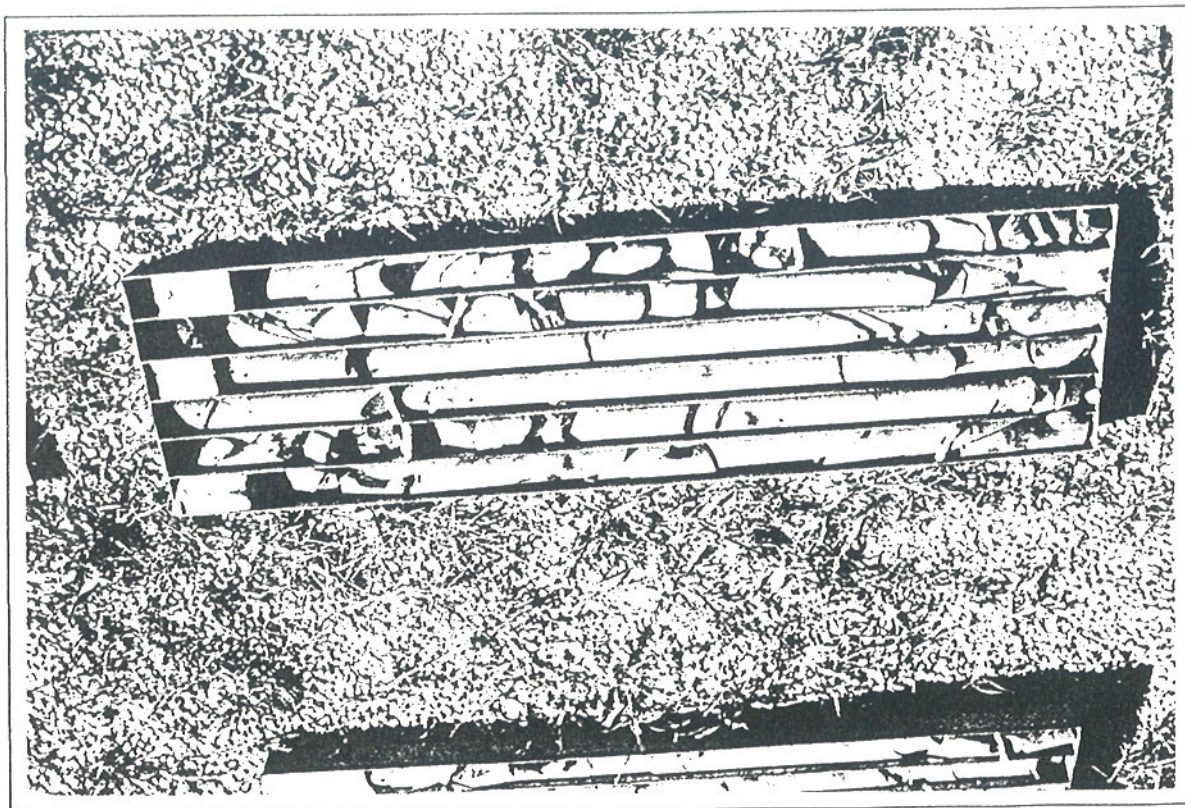
Project: Jandra Quarry Extension				Hole Number: DDH 6/97		Page No: 2
% Core Recovery	Depth (m)	Drill Time	Weathering	Structure	Symbol	Geological Description
-	27		Fresh	Dominant joints cut core axis $\approx 45^\circ$ .		13.4 to 30.0 Greywacke Fresh, very strong, very hard, calcite along joint planes, minor pyrite on some joint surfaces, becoming slightly coarser towards the base.
-	28					
-	29		Fresh			
-						
						End of Hole 30.0 metres

Box	Length
Box 1	3 to 9 metres
Box 2	9 to 15metres
Box 3	15 to 21 metres
Box 4	21 to 26 metres
Box 5	26 to 30 metres

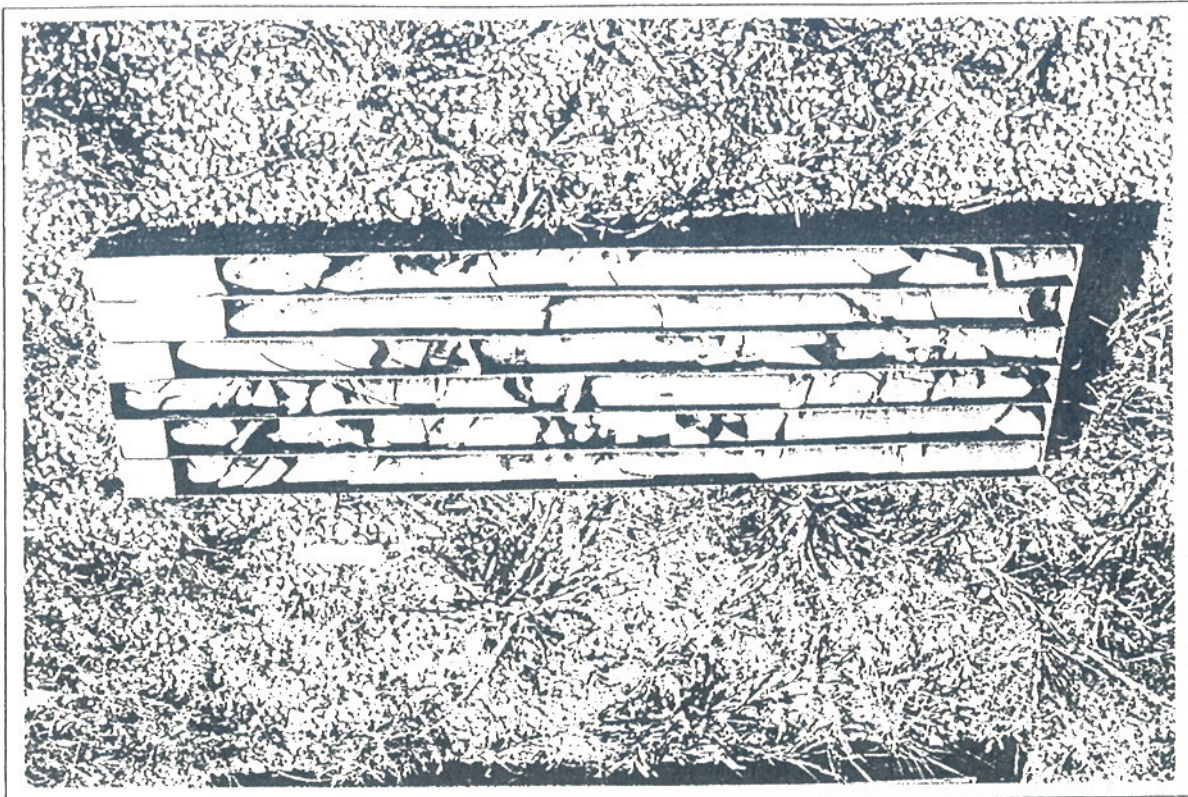




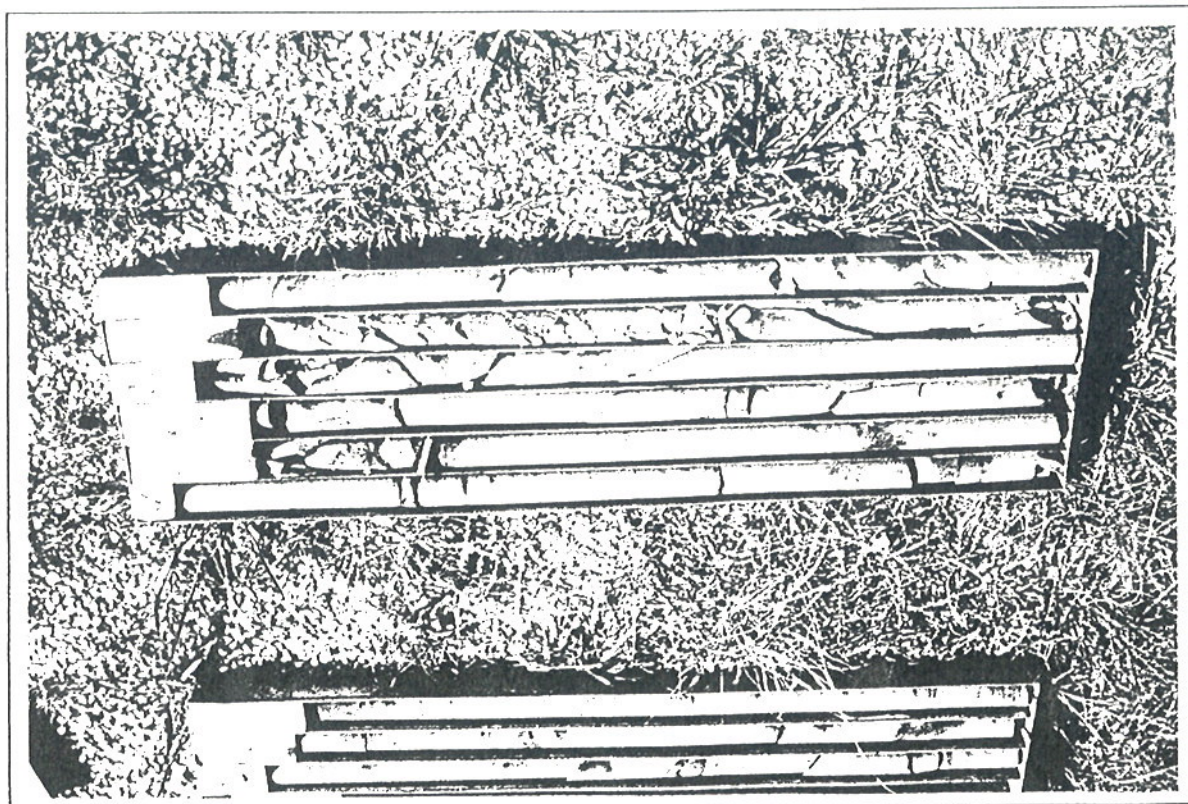
DDH 6/97 - Box 1      3.00 to 9.00 metres



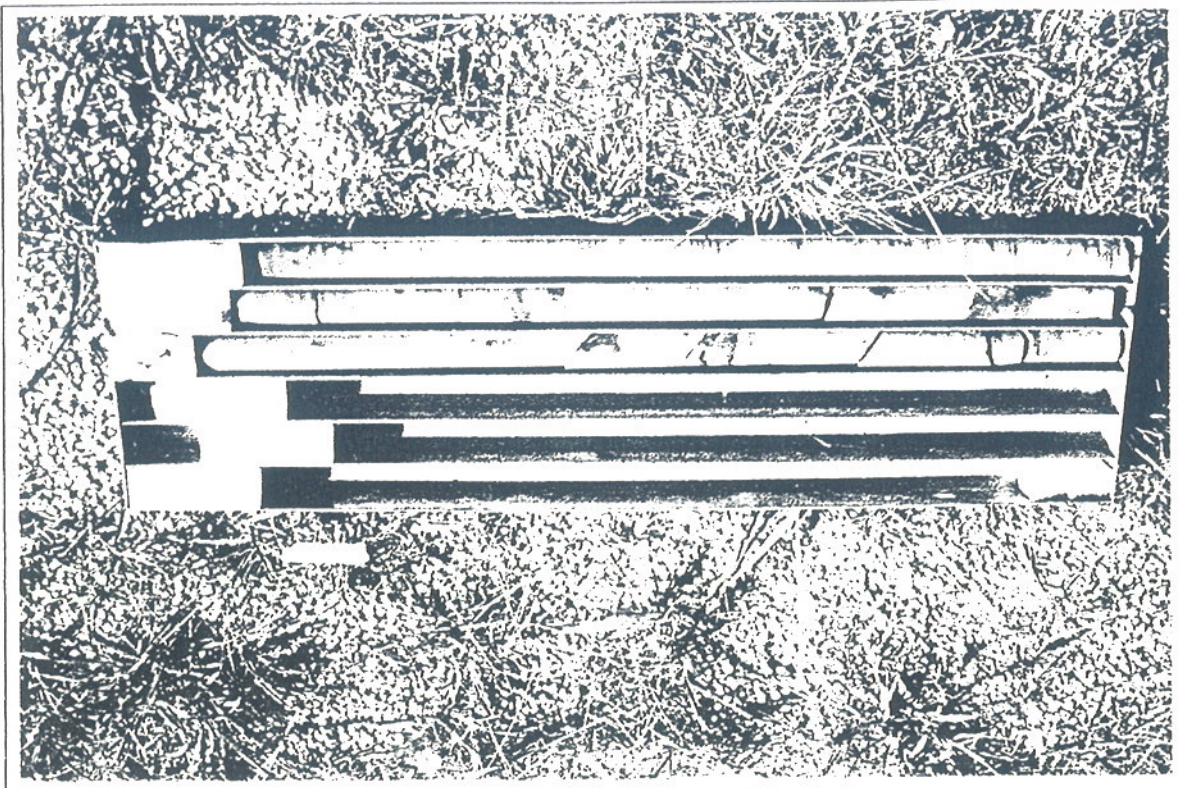
DDH 6/97 - Box 2      9.00 to 15.00 metres



DDH 6/97 - Box 3      15.00 to 21.00 metres



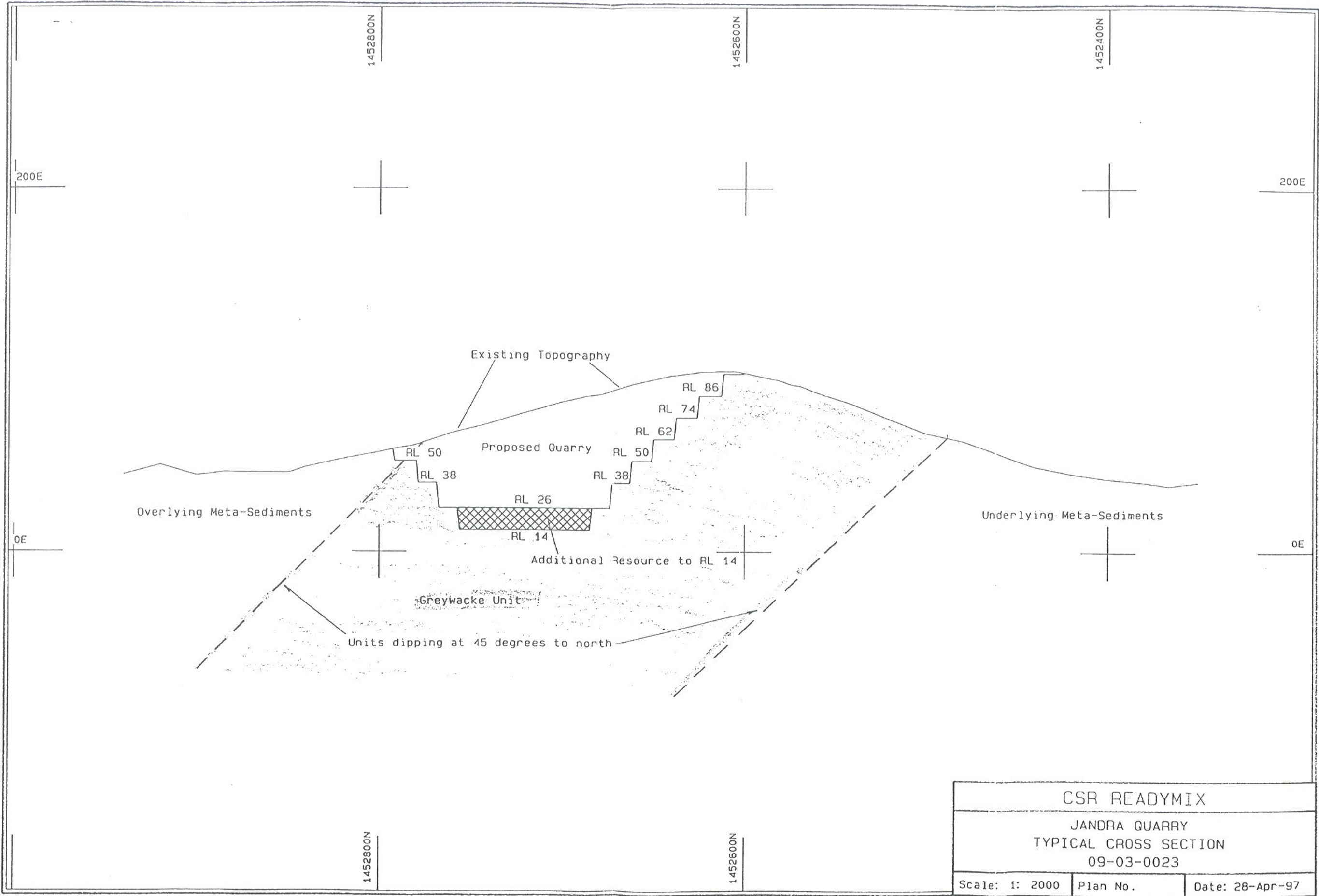
DDH 6/97 - Box 4      21.00 to 26.00 metres



DDH 6/97 - Box 5      26.00 to 30.00 metres

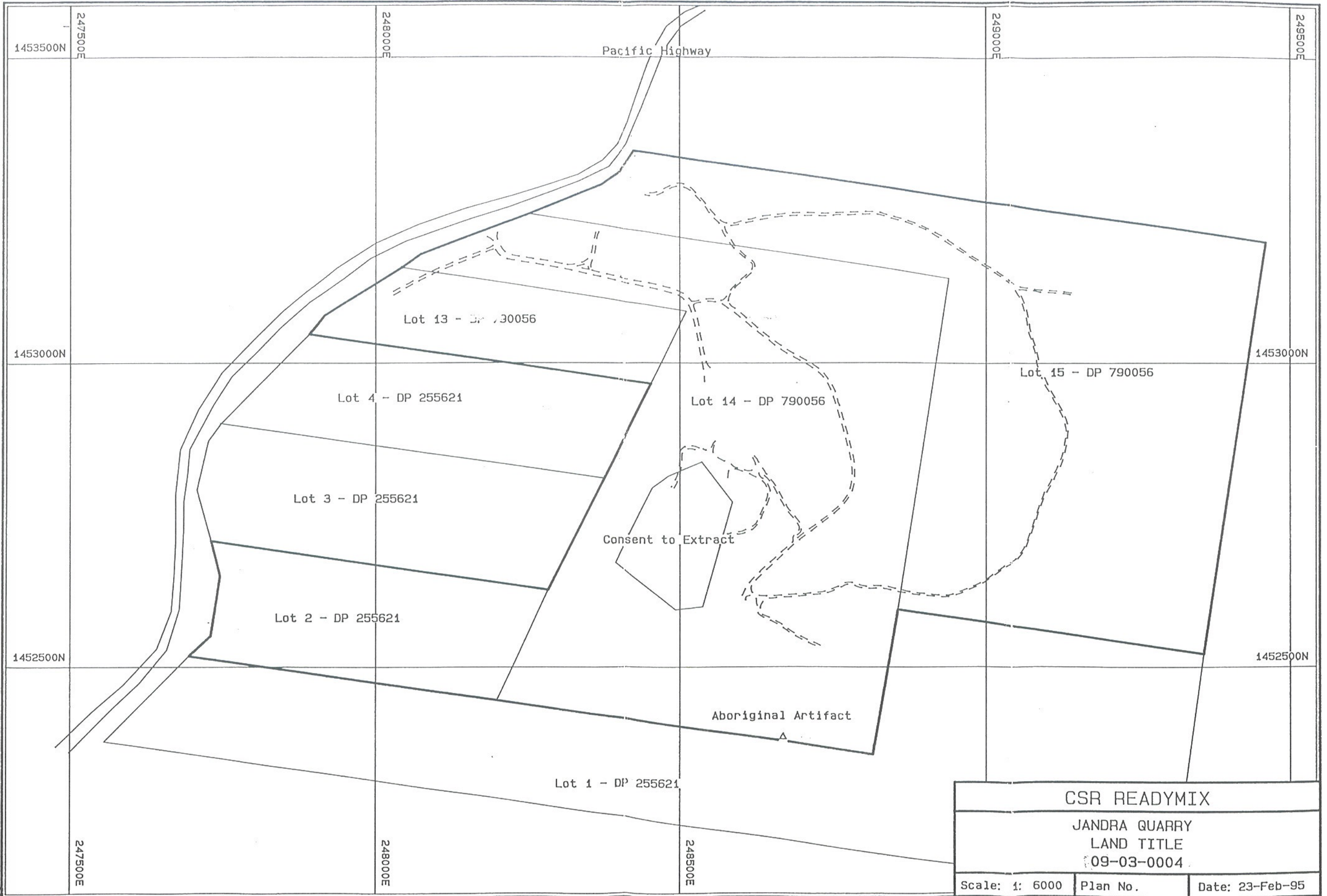
# FIGURES





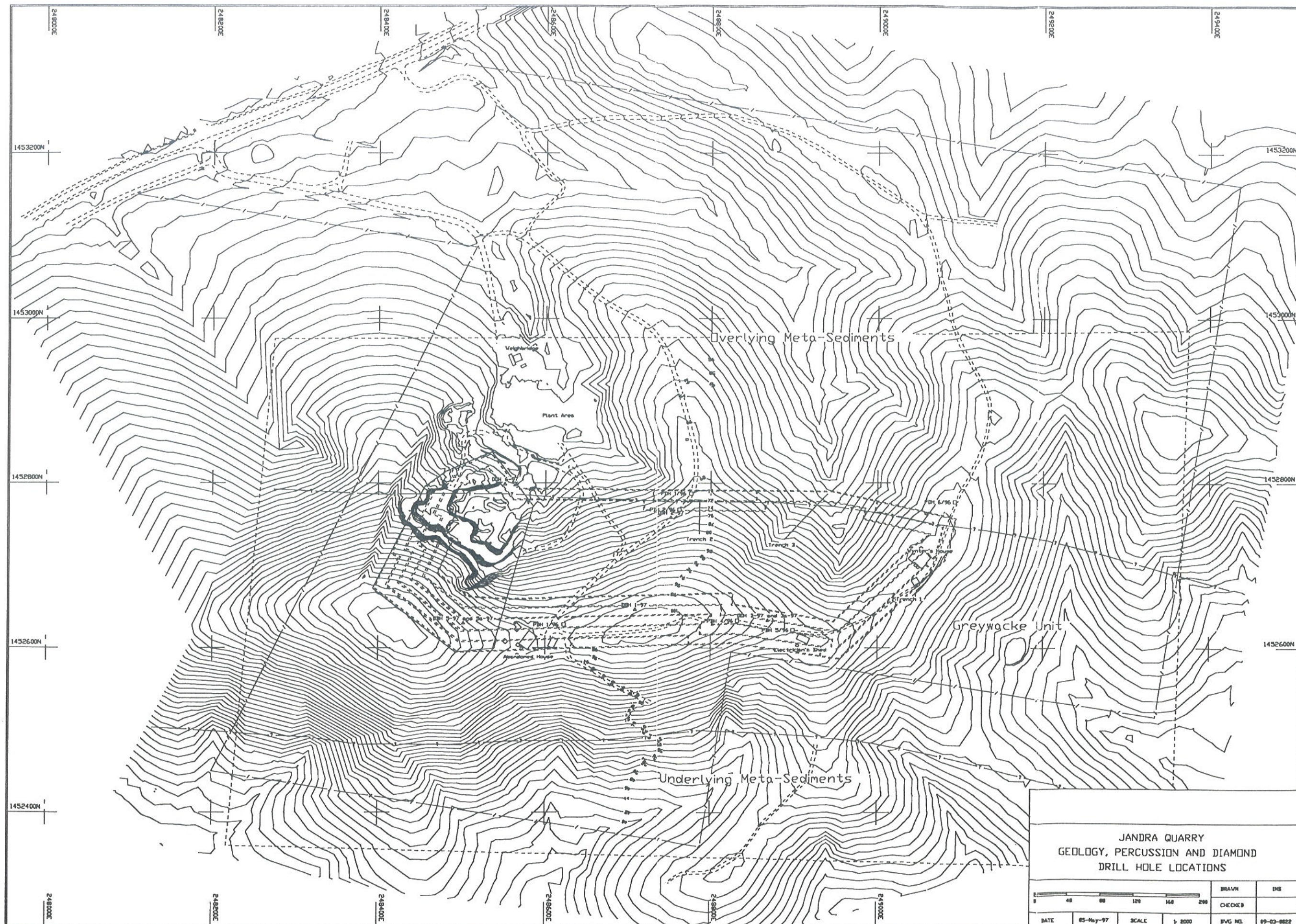
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JANDRA QUARRY		
TYPICAL CROSS SECTION		
09-03-0023		
Scale: 1: 2000	Plan No.	Date: 28-Apr-97

jangeo5a .pf



CSR READYMIX		
JANDRA QUARRY		
LAND TITLE		
09-03-0004		
Scale: 1: 6000	Plan No.	Date: 23-Feb-95

j.f.vuajlpuaf



**JANDRA QUARRY**  
**GEOLOGY, PERCUSSION AND DIAMOND**  
**DRILL HOLE LOCATIONS**

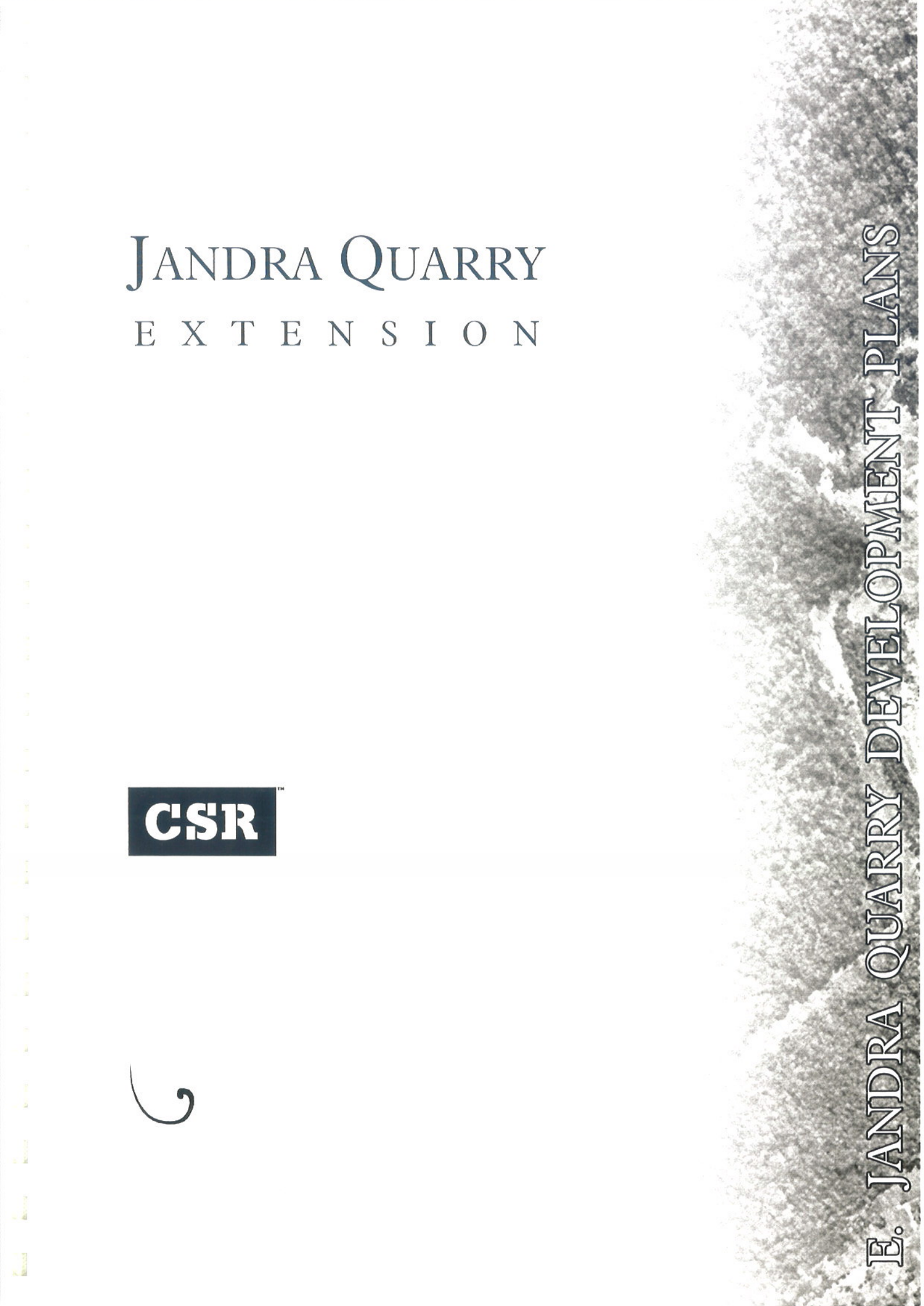
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DATE	05-May-97	SCALE
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	DVG NO.	09-02-8822



# JANDRA QUARRY E X T E N S I O N



E. JANDRA QUARRY DEVELOPMENT PLANS





## **JANDRA QUARRY**

### **Quarry Development Plans – April 1999**

#### **Design Parameters**

The quarry plans and rock volumes presented have been developed based on the following parameters:

- the existing approved face height of 12 metres is preserved to RL50 (the existing quarry floor),
- faces from RL50 to RL20 are 15 metres high,
- terminal quarry benches are half the face height, that is, benches at RL98, RL86, RL74, RL62 and RL50 are 6 metres wide and the bench at RL35 is 7.5 metres wide,
- the angle of repose of quarry faces is 75°,
- haul roads have a gradient of 1 in 10 and the haul road width is 15 metres,
- the density of the rock is 2.65 t/m<sup>3</sup>,
- topsoil is on averages 1 metre thick,
- weathered rock averages 10 metres in thickness.

#### **Stage 1 Development**

Stage 1 comprises the westerly development of the quarry towards the Pacific highway. The western limit of extraction is 400 metres from the highway.

Bench levels developed will be RL98, RL86, RL74, RL62 and RL50. Development will be from the east towards the west.

Access to all benches will utilise the existing haul road system.

Development of the upper most benches is the main priority – RL98 will be the first bench level completed. Overburden and topsoil removed from stripping in other areas of the development will be placed on terminal benches and trees and grass established.

Rock won from western quarry development will be:

	<b>Overburden (m<sup>3</sup>)</b>	<b>Weathered Rock (m<sup>3</sup>)</b>	<b>Fresh Rock (m<sup>3</sup>)</b>	<b>Tonnage (@ 2.65 t/m<sup>3</sup>)</b>
<b>Stage 1</b>	61,900	619,300	1,685,800	4,467,400

## Stage 2 Development

Stage 2 comprises the easterly development of bench levels developed will be RL98, RL86, RL74, RL62 and RL50. Development will be from the west towards the east. A drop-cut will be developed to access rock on RL35.

Upper benches will be rehabilitated as soon as access along them is no longer required.

Rock won from Stage 2 development will be:

	<b>Overburden (m<sup>3</sup>)</b>	<b>Weathered Rock (m<sup>3</sup>)</b>	<b>Fresh Rock (m<sup>3</sup>)</b>	<b>Tonnage (@ 2.65 t/m<sup>3</sup>)</b>
<b>Stage 2</b>	44,462	489,082	1,640,773	4,348,048

## Stage 3 Development

Stage 3 comprises the easterly development of the quarry to the western limit of extraction. The quarry does not breach the ridgeline to the south or to the east.

Bench levels developed will be RL98, RL86, RL74, RL62, RL50 and RL35. Development will be from the west towards the east.

Again, speedy rehabilitation of completed upper benches is the main priority. As soon as a bench is not required for access to other areas of the quarry, overburden and topsoil removed from stripping in other areas of the property will be placed on these benches and trees and grass established.

Rock won from Stage 3 development will be:

	<b>Overburden (m<sup>3</sup>)</b>	<b>Weathered Rock (m<sup>3</sup>)</b>	<b>Fresh Rock (m<sup>3</sup>)</b>	<b>Tonnage (@ 2.65 t/m<sup>3</sup>)</b>
<b>Stage 3</b>	34,538	300,718	1,371,567	3,634,652

## Stage 4 Development

Stage 4 comprises the development of the RL20 bench level and the northerly expansion of the western end of the pit.

Bench levels developed will be RL50, RL35 and RL20. A continuation of the drop-cut developed in Stage 2 will allow access to RL20.

Rock won from Stage 4 development will be:

	<b>Overburden</b>	<b>Weathered</b>	<b>Fresh Rock</b>	<b>Tonnage</b>
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	(m <sup>3</sup> )	Rock (m <sup>3</sup> )	(m <sup>3</sup> )	(@ 2.65 t/m <sup>3</sup> )
Stage 4	4,512	45,100	1,537,600	4,074,600

### End Use

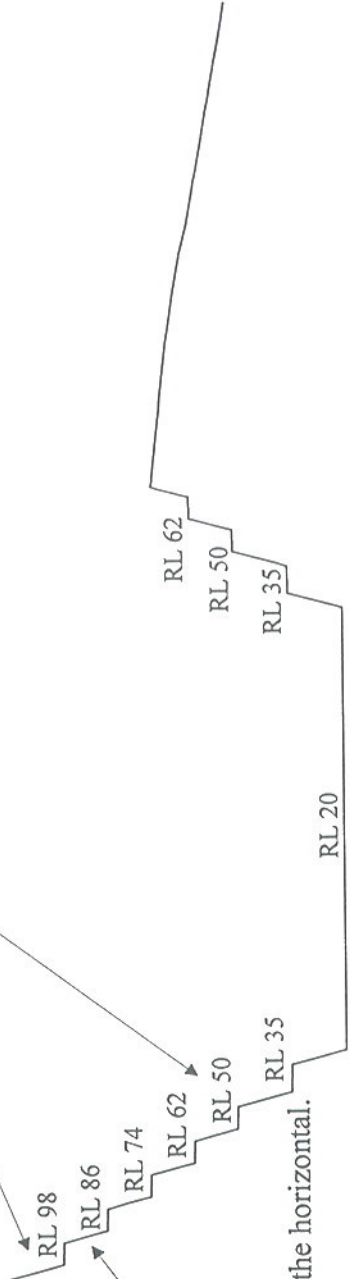
Following the completion of Stage 4 two options will be available to CSR.

**Deeper Development:** Geological evidence suggests that the greywacke unit continues below RL20 (the base level of quarrying proposed in this development application). Deeper development is most likely.

**Land Fill:** The quarry will be ideally developed to allow for landfill.

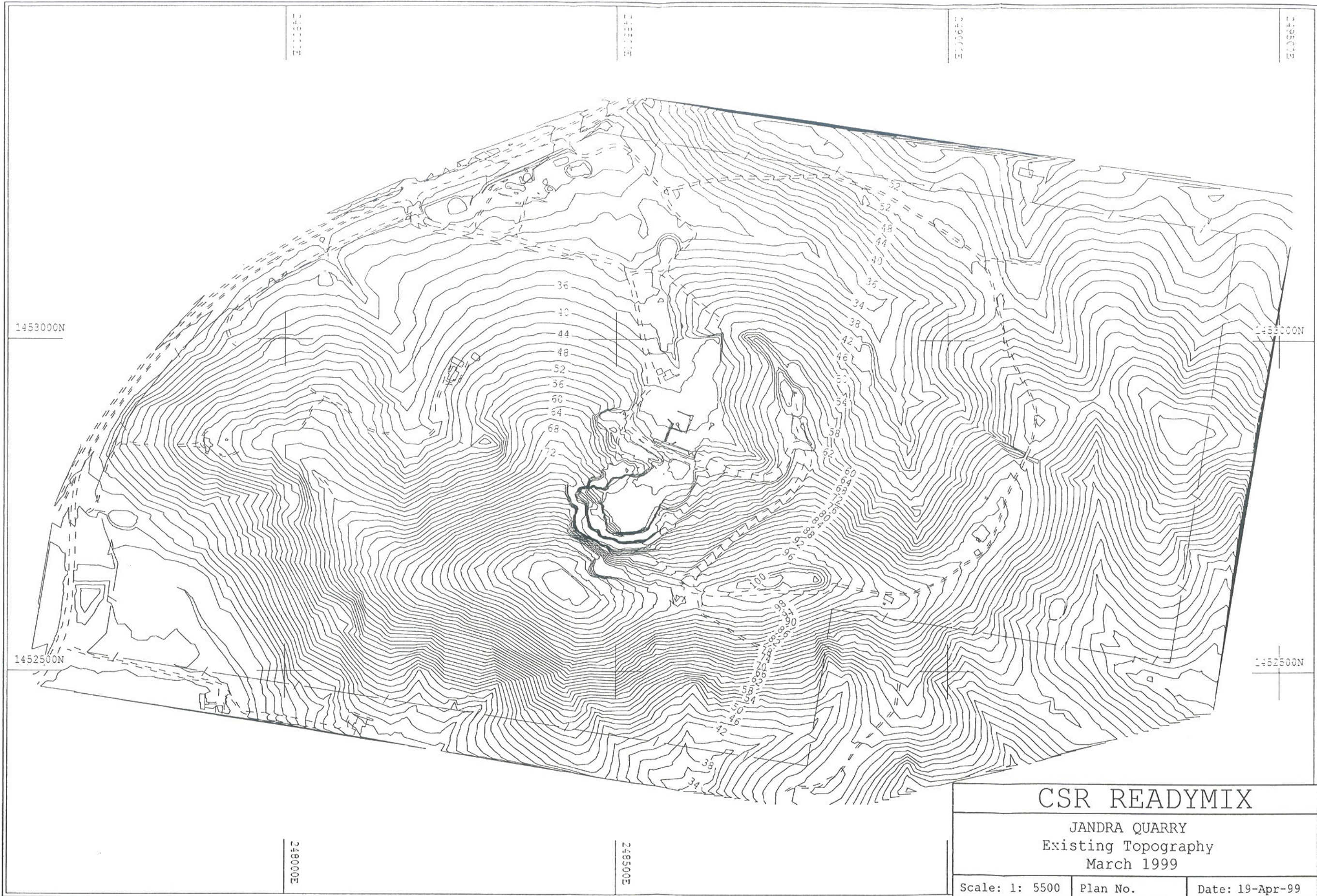
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Berm width is half the face height. That is, for a 12 metre face the berm width is 6 metres and for 15 metre faces, 7.5 metres.

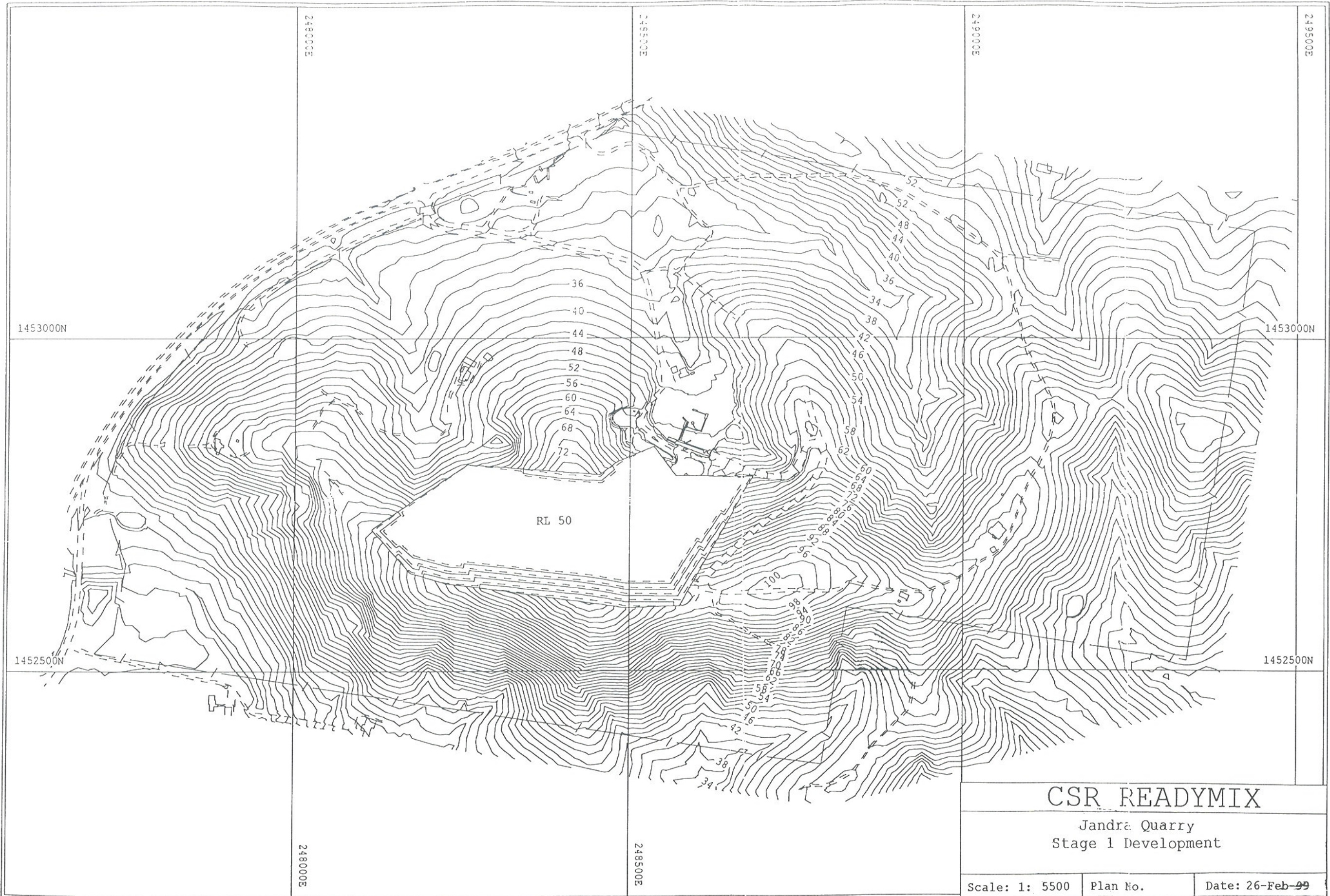


Angle of Repose of Quarry Face = 75 degrees from the horizontal.

Jandra Quarry -- Section through bench design looking west.



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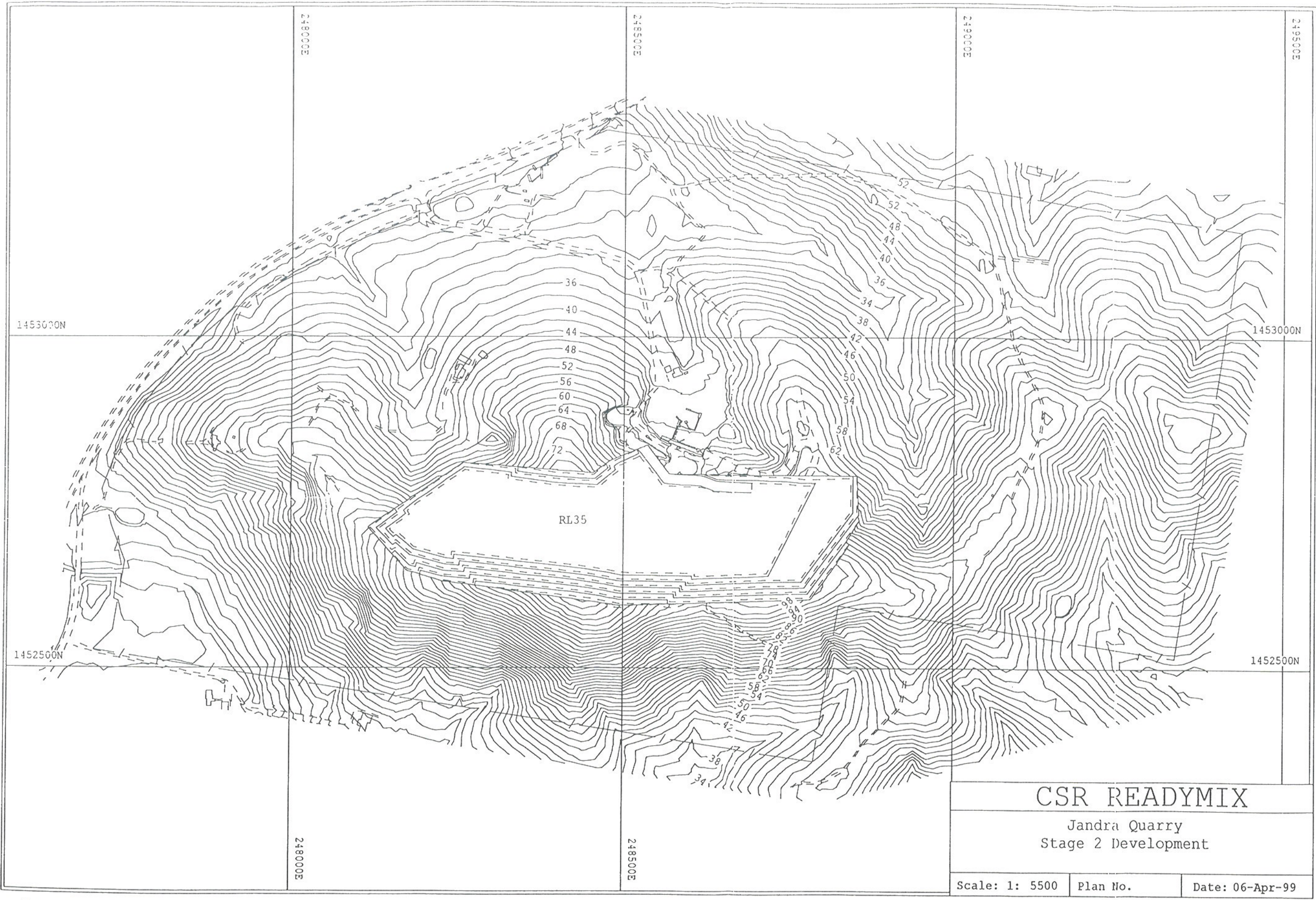
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Jandra Quarry  
Stage 1 Development

Scale: 1: 5500	Plan No.	Date: 26-Feb-99
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Jandra Quarry  
Stage 2 Development

Scale: 1: 5500

Plan No.

Date: 06-Apr-99

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