

TABLE 2 CRITERIA AND MEASUREMENTS, SEISMIC LINES

TABLE 2 (A) SEISMIC LINES ON DUNE RIDGES						
<i>Criterion</i>	<i>Intention</i>	<i>Objective</i>	<i>Land unit (functional)</i>	<i>GAS Score</i>	<i>Measurement of criterion</i>	<i>Commentary</i>
Angle of approach	Minimise length actually cut by maximising angle of approach	A,B,D	All dunes	<i>Angle of approach (degrees)</i>		Preferred outcome is orthogonal crossing of dune ridges. Better chance of natural infill rather than blowout with a direct cut. Angle influences extent of damage on dune flanks: sharper angles require more cross-cutting, increasing extent of disturbance. Sharper angles are more obvious to observers passing through swales.
				+2	90degree angle	
				+1	75 -90	
				0	60-75	
				-1	45-60	
				-2	< 45	
Depth of cut	Minimise trenching, spillovers, windrows by minimising depth of cut Even without blading, there will be some cutting of dunes, if only by passage of vehicle tyres	A,B,C	Ridges, clay plinth (yellow sands)	<i>Depth of cut at crest</i>		Extent of disturbance is related to depth of cut. A deeper cut will be wider at the crest and will involve more sand spilling onto flanks. Depth at crest will also influence depth of cut and/or height of fill on flanks. Depth at crest can thus be used as an index of compliance for both crest and flank, avoiding the need for derivation of a separate flank measurement. Greater mobility of red sand ridges allows more self-repair, hence deeper cuts can be accepted than for the preceding. Nevertheless, over-deep cuts still result in +/- permanent hollows. Depth at crest provides a measurable index to depths on approaches, as above.
				+2	0.3m	
				+1	0.5m	
				0	1m	
				-1	1.5m	
				-2	2m	
			Ridges, deep sand (red sands) and Irregular dunes	<i>Depth of cut at crest</i>		
				+2	0.5m	
				+1	1m	
				0	2m	
				-1	2.5m	
				-2	3m	
Vegetation retention; line screening	Minimise obtrusiveness by maintaining screening vegetation, and minimising vegetation removal generally	C, D	All dunes	+2	No vegetation removal (Bare sand at crossing)	No cut, wheelmarks only; bare sand implies high mobility/infill rates The 0.5m cutoff permits clearing of spinifex. We are not totally convinced that spinifex will regenerate as rapidly as expected in current literature. Any vegetation over 0.5m will (a) play a major screening role of (b) show any straight cut through it quite clearly. Note this does <u>not</u> differentiate on the basis of Santos priority classes, and is accordingly much simpler.
				+1	Vegetation <0.5m removed, line screened at least once between swale and crest	
				0	Vegetation <0.5m removed, no screening	
				-1	Vegetation >0.5m removed, line screened at least once between swale and crest	
				-2	Vegetation >.5m removed, no screening on line between swale and crest	

Seismic line objectives

- A. Terrain returned to its original configuration or to a reasonable resemblance of it**
- B. Soil surfaces restored to their original state or a reasonable resemblance of it**
- C. Plant species local to the area able to re-colonise**
- D. Linear obtrusiveness limited by visual obstruction.**

TABLE 2 (B) SEISMIC LINES ON SWALES, INTERDUNES AND FOOTSLOPES								
Criterion	Intention	Objective	Land unit (functional)	GAS Score	Measurement of criterion	Commentary		
Windrows Extent (length)	Minimise extent of windrows: indirectly, minimise blading; eliminate windrows on floodplain equivalents; indirectly, eliminate visual obtrusiveness and water flow redirection	A, B, D	Sandy swales and footslopes	+2	Zero windrow	Length of windrow can be continuous or interrupted: eg 100 @ 1m lengths would score as equivalent to 100m of continuous windrow. Both would be visible.		
				+1	<25m windrow /500m length of line			
				0	25-50m windrow /500m length of line			
				-1	50-100m windrow /500m length of line			
				-2	>100m windrow /500m length of line			
			Clayey sand swales & footslopes	+2	n/a		As the clay fraction increases, so does permanency of windrows (with decreasing self repair capability). Assessment scale shifts, and upper (+1,+2) scores become unavailable to GAS	
				+1	Zero windrow			
				0	<25m windrow /500m length of line			
				-1	25-50m windrow /500m length of line			
				-2	>50m windrow /500m length of line			
			Clay swales (floodplain equivalent)	+2	n/a			Equivalent to floodplain. Any windrow in a clay swale will be a long-term or permanent feature. Santos Codes require no blading of soil in floodplains and are retained here
				+1	n/a			
				0	Zero windrow			
				-1	<25m windrow /500m length of line			
				-2	>25m windrow /500m length of line			
Windrows Magnitude (height)	Minimise height of windrow where windrows occur; indirectly minimise barriers to water and wind transport, minimise barriers to seed dispersal.	A, C, D.	Sandy swales and footslopes	+2	0cm (no windrow)	A 5cm windrow (with rill kill) will have removed approx 1cm of surface soil and with it the propagating portions of perennial shrub species. A 10cm windrow removes approx 2cm including local seed banks. Saltbush (eg) cannot climb a 20cm windrow. Sandier landforms (less cemented) have some self-repair capability. There is latitude for taller windrows which will slump to some extent. The greater the clay fraction, the greater the permanency of windrows. Windrows are still considered unnecessary in almost all circumstances.		
				+1	5cm			
				0	10cm			
				-1	20cm			
				-2	>20cm			
			Clayey sand swales & footslopes	+2	n/a			
				+1	0cm (no windrow)			
				0	5cm			
				-1	10cm			
				-2	>10cm			
			Clay swales (floodplain equivalent)	+2	n/a		Equivalent to floodplain. Any windrow in a clay swale will be a long-term or permanent feature. Santos Codes require no blading of soil in floodplains and are retained here	
				+1	n/a			
				0	0cm (no windrow)			
				-1	5cm			
				-2	>5cm			
Vegetation retention; line screening	Minimise obtrusiveness by maintaining screening vegetation, and minimising vegetation removal generally	C, D	Sandy and clayey sand swales and footslopes	+2	No vegetation removal, sight interception intervals <100m	Vegetation height used as cutoff, not Santos priority. The 0.5m cutoff permits clearing of spinifex. We are not totally convinced that spinifex will regenerate as rapidly as expected in current literature. Any vegetation over 0.5m will (a) play a major screening role of (b) show any straight cut through it quite clearly. Sight interception intervals of >200m are equivalent to no sight interception at all: vision will be one of a totally cleared line.		
				+1	Vegetation <0.5m removed, sight interception intervals <100m			
				0	Vegetation <0.5m removed, sight interception intervals 100-200m			
				-1	Vegetation >0.5m removed, sight interception intervals 100-200m			
				-2	Vegetation >.5m removed, sight interception intervals exceed 200m			
			Clay swale: as for floodplains					

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- D. Linear obtrusiveness limited by visual obstruction.**

TABLE 2 (C) SEISMIC LINES ON FLOODPLAIN: SWAMPS AND FLATS

Stream crossings, terraces and levees generally can be treated as point samples for purposes of assessment, ie similar to wellsites.
 The Floodplain/swamps & flats land units will contain the lineally extensive seismic lines.

Criterion	Intention	Objective	Land unit (functional)	GAS Score	Measurement of criterion	Commentary
Windrows Extent (length)	Minimise extent of windrows: indirectly, minimise blading; eliminate windrows on floodplain equivalents; indirectly, eliminate visual obtrusiveness and water flow redirection	A, B, D	Clay or sandy clay floodplain including swampy areas	+2	n/a	Any windrow on a clay floodplain will be a long-term to permanent feature. The requirement to have <i>no</i> windrow cannot be <i>over-</i> achieved Santos Codes require no blading of soil in floodplains and are retained here. Any windrow may dam or redirect water,
				+1	n/a	
				0	Zero windrow	
				-1	<25m windrow /500m length of line	
				-2	>25m windrow /500m length of line	
Magnitude (height)	Minimise height of windrow where windrows occur; indirectly minimise barriers to water and wind transport, minimise barriers to seed dispersal.	A, C, D	Clay or sandy clay floodplain including swampy areas	+2	n/a	Any windrow on a clay floodplain will be a long-term to permanent feature. The requirement to have <i>no</i> windrow cannot be <i>over-</i> achieved Santos Codes require no blading of soil in floodplains and are retained here. Any windrow may dam or redirect water,
				+1	n/a	
				0	0cm (no windrow)	
				-1	5cm	
				-2	>5cm	
Vegetation retention; line screening	Minimise obtrusiveness by maintaining screening vegetation, and minimising vegetation removal generally	C, D	Floodplain with perennial vegetation (any height, any Santos priority coding)	+2	No vegetation damage, line not visible	Implicit is total avoidance, marked weaving of lines through perennial stands Damage through vehicle passage, not bladed. Line weaves. Vegetation can be damaged by vehicle passage, but no blading or removal of rootstock -1 and -2 scores both imply blading of vegetation Any more than 10% of line cleared will result in stock use (needs fencing).
				+1	Minor damage, line not visible	
				0	Minor damage, line visible	
				-1	<50m perennial cover removed /500m of line	
				-2	>50m perennial cover removed /500m of line	
			Floodplain without perennial vegetation (biannual or ephemeral)	+2	No blading, sight interception <100m	Close weaving of lines implied Open weaving of lines implied Current practice: straight lines through ephemeral without blading Permits some blading without major disincentive, eg in crossing crabholes Disincentive to lazy blading
				+1	No blading, sight interception 100m-200m	
				0	No blading, wheeltracks obvious	
				-1	<50/500m straight length	
				-2	Complete removal >50m/500m straight lengths	

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TABLE 2 (D) SEISMIC LINES ON FLOODPLAIN: STREAM CROSSINGS, LEVEES, TERRACES

<i>Criterion</i>	<i>Intention</i>	<i>Objective</i>	<i>Land unit (functional)</i>	<i>GAS Score</i>	<i>Measurement of criterion</i>	<i>Commentary</i>
Channel bank cuts (extent)	Minimise permanent alteration to banks	A, B	Channel, levee, terrace	+2	No blading or breaking of banks	Stream crossings have least impact where little or no construction is applied. If crossing is not cut, accelerated erosion from runoff is unlikely. The more cutting, the more potential for slumping at a later stage and the more obtrusive the displaced earth; hence the restoration requirements.
				+1	Cuts <0.5m in banks; deeper cuts fully restored	
				0	Cuts 0.5-1m deep in banks, partial restoration	
				-1	Cuts > 1m deep in banks, partial restoration	
				-2	Cuts >1m deep in banks, no restoration	
Channel bank cuts (nature)	Minimise channel blocking and excess artificial sediment loads	A, B	Channel, levee, terrace	+2	No blading or breaking of banks	As distinct from the size or extent of cuts in banks, the way cuts are made affects the blocking or otherwise of the channel. If cuts are simply bulldozed down into channels, the channel may be blocked, or, at best, an unnecessary additional sediment load created from crossing works.
				+1	Cut made by pulling back, no material in channel	
				0	Cut made by pulling back, minor debris in channel	
				-1	Up to 50cm causeway (block) across channel	
				-2	Channel blocked, >50cm causeway	
Vegetation retention & line screening	Maximise visual obstruction along lines at creek crossings; maximise maintenance of perennial cover on banks and levees	C, D		+2	No perennial vegetation removed, line deviates	The critical component is perennial vegetation. Given that some riparian vegetation is uncommon, a case can be made here for a species-specific criterion also.
				+1	Perennials <2m removed, line deviates	
				0	Perennials <2m removed, no deviation	
				-1	Perennials >2m removed, line deviates	
				-2	Perennials >2m removed, no deviation	

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TABLE 2 (E) SEISMIC LINES ON GIBBER AND STONY TABLELAND

Criterion	Intention	Objective	Land unit (functional)	GAS Score	Measurement of criterion	Commentary
Windrows Extent (length)	Minimise blading; minimise shifting of gibber cover; indirectly, eliminate visual obtrusiveness and water flow redirection	A, B, C	Slope <2%	+2	n/a	Length of windrow can be continuous or interrupted: eg 100 @ 1m lengths would score as equivalent to 100m of continuous windrow. Both would be visible. Windrows provide a means for measuring the extent of gibber disturbance or removal, rather than resorting to estimates of area disturbed
				+1	Zero windrow, no wheelmarks	
				0	Zero windrow, wheelmarks visible	
				-1	<25m windrow /500m length of line	
				-2	>25m windrow /500m length of line	
			Slope >2%	+2	n/a	Where slope is >2%, any form of windrow implies an erosion risk due to moved gibber. The -2 for a short length of windrow recognises that occasional heaps may be pushed up by vehicle or roller
				+1	n/a	
				0	Zero windrow, no wheelmarks	
				-1	Zero windrow, wheelmarks visible	
				-2	Windrow present (regardless of length)	
Windrows Magnitude (height)	Minimise blading; minimise shifting of gibber cover; indirectly, eliminate visual obtrusiveness and water flow transport, minimise barriers to redirection	A, C, D.	All slopes	+2	n/a	A gibber windrow is effectively a permanent fixture. The intent is to have no windrow on any gibber surface. On level surfaces, gibber windrows are highly visible. On sloping surfaces, the higher the gibber windrow, the more locally bared surface, the more pronounced the water flow redirection, and the greater the visibility.
				+1	n/a	
				0	0cm (no windrow)	
				-1	<5cm	
				-2	>5cm	
Line "screening"	Not possible to screen on gibber	D	All	+2	n/a	There is little point in line weaving in gibber. In all other landscapes, weaving will permit some hiding of the line. In open gibber (excluding stream crossings), weaving will simply increase the likelihood of the line being visible from a number of directions, rather than the single direction associated with a straight line.
				+1	n/a	
				0	n/a	
				-1	n/a	
				-2	n/a	

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TABLE 2 (F) SEISMIC LINES LAND UNIT INDEPENDENT: INFRASTRUCTURE, UPHOLES AND RUBBISH						
<i>Criterion</i>	<i>Intention</i>	<i>Objective</i>	<i>Land unit (functional)</i>	<i>GAS Score</i>	<i>Measurement of criterion</i>	<i>Commentary</i>
Infrastructure impacts	Limit impacts on pastoral and general infrastructure; encourage repair and reinstatement	n/a	Land unit independent	+2	n/a	Derived from Cockshell 1998
				+1	No observable impact	
				0	Infrastructure impact reported, remediated	
				-1	Impact remediation incomplete; or impact unreported	
				-2	Impact unremediated.	
Upholes	Minimise local alteration to terrain, minimise obtrusiveness	A, B, (D)	Land unit independent	+2	No cuttings; no subsidence; hole plugged	Derived from Cockshell 1998
				+1	Minor cuttings; no subsidence; hole plugged	
				0	Cuttings present but dispersed; no subsidence	
				-1	Cuttings mounded; subsidence; hole plugged	
				-2	Cuttings mounded; subsidence; hole open	
Litter and chemical pollution	Minimise visual impacts; encourage cleanup of minor spills.	A, B, (D)	Land unit independent	+2	No litter, no fuel or chemical spills	Derived from Cockshell 1998 Note that major pollution; eg rupture of fuel storage tanks, is covered under other legislation.
				+1	Maximum 1 pin flag/2 km, no spills	
				0	Maximum 1 pin flag/ km, no spills	
				-1	Max 2 pin flags or 1 other litter item/km, and/or small vehicle oil spill	
				-2	>2 pin flags or >1 other litter item/km, and/or numerous or large vehicle oil spills, and/or wastewater disposal obvious	

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