Goulburn Broken summary of information gaps:

understanding impacts on resource condition

Draft working document ***15 December 2006*** *(contributors: Rod McLennan, Mark Cotter, Megan McFarlane, Sue Botting, Wayne Tennant, Geoff Earl, Kate Brunt, Tim Barlow)*
Gaps identified using "National Framework for NRM Standards and Targets" and the equation: Outcomes = Outputs x Assumptions.

Matter for Target (in National Framework)	**Indicator Heading** (in National Framework)	**GB target "custodian"**	**Uncertainties**				**Importance of improving base knowledge**	**Importance of improving communication of knowledge**	**Comments and current processes to improve information or communication**	**Opportunities for Landscape Logic project**	**Key drivers**
			Resource Condition Target(s) - Uncertainty in setting	**Output data uncertainty (outputs funded through CMA books)**	**Uncertainty in assumptions used to measure outcome**						
					from outputs (short-term; annual)	**from direct measure (long-term; usually 5+ years)**					
1 Land Salinity	Area of land threatened by shallow or rising water tables										
	A Dryland	Mark Cotter	H	M	H	H	M	VH	1 Priority is to communicate newly available information (as it is for many areas of Australia!; "living with salt"). 2 Studies underway or about to start (most have strong links to other Matters for Target, especialy Native Vegetation - see *Biodiversity Monitoring Action Plan*): 2.1 Trade-offs and synergies between resource management actions (complementary; antagonistic; *eg* impacts on water yield of large-scale reafforestation). 2.2 Documenting assumptions (includes improving real-time monitoring for decision making). 2.3 Investigating assumptions *eg* landholder contributions independent of government programs. 2.4 Identifying high value assets at risk from salinity within Catchment. 2.4 End of Valley Targets - if regionally we cannot achieve them, what does that mean for MDB? 2.5 Merits of different methods *eg* traditional incentives, Environmental Management Incentives, Market Based Instruments, covenants, corporate and philanthropic funding.	1 Integration of dryland salinity knowledge into other issues at regional scale. 2 Contributions to studies underway or about to start (see left). 3 Studies that are needed: 3.1 Impact of policy drivers on Plan delivery. 3.2 Climate change implications. 3.3 Community attitude and level of activity in NRM. 3.4 Stream salinity dynamics, particularly salinity regimes. 3.5 Impact of changed salinity regimes on ecosystems.	1 MDBC inter-governmental agreement 2 National Water Initiative/White paper on water 3 Changing demographics 4 Drying climate (lowering water tables, shifting focus) 5 Multiple outcome concept challenging targeting ability 6 Assets/Threats paradigm - multiple assets, multiple threats multiple interactions
	B Irrigation	Ken Sampson	H	L	M	L	M	VH	1 RCT needs to better reflect approach of managing salt in the soil profile - cause and effect chain not readily apparent. Program is more about ongoing maintenance (groundwater pumping etc) than one-off works. Next step is to document cause and effect chain. 2 Output data back to 1990 is good. 3 Development of reporting system for water use efficiency well underway.	1 Document cause and effect chain to provide greater clarity of information for decision making. 2 Extremely strong links to water use efficiency and nutrient management. 3 Investigate possible links with water use efficiency reporting project.	

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2 Soil Condition	Soil Condition	Rick Felton	nil	M	H	VH	H	M	1 Establish a succinct statement of what a "healthy soil" is. (Likely to include a statement on "fit for purpose".) Aggregation from site to broad scales not likely to be useful. 2 Private/public good issues need to be sorted, including what role there is for government. 3 Managing stakeholder expectations	1 How does this relate to salinisation? Is it a subordinant issue? 2 How does this relate to stream health (low pH)? 3 How does this relate to biodiversity? 4 Is there a clear public good?	1 Proposed Green/White paper on Land and Biodiversity 2 Growing Victoria II 3 Declining terms of trade 4 Naturally acid soils
3 Native Vegetation Communities' Integrity	Native vegetation extent and distribution	Tim Barlow / Kate Brunt	H	L	VH	H	VH	H	1 GB Biodiversity Monitoring Action Plan (2006) systemises approach to improving knowledge, based on outputs/outcomes equation. This is being opportunistically implemented. It identifies opportunities for collaborative investigations. Note that there is a lack info on vegetation loss (illegal and legal). 2 RCTs have been useful in providing direction over past 7 years, but must undergo major review - this is subject to Land and Water Australia bid that has jumped through most early hurdles - but still not yet up. (Need greater alignment of physical targets and ecological outcomes (ie would Biodiversity Actoin Planning data analyses gives us more meaningful targets?)	Select appropriate opportunities identified in Biodiversity Monitoring Action Plan.	1 Proposed Green/White paper on Land and Biodiversity 2 Growing Victoria II 3 NRM Ministerial Council's national approach to biodiversity decline (Oct 2006) 4 Declining terms of trade 5 Landscape Change / Tree Change 6 Climate Change
	Native vegetation condition	Tim Barlow / Kate Brunt	H	M	VH	H	VH	H	Also see previous comments. Currently we have a static, universal target figure of 10%. This would change if analysed according to type of protection and Ecological Vegetation Class (EVC). Background trend on public land (ie up, down, or neutral) is critical infomation that is missing from analysis.		
4 Inland Aquatic Ecosystems Integrity (Rivers and other Wetlands)	River condition	Wayne Tennant	H	M	H	M	VH	VH	1 Many targets have been set and these need to be mapped so that a clear link to the decision-making hierarchy emerges. 2 Statewide process underway to better understand linkages between outputs and outcomes. Ecological models being developed to look at secondary and tertiary outcomes. 3 GB starting work on a project with Monash Uni (Sam Lake and Nick Bond) on effect of climate change on ecosystem resilience.	1 Document (and communicate) the cause and effect chain for river health - including liniks with terrestrial issues.	
	Wetland ecosystem extent and distribution	Simon Casanelia	VH	M	H	M	H	M	RCTs need to be developed with a clear hierarchy. Regional Wetland Prioritisation Framework complete. Wetland system and individual management plans underway.		

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	Wetland ecosystem condition	Simon Casanelia	VH	M	M	M	H	M	Index of Wetland Condition developed and to be trialled within the region.		
5 Estuarine, coastal and marine habitat integrity	Estuarine, coastal and marine habitat extent and distribution	not applicable									
	Estuarine, coastal and marine habitat condition	not applicable									
6 Nutrients in Aquatic Environments	Nitrogen in aquatic environments*	Wayne Tennant / Sue Botting	nil	M	M	L	M	L	1 It has been assumed that N is not an issues so no RCT is required. (Further notes on this are in 2005-06 Annual Report.) This assumption needs to be reviewed: the major contributor to reducing P has been Water Treatment Facilities (WTFs) but WTFs have not been designed as N reduction systems so there may not be equivalent reduction in N.		
	Phosphorus in aquatic environments	Wayne Tennant / Sue Botting	M	L	M	L	M	L	1 Strategy implementation ahead of schedule, although it still needs to be confirmed the proportion of contribution to P reduction through irrigation savings versus drought driven. 2 Extensive monitoring program in place for irrigation drains. Catchment monitoring sites need to be reviewed. Many waterways not monitored. Assumptions theory for contributions of P from diffuse sources, but there is much uncertainty around numbers and this needs more work. 3 Irrigaton Futures project is establishing a brief to look at implications of land use and management changes on P and water quality generally.	Possible links with Irrigation Futures project on P and water quality?	
7 Turbidity/ suspended particulate matter in aquatic environments	Turbidity/suspended solids	Wayne Tennant / Sue Botting	nil	L	M	L	M	L	1 No targets set (other than SEPP). Need to consider as an independent issue to P to cover all bases. 2 SEPP requirement to monitor. 3 Extremely strong links to previous (nutrients) work. 4 Siginificant work has been done within the region to evaluate the contribution of sediments and total P through National Land and Water Resources Audit case study "SedNet".		
8 Surface Water	In-stream salinity										

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Salinity in freshwater aquatic environments	*Dryland - within GB*	Mark Cotter	H	M	H	H	H	VH	1 As for land salinisation discussion above, identifying high value assets within Catchment at risk from salinity is underway. 2 Integration of knowledge of salinity with other issues eg wetlands is important.		
	Dryland - ex GB	Mark Cotter	H	M	M	M	M	VH	1 Similar story to that for land salinisation in the Dryland. RCTs too ambitious and the trade-off issues eg impacts on water yield of large-scale reafforestation is overwhelming.		
	Irrigation - within GB	Ken Sampson	H	M	M	M	M	H			
	Irrigation - ex GB	Ken Sampson	M	L	M	L	VH	M			
9 Significant native species and ecological communities	Selected significant native species & ecological communities extent and conservation status	Tim Barlow	VH	M	VH	M	VH	H	Long-term monitoring okay when done, just not extensive enough.	Analyse threatened species trends according to Actions for Biodiversity Conservation (ABC) model. May need regional conservation status for current targets to be relevant	
10 Ecologically significant invasive species	Selected ecologically significant vertebrate invasive species extent and impact	Greg Wood	L	L	L	L	H	H			
	Selected ecologically significant invasive vegetation species extent and impact	Greg Wood	L	L	L	L	H	H			

Other "Matters" not included in National Framework**

Water quantity	Environmental flows	Geoff Earl	H	L	VH	H	VH	VH	1. Assumed that provision of flows = healthy river. Measurement of resource condition rough. 2.Refining eflow recommendation (Lower and Upper Goulburn) and developing for Broken, Yea, Sevens, King Parrot Creeks. 3. Developing understanding of flow versus inundation (Goulburn River/Barmah Forest). 4. Victorian Environmental Flows Monitoring and Assessment Program: Goulburn and Broken Rivers and Barmah monitoring to identify ecological changes to actual flow events. 5. Need research on processes (eg current Broken Creek work on azolla/DO) to develop output/outcomes relationships.	Investigate existing studies.	

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	Water yield	Mark Cotter	VH	H	VH	L	VH	VH	Marty Anderies' work on "minimalist models" - strong links to River Murray salinity and land salinisation. ------Need to support work on risks to catchment yield from plantations, climate change, farm dams, groundwater extraction, irrigation return flows.	Interplay between resource management issues - trade-offs (complementarities, antagonistic) Likely future distribution requirements/demands. Future supply potential and	1 Climate change 2 White paper on water 3 End of Valley Targets
	Water use efficiency	Ken Sampson	H	M	M	M	VH	VH	See comments under Matter for Target 1 (Land salinity - irrigation).	See comments under Matter for Target 1 (Land salinity - irrigation).	
Climate change	Carbon balance	Tim Barlow	VH	H	H	H	VH	M			
	Work place	Tim Barlow	VH	H	H	H	VH	M			
Floodplain	Built infrastructure	Guy Tierney	M	L	M	M	H	H			
	Ecosystems	Guy Tierney	VH	L	H	H	M	M			
People	Communities and leadership	Bill O'Kane	M	H	M	M	VH	H		Frank Vanclay likely to add value here.	
	Practice change	Fiona Johnson?	H	M	M	M	VH	VH			
	Staff and expertise	Kate Pendergast	M	H	M	H	M	H			
Finances	Revenue and costs	Megan McFarlane / Stan Gibney / Bill O'Kane	M	L	M	M	M	H			

* Targets have not been set for nitrogen loads as the reduction of phosphorus, and subsequent increase in nitrogent to phosphorus ratio, was the emphasis of the strategy. However, opportunities to reduce nitrogen, particularly where associated with phosphorus reductions, were pursued where cost effective.
Should there be a groundwater matter for target as well (quality and quantity), as per SEPP?