

5. Assets and Threats

5.1 Assets

A list of assets for the Bookpurnong LWMP region was established based on AWE’s experience in the region and the list of priorities developed by the BL4EA and other individuals consulted in the development of the LWMP, including dryland farmers within the region.

Each asset was firstly assessed to establish its extent, condition, trend in condition, which then lead to a priority score as outlined in Table 5-1. The priority score gives a weighting of the relative importance of each asset. A high score indicates a high priority and a low score a low priority. Following discussion with the client Project Manager, a monetary value for each asset was not estimated, as it is inherently difficult to estimate the value of natural resource assets at this scale.

Table 5-1: Individual Assets and Assessment

Assets	Asset Assessment			Priority Score
	Extent	Condition	Trend	
Water supply - River	Approx 20 Km of river	Poor	Decline	5
Wetlands / Waterways	Approx 703.6 Ha	Poor	Decline	5
Visual amenity	Entire District	Good	Slow decline	1
Floodplain biodiversity	743 Ha	Poor	Decline	4
Highland biodiversity		Moderate	Slow decline	2
Community capacity	Current Population (110 approx.)	Moderate	Assume slow decline	4
MOU between BL4EA and DWLBC	Concludes in September 2009	Nearly finished	N/A	1
BL4EA reputation and history		Good	Stable	3
Residential property	Approx 37 Residential Houses	Good	Stable	2
Irrigated agriculture	1,912 Ha	Moderate	Slow decline	3

Assets	Asset Assessment			Priority Score
	Extent	Condition	Trend	
Dryland agriculture	15,370 Ha	Moderate	Slow improvement	3
Water supply infrastructure	Approx 15 Pumping Stations	variable	Slow improvement	2
Bookpurnong Salt Interception Scheme	22 Production bores and pipeline	Operational	N/A	4
Bookpurnong name/brand	Extent unknown	Good	Slow improvement	3
Aboriginal cultural sites of significance	Extent unknown	unknown	unknown	2
Post European settlement cultural sites of significance	Extent unknown	unknown	unknown	2
Recreational localities	Extent unknown	variable	Slow decline	2
Lock 4	Lock and Weir at river Km 516.2	operational	Stable	3
Soil and underlying geology	Highland throughout region	variable	Stable	3
Climate	Entire region	Moderate	Slow Decline	4

5.2 Threats

Reponses to the community consultation undertaken for this LWMP development helped to develop a series of threats to the Bookpurnong region as a whole.

Each threat was allocated a threat significance score which depicted whether the threat was likely to have a minor or major impact on the assets as outlined in Table 5-2. Each threat was also allocated a trend score as outlined in Table 5-3.

Table 5-2: Threat Significance Score Descriptions

Score	Description
1	Minor impact
2	Small impact
3	Moderate impact
4	Large impact
5	Major impact

Table 5-3: Threat Trend Score Descriptions

Score	Description
1	Getting better
2	Static
3	Getting worse

The significance score and the trend score were added together to produce a priority score.

Table 5-4 outlines the individual threats and the score allocated to them.

Table 5-4: Individual Threats and Assessment.

Threats	Threat Assessment		Priority Score
	Significance	Trend	
River salinity increases	5	2	7
River flow decline	5	3	8
Saline Groundwater discharge to river and floodplains	4	3	7
Nutrient/chemical/rubbish pollution	4	2	6
Pest plants	3	2	5
Pest animals	2	2	4
Changing land use - Encroaching of residential property into agricultural zone	3	2	5
Water logging soils	3	2	5
Soil salinity increase	3	3	6
Climate change	5	3	8
Loss of staff/personnel	3	3	6
Wear and tear (ageing)	1	2	3
Market contraction / Price deflation	4	3	7
Tourism	3	2	5

Increased input costs	3	3	6
Vandalism	1	2	3
Flood	4	1	5
Erosion	3	1	4

5.3 Priorities

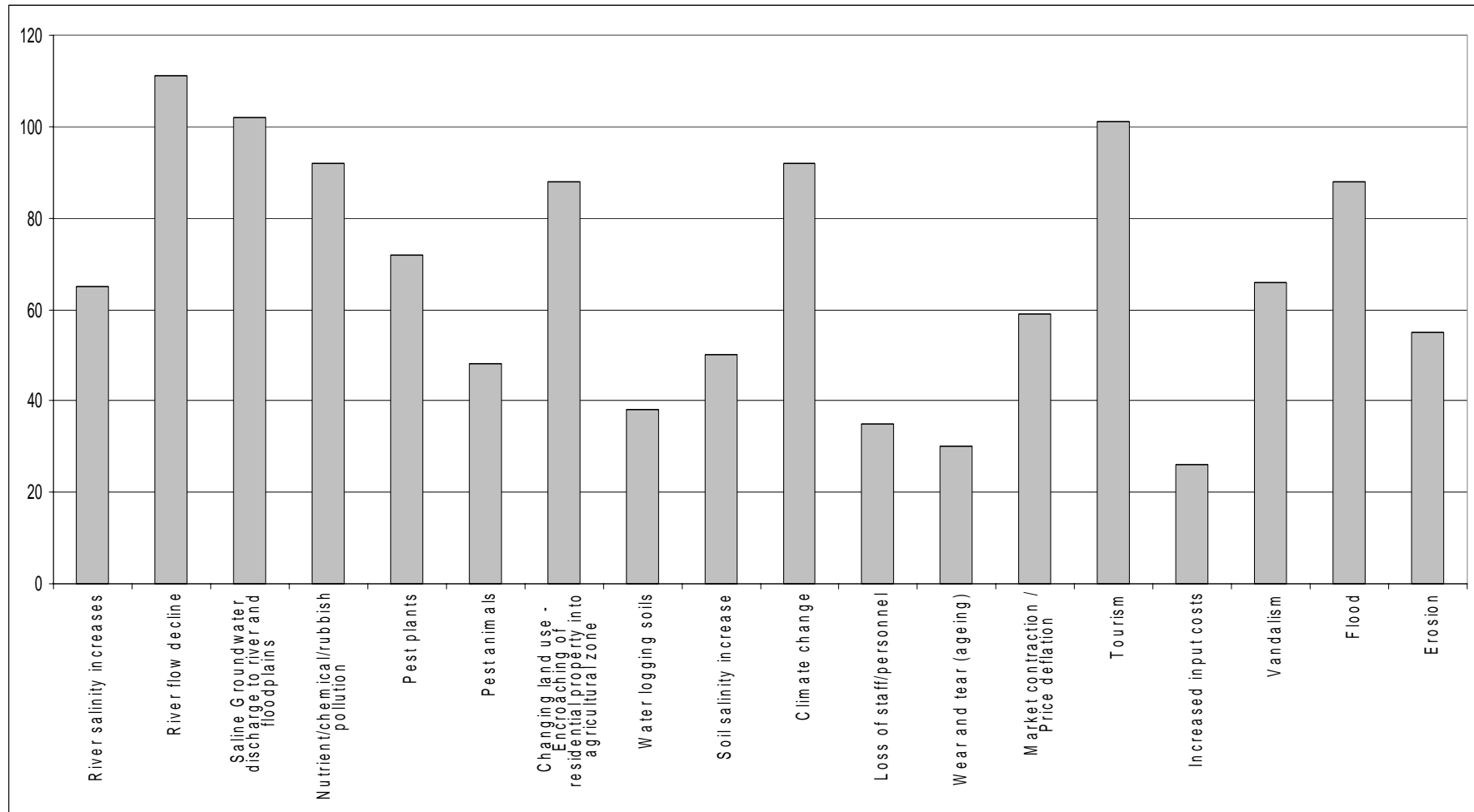
In comparing the asset score with the threats posed to each, a relative total score was developed to highlight the interaction between assets and threats as shown in Table 5-5: Indicative Interaction Between Assets and Threats Leading to Initial Identification of Priorities.

This importance score was used to highlight which of the threats have the highest priority, as indicated in Table 5-6: Relative Importance Score for Threats.

Table 5-5: Indicative Interaction Between Assets and Threats Leading to Initial Identification of Priorities

	Assets																				Total Score	
	Water supply - River	Wetlands / Waterways	Visual amenity	Floodplain biodiversity	Highland biodiversity	Community capacity	MOU between BL4EA and DWLBC	BL4EA reputation and history	Residential property	Irrigated agriculture	Dryland agriculture	Water supply infrastructure	Bookpurnong Salt Interception Scheme	Bookpurnong name/brand	Aboriginal cultural sites of significance	Post European settlement cultural sites of significance	Recreational localities	Lock 4	Soil and underlying geology	Climate		
	5	5	1	4	2	4	1	3	2	3	3	2	4	3	2	2	2	3	3	4		
Threat	River salinity increases	7	12	12		11				9	10			11							65	
	River flow decline	8	13	13	9	12				10	11		10	12			10	11			111	
	Saline Groundwater discharge to river and floodplains	7	12	12	8	11	9			9	10	10		11						10	102	
	Nutrient/chemical/rubbish pollution	6	11	11		10	8		9	8	9			9			8			9	92	
	Pest plants	5	10	10	6	9	7				8	8	7				7				72	
	Pest animals	4		9	5	8	6				7	7					6				48	
	Changing land use - Encroaching of residential property into agricultural	5	10	10	6	9	7		8	7		8		8			7			8	88	
	Water logging soils	5					7		8	7	8									8	38	
	Soil salinity increase	6			7		8			8	9	9								9	50	
	Climate change	8	13	13		12	10			10	11	11									12	92
	Loss of staff/personnel	6					10	7				9		9								35
	Wear and tear (ageing)	3									6		5	7				6	6			30
	Market contraction / Price deflation	7					11	8	10			10	10		10							59
	Tourism	5		10	6	9	7				8	8	7	9	8	7	7	7	7	8		101
	Increased input costs	6									9	9	8									26
	Vandalism	3			4	7	5			5	6	6	5	7		5	5	5	5	6		66
	Flood	5	10	10	6	9				7	8		7	9			7	7	7	8		88
	Erosion	4		9	5	8	6			6	7	7								7		55

Table 5-6: Relative Importance Score for Threats



6. Targets

This section outlines the policies and plans that could be used to develop targets, and proposes the Community Aspirational Targets, and Draft Management Action Targets (MATs) for the Bookpurnong Lock 4 LWMP region.

6.1 Setting Targets

There are a number of National/Interstate, State and Regional Plans and policies that propose and provide guidance on establishing targets. For ease of reference, the relevant targets/objectives from the strategies/policies/plans marked with an asterisk are listed in Appendix D:

National and Interstate

- National Water Initiative
- Murray-Darling Basin Agreement
- Integrated Catchment Management in the Murray– Darling Basin 2001–2010: Delivering a Sustainable Future*
- Murray Darling Basin Salinity Management Strategy 2001-2015*

State

- South Australian Strategic Plan*
- State NRM Plan 2007*
- Water Allocation Plan for the River Murray Prescribed Watercourse*
- South Australian River Murray Salinity Strategy 2001-2015

Regional and Local

- Draft Regional NRM Plan for the South Australia Murray Darling Basin*
- Guidelines for LWMPs in the South Australian Murray Darling Basin
- SA MDB NRM Board Resource Condition Targets
- Loxton to Bookpurnong Local Action Plan
- Bookpurnong to Lock 4 Preliminary LWMP
- Preliminary Pyap to Kingston LWMP

- Pike River Upgraded LWMP
- Draft Pyap to Kingston LWMP
- Riverland Development Corporation Strategic Plan 2006*
- Riverland Strategic Tourism Plan*
- District Council of Loxton Waikerie Strategic Plan
- Regional Planning Strategy for South Australia 2003 Riverland Planning and Development Area
- District Council of Loxton Waikerie Development Plan

6.2 Community Aspirational Targets

The following “Community Aspirational Targets” are targets which have been developed based on the initial consultation work and previous work undertaken by the community and have been reviewed by the community during consultation on the Draft LWMP.

Table 6-1: Community Aspirational Targets

Threat	Target	Priority (from Table 5.5)
River flow decline	Ongoing involvement of irrigators in Irrigation Efficiency Project. Minimise the effect of low river flow on floodplain health.	1
Saline groundwater discharge to river and floodplains	No discharge of saline groundwater to floodplain surface.	2
Tourism	Encourage tourism while minimising negative impacts.	3
Climate change	Minimise loss of production due to climate change.	4
Nutrient/chemical/rubbish pollution	No nutrient/chemical pollution in river or wetlands. Rubbish/litter minimised in the region.	5
Flood	Losses due to flooding minimised.	6
Changing land use – encroaching of residential property into agricultural zone	Harmonious interaction between residential and irrigation interests.	7

Pest plants	Improved management of pest plants.	8
Vandalism and recreational impacts on vegetation and infrastructure	No vandalism of infrastructure or environment.	9
River salinity increases	Zero increase in river salinity in the Bookpurnong River Reach.	10
Market contraction/price deflation	Maintain and expand profitability of businesses in the Bookpurnong Region.	11
Erosion	No loss of soil due to water or wind erosion.	12
Irrigated soil salinity increase	Minimise yield loss through salt affected soils.	13
Pest animals	Eradication of pest animals.	14
Waterlogging soil	No lost production through water logged soils.	15
Loss of staff/personnel	Minimise cost to businesses of changing personnel. Improved community capacity to drive and manage NRM improvements in the region.	16
Depreciating irrigation delivery infrastructure	No loss of operational time through machinery breakdown.	17
Increased input costs	Manageable input costs.	18

6.3 LWMP Management Action Targets

Management Action Targets for inclusion in the Bookpurnong Lock 4 LWMP are included in the next section. They will provide the community, the Management Committee and other organisations such as SAMDBNRMB with the ability to measure to what extent the plan is being implemented over time.

7. NRM Priority Strategies and Actions

Table 7-1: NRM Priority Strategies and Actions provides a description of the strategies and actions which have been developed to help achieve the targets identified in Chapter 6 - Targets.

The table includes indicative cost estimates for the proposed actions. The actions for the top 4 priority threats are also summarised by financial year in Section 8.6.

Table 7.1 Land and Water Management Plan - Strategies and Actions to address Priority Natural Resource Management Threats - WORK PLAN

Priority NRM Threats	Threats	Community Aspirational Target	Strategy	Action Number	Action	Action - Additional Detail	LWMP Management Action Target	Timeframe	Indicative Cost	Potential Partners with BL4EA
1	River flow decline	Ongoing involvement of irrigators in increasing regional Irrigation Efficiency	Maximise irrigation efficiency in the Bookpurnong LWMP region.	1.1	Encourage increased participation in Irrigation Efficiency Project to achieve 90% of irrigated land returning field application efficiency results by the 2010/2011 irrigation year.	The BL4EA, SAMDBNRM Board seek funding to support increasing IRES uptake in the region and the continued development of annual irrigation reports in the Bookpurnong LWMP region.	90% of irrigated landmass involved in the development of the IRES annual district report for the 2010/2011 year.	2010/2011 Reporting Year	\$30,000 per year (0.2 FTE IRES support)	DWLBC, RSSA, BL4EA, SAMDBNRMB, LBLAP
				1.2	Maintain regional Irrigation Field Application Efficiencies to 90% FAE per property for the life of the LWMP.	Maintain the field application efficiency of IRES users and provide system assessments to all users to ensure key adjustments to on-farm systems can be made, ensuring that the highest quality data is provided for IRES annual report development.	Field application efficiency across 90% of the irrigated landmass maintained at 90% FAE per user property by the end of the 2010/2011 reporting year.	2010/2011 Reporting Year	\$7,000 per year (0.05 FTE IIEP support)	DWLBC, RSSA, BL4EA, SAMDBNRMB, LBLAP
				1.3	Investigate drainage water reuse schemes.	Ratify options and perform cost/benefit analyses on outcomes defined through the perched groundwater investigations performed in 2009. Engage key agencies/partners/landholders in ratifying final decision making.	Key drainage management and reuse options ratified and management plans developed by the 09/10 irrigation year.	2009/2010 irrigation year	\$15,000 in first year	DWLBC, RSSA, BL4EA, SAMDBNRMB, LBLAP, landholders and private consultant
				1.4	Assist irrigators to develop drought management plans.	Survey irrigators and develop plans to assist in drought proofing irrigators and farmers as identified.	70% of irrigators have drought management plans by December 2010.	2010/2011 irrigation year	\$90,000	DWLBC, RSSA, BL4EA, SAMDBNRMB, LBLAP, landholders
		1.5	Provide information regarding government and local community support services.	LAP and/or PIRSA to distribute information via existing LAP website and in newsletter about where to obtain information on government and local community support services during drought.	100% of irrigators are aware of a range of drought support services by September 2009, utilisation monitored by BL4EA and the LBLAP.	2009/2010 irrigation year	\$10,000 in first year (0.1 FTE LBLAP support)	BL4EA, SAMDBNRMB, LBLAP, landholders		
		1.6	Develop wetland/floodplain management strategies for prioritised regional sites.	Assess the condition of regional sites in conjunction with key partners and prioritise the development of new management planning and key works. Identify opportunities for access to environmental water in accordance with developed management plan.	100% of regional wetlands and floodplains are prioritised for remedial/management action by 2012, assessment process commences in September 2009.	2009/2010 irrigation year	\$25,000 per year (0.25 FTE LBLAP support) \$7000 per year (field and data analysis costs)	DWLBC, RSSA, BL4EA, SAMDBNRMB, LBLAP, landholders + private consultant		
2	Saline groundwater discharge to river and floodplains	Maintain and/or reduce current levels of saline groundwater discharge to floodplain environments for the life of the LWMP.	Monitor trends in groundwater levels and irrigation efficiencies and provide an annual salt and water balance result in conjunction with irrigation annual reporting as a method of managing groundwater impacts to regional floodplain environments.	2.1	Actively analyse regional irrigation and groundwater data and utilise basic modelling tools to determine likely impacts on floodplain environments generated through irrigation practices.	Identify the scale of likely irrigation related contributions to floodplain salinity regionally and derive ongoing management strategies to minimise degradation, through targeted works with landholders and the BL4EA.	Annual data collection and modelling process in place by end of 09/10 year.	2009/2010 irrigation year	\$7,000 per year (0.05 FTE IIEP support) \$10,000 per year data analysis/modelling costs	DWLBC, RSSA, BL4EA, SAMDBNRMB, LBLAP, landholders + private consultant
				2.2	Review capacity of the Noora pipeline and investigate feasibility of expanding SIS to protect Gurra Gurra Lakes.	Identify the most realistic options for potential re-use of SIS disposal water and develop cost/benefit scenarios around the most promising options, link to drainage re-use studies in 1.3 Assess likelihood of SIS expansion to provide benefits.	Fund and develop a scoping study/investigations to quantify both potential regional SIS expansion and possible reuse options by July 2010.	2010/2011 irrigation year	\$50,000 (over 2 years) and in-kind committee support.	DWLBC, RSSA, BL4EA, SAMDBNRMB, LBLAP, landholders + private consultant
				2.3	Investigate ways of stabilising cliffs subjected to seepage in the past.	Develop cliff management plans in conjunction with assessing potential ongoing stresses from problematic groundwater processes, link to study developed in 2.1	Management planning scoped in 2010 and actual on-ground assessment occurs by 2010, management plan developed by June 2011.	2010/2011 irrigation year		
3	Tourism	Reduce negative impacts from tourism on Bookpurnong natural resources.	Encourage tourism while minimising negative impacts on the region.	3.1	Investigate placing bins, designating camp sites and tracks on floodplain camping areas.	Review outcomes of River Murray Sustainable Recreation Strategy and Sustainable Recreation Guide. Identify specific strategies or actions to be implemented. Survey recreational areas and educate landholders so they understand tourism needs. Liaise with regional tourism officer.	Recreational planning to commence November 2009. Education of public and private landholders from May 2010. Camp sites and tracks formalised by December 2010.	2009/2010 irrigation year	Committee time	RDC, Regional Tourism Officer, DCLW, SA Tourism Commission - Tourism Infrastructure, River Murray Urban Users Committee

Priority NRM Threats	Threats	Community Aspirational Target	Strategy	Action Number	Action	Action - Additional Detail	LWMP Management Action Target	Timeframe	Indicative Cost	Potential Partners with BL4EA
4	Climate change	Minimise loss of production due to climate change	Maximise regional and individual ability to adapt to climate change challenges through education and specialised planning.	4.1	Develop a regional scale adaptation strategy to climate change through targeted consultation and specialised planning.	Complete a regional scale analysis of key climate risks and provide recommendations of the most realistic options for adaptation for the Bookpurnong region, including developing an interactive tool to enable community decision making. Note: link with available government department initiatives.	A regional climate change adaptation strategy developed for the Bookpurnong LWMP area by June 2012, key actions implemented from July 2012.	2009/2010 to 2011/2012 irrigation years	\$40,000 per year (consultant cost) \$20,000 per year (0.3 FTE LBLAP support)	BL4EA, SAMDBNRMB, LBLAP, landholders and CSIRO
				4.2	All landholders within the Bookpurnong LWMP region are aware of carbon reduction strategies by 2013.	Implement a regional audit of carbon generation within the Bookpurnong LWMP region across the horticultural and dryland regions.	Regional audit of Bookpurnong Lock4 area footprint undertaken by July 2013.	2012/2013 irrigation year	\$10,000 per year (consultant cost) \$20,000 per year (0.3 FTE LBLAP support)	BL4EA, SAMDBNRMB, LBLAP, DCC landholders and CSIRO
5	Nutrient/chemical/rubbish pollution	Reduce nutrient/chemical/waste pollution on properties, in river, floodplains and wetland environments	Investigate improved methods of reducing pollution/runoff and communicate to the Bookpurnong community.	5.1	Encourage all chemicals used in accordance with label.	Undertake survey of business QA systems currently practiced. Consider establishing an environmental QA system Bookpurnong specific ("Bookpurnong tick"). First step may include ensuring all landholders hold chemical certificates and have endorsed chemical housing.	By 2015, develop a master plan with local council, industry and landholders which aims to ensure that waste disposal is effective and regional pollution is minimised. Ensure that monitoring occurs from the 2009/2010 irrigation year onwards across key agreed parameters.	Ongoing	Committee time and LAP officer support	LBLAP
				5.2	Encourage all irrigators using chemicals to hold appropriate accreditations.			2009	Committee time and LAP officer support	LBLAP
				5.3	Identify how to improve methods of waste management in the region to minimise litter and overall rubbish load in the region.	Discuss large rubbish removal system with council (e.g. negotiate a clean up campaign with DCLW and DC Berri Barmera, and discuss possibility of a rubbish amnesty with council. Encourage implementation of relevant recommendations of existing River Murray Sustainable Recreation Strategy and Sustainable Recreation Guide.	2008	Committee time and LAP officer support	DCLW, LBLAP, River Murray Urban Users Committee/Murray Care	
				5.4	Identify key monitoring sites for chemical and nutrient contamination and record and observe levels.	Identify and prioritise monitoring sites against agreed criteria and perform annual monitoring and evaluation activities with key partner groups. Results of investigations are communicated to the Bookpurnong community and local scale actions aimed at reducing incidence of contamination are implemented.	By 2013, identify and prioritise key monitoring sites and determine the scale of regional contamination issues against ANZECC guidelines.	2013/2014 irrigation year	\$20,000 per year (laboratory and consultant cost) \$7,500 per year (0.1 FTE LBLAP support)	BL4EA, SAMDBNRMB, LBLAP, landholders, DWLBC, DEH
6	Flood	Losses due to flooding minimised	Encourage development of flood response plans.	6.1	Each property to develop a flood response plan .	Prepare flood risk maps that highlight water depth and speed for various river flows for the Bookpurnong region. Following on from this individual property risk management plans can be developed. Ensure maps are linked with national water plans and consistent with State and Federal flood management policies.	Regional scale flooding risk assessment occurs in 2012, followed by the development of individual property scale risk management plans by 2013.	2012/2013 irrigation year	\$20,000 in first year (consultant cost) \$7,500 per year (0.1 FTE LBLAP support)	BL4EA, SAMDBNRMB, LBLAP, landholders, DWLBC, DEH
7	Changing land use - Encroaching of residential property into agricultural zone	Protect agricultural land from inappropriate residential development	Communicate to key authorities the need to protect Bookpurnong region from inappropriate residential development.	7.1	Liaise with SAMDBNRM Board and Local Government, Department of Planning and Local Government, Riverland Futures Taskforce and local landholders regarding Bookpurnong land use considerations.	Liaise with DCLW and Department of Planning and Local Government to identify opportunities to input to the development of the Riverland Regional Land Use Framework and develop regional priorities, and to ensure that the need to retain agricultural land for agricultural purposes whilst also providing for increased population growth in the Bookpurnong region is communicated effectively.	BL4EA ensures that is has a representative and lobbying role in regional land use and development policy development by 2010.	2010/2011 irrigation year	\$3,750 per year (0.05 FTE LBLAP support)	BL4EA, SAMDBNRMB, LBLAP, landholders, DPLG, DWLBC, DEH, Riverland Futures, DCLW, PIRSA,
				7.2	Provide comment on Development Plan Amendments by Council which relate to Bookpurnong region.	Liaise with DCLW to encourage the introduction of Development Plan policies (via a Development Plan Amendment) which satisfies Bookpurnong community interests to protect agricultural land e.g. potentially amending Country Living Zone to provide for population expansion to increase the size of the community.	BL4EA formalises membership or official liaison role with DCLW by June 2010.	2009/2010 irrigation year	BL4EA in kind support	BL4EA, LBLAP, landholders, Riverland Futures, DCLW, PIRSA

Priority NRM Threats	Threats	Community Aspirational Target	Strategy	Action Number	Action	Action - Additional Detail	LWMP Management Action Target	Timeframe	Indicative Cost	Potential Partners with BL4EA
8	Pest plants	Improved management of pest plants	Develop collaborative management plans for pest plants in line with NRM Board priorities.	8.1	Encourage landowners to contain and eradicate pest plants on own property and roadsides.	Develop specialised GIS databases to assist in decision making and record keeping and encourage landholders to eradicate and control pest plant infestations on private land. Record and assess outcomes.	All landowners aware of pest plants and have developed on-farm management plans and are participating in mapping and record keeping by December 2010.	2010/2011 irrigation year	\$10,000 in first year (purchase of committee PC, Arc GIS and imagery development costs) \$3,750 per year (0.05 FTE LBLAP support)	BL4EA, SAMDBNRMB, LBLAP, landholders, SAMRIC
				8.2	Ensure that community has accurate information on regional pest plant issues and develop consultation on planned initiatives.	Work closely with the SAMDBNRM's Plant and Animal Control team and develop educational material and services for the local community including developing control plans for landholders.	Coordinated regional workplan developed between SAMDBNRM Board and the BL4EA by 2010, landholders endorse and recognize strategy.	2010/2011 irrigation year	\$5000 per year of LWMP (provision of technical support by SAMDBNRM) \$1000 per year in promotional material	BL4EA, SAMDBNRMB, LBLAP, landholders, SAMRIC
				8.3	Liaise with the NRM Board to review pest plant programs in the Bookpurnong region.	Survey and identify areas and pests that need actioning and develop a strategy with landholder groups and individuals to achieve eradication.	Pest plant management programs reviewed by September 2009. Regional action plan commences development by July 2010.	2009/2010 irrigation year	\$50,000 per year in actual control costs	BL4EA, SAMDBNRMB, LBLAP, landholders, SAMRIC
9	Vandalism and recreational impacts on vegetation and infrastructure	No vandalism of infrastructure or environment	Develop a coordinated strategy to reduce vandalism and floodplain impacts from recreation.	9.1	Encourage landowners to minimise or avoid native vegetation clearance.	BL4EA and other stakeholders audit native vegetation cover in the Bookpurnong region using remote sensing on an annual basis.	Minimise and/or eliminate the removal of native vegetation regionally.	Ongoing	Committee time and LAP officer support	LBLAP
				9.2	Work with landholders to develop on-site management plans for native vegetation.	Develop and implement a native vegetation management plan for the Bookpurnong LWMP region that will produce a means of both managing and monitoring the status and condition of regional remnant native vegetation and new revegetation initiatives.	Regional Native Vegetation management strategy developed by BL4EA by 2010, vegetation cover (excluding natural death) maintained at 2009 levels for the life of the LWMP.	2010	\$7000 per year	BL4EA, LBLAP, SAMDBNRMB, DEH community, specialist groups and consultants
				9.3	Develop an incentive scheme in conjunction with project partners to encourage landholder-based revegetation in the Bookpurnong region.	Utilising the native vegetation management policy developed for Bookpurnong, develop annual targets of native vegetation preservation, management and extension through revegetation. Work with existing funding sources and similar projects to devolve incentives to Bookpurnong landholders.	Consult with all local landholders and develop an inventory of available land for revegetation or altered management by 2011.	2011	\$5,000	BL4EA, LBLAP, SAMDBNRMB, DEH community, specialist groups
				9.4	Investigate the scale of vandalism and recreational impacts on the Bookpurnong region.	Commission and implement a survey and document review in order to develop a regionally specific vandalism and recreational impact management strategy for the life of the LWMP.	Complete a vandalism/sustainable recreation strategy for the Bookpurnong LWMP region by 2012.	2012	\$35,000	BL4EA, LBLAP, SAMDBNRMB, DEH, community, specialist groups, DCLW, DPLG and consultants
10	River salinity increases	No salt accessions in Bookpurnong River Reach for the life of the LWMP	Maintain support for Bookpurnong SIS operation.	10.1	Extend Memorandum of Understanding with DWLBC, SAMDBNRMB, LBLAP for further 5 years.	Formalise linkages with SA Water and DWLBC and participate in SIS scheme operational review. Provide feedback to the community. Revise the MoU as necessary in consultation with stakeholders and revise targets as necessary.	BL4EA has a seat at table with agency staff in reviewing SIS scheme operations. MoU extended annually for the life of the LWMP.	2009 onwards	Committee time and LAP officer support	DWLBC, MDBA, LBLAP, SA Water
			Manage irrigation to minimise contribution to river salinity.	10.2	Compile regional irrigation annual report and monitor regional groundwater trends.	Review and manage annual irrigation applications in the region in conjunction with monitored groundwater trends and run of river trends to ensure the minimisation of potential drainage contributions to regional groundwater systems and the floodplain environment.	90% of the irrigated landmass in Bookpurnong is returning a field application efficiency result by 2010 and the irrigation community is informed annually on drainage and salinity matters for the life of the LWMP.	2009/2010 irrigation year	\$7,500 per year of LWMP (0.05 FTE support SAMDBNRM staff) \$2,000 per year of LWMP (reporting costs)	BL4EA, LBLAP, SAMDBNRMB, RSSA, DWLBC
11	Market contraction / Price deflation	Maintain and expand profitability of businesses in the Bookpurnong Region	Support development of regional marketing and branding strategy.	11.1	Seek private investment to develop a regional marketing/branding strategy.	Seek collaborative industry partnerships and opportunities to develop the Bookpurnong water use "tick" accreditation. Use trial plantings for both market/irrigation research with industry accreditation of results.	A regional marketing and branding strategy established by December 2010.	2010/2011 irrigation year	\$15,000 to develop regional marketing strategy and consultation. BL4 in-kind support.	BL4EA, RDC, Ag Groups, Industry Groups, Riverland Futures, PIRSA, landholders
				11.2	Develop trial plantings in the Bookpurnong region that will provide research dividends for both marketing and irrigation.	Develop collaborative trials in the Bookpurnong region that seek to record and analyse both the profitability and irrigation requirements/cultural practices required to grow crop types and products of high demand, this study will also link to the CSIRO regional climate change research project outcomes.	Ongoing research and development trials established by Dec 2013.	2013/2014 irrigation year	\$650,000 to develop trial facility/plantings in alternative industry, including infrastructure/funding research and establishment.	BL4EA, Consultant, SAMDBNRMB, Riverland Futures, DWLBC, PIRSA, landholders

Priority NRM Threats	Threats	Community Aspirational Target	Strategy	Action Number	Action	Action - Additional Detail	LWMP Management Action Target	Timeframe	Indicative Cost	Potential Partners with BL4EA
12	Erosion	Minimise loss of soil due to water or wind erosion	Encourage minimisation of erosion in Bookpurnong region.	12.1	Adopt best practice tillage especially for dryland agriculture.	Determine the balance of minimum versus multiple tillage practices occurring in the region and assess where improvements could be made within the region. Further develop tillage mapping for the region.	60% of region using no-till techniques by 2011.	2011/2012 irrigation year	\$10,500 (SAMDBNRM/PIRSA support 0.07 FTE) \$3,000 (material costs for mapping)	SANTFA, SAMDBNRM, PIRSA, SAMRIC, LBLAP, BL4EA, landholders
				12.2	Develop increased revegetation across the dryland region of the Bookpurnong LWMP region.	Develop a regional revegetation strategy for the Bookpurnong region (all highland areas) based initially on GIS analysis. Approach landholders and develop property scale plans subject to land availability, landholders consent and funding.	90% of Bookpurnong LWMP area assessed for on-ground action by 2011, 60% of eligible areas planted up by 2014.	2010/2011 irrigation year	\$10,500 (SAMDBNRM/PIRSA support 0.07 FTE - first year) \$2,000 per property plan	SAMDBNRM, PIRSA, SAMRIC, LBLAP, BL4EA, landholders
				12.3	Investigate ways of stabilising cliffs subject to runoff/seepage-based erosion	Seek geotechnical advice regarding cliff stabilisation and other regional erosion issues, including broad acre-based issues. Develop GIS based mapping of risk areas and prioritise and cost out areas for remediation.	Regional erosion mapping and investigation commenced by November 2010, all sites prioritised by 2013.	2010/2011 irrigation year	\$25,000 (consultant support) \$120,000 (costs for first 2 years of remedial works).	SAMDBNRM, PIRSA, SAMRIC, LBLAP, BL4EA, landholders
				12.4	Encourage the prevention of soil erosion by increasing groundcover retention.	Based on GIS analysis and annual regional soil risk analysis (DWLBC) target key areas in the Bookpurnong region, against land type and usage to develop site specific management plans between landholders.	Reduce the risk rating of the Bookpurnong region to half of its current level by 2015.	2009/2010 irrigation year	\$10,500 (SAMDBNRM/DWLBC support 0.07 FTE - first year) \$50,000 (costs for property scale mapping for life of LWMP)	SAMDBNRM, SAMRIC, DWLBC, DEH, LBLAP, BL4EA, PIRSA, landholders and consultant
13	Irrigated soil salinity increase	Minimise yield losses and land quality decline through salt affected soils	Manage irrigation practices to minimise increases in water and soil salinity.	13.1	Develop a regional soil salinity management and monitoring strategy.	Ensure that regional landholders have participated in soil salinity management training and develop 3-5 trial sites in Bookpurnong which employ soil sampler analysis and logging of soil solute/water quality/application rates to correlate annual soil salinity behaviour. Calculate optimum leaching requirements based on key factors and ensure that landholders are aware of requirements to maintain healthy soil.	Soil salinity monitoring program scoped by June 2010, trial sites established by August 2010. Project returns results for life of LWMP influencing change on-farm by direct communication of results to community.	2010/2011 irrigation year	\$10,500 (SAMDBNRM support 0.07 FTE per year of LWMP), \$24,000 (costs for trial property set up for life of LWMP: 2 reps of 6 samplers @ 200 each = \$2400 per site x 10 sites)	SAMDBNRM, LBLAP, BL4EA, landholders, SARDI
				13.2	Define best practice methods of limiting soil salinity increases and develop sustainable on-farm management techniques.	Landholders actively utilise training gained through the IIEP soil salinity management course and the results of the regional trials are monitored in their response to the utilization of improved management skills on farm.	60% of irrigated landmass in Bookpurnong resourced to accurately track soil salinity trends by 2012 and actively implementing management actions, results captured and published.	2010/2011 irrigation year	\$3,750 per year (0.05 fte LBLAP support) \$5,000 (recording and publication of results)	SAMDBNRM, LBLAP, BL4EA, landholders, SARDI
14	Pest animals	Improved management of pest animals	Management of pest animals in line with NRM Board priorities.	14.1	Encourage landowners to contain and eradicate pest animals on own property.	Develop specialised GIS databases to assist in decision making and record keeping and encourage landholders to eradicate and control pest animals on private land. Record and assess outcomes.	All landowners aware of pest animals and have developed on-farm management plans and are participating in mapping and record keeping by December 2010.	2010/2011 irrigation year	GIS costs (see 10.1) \$3,750 per year (0.05 FTE LBLAP support)	BL4EA, SAMDBNRM, LBLAP, landholders, SAMRIC
				14.2	Ensure that community has accurate information on regional pest animal issues and develop consultation on planned initiatives.	Work closely with the SAMDBNRM's Plant and Animal Control team and develop educational material and services for the local community including developing control plans for landholders.	Coordinated regional workplan developed between SAMDBNRM Board and the BL4EA by 2010, landholders endorse and recognize strategy.	2010/2011 irrigation year	\$5,000 per year of LWMP (provision of technical support by SAMDBNRM) \$1000 per year in promotional material	BL4EA, SAMDBNRM, LBLAP, landholders, SAMRIC
				14.3	Liaise with NRM Board to review pest animal programs in the Bookpurnong region.	Prioritise pest animal management in the region based on prioritisation process achieved in 14.1 and via NRM Board priorities, develop implementation plans and consult with landholders.	Pest plant management programs reviewed by September 2009. Regional action plan commences development by July 2010.	2009	Committee time and LAP officer support	BL4EA, SAMDBNRM, LBLAP, landholders, SAMRIC
15	Water logging soils	Minimise incidence of perched water tables affecting production.	Maximise irrigation efficiency.	15.1	Monitor and evaluate shallow groundwater systems regionally on an annual basis. Link to 1.1, 1.2, 10.1, 10.2.	Develop, in conjunction with programs 1 and 10 an annual overview of monitored shallow groundwater and drainage trends to provide a basis for instituting management of regional issues and publish to the community.	Monitored shallow groundwater/drainage levels reduced to 50% of 2009 levels by 2013.	2009/2010 irrigation year	\$7,500 per year of LWMP (0.05 FTE support SAMDBNRM staff) \$2000 per year (operation costs)	BL4EA, SAMDBNRM, LBLAP, landholders, SAMRIC
				15.2	Investigate reuse options for drainage water.	Utilising recommendations stemming from the AWE investigations of 2009, develop a series of strategies that will aim to extend the annual monitoring and quantification of drainage hazard in specific areas + outline the best reuse/disposal options.	10% of drainage water regionally is undergoing sustainable recycling by 2014 for crop use by instigating actions from 2009 (dependent on suitability of water resource to use).	2009/2010 irrigation year	\$7,500 per year of LWMP (0.05 FTE support SAMDBNRM staff) \$250,000 (set up of reuse system)	BL4EA, SAMDBNRM, LBLAP, landholders, SAMRIC, DWLBC and consultant
				15.3	Undertake water logging risk assessment.	Linking in with Actions 1, 2, 5, 7, 9, 10, 12, 13 utilise regional or property scale HEM to inform the development of remediation strategies as well as indicating where particularly high recharge rate/water logging risks could occur regionally, and utilise information to inform remediation and development activities.	Highest areas of recharge risk/water logging correlated through HEM analysis by May 2010 and groundtruthed further by August 2010.	2009/2010 irrigation year	\$15,000 for technical data analysis and ground truthing \$7,500 per year of LWMP (0.05 FTE support SAMDBNRM staff)	BL4EA, SAMDBNRM, LBLAP, landholders, SAMRIC, DWLBC and consultant

Priority NRM Threats	Threats	Community Aspirational Target	Strategy	Action Number	Action	Action - Additional Detail	LWMP Management Action Target	Timeframe	Indicative Cost	Potential Partners with BL4EA
16	Loss of staff/personnel	Enhance regional employment levels to stabilise business operations.	Encourage higher levels of staff retention.	16.1	Encourage capacity building within both the regional workforce and the community that will ensure that 'best management practices' are achieved through employment.	Establish a range of protocols that are sought for adoption within the Bookpurnong region and work with local businesses to scope out the possibility of influencing induction processes in the region. Seek to meet with local businesses on a periodic basis to exchange knowledge.	35% of regional businesses adopting and utilising agreed best management practice guidelines within their existing induction processes by 2014. BL4EA meets with regional businesses at least once annually.	Ongoing	Committee time and RDC	LBLAP, RDC, SAMDBNRMB, Industry Groups
				16.2	Develop better facilities for itinerant workforce in the Bookpurnong region.	Link with local businesses and the RDC to ascertain where the greatest priorities lie in determining the requirements needed to provide maximum retention and continuity for the transient workforce.	Scoping study highlighting where investment in infrastructure, equipment or resources is required. Commissioned by May 2010.	2010/2011 irrigation year	BL4EA committee time	RDC, DCLW
		16.3	Establish a BL4EA Development Officer to undertake/manage projects.	Employ a full time Development Officer to develop and implement key actions determined by the BL4EA in conjunction with other project partners or funders.	A BDO employed at least 0.5 FTE by 2012.	2010/2011 irrigation year	\$40-80,000 per year of LWMP (0.5 FTE support)	SAMDBNRMB, RDC, Federal Government		
17	Depreciating irrigation delivery infrastructure	Develop more efficient regional scale irrigation delivery system	Investigate the most cost effective and flexible irrigation delivery systems for the Bookpurnong region.	17.1	Assess feasibility of a single regional distribution system (RDS) to deliver irrigation water to all current BL4 irrigators with the provision for future expansion.	Develop supporting investigations to determine the feasibility and viability of a centralised delivery system within the Bookpurnong region.	A feasibility assessment and costing completed by December 2010.	2010/2011 irrigation year	\$80,000 in first year for investigations only including cost benefit of proposed options.	DWLBC, CIT, SA Water, Murray Futures, SAMDBNRMB and BL4EA and consultant
				17.2	Rationalise pumping infrastructure on floodplain and improve aesthetics.	Develop a community action plan in consultation with landholders and possible external funding to remove or aesthetically improve (e.g. paint) pumping infrastructure.	Unused pumping infrastructure removed from floodplain by June 2011.	2011	Committee time and LAP officer support	DWLBC, CIT, SA Water, Murray Futures
18	Increased input costs	Develop strategy to manage inputs costs	Investigate collaborative approaches to minimise input costs across businesses in the region.	18.1	Review possibilities of negotiating prices for energy, fuel and other inputs if purchasing for entire region.	Initiate specific input purchasing program before end of June, 2011. Community to identify and prioritise target commodity types/consumables.	Develop scoping in conjunction with the RDC and local landholders by September 2011.	2011/2012 irrigation year	BL4EA committee time plus costs	BL4EA, landholders, RDC

Abbreviations:	
BL4EA	Bookpurnong Lock 4 Environmental Association
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DCC	Commonwealth Department of Climate Change
DCLW	District Council of Loxton Waikerie
DEH	SA Department of Environment and Heritage
DEWHA	Department of the Environment, Water, Heritage and the Arts
DPLG	Department of Planning and Local Government
DWLBC	SA Department of Water Land and Biodiversity Conservation
FAE	Field Application Efficiency
Gurra Wet	Gurra Wet Pty Ltd
HEM	Helicopter Electro-Magnetic - refers to the airborne geophysical resistivity survey that was conducted in 2005
IIEP	Improving Irrigation Efficiency Project
IRES	Irrigation Recording and Evaluation System
LBLAP	Loxton Bookpurnong LAP
MDBA	Murray Darling Basin Authority
MOU	Memorandum of Understanding
PIRSA	Primary Industries and Resources South Australia
RDC	Riverland Development Corporation
RSSA	Rural Solutions South Australia
SAMDBNRMB	SA Murray Darling Basin Natural Resource Management Board
SAMRIC	South Australian Murray Darling Basin Resource Information Centre
SIS	Salt Interception Scheme
SANTFA	South Australian No-Till Farmers Association
SARDI	South Australian Research and Development Institute
CIT	Central Irrigation Trust

8. How to Implement This Plan

This section provides a guide to the “next steps” for implementation of this plan and includes a work plan for irrigation years 2009/2010 to 2014/15. Potential funding opportunities are also identified in Appendix D.

8.1 What Needs to be Done?

This Land and Water Management Plan needs to be implemented in accordance with the strategies and actions set out in Table 7-1: NRM Priority Strategies and Actions. Not all actions need to occur at the same time, and some tasks will take longer than others. Progress on the Plan also needs to be reviewed and monitored over time to ensure that progress is being made, and that changes to the Plan are made if and when necessary.

8.2 Who Will Take Responsibility and How Will it be Managed?

The coordination and “driving” of the plan will make a very real difference to how much of the plan is implemented and how soon. One of the major constraints to implementing this plan was identified in the early planning workshops, and this is the ability to apply time resources, from both the community and from the support organisations such as the SAMDBNRM Board, the LAP, and Government Departments.

It will be important to appoint a person or committee who takes on the responsibility of “driving” the implementation of the plan, ensuring that the priority actions are progressing as quickly as possible, and making sure the supporting resources are in place to keep the Plan’s implementation moving along.

In this regard the Workplan strongly recommends the ongoing employment of a Land and Water Management Planning Coordinator or a Development Officer. This needs to be of high importance in the development of outcomes stemming from this LWMP.

8.3 When Will it be Done?

Table 7-1: NRM Priority Strategies and Actions provides an indication of the timeframes for each proposed action. These timeframes are indicative only and also provide an indication of relative priority. It may be possible to complete some tasks earlier than others, should the opportunity arise. It is suggested however, that actions which are identified as a high priority are tackled first, even though these ones might have a higher level of difficulty. Once these tasks are progressing smoothly, other lower priority actions, which might be easy to do, could be undertaken in parallel.

8.4 How much will it Cost?

Table 7-1: NRM Priority Strategies and Actions provides indicative costs for the tasks recommended in this Plan. These costs will depend on the level of agency, NRM Board and other departmental/group support, the cost of consultant/contractor inputs (if required), and the inputs provided by the community. For some tasks, detailed costs or quotes should be sought to confirm actual cost.

Funding opportunities are likely to be available to undertake actions which also meet the needs and criteria of various funding bodies, which include Federal and State Governments. Some actions might not attract external funding, and these actions would need to be funded by the community, whether by providing time and labour, or by providing funds. A list of potential funding sources is included in Appendix D.

Available funding and time resources may also impact on the timing of the LWMP.

8.5 How Will Success be Measured?

The strategies and actions set out within the Plan are designed to contribute towards achieving the community, natural resource condition, and management action targets described in Section 6 - Targets. The extent to which the Plan conforms to the LWMP Guidelines is indicated in Appendix E.

Success of the Land and Water Management Plan will be measured on the basis of completion of the proposed actions described in Table 7-1: NRM Priority Strategies and Actions. It is acknowledged that, over time, the relative importance of various actions may change, and that new issues may emerge which require addressing. For this reason annual reviews of the progress and success of LWMP implementation are recommended, through an adequate monitoring and evaluation strategy, which will need to be built into all project plans, for the specific benefit of the LWMP's ongoing implementation evaluation.

8.6 Work Plan

This section “packages-up” groups of actions for the next three years from Table 7-1: NRM Priority Strategies and Actions. It includes actions to address the the top four priority threats identified in the plan. This will help fast-track prioritised implementation of the plan. The Bookpurnong Lock 4 community and its partners will be able to readily identify which actions can be progressed and in which order.

Table 7-1: NRM Priority Strategies and Actions provides more detail about each action.

8.6.1 Actions for 2009/2010

Priority Threat 1: River flow decline

Strategy: Maximise irrigation efficiency in the Bookpurnong LWMP region.

- Action 1.3: Investigate drainage water reuse schemes (\$15,000 in first year)

Strategy: Provide education and support for irrigators during drought

- Action 1.5: Provide information regarding government and local community support services (\$10,000 in first year)

Strategy: Manage floodplains and wetlands sustainably

- Action 1.6: Develop wetland/floodplain management strategies for prioritised regional sites. (\$25,000 per year – 0.25 FTE LBLAP support, \$7000 per year (field and data analysis costs)

Priority Threat 2: Saline groundwater discharge to river and floodplains

Strategy: Monitor trends in groundwater levels and irrigation efficiencies and provide an annual salt and water balance result in conjunction with irrigation annual reporting as a method of managing groundwater impacts to regional floodplain environments.

- Action 2.1: Actively analyse regional irrigation and groundwater data and utilise basic modelling tools to determine likely impacts on floodplain environments generated through irrigation practices. (\$7,000 per year IIEP support and \$10,000 per year data analysis/modelling costs)

Priority Threat 3: Tourism

Strategy: Encourage tourism while minimising negative impacts on the region.

- Action 3.1 Investigate placing bins, designating camp sites and tracks on floodplain camping areas (Committee time)

Priority Threat 4: Climate change

Strategy: Maximise regional and individual ability to adapt to climate change challenges through education and specialised planning.

- Action 4.1: Develop a regional scale adaptation strategy to climate change through targeted consultation and specialised planning (\$40,000 per year consultant cost, \$20,000 per year 0.3 FTE LBLAP support)

The indicative annual cost to undertake the above 2009/2010 tasks is estimated to be \$134,000.

8.6.2 Actions for 2010/2011

Priority Threat 1: River flow decline

Strategy: Maximise irrigation efficiency in the Bookpurnong LWMP region.

- Action 1.1: Encourage increased participation in Irrigation Efficiency Project to achieve 90% of irrigated land returning field application efficiency results by the 2010/2011 irrigation year (\$30,000 per year (0.2 FTE IRES Support)).
- Action 1.2: Maintain regional Irrigation Field Application Efficiencies to 90% FAE per property for the life of the LWMP. (\$7,000 per year (0.05 FTE IIEP support))

Strategy: Provide education and support for irrigators during drought

- Action 1.4 Assist irrigators to develop drought management plans (\$90,000)

Priority Threat 2: Saline groundwater discharge to river and floodplains

Strategy: Monitor trends in groundwater levels and irrigation efficiencies and provide an annual salt and water balance result in conjunction with irrigation annual reporting as a method of managing groundwater impacts to regional floodplain environments.

- Action 2.2: Review capacity of the Noora pipeline and investigate feasibility of expanding SIS to protect Gurra Gurra Lakes.
- Action 2.3: Investigate ways of stabilising cliffs subjected to seepage in the past.

Combined cost of Actions 2.2 and 2.3 is \$50,000 over two years and in-kind committee support.

Priority Threat 4: Climate change

Strategy: Maximise regional and individual ability to adapt to climate change challenges through education and specialised planning.

- Action 4.1: Develop a regional scale adaptation strategy to climate change through targeted consultation and specialised planning (\$40,000 per year consultant cost, \$20,000 per year 0.3 FTE LBLAP support)

The indicative annual cost to undertake the above 2010/2011 tasks is estimated to be \$212,000.

8.6.3 Actions for 2011/2012

Priority Threat 4: Climate change

Strategy: Maximise regional and individual ability to adapt to climate change challenges through education and specialised planning.

- Action 4.1: Develop a regional scale adaptation strategy to climate change through targeted consultation and specialised planning (\$40,000 per year consultant cost, \$20,000 per year 0.3 FTE LBLAP support)

The indicative annual cost to undertake the above tasks is estimated to be \$60,000.

8.6.4 Timing of other Actions

The work plan does not include all of the actions described in Table 7-1: NRM Priority Strategies and Actions. This work plan includes actions from the top 4 threats in the Bookpurnong Lock 4 region. It is recommended that these actions are addressed as a priority.

If additional time and resources are available, other actions within Table 7.1 should be pursued in order of actions which address the greatest threats first. However, where opportunities exist to pursue less urgent actions at low cost and with inputs from external organisations, then lower priority actions could be undertaken sooner than indicated in the table.

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