6.10 Summary of Cost Benefit Analysis

Table 64 to Table 70 lists all of the costs and benefits for the management actions in the plan for the programs addressing irrigation salinity, dryland salinity and ocean induced salinity. For the management actions where the economic costs and benefits could be quantified, the cost benefit ratio and Net Present Value are quoted for 4% and 8% discount rates for activities funded inside and outside the plan. For management actions where the economics could not be quantified, a list of the costs and benefits is provided.

■ Table 64: Irrigation Management Program: Economic cost: benefit analysis of management actions with quantifiable costs and benefits.

LS: Lateral Spray, CP: Centre Pivot, B/S: Beef/Sheep, D: Dairy

Management option	Costs (© = costed)	Benefits (© = costed)	Target		Cost Benefit ratio		NPV total activities over 30yrs ($'000)		NPV activities funded by the plan over 30yrs ($'000)	
			Total activities	Funded by the plan	4% discount rate	8% discount rate	4% discount rate	8% discount rate	4% discount rate	8% discount rate
IA. Recharge control – Irrigation management										
IA2 Conversion from flood to spray irrigation	Capital cost © Increased operational costs © Extension © Administration of incentives program ©	■ land salinity © ■ surface water salinity down-gradient ■ salinisation of wetlands ■ water and fertiliser use and labour input © ■ nutrient loads to streams and lakes © ■ salinisation of roads and infrastructure ©?	800 ha/yr over 30 years	150 ha/yr over 30 years	LS: 1.3 CP: 1.4	LS: 1.0 CP: 1.0	Assuming equal conversion to LS and CP $21,100	Assuming equal conversion to LS and CP $700	Assuming equal conversion to LS and CP $4,000	Assuming equal conversion to LS and CP $100
IA3. More efficient flood irrigation	Capital cost © Increased operational costs © Extension ©	■ land salinity on-farm and down-gradient © ■ surface water and wetland salinity ■ water use © ■ salinisation of roads and infrastructure ©?	50ha/yr high flow flood irrigation over 30 years	50ha/yr high flow flood irrigation over 30yrs	5.7	4.1	$2,800	$1,500	$2,800	$1,500
IA5. Prevent salt build up from irrigation water	Research & investigation © Extension © Reduced water volumes available to landowners	■ prevention of land salinisation on farm © ■ prevention of increased salt loads to streams	Prevention of 20% losses on 50ha/yr over 30yrs	Prevention of 20% losses on 50ha/yr over 30yrs	7.7	6.8	$950	$740	$950	$740
IC. Engineering options – Sub-surface drainage										
IC1 Public Groundwater Control Pumps	Investigation © Installation © Operation and maintenance © Decreased water quality	■ land salinity on-farm and down-gradient © ■ salinisation of roads and infrastructure ■ salinisation of wetlands	Operation of 19 existing, 2 approved pumps + 10 new pumps	10 new pumps	100%irr dairy SMP+: 7.2 SMP only: 4.7	100%irr dairy SMP+: 6.2 SMP only: 3.7	100% irrigated dairy: $32,840	100% irrigated dairy: $21,040	100% irrigated dairy: $10,380	100% irrigated dairy: $6,290
IC2 Private Groundwater Pumps in high watertable areas (TEDS)	Investigation © Installation costs ©	■ land salinity © ■ salinisation of roads and infrastructure ©? ■ salinisation of wetlands ■ new source of water	3 per year for the first 5 years	3 per year for the first 5 years	100% irrigated dairy: 4.8	100% irrigated dairy: 4.0	100% irrigated dairy: $5,580	100% irrigated dairy: $3,300	100% irrigated dairy: $5,580	100% irrigated dairy: $3,300
IE. Living with Salt										
IE1. Rehab around groundwater pumps **IE2.** Salt tolerant crops and pastures	Research & investigation to determine appropriate species Extension © Cost to sow and maintain ©	■ increased productivity on saline land © ■ decreased salinity in down-gradient water ways	45 ha/yr over 30 years (1350 ha)	45 ha/yr over 30 years (1350 ha)	B/S:0.1 D: 0.9	B/S:0.1 D: 0.7	B/S:-$1,900 D: -$300	B/S:-$1,300 D: -$500	B/S:-$1,900 D: -$300	B/S:-$1,300 D: -$500

- **Table 65: Irrigation program – unquantified costs and benefits of management actions without a cost benefit analysis (specific costs for these programs can be found in Table 71)**

Management option	Costs	Benefits
IA. Recharge control – Irrigation management		
IA4. Efficient irrigation development on 'Greenfield sites'	Development and implementation of irrigation guidelines Extension to ensure irrigation is efficient	Prevention of land salinity, salinisation of roads and infrastructure, salinisation of wetlands
IB. Recharge control – Agronomic options		
IB1. Perennial pasture and tree establishment in dryland areas affected by irrigation recharge	Research & investigation to determine appropriate species Extension Pasture and tree establishment	Increased productivity on saline land Decreased salinity in down-gradient water ways
IB2. Maintaining and managing existing native vegetation	Extension Cost to maintain trees	Prevention of future salinity
IC. Engineering options – Sub-surface drainage		
IC3 Free flowing bores discharging to rivers/drains	Investigation Installation costs Decreased water quality at disposal point	Decreased land salinity Decreased salinisation of wetlands, roads and infrastructure
IC4 Tile and mole drains	Installation costs	Improved drainage Decreased waterlogging and land salinity on-farm
ID. Engineering options – Surface drainage		
ID1. Improved surface drainage	Installation costs	Decreased waterlogging and land salinity on-farm
ID2. Viability of community drains	Investigation and installation costs Decreased water quality at disposal point	Decreased land salinity and waterlogging Improved drainage
IE. Living with Salt		
IE3. Productive uses of saline land and water including aquaculture and Government buy back.	Research & investigation to determine productive uses of saline land and water Buy back of saline land with environmental values Cost of rehabilitating land	Increased production Rehabilitation of saline land with environmental values
IF. Monitoring, evaluation and reporting		
IF1.1. Observation bore monitoring	Monitoring costs and data entry	Increased understanding of the extent and severity of the problem
IF1.2. Watertable depth maps, analysis and reporting	Data extraction, analysis and mapping Reporting	Increased stakeholder understanding of the problem
IF1.3. Sale watertable depth map and reporting	Data extraction, analysis and mapping Reporting	Increased stakeholder understanding of the problem
IF2.1. Soil salinity monitoring around pumps	Monitoring	Increased understanding of the effect of the management action
IF2.2. Reporting on soil salinity monitoring	Analysis and reporting	Increased stakeholder understanding of the problem
IF3. Ensuring vegetation establishment has multi-benefits	Liaising with other staff Analysis	Ensuring multi-benefits

- **Table 66: Costs and benefits of the Dryland Program**

Management option	Costs (© = costed)	Benefits (© = costed)	Target		Cost Benefit ratio		NPV total activities ($'000)		NPV activities funded by the plan ($'000)	
			Total activities	Funded by the plan	4% discount rate	8% discount rate	4% discount rate	8% discount rate	4% discount rate	8% discount rate
DD. Recharge control – Tree options										
DD1: Tree planting on recharge areas – commercial forestry and/or farm forestry	Extension © Cost to plant and maintain trees ©	Increased productivity on saline land © Decreased salinity in down-gradient water ways	Beng: 45 ha/yr for 15 years	Beng: 45 ha/yr for 15 years	Beng: With 5 year delay: 1.2 With 20 year delay: 1.19	Beng: With 5 year delay: 1.11 With 20 year delay: 1.06	Beng: With 5 year delay: $1,494 With 20 year delay: $1,417	Beng: With 5 year delay: $276 With 20 year delay: $254	Beng: With 5 year delay: $1,494 With 20 year delay: $1,417	Beng: With 5 year delay: $276 With 20 year delay: $254
DD2: Tree planting – recharge control plus increased biomass and biodiversity (including break of slope plantings and alley farming)			Beng: 45 ha/yr for 15 years	Beng: 45 ha/yr for 15 years	Beng: With 5 year delay: 0.02 With 20 year delay: 0.00	Beng: With 5 year delay: 0.01 With 20 year delay: 0.00	Beng: With 5 year delay: -$2,196 With 20 year delay: -$2,242	Beng: With 5 year delay: -$1,575 With 20 year delay: -$1,597	Beng: With 5 year delay: -$2,196 With 20 year delay: -$2,242	Beng: With 5 year delay: -$1,575 With 20 year delay: -$1,597
DE. Groundwater pumping										
DE1: Public Groundwater Control Pumps	Investigation © Installation © Operation and maint. © Decreased water quality at disposal point	Decreased land salinity on-farm and down-gradient © Decreased salinisation of wetlands, roads and infrastructure ©	Approx costs and benefits only	Approx costs and benefits only	100% dryland dairy: 0.6 100% dryland beef: 0.3	100% dryland dairy: 0.5 100% dryland beef: 0.2	100% dryland dairy: -$1,180 100% dryland beef: -$2,000	100% dryland dairy: -$1,300 100% dryland beef: -$1,850	100% dryland dairy: -$1,180 100% dryland beef: -$2,000	100% dryland dairy: -$1,300 100% dryland beef: -$1,850
DE2: Private pumps										
DF. Living with Salt										
DF1: Fencing off saline areas and sowing salt tolerant crops, pastures	Research & Investigation to determine appropriate species Extension Cost to sow and maintain	Increased productivity on saline land Decreased salinity in down-gradient water ways	70 ha/yr over 30 years (2,100 ha)	70 ha/yr over 30 years (2,100 ha)	B/S:0.1 D: 1.0	B/S:0.1 D: 0.8	B/S:-$2,500 D: $140	B/S:-$1,700 D: -$330	B/S:-$2,500 D: $140	B/S:-$1,700 D: -$330

- **Table 67: Dryland program –unquantified costs and benefits of management actions without a cost benefit analysis (see Table 72 for estimated costs)**

Management option	Costs	Benefits
DA. Salinity Mapping		
DA1: Agricultural land salinity mapping	Research and investigation costs	Knowledge of extent of problem allows remediation to begin
DA2: Salinity mapping in urban areas	Research and investigation costs	Knowledge of extent of problem allows remediation to begin
DA3: GFS investigation	Research and investigation costs	Allows analysis of causes of salinity
DA4: Impact of management actions	Research and investigation costs	Allows management actions to be refined based on likely impacts
DA5: Land capability and economic assessment	Research and investigation costs	Allows management actions to be further refined based on land capability and economic considerations
DA6: Capacity building and methods for adoption	Research and investigation costs	Allows methods for adoption to be determined
DA7: Integrated actions	Research and investigation costs	Allows integrated outcomes
DB. Whole Farm Planning		
DB1-4: Whole Farm Planning	Development of guidelines and database for plans Whole Farm Planning courses, cost of plan	Improved on-farm planning, incorporation of salinity considerations into broader natural resource management
DC. Recharge control – Pasture options		
DC1: Perennial pasture mapping	R&I to determine areas of perennial pasture	Increased productivity on saline land © Decreased salinity in down-gradient water ways Reduced recharge
DC2: Perennial pasture establishment and management	R&I to determine appropriate species Extension © Cost to sow and maintain perennial pastures ©	
DD Recharge control – Tree options		
DD1: Forestry options	Extension, establishment and maintenance costs	Economic return from trees, decreased salinity and improved biodiversity
DD2: Native vegetation options	Extension, establishment and maintenance costs	Decreased salinity and improved biodiversity
DD3: Protection of native vegetation	Extension, establishment and maintenance costs	
DE Groundwater pumping		
DE1: Public groundwater control pumps	Investigation, construction, maintenance, operational and renewal costs. Potential costs to water quality from disposal	Reduced salinity
DE2: Private groundwater pumps	Investigation, construction, maintenance, operational and renewal costs	Reduced salinity, additional source of irrigation water
DF Living with salt		
DF1: Salt tolerant crops and pastures	R&I to determine suitability	
DF4: Government buy-back of saline land for rehabilitation	R&I to determine suitability Buy back and remediation costs for land with environmental value	Environmental values of rehabilitated land
DG Monitoring, evaluation and reporting		
DG1.1: Watertable monitoring	Monitoring and data entry	Increased understanding of the extent of the problem
DG1.2: Watertable depth mapping	Data extraction and analysis, mapping and reporting, extension	Increased stakeholder awareness of the problem

- **Table 68: Ocean induced program –unquantified costs and benefits of management actions without a cost benefit analysis (specific costs for these programs can be found in Table 73; specific benefits difficult to assess)**

Management option	Costs	Benefits
OA. Engineering options – Surface drainage		
OA1: Structures to prevent lake inflow to rivers and/or wetlands	Investigation and capital costs Restricted access to some lakes and wetlands for larger boats	Decreased salinisation of wetlands and surface water Decreased land salinisation in surrounding areas
OA2: Sea walls	Maintenance Can lead to loss of beaches in front of sea wall	Reduced waterlogging and land salinity

- **Table 69: Surface water salinity program –unquantified costs and benefits of management actions without a cost benefit analysis**

Management option	Costs	Benefits
SA. Salinity Mapping		
SA1: Wetland Salinity Mapping (for wetlands other than Lake Wellington wetlands)	R&I to determine areas affected by salinity	Knowledge of extent of problem allows remediation to begin
SA2: Salinity mapping in urban areas	R&I to determine areas affected by salinity	Knowledge of extent of problem allows remediation to begin
SB: Environmental Flows		
SB1: Environmental Flow assessments	Cost of buying water Staff time for input into assessments	Reduction in in-stream salinity Incorporation of salinity considerations into broader natural resource management
SC: Monitoring, evaluation and reporting		
SC1.1: Surface water monitoring	Monitoring and data entry	Knowledge of extent of problem
SC1.1: Reporting of surface water monitoring	Analysis and reporting	Increased understanding of the problem by stakeholders
SC2.1: Spot salinity monitoring of Clydebank Morass	Monitoring and data entry	Knowledge of extent of problem
SC2.2: Reporting on Clydebank Morass salinity	Analysis and reporting	Increased understanding of the problem by stakeholders
SC3.1: Monitoring of Downd Morass and nearby observation bores	Monitoring and data entry	Knowledge of extent of problem
SC3.2: Reporting on Dowd Morass salinity	Analysis and reporting	Increased understanding of the problem by stakeholders
SC4: Monitoring of other wetlands	Monitoring and data entry	Knowledge of extent of problem

▪ Table 70: Community and agency engagement program –unquantified costs and benefits of management actions without a cost benefit analysis

Management option	Costs	Benefits
CA1: LGA engagement plan	Staff time to complete engagement plan Staff time for liaison with LGAs	Increased awareness of salinity issues by LGAs Salinity considered in planning applications
CA2: Community education	Staff time for integrating salinity into existing programs	Community more aware of causes of salinity Community more aware of ways to prevent and manage salinity
CA3: Project communications strategies	Time to complete communications strategies	Results of planning activities and significant on-ground works communicated to the community Successes of salinity program more widely publicised
CA4: SMP communications strategy	Time to complete communications strategy	Recommended management actions from the plan communicated to relevant stakeholders Progress of the plan towards implementation communicated to stakeholders
CA5: Field days	Time to organise and run the field day Advertising for the field day	Increased community awareness of salinity Opportunity for the community to see local examples of work undertaken to address salinity
CA6: Educational resources	Staff time to make resources available and known	Increased awareness of salinity by stakeholders and the community Increased understanding of management options Staff education