

Beacon River Salinity Management Study - Risk Analysis and Management Plan

Item No	Risk Assessment Category	Risk Issue and Failure Modes	Category of Consequences							Risk Score	Risk Level	Management and Action Plan
			Likelihood (Probability)	Agricultural Capacity	Environmental	Safety	Cost	Public Image	Sum of Consequences			
Significant Risk - Action Plan is required to reduce risk to a manageable level												
3.1	Property Damage	Properties damaged by flooding or poor drainage or salinization of previously unaffected areas resulting in crop loss and reduction in property value, including public assets such as roads.	5	3	3	3	4	4	17	85	H	Feasibility Study to specifically address the potential risk and consequences of flooding previously unaffected areas.
Medium Risk - Management of risk or Action Plan Required												
6.5	Legal Challenges	Legal Challenges affecting project (private, public and international).	5	4	3	0	3	4	14	70	M	Feasibility Study to consider the potential risks with Legal Challenges. Risks to be minimised by community consultation.
1.4	Engineering Solutions	Solutions to Engineering Design challenges are difficult to solve leading to scope and budget increases.	5	2	3	2	3	3	13	65	M	Feasibility Report to provide sufficient detail of design options and scope and cost implications in the cost/benefit analysis.
1.6	Area of Scope	Adequate definition of area affected by project	5	2	3	1	4	3	13	65	M	Feasibility Report to define the project boundaries.
2.1	Community Support	Division within the community affecting the implementation or completion of management options.	5	2	4	0	4	3	13	65	M	Community Consultation to continue through the project implementation and funding stages to address community concerns.
1.7	Impacts	Impact of each option ill-defined.	5	2	3	0	4	3	12	60	M	Feasibility Report is required to consider options sufficiently to establish cost/benefit analysis.
1.8	Other Options	Risk of not having alternatives scoped.	5	1	3	2	3	3	12	60	M	Community Consultation was intended to ensure that options were raised and considered. Risk Workshop demonstrated that not all issues had been addressed. MMLCDC to continue communication with local stakeholders.
2.3	Political Will	Political campaigning for other interests creates disharmony and erodes support for project, resulting in reduced potential to gain funding.	5	2	3	0	3	4	12	60	M	Risk Management Workshop demonstrated potential for disharmony. MMLCDC to continue consultation with local stakeholder groups.
2.5	Inequitable Impacts	Some farmers adversely affected by the overall scheme (upstream benefits - downstream disadvantaged).	5	2	3	0	4	3	12	60	M	Feasibility Study Report to consider land implications for each option in the cost/benefit analysis.
3.7	Risk of capital	Availability to fund the project up-front and ongoing.	5	2	4	0	3	3	12	60	M	Risk is beyond scope of project group's control.
4.2	Release of Nutrients	Nutrient & agricultural chemical loads creating toxic algae blooms in drainage channels, ponds or downstream water systems.	4	1	3	3	4	4	15	60	M	Feasibility Study to consider implications of pollutants. MMLCDC to consider prevention measures when project completed.
4.6	Land and Soil Degradation	Salinity loading in drainage water affect land and soil health of downstream crops and pasture.	5	3	3	0	3	3	12	60	M	Feasibility Study will address the salt loading in downstream drainage stream.
4.11	Flooding	Modified drainage creates increased frequency or severity of flooding in downstream catchment areas (incl. lakes & wetlands).	4	3	3	2	4	3	15	60	M	Feasibility Study to address potential impact of the saline drained water on the downstream catchment area.
1.5	Alternative Funding	Financial resources not available to fund solutions.	4	3	4	0	4	3	14	56	M	Beyond control of the Project Group's influence. Some influence can be achieved through local community and political support.
4.7	Public Health	Drainage channels and basins act as mosquito breeding grounds increasing rate of Ross River and other vector borne virus.	5	0	2	3	3	3	11	55	M	Project Design to address the formation of insect breeding ponds in the channel and ponds designs.
6.4	Precautionary Principle	Risk may not be adequately defined to gain approvals or incur public liability.	5	2	3	0	3	3	11	55	M	Risk Management Workshop aimed at achieving this goal. Additional risks may be raised through funding submission process and addressed on a case by case basis.
7.3	System Blockage	Drainage systems become blocked or weed choked without adequate maintenance (eg. siltation).	5	2	3	0	3	3	11	55	M	Management Plan required as a project handover deliverable. The Plan to include management and operation responsibilities of all parties.
7.4	System Maintenance	System poorly maintained leading to system failures and local flooding and salinization and crop or pasture loss.	5	2	3	0	3	3	11	55	M	Management Plan required as a project handover deliverable. The Plan to include management and operation responsibilities for all parties.

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8.2	Revegetation	Inappropriate choice of species, loss of diversity, noxious weeds.	5	2	3	0	3	3	11	55	M	MMLCDC to consult with Department of Agriculture and CALM on appropriate species and communicate to farmers.
3.3	Farm Access	Drainage channels cut access between parts of properties, making movement of stock, plant and equipment less efficient or difficult.	5	1	2	2	3	2	10	50	M	Design to consider minimising land utilisation and access disruptions
4.10	Leakage from Drains	Leakage from drains saturates soil or increases salinization of previously unaffected land.	5	3	2	0	3	2	10	50	M	Design to include piping solutions in areas of porous soils.
1.2	Flawed Design	Assumptions and concepts flawed by poor history, lack of understanding, or lack of investigation in or between options.	4	2	3	0	4	3	12	48	M	Feasibility study outcomes are aimed at addressing knowledge gaps.
1.3	Scope of Design	Scope of works either over or under defined resulting in cost and time increases within and beyond catchment. Risk of total failure.	4	2	3	0	4	3	12	48	M	Feasibility study is required to adequately address scope of design and evaluation of the options.
4.13	Biosecurity	Movement of weeds and other undesirable materials.	5	1	3	0	3	2	9	45	M	System design to consider migration of undesirable elements and incorporate blocking mechanisms where necessary.
4.14	Salinization of Lakes	Build up of salt in lakes.	5	1	3	0	3	2	9	45	M	Feasibility Study outcomes required to assess the potential impact on the lakes. Data currently not available.
4.8	Safety	Open channels can become a drowning or injury risk.	4	0	0	5	3	3	11	44	M	Channel design to safety requirements and incorporate barrier elements where necessary
7.1	Public Image and Opinion	Negative public opinion of project or operation of the drainage systems disrupting ability to construct or operate.	4	2	3	0	2	4	11	44	M	Community Consultation to continue through the project implementation and funding stages to address community concerns. MMLCDC to consider pro active campaign in local media to ensure widespread support.
2.6	Wider Community	Need to get and maintain wider community support.	4	1	3	0	3	3	10	40	M	As per Item No 7.4 (above)
2.7	Equity	Peer group pressure to participate compromises equity in funding.	4	2	3	0	3	2	10	40	M	Funding and management arrangements to consider the potential revenue implications on land owners.
4.5	Wetlands Fauna & Flora	Changes in ground water levels and quality disrupt fauna - wetland birds, insects and aquatic life.	4	1	3	0	3	3	10	40	M	Feasibility Study to address potential impact of the on ground water levels.
5.6	Latent Conditions Risk	Soil type causes drain to leak and elevates groundwater locally	4	2	2	0	3	3	10	40	M	Design to include piping solutions in areas of porous soils.
1.1	Design of Water Management Systems	Scope of project, assumptions, conditions poorly or inaccurately documented affecting design and budget risks inclusive of surface and ground water.	3	3	2	0	4	3	12	36	M	Feasibility Study aimed at addressing these issues. Design definition phase will further refine the scope of work to minimise risk exposure.
6.3	Asset Management	Ownership of the infrastructure and responsibility for management and maintenance not well defined, leading to arguments between stakeholders (and potential legal costs) on operation and preservation of the scheme.	4	2	1	0	2	4	9	36	M	Issue requires resolution within the Project Feasibility Report. Ownership and responsibilities will be dictated by the scope of works and design solution.
7.2	Cost Efficiency	System expensive to operate and the benefit does not adequately offset the capital or management costs.	3	2	3	0	3	4	12	36	M	Project Feasibility Study required to address the cost/benefit of each option to minimise risk.
4.12	Lake McDermott	Increased flows into Lake McDermott adversely affects the hydraulic performance of the lake system (ie local flooding, soil saturation, salinization).	4	1	3	0	3	2	9	36	M	Project Feasibility Study outcomes to address the hydraulic performance of the discharge areas.
5.8	Poor Design	Unsuitability of fundamental design.	3	2	3	0	3	3	11	33	M	Quality Assurance applied rigorously to design and feasibility to minimise risk.
7.5	Land Tenure	Ownership/vestment of works not assigned completely leading to construction, operation and maintenance failures.	3	1	3	0	3	4	11	33	M	Issue to be addressed within the Feasibility Study and resolved when a design solution chosen.
4.1	Release of Contaminants	Hydrocarbons, wastes or toxic spills deposited into drains and transported through to downstream water systems.	2	2	3	3	3	4	15	30	M	Design solution to consider implications of pollutants. MMLCDC to incorporate issue within the system Management Plan.
5.5	Latent Conditions Risk	Soil type is not conducive to draining ground water (drains & pumps).	3	2	2	0	3	3	10	30	M	Feasibility Study will consider soil types and potential for drainage. Data on soil types collected during this project phase.

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7.6	Management Structure	Roles and responsibilities not well defined leading to operation and maintenance failure.	3	1	3	0	3	3	10	30	M	As per Item No 6.3 (above)
4.15	Weather	Extreme weather conditions.	3	2	3	0	3	2	10	30	M	Risks to be considered in project design.
2.2	Population	Reduction in local population affecting the viability of local businesses and community support of the scheme.	3	0	3	0	3	3	9	27	M	Project outcomes are aimed at reducing the loss of land and resultant impact of population.
3.4	System Maintenance	System is too expensive to maintain and is eventually abandoned	3	0	3	0	3	3	9	27	M	As per Item No 7.2 (above)
5.7	Latent Conditions	Rock, rubble or excessive groundwater found in trenches during construction leading to requirement to relocate route, remove rock, or dewater thereby increasing costs and delaying project completion.	3	1	1	2	3	2	9	27	M	Project design documents to cover latent conditions and contractor to inform on latent conditions.
Minor Risks - Monitoring may be warranted												
3.8	Individual Land Values	Individual land values are adversely affected by the selected engineering solution or public perception of chosen solution.	4	0	0	0	4	2	6	24	L	Monitor and address during design phase if necessary.
5.4	Quality of Work	Completed works poorly constructed leading to increased maintenance costs and reduced life of assets or total failure.	3	2	1	0	3	2	8	24	L	Monitor and minimise potential during construction phase.
6.1	Agencies Requirements	Legislation or Authority Agencies change requirements to affect viability, system operation or need for additional construction.	3	2	0	0	3	3	8	24	L	Monitor and react as necessary
6.2	Licensing Requirements	Licensing requirements for the system changed by State Policy, environmental or other body.	3	2	0	0	3	3	8	24	L	Monitor and react as necessary
3.6	System Comparisons	System chosen is less economic than the alternative.	3	0	0	0	4	3	7	21	L	Monitor and reassess at design phase.
4.4	Native Fauna & Flora	Drainage channels disrupts native fauna.	3	0	3	0	2	2	7	21	L	Monitor and incorporate in design if necessary.
4.9	Odour	System creates unacceptable odour problem.	3	1	2	0	2	2	7	21	L	Design to minimise potential for ponding of stagnant water.
5.1	System Design	Contractor experiences difficulty constructing system.	3	1	1	0	3	2	7	21	L	Design to consider constructability (standard QA procedure)
2.4	Ownership Changes	Change of ownership resulting in lack of ongoing support for the project.	2	2	2	0	3	2	9	18	L	MMLCDC to monitor and communicate with farmers as necessary.
5.2	Financial Capability	Contractor goes bankrupt or walks off the job. Leaving uncompleted work, uncommissioned system or lack of warrantee on equipment and extra costs incurred.	2	2	1	0	3	3	9	18	L	Project Manager to monitor. Include financial capacity criteria in tender evaluation.
6.5	Ownership Change	Changes in owners acceptance of scheme.	2	3	2	0	2	2	9	18	L	MMLCDC to monitor and communicate with farmers as necessary.
3.2	Agricultural Capacity	Reduction in net usable land for crops/pasture by installation of drainage channels and evaporation ponds.	2	1	1	0	3	3	8	16	L	Project Feasibility to evaluate project's impact on land use availability.
5.9	Weather	Lost time and damage resulting in increased costs.	4	0	0	0	2	2	4	16	L	Project Manager to monitor and respond as necessary.
5.3	Poor Performance	Contractor slow in performance extending construction period and delaying drainage connections.	3	1	0	0	2	2	5	15	L	Project Manager to monitor and respond as necessary.
3.5	Land Values	Net Land values are adversely affected by the selected engineering solution or public perception of chosen solution.	2	0	0	0	3	2	5	10	L	Project Feasibility to evaluate project's impact on land use availability.
4.3	Flora and Fauna	Rare Flora present on drainage channel route & habitat destruction.	1	1	4	0	2	3	10	10	L	Project Feasibility to evaluate project's impact on Flora and Fauna.
8.1	Opportunity Ownership	If beneficial uses are found for the saline water, who has ownership of it.	3	0	0	0	0	3	3	9	L	Issue is beyond scope of current project.