

# MDBA ANALYSIS OF THE LINDSAY ISLAND FLOODPLAIN MANAGEMENT

## PROJECT BUSINESS CASE

### PROPONENT: VICTORIA

The MDBA's advice covers the following criteria in the Basin Officials Committee agreed *Phase 2 Assessment Guidelines for Supply and Constraint Measure Business Cases* (the Guidelines):

- Eligibility (3.1)
- Ecological values of the site (4.2)
- Ecological objectives and targets (4.3)
- Anticipated ecological outcomes (4.4)
- Hydrology of the area and environmental water requirements (4.5)
- Operating regime (4.6)
- Assessment of risks and impacts of the operation of the measure (4.7)
- Complementary actions and interdependencies (4.9)
- Project governance and project management arrangements - legal and regulatory requirements (4.11.2)

Business case assessments by the Department of the Environment will include advice from the MDBA on the technical feasibility and fitness for purpose of proposals as per section 4.8 of the Guidelines.

### Key points/summary

- The proposal meets the definition of a 'supply measure' under the Basin Plan and has adjustment potential.
- Information provided for ongoing operations and maintenance resourcing does not currently meet the phase 2 business case criteria and until this issue is resolved, there will be a significant risk for this project. Decommissioning works is not a suitable risk management action as this would negate the SDL adjustment benefits. A clear statement of ownership, funding and responsibility for ongoing operations and maintenance is required to meet phase 2 business case requirements.
- There is evidence that the project will provide ecological benefits, however there are issues where proposed hydrological targets exceed natural flows and are inconsistent with the Basin Plan. The operating regime set out in the business case must be amended in the detailed design phase of the project to avoid inundation at frequencies above natural levels. This will be required by no later than the end of August 2015 to allow sufficient time for the proposal to be modelled.

## 1. Eligibility (3.1)

The proposal meets the eligibility requirements under the Guidelines for further assessment and consideration in the SDL adjustment mechanism.

### 1.1 Supply measure requirements (3.1.1)

The proposal would meet the definition of 'supply measure' under the Basin Plan (cl.7.03 and (cl.7.15) to:

- operate to increase the quantity of water available to be taken in a set of surface water SDL resource units compared with the quantity available under the benchmark conditions of development;
- achieve equivalent environmental outcomes with a lower volume of held environmental water than would otherwise be required; and
- have no detrimental impacts on reliability of supply of water to holders of water access rights that are not offset or negated.

noting that a final determination will require MDBA modelling.

### 1.2 Measures not included in the benchmark conditions of development (3.1.2)

The MDBA confirms that the measure was not in the benchmark conditions of development (cl.7.02 of the Basin Plan).

## 2. Ecological values of the site (4.2)

A detailed description of the ecological values and features of the site is provided (section 4 of the business case and Appendix B) consistent with the assessment criteria in the Guidelines, including a description of the current condition of the site. In particular it is noted that:

- Lindsay Island is critical to the biodiversity of the lower River Murray because of the fast-flowing aquatic habitat that it provides. Floodplain anabranches now represent the only opportunity to promote flow-dependent fauna;
- The site provides important habitat for Murray cod and other native fish species with Mullaroo Creek supporting one of the most significant populations of Murray cod in the lower River Murray and Victoria (one of only two self-sustaining populations in lower River Murray);
- Lindsay Island watercourses support a range of conservationally significant species including freshwater catfish, silver perch and growling grass frog; and
- Lignum shrublands are an important habitat component however in 2013/14 more than half of the plants were dead and not expected to regenerate from rootstock.

## 3. Ecological objectives and targets (4.3)

Ecological objectives and targets are generally specified consistent with business case assessment criteria. Additional clarification on issues noted below, including targets of above natural flows, should be addressed to meet Guideline criteria.

Site specific targets for the site have been cross-referenced against the broad Basin Plan objectives, however their relationship with site specific objectives and targets in Appendix D of *The proposed Environmentally sustainable level of take for surface water of the Murray–Darling Basin: method and outcomes (November 2011)* (ESLT report) is not directly addressed. The MDBA’s assessment is that the site specific targets are not inconsistent with those objectives.

Ecological targets have been quantified however further evidence/analysis is required to enable a determination as to whether the selected targets are adequate or meaningful, for example native fish targets discussed below. A specific target for lignum shrublands is not provided although a target is set for platform building waterbirds breeding in lignum shrublands. It is not clear whether this is realistic given the current condition of lignum.

More explanation is required on how recommended hydrological targets relate to the proposed operating regime where discrepancies exist. In a number of instances these do not appear to align directly e.g. different thresholds, frequencies and/or durations. This arises at least in part because there is often more than one flow target for a particular vegetation group (e.g. red gum forest and woodland and lignum), however the operating plan only recognises a single flow threshold (in some cases, this flow threshold differs from any of the flow targets specified in the environmental water requirements). Furthermore, Ecological Associates (2014) refers to an analysis of event frequency and duration under natural conditions which appears to have informed the recommended environmental water requirements. However, the more recent hydrological analysis undertaken by Gippel (2014) shows that a number of these are overstated.

Hydrological targets for watercourses, red gum forest and woodland, lignum shrubland and woodland and black box in Appendix B appear to be near or exceed the frequency and/or duration of flows which would have occurred under natural conditions. However, this is difficult to assess as analysis of the hydrological targets under different modelling scenarios is not presented. Similarly, a statement is made that “flows of 70,000 to 90,000ML/d inundate red gum woodland at Lindsay Island. Under natural conditions these events occurred almost annually and lasted for two to three months”. Hydrological analysis presented in Table 5-2 show that these flows do not occur this frequently.

Victoria has provided additional information which indicates that the operating regime in the business case, in which above natural frequencies are proposed, is not how the project will actually be run. The operating regime set out in the business case must be amended as per the additional information when developing the detailed design of the project, to avoid inundation at rates above natural levels. In the interim, the MDBA will pursue discussion with Victoria to resolve the issue, and to ensure that any modelling undertaken is consistent with the intent of the additional information. The amended regime will be need to be settled by the proponent as soon as possible, and certainly no later than the end of August 2015, to allow sufficient time for the proposal to be modelled.

Analysis presented in Table 5.2 and 8.1 of the business case as representing the Basin Plan without the measure needs appears incorrect (increase from 31 per cent of years with an 80,000ML/d event under baseline conditions to 50 per cent of years under Basin Plan which is higher than natural at 44 per cent). Accordingly, it is stated that no additional operations above Basin Plan flows are anticipated. This should be checked and clarified.

Table 9.1 in the business case incorrectly cites MDBA (2012) – the Basin Plan, for the maximum interval between events. The Basin Plan does not contain this information. It is assumed this information may

have been taken from analysis presented within the ESLT report however it is inconsistent with this report, and again maximum intervals do not align with natural hydrology and the MDBA has not set maximum interval targets for the site.

Targets specified are based on commissioning of proposed works in 2020 however the project schedule has commissioning occurring in 2022.

Other supply measures are mentioned, particularly the Lindsay Island works constructed under TLM program upon which this project builds. The business case also highlights that operation of the proposed works in conjunction with Mulcra Island and Chowilla floodplain infrastructure will provide enhanced outcomes compared to the project in isolation. However, no investigation of the interactions and interdependences between measures is provided on the basis that this can only be done once the package of measures is known.

## 4. Anticipated ecological outcomes (4.4)

### 4.1 Anticipated ecological benefits (4.4.1)

Anticipated ecological benefits described in the business case generally meet business case assessment criteria. Some additional clarification would be helpful to understand the benefits more fully.

Anticipated ecological benefits are described in the business case and Appendix B. A monitoring program is proposed to test outcomes against assumptions and adaptively manage works operations.

One of the key matters the MDBA provided comment on during the feasibility phase was a request for more information on how outcomes for native fish, particularly Murray cod, will be maintained or improved. A project objective is to 'enhance Murray cod habitat by improving the productivity of connected riparian zones and wetlands while maintaining fast-flowing habitat'. The risk assessment highlights a moderate residual risk of reduced hydrodynamic diversity as 'regulator operation is likely to reduce or eliminate fast-flowing habitat that is particularly important for some fish species, including Murray cod'. It is acknowledged that the risk rating has been reduced from high to moderate through mitigation measures - fish passage considerations have been included in the design and operational plans will be developed using the hydraulic model to ensure hydraulic conditions appropriate for fish are maintained. Nevertheless, the specified target of 'the population of adult Murray cod in Mullaroo Creek and Lindsay River increases by 25% from 2015 levels by 2030' appears optimistic and the rationale for the target is not clearly explained. How the proposed operation of the works would enhance habitat for these species and thus contribute to achievement of the target (also see potential adverse ecological impacts below) is unclear.

The Expert Peer Review Panel, which Victoria engaged to review the submitted supply measure proposals, highlighted in their summary report that principal ecological outcomes for each project focus on enhancing vegetation and bird habitat with benefits to other organisms assumed to accrue collaterally from regime changes or as a result better habitat resulting from improvements to vegetation condition. Given the importance of this site to the nationally listed Murray cod further explanation of the benefits anticipated is warranted.

The business case identifies six inundation dependent ecological vegetation classes with conservation significance. It should be ascertained what percentage of each of these classes benefits from the improved inundation regime.

## 4.2 Potential adverse ecological impacts (4.4.2)

Potential adverse ecological impacts are covered to an acceptable level for the business case, noting that responsibility for actioning these strategies (including funding to adequately resource) must be incorporated into the detailed design and implementation of the proposal.

Potential adverse ecological impacts are assessed with mitigation measures developed for each key risk, including a monitoring program. Risks assessed include the matters raised by the MDBA during the feasibility phase.

Of particular concern is the risk posed to the EPBC listed Murray cod. Reduced hydrodynamic diversity is assessed as having a moderate residual risk after mitigation measures are applied. The Expert Panel (Terry Hillman) expressed the opinion that landscape effects of potential failure (Lindsay Island cod populations are lost in the absence of preventative actions) are an unacceptable option and therefore outweigh the other ecological gains offered by the proposed supply measure. Further, it was suggested that 'sound and well monitored actions to sustain the cod population are put in place before the measures are operationalised or those components of the measure that threaten the cod are dropped from the proposal'. Impacts on the EPBC-listed Murray cod must be minimised (and will be subject to EPBC approvals) and the MDBA supports comments from Terry Hillman that it is preferable that any impacts are avoided.

As noted above, there is the potential for adverse impacts on species through the implementation of above natural flows, which needs consideration.

The residual risk rating is assessed as moderate for a number of other key risks (low dissolved oxygen levels, groundwater salinity, increased carp and pest animal populations) despite a number of proposed mitigation measures. It is noted a risk management strategy will be developed for these. Three other risks of particular concern where mitigation measures and monitoring will be essential are:

- Low dissolved oxygen levels – Ning et al 2014 assessed potential blackwater risks (unclear if assessment was undertaken using the two blackwater models developed by MDFRC as this is not presented). The report provided general recommendations for minimising risks while also acknowledging that the works can offer benefits in mitigating the impacts of hypoxic blackwater. Specifically, the operation of the Lindsay Island works proposes to re-use water from the Primary Component although no specific comment is provided on whether this is a potential risk in the accumulation of high loads of bioavailable carbon. Hypoxia risks at Lake Wallawalla East are discussed. In addition the aggregated risk posed by multi-site watering is also raised although robust data does not exist. Managing the timing of flows/inundation and minimisation of pooling of water are two key mitigation strategies recommended along with a monitoring and evaluation program. It should be noted that the risks of negative watering impacts are not assessed in the SDL adjustment method.
- Increased carp populations – Recent carp population modelling undertaken by ARI highlight the significant risk of works sites providing conditions favourable to carp.

- Permanent removal or disturbance of flora and fauna habitat during construction – identified as a potentially very high risk after mitigation measures. This will require careful consideration during both the design and construction phases.

When considered in total, implementation of the mitigation measures for all the risks represents a large commitment of resources. As the supply measure is assessed on the basis that the risk mitigation strategies are put in place, it is important to ensure that responsibility for implementation of these strategies (including funding to adequately resource) is clearly defined in the detailed design in the event that the risk materialises. These include for example:

- additional monitoring (e.g. organic matter loads, dissolved oxygen levels, temperature salinity levels);
- additional on-ground actions (e.g. eradicate new infestations of pest plants, control pest animal populations, revegetate construction sites);
- additional planning and management functions (e.g. integrate water management with other sites in seasonal water planning process, develop a ‘fish exit strategy’ to inform regulator operation during the drawdown phase to maintain fish passage); and
- additional operational requirements (e.g. tailor watering regimes to provide a competitive advantage for native fish over carp, agitate water using infrastructure to increase aeration, time water manipulations to drown seedlings).

Lloyd Environmental (2014) identify a number of ecological risk knowledge gaps across all proposal sites (presence and distribution of threatened species, threats from episodic reduction in hydrodynamic diversity, stranding/isolation of native fish). There is therefore the potential that ecological risks have been underestimated due to a lack of available information. Given this uncertainty, these risks require further consideration throughout the life of the project i.e. detailed design, construction and operation and a monitoring and evaluation program will be essential to mitigate these risks.

As noted above, there is the potential for adverse impacts on species through the implementation of above natural flows, which needs consideration.

## 5. Hydrology of the area and environmental water requirements (4.5)

### 5.1 Current hydrology and proposed changes to the hydrology (4.5.1)

The business case and supplementary information provide sufficient information to explain the project’s current hydrology, and changes associated with the supply measure proposal. This meets the requirements of the Guidelines. To assist the proposal’s integration into the MDBA’s model-based assessment framework further clarification and refinements are likely to be required.

A hydraulic model was developed for the project using the MIKE-FLOOD modelling suite and was assessed by the Expert Peer Review Panel. As stated in the Panel’s report and the business case, the hydraulic modelling outputs were derived from steady state conditions which may result in an overstatement of the inundation (and environmental benefits) of the supply measure.

As indicated in the expert review panel report, the hydraulic model developed is fit for providing critical information to assess the business case. This model was originally developed for TLM investigation decisions and the 2D component has been expanded to develop the business case.

Uncertainties around unknown data, especially seepage and soil profiles, may change the inundation extent significantly.

The volume of water used by the environment has not been detailed in the business case.

Notwithstanding these issues, the assumptions used to represent the measure have been documented and the models and information provided appear sufficient for the proposal to be integrated in the assessment framework at this stage.

## 5.2 Environmental water requirements (4.5.2)

While information on environmental water requirements are broadly provided to the appropriate level of detail to meet Guidelines criteria, the proposal would benefit from clarification on the issues noted below.

Environmental water requirements are described in Appendix B.

There is inconsistency between Appendix B text and table describing water requirements of lignum shrublands.

Table 5.2 of the business case indicates the supply measure operation will result in a shift in timing of some high flow events (e.g. targeting Black Box) to earlier in the season. There is some inconsistency within the business case as this isn't apparent in Table 9.1. The proposed timing is considerably earlier than would have occurred naturally however a rationale is not provided in the business case. There may be implications on environmental outcome scoring. SFI equivalence mapping is timing dependent and it is possible that inundation events generated through works may occur outside the SFI window for the 40, and 60 GL/d Riverland-Chowilla Floodplain SFI events (June to December). Larger threshold SFIs have an all year timing and therefore this will not affect the SFI equivalence mapping.

## 6. Operating regime (4.6)

The business case does not provide a detailed operating regime, however the initial proposal of potential operating regimes is at a level of detail appropriate for concept design stage and is sufficient for initial modelling purposes. It is anticipated that further modelling to support a more detailed operating plan will be undertaken as this project is progressed. Noted below are areas in which further work should be carried out in the development of detailed designs.

The business case sets out the role of each key asset for the range of operating scenarios. The preferred timing, frequency and duration have been detailed for each operating scenario in the proposed operating plan for the works.

The risks associated with operation of the works are addressed to an appropriate level for a concept design.

The design of the various assets is robust and allows for adaptive management of the scheme over time.

### Monitoring

There is not enough information about the monitoring activities to determine if there is sufficient monitoring planned to support operations and water accounting. Information about water entering,

flowing within and exiting the site is necessary for the effective management of environmental watering events and their co-ordination with other river operations activities.

#### Accounting for the delivery and use of environmental water

All watering sites will need fully-developed water accounting arrangements supported by well-resourced monitoring in order to determine environmental water use. There are a number of methods that could be used and it is expected that accounting arrangements will be similar to equivalent sites under The Living Murray. Information about water entering, flowing within and exiting the site is necessary for the effective management of environmental watering events and their co-ordination with other river operations activities.

Water returning to the River Murray from the assets should be measured to allow re-crediting where possible. The MDBA is working with Victoria on this through the PPM Implementation Plan for the River Murray System. The business case does not discuss linkages between this work and the proposal, for example how water use will be measured or estimated.

Where irrigation infrastructure is used to deliver water to environmental sites, it is expected that arrangements will be put in place to secure delivery and set out how competing demands will be managed.

#### Use of environmental water

There is the potential for interaction between the proposed project and constraints, though this is expected to moderate, not remove the benefits. For example, even if constraints are relaxed, the project allows for a directed, efficient delivery of environmental water and targeted inundation under dry conditions.

Achieving proposed flows will require close collaboration with river operators and other environmental water holders, such as the CEWH and VEWH. There is insufficient information to assess whether arrangements are in place to ensure that environmental water can be delivered to the asset. Delivering proposed flows to watering sites will involve the use of held environmental water and it may not be possible in practice to deliver flows according to the preferred timing, frequency and duration detailed in proposed operating scenarios. There may be issues with an environmental water holder's watering priorities and whole-of-system operational considerations and allowing for this is not apparent in the business case.

In particular, whether approvals/licences etc. are required to ensure the regulators can extract water from the river, and whether arrangements are in place to manage flows between MDBA and other river operators is not clear. The Reference Group to assist and advise on commissioning and operation for each project will include the CEWH and VEWH, providing opportunities for input at this stage. The business case does not describe any consultation with water holders during the development of the proposal, and does not identify environmental entitlements required.

## **7. Assessment of risks and impacts of the operation of the measure (4.7)**

The risk management approach adopted is consistent with the AS/NZS ISO 31000:2009 standard and the level of detail is appropriate for application at the concept design stage. However, a number of risks have not been mitigated in the current business case to a level which meets Guideline criteria, as noted below.

### Operation and maintenance

Information provided for ongoing operations and maintenance resourcing does not meet the phase 2 business case criteria and until this issue is resolved, there will be a significant risk for this project.

The risk assessment of potential operation impacts lists lack of funding for ongoing operation, maintenance and management as a high risk to project success. The proposed mitigation actions aim to reduce the residual risk to low and include maintaining strong relationships with funding bodies and suspending operations if there are insufficient resources. Decommissioning works and/or suspending operations are not suitable risk management actions as they would negate the SDL adjustment benefits. In addition, a lack of resources for maintenance would result in asset impairment quite quickly. Should resourcing be reinstated at some later point, operation of those assets may not be possible. A clear statement of ownership, funding and responsibility for ongoing operations and maintenance is required to meet phase 2 business case requirements.

This assessment does not consider the risk of insufficient resourcing for operations and maintenance from the perspective of being able to operate works into the future to achieve the benefits upon which the SDL adjustment is based. A failure to operate due to lack of funding would result in the intended ecological equivalent outcomes not being achieved, in effect a project in which the adjustment is not delivered on an ongoing basis. As such, this risk is not adequately mitigated without a clear funding source.

The MDBA considers that funding of operations and maintenance of these assets must be assured by the relevant state.

### Ownership and governance

While the business case outlines the issues to be taken into consideration for determining governance arrangements, it does not provide information on important issues such as the ownership of the assets created as part of this project and responsibility for on-ground operation of the works.

There is a risk that the works could become impaired if the organisation responsible for operating the works does not have an experienced engineering crew to promptly undertake repairs, especially following high flows.

### Water quality

Risks associated with water quality parameters outlined in chapter 9, part 2 of the Basin Plan have been addressed for the most part and have followed the AS/NZS ISO 31000:2009 Risk management—Principles and Guidelines.

Mitigation measures for significant risk areas have been outlined including analysis of real time salinity and modelling for BSMS purposes. The risk associated with salt wash-off from the floodplain and the mobilisation of salt from saline groundwater remain at moderate levels after mitigation measures are in place. This requires additional measures in the development of the detailed design, as identified by Lloyd Environmental, 2014.

## Other risks

All other significant operating risks and impacts have been identified and controls put in place to reduce these risks to acceptable levels for a concept design. Risks that retain a moderate risk rating once mitigation controls are implemented have additional considerations listed in the business case.

## 8. Complementary actions and interdependencies (4.9)

The business case partly meets the Guidelines criteria for complementary actions and interdependencies.

The interdependency with the operation of Lock 7 has been identified.

The interaction between the operation of these works and the effect on the measurement of flow to South Australia and the Lindsay River allowance needs to be resolved.

The MDBA expects that the proposed works will be operated as part of a reach based approach potentially including Walpolla, Carrs – Cappits – Bunberoo, Lock 7, 8, 9 weir pool manipulation, Mulcra Island, Lindsay Island, Chowilla, Pike and Katarapko. Careful consideration will need to be given as to how these works are best co-ordinated in order to achieve whole-of-system outcomes, and further details should be provided as to how best to manage co-ordinated watering to achieve outcomes as part of the next phase.

Linkages between constraints and the supply measure have not been addressed in the business case and should be considered where relevant in the assessment of the project.

## 9. Project governance and project management arrangements (4.11)

### 9.1 Legal and regulatory requirements (4.11.2)

The business case has provided most of the required legal and regulatory requirements and an appropriate management strategy for each. This criteria will be further reviewed in the Department of the Environment's assessment.

Some limitations to the information provided are:

- A possible need for legislative change for securing native vegetation offsets has been identified, but a management strategy for this change is not provided – however non-legislative options are also being explored.
- The business case flags that no new agreements need to be created with water holders in the Basin. This conclusion has been provided without any context around the consideration of the project's requirements for environmental water. It is noted that the Reference Group to assist and advise on the commissioning and operation for each project will include the CEWH and VEWH, providing opportunities for input at this stage. However consideration of how the timings and volumes of environmental water required might be accessed is not readily apparent.
- While the business case identifies that no changes to water sharing frameworks and river operations rules and practices are required, consideration of how the implementation of the project will be reflected in the Victorian Murray Water Resource Plan should be considered in the future.

### Easements and rights of access

In order to guarantee the ability to operate the project works into the future, the owner of the asset or its agent will need to obtain and hold:

- the right to construct, operate and maintain the assets and the specific land required for these assets including land needed to gain access to the assets; and
- rights of access to all land impacted by a project for purpose of implementing the operating regime in order to achieve the intended ecologically equivalent outcomes upon which the SDL adjustment is based.

Although the business case includes some information about the need for easements and access rights, there is insufficient information about who is responsible for ensuring they are obtained, or who the beneficiary of the rights will be.

The MDBA's experience with similar infrastructure suggests that not addressing these issues early can impact the effective operation of the assets. The business cases should include a commitment by the relevant state that they will obtain and hold these rights.