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MURRAY–DARLING BASIN AUTHORITY

Basin Salinity Management (BSM) Procedures

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Acknowledgement of the Traditional Owners of the Murray–Darling Basin

The Murray−Darling Basin Authority pays respect to the Traditional Owners and their Nations of the Murray−Darling Basin. We acknowledge their deep cultural, social, environmental, spiritual and economic connection to their lands and waters.

The guidance and support received from the Murray Lower Darling Rivers Indigenous Nations, the Northern Basin Aboriginal Nations and our many Traditional Owner friends and colleagues is very much valued and appreciated.

Aboriginal people should be aware that this publication may contain images, names or quotations of deceased persons.

Version control

Version	Revision date	Description of changes	Author/modifier	Distributed to
V0.12	2 December 2022	Final formatting and comments removed and/or addressed	Kelly Gibson	N/A
V1.0	1 March 2023	Inclusion of Risk Management chapter following BSMAP endorsement/ BSMAP endorsement of consolidated procedures	Kelly Gibson	N/A

Review Cycle

Updates are implemented as required following any significant changes to the content, and the need for a review will be considered by the relevant advisory panel each year.

MDBA Reference: D23/7504

Contents

Appendices

1 Introduction to the BSM Procedures

Over the period from 2016 to 2022 the MDBA, working in consultation with Contracting Governments through the Basin Salinity Management Advisory Panel (BSMAP), has prepared BSM procedures to update and replace the Basin Salinity Management Strategy (BSMS) Operational Protocols. The BSM Procedures are practical guidelines that provide the necessary detail to support the consistent implementation of the Basin Salinity Management 2030 (BSM2030) strategy, including the obligations set out in Schedule B to the Murray Darling Basin Agreement (the Agreement).

1.1 Background

In November 2015, the Murray-Darling Basin Ministerial Council approved the BSM2030 strategy to guide joint salinity management from 2015–2030. The strategy builds on the successes of its predecessors, the Salinity and Drainage Strategy (1988 – 2000) and the Basin Salinity Management Strategy (2001 – 2015) to deliver a strategic, cost-effective and streamlined program of coordinated salinity management for the Murray-Darling Basin to 2030.

Schedule B sets out the obligations for the Contracting Governments and the Authority for Basin salinity management. Schedule B was amended in 2018 to give effect to the BSM2030 strategy. This formalised the commitments of the Contracting Governments and created new or altered powers or duties for the Authority in relation to Basin salinity management under Schedule B. The amendment regulations included a new provision that the Basin Officials Committee (BOC) may make, amend or revoke BSM Procedures as required to give effect to Schedule B.

A timeline of basin salinity strategies, schedules, procedures and protocols is provided in Figure 1.

1.1.1 BSM Procedures

These BSM procedures replace the BSMS Operation Protocols. They have been prepared to provide the necessary detail to support salinity management practitioners involved in the implementation of the BSM2030 strategy.

This report contains all the BSM Procedures with the exception of the Modelling procedures. The Modelling procedures are part of BSM procedures, however, they contain specific and complex technical details and as such they were prepared separately to the process undertaken for the BSM procedures included in this report. Both documents will be published and made accessible on the MDBA website.

Within this document, the BSM Procedures have been organised to align with the key elements of the BSM2030 strategy.

Clause 40A of Schedule B sets out the requirements relating to the BSM Procedures, while clause 41 sets out the matters that may be dealt with in BSM Procedures. Clause 40A states that:

40A. BSM procedures

(1) The Committee may, from time to time, make, amend or revoke such procedures (***BSM procedures***) as it considers necessary, desirable or convenient to give effect to this Schedule.

(2) BSM procedures must not be inconsistent with any provision of the Agreement (including its Schedules) and are of no effect to the extent of any inconsistency.

(3) The Authority must publish BSM procedures on its website.

1.1.2 Principles

The MDBA, in consultation with the relevant advisory panel and working groups, may recommend to BOC that procedures be made, amended or revoked, consistent with the following high-level principles that BSM procedures:

- are prepared only where there is a need for further detail beyond Schedule B and the BSM2030 strategy
- respect the rights and powers of Contracting Governments and the Authority
- do not attempt to be prescriptive where no such need exists
- do not attempt to modify the intent of Schedule B.

1.1.3 Review and update

It is intended that the BSM Procedures will be kept current. A log of issues has been established to capture issues requiring update as they are identified, and each year BSMAP will review the log of issues and determine if any of the BSM procedures need to be revised. BOC approval of the revised BSM Procedures will only be sought if the changes are deemed to be substantial enough to warrant re-approval.

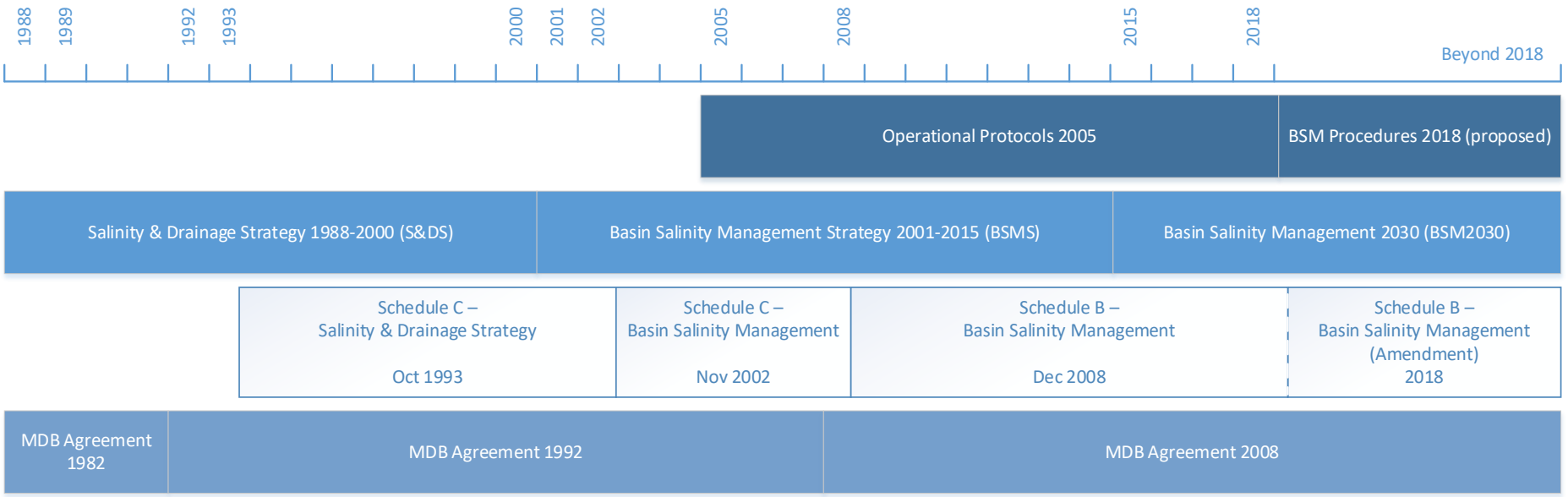


Figure 1 - Timeline of basin salinity strategies, Schedules, procedures and protocols

1.1.4 Glossary of terms

Accountable Action means a land or water management action undertaken after the nominated baseline date that is found to have a significant effect.

Action means:

(i) any work or measure; and
(ii) any alteration to, or cessation of, any work or measure

An action may include, for example:

- Salt Interception Schemes
- New irrigation development
- Changes in water management operating policies
- Changes in consumptive use of water in the system
- Recovery, delivery or use of environmental water
- New drainage works or significant alternations to existing drainage works
- Reduction in drainage accessions due to changes in irrigation management practises
- Growth in groundwater diversions and consequent effects on river flows
- Broad scale land use change including revegetation and clearance
- Other direct human induced activity for which the impact on the river, either immediately, or within 100 years, is significant

Approved models or methods

These are models and methods approved by the MDBA in accordance with Clause 38 of Schedule B of the Agreement. More detail is provided in the Modelling procedures.

Audit involves the Independent Audit Group for Salinity assessing the performance of partner governments and the MDBA in implementing the BSM2030 strategy and the provisions of Schedule B – including the methods used to quantify and record entries on the salinity registers. The auditing cycle is biennial. More detail on auditing can be found at Independent audit and assessment.

Audit and reporting plan

The audit and reporting plan provides details pertinent to the relevant audit and comprehensive reporting cycle.

This includes:

- providing information on context, priorities, reporting requirements, timelines and meeting schedules
- clearly identifying new developments and matters progressed since the last audit to inform continuous improvement
- specifying timelines to align with comprehensive reporting.

Baseline Conditions are the conditions that govern the movement of salt through the land and water within the Basin on 1 January 2000. It includes the salinity impacts of land and water management actions that took place prior to a nominated baseline date that have materialised within the river by

2000, but does not include the impact of management actions that took place after that nominated baseline date.

Baseline Date means:

(i) With respect to New South Wales, Victoria and South Australia – 1 January 1988; and
(ii) With respect to Queensland and the Australian Capital Territory – 1 January 2000;

Basin Plan is a plan that determines the amount of water that can be extracted or taken annually from the Basin for consumptive use (urban, industrial and agriculture).

Basin Salinity Target is the average river salinity target at Morgan, South Australia which is to maintain the simulated salinity below 800 EC for at least 95 per cent of the time; modelled over the 1975 to 2000 Benchmark Period.

Basin State means New South Wales, Victoria, Queensland, South Australia and the Australian Capital Territory.

Benchmark period is an observed climatic sequence over a defined period (determined to be the period 1 May 1975 to 30 April 2000) that is representative of hydrological variability across the Basin. It is used as a basis for simulating catchment responses at specified scenario dates (e.g. 2015, 2030, 2050 and 2100).

Basin Officials Committee (BOC) is the committee of officials from the six Basin governments established under the Murray-Darling Basin Agreement.

Basin Salinity Management Advisory Panel (BSMAP) refers to the advisory panel currently advising the MDBA and BOC on the implementation of Schedule B. BSMAP is a tier 2 committee established under the joint governance arrangements and reports to the BOCA. More detail is available at Governance.

BSMS refers to the Basin Salinity Management Strategy 2001-2015.

BSM2030 is the Basin-wide salinity strategy that replaced the BSMS in 2015.

BSM Procedures refers to these procedures. They are practical guidelines that provide the necessary detail to support the consistent implementation of the BSM2030 strategy, including the obligations set out in Schedule B. The BSM Procedures have replaced the BSMS Operational Protocols.

BSMS Operational Protocols refers to the protocols which gave effect to BSMS and Schedule B (formally Schedule C) to the Murray-Darling Basin Agreement.

CEWH is the Commonwealth Environmental Water Holder who manages water acquired by the Australian Government for the environment.

CEWO refers to the Commonwealth Environmental Water Office which is the office of the Commonwealth Environmental Water Holder.

Collective Account is the account used by Contracting Governments to hold credits and debits collectively on the registers.

Contracting Government means any of the Governments of the Commonwealth, New South Wales, Victoria, South Australia, Queensland and the Australian Capital Territory.

Constructing Authority means:

(a) the Contracting Government by which:

(i) any works authorised by this Agreement or the former Agreement have been, or are being, or are to be constructed;

(ii) any measures authorised under this Agreement or the former Agreement have been, or are being, or are to be executed; or

(b) any public authority or any Minister constituted or appointed for the purpose of constructing such works or executing such measures.

Delayed salinity impacts (also referred to as the 'legacy of history' salinity impacts) means a salinity impact which occurs after 1 January 2000, but which:

(i) In the case of New South Wales, Victoria or South Australia, is attributable to an action taken or decisions made in the State before 1 January 1988; and

(ii) In the case of Queensland or the Australian Capital Territory, is attributed to an action taken or decision made in that State before 1 January 2000.

EC is a unit of measurement for electrical conductivity, expressed in microsiemens per centimetre (µS/cm), measured at 25 degrees Celsius, commonly used as an indicator of water salinity (salt concentration).

End-of-Valley Target (EoVT) means a target introduced under the BSMS to serve as an indicator of catchment health and help assess and manage the impacts of salt exports from catchments to the shared water resources.

Estimating the salinity impact at Morgan: The MDBA River Model is the current approved model used to estimate the salinity impact at Morgan for years 2000, 2015, 2030, 2050, 2100. It is described in the Modelling procedures.

- Interpolation is the method used to estimate the current years' salinity impact by extrapolating between modelled predictions of salinity impact at Morgan.
- The cost function calculation used to determine the salinity cost effect (credits and debits) is described in the Modelling procedures.

IAG-Salinity refers to the Independent Audit Group for Salinity. More detail is available at Governance.

Joint works or measures means physical works or measures that change in-stream salinity, either through a reduction in salt loads or through a changed flow management regime, for which partner governments have formally agreed to cost sharing.

Joint Program is a program of salt interception works implemented under the BSMS to offset development activities and delayed salinity impacts with the aim of reducing modelled average daily salinity at Morgan by 61 EC.

Legacy of history salinity impacts refers to delayed salinity impacts arising from historical land and water management decisions taken before the nominated baseline date for which the Contracting Governments accept joint responsibility.

MDBA refers to the Murray-Darling Basin Authority, as agent of the joint program.

Monitoring involves the collection, analysis, reporting and use of information for activities conducted under the BSM2030 strategy.

MinCo refers to the Murray-Darling Basin Ministerial Council.

Murray-Darling Basin Agreement refers to Schedule 1 of the *Water Act 2007* (Cth).

Project Steering Committee (PSC): the MDBA typically engages a PSC for reviews and assessments of actions under the joint program. State Contracting Governments typically engage a PSC for reviews and assessments of state actions.

A PSC may include, but is not limited to, representatives from:

- Lead agency
- State Constructing Authority
- State Contracting government with an interest in a shared scheme, where relevant
- MDBA Assets
- MDBA Salinity Program
- Or any other personnel as nominated by representatives of the above

More details on specific arrangements for reviews of Joint works or measures is provided in Works or measures.

Proposal means any proposal relevant to any action that could have a significant effect.

Register A contains details of any actions after the baseline date (1st January 1988) that are considered to have a Significant Effect, excluding those actions that have the express purpose of offsetting Delayed Salinity Impacts. Register A also brings forward information about works carried out under the former Salinity and Drainage Strategy.

Register B records Delayed Salinity Impacts due to actions taken before the baseline date applicable to each state (the 'legacy of history' for which the Contracting Governments accept joint responsibility). It also contains details of the predicted future effects of actions aimed at addressing Delayed Salinity Impacts, including contributions from Joint Works or Measures, and their salinity costs.

Relevant advisory panel/Relevant working group: relevant advisory panels and/or working groups are committees established under either Tier 2 of the Joint Governance arrangements or Section 203 of the Water Act providing core governance functions for basin salinity management, specifically:

- The panel advising the MDBA and BOC on the implementation of Schedule B
- The working group advising the MDBA and BOC on the design, construction and operation of Salt Interception Schemes

However, a relevant advisory panel does not include a panel that is established for the purposes of either clause 5 or clause 38 of Schedule B.

A description of the governance arrangements for basin salinity management under BSM2030 is provided in Governance.

Reporting plan: a reporting plan is prepared during a status reporting year when auditing is not being undertaken. The reporting plan provides information on context, reporting requirements and timelines for a status reporting year. Further details may be found at Reporting and Governance.

Responsible for the work or measure: Contracting Government nominated under sub-clause 56(5) of the Agreement.

Salinity (or salt concentration) is the concentration of sodium chloride or dissolved salts in water, usually expressed in EC units or milligrams of total dissolved solids per litre (mg/L TDS).

Salinity credit is a reduction in average salinity cost effect.

Salinity cost effect is the change in average salinity costs resulting from an action.

Salinity debit is an increase in average salinity cost effect.

Salinity effect means a change in the average salinity at Morgan resulting from any action, that leads to a salinity cost effect.

Salinity Registers are a credit and debit based salinity accounting system which tracks all actions that are assessed to have a significant effect on river salinity. The salinity registers provide a primary record of Contracting Government accountability for actions that affect river salinity.

Salt load is the amount of salt carried in rivers, streams, groundwater or surface run-off, in a given time period. The salt load is often expressed in kg/day, tonnes/day or tonnes/year.

Schedule B is a schedule to the Murray-Darling Basin Agreement (Schedule 1 to the *Water Act 2007* (Cth)) that provides the accountability framework for the implementation of the BSM2030 by the partner governments.

SDL means long-term average Sustainable Diversion Limit.

Shared water resources refer to the water resources of the River Murray System as defined in Section 86A (3) of the *Water Act 2007* (Cth)).

Shared work or measure is a work or measure that comprises of joint works and State actions.

Significant effect is a change in average daily salinity at Morgan which the MDBA estimates, over the benchmark period, will be at least 0.1 EC by the year 2100. A significant effect is also a salinity impact which the Authority estimates will be significant which is important for consideration of salinity impacts which may occur below Morgan.

A significant effect can result from a change in the magnitude or timing of either or both of salt loads and water flows. The 0.1 EC change may occur at any time by the year 2100 and could be either an increase or a decrease.

Some types of actions that lead to an improvement in the long term can have an adverse impact in the short term, and vice versa.

Salt Interception Technical Working Group (SITWG) refers to the working group currently advising the MDBA and BOC on the design, construction and operation of Salt Interception Schemes. The working group is established as a committee under Section 203 of the Murray-Darling Basin Agreement. For more detail see Governance.

State actions means any accountable action that is designated wholly or partly as a State action in accordance with clause 20 or 24 of Schedule B and the relevant BSM procedures.

S&DS works or measures means works or measures entered on the Register maintained under the Salinity and Drainage Strategy.

Technical Working Group on Salinity Modelling (TWGSM) is a temporary working group established to advise the Authority and BSMAP on the proposed transition to a new MDBA River Murray modelling platform and the proposed amendments to the estimate of salinity and salt loads under baseline conditions. For more detail see Governance.

The Living Murray program (TLM) refers to the environmental watering program being a partnership between the Commonwealth and NSW, Victorian, South Australian and ACT governments and managed by the MDBA.

2 Basin-wide Accountability

2.1 Introduction to the accountability framework

The accountability framework commits Contracting Governments to maintain agreed salinity levels and ensure actions that increase river salinity are offset by investment in actions to reduce salinity.

The main feature of the accountability framework is the salinity registers which track significant increases or decreases in modelled salinity impacts attributable to Contracting Governments, individually or collectively.

The Basin Salinity Target sets a measurable goal for basin salinity management, against which the cumulative impacts of actions in the basin can be tracked.

On-going monitoring, reporting, review and independent audit, ensures the registers and other elements of the accountability framework are maintained.

These accountability arrangements provide Contracting Governments with a transparent and defensible basis for salinity management investment and decision making across the Basin.

2.1.1 This procedure

This procedure introduces the accountability framework including the evolution of the framework, key concepts and features. It is descriptive, rather than prescribing the specific arrangements for basin-wide salinity accountability under the BSM2030 strategy.

2.1.2 Related procedures

Basin-wide accountability procedures include:

- Salinity impact assessment process
- Register entries
- Conducting reviews and assessments
- Environmental water accountability
- Register operations

These procedures prescribe the specific arrangements for basin-wide salinity accountability under the BSM2030 strategy.

2.1.3 Background

2.1.3.1 Salinity & Drainage Strategy (S&DS)

The Salinity & Drainage Strategy (1988 to 2000), and the accompanying Schedule C to the Agreement, provided a framework for the New South Wales, Victorian, South Australian and Commonwealth Governments to jointly manage River Murray salinity. Under the S&DS, each of these State Contracting Government became accountable for actions significantly affecting river salinity taken within its jurisdiction since 1 January 1988.

The S&DS introduced a pollution offsets approach to basin salinity management. The impacts of actions were quantified on salinity registers and each State Contracting Government was responsible for recording any action that increased or decreased salinity levels in the River Murray after 1988, and to maintain these impacts in balance.

The key feature of action undertaken to reduce river salinity was the joint investment by the Commonwealth, New South Wales, Victoria and South Australia in works and measures (S&DS works or measures) to reduce average salinity at Morgan by 80 EC. The benefits of the S&DS works or measures were distributed between Victoria, New South Wales and the river.

2.1.3.2 Basin Salinity Management Strategy (BSMS)

The Basin Salinity Management Strategy (2001 to 2015) extended the accountability framework established under the S&DS. A number of improvements were made to the framework, reinforcing the pollution offsets approach and strengthening the role of the salinity registers in basin salinity management.

The BSMS enabled accountable actions that occurred right across Murray-Darling Basin catchments to be accounted where they had a significant effect. It also ensured that the delayed salinity impacts from actions taken before individual states entered into the Agreement could be accounted for in the future.

The accountability framework was formalised under Schedule C (subsequently under Schedule B) to the Agreement, as was the commitment of the Australian Capital Territory and Queensland.

The Basin Salinity Target was introduced for the first time under the BSMS and a process for salinity monitoring, reporting and audit was established to track progress against the target.

The Commonwealth, Victorian, New South Wales and South Australian governments further invested in joint actions to reduce average salinity at Morgan, this time with a Joint Program of joint works or measures (BSMS works or measures) to reduce average salinity at Morgan by 61 EC. The benefits were distributed between the Commonwealth, Victoria, New South Wales and South Australia to offset delayed salinity impacts as well as impacts of new accountable actions. The Commonwealth agreed to allocate its share of the benefit to Victoria, New South Wales and South Australia to offset delayed salinity impacts.

2.1.3.3 Basin Salinity Management 2030 (BSM2030) strategy

Contracting Governments have demonstrated their confidence in the BSMS accountability framework by committing to the ongoing use and maintenance of the registers under the BSM2030 strategy (2016 to 2030).

This accountability framework has been brought forward for the BSM2030 strategy, with some key adjustments to reflect the current operating environment.

A timeline of basin salinity strategies, Schedules, procedures and protocols is provided in Introduction.

2.1.4 Salinity registers

The register approach was developed using the principles of a pollution trading framework. It provides a mechanism to offset increased salinity impacts (debits) through actions that reduce salinity impacts (credits).

Cl. 1(2)

The registers are maintained as a record of salinity impacts on the river. They track all actions that are assessed to have a significant effect, and display the attribution of arising salinity impacts to the relevant Contracting Governments, individually or collectively.

Cl. 16(1) The salinity impact offset mechanism is given effect by Schedule B which requires Contracting Governments maintain a positive net register balance. It is this relative representation of jurisdictions' impact on the river that ensures due consideration is given to potential negative salinity impacts while driving investment in offsets to correct past and future impacts.

Two salinity registers, Register A and Register B, are maintained to separate out the management response for the impacts of contemporary actions from that of historical actions.

More details on the specific arrangements for designating credits and debits to Registers A and B is provided in Register entries.

2.1.4.1 Register A

Cl. 15(3) Register A is designed to account for accountable actions, that is, any actions taken after the nominated baseline date that are considered to have a significant effect.

All accountable actions taken after the nominated baseline date are recorded on Register A in the relevant State, Commonwealth and Collective Account. This includes works and measures carried out under the BSMS and S&DS.

Cl. 15(4) The exception to this arrangement is any actions that are undertaken expressly for the purpose of offsetting delayed salinity impacts entered on Register B (see below).

2.1.4.2 Register B

Cl. 15(4) Register B was created to address the 'Legacy of History' salinity impacts that arose from historical land and water management decisions. Register B records delayed salinity impacts due to actions taken before the baseline date applicable to each state (the 'legacy of history' for which the Contracting Governments accept joint responsibility). It also contains details of the predicted future effects of actions aimed at addressing delayed salinity impacts, including contributions from Joint Works or Measures, and their salinity costs.

Some actions undertaken prior to the nominated baseline date have a delayed salinity impact that does not occur until after 2000. Delayed salinity impacts which the MDBA considers may have a significant effect must be entered on Register B.

In some cases, part of the salinity impact may occur before, and part during and after the year 2000. In these situations, the part before 2000 will already be included in the suite of baseline conditions and only the part of the salinity impact that occurs during and after 2000 will be included as a delayed salinity impact on Register B. Figure 2 below provides an example of this situation for Victoria, NSW and South Australia. Figure 3 provides an example for QLD and ACT.

Cl. 15(4) Accountable actions undertaken expressly for the purpose of offsetting delayed salinity impacts as nominated by the relevant Contracting Government accordingly, are entered as credits on Register B. Consistent with accountable actions on Register A, Contracting Governments are accountable for these Register B credits after the relevant nominated baseline date. The intent of this arrangement is consistent with the approach taken to attribute salinity impacts of joint works or measures predominantly (although not exclusively) constructed to address delayed salinity impacts.

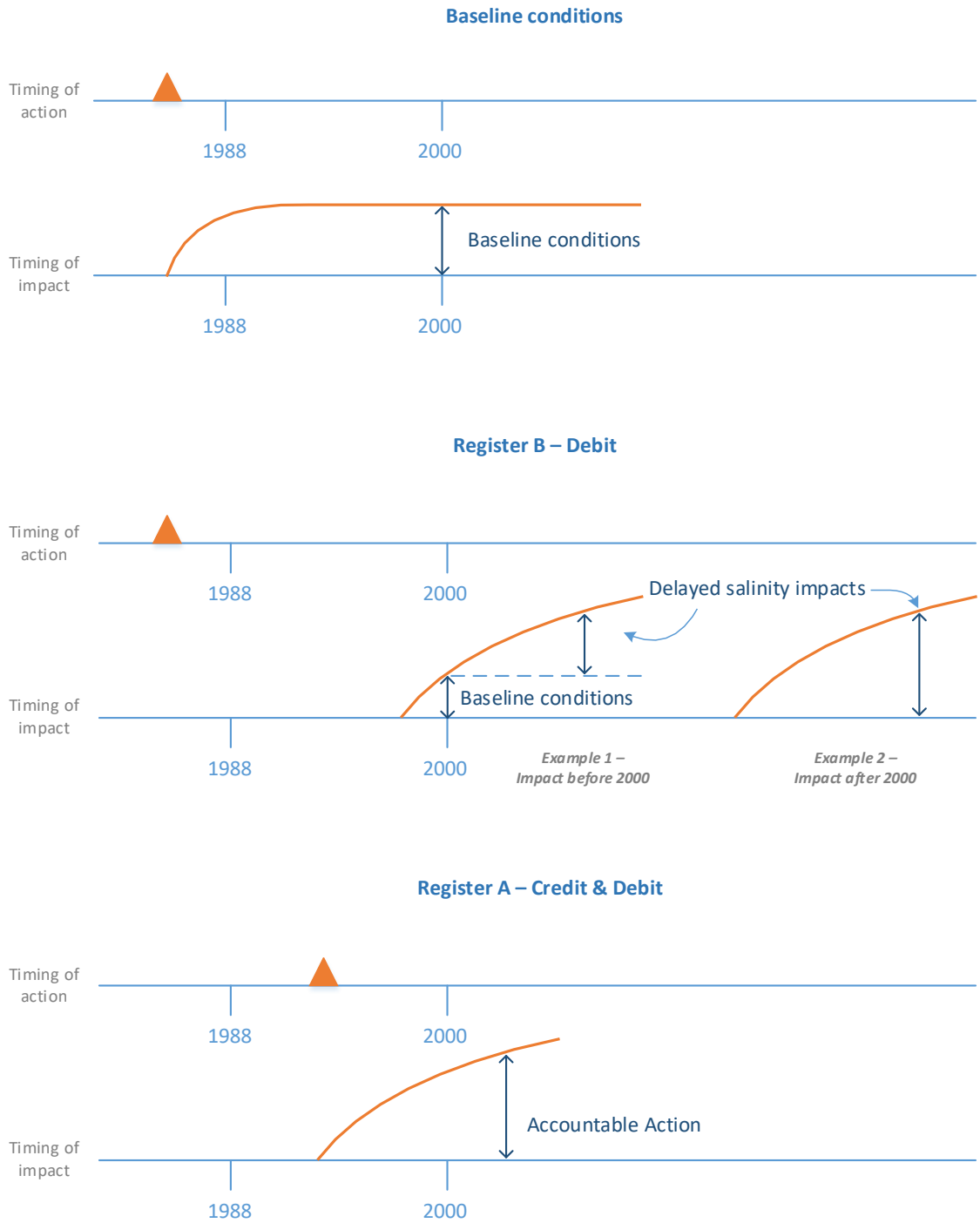


Figure 2 - Examples of how salinity impact of actions are accounted for in the baseline, or entered on Register A and Register B for Victoria, NSW and South Australia

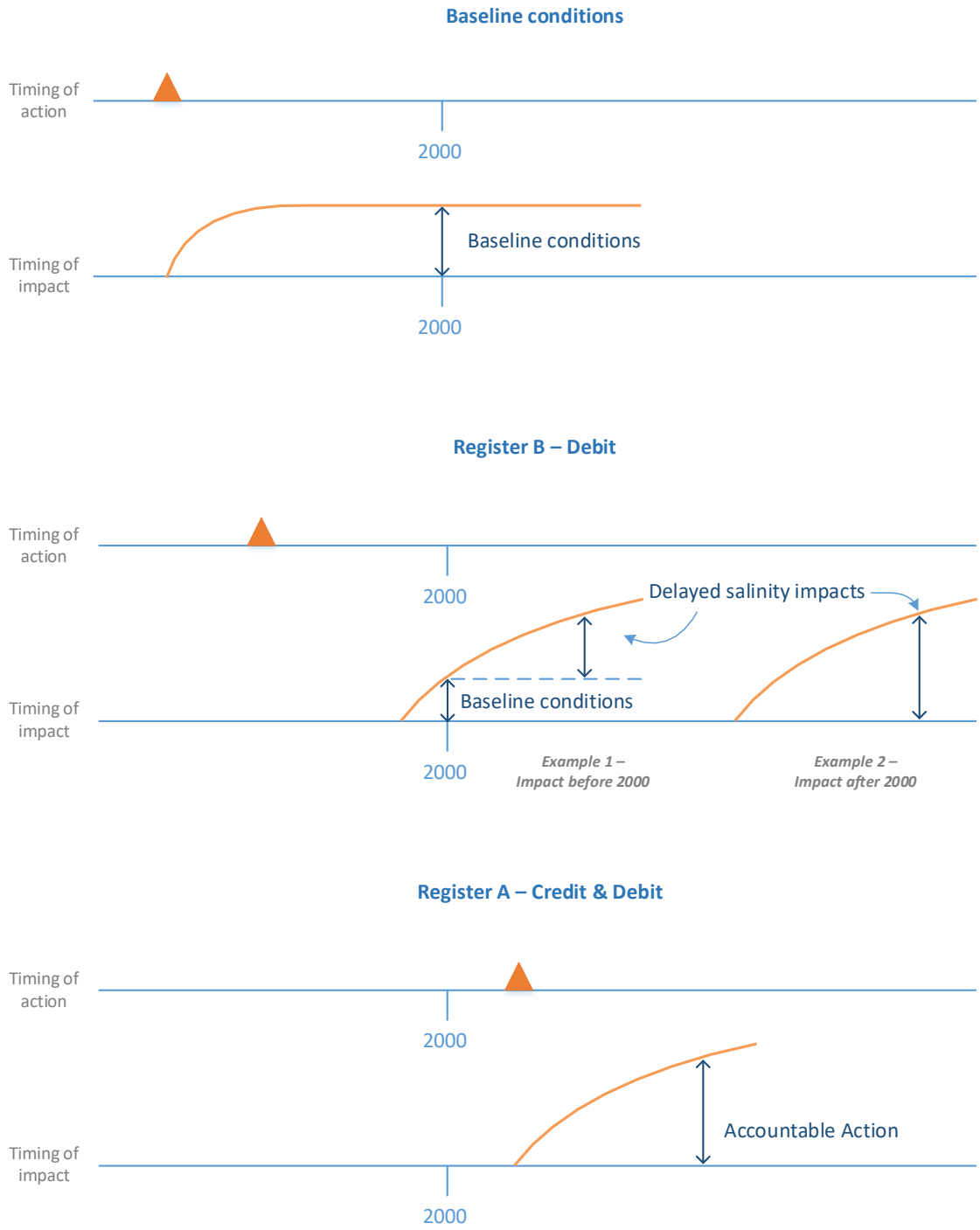


Figure 3 - Examples of how salinity impact of actions are accounted for in the baseline, or entered on Register A and Register B for Queensland and ACT

2.1.4.3 Register accounts

The registers include accounts for each of the Contracting Governments, and a Collective Account, to keep track of salinity impacts attributable to Contracting Governments, individually or collectively. State Contracting Governments maintain register accounts on both Register A and B, while the Commonwealth and Collective Accounts are maintained on Register A only.

At the time of writing, Queensland and the ACT did not have any salinity register entries.

Cl. 16(1)

Contracting Governments must maintain a neutral or positive net register balance, and a neutral or positive balance in Register A for accounts for which they are responsible. This includes the Collective Account for which Contracting Governments are jointly responsible.

Register entries sets out responsibilities for register accounts and arrangements for attributing the salinity impacts of different actions to these accounts.

2.1.4.4 The Collective Account

The purpose of the Collective Account is to further streamline the accountability framework and reduce accounting costs by allowing Contracting Governments to hold credits and debits collectively on the registers.

Cl. 16A

Contracting Governments jointly must ensure that the Collective Account has salinity credits equal to or greater than its salinity debits.

If the Collective Account converges toward zero, the MDBA may initiate a review of potential impacts and propose further action to mitigate impact to the Collective Account.

2.1.5 Salinity impacts

2.1.5.1 Salinity impacts

Estimates of the salinity impacts arising from accountable actions and delayed salinity impacts are entered on the registers as an outcome of the salinity impact assessment process.

Salinity impacts are expressed on the registers in two ways, as the change in physical salinity effect (EC) and corresponding salinity cost effect ($ millions/year). Credits and debits are expressed as cost effects and used to determine register balances.

Cost effects relate levels of river salinity to the economic impact on the various River Murray water users. The cost effects are determined using salinity cost functions which have been developed and reviewed over a period of time and consider agricultural, household, commercial and industrial consumers and government instrumentalities.

Cost effects also allow for the impacts of actions taken upstream of Morgan to be considered on areas below Morgan.

The decision to include both economic and physical salinity arose because of concerns from mid-Murray irrigators as to the adverse economic effects to water users from drainage schemes upstream of salt interception schemes.

While cost effects, or the credits and debits, on the register provide the final position of states in terms of accountability for salinity impact, the physical salinity effect or EC is commonly referred to in practice as it is more easily understood.

The MDBA River Murray model is used to estimate salinity impacts from salt load, flow and salinity input data. The MDBA River Murray model and the method for determining cost effects from salinity effects (EC) is described in Modelling.

2.1.5.2 Projected future and current salinity impacts

Salinity impacts (EC) are entered on the registers as predictions of current and future impacts at Morgan generated during the salinity impact assessment process.

Salinity impacts (EC) are entered in the registers for key years 2000, 2015, 2030, 2050 and 2100 to provide an indication of any trends in the short, medium and long term.

Cl. 19(1), 20(3)

The salinity impact (EC) for the current year is estimated by interpolating between relevant data points.

Salinity cost effects are entered on the registers for the current year only.

2.1.6 Key features of the accountability framework

2.1.6.1 Basin Salinity Target

Cl. 7(1)

The Basin Salinity Target is to maintain the average daily salinity at Morgan at a simulated level of less than 800 EC for at least 95% of the time, under the hydrologic conditions of the benchmark period. The hydrological conditions of the benchmark period are used to standardise the Basin Salinity Target assessment.

Achievement of the Basin Salinity Target is assessed by the MDBA using approved models. The method used to assess achievement of the Basin Salinity Target is described in Modelling.

2.1.6.2 Benchmark period

The biggest influence on the variability of flows, salinities and salt loads in the Murray Darling Basin is climate variability. The benchmark period is used to eliminate the influence of climatic variability on salinity impact assessments.

The benchmark period is an observed climatic sequence over a defined period, used consistently in models to standardise the outputs of salinity impact assessments and the Basin Salinity Target. This enables prediction of a combination of actions and allows the impact of actions to be tracked independently of fluctuations in hydrological conditions.

Data on flow, salinity and salt loads must also be expressed over a period of at least 20 years for it to be directly useful in determining whether a percentage probability of non-exceedance over the long term is being met or not. The benchmark period has been set over a 25 year period, 1 May 1975 to 30 April 2000, to encompass a range of hydrological and climatic conditions in the basin.

Examples of hydrological and climatic sequences of the benchmark period are provided in Appendix 1.

2.1.6.3 Significant effect

Cl. 18(3)

A significant effect is a change in average daily salinity at Morgan which the MDBA estimates that, over the benchmark period, will be at least 0.1 EC by the year 2100.

A significant effect can result from a change in the magnitude or timing of either or both of salt loads and water flows. The 0.1 EC change may occur at any time by the year 2100 and could be either an increase or a decrease.

Some types of actions that lead to an improvement in the long term can have an adverse impact in the short term, and vice versa.

Cl. 18(3)

A significant effect is also a salinity impact which the MDBA estimates will be significant. This is important for consideration of salinity impacts which may occur below Morgan.

2.1.6.4 Accountable actions

Any land or water management action undertaken after the nominated baseline date that is found to have a significant effect.

2.1.6.5 Delayed salinity impacts

Salinity impacts of actions may take many decades to take an effect and manifest in the rivers or their salinity response curve may not be linear in the first 30 years. 'Legacy of History' actions undertaken in the catchments are an example of delayed salinity impacts recorded on the registers.

In these cases and for actions that took place prior to the nominated baseline date, it is necessary to account for these impacts that occur after 1 January 2000, separately to accountable actions.

2.1.6.6 Nominated baseline date

The baseline date represents the point in time where basin states commitment to basin-wide salinity accountability was formalised:

- For Vic, NSW and SA this is 1 January 1988
- For QLD and ACT this is 1 January 2000

2.1.6.7 Baseline conditions

The accountability framework relies on the definition and adoption of an agreed set of baseline conditions as the basis for understanding the change in salinity impact due to accountable actions and delayed salinity impacts in the basin. These baseline conditions are the conditions that govern the movement of salt through land and water at a given point in time.

This includes the conditions associated with:

- Water use
- Land and water policies and practices
- River operating rules
- Salt Interception Schemes
- Run-off and salt mobilisation processes
- Groundwater status and conditions

For the purpose of the accountability framework, these give rise to estimates of salinity, salt load and flow regime at the Basin Salinity Target site (Morgan) and other locations of interest at 1 January 2000.

To avoid duplication with register entries, baseline conditions include only impacts that occurred before 1 January 2000 associated with actions that took place before the nominated baseline date. This is described above in Figure 2.

Actions that took place after 1988 which caused salinity impacts before 2000 for Victoria, NSW and South Australia, are accountable actions, and as a result the salinity impacts arising from these actions are not included in the baseline (at 1 January 2000).

NOTES

Collectively

Credits and debits entered in the collective column are attributed to Contracting Governments collectively

Salinity impact assessment process

See Salinity impact assessment process for a full description of the process used to generate register entries from a proposal. See Conducting reviews and assessments for a description of the arrangements for the detailed assessment.

Salinity cost functions

Cost functions have been developed to reflect the estimated economic effect of rising salinity levels in the basin. This includes costs to agricultural water users, as well as costs to industrial and domestic water users and takes into account the best available information about land use and gross margin conditions at the time of estimation.

Salinity cost functions were last updated during the BSMS to reflect the method developed by GHD and the Allens Consulting Group.

Interpolating

Interpolation involves estimating the value of an intermediate data point by assuming a linear relationship between two adjacent data points. For the purpose of the salinity registers, this approach is used to predict the current years' impact by extrapolating between modelled predictions of impact at 2000, 2015, 2030, 2050 and 2100.

This approach was adopted in 2010 following recommendation of the BSMS Mid-Term Review that consideration be given to improving the consistency between calculation methods used for Register A and Register B components.

The approach superseded the '50 year ticking clock' for Register B debits and '30 year average' approach used for all other register entries as it would enable Register A and Register B to be summed with confidence. Analysis undertaken following the BSMS Mid-Term Review indicated that the interpolation was no less precautionary than previous approaches.

Appendix 1. Benchmark period examples

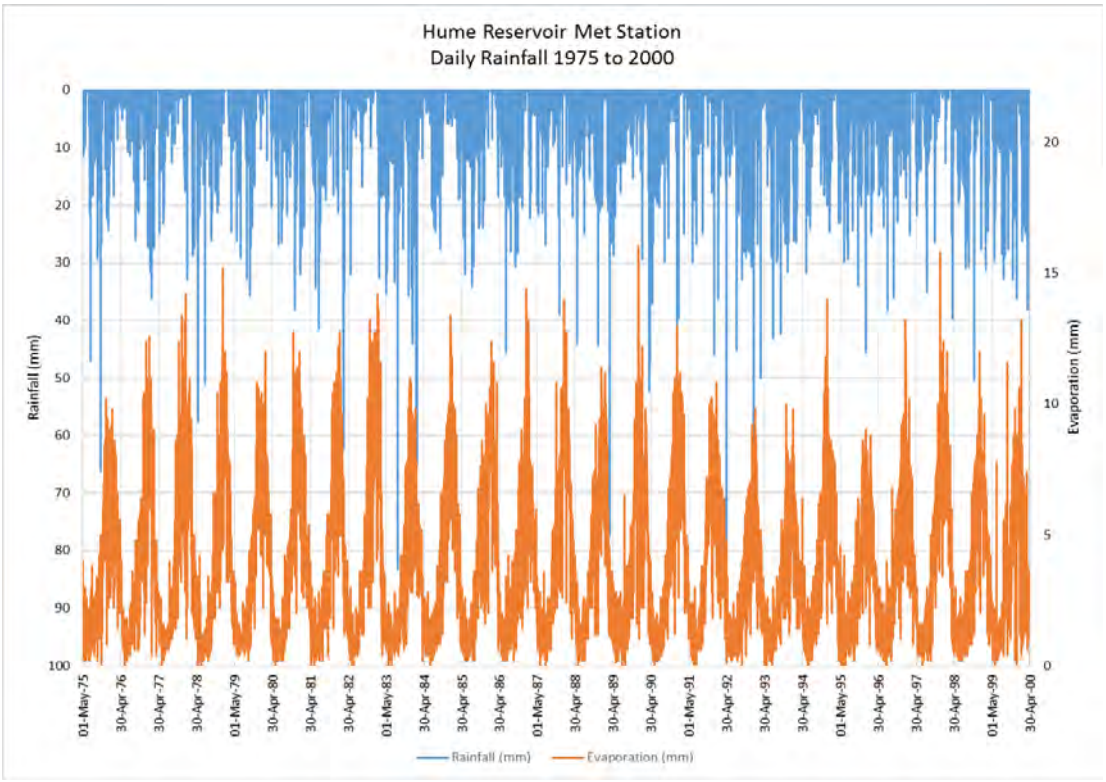


Figure 4 - Examples of climate and hydrological sequences of the benchmark period - Hume Reservoir Met Station

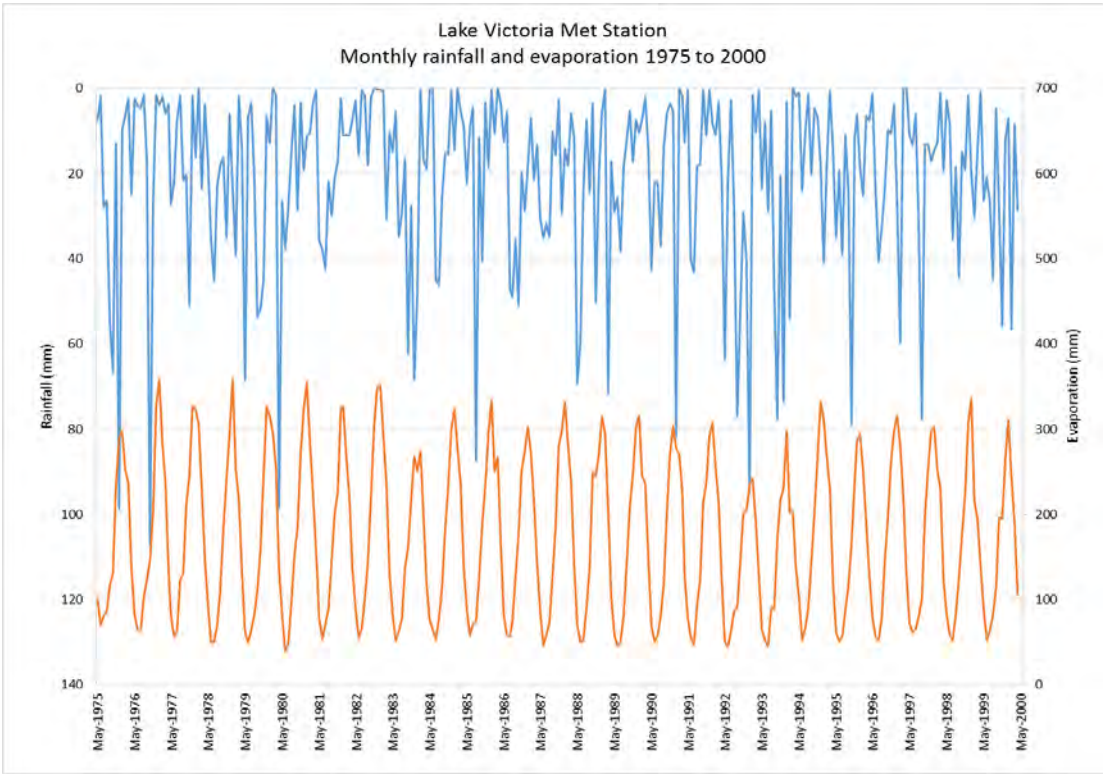


Figure 5 - Examples of climate and hydrological sequences of the benchmark period – Lake Victoria Met Station

2.2 Register entries

Salinity impacts of accountable actions and delayed salinity impacts are entered on the registers according to a set of rules agreed to by Contracting Governments and documented in Schedule B to the Murray-Darling Basin Agreement.

These rules distribute credits and debits fairly between Contracting Governments and in a manner that acknowledges changes over time in Basin Salinity Management.

This includes arrangements for entering salinity impacts on the registers according to:

- **Timing of entries** – Whether the action generates a credit or a debit
- **Entry on register A or B** – Whether the action deals with the impacts of historical actions (delayed salinity impacts) for which the Contracting Governments accept joint responsibility or contemporary actions (accountable actions) for which the Contracting Governments accept individual responsibility.
- **Entry by register account** – The Contracting Government or Governments accountable for the actions

In some cases, it may be appropriate to remove or replace register entries to provide an up to date representation of salinity impacts and accountable actions. Arrangements are in place to allow this to occur including where an accountable action is reviewed, superseded or it is estimated that the action no longer generates a significant effect.

2.2.1 This procedure

This procedure sets out the rules for entering the salinity impacts of accountable actions and delayed salinity impacts on the Registers. These rules apply to new and revised assessments of accountable actions and underpin existing register entries.

It also includes arrangements for removing or replacing a register entry.

2.2.2 Related procedures

Introduction to the accountability framework describes the accountability framework including key concepts and features.

The process for assessing a proposal or new accountable actions is set out in the Salinity impact assessment process.

Arrangements for the detailed assessment of salinity impacts are described in Conducting reviews and assessments.

Register operations sets out the arrangements for maintaining the registers, including arrangements following a review, and the management of register balances.

Works or measures sets out specific arrangements for attributing the salinity impacts of Joint Works and Measures.

Environmental water accountability sets out specific arrangements for the attributing the salinity impacts of environmental water actions.

2.2.3 Timing of entries on the registers

Cl. 22(1) Salinity credits must be entered on the registers when the accountable action that gives rise to them is declared effective

Cl. 22(2) Salinity debits resulting from accountable actions must be entered on the registers prior to beginning the action that gives rise to them

Salinity debits resulting from delayed salinity impacts must be entered on the registers within a year of the debits being estimated

When entries are made on the registers any prior provisional entries must be deleted

2.2.4 Entry on Register A or Register B

Cl. 15(3) The following arrangements apply to the entry of salinity impacts on Register A:

- An entry must be made for any action undertaken after the nominated baseline date which has an impact after the nominated baseline date, except where:
  - Cl. 15(4) The action is undertaken expressly with the purpose of offsetting delayed salinity impacts
- Works and measures undertaken under the S&DS must be recorded on Register A

Cl. 15(4) The following arrangements apply to the entry of salinity impacts on Register B:

- Delayed salinity impacts due to actions taken before the nominated baseline date, where the impact occurs after 1 January 2000, must be entered on Register B
- Where part of a delayed salinity impact occurs before and part occurs after 1 January 2000:
  - the part occurring after 1 Jan 2000 must be entered on Register B
  - the part occurring before 1 Jan 2000 must be included in the baseline
- Actions undertaken after the nominated baseline date that are undertaken expressly for the purpose of offsetting delayed salinity impacts on Register B, must be entered on Register B
- Contracting Government/s must nominate where an action is undertaken for the express purpose of offsetting delayed salinity impacts when bringing forward a proposal for salinity impact assessment

2.2.5 Entry by register account

Cl. 21, 21A The MDBA must attribute credits and debits to the relevant Contracting Government or Governments by entering the credits and debits on the register account for which they are responsible

Cl. 21A(3) If credits and debits are expected to be attributed to the Collective Account BOC must determine which Contracting Government is to be responsible for:

- Providing all relevant information about the accountable action to the MDBA for the assessment
- Monitoring and reviewing the accountable action

The arrangements for entering credits and debits by register account are set out in Table 2.1 below

Cl. 21B A record of the proportions in which salinity credits and debits are attributed for joint works or measures and S&DS works or measures must be established and maintained. For S&DS works or measures this is available in Table 3.1 of Authorised works or measures. For joint works or measures this is available in Table 3.2 of Authorised works or measures.

Table 2.1 - Default arrangements for entering credits and debits by register account

Accountable action type	Default arrangements for entering credits and debits
State action	Relevant Basin State account
Shared state action	Shared between relevant Basin State accounts in a proportion agreed by the relevant State Contracting Governments
Joint works or measures	According to agreed arrangements for attributing the benefits of joint works or measures (see Table 3.2 – Attribution of salinity benefits arising from joint works or measures)
Shared works or measures	Joint works or measures component according to agreed arrangements for attributing the benefits of joint works or measures (see Table 3.2 – Attribution of salinity benefits arising from joint works or measures State action component to the relevant state account
S&DS works or measures	According to agreed arrangements for S&DS work or measures (see Table 3.1 – Attribution of salinity benefits arising from S&DS works or measures)
Environmental water actions excluding TLM	According to agreed environmental water accountability arrangements
TLM actions	According to agreed arrangements for attribution of TLM set out in Environmental water accountability

2.2.6 Removing or replacing register entries

An existing register entry may be replaced with one or more new entries providing that:

- The relevant Contracting Government/s, MDBA or BOC inform the MDBA of the intention to replace a register entry when initiating a review or assessment of a relevant action

- The MDBA, in consultation with a relevant advisory panel, may replace an existing register entry with a register entry/entries arising from a review or assessment of a relevant action

Where, as a result of a review, it is estimated that an accountable action or delayed salinity impact no longer generates a significant effect:

- The lead agency undertaking the review must inform the MDBA if they are of the opinion that the action no longer generates a significant effect

Cl. 24(2)

- The MDBA, in consultation with a relevant advisory panel and on the advice of BOC, may declare the action ineffective and remove the register entry from the registers
- The MDBA may request the lead agency put in place a program to ensure the salinity impacts arising from the action continue to be monitored

The MDBA, in consultation with a relevant advisory panel, must give due consideration to the implications for sequencing of actions in the MDBA River Murray model when removing or replacing register entries

NOTES

Is declared effective

Cl. 21(1,3)

That is, when the accountable action, or the relevant stage of an accountable action is declared effective under Clause 64 of the Agreement. Or, in the case of a State Action that is not required to be declared effective under Clause 64 of the Agreement at the time when the MDBA considers that accountable action is substantially complete.

See Salinity impact assessment process for more details.

Prior to beginning the action

In the case of actions that are subject to formal approval prior to commencement, the entry should be made at the time the approval is given.

TLM actions

Includes TLM works or measures, TLM dilution benefits and other TLM actions as appropriate.

No longer generates a significant effect

For example, an action may cease to generate a significant effect as a result of major changes in infrastructure or other major land or water use changes in a given area.

Consideration should be given to any action that may cease to generate a significant effect that may be declared ineffective by the MDBA under Cl. 70 of the Agreement.

2.3 Register operations

The salinity registers are periodically updated to incorporate:

- Outcomes of recent reviews and assessments
- Transfer of credits and debits, and
- Major changes to the registers due to reviews of core components of BSM2030

These register operations are undertaken in a manner that seeks to balance:

- Ongoing improvements in the use of new knowledge and best available science
- Register stability to provide certainty where possible
- Effort appropriate to the level of risk

2.3.1 This procedure

This procedure describes the arrangements for register operations including annual updates and adjustment processes

2.3.2 Related procedures

An introduction to the registers is provided in Introduction to the accountability framework.

The arrangements for attributing register entries to a Contracting Government or Governments on Registers A and B is set out in Register entries.

Specific arrangements for attributing the benefits of works and measures are set out in Works or measures.

Specific arrangements for offsetting environmental water accountability are set out in Environmental water accountability.

2.3.3 Transfers of credits and debits

Cl. 23(1) A Contracting Government may elect to transfer their credits or debits to another register account or accounts within Register A or within Register B in accordance with the requirements below.

Cl. 23(2A) A Contracting Government may elect to transfer their credits or debits in Register A into the Collective Account in accordance with the requirements below.

Cl. 23(2) The MDBA must process a transfer of credits or debits between register accounts on Register A, where:

- All relevant Contracting Governments[1] agree to the transfer
- The MDBA is informed in writing of the above agreement and its effect

[1] That is, any Contracting Governments responsible for the register accounts from which the credits or debits may be transferred and any Contracting Government responsible for register accounts to which the credits or debits may be transferred.

- Any transfers into or out of the Collective Account of environmental water actions are undertaken in accordance with Environmental water accountability

Cl. 23(3) The MDBA must process a transfer of credits or debits between register accounts on Register B, where:

- All relevant Contracting Governments[2] agree to the transfer
- There is prior written approval of BOC

Cl. 23(5) Contracting Governments may elect to transfer credits in their register account:

- From Register A to Register B, or
- From Register B to Register A

Upon receipt of a written request from a Contracting Government regarding the transfer of credits between their register accounts, the MDBA may process a transfer of credits between Register A and Register B, where:

- The written request includes relevant background on the origin of the credit and any previous transfers relating to the credit
- There is prior written approval of BOC for any transfer from Register B to Register A of:
  - any credits arising from the attribution of Joint works or measures
  - any credits previously transferred from another State Contracting Government within Register B.

For any transfer of credits between Register A and Register B, consideration should be given to:

- Protection of any improvement in salinity that contributes to the baseline at year 2000 using modelling scenarios, and
- Level of confidence associated with the register entry in question

2.3.4 Annual register updates

The MDBA may update the salinity registers annually to reflect changes due to BSM2030 activities undertaken during the previous financial year. This may include:

- Salinity impact assessment for new accountable actions
- Updates to existing register entries as a result of reviews
- Transfers of credits or debits between accounts or Registers
- Other register updates that may be required as per audit recommendations and/or as agreed by BOC
- Incremental changes due to interpolation calculations

[2] That is, any Contracting Governments responsible for the register accounts from which the credits or debits may be transferred and any Contracting Government responsible for register accounts to which the credits or debits may be transferred.

The MDBA may seek endorsement from a relevant advisory panel for proposed annual updates to the salinity registers

Annual register updates may be undertaken in accordance with the timeframes in Figure 6.

The MDBA must keep a record of annual register updates and make the record available to Contracting Governments on request.

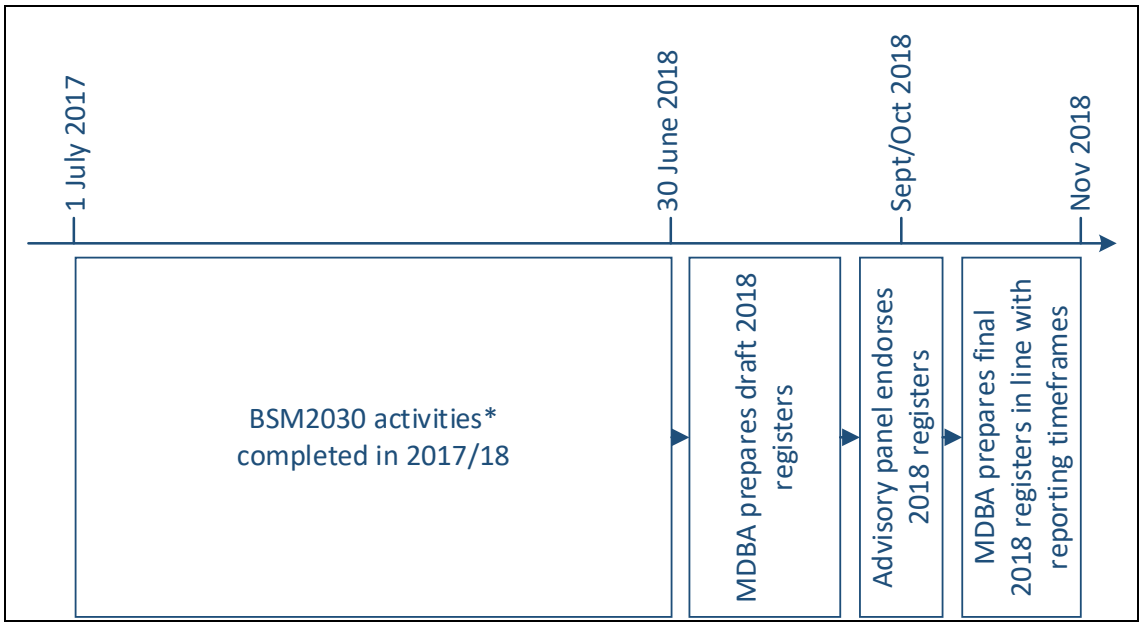


Figure 6 - Example for 2017/18 timeframes for annual register updates.

*Activities may include assessments, reviews, transfers of credits and debits and other activities affecting register entries

2.3.5 Management of major shifts in the registers

From time-to-time activities undertaken under the BSM2030 strategy may cause substantive changes across a number register entries and result in major and uneven shifts in Basin States' register balances.

Major shifts in the registers may result from the application of new knowledge, new methods or policy to aspects of the accountability framework such as:

- Reviews and subsequent updates to MDBA River Murray models and methods, including the baseline
- Reviews and subsequent updates to the benchmark period
- Reviews and subsequent updates to salinity cost functions
- Reset of the chronological sequencing of actions and their reviews in the register

2.4 Salinity impact assessment process

New actions undertaken in the basin must be assessed to determine whether an accountable action should be declared and if so, what the corresponding register entry should be.

This is referred to as the salinity impact assessment process (Figure 7) and involves two steps:

- Determining a significant effect.
- Assessing the salinity impact and attributing credits and debits.

Indicative salt load or flow and salinity data may be used to determine a significant effect, while data used to undertake the assessment must be generated by approved models or methods.

Contracting Governments and the MDBA both have a role to play in this process.

2.4.1 This procedure

This procedure sets out the salinity impact assessment process under the BSM2030 strategy.

2.4.2 Related procedures

A description of the arrangements for conducting assessments is set out in Conducting reviews and assessments.

Salinity impact assessment arrangements specific to environmental water actions are described in Environmental water accountability.

Details of the requirements surrounding the development of approved models and methods used to undertake an assessment are set out in Modelling.

Register entries describes the arrangements for entering credits and debits on the registers for actions other than environmental water actions.

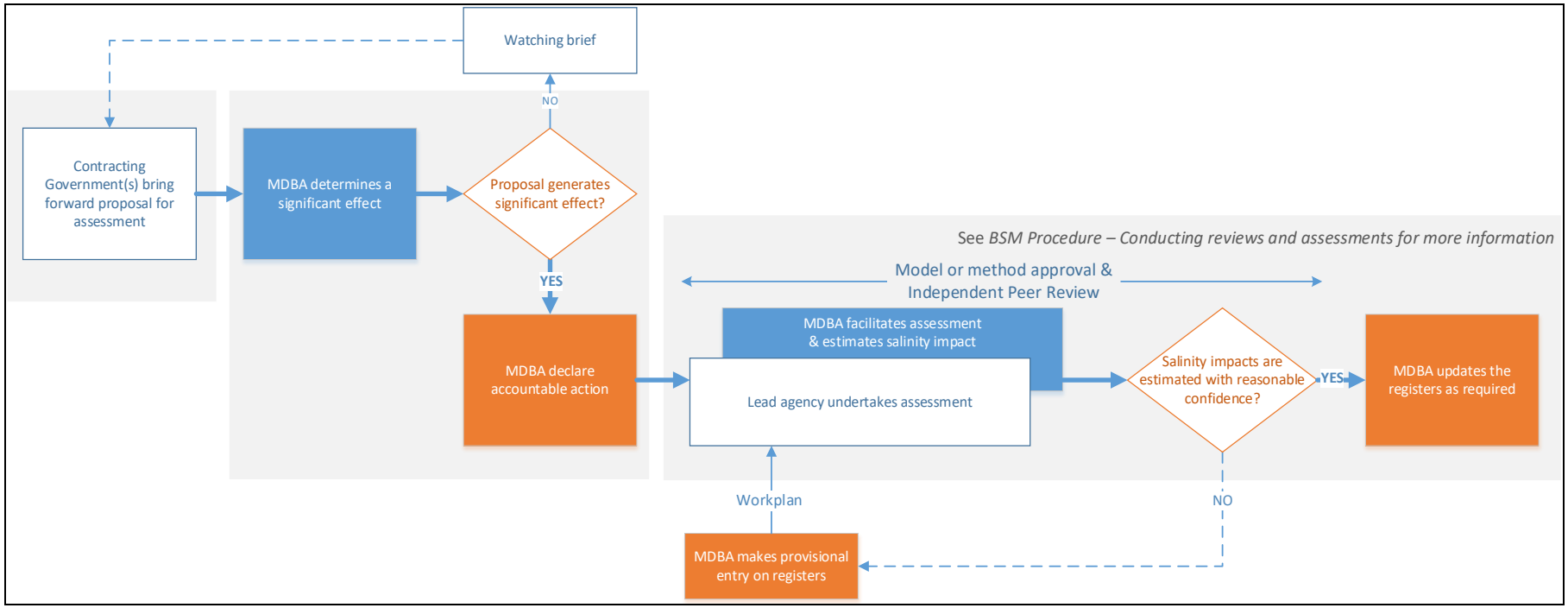


Figure 7 - Overview of the salinity impact assessment process

2.4.3 Roles and responsibilities

An overview of key roles and responsibilities is provided in Table 2.2 and Table 2.3 below.

Cl. 17A, 18, 19, 20, 21, 22

Table 2.2 - Agency responsible for key steps in the salinity impact assessment process

Key step	Responsible agency
Proposal	• Contracting Government of the state in which the proposed action would take place brings forward proposal • Proposed Collective Account actions are the collective responsibility of Contracting Governments • BOC may inform the MDBA of a proposal • MDBA may also direct a Contracting Government to bring forward a proposal it has not yet been informed about.
Significant effect	• MDBA determines significant effect with input from relevant Contracting Government
Assessment	• MDBA facilitates the assessment • Lead agency undertakes the assessment • MDBA estimates salinity impact

Cl. 19(3), 21A(3)

Table 2.3 - Lead agency responsible for undertaking the assessment

Accountable action is wholly or partly:	Lead agency
Joint work or measure	Contracting Government responsible for the work or measure
State action	Relevant State Contracting Government/s
Collective Account actions	Contracting Government nominated by BOC
Environmental water actions	See Environmental water accountability

2.4.4 Bringing forward a proposal for assessment

Cl. 17A(1), 18(2)

If an action, or group of actions, is considered likely to generate a significant effect, then it must be brought forward for assessment as a proposal.

The exceptions to this are:

- If the relevant Contracting Government demonstrates that an action is accounted for in the baseline or on the register then it must not be assessed as a new action
- Changes in day-to-day river operations are not considered 'actions' and therefore must not be assessed as actions

2.4.5 Determining a significant effect

Once the MDBA has been informed of a proposal, the relevant Contracting Government must supply all relevant information to the MDBA in order to determine whether it may have a significant effect. At a minimum this must include:

- Indicative data on the expected change in flow and salinity and/or salt loads to local river and subsequently to shared rivers
- Whether debits or credits are expected
- Which account it is expected debits or credits will be attributed to
- Whether any credits expected from the proposal will offset:
- Existing salinity impacts, and whether these are delayed salinity impacts
- Expected future salinity impacts, and whether these are delayed salinity impacts or impacts of new developments
- Whether an action is undertaken for the express purpose of offsetting delayed salinity impacts
- Whether the balance of any other register accounts is likely to be impacted by the assessment

Cl. 18(1,1A) Once informed of a proposal and supplied with the relevant information about the proposal, the MDBA must make an initial assessment to determine whether the action, either on its own or cumulatively, will generate a significant effect.

Cl. 18(1,1A) The MDBA must use the information and data provided by the Contracting Government to determine whether the action will generate a significant effect.

The MDBA may relate a predicted change in local salt loads, or flow and salinity, to salinity levels and salinity cost effects at Morgan, typically using a preliminary run of the MDBA's River Model in order to determine a significant effect.

Cl. 19(1) If the MDBA identifies that a proposal has or may have a significant effect, the MDBA must declare the action an accountable action.

If an accountable action is declared the MDBA must:

Cl. 17(2)
- Designate the accountable action in whole or in part as either or both of a State action and a Joint work or measure, or neither of them

Cl. 15(3,4), 17(2)
- Decide whether an action is to be entered on either or both of Register A and Register B

2.4.6 Assessment of salinity impacts

Conducting reviews and assessments describes the arrangements for undertaking the assessment of salinity impacts.

In the event that an accountable action is declared the MDBA must facilitate the assessment

Cl. 19(2) The lead agency must undertake the assessment by generating and providing to the MDBA all relevant information.

The level of detail provided must be proportionate to the magnitude of expected salinity impact.

Cl. 19(1) After all relevant information is provided by the relevant lead agency the MDBA must use this information to:

Cl. 20(3)
- estimate the salinity impact at Morgan for years 2000, 2015, 2030, 2050 and 2100, and use the interpolation method for the current year, and
- estimate the salinity costs effect (credits or debits) for the current year

Cl. 38(1) Both the lead agency and the MDBA must use approved models or methods to undertake the assessment or estimate the salinity impact.

If the MDBA has estimated credits and debits with confidence and in accordance with Conducting reviews and assessments and Register entries the MDBA must:

Cl. 20(1)
- Enter the credits and debits on the register

Cl. 17(3), 21, 21A
- Attribute those credits or debits in accordance with the outcomes of the assessment

2.4.7 Procedure – Provisional entries

Cl. 20A(1,2) If the MDBA is unable to confidently estimate the salinity impacts of an accountable action it may make a provisional entry in Register A or Register B.

The provisional entry is made as an estimate of the salinity effect as EC at Morgan in a dedicated column on the register and does not contribute any credits or debits to a register account, and assessment against the Basin Salinity Target at Morgan.

In the event a provisional entry is made, relevant Contracting Governments and the MDBA must agree on a workplan that will enable the MDBA to, as soon as practicable (Figure 8):

Cl. 20A(3)
- Estimate the cost effect (credits or debits), and
- Amend the relevant register accordingly

The workplan must:

- include a time-frame and scope consistent with the extent of potential salinity impact
- define what an acceptable level of confidence in cost effect estimates is, and how it will be demonstrated that this level of confidence has been achieved

Cl. 20A(4) Each relevant Contracting Government must give to the MDBA all relevant information to assist with the development of the workplan.

If once the workplan is implemented, the MDBA is still unable to confidently estimate salinity impacts, then:

- Where reasonable justification is provided for the outcome, the workplan may be revised

- Where reasonable justification cannot be provided for the outcome, the MDBA must determine the cost effect (credits or debits) using the best available estimate of salinity impacts and amend the register accordingly

The MDBA may use its discretion to decide what constitutes reasonable justification above.

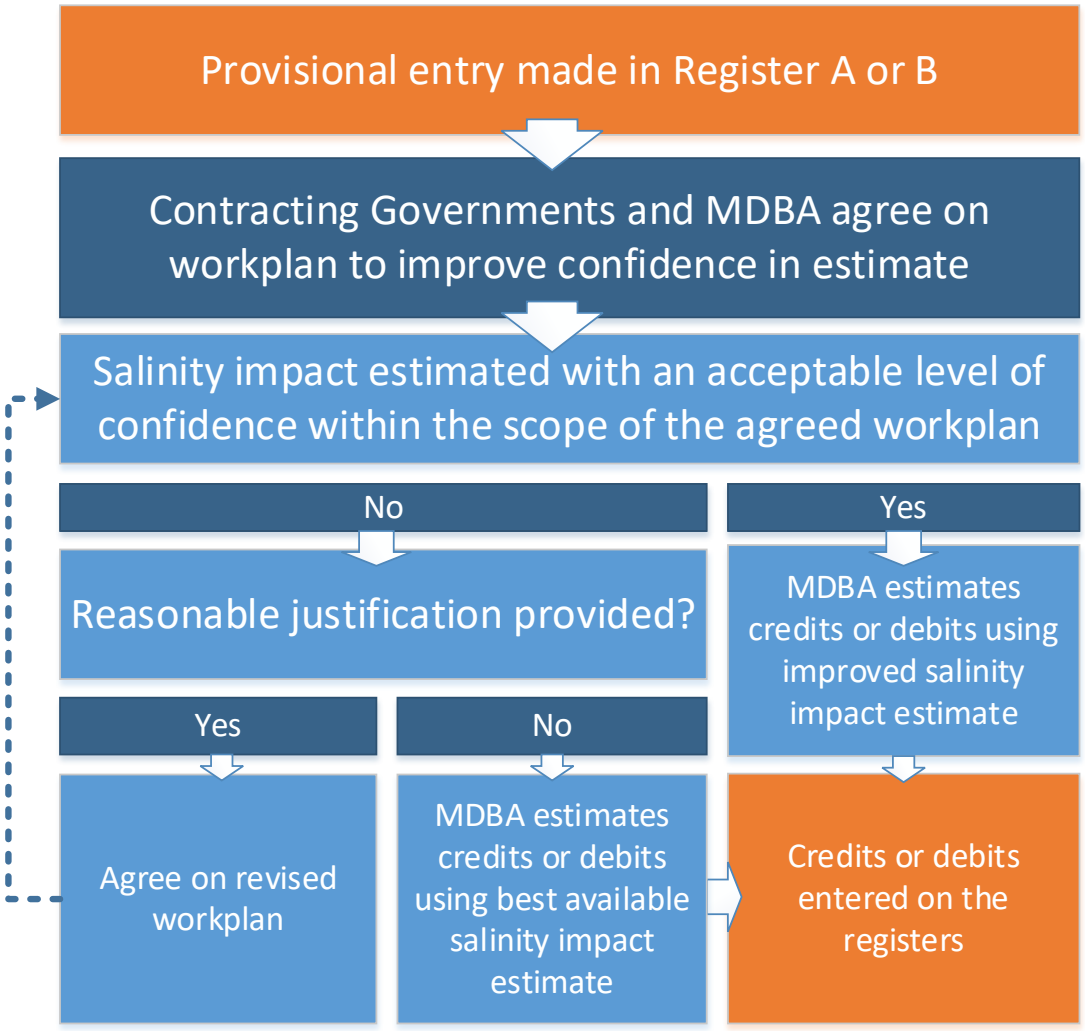


Figure 8 - Process for progressing provisional entries

NOTES

Wholly or partly

Where accountable actions are made up of more than one type of action, the Review Plan sets out the lead agency responsible for providing further information for the detailed assessment as required.

An example is shared works or measures which are partly joint works or measures and partly state actions.

Typically the State Action of a shared scheme will be held by the same State responsible for Joint works or measures in accordance with Clause 56(5) of the Agreement.

Where this is not the case, the MDBA may nominate the lead agency in the Review Plan to provide further information for the detailed assessment as required.

Note that salinity impact assessments of shared works or measures and other accountable actions that are classified in part are likely to affect more than one Contracting Government and follow the process described in Conducting reviews and assessments.

Cumulatively

Similar or associated actions that may not individually produce a significant effect should be aggregated at a suitable scale and treated cumulatively for the purpose of the salinity impact assessment process. Such actions may be brought forward to be assessed together to avoid a situation where assessing associated impacts individually may result in significant salinity impacts being overlooked.

Circumstances have been identified for environmental water actions where the need to assess actions cumulatively may apply, such as the cumulative impacts from the system scale use of environmental water or the cumulative impacts of salt mobilisation from SDL works and measures.

Accounted for in the baseline or on the register

This should be considered for every action, and especially, but not limited to:

- Changes in irrigation footprint or diversions
- Changes in river operating rules or management arrangements
- Environmental water actions

Note that it is recommended the MDBA make available to jurisdictions a document capturing the actions and conditions already accounted for in the baseline, following the upcoming review of the baseline.

Changes in day-to-day river operations

As opposed to operational rule changes and environmental water actions which must be assessed as actions.

This is consistent with definitions of river operations and actions in Schedule B and the Agreement.

Expected change in flow and salinity and/or salt loads

For an initial assessment (when determining a significant effect) approximate estimates of the change in salt loads or flow and salinity change caused by the action may be used. Models used will not need to be approved until the detailed assessment.

For a detailed assessment, this must be based on estimates generated by an approved model or method.

The data provided:

- Must show the change in salt loads or flow and salinity due to the action i.e. the difference between a base run without the action, and scenarios with the action
- Salt load data should be provided as a time series where possible, however providing data as averages per year modelled over the benchmark period is also acceptable
- Flow and salinity data should be provided as a daily time series modelled over the benchmark period
- Must demonstrate the change locally and at a point in the shared system where the MDBA can relate the data to their river modelling platform

More details are provided in Modelling.

Likely to be impacted by the assessment

Where the salinity impact assessment will impact more than one Contracting Government, other Contracting Governments may be involved in the assessment in accordance with Conducting reviews and assessments.

Neither of them

See Environmental water accountability for details of arrangements for attributing environmental water actions.

All relevant information

Typically this information must first be generated via the development or application of approved State Contracting Government models or methods in the lead agency component of the assessment.

The information required will depend on the proposal but at a minimum may include:

- Synthesised data on the expected change in flow and salinity and/or salt loads to local river and subsequently to shared rivers
- Information about any consequences that may erode the benefits of a previous action
- The methodology adopted, and its assessed strengths and limitations
- Comments on the adequacy and quality of data available for carrying out the analysis
- Discussion on the confidence limits of the results achieved
- Recommendations on proposed monitoring arrangements

More detail on the key steps, outputs and requirements of the lead agency component of assessments is provided in Conducting reviews and assessments.

Interpolation method

Interpolation involves estimating the value of an intermediate data point by assuming a linear relationship between two adjacent data points. For the purpose of the salinity registers, this approach is used to predict the current years' impact by extrapolating between modelled predictions of impact at 2000, 2015, 2030, 2050 and 2100.

This approach was adopted in 2010 following recommendation of the BSMS Mid-Term Review that consideration be given to improving the consistency between calculation methods used for Register A and Register B components.

The approach superseded the ’50 year ticking clock’ for Register B debits and ‘30 year average’ approach used for all other register entries as it would enable Register A and Register B to be summed with confidence. Analysis undertaken following the BSMS Mid-Term Review indicated that the interpolation was no less precautionary than previous approaches.

2.5 Conducting reviews and assessments

Reviews and assessments of accountable actions and delayed salinity impacts are an important element of the salinity accountability framework.

Assessments quantify the salinity impacts of accountable actions for entry on the registers for the first time. In many cases this involves the development of a new State Contracting Government model or method.

Reviews of accountable actions and delayed salinity impacts are undertaken on a regular basis to ensure that approved State Contracting Government models or methods and corresponding register entries remain up to date and are based on the best available information.

The following arrangements help to ensure reviews and assessment are conducted efficiently and effectively under the current policy, and are adequately informed by the latest technical understanding:

- Clear roles and responsibilities for lead agencies and the MDBA
- Arrangements for peer review of reviews and assessments
- Input from advisory panels, technical working groups, independent experts and others where appropriate
- Arrangements that can be tailored to the complexity of the review or assessment
- Guidance on the content of reviews and assessments.

2.5.1 This procedure

This procedure sets out the arrangements for conducting reviews and assessments of accountable actions and delayed salinity impacts. This includes the reviews and assessments described below (Table 2.4), as well as the peer review arrangements and the approach for assigning a confidence rating to a register entry as an outcome of an assessment or review.

The procedure does not include assessment or review of MDBA models and/or methods as this is adequately covered in Schedule B.

Table 2.4 - Assessments and reviews covered by this procedure

Triggered by	Type of assessment or review	Typical outcome
Assessment	Assessments of new accountable actions	New register entry
	Development of new models and/or methods	Approved model or method
Review	Reviews of existing register entries	Update register entry
	Reviews of existing models and/or methods	Approved model or method

This procedure describes both the MDBA and lead agencies contributions to reviews and assessments.

2.5.2 Related procedures

Details of the salinity impact assessment process for new proposals are provided in Salinity impact assessment process.

Details of the requirements for scheduling and assigning lead agencies for reviews are provided in Developing the Review Plan.

Works or measures details specific arrangements pertaining to the review and assessments of works or measures in addition to this procedure.

Requirements for developing and amending models and methods underpinning the review and assessment processes are provided in Modelling.

2.5.3 Roles and responsibilities

Cl. 19(1), 24 (1), 38 (2,5)

The MDBA must facilitate:

- An assessment after an accountable action is declared, in accordance with Salinity impact assessment process
- A review according to the schedule in the Review Plan

Facilitation of an assessment or review may involve:

- Facilitating relevant discussions with the lead agency and relevant advisory panel
- Specifying outputs required from the lead agency component of an assessment
- Seeking policy and technical advice from Independent Peer Reviewers (IPR), Project Steering Committee (PSC), relevant advisory panel and/or working groups and others as required
- Other activities described in this procedure

Cl. 19(2)

A lead agency must undertake:

- An assessment after an accountable action is declared, in accordance with Salinity impact assessment process

Cl. 33(1)

- A review in accordance with the schedule in the Review Plan

The lead agency responsible for undertaking:

- An assessment is set out in Salinity impact assessment process
- A review is set out in Developing the Review Plan. A record of the current nominated lead agencies is maintained in the Review Plan

The MDBA may, at its discretion, provide an opportunity for non-lead agency Contracting Governments to be more actively involved in that review or assessment, provided that:

- A request is made by the relevant Contracting Government to the MDBA
- The request describes how the Contracting Government is likely to be impacted by the review or assessment (e.g. impact to register balance or subsequent reviews)

- The request includes details of the extent to which the Contracting Government wishes to be involved (e.g. timing, stage in process, role and contribution)

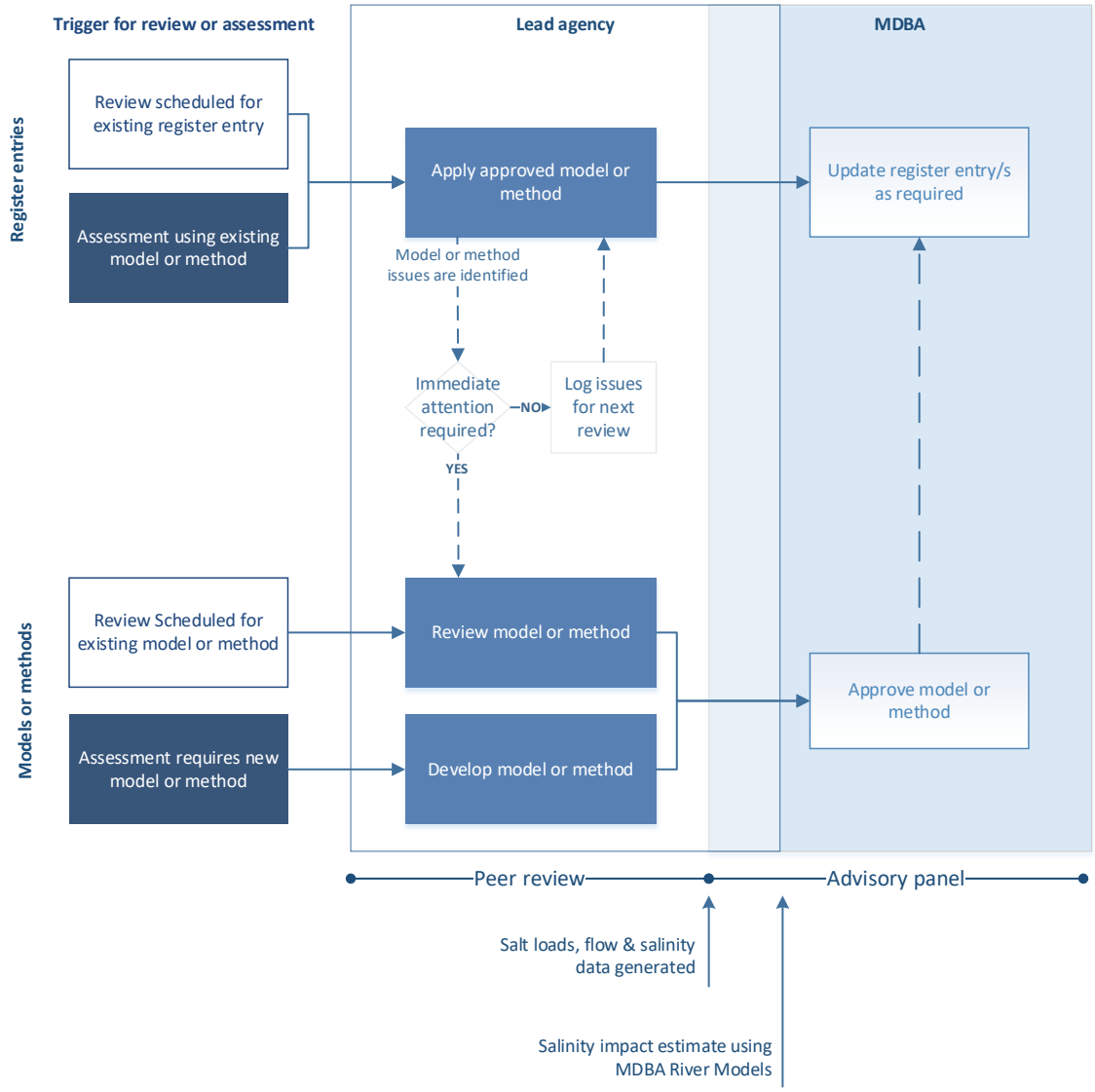


Figure 9 - Pathways for conducting reviews and assessments

2.5.4 Determining review or assessment pathway

Review and assessment pathways that may be undertaken are described in Figure 9.

When initiating a review or assessment, the lead agency, with advice from the MDBA and in accordance with the review plan, must specify whether it relates to one or more of:

- Assessment using an existing model or method
- Assessment requiring the development of a new model or method
- Review of a register entry
- Review of a model or method

And which pathway in Figure 9 the lead agency plans to follow accordingly.

If, during a review or assessment of a register entry, significant issues are identified with the existing model or method, the MDBA, in consultation with the lead agency, may:

Cl. 24(3)
- postpone any register entry updates until after the model or method is reviewed,
- request the lead agency make a log of issues to be addressed during future reviews or assessments, and/or

Cl. 32(6)
- amend the Review Plan to bring forward the model or method review if necessary.

2.5.5 Review and assessment process

The process described in Figure 10 will be followed unless otherwise decided by the MDBA, in consultation with the relevant advisory panel.

The MDBA may seek policy and technical advice during the lead agency or MDBA component of the review or assessment as required.

It is recommended that the MDBA seek policy and technical advice at a minimum where:

- The review or development of a State Contracting Government's model or method is involved
- More than one Contracting Government is impacted by a review or assessment
- Significant issues are identified during a register entry review or assessment and this triggers a review of a model or method

2.5.6 Peer review arrangements

An IPR must be engaged to undertake a peer review of a review or assessment, unless the MDBA, in consultation with the relevant advisory panel, decides when a review is initiated that:

- It is more appropriate and cost effective for the MDBA or a Contracting Government to deliver a peer review of a review or assessment
- That a peer review is not required

An independent peer review must advise the MDBA on:

- Whether a review or assessment is fit-for-purpose
- Level of confidence in a review or assessment undertaken by a lead agency

- Recommendations on opportunities to improve confidence in a review or assessment

When undertaking complex projects, the project owner, may consider the merits of expanding the scope of the IPR to additional project stages. This may include:

- Project delivery – when undertaking complex projects, it should be expected that new methods and or modelling techniques will be required to be undertaken. It will be imperative to have appropriate representation to scrutinise, challenge and understand the proposed methods and outcomes. The IPR may work in parallel with the project delivery team to achieve this and should have the ability to communicate outcomes to the project owner so they may make informed decisions.

The IPR should be a competent person who is suitably qualified with relevant experience. Depending on project complexity, more than one IPR may be needed.

2.5.7 Assigning a confidence rating to a register entry

There is no statutory obligation for arriving at or including a confidence rating on the Registers. Rather its inclusion within the Registers came about because it was considered useful information that would add value to the understanding of accountability and was included during the early years of the Basin Salinity Management Strategy.

Appendix 2 outlines the approach to assigning a confidence rating to salinity assessments in detail.

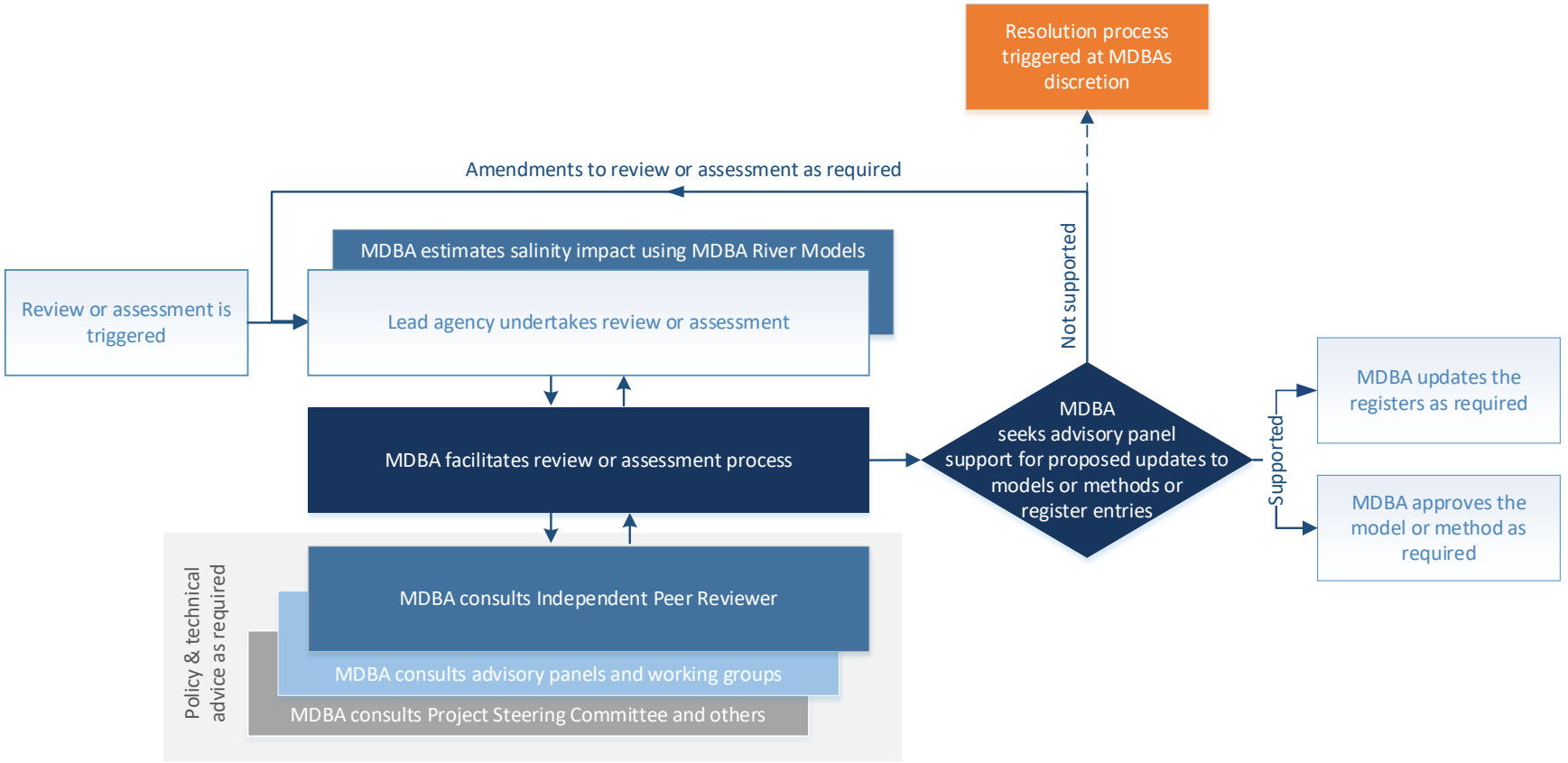


Figure 10 - Process for review or development of models and methods

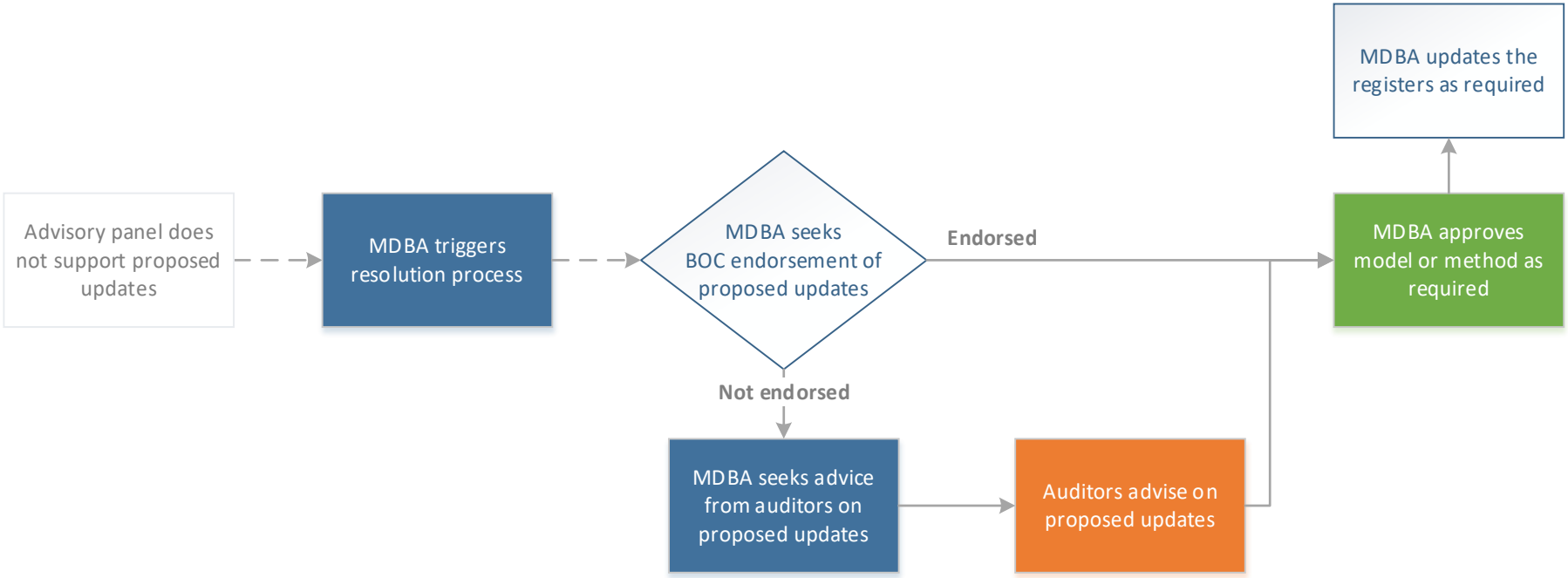


Figure 11 - Resolution process

2.5.8 Finalising review outcomes

After the MDBA is satisfied with the outputs of the lead agency component of the review, the MDBA must:

- Prepare a preliminary run of the MDBA River Model using the outputs of the lead agency component of the review
- Present any preliminary salinity impact (EC and cost effect) estimates including details of any MDBA River Model runs to the relevant advisory panel and/or working group
- Present any policy or technical advice received from key stakeholders and any proposed updates to the registers and models or methods to the relevant advisory panel and/or working group

The relevant advisory panel and/or working group may advise the MDBA on:

- Level of confidence in salinity impact (EC and cost effect) estimates made using the MDBA River Model
- Recommendations on opportunities to improve confidence in a review or assessment

The MDBA, in consultation with the relevant advisory panel, and taking into consideration policy and technical advice where relevant, may as a result of a review or assessment:

Cl. 24 (3)
- Update the registers

Cl. 20A (2)
- Make a provisional entry

Cl. 38 (5)
- Approve a State Contracting Government model or method
- Recommend further work be undertaken and timelines for undertaking that work

Where the relevant advisory panel is unable to support proposed updates to the registers or models or methods, the MDBA may seek direction from BOC or auditors in the resolution process described in Figure 11.

2.5.9 Content of a review or assessment – Lead agency component

A review or assessment of a register entry may include the following key steps:

- Methodology
- Collection/collation of best available data
- Application of model/method
- Outcomes

A review or assessment of a model or method may include the following key steps:

- Methodology
- Conceptualisation
- Calibration
- Scenario run

- Uncertainty analysis
- Outcomes

Cl. 19(2) The outputs of the lead agency component of a review or assessment will depend on the specific information required by the MDBA to finalise the review or assessment but may include a report detailing:

- Synthesised data on the expected change in flow and salinity and/or salt loads to local river and subsequently to shared rivers at 2000, 2015, 2030, 2050 and 2100
- Information about any consequences that may erode the benefits of other actions
- The methodology adopted, and its assessed strengths and limitations
- Comments on the adequacy and quality of data available for carrying out the analysis
- Discussion on the level of confidence in the results achieved
- Recommendations on proposed monitoring arrangements

The lead agency must:

- Ensure relevant issues logged during past reviews are addressed as appropriate
- Include metadata for key input data, including information on the source, date collected, and comment on the degree of confidence in data used
- Ensure appropriate Quality Assurance processes have been followed (e.g. ISO 9001:2015)

The MDBA must:

Cl. 19(2)
- Confirm the suitability of outputs from the lead agency component of the review

More details on the specific requirements of gaining model or method approval are provided in Modelling.

2.5.10 Content of a review or assessment – MDBA components

The MDBA component of a review or assessment must be undertaken in accordance with the approved MDBA River Model as described in more detail in Modelling.

The outputs of the MDBA run of the MDBA River Model review or assessment at a minimum must include a report detailing:

Cl. 17(3)
- Estimates of the salinity impact (EC) at Morgan for years 2000, 2015, 2030, 2050 and 2100, and for the current year

Cl. 17(3)
- Estimates of the salinity cost effect (credits or debits) for the current year

Cl. 20(1,2)
- How credits and debits are entered in the registers in line with Register entries
- Discussion on the level of confidence in the salinity impact estimate (EC and cost effect)

2.5.11 Representation of irrigated area in reviews and assessment

The irrigated area is used widely in the assessment of salinity impact of accountable actions and delayed salinity impacts.

To maintain a level of consistency, the following high-level principles must be considered in the representation of irrigated area in assessments and reviews of accountable actions:

- Maintain a conservative approach to avoid under estimation of impacts
- Seek to apply the best available metric that is representative of the change in water use and irrigated area
- Provide a determination based on contemporary water use at the time of the assessment or review

Further guidance or requirements for the estimation of irrigated area may be provided in Modelling.

NOTES

Assessments

In this procedure, the focus is on the assessment of salinity impacts via the development or application of models or methods to inform register entries.

The full salinity impact assessment process is described in Salinity impact assessment process.

Reviews

In this procedure, the focus is on review of register entries including the review of supporting models or methods.

More details on the scheduling of these reviews is available in Developing the Review Plan.

Schedule in the Review Plan

A review must be conducted such that outcomes from the review may be brought onto the registers in the year specified in 'recommended review date' in the Review Plan

Independent Peer Reviewers (IPR)

MDBA typically engages IPRs in order to gain independent advice on models, methods or other technical or policy aspects of reviews and assessments.

MDBA is satisfied with the outputs

Determining the suitability of data outputs from the lead agency component of the review usually involves a preliminary run of the new data in the MDBA River Model prior to finalising.

The MDBA will typically seek the advice of an IPR to confirm whether or not the outputs are fit-for-purpose.

In some cases this may also involve consultation with key stakeholders, including gaining the support of other Contracting Governments impacted by the review, or gaining the support of a relevant advisory panel and/or working group.

Where the outputs are found not to be fit-for-purpose, the MDBA may request changes to the lead agency component of the review.

Fit-for-purpose

That is, demonstrate to the MDBA (in most cases via the IPR) that the lead agency component of the review is fit-for-purpose.

Appendix 2. Approach for assigning a confidence rating to a register entry as an outcome of an assessment or review

Background

Each Register entry currently has a qualitative "confidence rating". The rating is currently expressed as "high, "medium" or "low".

Schedule B does not require this attribute meaning there is no statutory obligation for arriving at or including a confidence rating on the Registers. Its inclusion within the Registers came about because it was considered useful information that would add value to the understanding of accountability and was included during the early years of the Basin Salinity Management Strategy.

Prior to the preparation of the BSM Procedures, the determination of a confidence rating value was supported by the Independent Peer Assessment process. Terms of Reference (ToR) for independent assessments of models, delayed salinity impacts and accountable actions seek advice from the Independent Peer Assessor. The relevant State Contracting Government also commonly provide their perspective when the outcome of a salinity assessment or review is presented to BSMAP for formal consideration by the MDBA.

Some years ago, the IAG-Salinity advised the MDBA to develop a clear basis for assigning a confidence rating. BSMAP members (meeting 7) requested "*MDBA to develop a document that provides definitions regarding confidence ratings*".

Concepts underpinning confidence ratings

In developing a consistent process for assigning a confidence rating, it is critical to have an agreed understanding of its purpose.

In this procedure, it is assumed that the purpose is a qualitative assessment as to assess whether the assessment is 'good enough', or 'as good as it can be'?

These questions warrant both technical and policy considerations:

- Technical: a "confidence interval" is an indicator of the uncertainty surrounding the best estimate represented by the available data. In a BSM modelling context, it is arguably a mathematical/stochastic rating or a qualitative equivalent (options are provided within the Modelling procedures).
- Policy - BSM2030 principles provide guidance to all aspects of Basin salinity management. The BSM2030 principles considered most pertinent to the register entry confidence rating are:
  - Risk based approach
  - Cost efficient and cost-effective management
  - Accountability and transparency.

Assigning a confidence rating

The concepts above, have been considered in the development of the methodology:

- Table 2.5 – provides a basis for assigning an uncertainty rating
- Table 2.6 – provides a basis for assigning a principles score

With respect to Table 2.6, three guiding principles have been identified as having significant relevance to the assessment. A qualitative evaluation is required to arrive at a position on how well the salinity assessment leading to the Register entry has aligned with these guiding principles. Given

that some principles are likely to align better than others, the methodology provides for the scoring of each principle with the results summed to arrive at a total score. This means that the highest score (9) will be achieved when the assessment is closely aligned with all three, and the lowest score (3) if "insufficient" consideration has been given to any of the principles during the assessment.

Table 2.7 – combines the outcome from Table 2.5 and Table 2.6 to arrive at a confidence rating.

Table 2.5 - Uncertainty rating

	Qualitative	Quantitative
Narrow (Score 3)	Strong evidence underpinning conceptualisation Few data gaps in conceptual model High confidence in most sensitive parameter values	Stochastic analysis shows narrow uncertainty band in flows/salt loads Narrow range of possible outcomes
Intermediate (Score 2)	Moderate gaps in data and uncertainty in parameterisation Different conceptual models possible but evidence generally supportive of adopted option.	Range of possible flow/salt load outcomes but probabilistic analysis indicates likelihood of intermediate uncertainty band.
Wide (Score 1)	Significant gaps in data. Range of quite different conceptual models possible. Low confidence in most sensitive parameter values	Wide range of possible flow/salt load outcomes with similar probabilities across wide uncertainty band range

Table 2.6 - Scoring on principles

	Accountability & Transparency	Cost effective and cost efficient	Risk based approach (monitoring & methodology) commensurate with risk
High	3. Evidence that assessment reflects the current status of knowledge and has built substantially on previous work/assessments (e.g., given appropriate consideration to previous review and any pertinent IPA recommendations)	3. Technical rationale that additional effort (monitoring and/or method) unlikely to substantially improve predictive performance.	3. High – Resourcing generally commensurate with importance of Register entry taking into account matters such as: (a) Magnitude of the Register entry (b) Potential for large change in the Register entry (c) Importance of Register entry to a state(s) maintaining its overall Register balance in credit.
Intermediate	2. Some evidence that assessment has built on previous work/assessments but further progress possible	2. Technical rationale that some additional effort (monitoring and/or method) would contribute to improved predictive performance.	2. Moderate confidence – Resourcing somewhat underdone given importance of Register entry gauged by (a), (b) and (c) above.
Low	1. No evidence that previous review and IPA recommendations have been progressed sufficiently to inform the assessment	1. Evidence that additional effort (monitoring and/or method) would substantially improve predictive performance of the methodology.	1. No evidence/rationale that assessment resourcing is commensurate with the importance of the Register entry gauged by (a), (b) and (c) above.

Table 2.7 - Confidence rating

		Principles score		
		High (Score 8-9)	**Intermediate (Score 5-7)**	**Low (Score 3-4)**
Uncertainty rating	**Narrow (Score 3)**	High	High	NA
	Intermediate (Score 2)	High	Med	Low
	Wide (Score 1)	Med	Low	Low

Note that the principles score is cumulative of the scoring for the 3 principles as per table 2.6.

Testing the approach

The approach has been retrospectively tested (through on-line discussions with Victorian and South Australian salinity managers and modellers) on a number of Register entries, for the sole purpose of testing whether the results appeared reasonable. The results are tabulated in Table 2.8.

Table 2.8 - Workshopped application of the methodology to Models/Register entries

		Principles score		
		High (Score 8-9)	**Intermediate (Score 5-7)**	**Low (Score 3-4)**
Uncertainty rating	**Narrow (Score 3)**			
	Intermediate (Score 2)	N2SA Border	RE assessed with Pyap Kingston model RE assessed with Loxton-Bookpurnong model	
	Wide (Score 1)	Connections Project	SIMRAT application to small SA Register entries	

Intuitively, the results appear to be in the “right ballpark” noting that with qualitative assessments, it is quite possible for different assessors to arrive at a different outcome.

For example, N2SA Border has been rated differently to SA Register model based entries. Arguably this is because for the N2SA Border model, the detailed uncertainty analysis provided higher levels of accountability and a greater demonstration of “effort commensurate with risk”. However, it must be recognised that a different assessor may reach alternative interpretations and conclusions. Most

importantly for this test of the application of the method, is that a debate around the most appropriate scoring is expected to be able to reach consensus on a High or Medium confidence rating and a Medium or Low confidence rating. A debate between a High or Low confidence rating is not anticipated.

Application

The Murray River model applies to all Register entries and so would not be generally considered as part of the Confidence assessment. An exception may be assessments that only use the Murray River model in the assessment (such as water trade assessments).

The approach would be most commonly applied under the Terms of Reference for an Independent Peer Assessment (IPA) and:

- The uncertainty rating would be assigned based upon the model development phase of a project.
- Where the model was then used to generate estimates of flows or salt loads for a salinity Register entry:
  - A principles score would be generated
  - The principles score and uncertainty rating would be combined to generate a Register entry confidence rating.

The qualitative basis for the assignment of scores, means that dialogue between the agency responsible for the assessment and the IPA will be necessary to reach a shared understanding and rationale for the assignment of scores.

There will be some challenges in the application of the approach to Register entries that are informed by multiple models. This applies particularly to Register entries that are informed by separate models that are updated in different years (e.g. South Australian groundwater models).

A prescriptive approach to applying the methodology in these circumstances is not considered appropriate. For such Register entries, this will be an important discussion point for the IPA and agency responsible for the model development and assessment i.e., taking into account previous assessments and peer assessments applicable to other parts of the Register domain, how the "part assessment" impacts the overall understanding of uncertainty and alignment with BSM principles, and so develop a rationale for landing on an updated confidence rating representative of the full Register entry.

For all Register entries, the assigned confidence rating will be a point in time evaluation. i.e., a reflection of the confidence at the time the Register entry was included or updated on the Register. At the next scheduled review, additional knowledge may be available that may lead to a change in the Register entry and/or the confidence rating.

The testing of the method (Table 2.8) indicates that the application of the approach may lead to different confidence ratings to those already represented on the Register. However, it is not

intended that the method will be applied retrospectively. Confidence ratings currently assigned to Register entries will stay on the Register until the next review of that action.

2.6 Environmental water accountability

Environmental water actions are estimated to have a net long-term salinity benefit for the shared water resources due to the substantial dilution benefits from delivering the water. However, some environmental water actions may also mobilise salt into the river system.

The positive and negative salinity impacts associated with environmental water actions are formally incorporated into the accountability framework for the first time under the BSM2030 strategy.

Contracting governments have agreed to a collaborative approach to salinity accountability of environmental water actions, recognising that there will be an opportunity to improve upon this approach as our understanding of salinity impacts associated with environmental water actions matures.

2.6.1 This procedure

This procedure describes the accountability arrangements for the following environmental water actions:

- Delivery of environmental water
- Recovery of environmental water
- Use of environmental water
- Operation of works or measures to support environmental watering
- Changes in river operations to support environmental watering

This includes actions associated with Basin Plan water, TLM water and some actions associated with non-Basin Plan water held by State Contracting Governments.

2.6.2 Related procedures

Salinity impact assessment process and Conducting reviews and assessments describes broader arrangements for the salinity impact assessment process and review process.

Register entries describes the arrangements for entering credits and debits on the registers for actions other than environmental water and Register operations describes arrangements for operating the registers.

2.6.3 Basin Plan water register entries prior to 2030

Basin Plan water actions will be entered onto the registers in the order in which they are assessed in accordance with the salinity impact assessment process.

This will occur over the period to 2030 which allows for environmental water accountability arrangements to be reviewed and revisited:

- during the BSM2030 strategy review (by 2026); and
- at other times as required

Dilution benefits from the delivery of Basin Plan water will initially be brought onto Register A as a provisional entry.

This provisional entry will be made using the existing modelled scenario of water delivery over the benchmark period and adjusted annually in line with the volume of held environmental water entitlements, and at various stages as per Table 2.9 below.

Table 2.9 – Adjustments to entries for delivery of Basin Plan water

Adjustment to entry	Formal entry on register
Initially, based on volume of Basin Plan water recovered at 30 June 2016, and annually thereafter	Once full volume of environmental water recovery is known (expected 2019) and can be modelled with confidence
Based on second stage of water recovery through efficiency measures and any outstanding water recovery 2020 – 2024	After further work has confirmed the entry (expected 2024)
Based on any further water recovered as required 2025 – 2030	After further work has confirmed the entry (before 2030)

Other than dilution benefits described above, it is not expected that there will be many register entries for Basin Plan water actions prior to the BSM2030 strategy review (to commence by 2026) noting that:

- Minimal salinity impacts are anticipated due to use of environmental water while existing constraints continue to apply
- It will take time for works associated with the SDL adjustment mechanism to be constructed and to become operational
- Salt mobilisation from environmental water actions in floodplains and wetlands is a knowledge priority in the BSM2030 strategy and it will take time for the outcomes of investigations under this knowledge priority to be understood

2.6.4 Salinity impact assessment and review

Environmental water actions must be brought forward as proposals for assessment to determine whether an accountable action should be declared and if so, what the corresponding register entry should be.

The salinity impact assessment process for environmental water actions must be undertaken in accordance with the Salinity impact assessment process in addition to the specific requirements set out in this procedure.

The review of any accountable actions arising from environmental water actions must be in accordance with the Conducting reviews and assessments and the Review Plan.

The lead agency responsible for the salinity impact assessment of environmental water actions is as follows in Table 2.10, unless otherwise agreed by BOC.

Cl. 19(2) Where the MDBA is the lead agency for an assessment, any Contracting Government with information in its possession that may assist the MDBA to assess the salinity impacts of the accountable action accurately, must give the information to the MDBA.

MDBA may also assess the cumulative impact of:

- aggregated environmental water actions across the system
- operation of SDL adjustment works or measures

Table 2.10 – Lead agencies for the salinity impact assessment

Lead agency	Environmental water actions
Basin States	• Recovery of Basin Plan water • Operation of SDL adjustment works or measures • Operation of TLM works or measures • Delivery of Basin state e-water (non-Basin Plan)
MDBA **As an agent of the joint business**	• Delivery of Basin Plan water • Delivery of TLM water • Changes to river operations to support Basin Plan outcomes (excl. operation of SDL adjustment works or measures)
Collective responsibility **BOC to determine**	• Use of environmental water (excl. operation of SDL adjustment works or measures and TLM environmental water actions)

2.6.5 Attributing salinity impacts of environmental water actions

Salinity impacts of environmental water actions must be attributed according to the default arrangements described in Figure 12 below unless otherwise agreed by BOC.

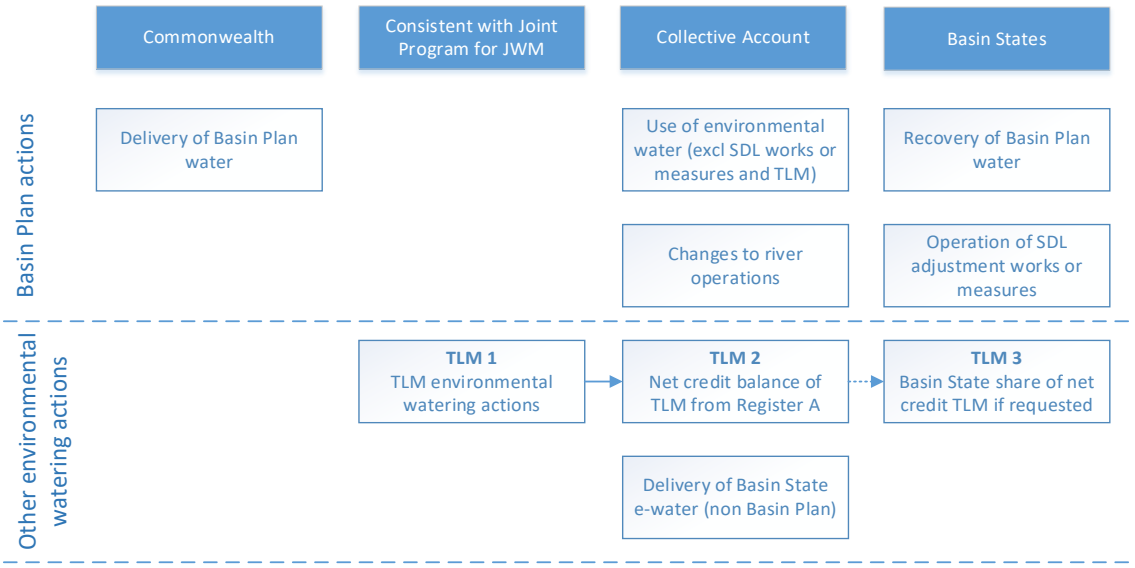


Figure 12 - Default arrangements for attributing environmental water actions

TLM environmental water actions must be attributed according to a set of agreed high level principles consistent with the approach for attributing the 61 EC Joint Program of Joint works or measures (see TLM 1 in Figure 12), noting that:

- Contracting Governments have agreed that after any TLM Register A salinity debits have been offset, the remaining TLM Register A salinity credit balance will be held in the Collective Account (see TLM 2 in Figure 12), and

Cl. 23(2C)

- The MDBA must, at the request of a State Contracting Government, transfer their share of TLM credits held in the Collective Account providing that the requirements in Table 2.11 are met (see TLM 3 in Figure 12)

Table 2.11 – Requirements which must be met in order for the MDBA to transfer a State Contracting Government their share of TLM credits

Timing	State Contracting Governments must make a request for transfer to the MDBA by 30th November of a given year in order to have offsets incorporated into register updates for the following year
Analysis of impacts	After receiving a request for transfer of TLM credits to a State Contracting Government, the MDBA must, using a method appropriate for the level of risk, analyse the impacts to the registers and inform Contracting Governments of the findings
Mitigation of impacts	If MDBA or any Contracting Government considers the impacts of the transfer on the Collective Account to be unacceptable, the MDBA, acting on the advice of BOC and in accordance with Schedule B and any BSM Procedures, may take further action to mitigate the impact on the Collective Account. The MDBA must, regardless of impacts on the Collective Account, process the transfer of a State Contracting Governments TLM credits, unless the MDBA is directed otherwise by BOC

2.6.6 Environmental water offsets

Cl. 16A Where there are salinity credits available in the Commonwealth account, the following debits must be offset:

- Recovery of Basin Plan water
- Operation of SDL adjustment works or measures
- Use of other environmental water to support Basin Plan outcomes
- Changes to river operations to support Basin Plan outcomes

Except where:

- Pre-existing contractual arrangements stipulate other arrangements for Commonwealth credits
- The requirements set out in Table 2.12 below are not met

In the event that environmental water actions are entered on the registers as a result of the salinity impact assessment process, the MDBA must:

- Confirm that the requirements set out in Table 2.12 are met, and if so
- Process the offsets as part of the next annual register update

Cl. 24 In the event a review of environmental water debits leads to a change in the corresponding register entry, the MDBA must ensure the associated offset is adjusted accordingly

Table 2.12 – Requirements for processing Commonwealth offsets (Appendix 3 for more details)

Debit to be offset	Demonstration of alignment
Recovery of Basin Plan water	• Clear documentation demonstrating that water recovered is Basin Plan water • Salinity impacts are determined using approved models or methods (see Modelling), in accordance with Schedule B
Operation of SDL adjustment works or measures	• Clear documentation demonstrating the alignment between the project and the achievement of ecological outcomes of the Basin-wide Watering Strategy, e.g. endorsed operational plan • Salinity impacts are determined using approved models or methods, informed by an endorsed operational plan, in accordance with Schedule B
Changes to river operations to support Basin Plan outcomes	• Documented alignment of the changes in operational rules with overall environmental objectives (Chapter 8 of the Basin Plan) e.g. endorsed operational rule change • Salinity impacts are determined using approved models or methods, informed by an endorsed operational rule change, in accordance with Schedule B

Debit to be offset	Demonstration of alignment
Use of environmental water to support Basin Plan outcomes	• Clear documentation demonstrating the use of environmental water consistent with Basin-wide Watering Strategy e.g. environmental water proposals • Salinity impacts are determined using approved models or methods in accordance with Schedule B (Note: this is a knowledge priority under the BSM2030 strategy)

The MDBA must process offsets in the following sequence when updating the registers to the extent that there are credits available:

1. Commonwealth credits are used to offset environmental water debits in the Collective Account
2. Commonwealth credits are used to offset environmental water debits in Basin State accounts
3. Commonwealth credits are used to offset responsive management of SIS debits in the Collective Account
4. Basin State delivery of non-Basin Plan environmental water credits to be used to offset debits in the Collective Account and responsive management of SIS
5. TLM credits in the Collective Account to be used to offset remaining debits in Collective Account if required and after any relevant transfers to State contracting Government accounts have been processed

NOTES

Environmental water actions

Environmental water actions and expected salinity impacts are described in Table 2.13 below. Other environmental watering regimes undertaken by a state at a site for which they are responsible as a unilateral decision are considered state actions and arrangements for these actions is covered by BSM Procedure – Salinity impact assessment process.

Where appropriate, the salinity impact of these actions may be assessed cumulatively.

Table 2.13 – Environmental water actions in this procedure

Environmental water action	Salinity impact	Credits or debits
Delivery of environmental water	Generates dilution benefits May be delivery of Basin Plan water (attributed to Commonwealth Account), delivery of TLM water or non-Basin Plan water held by Basin States (attributed to the Collective Account)	Credits
Recovery of environmental water	Typically generates benefits (credits) by reducing salt mobilisation caused by irrigation activities May have adverse impacts in some circumstances	Credits & debits
Use of environmental water	Includes adverse impacts arising from use of water on floodplains and in wetlands and weir pool manipulations, where these actions mobilise salt into the river system Use of environmental water excludes use associated with operation of SDL works or measures and environmental watering undertaken as part of TLM Considered a knowledge priority to be assessed cumulatively at the system scale	Debits
Operation of works or measures	Includes potential benefits and adverse impacts resulting from environmental water use associated with the operation of works or measures associated with environmental water actions	Credits & debits

Environmental water action	Salinity impact	Credits or debits
	May be operation of TLM works or measures, or operation of SDL adjustment works or measures Salinity impacts from the operation of works or measures may be assessed individually or cumulatively	
Changes in river operations	River operations rule changes that arise to accommodate the environmental water actions such as changes to the Lake Victoria flushing rules Excludes changes that are part of the SDL adjustment mechanism and weir pool manipulations	Credits & debits

Basin Plan water

Includes Commonwealth environmental water holdings or other held environmental water held by a State Contracting Government to offset the reduction in the long-term average sustainable diversion limit.

Modelled scenario of water delivery

The provisional entry for Basin Plan water will be based on the proportion of water (by volume) recovered at that point in time, compared with the estimated dilution benefit from the delivery of 2,800 GL of Basin Plan water that was modelled in 2009 during development of the Basin Plan and is to be reviewed based on SDL adjustment.

The MDBA maintains a database of held environmental water and publishes progress of water recovery towards meeting the surface water recovery target SDLs on its website.

Modelled with confidence

The delivery of Basin Plan water has been modelled using the current version of the MDBA's River Murray Model as an interim arrangement. The implementation of MDBA's new River Murray Model (SOURCE) will allow the MDBA to generate a new entry for the delivery of Basin Plan water with greater confidence.

Cumulative impact

The MDBA may assess salinity impacts of environmental water actions cumulatively, including:

- salt mobilisation from the aggregation of watering actions across the system
- salt mobilisation from SDL adjustment works and measures

The MDBA may undertake these assessments cumulatively where assessing actions individually may result in salinity impacts being overlooked. For example:

- assessing the same actions individually may not generate a significant effect
- the sum of actions assessed individually may be less than actions assessed cumulatively

- salt mobilisation processes, not directly associated with any individual action, but caused by actions taken together may be overlooked

High level principles

TLM-BSMS High Level Principles for the accountability of TLM environmental water actions were adopted by the MDBC on 26 August 2008 (MinCo Meeting 96) and are as follows:

- *The governments signed up to the TLM IGA are jointly responsible for the salinity impacts (credits and debits) of TLM environmental watering, including both the dilution impacts of water delivery along the Murray River channel, and the salt mobilisation arising from environmental watering events;*
- *That the governments signed up to the TLM IGA are jointly responsible for the salinity impacts (credits and debits) of TLM water recovery actions post 23 August 2003 (consistent with the TLM Business Plan 2007); and*
- *Investment (if any) to offset TLM salinity impacts will be considered in terms of the combined impact of all TLM actions.*
- ***Note** that "jointly responsible" under recommendation (a) means that any credit or debit arising from the combined impact of all TLM actions will be attributed equally between New South Wales, South Australia, Victoria and the Commonwealth, consistent with the approach for attributing the 61 EC Joint Work and Measures Program as prescribed in the BSMS Operational Protocols.*

JW&M (61 EC) program attribution of salinity debits and credits

Register A

SA: 16.39% (10/61 EC)

VIC: 16.39% (10/61 EC)

NSW: 16.39% (10/61 EC)

Aust Gov: 0% (0/61 EC)

Sub total: 49.17% (30/61 EC)

Register B

SA: 8.61% (5.25/61 EC)

VIC: 8.61% (5.25/61 EC)

NSW: 8.61% (5.25/61 EC)

Aust Gov: 25% (15.25/61 EC)

Sub total: 50.83% (31/61 EC)

Register updates for the following year

For example where a request is made prior to 30th November in 2020, the corresponding amendment to register balances will be updated at the end of the 2020-21 financial year and incorporated in the 2021 salinity register.

See the Register operations for more information

Pre-existing contractual arrangements

That is, contractual arrangements for the distribution or transfer of credits in place prior to the action to be offset being entered on the register.

An example is existing contractual arrangements surrounding the recovery of water via the GMW Connections project.

Endorsed operational plan

Consistent with the approach for determining the salinity benefits of salt interception schemes, an operational plan will be the basis for estimation of salinity impacts of SDL works or measures as follows:

Prior to construction, the proposed operational plan will inform a preliminary estimate of salinity impact, entered as a provisional entry on the registers.

Once the SDL works or measures are constructed, a post construction review will be undertaken and the preliminary estimate of salinity impact will be updated according to the endorsed operating plan and formally entered on the registers in accordance with Salinity impact assessment process.

Some circumstances

Such as decreased dilution effects associated with reduced drainage.

Use of environmental water

Includes the use of Basin Plan water and non-Basin Plan water held by Basin States, such as the use of water on floodplains and in wetlands and weir pool manipulations.

Excludes use of environmental water associated with the operation of SDL adjustment works or measures and environmental water used under TLM.

River operations rule changes

Such as those endorsed by BOC through update to Objectives & Outcomes and Specific Objectives & Outcomes for river operations in the River Murray system.

Appendix 3. Requirements for processing Commonwealth offsets

At Ministerial Council meeting 15 (Agenda item 07) it was agreed that under the BSM2030 strategy the Commonwealth will make available to the relevant jurisdictions and the Contracting Governments collective (Collective Account), sufficient credits to offset any debits associated with:

- Use of environmental water associated with the Basin Plan (excluding operation of SDL works or measures and where already accounted for under TLM)

In addition, it was agreed that under the BSM2030 strategy the Commonwealth will make available sufficient credits on a *case-by-case basis* to offset any debits associated with:

- Recovery of Basin Plan water
- Operation of SDL adjustment works or measures
- Changes to river operations to support environmental outcomes

The requirements for the case-by-case basis are captured in Table 2.12 of Environmental water accountability.

Alignment with Basin-wide Watering Strategy

According to the Basin Plan (Clause 8.03), the Commonwealth Environmental Water Holder (CEWH) must perform its functions and exercise its powers in the use of held environmental water in a way that is consistent with the environmental watering plan, and the Basin-wide Watering Strategy (BWS). This includes consistency with the principles to be applied with environmental watering (Division 6, Subdivision A).

Consistent with these statutory obligations for the use of environmental water the Commonwealth requires the actions that are to be offset to provide a level of evidence to demonstrate that they align with the achievement of ecological outcomes of the BWS and principles to be applied in environmental watering.

This alignment should be readily demonstrable given that:

- The recovery of Basin Plan water is part of the broader suite of water reforms that make the ecological outcomes of the BWS possible
- Under the Basin Plan, all environmental watering is to be undertaken in line with the environmental objectives which underpin the BWS (Cl. 8.34) and the principles to be applied in environmental watering
- SDL adjustment works or measures must be designed, constructed and operated consistently with the requirements for all environmental watering (including Cl. 8.33 & 8.34) under the Basin Plan
- Changes to river operations to support Basin Plan outcomes refers to operational rule changes which may be required to ensure rivers can be managed to achieve multiple objectives, including the environmental objectives which underpin the BWS

Endorsed operational plans, river operations rule changes and other documentation should demonstrate this alignment with the Basin-wide Watering Strategy.

Endorsed operational plan

The Commonwealth requires that determination of the credits required to offset debits associated with the operation of SDL adjustment works or measures will be on the basis of an operating plan endorsed by the Commonwealth. Endorsement of the operating plans will be undertaken considering the advice of the CEWH and the MDBA.

The design, construction and operation of SDL adjustment works or measures must be undertaken in accordance with proposed operational plans that align with the requirements for all environmental watering under the Basin Plan and may be used to demonstrate alignment with the Basin-wide Watering Strategy.

These plans change from the initial design phase, through the construction phase, and again when the structure is operated, based on learnings at each step along the way.

Consistent with the approach used to estimate the salinity impacts of SIS the endorsed operational plan will provide the basis for the estimation of salinity impacts of the operation of SDL adjustment works or measures in the detailed assessment.

Modelling evidence base

The Commonwealth requires that the evidence base for estimating salinity debits to be offset, including model assumptions, is documented.

Models or methods used to estimate salinity impacts of accountable actions must be approved by the MDBA in accordance with Clause 38 of Schedule B to the Agreement and any BSM procedure. BSM procedures require that the evidence base, including model assumptions, for estimating salinity impacts be documented as part of the assessment and review process.

2.7 Tracking and managing data supplied to estimate salinity impacts using the River Murray model

This procedure outlines the steps for tracking and managing data provided to the MDBA for assessing the salinity impact of existing and new register entries using the River Murray model. Register entries and the models that support the entries are reviewed according to the schedule set out in the Review Plan. When a review happens, the affected register entries are reassessed and before the end of September each year the registers are updated to reflect the new information.

2.7.1 This procedure

This procedure sets out the process for tracking and managing River Murray model input data arising from the review of existing register entries and/or models under the BSM2030 Strategy or from new accountable actions. Data for estimating the salinity impacts using the River Murray model can be either salt load data or time series of flow and salinity data.

2.7.2 Related procedures

Details of the salinity impact assessment process for new proposals are provided in Salinity impact assessment process.

A description of the arrangements for conducting assessments is set out in Conducting reviews and assessments.

Salinity impact assessment arrangements specific to environmental water actions are described in Environmental water accountability.

Details of the requirements surrounding the development of approved models and methods used to undertake an assessment are set out in Modelling.

Register entries describes the arrangements for entering credits and debits on the registers for actions other than environmental water actions.

2.7.3 Generation of data

Contracting Governments and the MDBA are responsible for identifying new actions which may have a significant effect and for reviewing each register entry and the models that are supporting them.

Modelling of the salinity impact for a new accountable action will result in the generation of either salt load data or flow and salinity time series data, as will the review of an existing register entry and/or model.

2.7.4 Assessing changes in flow, salinity and/or salt loads

When a new action is identified, Contracting Governments must provide estimates of the change in salt loads and/or flow and salinity caused by the action.

Models used to provide the data at this stage of the assessment for a new action do not need to be approved. This stage of assessment is required to determine if the salinity impact from the action will result in a significant effect at Morgan, and if so, the action will then proceed to a detailed assessment.

For a detailed assessment, this must be based on estimates generated by an approved model or method. However, sometimes the method is being approved simultaneously with the revised

estimate, and under these circumstances the revised estimate can only be used for register purposes once the model is approved.

2.7.5 Supply of data to the MDBA for estimating salinity impacts

Once the new data is generated and supplied to MDBA, State Contracting Governments officially request MDBA to provide a detailed assessment of the modelled salinity impact at Morgan.

For register entries that are related to changes in river operations, demand trends, permanent trade, and growth in diversions, it is the responsibility of MDBA modellers, in consultation with Contracting Governments, to update this data when changes are required.

The data provided for a detailed assessment:

- Must be able to show the change in salt loads and/or flow and salinity due to the action i.e. the difference between a base run without the action, and scenarios that include the action
- Data must be provided as either annual average salt loads (tonnes/day) or time series of daily (tonnes/day) or monthly (tonnes/day) salt loads and/or time series of daily flow (ML/day) and salinity (EC) covering the benchmark period (currently 1 May 1975 to 30 April 2000) for the 1988/2000 benchmark conditions and the scenario/s that include the action
- Where model outputs apply to more than one register entry, these must be apportioned according to the relative contribution for each action before being supplied to MDBA. While this results in more MDBA river model runs, it removes the requirement for apportioning the salinity effect at Morgan as a post-processing step
- Must demonstrate the change locally and at a point in the shared system where the MDBA can relate the data to a node in the River Murray model
- Data must be supplied in Microsoft excel compatible format.

If only one register entry is affected the filename should include the register entry name and date. If more than one entry is affected, then the file name should include the model name and date.

Any additional documentation, such as reports describing the new or upgraded model and the method for estimating salt loads or time series of flow and salinity, supporting the assessment should be supplied to the MDBA at the same time.

The data is to be supplied to the MDBA via email and must be sent to both the MDBA salinity modeller (via the salinityregisters@mdba.gov.au email) and the MDBA representative for reviews of models and register entries (via the bsmap@mdba.gov.au email).

2.7.6 Receipt and archiving of data by MDBA

The email requesting the assessment of the modelled salinity impact at Morgan (River Murray model runs) with the supplied data attached will be archived by the MDBA to ensure that the original email and data are accessible as a single point of truth for the data supplied. These will be stored in the MDBA records management system (MDBA Reference: E2009/1632 Model Run Requests).

MDBA will acknowledge via email the receipt of the request for an assessment and the data received.

2.7.7 Conversion of supplied data to be used in the River Murray model

Data received by the MDBA is checked for appropriateness and adjusted, if necessary, so the data can fit into the River Murray model.

Examples of adjustments for data that is supplied as daily time series of flow and salt loads are:

- factoring up drain flow and salt load data to account for ungauged catchments (*e.g*. Sunraysia drying of drains register entry)
- adjusting flow and salt load at tributary input sites to the River Murray to account for drains that enter upstream of those sites (*e.g.* Shepparton L.W.M.P. register entry)

Metadata describing any adjustments made to the data supplied to the MDBA will be archived in the MDBA records management system (MDBA Reference: E2009/1632 Model Run Requests container) and related to the original supplied data.

Metadata documents will contain a description of the request including the sender of the request, a summary of the data before and after adjustments, a description of the method used for the assessment and a summary of the model run results.

The data (as adjusted or as supplied if no adjustments were required) to be used in the River Murray model is saved and processed in the appropriate folder (currently MDBA workspace RM/7547).

The spreadsheet maintained for the register entries and used for assessments based only on salt loads from groundwater models is updated annually for each salinity register. The current version is available at MDBA reference D22/30510.

2.7.8 Assessing requests and providing results to Contracting Governments

The turnaround for an assessment is ten working days from the date of receiving the request subject to the clarification of any modelling questions and issues.

The model run results that include a summary of the data sent, the detailed method of assessment and a summary of any adjustments are captured in a document that is sent to the relevant Contracting Government. This email is archived in the MDBA records management system (MDBA Reference: E2009/1632 Model Run Requests container).

An acknowledgement of receipt via email from the relevant Contracting Government is expected in response.

2.7.9 Register technical report

After the outcomes from the assessment of a new accountable action, or the review of a model or register entry, are incorporated in the Salinity Registers, the changes are included in the Register technical report which is provided each year to BSMAP members for comment at the February BSMAP meeting.

3 Works or Measures

3.1 Authorised works or measures

Programs of authorised works or measures have been implemented under the Salinity & Drainage Strategy (S&DS) and the Basin Salinity Management Strategy (BSMS) to reduce river salinity in the Murray-Darling Basin, and they continue to be implemented under the Basin Salinity Management 2030 (BSM2030) strategy. These authorised works or measures are listed in Appendix 2 of Schedule B to the Murray-Darling Basin (MDB) Agreement.

Salt interception schemes (SIS) have been the focus of authorised works or measures programs constructed under the S&DS and BSMS, as they offer a particularly effective and direct method of reducing in-river salinity.

3.1.1 This procedure

This procedure provides context around authorised works or measures implemented under the S&DS, BSMS and BSM2030 strategy, and describes the accountability, assessment and review arrangements for salinity impacts arising from authorised works or measures.

Works or measures to be implemented as part of the Sustainable Diversion Limits Adjustment Mechanism are currently proposed in accordance with the Basin Plan. Where these works or measures have salinity impacts to the shared water resources they will be accountable under Schedule B to the MDB Agreement. Asset management and ownership arrangements for these works or measures are yet to be confirmed and implications of these arrangements will be considered in future updates to BSM procedures. The salinity accountability arrangements for the Sustainable Diversion Limits Adjustment Mechanism works or measures are set out in the Environmental water accountability.

3.1.2 Related procedures

The salinity impact assessment process is described in Salinity impact assessment process.

The arrangements for conducting reviews and the detailed assessments of Accountable Actions and delayed salinity impacts are described in Conducting reviews and assessments.

The requirements for entering the salinity impacts of Accountable Actions and delayed salinity impacts on the registers are described in Register entries.

Accountability arrangements for environmental water actions are described in the Environmental water accountability.

3.1.3 Background

3.1.3.1 Salt interception schemes

In the Murray-Darling Basin, regional groundwater generally flows towards the lower River Murray. Between the townships of Swan Hill and Morgan the salinity of groundwater is extremely high. As a consequence, since the establishment of the S&DS in 1988, the primary focus of SIS development has been in the lower River Murray from Mallee Cliffs in NSW to Woolpunda in South Australia to divert saline groundwater and drainage water to disposal basins before it enters the floodplains and rivers. Schemes have also been constructed at Barr Creek, Pyramid Creek and the Upper Darling (downstream of Bourke) to target significant point source salt loads.

3.1.3.2 Investment in authorised works or measures

Since 1988, the Commonwealth Government together with the Governments of NSW, Victoria and South Australia have invested in programs to reduce salt entering the River Murray primarily (but not exclusively) through the construction and operation of SIS. From 2001, funding arrangements have recognised the shared responsibility for the historical increase in salt load discharged to the River Murray and also the need to provide offsets that permitted future irrigation development within the Basin.

Works or measures implemented under these programs were authorised under Cl. 56 of the MDB Agreement and are listed in Appendix 2 of Schedule B to the MDB Agreement. In accordance with the MDB Agreement, works must be constructed, operated, maintained and implemented consistent with the River Murray Operations Asset Agreement and River Murray Operations Asset Management Plan.

In some cases States invested in SIS on their own, which occurred when other jurisdictions decided joint investment was not required. These works or measures are accounted for within the salinity accountability framework as state actions. In other cases, the costs and associated benefits of a SIS were shared between a State individually and jointly with the other jurisdictions. These works or measures are accounted for within the salinity accountability framework as shared works or measures.

The focus of joint investment in authorised works or measures has been on the implementation of SIS in highly saline reaches of the River Murray in South Australia, where there is a greater potential for return on investment. As a result, South Australia's opportunity to generate credits through state actions for their State account has been reduced. The introduction of shared works or measures sought to address this issue by providing an alternative model for South Australia in particular to invest via State components of SIS proposals.

3.1.3.3 S&DS works or measures

Under the S&DS from 1988 to 2000, Victoria, NSW, South Australia and the Commonwealth invested in a program of authorised works or measures that sought to reduce salt loads entering the River Murray.

The S&DS works or measures program sought to reduce average daily salinity at Morgan by 80 EC, a modelled target derived as the optimum economic outcome that could be achieved through construction and operation of SIS along the River Murray.

A salinity benefit of 15/80 of the total benefit achieved was attributed to each of Victoria and NSW to offset the impacts of future drainage and salinity control works or development in irrigation areas. The remaining salinity benefit of 50/80 of the total benefit achieved was set aside by South Australia and the Commonwealth to improve River Murray salinity and contribute to net salinity reduction. With the introduction of the accountability framework, NSW and Victoria each received their benefit as salinity credits on the salinity registers.

3.1.3.4 Joint works or measures

Victoria, NSW, South Australia and the Commonwealth invested in a second program of authorised works or measures under the BSMS over the period from 2001 to 2015, known as the Joint Program of Joint works and measures.

The joint program was required to reduce modelled average daily salinity at Morgan by 61 EC in response to a salinity audit[3] that predicted large increases in river salinity due to the impacts of

[3] MDBMC, 1999, The Salinity Audit of the Murray-Darling Basin. A 100-year perspective, 1999

Cl. 10 historical actions. A major driver for the joint program was to address this 'Legacy of History' as the expected delayed salinity impacts came to be known.

It was agreed that the corresponding salinity credits would be attributed in equal parts to each of Victoria, NSW, South Australia and the Commonwealth. Each of the states 25% share was split between Register A and B, 16.39% and 8.61% respectively, to ensure sufficient credits were provided to offset delayed salinity impacts on Register B. The Commonwealth Government's 25% share was assigned to the State Contracting Governments' Register B accounts in the proportions of NSW (15%), Victoria (5%) and SA (80%). The Commonwealth agreed to assign their share to resolve the difference between the States' predicted future salinity impacts from the 'Legacy of History' made at the time of agreement of the BSMS in June 2001.

3.1.3.5 BSM2030 strategy

The existing suite of SIS have been very successful in reducing river salinity and are still essential to achieving the Basin Salinity Target. They are most effective in reducing river salinity during low flow periods, and especially critical towards the end of prolonged drought sequences when system dilution is no longer available.

Cl. 10(2) Modelling indicates that there will be no need for further joint capital investment in new SIS for the life of the BSM2030[4] strategy. Nonetheless, Schedule B to the MDB Agreement allows for further joint works or measures to be undertaken under the BSM2030 strategy where Ministerial Council decides it is necessary for maintaining salinity at or below the Basin Salinity Target at Morgan.

In addition, under the BSM2030 strategy, a responsive approach to SIS management is being trialled in order to take opportunities to reduce operations and associated operating costs during periods of low river salinity. It will also provide an opportunity to better understand the operational capabilities of SIS, and the landscape and river salinity responses arising from the change in operations.

Other opportunities to further improve SIS management, monitoring and modelling have been identified and will be pursued under the BSM2030 strategy.

3.1.4 Attribution of salinity benefits

Salinity credits or debits arising from S&DS works or measures are attributed in accordance with the agreed proportions in Table 3.1.

Cl. 11(1) Salinity credits or debits arising from joint works or measures are attributed in accordance with clause 11 of Schedule B. Salinity credits or debits, unless the Ministerial Council decides otherwise, are attributed to the Contracting Governments according to the formula set out in clause 11(1) (repeated in Table 3.2). The reallocation of the Register B Commonwealth salinity benefits from joint works or measures is shown in Table 3.2, as agreed at Ministerial Council meeting No. 32 (November 2002).

Cl. 11(2) The exception to the attribution of salinity credits or debits arising from joint works or measures in accordance with clause 11 (1) of Schedule B can be made where BOC or the BSM Procedures require the credits or debits to be attributed to all Contracting Governments in the Collective Account.

[4] MDBA, 2014, General review of salinity management in the Murray-Darling Basin

Table 3.1 – Attribution of salinity benefits arising from S&DS works or measures

	% share	Proportion of salinity benefit
New South Wales	18.75%	15/80
Victoria	18.75%	15/80
The river*	62.75%	50/80
Total	**100%**	**80/80**

* South Australia and the Commonwealth agreed to return their share of the salinity benefits to the River Murray to improve water quality (this share is not recorded on the salinity register)

3.1.5 Protecting the salinity benefits provided by Authorised works or measures

The benefits arising from any subsequent accountable action should not erode the credits assigned to an existing authorised work or measure on Register A or Register B without prior agreement of the MDBA in consultation with a relevant advisory panel and BOC.

Guidance has been developed for this BSM Procedure to assist with the interpretation of this principle and to improve clarity in its application. This includes:

- States should protect the joint salinity benefits provided by authorised works or measures
- States should not intentionally reduce the joint salinity benefits provided by authorised works or measures by establishing State actions to reduce salt loads that were previously intercepted by authorised works or measures
- A change in the joint salinity benefit provided by an authorised work or measure can occur as a result of new knowledge, such as through an improved conceptual understanding, improved models, or additional data provided by monitoring

This principle does not restrict States to undertake actions behind authorised works or measures, such as improving irrigation efficiencies, that are not primarily intended to reduce salt loads being intercepted by the authorised works or measures.

Additional detail regarding the history of this principle is provided in the notes section.

3.1.6 Determination of the sharing ratio for Joint and State components of shared works or measures

In the case of shared works or measures, the ratio by which salinity benefits and scheme costs will be shared between a Joint work or measure and a State action must be agreed by Ministerial Council as part of the SIS construction approval process.

Any subsequent decisions regarding changes to the ratio by which salinity benefits and scheme costs are shared between a Joint work or measure and a State action must take into consideration the following principles:

- Provide consistency and certainty
- Inform planning for future risks
- Respect initial investment decisions and consider subsequent decisions
- Defensible and transparent approach

Where the salinity impact arising from any shared works or measures is re-estimated as part of a review, the MDBA must apply the current agreed sharing ratio for that shared work or measure, unless otherwise determined by BOC, considering advice from any relevant advisory panel.

Where the sharing ratio for any shared work or measure is amended by BOC, they must inform Ministerial Council of the change.

Table 3.2 – Attribution of salinity benefits arising from joint works or measures

Register A[5]		
	% share	**Proportion of salinity benefit**
New South Wales	16.39%	10/61
South Australia	16.39%	10/61
Victoria	16.39%	10/61
Sub-total Register A	**49.17%**	**30/61**

Register B[5]		
	% share	**Proportion of salinity benefit**
New South Wales	8.61%	5.25/61
South Australia	8.61%	5.25/61
Victoria	8.61%	5.25/61
Commonwealth	25.00%	15.25/61
Sub-total Register B	**50.83%**	**31/61**
Total	**100%**	**61/61**

Reallocation of Register B Commonwealth salinity benefit[6]		
	% share of 61 EC	**Proportion of salinity benefit**
New South Wales	3.75%	2.2875/61
South Australia	20%	12.2/61
Victoria	1.25%	0.7625/61
Sub-total	**25.00%**	**15.25/61**

[5] Schedule B clause 11(1) sets out the attribution of salinity credits or debits for joint works or measures
[6] Ministerial Council meeting No. 32 (November 2002)

3.1.7 Apportionment of costs

Cl. 48(1) The share of the cost of any S&DS work or measure or any joint work or measure must be apportioned consistent with Cl. 72 of the MDB Agreement, except where:

Cl. 48(2)

- The share of costs is varied by an agreement made when transferring credits or debits in accordance with Cl. 23 of Schedule B to the MDB Agreement and the Register operations

The share of the cost for the accountable component of any shared work or measure must be apportioned in the same ratio as the share of the salinity benefit for the accountable component.

3.1.8 Reviews and assessments

Reviews and assessments of S&DS works or measures, joint works or measures and shared works or measures must be undertaken in accordance with Conducting reviews and assessments and Salinity impact assessment process.

A review of the operational performance of SIS in accordance with Cl. 53 of the MDB Agreement may be used to inform the reviews of register entries and models associated with S&DS works or measures and joint works or measures.

A relevant working group may advise on the content of reviews of S&DS works or measures and joint works or measures in accordance with this procedure.

The MDBA may request that a project steering committee is formed comprising representatives from relevant agencies to provide advice on reviews of S&DS works or measures, joint works or measures and shared works or measures.

The MDBA may seek technical advice from a relevant working group on:

- Investigations required to assist in the determination of an accountable action arising from a proposal relating to a joint work or measure
- Whether a declared accountable action relating to an authorised work or measure be designated in whole or in part either or both a joint work or measure or a state action in accordance with Table 3.3
- Reviews of S&DS works or measures, joint works or measures, and shared works or measures

A relevant advisory panel may seek technical advice from a relevant working group on:

- Proposed updates to register entries arising from reviews of S&DS works or measures, joint works or measures, and shared works or measures

The MDBA may facilitate provision of technical advice from a relevant working group as per the process described in Figure 10 of Conducting reviews and assessments.

Following a review of a register entry for an S&DS work or measure, a joint work or measure, a shared work or measure, or associated model, the MDBA must finalise review outcomes in accordance with Conducting reviews and assessments.

3.1.9 Trial of responsive management of SIS

MDBA must implement a trial of responsive management of SIS, initially for a 3-year period commencing in 2016-17.

MDBA must report annually on the implementation of the trial of responsive management of SIS as part of the BSM2030 strategy reporting process.

The effectiveness of the trial will be reviewed at the end of the trial period. The review must:

- Consider the effectiveness of responsive management of SIS
- Consider the salinity impacts, local and third party impacts, and the costs and benefits
- Make recommendations for future operation of responsive management of SIS

Following the trial, if responsive management of SIS is implemented and is declared an accountable action and the MDBA has estimated credits and debits with confidence:

- Credits and debits arising from responsive management of SIS will be attributed to all Contracting Governments in the Collective Account
- Commonwealth environmental water credits remaining, once offsets of environmental water debits are accounted for, may be used to offset debits arising from the responsive management of SIS for the life of the BSM2030 strategy only
- Basin State delivery of non-Basin Plan environmental water credits may be used to offset debits arising from the responsive management of SIS
- The MDBA must process any offsets of responsive management of SIS debits in accordance with Environmental water accountability

Table 3.3 – Features of joint works or measures, state actions (state schemes) and shared works or measures

	Joint work or measure	State actions (state schemes)	Shared work or measure
Classification	• To offset salinity debits due to both accountable actions on Register A and delayed salinity impacts on Register B • Approved under cl. 12 of Schedule B • Typically infrastructure based with immediate (within 2 years) and direct benefit for the River Murray as modelled at Morgan • Non-infrastructure based works or measures may be considered if other criteria are met • Deliver demonstrable benefits and be cost-effective considering expected salinity environmental, economic and social benefits • Meet land use, environmental and any statutory requirements	• Comprises predominantly accountable actions providing demonstrable local, regional and/or commercial benefits • May address delayed salinity impacts or offset impacts of new developments, with a direct benefit for the River Murray as modelled at Morgan • May comprise individual actions undertaken to manage risks of catchment salinity to the shared water resource	• Works or measures that comprise a combination of joint works or measures and state actions • Approved under cl. 12 of Schedule B
Salinity benefit	• Attributed in accordance with Cl. 11 of Schedule B to the MDB Agreement as per arrangements in Table 3.2 • Commonwealth's 25% share of salinity credits is assigned to Register B in accordance with arrangements agreed at Ministerial Council meeting 32 (November 2002) – see Table 3.2	• Attributed to the relevant State/s account (State action)	• Attributed in direct proportion to the ratio determined between the joint and state component
Management & funding – Construction, Operation, Maintenance & Renewals	• MDBA on behalf of Asset Controlling Governments in accordance with Part VIII of the MDB Agreement	• State/s implementing the works or measures • Where a state action is a joint asset, it is managed by MDBA on behalf of the relevant State Contracting Government, and funded by the relevant State Contracting Government	• MDBA on behalf of Asset Controlling Governments in accordance with Part VIII of the MDB Agreement

	Joint work or measure	State actions (state schemes)	Shared work or measure
Delivery – Construction, Operation, Maintenance & Renewals	• Relevant State Constructing Authority in accordance with Part VIII of the MDB Agreement	• Relevant agency for the State/s implementing the works or measures • Where a state action is a joint asset, MDBA on behalf of the relevant Contracting Government	• Relevant State Constructing Authority in accordance with Part VIII of the MDB Agreement

NOTES

Authorised works or measures

Cl. 56

These are works or measures authorised under Cl. 56 of the MDB Agreement that are listed in Appendix 2 of Schedule B to the MDB Agreement. This includes both S&DS works or measures and Joint works or measures.

Shared works or measures

Where an authorised work or measure comprises a combination of a joint work or measure and a state action, it is a shared work or measure.

As at November 2022, authorised works or measures that are listed in Appendix 2 of Schedule B to the MDB Agreement that are shared works or measures are:

- Murtho SIS (joint component 98% / state component 2%)
- Waikerie Lock 2 SIS (joint component 94% / state component 6%)
- Loxton SIS (joint component 98% / state component 2%)
- Bookpurnong SIS (joint component 69% / state component 31%)
- Mildura-Merbein SIS refurbishment (joint component 50%/ state component 50%)

Note that both the Mildura-Merbein SIS and the Buronga SIS include a component in the baseline that is attributed for modelling purposes to Victoria and New South Wales respectively.

Share of the cost for Joint works or measures

In brief, the joint venture budget component may be summarised as (Cl. 72 of the MDB Agreement should be referred to in full for more information):

	Commonwealth	SA	Vic	NSW
Investigation & Construction	25%	Balance of costs shared equally between States		
Operation & Maintenance	0%	Balance of costs shared equally between States		

History of the joint works or measures principle from the BSMS Operational Protocols

The BSMS Operational Protocols included a principle relating to the salinity benefits provided by Joint works or measures. The principle stated that "*the benefits arising from any new action should not erode the credits assigned to an existing joint work or measure on Register A or Register B without prior agreement by the Commission.*" The principle remains relevant under the BSM2030 strategy and has been revised slightly to ensure consistency with the amended Schedule B.

The intent of the principle was to ensure that States did not intentionally undertake actions behind authorised works or measures, such as constructing works that were State actions, to reduce the salt loads that were available to be intercepted by the authorised works or measures, and hence reduce the salinity credits provided through the joint investment. This principle does not restrict States to undertake actions behind authorised works or measures, such as improving irrigation efficiencies,

that are not primarily intended to reduce salt loads being intercepted by the authorised works or measures.

In relation to shared actions, this principle also ensured that if a joint work was already addressing post 88 salinity impacts and the register entry reflects this, the State cannot adopt this benefit as a State action when determining sharing arrangements. It can only adopt benefits into the future that are beyond that already claimed.

Jointly managed state salt interception schemes

Pike Stage 1 SIS is currently the only example of a jointly managed SIS that is a 100% State action. When undertaking assessments or conducting reviews of jointly managed state SIS, the MDBA and relevant advisory panel may seek technical advice from a relevant working group.

Reallocation of the Register B Commonwealth salinity benefit

The assignment arrangement for the distribution of the Register B Commonwealth salinity benefit was based upon the Commonwealth's agreement to resolve the difference between the States' future impacts taking into account the 1999 Salinity Audit predictions of the 'Legacy of History' (delayed salinity impacts) made at the time of agreement to the BSMS in June 2001. This assignment of the Commonwealth's credits was approved at Ministerial Council meeting No. 32 (November 2002). The assignment of credits to States from the Commonwealth may be modified in future as the result of reviews under the Review Plan.

Asset Controlling Governments

Cl. 54(2)

The Commonwealth, South Australian, New South Wales and Victorian governments as set out in the RMO Assets Agreement.

Cl. 14

State Constructing Authorities (under the* Water Act *2007)

State Authorities in South Australia, Victoria and New South Wales hold assets in their name for, and on behalf of, the Asset Controlling Governments. They undertake operation and maintenance as directed and funded by the MDBA (River Murray Operations Work Plan and/or the Asset Management Plan). The State Constructing Authorities for authorised works or measures listed in Appendix 2 of Schedule B to the Murray-Darling Basin Agreement are:

- Minister for River Murray (South Australia) delegated to Department for Environment and Water and South Australian Water Corporation
- Goulburn-Murray Water (Victoria)
- Water NSW (NSW)
- NSW Department of Planning, Industry and Environment – Water

Asset management, operations, maintenance, monitoring and approval requirements

Under the MDB Agreement, this must include requirements stipulated in the Work Plan and/or the Asset Management Plan, and may include, but is not limited to:

- Relevant asset management and operating procedures
- Operations and maintenance manuals
- Land management requirements and associated approvals and monitoring

4 Flow management

4.1 Review of elevated salinity events

Contracting Governments, through the BSM2030 strategy, have committed to the coordinated review of in river elevated salinity events to understand the causes, impacts and effectiveness of management responses and to identify potential policy improvements. This supports the Basin Plan flow management obligations to have regard to the salinity targets for managing water flows.

Under the Basin Plan, entities must have regard to the flow management targets for salinity. These entities include the Murray-Darling Basin Authority, Basin Officials Committee (BOC), agencies of Basin States and environmental water holders and managers (of both planned and held environmental water) including the Commonwealth.

The causes and timing of elevated salinity events are diverse and complex, commonly arising from the cumulative impacts of coinciding or sequential events. Given that salinity management is the primary focus of the BSM2030 strategy, the inclusion of flow management in the new strategy provides an opportunity for the relevant advisory panel to look at the collective outcome for salinity in the shared water resources from individual actions and accountabilities. Where an elevated salinity event warrants further investigation, a review will be conducted to identify if policy changes may result in improved salinity outcomes.

The review of elevated salinity events involves processes for entities to be informed and to benefit from the gathering of collective learnings from salinity managers, environmental water holders and managers, MDBA river managers and their state counterparts, and salt interception scheme (SIS) operators with respect to salinity outcomes resulting from flow management.

4.1.1 This procedure

This procedure defines an elevated salinity event and outlines a process for reviewing elevated salinity events including their causes and impacts, the effectiveness of management responses, opportunities for policy improvements, and for information sharing. It will consider operational responses but will not make any recommendations regarding the operational aspects of dealing with elevated salinity events.

This review process does not replace the responsibilities of jurisdictions identified in the Basin Plan in having regard to the Basin Plan Targets, reviewing their performance against targets, and where necessary identifying improvements to operational or decision making practice.

4.1.2 Elevated salinity events

Under this procedure:

An elevated salinity event refers to an increase in river salinity levels which may result in adverse impacts, arising from a single event or the cumulative impacts of coinciding or sequential events. These elevated salinity levels may cause one or more of the following:

- A management response, or
- Contribution to exceeding a target or the near miss of exceeding a target.

A response-based elevated salinity event is where an increase in river salinity levels results in:

- A management response from river operators/managers, such as a change to river operations or additional monitoring of salinity levels. These are more likely to be in response to climatic events
- The implementation of a contingency plan from a managed event such as an environmental watering event or a weir pool lowering
- Recognition of the need to respond, however the event occurs at a point in time or a geographical location where there are no management options available
- Advice being provided to stakeholders regarding increased salinity levels

A target-based elevated salinity event is where an increase in river salinity levels:

- Exceeds an agreed threshold or trigger in a salinity risk management plan from a managed event such as an environmental watering event or a weir pool lowering, or
- Contributes to exceeding a target or near miss of exceeding a target such as a salinity flow management target outlined in section 9.14 of the Basin Plan

4.1.3 Reviews of elevated salinity events

Reviews of elevated salinity events will be conducted annually, if required, through a coordinated process examining the individual actions of each entity involved in flow management, the collective outcomes for salinity in the shared water resources, and policy implications.

These reviews will be in addition to the usual planning, implementation and review activities of each jurisdiction that are undertaken at frequencies appropriate to their business requirements and to fulfil their responsibilities identified in the Basin Plan to have regard to the Basin Plan salinity targets for managing water flows.

4.1.4 Process for review of elevated salinity events

The review of any elevated salinity events from the previous year (July to June) will take place on an annual basis, if required, following discussion and agreement at the July meeting of the relevant advisory panel.

The process to identify elevated salinity events requiring review includes:

- A standing sub-item in the 'Other Business' section of all meeting agendas of the relevant advisory panel
- Contracting Governments or MDBA request that the relevant advisory panel determine if an elevated salinity event requires review
- Review of information in the annual summary of river operations, environmental water holders and managers Basin Plan reporting, or in response to recommendations from independent auditors

MDBA will coordinate reviews on behalf of the relevant advisory panel, and jurisdictions and MDBA river managers will compile the information and undertake an analysis of any elevated salinity events in the relevant jurisdiction. Other Contracting Governments can elect to participate in the review, given the geographic location, identified salinity impacts or target exceedances, or where they are the owners of the policies that may be identified for potential improvement.

If there has been an elevated salinity event the jurisdictional agencies, MDBA river managers and environmental water holders and managers will share all relevant information on the event with the relevant advisory panel following a preliminary process to verify that the elevated salinity event was a real event, and not the result of measurement error, calibration issues, or other equipment fault.

- MDBA river managers will share any information collected during the elevated salinity event including information that has been prepared and used in the reporting of salinity outcomes in the Annual Summary of River Operations
- Environmental water holders and managers will share all relevant information collected during the elevated salinity event including information that has been prepared for:
    - Basin Plan Schedule 12, Matter 14 reporting that shows how entities had regard to the targets listed in section 9.14(5) of the Basin Plan
    - Any relevant information arising from relevant coordination forums
- Jurisdictional salinity managers will share all relevant information to assist the review of an event

The relevant Contracting Government will compile and analyse information from the elevated salinity event and present this information to a discussion forum in either August or September. The forum will involve salinity managers, river operators and environmental water managers from relevant committees.

During the process for reviewing an elevated salinity event the following issues may be investigated:

- The cause, duration and magnitude of elevated salinity events, including the scale, timing and sequence of the actual salinity response, and results (summary statistics) of salinity monitoring and flow during each elevated salinity event, and the context given any previous events and associated historical management actions
- The impacts on water users and the environment, including the cumulative impacts associated with each event, and an assessment of the impact of the event on salinity levels at relevant Basin Plan target reporting sites. Water users include users of water for irrigation, domestic, and recreational purposes
- The effectiveness of mitigation and management responses, including the individual actions of each entity involved in flow and salinity management, the adequacy of monitoring undertaken, the use of risk management plans and procedures, and a summary of engagement with relevant government agencies, river users and the community, and any education activities undertaken in response to the elevated salinity event
- The outcomes and key lessons from the review of elevated salinity events, including a summary of knowledge improvements from this event and previous events, suitability of available data to determine the cause of the elevated salinity event, the regard for both water quality and water quantity, and the collective outcome for salinity in the shared water resources
- Proposed changes to policy and updating the documented practice, including changes to guidelines aimed at assisting entities in having regard to the salinity targets for managing water flows

At the end of the review process:

- The relevant advisory panel will consider the preliminary outcomes from the review of an elevated salinity event in October and may make recommendations for any changes and improvements to policies
- The Independent Audit Group for Salinity, every two years, will consider the outcomes from any reviews of elevated salinity events and may make recommendations for any changes and improvements to salinity management policies
- Outcomes from the review of an elevated salinity event will:
    - be shared, through the relevant secretariats, with relevant committee members for their consideration and response
    - inform BSM2030 and Basin Plan reporting
    - be shared with BOC through BSM2030 status and comprehensive reporting

The final outcomes from the review of an elevated salinity event will be available by around December each year.

Where the outcomes from a review identify the potential for policy improvement, members of the relevant advisory panel will be requested to pursue these opportunities for policy changes in the relevant jurisdiction or through BOC and the Authority.

NOTES

Relevant coordination forums

Such as the Southern Connected Basin Environmental Watering Committee (SCBEWC) and the Water Liaison Working Group (WLWG).

Relevant committees

Such as BSMAP, SCBEWC and WLWG.

Have regard to

A number of provisions of the Basin Plan require decision-makers to 'have regard to' certain matters when performing functions and making decisions. When a decision-maker is required to 'have regard to' particular matters, it is expected that the decision-maker will give those matters proper, genuine and realistic consideration, even if not ultimately bound to act in accordance with those matters. A requirement to 'have regard to' a particular matter or matters does not mean that the decision-maker cannot have regard to other relevant matters, for example, the benefits and costs of taking a particular action. Section 1.07 of the explanatory statement in relation to the Basin Plan provides further information about the phrases 'have regard to', 'having regard to' and 'regard must be had'.

MDBA has also prepared further guidance about having regard to the flow management targets within the Basin Plan.

5 Salinity management in catchments

5.1 Catchment salinity

Under the BSM2030 strategy, Contracting Governments must consider the impacts of catchment salinity on shared water resources. In practise, this involves consistent monitoring, reporting and reviewing salt exports from each of the main tributary catchments.

The purpose of this work is to provide catchment scale context of salinity trends and risks to the shared water resources to inform appropriate adaptive management responses.

5.2 Catchment salinity under BSM2030

Under the BSM2030 strategy, EoVTs now play an important role in building an understanding of salinity trends and risks to the shared water resource arising from tributary catchments.

Monitoring is undertaken at End-of-Valley-Target sites (EoVT sites) to ensure continuity and consistency of data sets for all tributary catchments. Monitoring and reporting outputs are considered against estimates of salinity and salt loads under baseline conditions at each EoVT site.

Reviews of EoVTs, associated models, baseline data sets and projected salinity trends provide an understanding of salinity risk to the shared water resource.

The salinity registers continue to provide the basis for assessing and managing the salinity impacts of 'legacy of history' and the net effect of catchment actions (if any) that impact on the shared water resources.

Basin States may consider the need for additional measures to protect catchment assets and to manage and monitor impacts of land and water salinisation in the catchments consistent with state or regional initiatives. The BSM2030 strategy will continue to support adaptive management responses through state-led programs such as water resource plans, land and water management plans and catchment plans.

5.2.1 This procedure

This procedure provides the approach for building an understanding of salinity trends and risks to the shared water resources arising from tributary catchments to inform adaptive management responsibilities. This procedure also provides a guide to State Contracting Governments in the efficient and effective reporting of flow and salinity monitoring data in biennial comprehensive reports.

5.2.2 Related procedures

Monitoring sets out the requirements for monitoring EoVTs under the BSM2030 strategy.

Reporting provides reporting requirements for Contracting Governments and Developing the Review Plan describes the responsibilities for EoVT reviews and their frequency.

5.2.3 Background

Rising salinity in the 1990's from deteriorating tributary catchments was perceived to be a major and growing threat to the shared water resources of the Murray-Darling Basin. In response to this threat, in 2001 the BSMS introduced End-of-Valley-Targets (EoVTs) to serve as indicators of catchment health and to help assess and manage the impacts of salt exports from catchments to the shared water resources.

While the BSMS allowed for further rises in salinity at some EoVTs, in effect they were intended to provide a 'cap' on salinity from catchments. Through the achievement of EoVTs, it was anticipated that within valley assets would be protected, and on-ground works would provide an offset mechanism and contribute to downstream salinity benefits.

EoVTs were introduced at a time when it was expected that without substantial intervention, three to five million hectares of land would become salinised in the next 100 years as a result of deteriorating catchments. However, new knowledge showed that salinity in tributary catchments was cyclical in nature, and that, for most areas, the predicted maximum future impacts will not be substantially worse than was seen during the wet years of the 1990s.

Given this, it is now clear that any new actions and significant change in projected salt loads will be addressed through the accountability framework and the binding accountability arrangements for EoVTs under the BSMS are no longer required.

5.2.4 Monitoring and reporting on catchment salinity

Cl. 26 Contracting Governments must, in accordance with Monitoring, operate and maintain continuous flow and salinity monitoring recorders at EoVT sites for which they are responsible

Monitoring will provide data sets that are essential to understand changes in risk profile from changes over time in the catchments including from a variable climate

Cl. 29 In accordance with the Reporting procedure, State Contracting Governments must include in their status reports a short text summary of EoVT sites for which they are responsible which includes:

- confirmation that monitoring has been undertaken at the EoVT sites for the reporting period
- reporting if there were any data collection issues and the steps taken to resolve those issues, and
- that the EoVT results for the status reporting period will be reported in the following comprehensive reporting period.

In accordance with Reporting, State Contracting Governments must include in their comprehensive reports a short text summary of EoVT sites for which they are responsible which includes:

- an evaluation of flow and salinity monitoring at EoVT sites for which they are responsible, covering the two-year period since the last comprehensive report, with analysis and evaluation for each of the two years and any recommendations if required. The tools and resources to support comprehensive reporting and the steps for completing the comprehensive reporting are setout at Appendix 4
- any actions undertaken within valleys aimed at managing salinity, including where relevant, actions undertaken during the two-year period since the last comprehensive report

Contracting Governments may undertake risk assessments of catchment salinity through water resource plan, land and water management plan and catchment plan processes.

5.2.5 Review of catchment salinity trends and risk profile

Cl. 32(3,4), 33(1)

Contracting Governments must review EoVTs, associated models, baseline data sets, and projected salinity trends for the relevant catchment in accordance with the Review Plan. This will ensure a contemporary understanding of the salinity risk to the shared water resources from valleys for input into the review of the BSM2030 strategy.

A report arising from a review of EoVTs must include:

Cl. 33(3)

- Information about salinity trends, predictions and risk profile for the relevant catchment including:
    - An assessment of any trends in salinity and salt load conditions since the last review of the EoVT
    - Comment on the level of salinity risk posed to the shared water resource in relation to the EoVT considering baseline conditions
- Implications of flow and salinity trends and emerging risks for:
    - Actions on the salinity registers or identification of new proposals, and
    - Water resource, land and water management and catchment plans
- Any other assessment or comment on monitoring data that may be relevant for providing catchment scale context of salinity risks in catchments
- Comment on whether the EoVT, including estimates of salinity and salt loads, and EoVT sites are fit-for-purpose for identifying salinity risks in catchments

5.2.6 Determining appropriate management response

If through monitoring, reporting or as part of the review of EoVTs, associated models and baseline data sets, a catchment is identified as posing an increasing salinity risk to the shared water resources:

- The relevant Contracting Government must assess the need for additional monitoring and detailed modelling
- MDBA, in consultation with the relevant Contracting Government, may direct the relevant Contracting Government to undertake additional monitoring and detailed modelling

Contracting Governments must inform the MDBA of any catchment action that is estimated to change the daily salinity at Morgan by at least 0.1 EC by 2100, in accordance with Salinity impact assessment process.

Where a catchment is identified as presenting an increasing salinity risk, Contracting Governments may, where appropriate, undertake cost-effective measures to protect local assets or shared water resources, and to improve landscape productivity.

5.2.7 Amending an EoVT

Cl. 9(2)

The relevant Contracting Government or MDBA may request the Ministerial Council to amend an EoVT in Appendix 1 of Schedule B following a review of an EoVT or at any other time.

Cl. 9(3)

If a Contracting Government makes a request to amend an EoVT, the MDBA must consult with that Contracting Government and other Contracting Governments through the Basin Officials Committee.

Cl. 9(4,5) The MDBA must recommend to the Ministerial Council whether a request to amend an EoVT should be adopted including:

- The MDBA's estimate on the likely effects of meeting the nominated target on environmental, economic, social and other characteristics in the River Murray, and on meeting the Basin Salinity Target
- The MDBA's advice on whether the nominated target is contributing adequately to achieving the objectives of the BSM2030 strategy
- Any new information about relevant matters which has become available to the MDBA since the EoVT was adopted by Ministerial Council

Cl. 9(6) The Ministerial Council:

- May after considering the matters set out in any recommendation made by the MDBA, amend an EoVT, and
- Must resolve to amend Appendix 1 to Schedule B to include any amended EoVT

NOTES

End-of-Valley-Targets (EoVTs)

End-of-Valley Targets are set out in Appendix 1 of Schedule B. EoVTs provided an indicator of catchment health under the BSMS and are retained under BSM2030 to support consistency of monitoring and reporting activities.

End-of-Valley-Target sites (EoVT sites)

End-of-Valley-Target sites are the sites specified in Appendix 1 of Schedule B, at which monitoring of salt exports to shared water resources is undertaken.

Estimates of salinity, salt load and flow under Baseline conditions at each EoVT site

The accountability framework relies on the definition and adoption of an agreed set of baseline conditions as the basis for understanding the change in salinity impact due to accountable actions and delayed salinity impacts in the basin. These baseline conditions are the conditions that govern the movement of salt through land and water at a given point in time at a location of interest.

This includes the conditions associated with:

- Water use
- Land and water policies and practices
- River operating rules
- Salt Interception Schemes
- Run-off and salt mobilisation processes
- Groundwater status and conditions

Salinity, salt load and flow under baseline conditions is estimated at End-of-Valley-Target sites to support catchment salinity reporting and review activities.

Appendix 4. Improved reporting method for End-of-Valley Target sites

Background

The improved reporting method set out in this appendix provides guidance to State Contracting Governments, including relevant background and resources, to support the efficient and effective evaluation of flow and salinity monitoring at EoVT sites.

Technical background

The method presented requires the preparation of five-year rolling salinity and salt load exceedance curves using continuous flow and salinity monitoring data for comparison against an estimate of baseline conditions.

Exceedance curves display the probability that salinity or salt load will remain below a concentration or amount over a period of time (percentage of days). This evaluation method is effective because it allows for the interpretation of data in the context of frequency of high and low measurements and provides a comparison with the frequency of high and low measurements of the past.

Five years is considered long enough to generate meaningful statistics but short enough to differentiate between wet and dry sequences.

Modelled datasets provide estimates of salinity and salt load baseline conditions over the Benchmark Period (1975-2000) (Cl. 36; 37, Schedule B). The use of modelled data is required because continuous monitoring of flow and salinity is not available for most EoVT sites over the Benchmark Period. Modelled data generates an envelope of salinity and salt load frequency outcomes for comparison with measured reporting data.

The range and frequency of measured outcomes at a given EoVT site for any reporting year is expected to vary, and its position relative to the baseline data envelope will depend upon how well the modelled data is representative of more recent conditions. A conceptual understanding of the valley and main drivers of flow, salinity, and salt load is important to understand and explain recent outcomes relative to the best estimate of what occurred in the past.

Application

The improved reporting method for EoVT sites is applied in two parts:

- **Set-up of reporting tools and resources** to support the ongoing implementation of the approach. State Contracting Governments are encouraged to periodically update these tools and resources over time, so that subsequent comprehensive reporting is informed by ongoing consideration of new knowledge.
- **Comprehensive reporting** undertaken by State Contracting Governments every two years. This involves use of the tools and resources prepared during set-up (and subsequent improvements) to support the presentation and interpretation of monitoring data.

Set-up of tools and resources

The following materials are to be assembled during the set-up phase, and updated periodically, to support comprehensive reporting of monitoring results for each EoVT catchment:

- Modelled salinity and salt load dataset, which are included within the exceedance curve reporting template

- Benchmark Period exceedance curve envelope using the provided MS Excel based exceedance curve reporting template[7]
- Rainfall charts
- Contextual narrative

Modelled salinity and salt load dataset

Salinity and salt load datasets are required for the set-up of the exceedance curve reporting template. This has been pre-populated in the exceedance curve reporting template, and must constitute:

- Modelled estimates of salinity (EC) and salt load (tonnes per day) for the relevant EoVT site (Cl. 36; 37, Schedule B)
- Daily timeseries over the Benchmark Period segmented into five-year periods
- Five-year periods that start and end according to the financial year (over the period 1/7/1975-30/06/2000)[8]
- Five-year periods that are labelled with the concluding year (e.g. 2020-2021 is labelled FY2021, this labelling is a convention in the exceedance curve tool) [9].

Benchmark Period exceedance curve envelope

The Benchmark Period exceedance curve envelope is prepared using the salinity and salt load dataset as follows:

- Salinity and salt load percentiles (at 1% intervals) are calculated for each five-year period
- Percentiles correspond to percentage of time (days) a value was not exceeded in each five-year period
- Salinity and salt load values are plotted against percentiles for each five-year period to produce a series of overlapping salinity exceedance curves over the Benchmark Period
- Upper and lower bound exceedance curves are determined by selecting the highest and lowest salinity and salt load values occurring at the percentile of interest for each EoVT site
    - Default percentiles have been selected to align with salinity peak percentiles for reporting against the majority of EoVT target sites specified in Schedule B
    - The default percentile of interest for salinity and salt load exceedance curves is the 80th percentile
    - The 80th percentile provides a measure that captures the majority of events, whilst recognising the relatively small percentage of more extreme, or exceedance events in the system

[7] RMCG (2022) *EoVT exceedance curve reporting template*, MS Excel based tool, prepared for MDBA on behalf of BSMAP (unpublished at time of writing)
[8] Datasets are aligned to financial years rather than the exact Benchmark Period to support comparison with reporting year data.
[9] RMCG (2022) *EoVT exceedance curve reporting template*, MS Excel based tool, prepared for MDBA on behalf of BSMAP (unpublished at time of writing)

- The area between the upper and lower bound exceedance curves provides the baseline exceedance curve envelope for future reporting years.

Rainfall charts

Short- and long-term climatic conditions are an important driver of salt loads and flows from every catchment. Climatic conditions may be presented using Residual Mass Rainfall charts which show periods of above average (slope is positive) and below average (slope is negative) rainfall, while also providing information about the impacts of preceding conditions. This is relevant to interpreting salinity and salt load results due to time lags which are typical for groundwater responses to climate conditions.

Rainfall charts should be prepared as follows:

- Rainfall data available as point data via SILO Australia
- Identify suitable point data site for the EoV catchment. It is recommended that a site in the upper reaches of the catchment is selected to reflect major yield generating areas
- Download monthly rainfall totals timeseries from 1/7/75 to current date
- Calculate the average total monthly rainfall over the period
- Calculate the Residual Mass Rainfall over the period according to a monthly timestep. The Residual Mass Rainfall is obtained by calculating the cumulative deviation from the average
- Prepare the rainfall chart by plotting monthly Residual Mass Rainfall over the period.

Contextual narrative

The purpose of the contextual narrative is to help reporting teams interpret the latest reporting data.

Narratives should synthesise the current conceptual understanding of the catchment processes (i.e., hydrological, geological) driving salinity and salt loads trends reported at the EoVT site. Therefore, the information presented in each narrative will be unique to that EoVT catchment.

Contextual narratives should be prepared using current knowledge within State departments accessed via interviews with relevant personnel and synthesis of information in background reports. Narratives may include:

- Catchment map showing location of EoVT site, selected rainfall data station site and any other key features or supporting information data sites
- Presentation of the current understanding of local salinity and salt load trends and risks
- Description of the underlying landscape characteristics which influence short- and long-term changes in flow, salinity, and salt loads
- Description of the influence catchment climate conditions are likely to have on short- and long-term changes in flow, salinity, and salt loads
- Description of other variable factors likely to have the most significant impact on salinity and salt loads
- Additional supplementary data and reference material
    - Examples of additional supplementary data which may be useful includes timeseries data for flow, salinity and salt loads and complementary statistics (e.g., five-year moving averages) and allocation or delivery data for sites with upstream regulation.

Contextual narratives should be as concise as possible (e.g., between 4-6 pages). They should reference exceedance and rainfall curves and include conceptual diagrams and other graphs and figures, where appropriate.

Comprehensive reporting

During comprehensive reporting, State Contracting Governments should prepare the following for each EoVT catchment:

- Measured salinity and salt load dataset
- Reporting period exceedance curve
- Interpretation of exceedance curve results
- Any recommendations, if required
    - For improvement to monitoring and reporting processes and supporting models
    - For appropriate management responses

Measured salinity and salt load dataset

Observed salinity and salt load datasets are required for the set-up phase. The datasets must constitute:

- Results of salinity (EC) and salt load (tonnes per day) monitoring data for the relevant EoVT site:
- Monitoring data must be cleaned by State Contracting Governments prior to use
- Daily timeseries for the preceding five years
- Five-year periods start and end according to the financial year
- Five-year periods are labelled with the concluding financial year.

Reporting period exceedance curve

Reporting period exceedance curves should be prepared using the measured salinity and salt load dataset and baseline exceedance curve envelope as follows:

- Salinity and salt load percentiles (at 1% intervals) are calculated for the most recent five-year period with a complete dataset
- Percentiles correspond to percentage of time (days) a value was not exceeded in each five-year period
- Salinity and salt load values are plotted against percentiles for the current reporting period (most recent five-year period) over the baseline exceedance curve envelope
- Two preceding reporting period exceedance curves are to be plotted alongside the current reporting period for comparison (e.g., a plot prepared following the conclusion of the 2022 financial year would include financial years 2018-2022; 2016-2020; 2014-2018)

Interpretation and recommendations

Clear interpretation of the results presented in salinity and salt load exceedance curves is required for the evaluation of flow and salinity monitoring data to be effective. Interpretation should draw upon the contextual narrative and supporting information prepared during the set-up phase. The narrative may consider some or all of the following:

- Is there a clear trend in salinity and salt loads at the EoVT site?
- How do reporting period salinity and salt loads compare to the baseline exceedance curve envelope?
- How have climate conditions influenced reporting period salinity and salt loads?
- What other variable factors are likely to have influenced reporting period salinity and salt loads?
- Are there any signs of increasing salinity risk at the site, and if so, is this risk likely to impact shared water resources?
- Is the data reliable (including modelled data) and the methods appropriate?
- Are there any monitoring gaps or data (including modelled data) inconsistencies that need to be addressed?
- Is there any other information which may be used to improve the effectiveness and efficiency of the reporting method?
- Is there new knowledge available on salinity and salt load risk and can this be used to update reporting resources and tools?

Where required, recommendations should be prepared which consider the need for:

- Improvements to monitoring and reporting processes and supporting models which may include:
    - Improvements to continuous flow and salinity monitoring recorders at EoVT sites (BSM Procedure – Monitoring)
    - Updates to the contextual narrative and supporting information
    - Updates to and/or accreditation of State Contracting Government models used to generate EoVT site modelled salinity and salt load datasets
    - Updates to this procedure.
- Appropriate management responses where a catchment is identified as posing an increased salinity risk to the shared water resources.

Exceptions to the improved reporting approach

There are inherent differences between EoVT catchments which may require alternative approaches to the approach described in this procedure. Some examples which have been identified include:

- **Lower River Murray sites:** Upstream river regulation generally has greater influence on the salinity and salt loads recorded at these sites than local (South Australian) catchment processes. Therefore, alternative resources and processes may be more useful for interpreting local catchment salinity risk.
- **Highly variable flow and salinity:** Some EoVT sites in the northern basin are dominated by extreme episodic events. In some valleys, such variability is a constraint to the development of robust models if there is limited measured data available over the calibration period. However, in such cases, the reporting method in this procedure should still be considered, as it may assist in making the case for continuous improvement in the northern basin tributary models.

- **Non-exceedance percentiles:** The default 80th percentile exceedance value used to define the upper and lower baseline exceedance curve envelope may not be applicable at all sites. The default has been selected on the basis that it captures most events while recognising the smaller percentage of more extreme events. However, for some EoVT sites, there may be a scientific or technical rationale for choosing an alternative.

Where a State Contracting Government considers alternative approaches to be more appropriate for a given site, the technical rationale should be documented, and the underlying science should be referenced.

6 Monitoring, Review, Reporting and Audit

6.1 Monitoring

Monitoring data is essential for effective on-going management of salinity.

In the context of basin salinity management, physical measurements of flow and salinity are key indicators of success.

Figure 13 describes some of the main contributions of flow and salinity monitoring to Basin Salinity Management.

6.1.1 This procedure

This procedure describes the key requirements for monitoring under the BSM2030 strategy including the Basin-wide Core Salinity Monitoring Network.

6.1.2 Related procedures

Reporting sets out the reporting requirements under the BSM2030 strategy, including requirements for providing monitoring results to the MDBA.

Salinity management in catchments provides guidance on arrangements for managing salinity levels within catchments, including specific requirements for monitoring End-of-Valley-Target (EoVT) sites.

6.1.3 Key requirements

Monitoring involves ongoing measurement and observation at critical locations across the basin collected:

- using scientific techniques where possible
- appropriate to the level of risk

Cl. 25(1) Contracting Governments must carry out monitoring required to fulfil reporting obligations including:

Cl. 26
- Monitoring at EoVT sites for which it is responsible, and

Cl. 28
- Monitoring salinity impacts of accountable actions and delayed salinity impacts

Contracting Governments may carry out monitoring for other purposes including to support the activities described in Figure 13.

Cl. 25(1) Contracting Governments must provide results for monitoring at EoVT sites and accountable actions and delayed salinity impacts to the MDBA on request, and as required by the reporting process.

Contracting Governments and the MDBA must identify and demonstrate their commitment to key monitoring sites used for basin salinity management through the Basin-wide Core Salinity Monitoring Network.

In addition to the monitoring undertaken via the Basin-wide Core Salinity Monitoring Network, Contracting Governments and the MDBA may undertake other important data collection to support the delivery of BSM2030.

Monitoring under BSM2030 should support, and must not be inconsistent with monitoring requirements of the Basin Plan.

6.1.4 Monitoring at EoVT sites

A State Contracting Government must undertake monitoring in respect of relevant EoVT sites for which it is responsible.

Monitoring at EoVT sites must involve continuous flow and salinity monitoring where data is available.

Results of monitoring at EoVT sites may be used to support salinity management in catchments, model validation and other aspects of Basin Salinity Management.

Requirements for the interpretation and use of the results of monitoring at EoVT sites are described in more details in Catchment salinity.

6.1.5 Monitoring salinity impacts of accountable actions & delayed salinity impacts

Responsibility for undertaking monitoring of salinity impacts of accountable actions and delayed salinity impacts is as described in Table 6.1. This includes responsibility for monitoring any provisional entries associated with accountable actions and delayed salinity impacts.

Cl. 28(1,2,3) Contracting Governments must undertake monitoring of the salinity impacts of accountable actions and delayed salinity impacts in accordance with an approved monitoring program for actions for which they are responsible (Table 6.1).

Table 6.1 – Responsibility for monitoring accountable actions and delayed salinity impacts

Register entry	Agency responsible for monitoring
Joint works or measures	Contracting Government responsible for the work or measure
S&DS works or measures	
TLM works or measures	Agency to be nominated by BOC
State action	Relevant State Contracting Government/s
Delayed salinity impacts	Relevant State Contracting Government/s
Collective Account actions	State Contracting Government nominated by BOC

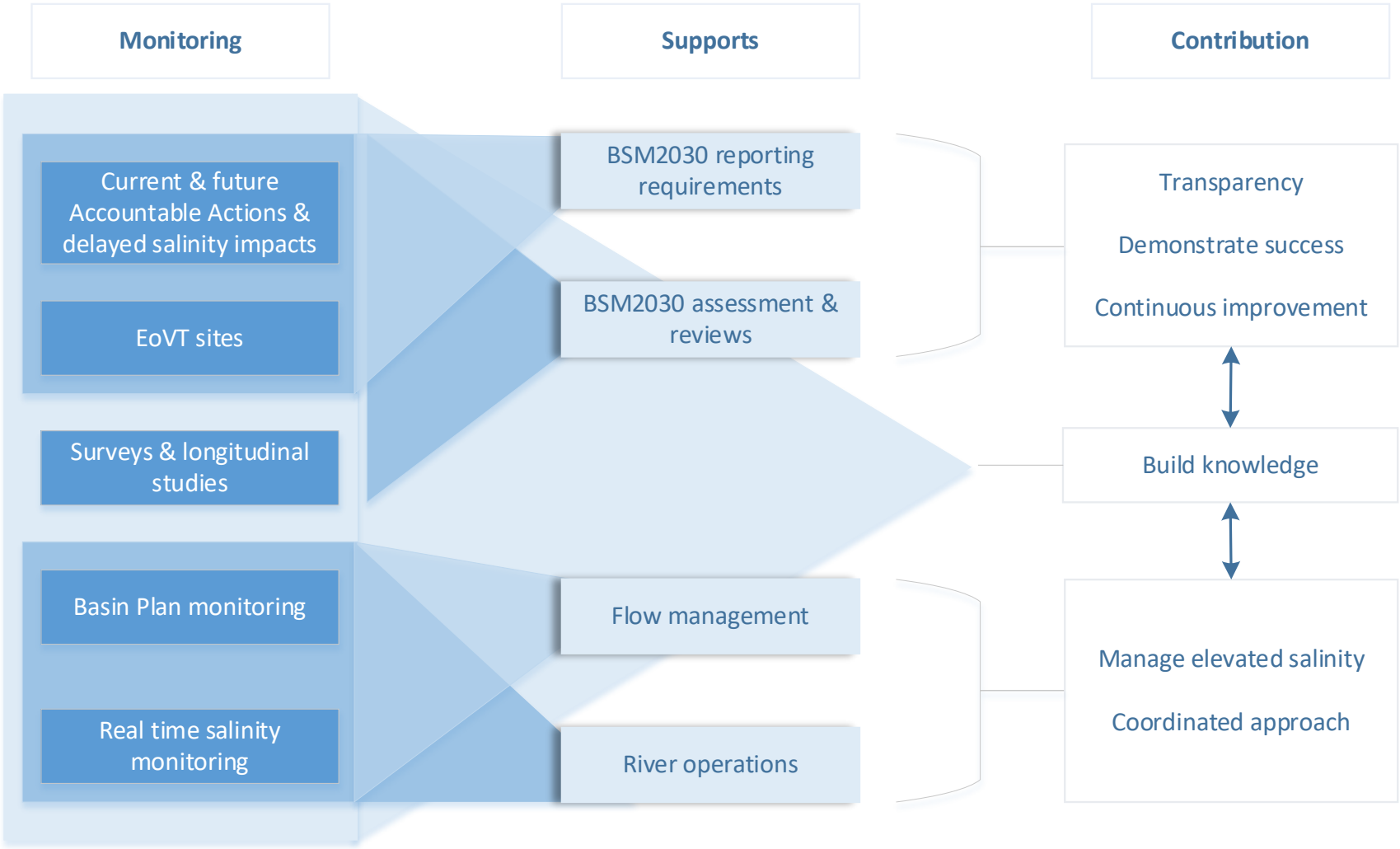


Figure 13 - Contributions of flow and salinity monitoring to Basin Salinity Management. Note: monitoring sites are often used for more than one purpose

6.1.6 Monitoring program for accountable actions and delayed salinity impacts

Cl. 27(1,2,2A)

A State Contracting Government responsible for monitoring as per Table 6.1 must give the MDBA a proposed monitoring program within the timeframes described in Table 6.2.

Cl. 27(3)

After a proposed program is received, the MDBA must either accept, accept with amendments or decline to accept the program setting out its reasons for doing so.

It is recommended that the following information be made available as part of the monitoring program:

- Description of the monitoring network
- Description of how monitoring data is used
- Data collection and analysis protocols

Contracting Governments may fulfil the requirements for establishing a monitoring program for accountable actions or delayed salinity impacts by capturing the relevant information in:

- assessment or review reports
- the Basin-wide Core Salinity Monitoring Network if the monitoring sites are nominated to be part of this network

Cl. 27(1,2,2A,2B)

Table 6.2 – Timeframes for providing a monitoring program to the MDBA

Type of action	Timeframes
Joint Works or Measures and State actions designated under Cl. 24(2)	Within 3 months of a Government being nominated
State Actions	Within 3 months of the action being completed
Delayed salinity impacts	Within 3 months of the action being entered in the registers
Collective Account actions	Within 3 months of a Government being nominated by BOC

NOTES

Measurement and observation

It is recommended that where possible, monitoring be based on direct measurements of both pre-action and post-action flow, groundwater levels and salinity levels, taking account of the prevailing stream flow and groundwater levels.

Where direct measurement is not possible, observations or surrogate measures of "cause and effect" may be used as an alternative.

This ensures data gathered is reliable and can be readily used to draw robust conclusions.

Other important data collection

Such as monitoring to support river operations, surveys and longitudinal studies.

This may include appropriate data collection to:

- support the identification and assessment of future accountable actions and delayed salinity impacts
- Provide additional information to support priority knowledge development and the development of the next phase of Basin salinity management post 2030
- Reduce uncertainty in areas identified as knowledge priorities, such as salinity risks from the Mallee region and salt mobilisation from floodplain watering activities

Monitoring requirements of the Basin Plan

Including Clause 9.14(6) of the Basin Plan.

Relevant EoVT sites for which it is responsible

That is, consistent with responsibility for EoVT sites set out in Appendix 1 of Schedule B.

Works or measures

Includes both Joint works or measures and S&DS works or measures.

Cl. 28(4)

Note that salinity impacts of S&DS works or measures are monitored in accordance with a monitoring program approved in accordance with Clause 12 of the former Schedule.

Responsible for work or measure

Contracting Government/s nominated under sub-clause 56(5) of the Agreement as responsible for the construction, operation and maintenance of the work or implementation of the measure.

Approved monitoring program

Cl. 27(3), 28(4)

That is, approved under Clause 27 for Joint works or measures, state actions and delayed salinity impacts and approved under Clause 12 of the former Schedule (Schedule C to the S&DS) for S&DS works or measures.

See Monitoring program for accountable Actions and delayed salinity impacts for more details.

State actions designated under Cl. 24(2)

When a Joint work or measure is designated a State Action under Clause 24(2), the responsible State Contracting Government must give the MDBA the proposed program within 3 months of such designation.

Appendix 5. Basin-wide core salinity monitoring network

A monitoring network comprised of the key salinity monitoring sites has been identified under the BSM2030 strategy. A commitment is made to the operation, maintenance and reporting on the delivery of monitoring at these sites.

Collectively these key salinity monitoring sites will form the Basin-wide Core Salinity Monitoring Network (the Network).

Consistent with the purpose of monitoring under the BSM2030 strategy, the Network provides critical information to:

- Underpin groundwater and surface water models
- Inform the review of accountable actions and delayed salinity impacts, and meet other accountable obligations
- Support river operations, SIS operations and environmental flow management
- Enable an evaluation of outcomes at salinity target sites under the BSM2030 strategy, and at Basin Plan reporting sites which have salinity targets for managing water flows
- Enable an evaluation of salinity risks from catchments where an EoVT is set and for assessing tributary salinity inputs
- Understand the impacts of climatic variability on salinity, and reduce the uncertainties associated with the magnitude of future impacts

Database of key monitoring sites

The Network serves to emphasise the importance of core monitoring units (key sites) in basin salinity monitoring in each of the basin states. It is maintained as a database of these key monitoring sites including:

- The monitoring site location and description
- The purpose for their inclusion in the network
- Monitoring units and determinants (salinity, flow, water level, temperature etc.)
- Data custodian and nominee
- Monitoring commencement date

Implementing and maintaining the network

The key salinity monitoring sites are determined by Contracting Governments or the MDBA in line with monitoring accountabilities and responsibilities. Contracting Governments and the MDBA must nominate key sites for which they are responsible and inform the MDBA of the nominated key sites as soon as possible after BSM2030 has come into effect.

Contracting Governments or the MDBA may nominate further sites or retract previously nominated sites for which they are responsible from the Network and when informed of a change to nominated sites, the MDBA must amend the Basin-Wide Core salinity Network accordingly.

Where an amendment to key sites has the potential to affect the monitoring activities of another (non-nominating) Contracting Government, that government must be consulted prior to the MDBA making any amendments to key sites.

Contracting Governments and the MDBA must report on any changes to nominated sites for which they are responsible, including providing reasons for the change via the Reporting. Changes to nominated sites will be reviewed by the IAG-Salinity biennially in line with the Independent audit and assessment.

The Basin-Wide Core Salinity Monitoring Network will be reviewed at least every 5 years.

Contracting Governments and the MDBA will continue operation and maintenance of the Network for the life of the strategy.

Responsibility for funding the monitoring sites included in the Network will not change from existing arrangements for that site.

6.2 Developing the Review Plan

Contracting Governments have committed to review and report on salinity risks (including register entries and the associated assessment methods) to achieve continuous improvement in the estimates of the salinity effects on the River Murray.

Continuous improvement may involve:

- Improved estimates of:
    - the quantum or timing of salt loads or flows to a major tributary or the River Murray
    - salt transport or flows within a major tributary or the River Murray
- Changes in the confidence in the above estimates
- Changes to the management of the register entry such that there is:
    - A reduction in adverse salinity impacts
    - Increased salinity benefits or
    - Improved cost effectiveness of operations (primarily relating to salt interception works and measures).

Each review commonly involves the evaluation of new data and other sources of knowledge used to estimate the salinity impact.

Consistent with arrangements agreed under the BSM2030 strategy and Schedule B to the Murray-Darling Basin Agreement, the frequency of reviews will be set out in a register entry and model review plan (the Review Plan), with a 10-year outlook and a focus on reviews to be completed over the next four years.

The Review Plan will provide Contracting Governments and the MDBA with the means of making pragmatic decisions to focus limited resources on the most significant salinity risks or where there is likely to be significant change or uncertainty. The 10-year outlook will inform business and longer-term planning and the 4-year focus will provide Contracting Governments with a basis for estimating budgetary and resourcing requirements over the shorter term.

6.2.1 This procedure

This procedure is intended to guide the development and annual review of the Review Plan. The Review Plan specifies the timing and responsibility for reviews of register entries, models and outcomes at End-of-Valley Target (EoVT) sites.

6.2.2 Related procedures

Conducting reviews and assessments describes the process, roles and responsibilities for undertaking reviews of register entries and models.

Catchment salinity describes the arrangements for monitoring, reporting on and reviewing catchment salinity under the BSM2030 strategy including EoVTs and EoVT sites.

6.2.3 The Review Plan

Cl. 33(1) Reviews of Register entries, models and outcomes at EoVT sites must be undertaken in accordance with the Review Plan.

Cl. 32(3) The Review Plan must provide for the review of:

- Register entries (being all accountable actions including provisional entries, and delayed salinity impacts)
- Models or assessment methods associated with register entries (including groundwater models or assessment methods used to support the estimation of effects of accountable actions or Delayed salinity impacts)
- Salinity outcomes at EoVT sites – including associated models and baseline data for each valley to understand the salinity trends, predictions and risk profile;
- Any other model used or approved by the MDBA to estimate salinity impacts
- Any other baseline actions that were subject to review processes under the BSMS
- Any other actions that have a review requirement and are not covered by the points outlined above

6.2.4 Review responsibility

The Review Plan must set out which of the MDBA or Contracting Governments will be responsible for undertaking each review.

Cl. 32(4) Unless determined otherwise by BOC, responsibility must be consistent with Table 6.3 below .

Table 6.3 – Responsibility for undertaking each review

Review	Type	Lead agency
Register entries	Joint works or measures	MDBA
	State action	State or States (if the action is shared by States)
	State action attributed to the Collective Account	As determined by BOC
	Delayed salinity impacts	State
	Delivery of Basin Plan water	MDBA
Model or assessment method	Used to estimate salinity impacts of an accountable action, delayed salinity impact or outcomes at EoVTs	MDBA or Contracting Government responsible for reviewing the Register entry
	Any other model used by the MDBA	MDBA
Salinity outcomes at EoVT sites		State

6.2.5 Review frequency

The Review Plan will have a 10-year outlook, setting out the frequency at which each item must be reviewed so that:

Cl. 32(5)

- every item will be reviewed at least once during the period 2016 – 2026, and once in any 10 year period (that is, all items will be reviewed within ten years of their last review date under the BSMS) and
- there may be more frequent reviews of some items, appropriate to the level of risk, uncertainty or new knowledge associated with the item

The frequency of reviews (Table 6.4, Table 6.5 and Table 6.6) should generally be consistent with current and future estimates of the salinity effect, and the degree of uncertainty in the most recent estimate of the salinity effect.

Cl. 32(7) A model underpinning one or more Register entries may, but need not be, reviewed at the same time as the relevant Register entry or entries. However, where it is not possible to review a model and all of its associated register entries at the same time, then the implications of changes to the model on register entries that will be reviewed at a later date need to be documented.

6.2.6 Developing the Review Plan

The Review Plan must be prepared by the MDBA on the advice of the Contracting Governments and approved by MDBA on the advice of BOC.

In developing the first Review Plan, and when conducting the annual review, any changes to the MDBA river model, including the transition to the Source modelling platform, will be considered to ensure the efficient use of resources and to maximise register stability.

In developing the first Review Plan it will be necessary to consider the next review date for register entries or models for which reviews started under the BSMS but were not completed by the commencement of BSM2030. For those register entries and/or models:

- The MDBA will seek advice from the relevant Contracting Government and the MDBA salt interception program manager, on the likely timing of submission of those reviews and the timeframe for finalisation and inclusion within the salinity registers. For those reviews, the estimated date for inclusion on the salinity registers must provide the starting point for applying the risk-based approach to determine the timing of the next scheduled review
- Any register entry changes that arise from those reviews must be included by the 2017 Register. In the event of a delay, Contracting Governments or the MDBA may put forward (with justification) an alternative timeframe
- Any changes to a review arising from the implementation of BSM2030 must not be retrospectively applied to a review that commenced under the BSMS

The development of the Review Plan must follow the approach illustrated by Figure 14.

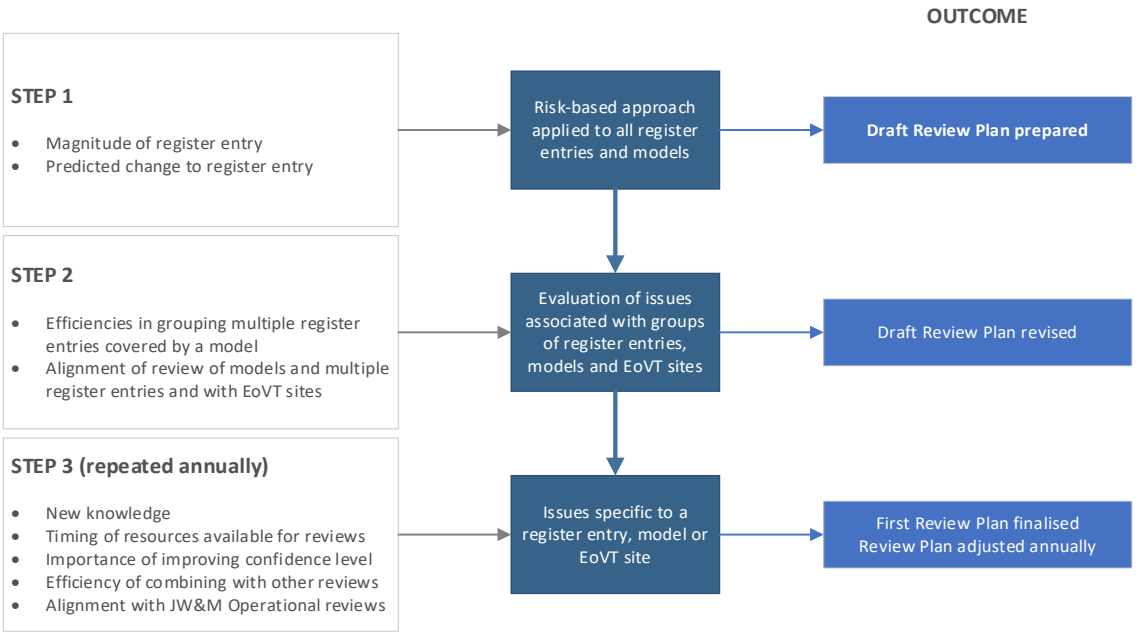


Figure 14 - Approach for developing the Review Plan

6.2.7 Annual review of the Review Plan

Cl. 32(6) The Review Plan must be reviewed annually, and may be amended by the MDBA on the advice of Contracting Governments, in order to alter the review frequency for any item.

The IAG-Salinity may comment and provide advice on the Review Plan as part of the biennial auditing cycle. In providing advice to the MDBA on the Review Plan, the IAG-Salinity will consider:

- the factors within this procedure in developing the Review Plan
- justifications for any amendments to the review frequency and timing provided by the Contracting Governments or the MDBA salt interception program manager

Any amendments arising from the annual review of the Review Plan, if necessary, will take into consideration advice provided by the IAG-Salinity in its biennial audit report, and any BOC directions.

The annual review of the Review Plan (Step 3 in Figure 14):

- Must include an explicit justification for the change from the timing proposed under Step 1. Justifications for a change may include:
  - the relative size of the salinity effect even though the forecast salinity effects may not change over time
  - the uncertainty of future salinity impacts from potential changes and trends in catchment land and water use
  - the timing of resources being made available to undertake the review do not enable the proposed timing of a review being achieved
  - the absence of new knowledge that would lead to a change in the estimate of the salinity impact noting that the absence of new knowledge should not be due to a failure to implement monitoring arrangements agreed under BSM2030

        - The efficiencies that will be achieved by combining several register entry reviews with a model review.
    - Must not lead to the delay in the completion of a review of a register entry, model or outcomes at EoVT sites beyond 10 years from the last review date listed in the BSMS 2014-2015 Annual Implementation Report.
    - Must include a statement as to why a proposed delay in timing will not compromise the risk-based approach to the scheduling of reviews.

The evaluation of the availability of new knowledge that informs recommendations for the annual review of the Review Plan may include, but is not limited to, new data or additional sources of data, changes in the conceptualisation, model upgrades, and outcomes from other reviews.

Table 6.4 – Factors to be considered in assigning review dates to types of register entries

Type of register entry	Recommended review frequency	Factors for considerations in proposing a review frequency
Salt Interception Schemes	5 years	Large investment and need to understand register implications of responsive SIS management
TLM and environmental water actions	5 years	High level of uncertainty of salinity impacts. Significant monitoring being undertaken. Substantial improvement in knowledge base anticipated during early years of BSM2030
New register entries	5 years	Current register entry based on a single assessment and likely to be data limited. Substantial improvement in knowledge base anticipated leading up to first review
Other high impact and high change register entries	5 years	Salinity impact >1 EC at 2015 Salinity EC impact change >50% of 2015 EC by 2050
Other high impact and low change register entries	7 years	Salinity impact >1 EC at 2015 Salinity EC impact change <50% of 2015 EC by 2050
Other low impact and high change register entries	7 years	Salinity impact <1 EC at 2015 Salinity EC impact change >50% of 2015 EC by 2050
Other low impact and low change register entries	10 years	Salinity impact <1 EC at 2015 Salinity EC impact change <50% of 2015 EC by 2050
Provisional register entries	5 years	Need to resolve uncertainty and to include the salinity cost effect in the Salinity Registers

Table 6.5 – Factors to be considered in assigning review dates to types of models

Type of model	Maximum review frequency	Factors for considerations in proposing a review frequency
Groundwater flow models	10 years	Flow and salt transport processes in groundwater is highly variable and uncertain. Monitoring commonly leads to significant improvements in knowledge over time and hence refinements to model conceptualisation and calibration
Surface water flow and salt transport model	10 years	The science underpinning surface water flow and salt transport are relatively well understood. The main areas for improvement involve refining estimates of unaccounted salt loads, or transitioning to a new modelling platform

Table 6.6 – Factors to be considered in assigning review dates to outcomes at EoVT sites

Type of review	Maximum review frequency	Factors for considerations in proposing a review frequency
Outcomes at EoVT sites	10 years	Review timing is likely to be aligned with the agreed date for a review of any relevant delayed salinity impact register entry

6.3 Reporting

Basin salinity management reporting arrangements ensure transparency and promote compliance with the agreed actions and accountabilities under Schedule B of the Murray-Darling Basin (MDB) Agreement.

Reporting arrangements have been streamlined under the Basin Salinity Management 2030 (BSM2030) strategy to reflect the maturity of collaborative arrangements in basin salinity management. For 15 years under the Basin Salinity Management Strategy, Contracting Governments and the MDBA provided audited comprehensive reporting to Ministerial Council regarding basin salinity management. Given the progress in basin salinity management over that time, reporting was able to be streamlined, without risking strategy implementation or achievement of the strategy objectives.

Under the BSM2030 strategy, State Contracting Governments and the Authority alternate each year between status reporting and comprehensive reporting, with the latter aligning with the audit and assessment requirements under Clause 34 of Schedule B. The Commonwealth's reporting requirements do not vary, and as such, each year they prepare an annual report.

6.3.1 This procedure

This procedure sets out the BSM2030 strategy reporting requirements of the Contracting Governments and the Authority. It guides reporting under the BSM2030 strategy consistent with Schedule B requirements. Future updates to this reporting procedure should consider opportunities to further align BSM2030 reporting and Basin Plan reporting.

6.3.2 Related procedures

Independent audit and assessment describes the arrangements for undertaking the independent audit and assessment.

6.3.3 Reporting requirements

The BSM2030 strategy reporting arrangements commenced in 2015-16 and a summary of the reporting requirements is outlined in Figure 15. The biennial cycle of status reporting followed by audited comprehensive reporting will continue to apply until amended through the preparation of a new basin-wide salinity management strategy replacing the BSM2030 strategy and the revision and amendment of Schedule B.

Comprehensive reporting demonstrates progress in implementing the BSM2030 strategy and compliance with the obligations in Schedule B to the MDB Agreement. The purpose of status and annual reporting is to maintain reporting continuity and to demonstrate progress against the key compliance aspects of Schedule B.

The biennial audit and assessment, conducted by the Independent Audit Group for Salinity (IAG-Salinity), is aligned with comprehensive reporting process (see *Independent audit and assessment* for more detail).

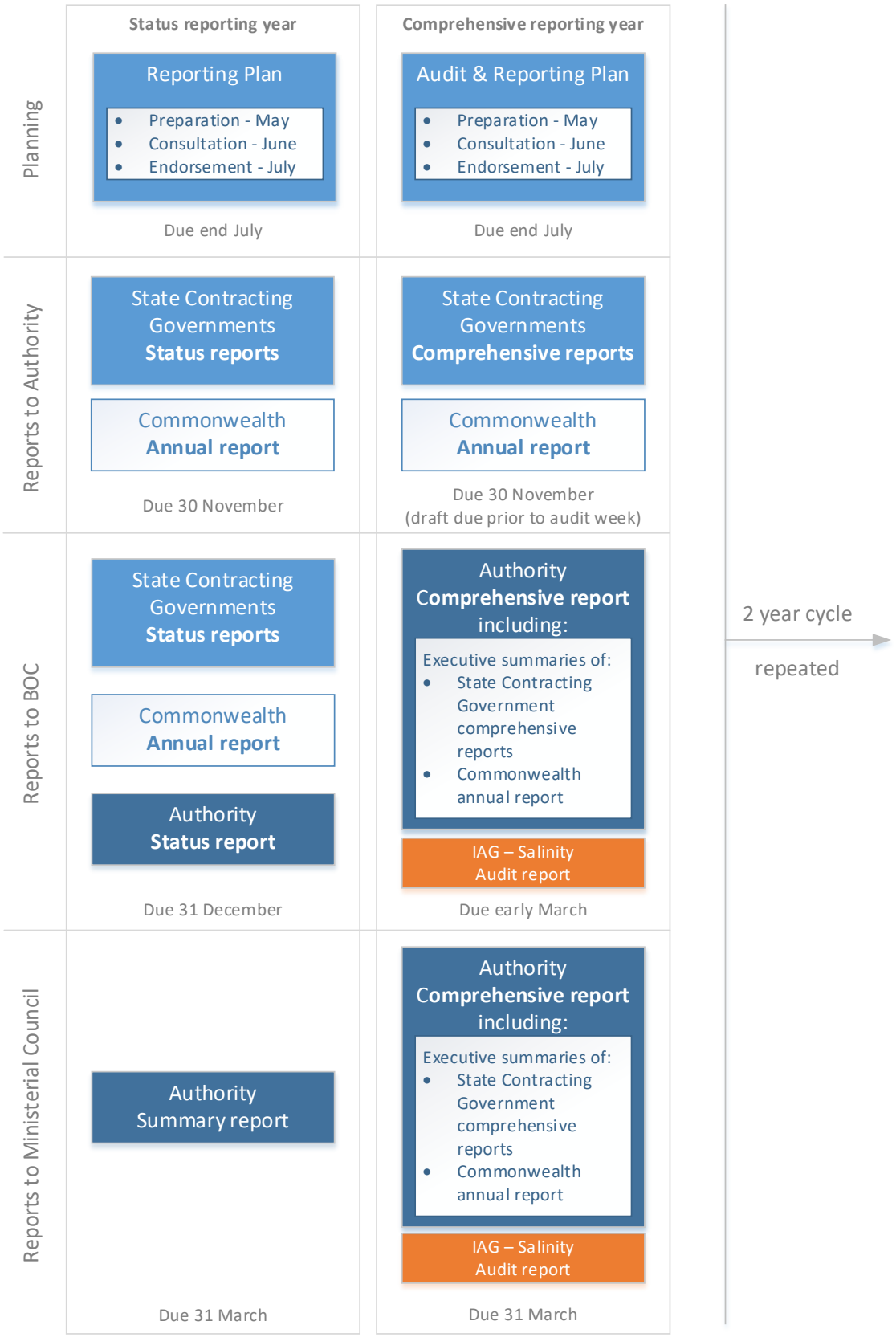


Figure 15 - Summary of reporting requirements under the BSM2030 strategy

6.3.4 Reporting process and timelines

Cl. 29, 30, 31

Each year the Authority, in consultation with Contracting Governments, will prepare a plan outlining the timeframes for the preparation and provision of reports under the BSM2030 strategy. The plan will be provided to a relevant advisory panel for consultation and endorsement well in advance of the reporting timeframes, and at least by 31 July each year. In status reporting years, the plan will be known as the "Reporting plan". For comprehensive reporting years, it will be known as the "Audit and reporting plan" as it will also outline the timeframes related to the audit and assessment process.

In status reporting years, the Contracting Governments and Authority status reports and the Commonwealth's annual report, must be given to the Basin Officials Committee (BOC) by 31 December. For these years, the Authority must also prepare a summary report and provide this report to Ministerial Council by 31 March of the following year. This report must include a summary of the information included in the status reports prepared by the Contracting Governments and the Authority, and also the annual report prepared by the Commonwealth.

In comprehensive reporting years, the Authority and State Contracting Governments' comprehensive reports, and the Commonwealth's annual report, must be prepared and provided in sufficient time to inform the IAG-Salinity's audit and assessment processes.

For comprehensive reporting years, the Authority's comprehensive report must be given to Ministerial Council by 31 March of the following year. The Authority's comprehensive report must include the executive summaries from the State Contracting Governments' comprehensive reports, the executive summary of the Commonwealth's annual report, and the executive summary and recommendations from the IAG-Salinity's audit report.

6.3.5 Reporting by State Contracting Governments

Scope of State Contracting Governments' status reports

Each status report must include:

- a short text summary of EoVT sites which includes:
    - confirmation that monitoring has been undertaken at the EoVT sites for the reporting period,
    - reporting if there were any data collection issues and the steps taken to resolve those issues, and
    - that the EOVT results for the status reporting period will be reported in the following comprehensive reporting period
- documentation of any changes to the sites included in the Basin-wide Core Salinity Monitoring Network for which the Government is responsible
- information about progress on any proposed or new Accountable Action
- outcomes from any review progressed by the Government in the previous financial year (as required under the Review Plan)
- a summary of the operation and implementation of existing State Works or Measures

Appendix 6 provides an example of a table of contents for State Contracting Governments' status reports.

State Contracting Government comprehensive reports

Each activity included in a State Contracting Government's status report must be included in the comprehensive report. In addition, the comprehensive report will also include:

- an executive summary, that will be published as an appendix to the Authority comprehensive report
- any actions undertaken within valleys aimed at managing salinity. This will include, where relevant, actions undertaken during the two-year period since the last comprehensive report
- evaluation of flow and salinity data from monitoring at EoVT sites for which the Government is responsible, covering the two-year period since the last comprehensive report, with salinity exceedance curve, rainfall chart and contextual narrative for each of the two years (see BSM Procedure – Catchment salinity, regarding the reporting template and instructions on how to report)
- community engagement, education and knowledge improvements undertaken

Where relevant, comprehensive reports will also include activities progressed during the two-year period since the last comprehensive report.

Appendix 6 provides an example of a table of contents for the State Contracting Government comprehensive report.

6.3.6 Reporting by the Commonwealth

Scope of Commonwealth annual reports

Each annual report must include:

- an executive summary. For reporting periods that are subject to an audit, the executive summary will be published as an appendix to the Authority comprehensive report
- information about the progress of Commonwealth agencies in undertaking any work or measure, for which the Commonwealth is responsible
- outcomes from any review progressed by Commonwealth agencies in the previous financial year (as required under the Review Plan)
- the volumes of water held and available for use by the Commonwealth Environmental Water Holder (CEWH)
- the use of held environmental water by the CEWH
- community engagement, education and knowledge improvements undertaken
- any monitoring outcomes relating to salinity impacts from specific watering events that may be available
- the Commonwealth response to the IAG-Salinity recommendations.

MDBA will support Commonwealth agencies in undertaking their annual reporting by providing the following information:

- the volume of held environmental water and, for the Basin Plan water dilution benefits register entry, the corresponding salinity effect at Morgan (as a proportion of 2800 GL Basin Plan model run)
- any information relevant to offsets from the Commonwealth account in the salinity register provided to either the Collective account or the State Contracting Governments' accounts

The Commonwealth Environmental Water Office (CEWO) will provide the following information as part of the compilation of the annual report:

- relevant information from the CEWH Basin Plan Schedule 12 reporting relating to flow-based management, strategic knowledge improvement, and community engagement and education activities.

Appendix 6 provides an example of a table of contents for the Commonwealth annual report.

6.3.7 Reporting by the Authority

Scope of Authority status report

The Authority status report must include:

- a summary of the operation and implementation of existing joint works or measures (JWM) and progress of any proposed new JWM
- outcomes from any review progressed by the Authority in the preceding financial year
- salinity outcomes relative to the Basin salinity target, and for reference, the most recent reporting undertaken for the Basin Plan on outcomes against salinity targets for managing flows, and the salt export objective
- a summary of the Registers
- an explanation of any proposed variations to the expected frequency and scope of reviews contained in the Review Plan
- outcomes from any review undertaken on the causes of elevated in-river salinity events, effectiveness of mitigation actions and recommendations on policy implications
- a list of each report made by the Authority under clause 44 or 45 in the preceding financial year.

Appendix 6 provides an example of a table of contents for the Authority status report.

Scope of Authority comprehensive reports

Each activity included in the Authority's status report must also be included in the comprehensive report. In addition, the comprehensive report will include:

- an evaluation of flow and salinity data from monitoring for which the Authority is responsible, covering the two-year period since the last comprehensive report, with salinity exceedance curve, rainfall chart and contextual narrative for each of the two years (see BSM Procedure – Catchment salinity, regarding the reporting template and instructions on how to report)
- a summary of community engagement, education and knowledge improvements, and details of other activities that have been undertaken to meet the objectives of the BSM2030 Strategy
- the executive summary from each State Contracting Governments' comprehensive reports and the Commonwealth's annual report
- outcomes of the audit report under cl 34
- a copy of the contents of Register A and Register B as at 30 November in the preceding calendar year

Where relevant, comprehensive reports will also include activities progressed during the two-year period since the last comprehensive report.

Appendix 6 provides an example of a table of contents for the Authority comprehensive report.

Scope of Authority summary report

The Authority will prepare a summary report of Contracting Government and Authority key outcomes for Ministerial Council during status reporting years.

6.3.8 Publication of Authority reports

Under Schedule B, the Authority is required to publish on its website:

- each status and comprehensive report prepared by the Authority
- the summary report prepared by the Authority for Ministerial Council
- the IAG-Salinity's audit report

Appendix 6. BSM2030 reporting templates

State Contracting Government status report

Table of Contents

1. Introduction
2. Outcomes and key achievements
   - an overview of outcomes and key achievements in implementing the BSM2030 strategy
3. State Works or Measures
   - a summary of the operation and implementation of existing State Works or Measures
4. Review of models and register entries
   - a summary of the outcomes from any review progressed by the Government in the previous financial year (i.e. as required under the Review Plan)
   - an explanation of any changes to the Review Plan as put forward by the Government and agreed by the Authority
5. Proposed or new accountable actions
   - information about progress on any proposed or new Accountable Action
6. End-of-valley target sites
   - confirmation that monitoring was undertaken at each EoVT site for which the Government is responsible
   - reporting if there were any data collection issues and the steps taken to resolve those issues, and

   that the EOVT results for the status reporting period will be reported in the following comprehensive reporting period
7. Core salinity monitoring network
   - a list of any changes to the sites included in the Basin-wide core salinity monitoring network for which the Government is responsible

State Contracting Government comprehensive report

Table of Contents

1. Executive summary
    - Salinity accountability framework
    - Management of SIS
    - Salinity management
    - Efficient governance
    - Strategic knowledge improvement
    - Community engagement and communication
    - Priorities for future work
2. Introduction
3. Salinity accountability framework
    - Report on the State Contracting Government register position
    - information about progress on any proposed or new Accountable Action
    - Any salinity accountability for environmental water management issues including those related to collective accountability, Basin Plan water recovery, SDL adjustment works and measures
4. Management of SIS
    - salt intercepted by schemes in the relevant state
    - relevant information on the operation of State Works or Measures and authorised works or measures cross-referenced to the Authority report that provides a summary of the operation of authorised works or measures
5. Salinity management
    a. Flow-based management
        - State e-water use with relevance to salinity management
        - any Basin Plan flow management reporting with relevance to salinity management (e.g. having regard to the salinity targets for flow management - not seeking additional reporting just any useful information already reported under Basin Plan requirements)
    b. Land-based management
        - any actions undertaken within valleys aimed at managing salinity (including Accountable Actions within valleys)
    c. EoV outcomes
        - evaluation of flow and salinity data from monitoring at EoVT sites for which the Government is responsible, covering the two-year period since the last comprehensive report, with salinity exceedance curve, rainfall chart and contextual narrative for each of the two years
6. Efficient governance
    - In 2017, a list of the sites included in the Basin-wide core salinity monitoring network for which the Government is responsible
    - From 2019, any changes to the Basin-wide Core Salinity Monitoring Network for which the Government is responsible
    - Outcomes from any review progressed by the Government in the previous financial year (i.e. as required under the Review Plan)
    - The Government's response to the Independent Audit Group for Salinity biennial audit recommendations
7. Strategic knowledge improvement

- knowledge improvements undertaken by the Government including work undertaken towards BSM2030 knowledge priorities

8. Community engagement and communication
    - Community engagement and education activities undertaken by the Government and details of other activities that have been undertaken to meet the objectives of the Strategy
    - Communication activities
9. Priorities for future work

Commonwealth annual report

Table of Contents

1. Executive summary
    - an overview of the outcomes and key achievements in implementing the BSM2030 strategy
2. Salinity accountability for environmental water
    - report on the Commonwealth register position, including any offsets provided from the Commonwealth account
    - information about the progress of the Commonwealth in undertaking any work or measure, for which it has been nominated as the responsible Government under sub-clause 56(5) of the Agreement.
3. Salinity management
    a. Flow-based management
        - the volumes of water held and available for use by the CEWH
        - the use of held environmental water by CEWH with relevance to salinity management
        - any Basin Plan flow management reporting with relevance to salinity management (e.g. having regard to the salinity targets for flow management - not seeking additional reporting just any useful information already reported under Basin Plan requirements, including any monitoring for salinity impacts from specific watering events)
4. Efficient governance
    - Commonwealth response to the Independent Audit Group for Salinity audit recommendations
    - outcomes from any review progressed by the Commonwealth in the previous financial year (i.e. as required under the Review Plan noting that the MDBA is responsible for completing the review of Basin Plan water dilution benefits)
5. Strategic knowledge improvement
    - knowledge improvements undertaken by the Commonwealth including any work undertaken towards BSM2030 knowledge priorities
6. Community engagement and communication
    - Community engagement and education activities undertaken by the Commonwealth and details of other activities that have been undertaken to meet the objectives of the Strategy
    - Communication activities
7. Priorities for future work

Authority status report

Table of Contents

1. Introduction
2. Overview of outcomes
    - an overview of outcomes and key achievements in implementing the BSM2030 strategy
3. Summary of authorised works or measures
    - a summary of the operation and implementation of existing authorised works or measures and progress of any proposed new joint works or measures
    - progress of the trial of responsive management of SIS
4. Review plan
    - an explanation of any proposed variations to the expected frequency and scope of reviews contained in the Review Plan
5. Reviews
    - a summary of the outcomes from any review progressed by the Authority in the preceding financial year
6. Summary of the salinity registers
    - a summary of the salinity registers
7. Modelled salinity outcomes at Morgan
    - modelled salinity outcomes relative to the Basin salinity target
8. Observed salinity outcomes at Morgan
    - measured salinity outcomes over several time intervals
9. Basin Plan reporting
    - the most recent reporting undertaken for the Basin Plan on outcomes against salinity targets for managing flows, and the salt export objective
10. Elevated salinity events
    - outcomes from any review undertaken on the causes of elevated in-river salinity events, effectiveness of mitigation actions and recommendations on policy implications
11. Core salinity monitoring network
    - a list of any changes to the sites included in the Basin-wide core salinity monitoring network for which the Authority is responsible
12. Exception reports
    - a list of each report made by the Authority under clause 44 or 45 in the preceding financial year

Authority comprehensive report

Table of Contents

1. Executive summary
    - Salinity accountability framework
    - Management of SIS
    - Salinity management
    - Efficient governance
    - Strategic knowledge improvement
    - Community engagement and communication
    - Priorities for future work
2. Introduction
3. Salinity accountability framework
    - a summary of the Registers
    - a copy of the contents of Register A and Register B as at 30 November in the preceding calendar year
    - any changes to the registers regarding e-water related register entries in the Collective account or the Commonwealth account
    - information about progress on any proposed or new Accountable Action
    - salinity outcomes relative to Basin salinity target
    - a list of each report made by the Authority under clause 44 or 45 in the preceding financial year
4. Management of SIS
    - a summary of the operation and implementation of existing authorised works or measures and progress of any proposed new JWM
    - progress of the trial of responsive management of SIS
5. Salinity management
    a. Flow-based management
        - outcomes from any review undertaken on the causes of elevated in-river salinity events, effectiveness of mitigation actions and recommendations on policy implications
        - the most recent reporting undertaken for the Basin Plan on outcomes against salinity targets for managing flows, and the salt export objective
        - the collective outcomes of efforts to have regard to the Basin Plan salinity targets for managing water flows

    b. EoV outcomes
        - evaluation of flow and salinity data from monitoring for the Basin salinity target at Morgan, covering the two-year period since the last comprehensive report, with salinity exceedance curve, rainfall chart and contextual narrative for each of the two years
6. Efficient governance
    - any changes to and improvements in the modelling platforms and other technical elements that underpin the salinity registers
    - in 2017, a list of the sites included in the Basin-wide Core Salinity Monitoring Network for which the Authority is responsible
    - from 2019, any changes to the sites included in the Basin-wide core salinity monitoring network for which the Authority is responsible
    - outcomes from any review progressed by the Authority in the preceding financial year

- an explanation of any proposed variations to the expected frequency and scope of reviews contained in the Review Plan
- the executive summary from each Contracting Governments' comprehensive report, included as appendices
- the executive summary and recommendations of the audit report under cl 34
- the Authority's response to the Independent Audit Group for Salinity biennial audit recommendations

7. Strategic knowledge improvement
    - knowledge improvements undertaken by the Authority including work undertaken towards BSM2030 knowledge priorities
8. Community engagement and communication
    - community engagement and education activities undertaken by the Authority and details of other activities that have been undertaken to meet the objectives of the Strategy
    - communication activities
9. Priorities for future work

Appendix A: Extract from the report of the IAG-Salinity
Appendix B: Salinity registers
Appendix C: Baseline conditions
Appendix D: Salinity and salt load exceedance curves for end-of-valley target sites
Appendix E: BSM2030 operational processes
Appendix F: Executive summaries from Contracting Government reports

6.4 Independent audit and assessment

The MDBA and Contracting Governments must seek independent and constructive feedback on whether the BSM2030 strategy objectives and obligations under Schedule B of the Murray-Darling Basin Agreement are being met. The MDBA facilitates an independent audit and assessment every second year to meet this requirement and ensure continuous improvement over the life of the BSM2030 strategy.

6.4.1 This procedure

This procedure describes the arrangements for undertaking the independent audit and assessment ("audit and assessment").

6.4.2 Audit and assessment

Cl. 34(2A) The audit and assessment must commence by November 2016 and every second year thereafter to align with comprehensive reporting years.

Cl. 34(1) The MDBA must appoint an Independent Audit Group (IAG-Salinity) to carry out the audit and assessment.

Cl. 34(2) The MDBA must develop Terms of Reference (ToR) to provide direction to the IAG-Salinity
By the first week of August each audit year, the MDBA may develop an audit and reporting plan to guide the audit and assessment.

Cl. 34(3) The auditors must audit:

- The reports of each review conducted in the preceding two financial years by each Contracting Government and by the MDBA
- Register A and Register B

The auditors must assess:

- The implementation of the BSM2030 strategy, and
- The Review Plan

Cl. 34(4) Auditors must reach a consensus view and report about:

- The performance of each Contracting Government and the MDBA in implementing the provisions of the Schedule B since the previous audit and assessment
- Whether the MDBA has fairly and accurately recorded the salinity impacts of each action entered in Register A and Register B

Cl. 34(5,6) The IAG-Salinity must present audit and assessment findings and any recommendations arising from the audit and assessment in a report to the MDBA.
The MDBA and Contracting Governments must provide a formal response to the recommendations of IAG-Salinity through the comprehensive reporting process.

NOTES

IAG-Salinity

The IAG-Salinity may be established as a committee under section 203 of the *Water Act 2007* (Cwth) or via individual contracts for an audit cycle.

To achieve a balance between continuity and renewal there is an opportunity for extending appointments for up to three audit cycles.

The IAG-Salinity will be an expertise-based body consisting of one lead auditor and as many other members as required, determined periodically by the MDBA and Contracting Governments. Appointment to the IAG-Salinity will primarily be based on qualifications, knowledge and experience in natural resource management and auditing processes as outlined in the Terms of Reference.

Amending Terms of Reference

The MDBA, in consultation with Contracting Governments may amend the Terms of Reference, including operating arrangements, at any time to include additional matters to be covered by the audit.

Provide a formal response

The formal response, along with the IAG-Salinity audit report will be submitted to the Basin Officials Committee and Ministerial Council as part of the package of reports included in the comprehensive reporting process.

6.5 Review of BSM2030 strategy & Schedule B

Cl. 35A

The BSM2030 strategy will be subject to a review that will commence by 2027. The operation of Schedule B will also be subject to a review either as part of the BSM2030 strategy review or separately if required.

By 2027, there will be an opportunity to learn from:

- Completion or progression of Basin Plan implementation actions
- A further 10 years of environmental watering
- Responsive management of SIS trial
- Investment in knowledge priorities
- Operation of the revised Schedule B

The purpose of the reviews is to improve understanding of contemporary salinity risk and associated uncertainty to inform the development of the next phase of Basin-wide salinity management.

6.5.1 This procedure

This procedure describes the arrangements for the review of the BSM2030 strategy and operation of Schedule B.

6.5.2 Review of the BSM2030 strategy

Cl. 35A(1)

The MDBA must prepare, in consultation with Contracting governments, a plan to review the BSM2030 strategy by 31 December 2025 for approval by BOC.

Cl. 35A(1)

The MDBA must commence a review of the BSM2030 strategy in accordance with that plan by 31 December 2026.

The review may draw on monitoring data collected via the Basin-wide Core Salinity Monitoring Network.

The review must:

- Include, or include the outcomes of, a review of operation of Schedule B
- Consider future salinity management requirements in the context of a fully implemented Basin Plan
- Consider the operation of salt interception schemes including where appropriate, drawing on outcomes from the responsive management of SIS trial
- Re-evaluate the salinity risks and present an improved understanding of salinity impacts arising major changes to the flow regime
- Consider outcomes from reviews of Basin Plan targets

The review may include items described in Table 6.7 below and other items as appropriate.

Table 6.7 – Suggested items for review as part of the review of the BSM2030 strategy

Item	Description
Contemporary salinity risk and projections	Summary including salinity projections for 2030, 2050 and 2100 for the valleys for which EoVT have been set, and at the Basin Salinity Target site at Morgan
Salinity impacts of environmental water	Evaluation of how the recovery, delivery and use of environmental water has impacted upon in-river salinity relative to salinity targets
SIS performance	Evaluation of SIS operations and outcomes
Current modelling and accounting arrangements	Evaluation of utility of arrangements including providing a standardised approach to evaluate salinity outcomes over variable climate The standardised approach should include key components of the modelling framework: - 1975-2000 Benchmark Period - Baseline Conditions - Cost Functions - MDBA River Murray model platform
Future salinity accountability framework requirements	Evaluation of the utility of the accountability framework in meeting future salinity management requirements
Future governance arrangements	Description of arrangements

6.5.3 Review of operation of Schedule B

The MDBA must review the operation of Schedule B:

Cl. 35A(2)
- As part of the review of the BSM2030 strategy

Cl. 35(1)
- At such times as BOC directs
- At any time the MDBA considers appropriate

Cl. 35(2,3) The scope of the review will be determined as appropriate by the MDBA in consultation with Contracting Governments, but may include:

- A summary of delayed salinity impacts, and salinity impacts of every Accountable Action undertaken in the Murray-Darling Basin before the date of the report

- A description of any proposed additions or alterations to the joint program made since the last review of the Schedule to ensure that the Basin Salinity Target is met
- The conclusion that a Contracting Government has not met its Schedule B obligations

Reviews of register entries, models and EoVTs undertaken during the preceding 5 years must be used to inform the review of Schedule B.

The MDBA must prepare and provide to the Ministerial Council, a review report that includes conclusions about the usefulness and effectiveness of the Schedule and any recommendations that might improve its operation.

NOTES

Salinity risks

Including associated uncertainty

Improved understanding

Based on new knowledge

Summary

Based on the reports prepared under Cl. 33 of the Schedule since the last review of the BSM2030 strategy

7 Modelling

7.1 Modelling

While the Modelling procedures are part of BSM procedures, they contain specific and complex technical details and as such were prepared separately to the process undertaken for other BSM procedures. As a result, they are contained in a separate document located here:<insert link here to report when live>

8 Governance

8.1 Governance

The achievements of the BSM2030 strategy and its predecessors are underpinned by the joint commitment of Contracting Governments to share responsibilities for managing salinity impacts on shared water resources in the Murray-Darling Basin.

Schedule B to the Murray-Darling Basin Agreement, supported by the BSM procedures, sets out the roles and responsibilities by which collaborative arrangements are coordinated, agreements reached, and decisions confirmed and recorded under the BSM2030 strategy.

Governance arrangements ensure this collaborative approach is delivered efficiently and in line with agreed objectives.

8.1.1 This procedure

This procedure provides an overview of governance arrangements for the BSM2030 strategy including a current list of relevant committees, advisory panels and working groups. Specific details of roles and responsibilities are covered in Terms of Reference documents, Schedule B of the Murray-Darling Basin Agreement, BSM Procedures and the Murray-Darling Basin Agreement.

8.1.2 Responsibilities under the BSM2030 strategy and Schedule B

MDBA performs key functions under the BSM2030 strategy that include, but are not limited to:

- coordinating the implementation of the BSM2030 strategy;
- implementing those aspects of Schedule B of the Murray-Darling Basin Agreement for which the MDBA is responsible;
- coordinating the activities of each Contracting Government and, where relevant, its Constructing Authority in undertaking the Joint Program of joint works or measures and S&DS works or measures, and implementing the trial of responsive management of salt interception schemes; and
- providing executive support to relevant committees, advisory panels, and technical working groups.

Consistent with the core functions and governance arrangements under the Murray-Darling Basin Agreement:

- the MDBA consults with the Contracting Governments and provides advice to the Basin Officials Committee Alternates (BOCA), the Basin Officials Committee (BOC) and Ministerial Council on the implementation of Schedule B and the BSM2030 strategy; and
- Ministerial Council, BOC and BOCA provide direction to the MDBA on the implementation of Schedule B and the BSM2030 strategy.

The following committees, advisory panels and working groups perform key roles in the implementation of the BSM2030 strategy.

Basin Salinity Management Advisory Panel (BSMAP) is a tier 2 committee established under the joint governance arrangements and reports to the BOCA.

BSMAP is established to:

i. provide advice to the BOCA and the Authority on Basin salinity policy and technical issues;

ii. fulfil the requirements set out in Schedule B to the Murray-Darling Basin Agreement (the Agreement);

iii. coordinate the implementation of all aspects of the Basin Salinity Management 2030 (BSM2030) strategy; and

iv. coordinate implementation of the requirements relating to salinity set out in the Basin Plan.

The role of BSMAP is to advise the Authority and the BOCA in relation to basin salinity management.

For joint venture business, the BSMAP will:

i. ensure the efficient and effective operation of Schedule B to the Agreement and the BSM2030 strategy;

ii. coordinate implementation of all aspects of Schedule B to the Agreement and the BSM2030 strategy;

iii. identify and prepare advice on policy and technical issues associated with the operation of Schedule B to the Agreement and the BSM2030 strategy;

iv. recommend amendments to Schedule B to the Agreement and the Basin Salinity Management procedures to implement salinity management more effectively in the Murray–Darling Basin;

v. provide a forum for governments to have visibility of, and input into, budget development for the BSM2030 program.

For Basin Plan business, the BSMAP will:

i. identify and prepare advice on policy and technical issues related to salinity management under the Basin Plan.

BSMAP is also required to undertake such other functions in accordance with any directions given, and any policies or guidelines established by, the Ministerial Council, the Authority, the Basin Officials Committee (BOC), or the BOCA from time to time; and to serve as a forum to exchange salinity management information between Basin Governments and other relevant joint governance committees and working groups.

Salt Interception Technical Working Group (SITWG) is a committee established under section 203 of the Water Act.

The role of SITWG is to advise the Authority and the Basin Officials Committee on:

i. the delivery of the Joint works and measures program and the reviews of Joint works and measures as required under the provisions of Schedule B of the Act; and

ii. the salt interception scheme operations, including the trial of responsive management, to be employed for the Joint works and measures to ensure that

management actions are directed toward achieving the salinity targets (Basin Plan and BSM2030) the design, construction and operation of Salt Interception Schemes (SIS) managed as authorised works or measures.

SITWG is also established to:

i. foster a sharing of expertise to ensure that Joint/Shared works are investigated, designed, constructed, operated, maintained and renewed efficiently, effectively and economically to deliver the agreed salinity benefits and BSM2030 Strategy;

ii. provide technical advice on:

- proposals submitted to the Authority by Contracting Governments in accordance with Schedule B of the Agreement, relating to proposed Joint, State or Shared works; and
- investigations required to assist in the determination of whether a proposal submitted by a Contracting Government in accordance with Schedule B is an Accountable Action as defined Schedule B of the Agreement, and if this Accountable Action should be considered as a Joint, State or Shared work;

iii. provide technical review of preliminary and concept designs for proposed Joint/Shared works;

iv. provide technical advice to the Authority on:

- proposed Joint or Shared works prior to the proposal being submitted to the Authority for approval under Clause 56 of the Agreement;
- general scheme of work submitted under Clause 58 (1) of the Agreement;
- maintenance programs and required investment;
- designs, specifications and estimates submitted under Clause 58 (2) of the Agreement;
- declaration that the works are effective under Clause 64 of the Agreement;
- reviews of the Joint/Shared Works required in accordance with Schedule B to the Agreement;
- operations plans for Joint/Shared Works;
- annual reports on performance of Joint/Shared Works; and
- arrangements for coordinated management of existing/proposed salt interception works to achieve operational efficiencies;

v. provide technical advice to the Basin Salinity Management Advisory Panel on:

- proposed variations to current entries on the Authority's Salinity Registers arising from reviews of Joint/Shared works; and
- outcomes from the trial of responsive management of salt interception schemes; and

vi. provide technical advice as requested by the Authority or the Basin Officials Committee.

Technical Working Group on Salinity Modelling (TWGSM) is a temporary working group established for a specific purpose.

The role of TWGSM is to advise the Authority and BSMAP on proposed transition to a new MDBA River Murray modelling platform and the proposed amendments to the estimate of salinity and salt loads under baseline conditions.

The TWGSM will:

i. review and provide comments on relevant reports to the MDBA;

ii. provide technical advice to the MDBA on the proposed amendment to the estimate of salinity and salt load under baseline conditions;

iii. provide technical advice to the Basin Salinity Management Advisory Panel (BSMAP) and the Authority Office regarding the use of updated BIGMOD model on matters including, but not limited to:

- how to use outcomes from ongoing five-year reviews of accountable actions in the updated MDBA's river models;
- the chronological sequencing of register entries in the MDBA river models; and
- adjustment to register entries and development of new salinity registers using the updated BIGMOD model;

iv. provide technical advice about suitability of the Murray SOURCE model for salinity accountability purpose under Schedule B and comment on the model's likely readiness / suitability for this purpose; and

v. provide technical advice about the use of the Murray SOURCE model for salinity accountability purposes.

Independent Audit Group for Salinity (IAG-Salinity) is established under Clause 34 of Schedule B to conduct an audit and assessment.

The role of IAG-Salinity is to advise the Authority on the performance of each Contracting Government and the MDBA in implementing the provisions of the Schedule B and the BSM2030 strategy, including that the salinity registers are a fair and accurate record of the salinity impacts of each action.

SIS Operators Forum is an informal group that was established to provide collaboration on operational matters for Salt Interception Schemes (SIS), including the trial of responsive management for SIS.

The role of the SIS Operators Forum is to advise the MDBA and SITWG on the operation and maintenance of authorised works or measures.

Figure 16 describes the core governance arrangements for the implementation of the BSM2030 strategy. The current Terms of Reference for each of these committees, advisory panels and working

groups shown in Figure 16 can be accessed via the MDBA references outlined in the Notes section below.

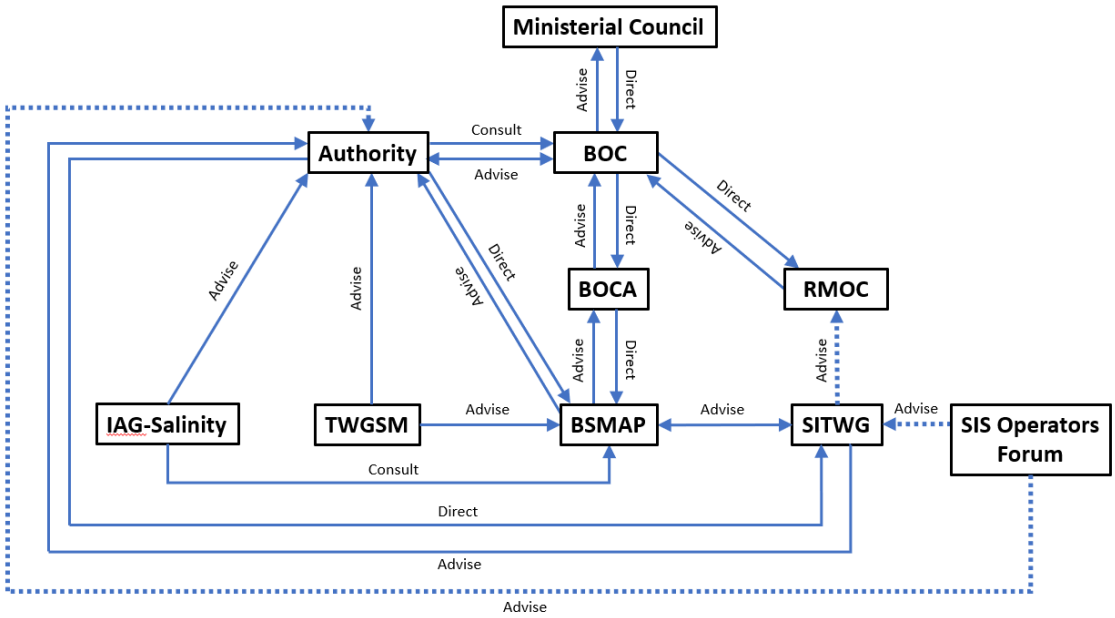


Figure 16 - Governance arrangements for implementation of the BSM2030 strategy (the dashed lines represent informal arrangements)

(Note: Unbroken line = formalised communication/ reporting channels. Dotted lines indicate informal reporting/ communication channels)

NOTES

Terms of reference

The terms of reference for relevant committees, advisory panels and working groups are provided below:

- Basin Salinity Management Advisory Panel (BSMAP) – MDBA reference D22/30308
- Salt Interception Technical Working Group (SITWG) – MDBA reference D16/41480
- Technical Working Group on Salinity Modelling (TWGSM) – MDBA reference D16/15397
- Independent Audit Group for Salinity (IAG-Salinity) – MDBA reference D17/17411

9 Risk Management

9.1 Risk Management

9.1.1 This procedure

This procedure is based on the basin-wide risk management framework for the BSM2030 strategy. The risk management framework provides a relatively simple to follow two-stage process and focuses on key risks to achieving the objectives of the BSM2030 strategy.

9.1.2 Related procedures

Introduction to the accountability framework describes the accountability framework including key concepts and features.

Governance provides an overview of governance arrangements for the BSM2030 strategy including a current list of relevant committees, advisory panels and working groups.

9.1.3 Background

At its core, BSM2030 is a risk-based strategy. One of the strategy's guiding principles requires that "management actions and investigations will be targeted to address significant salinity risks and take into account the potential for cumulative and future impacts". The strategy also calls for governance arrangements to be flexible, efficient and fit-for-purpose, and to consider risk in prioritising effort.

Whilst all jurisdictions embrace the concept of a risk-based approach to strategy actions, this procedure sets out a common risk assessment and management framework focused on the BSM2030 strategy objectives, consistent with AS ISO 31000:2018. The BSM strategy objectives are:

1. To ensure salinity levels in the shared water resources of the Murray–Darling river system are appropriate for the protection of economic, environmental, cultural and social values.
2. To manage salinity in the shared water resources through agreed works and measures implemented by partner governments with their communities.
3. To monitor and assess salinity levels and salt loads across the Basin to identify salinity risks and to support the implementation of cost-effective measures to protect the shared water resources and local assets.
4. To identify salinity risks and, where appropriate, contribute to the maintenance of appropriate salinity levels for the protection of local assets and downstream water resources through water resource plans, land and water management plans or other relevant statutory instruments.
5. To facilitate continuous improvement and provide assurance that flow management that affects the shared water resources is collectively undertaken in ways that have regard to the Basin Plan salinity targets.
6. To optimise the benefits of salinity control for economic, environmental, cultural and social values across the Basin.

This risk management procedure aims to distil information from jurisdictions, MDBA and other relevant sources to identify and focus on the risks most relevant to achieving the objectives of the BSM2030 strategy.

9.1.4 BSM2030 strategy risk management framework

An outline of the BSM risk management framework is set out below in Figure 17. Phase 1 allows jurisdictions and the MDBA to identify and collate the key risks to Basin salinity management with the flexibility to adopt a risk framework of choice that is consistent with best practice. Stage 2 applies the key risk approach to the BSM2030 strategy.

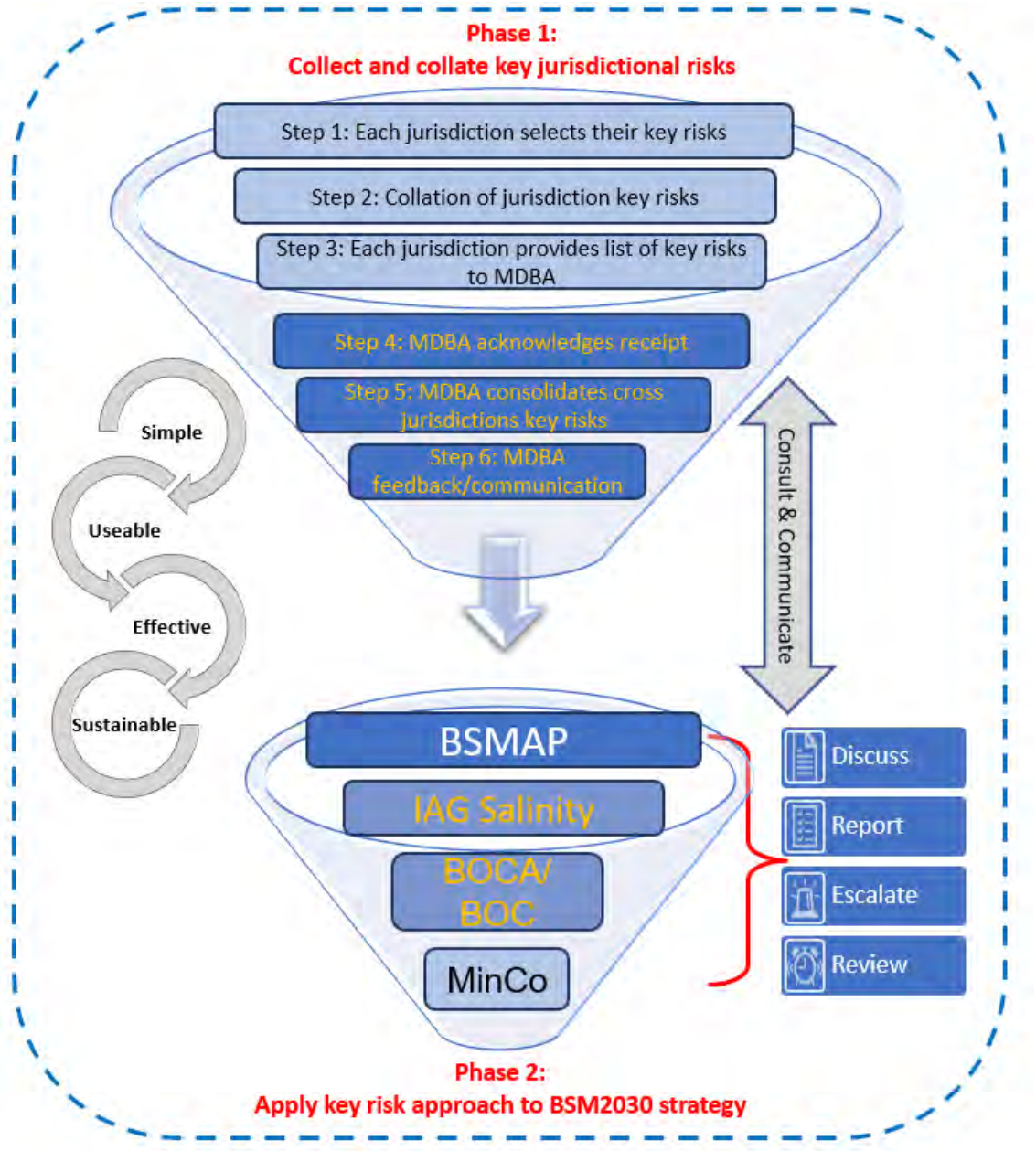


Figure 17 - BSM2030 strategy risk management framework

9.1.5 Features of the framework

A two-stage process:

Phase 1: Each jurisdiction collects and collates their own key risks to BSM2030 strategy implementation and provides them to the MDBA, which then consolidates all key risks across all jurisdictions into a single Basin-wide risk register. It is suggested that jurisdictions select and provide

key risks which are rated moderate or significant, up to five key risks, which should be sufficient to capture the nuances of the risk environment, position helpful discussions of shared experience, and effectively inform governance layers.

Jurisdictions can use the risk framework of their choice (in completing steps 1 to 3 in Figure 17) to assess their key risks to BSM2030 strategy objectives.

Phase 2: Jurisdictions (through BSMAP) then use the Basin-wide risk register to communicate and address whole of Basin risks to BSM2030 strategy objectives. Refer to Phase 2 of Figure 17.

9.1.6 Phase 1: Collect and collate key risks

Which risk framework to use?

Jurisdictions need to identify and utilise a framework for assessing and consolidating risks. The framework must be based on accepted best practice, and selected from the options below:

- **Option 1**: The framework already embedded within the jurisdiction's organisation (i.e., their corporate risk management framework), or

- **Option 2**: In the absence of a corporately mandated risk management framework, either a framework that meets the jurisdiction's needs, or the framework set out in Appendix 7.

Jurisdictions must use the likelihood/consequence matrix attached to the respective risk management framework used for the initial assessment. It is recommended that the five highest scoring risks identified form the key risks. It is sufficient to report low scoring and/or less than five key risks if that is a true reflection of a jurisdiction's risk profile.

9.1.6.1 Step 1: Jurisdiction key risk selection

At least once a year (in sufficient time before the February BSMAP meeting) each jurisdiction and the MDBA will use their chosen framework to identify their key risks. This may involve liaison with internal project/program teams for clarification and validation.

9.1.6.2 Step 2: Collation of jurisdiction key risks

Each jurisdiction and the MDBA will collate their key risks in a Risk Register. An example of this register is provided at Appendix 9 (and will be available via GovTeams).

The Risk Register Appendix 9 has been designed to firstly enable each jurisdiction to collect and provide sufficient information to enable a necessary level of risk-based insight for governance purposes, without overburdening jurisdiction's by requiring detailed risk information.

Each jurisdiction will collate their identified key risks into the Risk Register in sufficient time before the February BSMAP meeting.

9.1.6.3 Step 3: Provision of list of key risks to MDBA

Each jurisdiction emails their Risk Register to the MDBA BSMAP secretariat email address (bsmap@mdba.gov.au).

9.1.6.4 Step 4: MDBA receipt acknowledgement

The MDBA BSMAP secretariat will respond via email to each jurisdiction, confirming receipt of their Risk Register. This allows receipt tracking to ensure all updates have been received.

9.1.6.5 Step 5: MDBA cross jurisdiction key risk consolidation (BSM2030 Consolidated Risk Register) and Risk Treatment Plan

MDBA will consolidate each of the jurisdiction Risk Registers into the BSM2030 Consolidated Risk Register (Example of column headings is at Appendix 10. MDBA may adjust the register:

- to group together duplicate risks (if and where they exist)
- by conducting a risk moderation exercise[10] using a common risk management framework to provide risk relativity and a consistent basis for evaluation risk from a BSM2030 strategy perspective. The moderation exercise may highlight outlier risks that require further discussion by BSMAP (i.e., unique/inherently severe risks), and downgrade risks less relevant to the BSM2030 strategy objectives.

Any changes resulting from a moderation exercise will be communicated to jurisdictions as part of Step 6. When finalised, the BSM2030 Consolidated Risk Register will be available for BSMAP members to view via GovTeams (noting risks may evolve or change and that this process is not static). Should members become aware of a risk that requires BSMAP consideration outside of the formal process for risk consideration, they should email the BSMAP secretariat (bsmap@mdba.gov.au). As appropriate, the BSMAP secretariat will raise the new/ changed risk, with the wider BSMAP members.

Following the risk consolidation process (development of the BSM2030 Consolidated Risk Register, and upon each annual review), MDBA will prepare a Risk Treatment Plan for consideration by BSMAP out of session in the format included at Appendix 11.

9.1.6.6 Step 6: MDBA feedback/communication

Before the BSM2030 Consolidated Risk Register is finalised, MDBA will communicate with relevant jurisdictions on issues including but not limited to the following:

- seeking risk clarification (if necessary)
- advising of, and seeking feedback on, any changes MDBA has made, or is proposing, to risks, and
- providing a copy of the completed BSM2030 Consolidated Risk Register in advance of any governance meetings.

The output will be an annually aggregated and qualified summary of key risks from across jurisdictions and the MDBA (the finalised BSM2030 Consolidated Risk Register). This will be used as a reference tool for BSM2030 strategy meetings.

[10] The moderation exercise by MDBA will involve identifying the commonly described and similarly rated risks prior to further discussion and agreement by BSMAP.

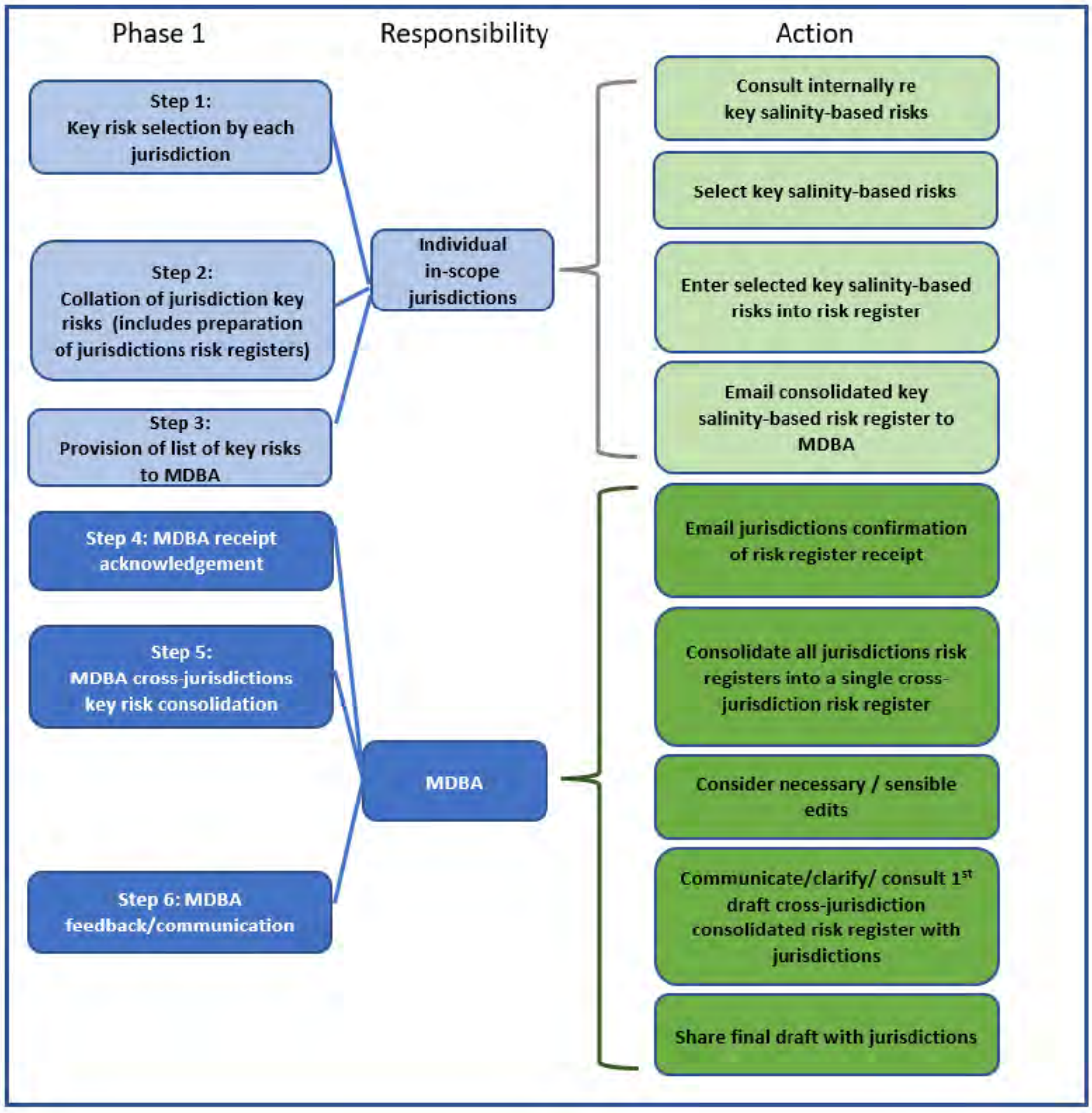


Figure 18 - Actions under phase 1 of the key risk approach

9.1.7 Phase 2: Applying the key risk approach to the BSM2030 strategy

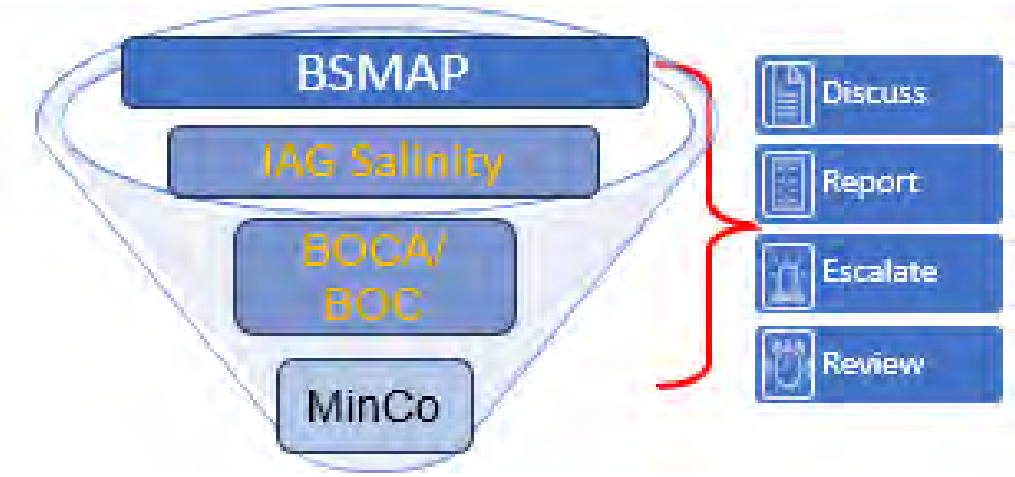


Figure 19 - Phase 2

9.1.7.1 Phase 2 approach

Phase 2 involves using the information obtained from Phase 1, and captured in the BSM2030 Consolidated Risk Register, to manage risks to the BSM2030 strategy objectives. Primarily, this approach is driven by four actions – discuss, report, escalate and review – in relation to the current BSM2030 strategy governance framework.

9.1.7.2 Applying the key risks: Preliminary considerations

The Phase 1 and Phase 2 activities under the key risks approach are tailored as much as possible to existing governance arrangements (Figure 20), and in particular, are focused on BSMAP, as BSMAP is the primary mechanism implementing the BSM2030 strategy and the 'hub' through which key risk information needs to flow.

While it is also important that the framework involves the more senior governance bodies of BOCA, BOC and the MinCo, engagement with those bodies will be significantly limited due to the broader whole of Basin focus of those bodies.

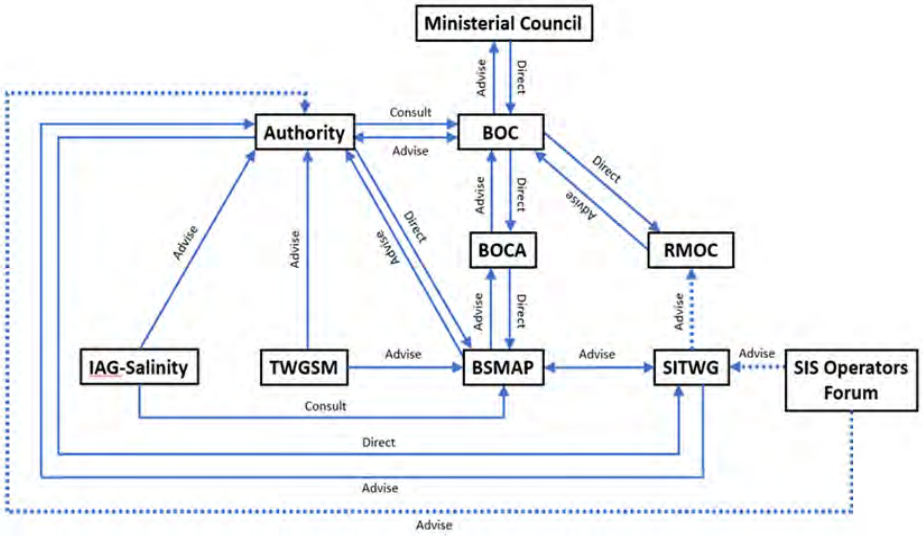


Figure 20 - BSM2030 strategy governance

(Note: Unbroken line = formalised communication/ reporting channels. Dotted lines indicate informal reporting/ communication channels)

9.1.7.3 Applying the key risks: Discuss, Report, Escalate and Review

Table 9.1 summarises key BSMAP phase 2 actions and timeframes.

Table 9.1 - BSMAP phase 2 actions

	Discuss (BSMAP meetings)	Report	Escalate	Review
BSMAP actions	• February review of BSM2030 Consolidated Risk Register (and associated Treatment Plans). • Discuss and agree any changed risks, new risks and risk ratings (including residual risk ratings)	• Finalise the Consolidated Risk Register for reporting to the IAG for Salinity (every second year), and BOCA if required. • Prepare an annual report for BOCA on BSM2030 strategy risks. • Consider reporting to others (IAG for Salinity, SITWG or TWGSM)	• Set 'triggers' for when BSMAP should escalate BSM2030 strategy risks to BOCA outside the annual reporting period.	• (Optional: July update of risk register)

9.1.7.4 Step 1: Discuss (BSMAP meetings)

This primarily relates to the discussion of the BSM2030 Consolidated Risk Register at BSMAP.

- At its February meeting, BSMAP should review the BSM2030 Consolidated Risk Register. Actions at this meeting may include:

- tabling the revised Register
- revisiting BSM2030 strategy success statements in the context of the objectives and key elements of the strategy (This process is discussed in more detail at Appendix 7), and
- considering key risks and reaching a consensus about the status of those risks on the BSM2030 Consolidated Risk Register (are they the same, has the risk trajectory moved up or down etc.). This discussion should include:
  - the current risk description
  - potential consequences and likelihood
  - Initial risk rating
  - risk controls/treatments and their effectiveness
  - residual risk ratings post application of risk controls/ treatments or mitigations, and
  - any lessons learned.

- Discussion should involve BSMAP participants testing the assumptions behind each of the key risks being considered, primarily to generate an agreed understanding about the risk assessment.
- In terms of a proactive, ongoing, and whole of program approach to BSM2030 strategy risk management, it is the *BSMAP discussions* that are critical – the BSM2030 Consolidated Risk Register is the mechanism to trigger these discussions.

9.1.7.5 Step 2: Report

Reporting will be based around the BSM2030 Consolidated Risk Register created from Phase 1.

- The BSM2030 Consolidated Risk Register forms the centrepiece of BSM2030 strategy reporting on risk, whether it is for BSMAP, the IAG Salinity, or other governance bodies noted in Figure 20. This is firstly to enable risk to be reported consistently across all jurisdictions and interested parties, and secondly to avoid the burden of creating a new report.
- BSMAP will need to determine *which risks* should be reported 'up the line' to BOCA and *when*. Depending on the reporting protocols for those bodies, BSMAP may:
  - provide an annual report to BOCA on BSM2030 strategy risks, and
  - set 'triggers' for when BSMAP should escalate BSM2030 strategy risks to BOCA outside the annual reporting period.
- BSMAP may also consider whether/when the register is provided to other governance bodies, such as SITWG and TWGSM.

9.1.7.6 Step 3: Escalate

BSMAP will need to determine the 'triggers' for risk and/or issues to be escalated on an 'ad hoc' basis to BOCA.

9.1.7.7 Step 4: Review

The annual review of the BSM2030 strategy would take place during BSMAP's February meeting (see above).

Further details, including examples, of the key risk approach are set out in the appendices below.

Appendix 7. A risk management framework alternative

Purpose:

The approach described here is intended to complement the 'key risk' approach described in the body of this Procedure in two respects, as follows:

- If a jurisdiction does not have/use their own risk management framework, this framework can act as a proxy (if desired).
- If a jurisdiction does have their own risk management framework but wishes to benchmark the assumptions of their framework, this framework can be used as a proxy (if desired).

Context

The following content is a summary 'walkthrough' of the five (5) phases of the framework, namely:

1. **Establishing the context**
2. **Risk identification**
3. **Risk assessment**
4. **Risk evaluation**
5. **Risk treatment**

Each phase is supported by two points of context, as follows:

- a pictorial sense of the framework process through the lens of the stages (provided in Figure 21), and
- a walkthrough using an example risk.

Figure 21 - The five Phases of alternative risk management framework

Phase 1: Establishing risk context

Figure 22 - Phase 1 Establishing risk context

What:

Define the organisation's strategic and operational context and use this to determine what success looks like in the form of 'success statements'.

Why:

Having a concise articulation of what success looks like, in the context of your organisational objectives, sets a basis for identifying relevant risk (i.e., what things can delay or prevent achievement of objectives/success statements).

How:

Action 1: Capture organisational objectives

Action 2: In a set of short (bullet point) statements, describe what the successful achievement of those objectives looks like.

Example

BSM2030 Objectives

- To ensure salinity levels in the shared water resources of the Murray–Darling river system are appropriate for the protection of economic, environmental, cultural and social values.
- To manage salinity in the shared water resources through agreed works and measures implemented by partner governments with their communities.
- To monitor and assess salinity levels and salt loads across the Basin to identify salinity risks and to support the implementation of cost-effective measures to protect the shared water resources and local assets.
- To identify salinity risks and, where appropriate, contribute to the maintenance of appropriate salinity levels for the protection of local assets and downstream water resources through water resource plans, land and water management plans or other relevant statutory instruments.
- To facilitate continuous improvement and provide assurance that flow management that affects the shared water resources is collectively undertaken in ways that have regard to the Basin Plan salinity targets.
- To optimise the benefits of salinity control for economic, environmental, cultural and social values across the Basin.

Figure 23 - Example of dot points - BSM2030 Objectives

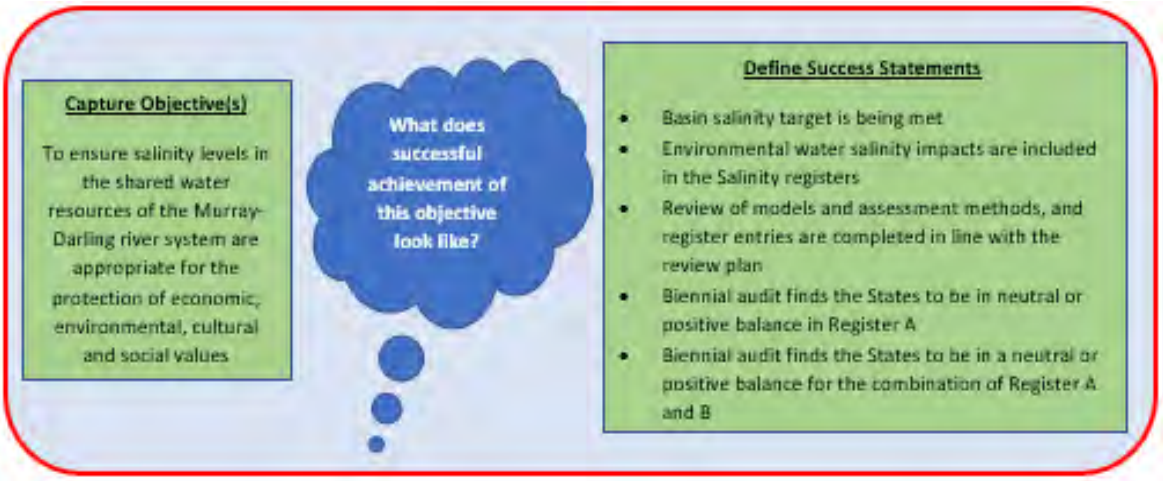


Figure 24 - Establishing risk context example

Phase 2: Risk identification

Figure 25 - Phase 2 Risk identification

What:

Using the objectives/success statements from Phase 1 as context, articulate risks that could foreseeably delay or prevent achievement of the objectives/success statements.

Why:

A concise articulation of risks sets the basis for targeted risk management. Risk management actions are often only as good as the risks identified. It is important to spend time and effort to make sure the risk scan is scoped correctly.

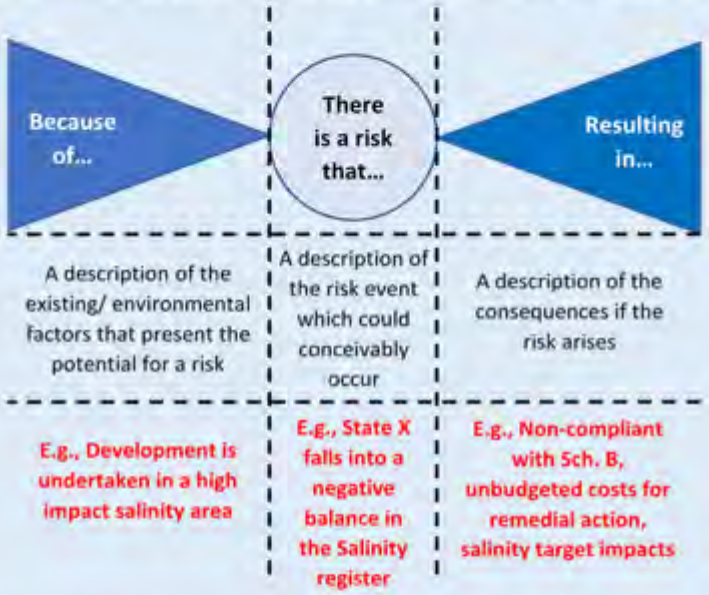
How:

A common and effective way to describe a risk is to use the 'Bowtie' method. This approach is described below in Figure 26.

Hint Box: How to Articulate Risks

The Bowtie Method is an effective way to describe the attributes of a risk. The key attributes being:

- **The cause(s) that can trigger the risk event (i.e., the set of circumstances in play that give rise to risk)**
- **The risk event (i.e., what happens)**
- **The consequence(s) (i.e., what are the impacts resulting from the risk occurring)**



Why is it important to recognize all three components of a risk?

There are a few reasons why clear articulation of a risk is important. Key reasons being:

- **Even a subtle change in a risk description can change the nature of the risk, and thus the nature of the controls to manage it with**
- **It makes it easier for other parties to understand the risk**
- **It makes it easier to develop a consensus on risks**
- **It makes risk prioritization more reliable (i.e., if risks are articulated well, it is easier to confirm which risks require preferential attention and resources)**
- **Controls can be applied to prevent/minimize a risk, to prepare an organization well to respond to a risk, and to support swifter recovery after a risk. A Bowtie articulation helps inform the suite of customized controls**

Figure 26 - The Bowtie method

Phase 3: Risk assessment

Figure 27 - Phase 3 risk assessment

What:

Each risk can be assessed through the common risk attributes of:

- *Likelihood*:
  - How likely will the risk eventuate in a defined period of time?
- *Consequence*:
  - What is the nature of the consequences and how severe will they be?

Why:

Having a measurement of risk delivers a sense of risk relativity (i.e., which risks are significant versus which risks are not). This is important because it allows an organisation to identify risk priorities and focus its resources on the things that matter.

How:

A commonly accepted risk assessment approach is the 5x5 risk matrix (Figure 28 below).

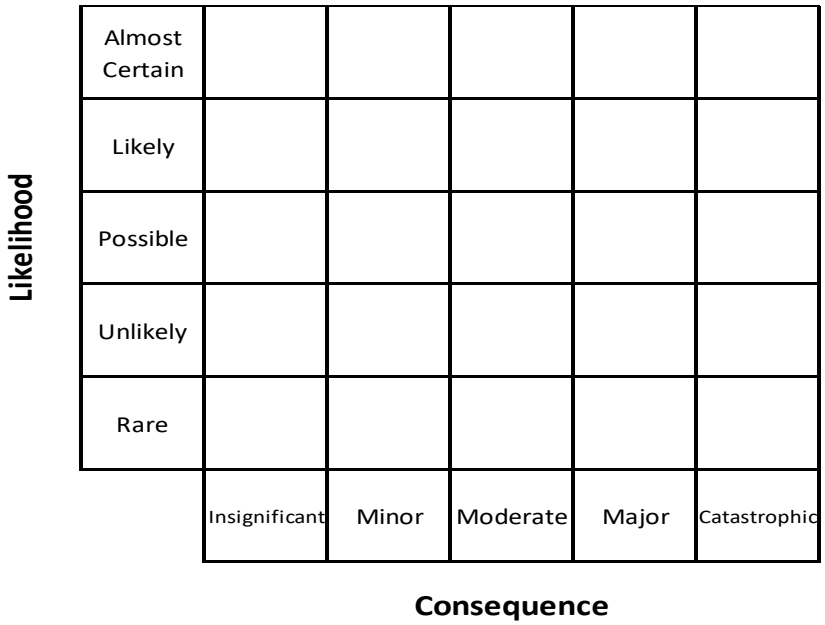


Figure 28 - Standard 5x5 Risk matrix

Hint Box: Accounting for multiple consequences

Many risks can result in a multitude of consequence types, thus triggering more than one consequence category in the risk assessment tool. If this occurs, score the risk consequence on the basis of the highest impact consequence category.

The next step involves describing gradients of likelihood and consequence in a way that is relevant to the organisation. This involves:

- confirming consequence categories
- confirming a description of impacts that attach to each consequence category, ranging from Insignificant to Catastrophic, and
- confirming a description of likelihood from Rare through to Almost Certain.

Once complete, this exercise results in a risk assessment tool that enables a user to plot any risk on the 5x5 risk matrix. A version of this customised tool is provided in Appendix 8.

Example:

Using the sample risk identified in the 'Hint Box: How to Articulate Risks', and the risk assessment tool, the risk can be plotted into the risk matrix as follows (noting that in this sample instance the assessment has resulted in a Likelihood rating of 'Likely' and a Consequence rating of 'Major')

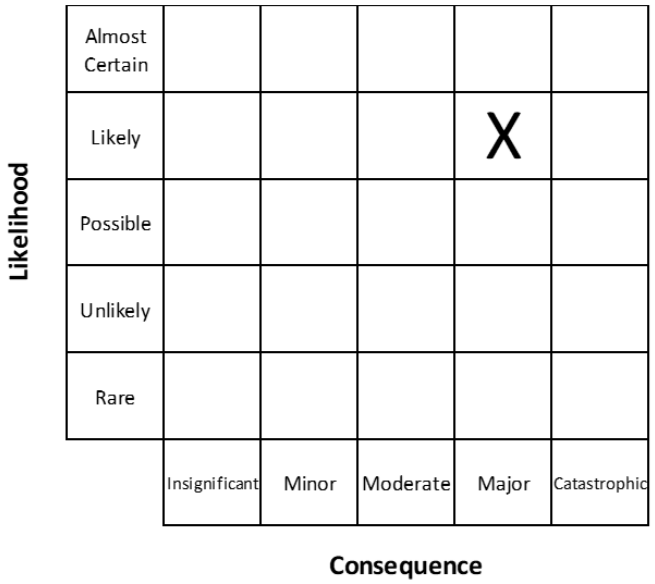


Figure 29 - Plotting a risk in the risk matrix

Phase 4: Risk evaluation

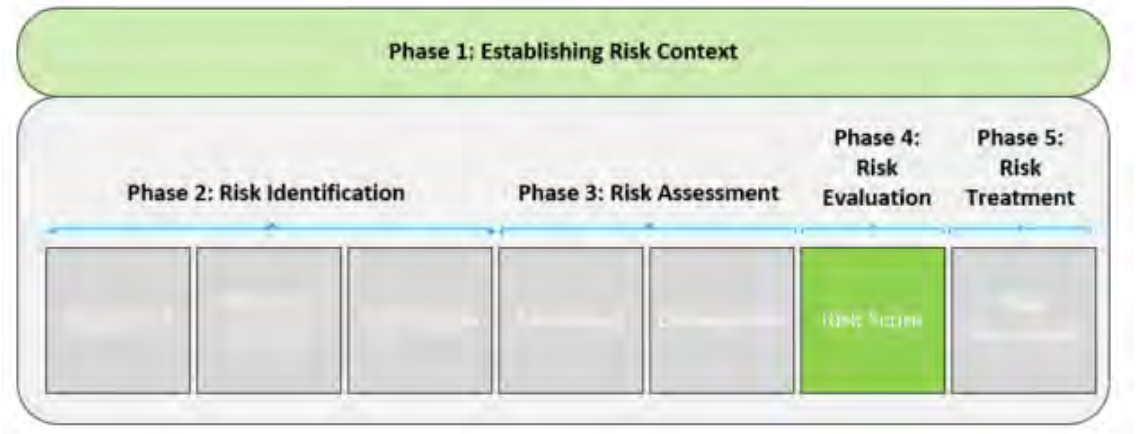


Figure 30 - Phase 4 Risk evaluation

What:

Risk evaluation involves scoring a risk based on the area in which the risk assessment appears on the 5x5 risk matrix.

Why:

By allocating areas of the 5x5 risk matrix with degrees of importance, there is a consistent basis for risk escalation and prioritisation. This means that different users, identifying different risks, can still arrive at a collective risk profile that identifies relative priorities.

The allocation of low importance areas versus high importance areas reflects organisational risk tolerance (i.e., how much risk an organisation is prepared to accept before an alternative risk management approach is required).

How:

Allocating risk importance in the 5x5 risk matrix can be achieved by:

- collectively determining risk tolerance thresholds in the context of likelihood and consequence, and
- colour coding those thresholds into the 5x5 risk matrix.

Example:

The example 5x5 risk matrix below uses the risk evaluation thresholds adopted by MDBA's most recent risk management framework iteration.

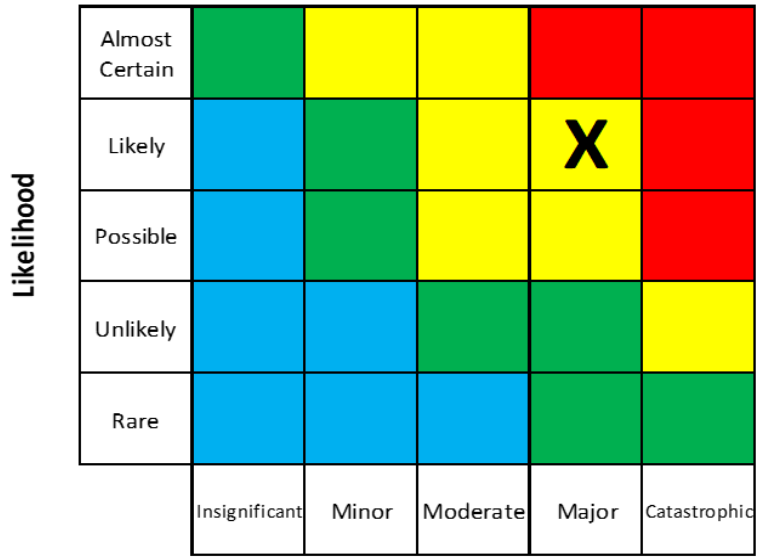


Figure 31 - A risk evaluation allocation

The colour codes hold practical relevance as follows:

Table 9.2 – Escalation and management protocols

Colour code	Risk Score	What does this mean
	Low	• Tolerable level of risk and may be accepted if there are no treatment strategies that can be easily and economically implemented
	Moderate	• The risk level can be accepted if there are no treatment strategies that can be implemented in a cost-effective manner • Management responsibility must be specified
	Significant	• The level of risk may be accepted provided there has been exhaustive assessment of potential treatment strategies aimed at reducing the risk level, and all viable strategies have been developed and implemented • Chief executive is notified of the risk
	High	• Immediate action is required by the risk owner • Audit Committee is advised for enterprise level risk • If the risk is unavoidable or it is justified to accept or retain the risk to deliver an outcome, the risk may be accepted in the short to medium term where all reasonable efforts have been made to mitigate the risk

Example

In the instance of the example risk, it has been scored as a 'Significant' risk and would be subject to the escalation and management protocols designated for this level of risk.

	Significant	• **The level of risk may be accepted provided there has been exhaustive assessment of potential treatment strategies aimed at reducing the risk level, and all viable strategies have been developed and implemented** • **Chief executive is notified of the risk**

Figure 32 - Example

Stage 5: Risk treatment

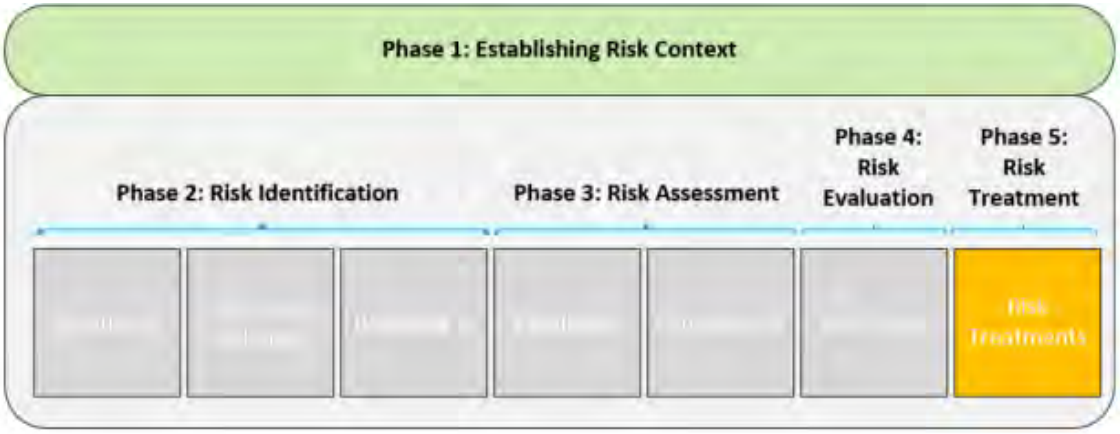


Figure 33 - Phase 5 Risk treatment

What:

With risks now identified, assessed and evaluated through the previous stages, the next step involves considering, planning and implementing treatment options.

Why:

The effective and customised treatment of risks is necessary to bring greater certainty to achieving your organisational objectives and success statements.

How:

Risk treatment application should be integrated into daily activities and project planning. Aspects of this approach include:

- Developing an action plan (Risk Treatment Plan) for implementing and monitoring risk treatments. This action plan would be a part of the risk register (as a separate worksheet – see Appendix 11), with the following column headers:

Table 9.3 - Sample risk treatment action plan column headers

Risk Trigger	Risk Owner	Treatment Actions	Target Date	Risk Review Frequency	Next Review Date	Target Risk Score

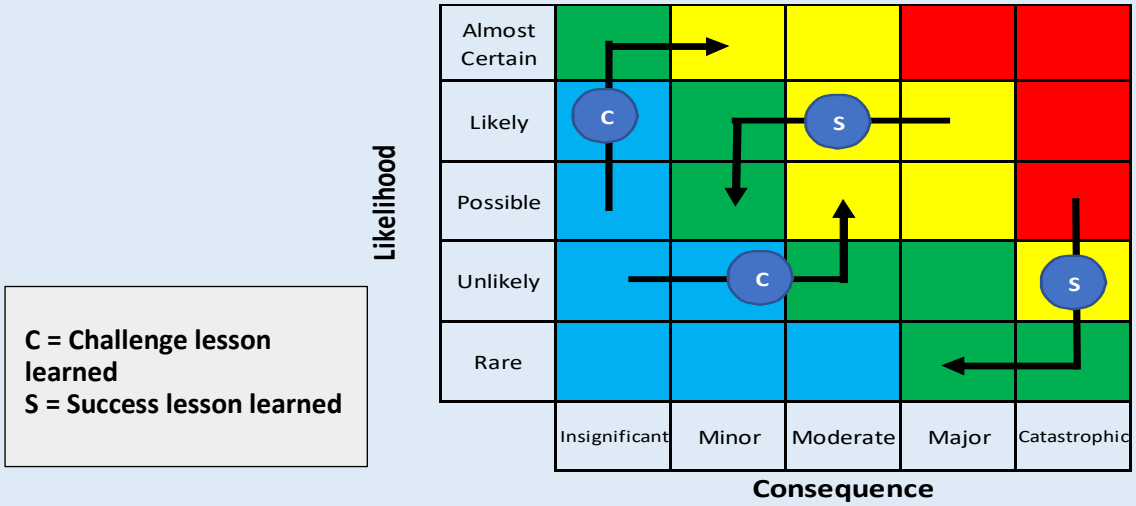
- Recognition of shared risks. In a practical sense, shared risk recognition, roles and responsibilities can be coordinated through three lenses:
    - *Risk ownership*: Which party is accountable for the risk (i.e., where does the buck stop)?
    - *Risk responsibility*: Which party is responsible for oversighting prudent management of the risk (i.e., that monitoring treatments are implemented and maintained)?
    - *Treatment responsibility*: Which party is responsible for implementing and managing a particular treatment option?

- Sharing lessons learned. Risks and treatments seldom act in isolation. Sharing lessons across multiple risks can often reward other teams/organisations as good practice can be exported from one to the benefit of another.

Hint Box: What lessons should you share

Often a change in a risk score is an indication of either good risk management practice, or a challenge requiring improvement.

An arrangement can be embedded where a certain type of risk score movement triggers a lessons learned discussion. The discussion would involve relevant stakeholders (especially those who can describe the lesson and those who will benefit directly from hearing the account). The picture below demonstrates a potential approach to establish lessons learned triggers based on risk scores:



If any risk score changes (up or down) by a factor of 2 x 1 square in the risk matrix, it can be adopted into a lessons learned discussion.

Appendix 8. Risk management framework alternative: Risk assessment tool

The following Consequence and Likelihood matrices support the Risk management framework alternative described in Appendix 7. More specifically, these matrices support Phase 3: Risk assessment of the framework alternative (see Figure 27). There are three steps involved:

1. Consequence matrix

A consequence matrix (see Table 9.4 below) allows a user to determine and measure the types of consequences that could arise in the event of a risk occurring. The user plots the consequences of the identified risk according to their assessment of the type of consequence and the gradient of impact (i.e., Insignificant, Minor, Moderate, Major, or Catastrophic).

- Note: Often a risk will trigger more than one type of consequence. Plot each of the consequence types on the matrix. The positioning of the risk in the ultimate/combined Consequence/Likelihood matrix will be driven by the consequence type that scores the highest gradient of impact.

2. Likelihood matrix:

A likelihood matrix (see Table 9.5 below) is then used to determine and measure the likelihood of a risk eventuating. The user plots the relevant level of likelihood in the context of the timescale in the matrix below.

- Note: Likelihood can be viewed as a function of risk control effectiveness. This approach is adopted in the likelihood definitions below.

3. Applying the combined matrices

The combined consequence and likelihood assessments are then plotted on the 5x5 risk matrix as described (see Figure 31).

Table 9.4 - Consequence matrix

Consequence Type	Insignificant	Minor	Moderate	Major	Catastrophic
Program Outcomes	Basin salinity management outcomes and objectives substantially met.	Delivery of basin salinity management outcomes and objectives temporarily delayed or varied.	Delivery of basin salinity management outcomes and objectives substantially delayed or varied.	Unable to deliver basin salinity management outcomes and objectives without significant additional expense and/or variations.	Unable to deliver major basin salinity management outcomes in the foreseeable future.
	Key implementation activities substantially delivered.	Key implementation activities interrupted resulting in slightly reduced performance.	Some interruptions in key implementation activities resulting in reduced performance.	Breakdown in key implementation activities resulting in ongoing variations in performance.	Unable to undertake primary functions and implementation activities for a prolonged period.
	No measurable adverse salinity impacts to economic, environmental, cultural and social values.	Only minor, if any, adverse salinity impacts to economic, environmental, cultural and social values.	Significant adverse salinity impacts to economic, environmental, cultural and social values over a short to medium term period.	Extensive adverse salinity impacts to economic, environmental, cultural and social values over a prolonged period which has major political and/or economic consequences.	Severe adverse salinity impacts to economic, environmental, cultural and social values which have long term consequences and severe impacts on the national economy.

Interdependency and reputation	Little, if any, impact on jurisdiction confidence or organisational reputation	Isolated, minimal and/or short term impact on jurisdiction confidence or reputation.	Moderate or broader damage to jurisdiction confidence or reputation with short to medium term ramifications. Requires Executive attention.	Widespread impact to jurisdictions. Longer term impact to jurisdiction perceptions or reputation. Public perception severely damaged - considerable resources required to recover.	Reputation and relationship with key jurisdictions irrevocably damaged resulting in a material change in public perception and loss of government or financial support.
	Incidental media coverage.	Limited local/social media coverage.	Some local/social media coverage.	Extensive national/social media coverage.	Sustained national/social media attention. International media interest.
Capacity & capability	Skills, experience and capability deficiencies (capabilities) may exist within work teams. Minimal impact on delivery/performance.	Temporary gaps (less than 3 months) in capabilities slightly impacting the ability to efficiently achieve objectives.	Gaps (less than 6 months) in the availability of relevant capabilities, leading to short to medium term delays in achieving objectives.	Long term (6-18 months) gaps or unavailability of relevant capabilities, leading to substantive delays (6+ months) in achieving objectives.	Permanent loss of capabilities, leading to significant risk of project failure and/or inability to meet key objectives within statutory or policy timeframes.
	Isolated recruitment and/or retention problems within the project.	Short term recruitment lag.	Difficulty recruiting staff to project.	Skill gaps across project that cannot be managed to avoid adverse impacts.	Skill gaps in key positions leading to disruption in management capability and program/project delivery.

	< 5 per cent Budget impact.	5-10 per cent Budget impact.	10-25 per cent Budget impact.	25-50 per cent Budget impact.	>50 per cent Budget impact.
Financial	No impact to program delivery.	Minor consequential impacts to program delivery.	Funding reallocations required. Some activities under the accountability framework reprioritised and/or delayed.	Cost overruns leading to: • reprioritising project activities • reallocating resources, or • rationalising/rephasing/ceasing other projects Some activities under the accountability framework not undertaken.	Cost overruns leading to: • urgent need for funding outside Budget cycle • a large number of activities under the accountability framework not undertaken • project termination, and/or • Ministerial briefing.
Legal & Compliance	Insignificant or technical failure to comply with internal policies or BSM Procedures.	Substantive failure to comply with internal policy or BSM Procedures, with minimal impacts.	Substantive failure to comply with internal policy or BSM Procedures, with significant impacts. Substantive failure to comply with government policies, Schedule B, regulations or Acts.	Multiple failures to comply with government policies, Schedule B, regulations or Acts, with significant reputational or financial impacts.	Significant and ongoing failures to comply with major government policies, Schedule B, regulations or Acts, with significant reputational or financial impacts.
	Minimal likelihood of legal liability or sanctions	Civil claims (damages) with minimal financial impact.	Civil claims (injunctions, damages) with moderate impact.	Civil claims for significant remedies (damages, injunctions, restitution).	Multiple/class actions for significant remedies.

		Minor statutory fine or remediation order.	Moderate statutory fine and/or remediation order.	Significant statutory fine and/or remediation order. Criminal proceedings against individuals.	Significant statutory fines or orders for multiple breaches. Significant criminal proceedings against individuals.

Table 9.5 - Likelihood matrix

Likelihood	Probability	Definition
Rare	**0 - 10%** probability the risk event will occur	**Effective:** There are no control gaps and controls are believed to be operating effectively. The control environment has prevented the risk from occurring in the past. If the risk eventuates, it is most likely due to external circumstances beyond the control of the organisation. May occur only in exceptional circumstances.
Unlikely	**10 - 20%** probability the risk event will occur	**Moderately effective:** The majority of controls are strong with few control gaps. Controls are influencing the risk level, though improvement is needed. The strength of the control environment means that it is likely that the risk eventuating would be caused by external factors not known to the organisation or beyond its ability to influence. Near misses may have occurred in the past, however they likely to be within organisational risk appetite and tolerance. Should not occur in most circumstances.
Possible	**20 - 40%** probability the risk event will occur	**Partially effective:** There are some control gaps, resulting in the control having a limited influence on risk level. Actions are already established to address known control weaknesses but are not fully implemented, or the exposures are not controllable but actively monitored. Isolated incidents of the risk may have occurred previously, however, the impact consequence has been low. The risk event might occur at some time.
Likely	**40 - 80%** probability the risk event will occur	**Largely Ineffective:** there are significant control gaps and weaknesses. The majority of existing controls are weak and do not materially influence the likelihood of the risk event or consequences occurring. A causal connection can be made between the weak controls and prior incidences of the risk event occurring. The risk event will occur in many circumstances.
Almost certain	**80 - 100%** probability the risk event will occur	**Non-existent/ineffective:** there are no controls for identified risk causes, or the controls that are in place are so weak as to be practically non-existent. Weak controls have allowed repeated instances of the risk event in the past. There is almost no doubt that the risk will eventuate.

Appendix 9. Example column headings for jurisdictions risk register

					Triggers (because of)	Risk Identification (there is a risk that)	Consequences (resulting in)	Risk Score	Risk treatment actions/ Controls	
Item #	Stakeholder	Date entered	Dated updated	Risk type	Risk Trigger	Risk Description	Risk Consequence			Risk comments

Appendix 10. Example column headings for BSM2030 Consolidated risk register

				Triggers (because of)	Risk Identification (there is a risk that)	Consequences (resulting in)	Risk Score (Likelihood)	Risk Score (Consequence)	Risk Score	Risk treatments controls/ Actions	Risk Score (Likelihood)	Risk Score (Consequence)	Residual Risk Score	
Item #	Date entered	Dated updated	Risk type	Risk Trigger	Risk Description	Risk Consequence								Risk comments

Colour Code (use in risk score columns)

- High
- Significant
- Moderate
- Low

Appendix 11. Example column headings for Risk Treatment Plan

Item #	Risk Trigger	Risk Owner	Treatment Actions	Target Date	Risk Review Frequency	Next Review Date	Target Risk Score

Office locations – *First Nations Country*
Adelaide – *Kaurna Country*
Canberra – *Ngunnawal Country*
Goondiwindi – *Bigambul Country*
Griffith – *Wiradjuri Country*
Mildura – *Latji Latji Country*
Murray Bridge – *Ngarrindjeri Country*
Toowoomba – *Jarowair and Wakka Wakka Country*
Wodonga – *Dhudhuroa Country*

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