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Cover Image: Lake Victoria 'Talgarry Beach'-Photo courtesy of Emma Hampton, MDBA, 2014

#### Acknowledgement of the Traditional Owners of the Murray–Darling Basin

The Murray–Darling Basin Authority acknowledges and pays its respect to the Traditional Owners and their Nations of the Murray–Darling Basin. The contributions of earlier generations, including the Elders, who have fought for their rights in natural resource management, are also valued and respected.

The MDBA recognises and acknowledges that the Traditional Owners and their Nations in the Murray– Darling Basin have a deep cultural, social, environmental, spiritual and economic connection to their lands and waters. The MDBA understands the need for recognition of Traditional Owner knowledge and cultural values in natural resource management associated with the Basin. Further research is required to assist in understanding and providing for cultural flows. The MDBA supports the belief of the Northern Murray– Darling Basin Aboriginal Nations and the Murray Lower Darling Rivers Indigenous Nations that cultural flows will provide beneficial outcomes for Traditional Owners.

The approach of Traditional Owners to caring for the natural landscape, including water, can be expressed in the words of Ngarrindjeri elder Tom Trevorrow: 'our traditional management plan was don't be greedy, don't take any more than you need and respect everything around you. That's the management plan—it's such a simple management plan, but so hard for people to carry out.\*1 This traditional philosophy is widely held by Traditional Owners and respected and supported by the Murray–Darling Basin Authority.

<sup>&</sup>lt;sup>1</sup> Tom Trevorrow (2010) Murrundi Ruwe Pangari Ringbalin 'River Country Spirit Ceremony: Aboriginal Perspectives on River Country'.

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# Abbreviations

ACID	Aboriginal Cultural Information Database
AHD	Australian Height Datum
AHIP	Aboriginal Heritage Impact Permit
BMEC	Barkindji–Maraura Elders Council
CHTL	Cultural Heritage Team Leader
DSM	Digital Surface Model
HUS	Historically Undisturbed Sediments
LFA	Landscape Function Analysis
LVAC	Lake Victoria Advisory Committee
LVCLPoM	Lake Victoria Cultural Landscape Plan of Management
LVOS	Lake Victoria Operating Strategy 2002
LVP	Lake Victoria Program
LVPSO	Lake Victoria Program Support Officer
LVPM	Lake Victoria Program Manager
LVWG	Lake Victoria Working Group
NOW	NSW Office of Water
MDBA	Murray–Darling Basin Authority
OEH	NSW Office of Environment and Heritage
SA Water	South Australia Water Corporation
SRP	Scientific Review Panel
UAV	Unmanned Aerial Vehicle



# About this report

Lake Victoria is a naturally occurring shallow freshwater lake near the South Australian and Victorian borders, approximately 60 kilometres downstream of the Murray–Darling Junction in south-western New South Wales. Since 1928, Lake Victoria has been operated by the Murray–Darling Basin Authority (MDBA) and its predecessors as regulated off-river storage. As part of the River Murray System, Lake Victoria plays an extremely important role in water supply regulation. Lake Victoria is owned by the South Australian Government and operated by the South Australia Water Corporation (SA Water), on behalf of a joint venture comprising the Australian, New South Wales, Victorian and South Australian Governments. SA Water's program of works is funded and directed by the MDBA on behalf of the four asset controlling governments.

Regulation of the lake over the last 80 years has contributed to the erosion and exposure of Aboriginal cultural material on the lakeshore and surrounding cliffs, in particular Aboriginal burial grounds. Since 1994 substantial works have been built to protect all known burials from wave and wind erosion. An Environmental Impact Statement was prepared to support a s.90 Consent Permit, now an Aboriginal Heritage Impact Permit (AHIP) application, under the *National Parks and Wildlife Act 1974* (NSW), to allow continued disturbance of non-burial Aboriginal objects by regulation of the lake.

This Annual Compliance Report compiled by the NSW Office of Water (NOW), Lake Victoria Program Manager (LVPM), provides a summary of activities that have been undertaken during 2013–14, or earlier, to demonstrate compliance with each of the Conditions contained in the AHIP. Some parts of this report contain excerpts of data and information from other sources. Full bibliographic details of these other sources are provided at the end of this report.



# Foreword

The Lake Victoria Advisory Committee had four meetings this reporting year. It is heartening to see new members filling vacancies on the Barkindji–Maruara Elders Committee (BMEC) and acquiring site management knowledge that their elders have already shared with us. One of our first landholder representatives, Mr Robert Duncan of *Dunedin Park* passed away. Following organisational restructures, new government employees were welcomed. Damian Green, MDBA riparian program director, Graeme Enders, Office of Environment and Heritage (OEH) regional director and Tim Kruger from SA Water.

Highlights of the year included the Rufus River Memorial Day held on August 25th 2013 to remember the ancestors lost and to promote reconciliation and unity in the community; approximately 100 people attended the event. This was followed on November 28th by the official opening of the Keeping Place and Camp Ground when David Dreverman, General Manager River Murray Water, officiated. Keryn Kefous, an archaeologist who had worked around the lake in the 1980s returned a number of cultural heritage artefacts to the traditional owners as part of the Keeping Place opening. New protocols have been drafted to cover operation of these facilities, along with reviews of existing management protocols.

Only a third of the burials recorded on the reorganised database were monitored this year due to the lake being held at a higher level, field staff changes and problems with inputting site information to the database. However, five new burials were located and protected and protection works were undertaken on the Nulla Lunette. Both SA Water and NOW have jointly undertaken works and share the new pest plant and weeds officer, Shaun Richardson, in eradication activities around the lake.

Concerns were raised about the management of lake levels not allowing enough time for burial inspections. Significant rainfall in March meant that the lake was higher than expected and this impacted on burial protection around the foreshore. The Lake Victoria Operating Strategy (LVOS) aims to lower the lake level to <24.5m Australian Height Datum (AHD) in autumn to assist shoreline vegetation growth and protect the burials. In most years the additional flow would have been passed to SA. However, if there is not much water in the upper storages, then any additional water from upstream should be captured and MDBA do not have to lower the lake level to less than 24.5m by the end of May so as to conserve water for the next dry period. It is likely that the lake level would now increase over winter further restricting monitoring and protection of burials on the foreshore.

Long awaited scientific studies from the University of Melbourne were completed into historically undisturbed sediments (HUS). The fine clay HUS layer exposed on the eastern shore was deposited under water several thousand years ago when the lake was much higher than it is now. Shells found within the HUS are not associated with midden deposits.

Work on the AHIP review and renewal was conducted with stakeholder meetings: representation on BMEC raised the most interest along with Condition 42 'Quantify the impacts'. To that end the following studies have been undertaken: depth to ground water level analysis and mapping, landscape function of neighbouring properties and an economic assessment of impacts on neighbouring properties. All is on track for a renewal of the AHIP with clearer conditions.

Dr Jane Lennon AM, Chair, Lake Victoria Advisory Committee (LVAC), August 2014



# Statement of the cultural heritage condition—2013–14 reporting period

Another challenging year, due to the transition of numerous staff involved in the Lake Victoria Program and reduced funding due to budget cuts. The protection of cultural heritage on the lake foreshore, cliffed areas and the lunette is based on a strategy which involves ongoing surveillance and implementation of a cultural heritage protection works program. The priority focus is the protection of burial sites.

The monitoring program that has been delivered for many years was reviewed this year by the Scientific Review Panel with some significant changes in direction trialled. The modifications will improve techniques, streamline data collection and reporting, implement new technology and reduce costs to the program. In a view to reducing the time and effort needed to collect data, a Digital Surface Model (DSM) for Lake Victoria is being developed. Data for the DSM is collected by a small unmanned aerial vehicle (UAV), also known as a drone.

An integrated monitoring program will analyse and link data to hopefully, better understand connections in the landscape. The new program will layer data from the drone aerial photography, photo point monitoring and Landscape Function Analysis (LFA) to create a whole landscape representation. The potential of the drone is encouraging in the aspects of burial, vegetation and erosion monitoring. The imagery will provide a detailed aerial view of the area allowing us to identify potential negative impacts sooner and promote proactive mitigation practices.

The new Cultural Heritage Monitoring Program developed by Archaeologist Colin Pardoe, has been implemented and functioning since January 2013. A 12 month review of the on ground practicality has identified gaps in the data, triggering an extension of the parameters in the program. I believe with some future fine tuning of the program we will deliver a comprehensive monitoring program second to none.

Burial protection and maintenance was restricted this period due to the amalgamation of an unusual year for rainfall and an essential upgrade to the outlet regulator.

The process to review and renew the AHIP is progressing well and on track to make the August 2014 deadline. Upon the successful renewal of the AHIP, the Lake Victoria Cultural Landscape Plan of Management will also undergo a review in the future to improve the management procedures of Lake Victoria.

Steve McGlashan Lake Victoria Program Manager 27 October 2014



# LAKE VICTORIA STORAGE CULTURAL HERITAGE COMMON PLACE NAMES



PROJECTION - UTM DATUM - GDA94

SCALE 1:75,000

Figure 1: Cultural heritage common place names.



# Snap shot of 2013-14

## Burial protection works

• Burial protection work and monitoring activities were conducted on 12 days for the 12 month period. Five new burials received protection works, two of these were on Nulla, which is outside the AHIP area. No existing burials were protected

# Cultural heritage monitoring and the Aboriginal Cultural Information Database (ACID)

- A new Cultural Heritage Monitoring Program was developed and implemented in January 2013.
- A 12 month review of the on ground practicality has identified gaps in the data, triggering an extension of the parameters in the program.
- 11 existing protected burial sites and five new burials sites were added to the ACID. There are currently 296 burials on the database of which 217 are within the AHIP boundary. All known burial sites have now been ground-truthed.
- Three new burial locations were discovered within the AHIP area. A further two new burials were discovered outside the AHIP area on the Nulla lunette.

# Lake Victoria Advisory Committee (LVAC) and community relations

- Four LVAC, Lake Victoria Working Group (LVWG) and BMEC meetings were held.
- 33 cultural heritage monitoring field trips were undertaken by the BMEC.
- Neighbouring landholders continued to provide valuable advice to the LVAC.

## Employment of Aboriginal workers at Lake Victoria

• The MDBA and SA Water continued to support the Aboriginal Trainee program as well as three Aboriginal Identified Positions. Three of the five identified positions are filled, with plans in place to recruit for the annual Aboriginal Trainee Program for 2015.

## Lake Victoria Cultural Landscape Plan of Management (LVCLPoM)

- Protocols continued to be reviewed and updated in consultation with the LVAC.
- A draft protocol was developed to guide requests for services from BMEC Elders.
- Draft protocols were developed for the Campground and Keeping Place.
- A review of the LVCLPoM is planned for the 2014–2015 period.

# Research activities, the Scientific Review Panel (SRP) and scientific monitoring

- Ian Sluiter (Botanist) and Daniel Haines (SA Water) undertook vegetation and Shoreline profile monitoring.
- The SRP reviewed the monitoring program and have initiated modifications.
- A DSM for Lake Victoria is being developed.



### Land management

• Land management activities focussed on feral animal control and the treatment of problematic weeds—Spiny emex (*Emex australis*) and Noogoora burr (*Xanthium occidentale*).

### Lake operations

• Lake operations were consistent with the LVOS minimising damage to cultural heritage and supporting target vegetation.

## Impacts outside of the lake

• The MDBA continued to work with neighbouring landholders who have been affected by lake operations.



# Compliance response

# Lake Victoria Advisory Committee (LVAC) and community relations (Conditions 1–11)

- Four LVAC meetings were convened in the reporting period; August and November 2013 (Meetings 69 and 70), February and June 2014 (Meetings 71 and 72).
- LVAC bid farewell to 11 members and welcomed 14 new members, due to resignations and retirements.
- Minutes of the LVAC and LVWG meetings were distributed to stakeholders in a timely manner.
- LVAC was provided with a summary of the partner agencies' (MDBA, NOW and SA Water) actions undertaken to comply with the AHIP conditions at each meeting.
- Neighbouring landholders continued to provide valuable advice to the MDBA as members of LVAC.
- Landholders continued to support MDBA, NOW and SA Water by providing access to their properties to allow for land management activities. In recognition of this partnership, NOW continue to support management of feral animals and weeds on Talgarry Station and Dunedin Park.
- Landholders were advised of activities which may have affected their lands.
- NSW Government reduced their contribution to the MDBA programs and this has been reflected in NOW's reduced budget for the Lake Victoria Program (LVP).
- A power point presentation was delivered on behalf of Adrian Wells, Murray Darling Association (MDA) and Griggs Media, demonstrating the development of an updated version of the Taru DVD, and the production of 3 short educational DVD's, using footage upon Lake Victoria.
- The 'Dolphin' monitoring platform has been installed in the middle of the lake, replacing the pontoon that was continually damaged in high energy wind events. The monitoring station is integral to the accurate recording of lake levels and salinity data.
- Rob Gregory advised the Murray Catchment Management Authority officially became the Western Local Land Services on the first of January. The restructure is still being finalised and the final details are not clear as yet. Mr Gregory was confident that all the previous functions will still be available in the future.
- The Duncan family of Talgarry Station and Dunedin Park continued to permit SA Water to utilise a quarry pit on their land. The winnable materials allow for the continued maintenance of the Lake Victoria levy structures.
- The Talgarry Station quarry has now been processed and rehabilitated. The Duncan family kindly granted permission for the application of a licence, to store the extracted material on the property.
- The 2012–13 Annual Compliance Report was tabled at LVAC 72. Due to varying reasons the finalisation of the report was delayed. The LVPM has implemented a solution to have the report delivered at the December 2014 meeting.
- The AHIP, formally known as 'the Consent', is due to expire in August 2014. Development of a strategy to renew the permit commenced in early 2012. The process to review and apply for a variation to the AHIP is progressing well and is expected to be completed on time.



• A Memorial Day steering committee was formed represented by three government agencies, BMEC and Aboriginal community members. The day was a huge success and was attended to by over 100 community members.



Figure 2: Lake Victoria Advisory Committee meeting. Photo courtesy Steve McGlashan

#### BMEC meetings and BMEC involvement at Lake Victoria (Conditions 1–11)

- Four BMEC meetings were held in the reporting period; August, November 2013, February and June 2014
- Seven Elders moved on from the BMEC due to ill health or work commitments during this reporting period and will be sadly missed. The LVP would like to thank the members for their passion and being involved in the protection of Lake Victoria cultural heritage. Seven new members have been elected to the council and will be a part of the new generation.
- Arthur Kirby resigned as BMEC chair after four years and was replaced by Barry Pearce. Barry unfortunately also had to resign in May due to other commitments.
- The Lake Victoria Aboriginal Facilitator position was regraded and re-classified to the Lake Victoria Program Support Officer (LVPSO).
- The LVPSO position was re-advertised, interviews conducted and a candidate was nominated. Robert Evitt was awarded the LVPSO. Due to personal reasons Robert resigned triggering the eligibility list and Pamela Dunrobin was welcomed to the team.
- Shane Bloggs (SAW, Aboriginal Workforce Sustainability Coordinator) attended the February BMEC meeting to explain the SA Water trainee recruitment procedure. Shane described the improved recruitment process this year that has resulted in a higher number of applications from previous years.
- Harvey Johnston (OEH) provided an update of the progress of the Cultural Heritage Awareness Training. Staff and contractors accessing Lake Victoria need to have cultural heritage awareness. OEH will deliver the legislative component and Brian's Local Indigenous Services Sunraysia will deliver the cultural component of the training package.
- The BMEC participated during the filming of the updated version of the Taru DVD, and the production of three short educational DVD's by Griggs Media.
- The BMEC received a presentation by Kerryn Kefos, an archaeologist worked at the lake during the 1980s. She excavated a lot of material during her work and acknowledges the material collected belongs to the Barkindji and Maraura people and wished return it to the traditional owners.



- Wade Stidiford, acting Cultural Heritage Team Leader (CHTL) commenced Elders home visits with Pam, to strengthen relationships with the community and provide more regular updates of lake operations.
- Kenny Clark (OEH) provided a project update on the Taroo Lands negotiation project. The project involves State forest land neighbouring Lake Victoria in the process of being handed over to a nominated Aboriginal Group. OEH are managing the lands until the handover is finalised.
- Arthur Durband (Associate Professor, Texas Tech University) presented a proposal for permission to scan the Nitchie man remains being held at the Sydney University.
- Dr Michael C Westaway (Senior Research Fellow, Griffith University) presented a
  proposal to date sites of megafauna fossils to compare the paleontological signature of
  two different bioregions/catchments. This would establish how different the ecology was
  and how mega fauna populations responded to climate change and interaction with the
  first Australians.
- Jeanette Hope (Archaeologist) provided an update on the on the Salt Flat gravel pit AHIP, and the Tindale archives request. The former has now been processed by OEH, and a date to collect the shell samples for radiocarbon dating will need to be finalised.
- The BMEC received a presentation regarding the repatriation of human remains excavated by a dentist in the 1950's and currently stored at the Melbourne Museum. OEH would like to transfer these remains to Lake Victoria and offered the traditional owners an opportunity to assist in facilitation of this process.
- The BMEC advised on the following:
  - selection processes for the LVPSO, CHTL and Trainee positions
  - traditional Aboriginal Lore and how Lore should be used to guide the process for protection of traditional burials
  - information about traditional methods for the protection of burials
  - excavations works for the Outlet Regulator Upgrade
  - excavations for the salinity management team
  - excavations for Keeping Place
  - drilling investigations
  - Nulla lunette burial protection works
  - excavations for fencing works.



Figure 3: Sharing cultural knowledge. Photo courtesy Pam Dunrobin.



## Sub-committees (Condition 2)

- The LVWG, a sub-committee of the LVAC, met four times during 2013–14, in August, November, February and June.
- The membership of the LVWG underwent considerable change during the year as a result of new staff being appointed in several agencies. The LVWG provided a platform for agency staff to discuss and resolve management issues including;
  - the review of the AHIP
  - drafting the Annual Compliance Report, and
  - clarifying the responsibilities of each agency for activities at Lake Victoria, including;
    - monitoring
    - pest plant and animal control, and
    - management and maintenance of the Keeping Place and of the Noola Campground.
- Regular additional meetings to coordinate works programming between NOW and SA Water have continued to assist in achieving improved outcomes.

## Employment of Aboriginal workers at the lake (Conditions 1, 8 & 9)

- The Aboriginal Trainee Program continues to be supported and includes a commitment to employ two Aboriginal trainees every 12 months. The aim of this program is to provide Aboriginal youth with the necessary skills and qualifications to be able to gain meaningful work within the wider community.
- Trainees are provided with an opportunity to gain a Level 2 certification in Conservation and Land Management with TAFE. Trainees also receive experience and competency certification in the use and operation of heavy plant and in works related to the water management industry.
- SA Water attended the annual Clontarf seminar again this year. The seminar is designed to give organisations and the local Aboriginal community an opportunity to network and discuss employment prospects.
- The Cultural Heritage Supervisor, John Grima resigned from his position in January and Wade Stidiford acted in the position for the remainder of the year.
- The Cultural Heritage Supervisor position has been retitled to Cultural Heritage Team Leader. The position was advertised in May and applications closed mid-June.
- 2013 Trainee Baden Moore was granted an extension of his contract to back fill the staff vacancy, due to the resignation of John Grima.
- Advertising and selection for the two Aboriginal Trainee positions were conducted in November 2013. Rodney Lawson and Brendan Johnson were the successful applicants.
- Difficulties are still being experienced in retaining Trainees to allow successful completion of their traineeship.

# BMEC activities outside the AHIP which complement the LVCLPoM (Conditions 8 & 9)

- BMEC members were involved in cultural heritage monitoring activities including:
  - monitoring of post hole excavations on the Nulla Boundary fence upgrade and Kulcurna fence
  - Nulla Lunette burial monitoring works.





Figure 4: Monitoring Kulcurna fence construction. Photo courtesy Jody Thompson.

Sharing of information with the broader community (Conditions 10, 11, 52, 53, 64b, 68, & 69)

- The LVPSO and the CHTL worked collaboratively to actively promote the importance of Lake Victoria, education and the protection of cultural heritage. A request from the Coomealla High School at Dareton to deliver a presentation emphasising the importance of education and Lake Victoria to local Aboriginal youth, was so well received, the LVP has been invited to present to a variety of programs in the future.
- NOW LVP staff hosted a work experience student for a week in May. This offered the opportunity to expose the students to a variety of programs conducted within the LVP including water, cultural heritage and pest and weed management.
- The Camp ground and Keeping Place construction phases are finalised and were opened by David Dreverman at the November LVAC meeting involving LVAC members and members of the community. Administrative restraints have delayed the attainment of the approvals for the Keeping Place and Camping Ground use.
- NOW and SA Water assisted the community in planning and running a Memorial Day to remember the ancestors lost and to promote reconciliation and unity in the community on August 25 2013. Most of the attendees were from the broader community including school groups, landholders and community groups. This was attributed to local ABC radio conducting an interview with the LVPM and promoting the event.
- Students from Wentworth Primary school interacted with the BMEC during the filming of the updated version of the Taru DVD, and the production of three short educational DVD's. BMEC members took the opportunity to share cultural knowledge providing the school children with direct knowledge from the local Aboriginal people.
- The production the updated version of the Taru DVD, and of three short educational DVD's is expected to be finalised in 2014–2015. The use of a visual tool with clear,



concise information will assist in delivering knowledge to a wide range of targeted audiences, focussing on:

- the importance of Lake Victoria, and how and why is it regulated the way it is
- engaging with the BMEC to advise on the caring of Lake Victoria
- the main priorities of the management of water and the preservation of cultural heritage
- explanation of the importance of complying with the AHIP and the consequences of non-compliance
- procedures and methods to protect burials.
- A Mildura youth camp, facilitated by Kenny Clark (OEH) and Keith Hampton (Mildura District Aboriginal Services Manager) visited the Nulla Lunettes on the 29<sup>th</sup> October 2013. The Aboriginal youth gained practical experience and knowledge about cultural heritage including burial protection and artefact identification.
- Any reports or publications containing culturally sensitive information are referred to the BMEC prior to release. Authorised reports are forwarded to the Australian Museum, Sydney and the Australian Institute of Aboriginal and Torres Strait Islander Studies in Canberra for their records, and distribution to interested aboriginal groups. Further information is available to these organisations upon request.
- Boort School visited the lake in March. The group involved were year 12 students and the lake visit centred on their geography unit. The CHTL delivered a power point presentation to the students regarding the history of Lake Victoria and the importance of the cultural heritage in the area.
- The June LVWG meeting included a field trip to meet with neighbouring land holders and discuss issues associated with lake operations. Positive outcomes of the field trip were suggested improved processes that should be considered for inclusion in the LVCLPoM.
  - SA Water and NOW continued to communicate with adjacent landholders on the following:
  - feral animal control programs
  - weed control programs
  - the quarry pit on Talgarry Station
  - expected flows along Frenchmans Creek.



Figure 5: Filming at Lake Victoria. Photo courtesy Shaun Richardson.



# Lake Victoria Cultural Landscape plan of Management (LVCLPoM) (Conditions 12–17)

- The LVCLPoM continues to guide the management of cultural heritage within the cultural landscape.
- Development of a strategy to revise the LVCLPoM has commenced.
- The review of the LVCLPoM will focus on the relationships of the core elements that unite the landscape as a whole. The modifications will document improved techniques, new data collection and reporting methods. The review of the CLPoM will be overseen by the LVAC.
- Reviews of the protocols and procedures were referred to LVAC as required.

#### Reporting (Conditions 18–19)

- The final draft 2012–13 Lake Victoria Annual Compliance Report was distributed in February 2014 and then submitted to the Chief Executive of OEH.
- A presentation of the final report was delivered to the June LVAC 72 meeting and a copy of the report was made available on the MDBA website.

#### Communication and access (Conditions 20, 51 & 67)

- MDBA graduate staff visited the lake on 25<sup>th</sup> November as part of their annual tour of the basin.
- The 'Lake Victoria a Special Place' brochure has been printed and is available at the information bay which continues to be used by large numbers of visitors.
- The Lake Victoria access protocol has been updated and is currently in review.

#### Revegetation strategies (Condition 21)

- During the 2013–2014 period, lignum (*Duma florulenta*) and River red gum (*Eucalyptus camaldulensis*) has regenerated in great numbers. East moon and Snake Island are areas that have the most regeneration. While this is fortuitous for our revegetation strategy the increased density of numbers provides an ideal habitat for feral pigs.
- Recruitment of spiny sedge (*Cyperus gymnocaulus*) has continued along strand lines and near established or mature plants.
- Common reed (*Phragmites australis*) continues to increase in density, especially along the Talgarry Barrier. Recruitment has occurred as a result of favourable climatic conditions and lake operations.
- Monitoring of revegetation areas around the lakeshore has shown that plants are thriving. These plantings are filling gaps between fringing vegetation and help to protect culturally sensitive sites at higher elevations.

#### Research activities (Condition 22)

Landscape Function Analysis http://www.csiro.au/services/EcosystemFunctionAnalysis

• Spiny sedge (*Cyperus Gymnocaulos*) is a hardy, native long lived sedge that grows around the foreshore of Lake Victoria. Spiny sedge can withstand both long periods of inundation and exposure and is effective at stabilising the sandy-clay foreshore. These characteristics are important at Lake Victoria for reducing foreshore erosion and



subsequent damage to cultural heritage material. It is believed that the surface area of spiny sedge acts to collect and slow sediment movement on the foreshore of Lake Victoria. Reduced sediment movement results in a reduction in erosion and exposure of in situ Aboriginal burials.

 To be able to define specifically at what spiny sedge distribution, arrangement and density allows for the satisfactory protection for cultural heritage, David Tongway and Hugo Bowman conducted a field campaign over 5 days in early June collecting data using LFA. The LFA field campaign was also used to refine the application of LFA on remote sensed imagery collected by an UAV.

#### Spiny sedge biology

- Conventional vegetation monitoring has shown that the area covered by spiny sedge has
  increased since monitoring commenced in 1998. However, LFA shows the level of cover
  of spiny sedge in many areas is still not enough to achieve adequate protection for
  cultural material. It is also not yet known whether the main cause of this increase in cover
  is due to lake operation through the millennium drought, and if wetter years resulting in
  different operations under LVOS, would result in some of these gains in cover being lost.
- In order to manage for increased spiny sedge growth, an understanding of the plant's biology and limiting factors is required. The most significant limiting factors on expansion of Spiny sedge are:
  - time underwater and time exposed,
  - grazing pressure,
  - substrate type and stability
  - numbers of young plants (propagules) to colonise new areas.
- In order to better understand the impact of these limiting factors, Dr Jane Roberts, an SRP member, visited the lake to investigate spiny sedge. Dr Roberts compared the biology and the relationship of root growth and development of spiny sedge plants to the plants' elevation and substrate type around the lake.
- Several young and old Spiny Sedge tussocks were excavated and quite a different type of roots on young recruits from old well-established tussocks was found. Roots on young recruits were considerably shorter and easy to separate from the sand. The older tussocks had thin trailing roots which were hard to excavate without breaking and hard to wash clean of sand particles, but were much longer, sometimes as much as 35–40 cm deep into the dune.
- This preliminary work helped to inform the planning for a long term study. The long term study is expected to explore the effect of lake levels on growth, maintenance, mortality and reproduction of spiny sedge. The study will include the development of a predictive model that aims show what lake operations are required to provide favourable conditions for the continued expansion of this plant, and once established what operational thresholds exist to maintain spiny sedge cover.
- The outcomes of the model will complement the LFA monitoring currently being trialled around the lake. Together, the outcomes from these two projects aim to establish the necessary cover required to protect cultural heritage material and how to achieve the desired cover. This knowledge will greatly assist conservation of cultural heritage material into the future through natural foreshore stabilisation





Figure 6: Spiny Sedge (Cyperous Gymnocaulos) investigations. Photo courtesy Jane Roberts.

#### Scientific Review Panel (SRP) (Conditions 23–26)

- The SRP met four times in the 2013–14 year—24 July, 6 November and 20 December 2013 and 25 March 2014. Following the recommendations provided by Webb et al. (2013) and the SRP's own recommendations, the SRP and the LVP staff dedicated resources to redesigning and implementing a trial of a renewed Lake Victoria Monitoring Program in 2013–14. During the four meetings held in 2013–14, the SRP discussed and provided advice on:
  - the principles and broad objectives of what monitoring at Lake Victoria is to achieve
  - what components of the existing monitoring program were meeting the needs of the LVP and what components were not
  - suggested modifications to the vegetation, cultural heritage and shoreline monitoring programs
  - the Cultural Heritage Monitoring Program implementation
  - text for the review of the AHIP
  - the outcomes and future application of recommendations from Cupper (2014), Rollins and Punthakey (2013), Sluiter (2013) and Haines (2014)
  - implementation of Pardoe, (2014).
- The specifics of the monitoring programs are discussed further in the appropriate monitoring sections throughout this report. The SRP are due to meet again in August 2014.

Strategies to monitor cultural heritage protection and disturbance (Conditions 27, 58 & 76)

- The Cultural Heritage Monitoring Manual continued to be revised during the year. The manual was written by Dr Colin Pardoe (SRP member), Hugo Bowman (MDBA) and Daniel Haines (SA Water) consisting of three sections:
  - I. Cultural Heritage Monitoring Overview
  - II. Cultural Heritage Monitoring Step by step guide to data collection



- III. Guide to lithology, artefacts and sites
- The manual builds on the strategies for cultural heritage monitoring outlined in Part 3 of the LVCLPoM. The manual places a heavy focus on monitoring burial condition to inform high priority burial protection and maintenance works.
- Retraining in the use of the monitoring program was conducted in late April 2014 by Dr Pardoe with the assistance of Daniel Haines. Training was provided to the SA Water Cultural Heritage Team and to MDBA staff of the LVP.
- Cultural Heritage Monitoring at Lake Victoria has been enhanced over several years by improved monitoring techniques and the development of single spatial database, the ACID (Condition 29). Improved monitoring techniques allow new and existing cultural heritage site condition and location to be recorded on site using a portable Gtec unit (data acquisition with GPS). The database can be interrogated rapidly, with reports and maps able to be generated for annual reporting and also to inform the burial protection works and monitoring program during the year.
- As part of the new monitoring program being trialled in 2014–15, cultural heritage maps will be able to be overlain by the whole of lake vegetation mapping to provide an estimate of vegetation coverage and soil erodability for each cultural heritage site or area as required. Over time this will enable a greater understanding of the relationships between lake level, cultural heritage condition, shoreline erosion and vegetation coverage. A greater understanding of the risks to cultural heritage will provide the basis for potential changes to land and water management at the lake.



Figure 7: Cultural heritage data recording with Getac. Photo courtesy Pam Dunrobin.

Monitoring burial protection works (Conditions 28, 58 & 76)

- Inspection of burial protection works by the Cultural Heritage Team and BMEC members has continued. Monitoring and protection works occurred on 12 days in the 12 month period.
- The introduction of the new cultural heritage monitoring program and Getac units has ensured monitoring of burials, artefacts and scar trees are more resource efficient.



- The new templates created for ArcPad were deployed to staff after a lengthy period of fine tuning and extending the parameters of the system.
- With lake levels not receding below 25 m AHD for most of the year, 108 of the recorded 296 burials (36%) were monitored. Many of the remaining 188 were submerged and only five of the 108 monitored required some attention, none were replenished (four were outside the AHIP and one was partly submerged). The rest of the monitored burials (102) were in good condition.
- Five new burials were discovered and protected. Three of the new burials were inside the AHIP area.
- 1% of recorded non-burial sites within the AHIP area were monitored using the new method during 2013–14. One new canoe tree was discovered in the Frenchmans creek, bringing the total of non-burial sites to 125.



Figure 8: Burial monitoring at Talgarry beach. Photo courtesy SA Water CH team.

## Aboriginal Cultural Information Database (ACID) (Condition 29)

- The templates created for cultural heritage data collection were refined to give a better reporting structure and overview of the physical state of sites in the field. The new templates were deployed to staff and training undertaken on site.
- The LVPM, SA Water cultural heritage staff and the SA Water Coordinator Survey Services have discussed the need to, record burials and cultural heritage artefacts that are submerged. By doing this it will help with the planning of future monitoring programs and give a much better understanding of what sites are accessible at particular lake levels. The ongoing field verification of historically recorded burials and cultural heritage artefacts will continue in the future.
- ACID now contains:
  - 296 burials recorded with 281 protected (15 recorded burials were unable to be protected before rising lake levels over several reporting periods).
  - 217 burials recorded inside the AHIP.
- All burial sites have now been identified and individually tagged.





Figure 9: Burial Monitoring at Talgarry beach. Photo courtesy SA Water CH team.

#### Environment, impacts and mitigation actions (Conditions 30 & 31)

- Erosion is a major process affecting the stability of the foreshore of Lake Victoria. Part 3
  of the LVCLPoM outlines the strategy for the management and monitoring of lakeshore
  erosion. Thirty seven erosion monitoring transects have been established around the
  shoreline of Lake Victoria, some since 1995. Transects are surveyed annually to monitor
  the extent of sediment erosion and deposition along the transect. Where significant
  erosion is detected, the OEH is notified through this Report
- The shoreline transect data from 1998-2011 has shown that over the long term, the lake foreshore is relatively stable with the exception of the eastern foreshore (Webb et al, 2012). In some areas of the eastern foreshore, there has been >50cm of sediment loss, primarily between 23–25m AHD which includes the HUS layers. Eastern shore profiles have also experienced significant sediment gains, generally above 25m AHD.
- Preliminary assessment and comparison of 32 shoreline profile transects between 2013 and 2014 supported these findings, indicating that the northern and western beaches appeared to be stable with no real areas of concern. The southern islands, Talgarry Barrier and the eastern shore appeared to show several areas of concern and were flagged to be closely watched into the future. As the lake level during collection of the 2014 profiles was around 25m AHD, comparisons can only be made with past transects above 25m AHD, this is particularly limiting in terms of being able to provide comment on recent impacts on the HUS as the three HUS layers occur below 25.8m AHD. Keeping this limitation in mind, the initial data assessment indicates that the majority of sand movement during 2013–14 in Frenchmans Islands, Talgarry Barrier and the eastern shore appears to have occurred between 25.5 and 26.5m AHD.
- Further interpretations, including comment on this year's profile limitations are being drafted by Dr Wayne Stephenson at the time of writing this Report. The outcomes of Dr Stephenson's analysis, expected in late 2014, will determine if any erosion management interventions are required and will be reported in the 2014–15 Annual Compliance Report.
- New procedures for monitoring shoreline stability are being trialled in order to continue to implement the lakeshore erosion monitoring strategy. In a view to reducing the time and effort needed to collect foreshore sediment stability data, a DSM for Lake Victoria is being developed. Data for the DSM is collected by a small UAV, also known as a drone. Using this method of data collection will enable all of the exposed Lake Victoria shoreline to be monitored for erosion and sedimentation, including the HUS layers, the cliffed shoreline and



any large scale protection works. If the trial proves successful, a DSM would be developed each year to monitor how the entire foreshore changes over time. This information will assist the understanding of sediment movement around the lake foreshore. The trial is progressing and will be further documented in the next Annual Compliance Report.

Cupper (2014) also provided valuable information on the HUS layers occurring on the • eastern foreshore and Talgarry Barrier at Lake Victoria. The study showed that the clayey silt benches on the eastern foreshore were deposited around 5,500 to 14,000 years ago under a near shore shallow water environment. Cupper (2014) concluded that the underwater environment where the layers formed was not suitable for human habitation, and the layers are therefore unlikely to contain in situ archaeology. However, people would have occupied the exposed surfaces in between and following depositional periods when lake levels were lower. Cupper (2014) advised that erosion of the HUS deposits in these areas is likely to have limited detrimental impacts on in situ cultural heritage, but would potentially disturb cultural heritage on the surface. However, the sandy HUS deposits at Talgarry Barrier in the south-eastern portion of the lake formed sub-aerially, and have extensive in situ cultural deposits (Hope 1998). Cupper (2014) also noted that erosion of Talgarry Barrier deposits is likely to have a detrimental impact on cultural heritage and advised that the current program of active management would need to continue if negative impacts are to be minimised. Varying lake levels during depositional phases of the clayey silt benches may explain the findings of Hope (1998) where some culturally associated shell material was found in the eastern foreshore HUS. Given the recommendations of Cupper (2014), erosion of Talgarry Barrier remains a management priority and the Barrier will be carefully managed to conserve the associated cultural material.

## Monitoring vegetation (Conditions 32–34 & 57)

- Part 3 of the LVCLPoM and the LVOS detail the strategy for the management and monitoring of lakeshore vegetation.
- Although the strategy for the management of foreshore vegetation will remain the same, a new procedure for monitoring foreshore vegetation is being trialled, however the current vegetation photo point monitoring continues to be a valuable asset in visually demonstrating any changes in vegetation over time, as such, it was conducted again in early June 2014.
- The vegetation monitoring transects, usually monitored annually, were this year replaced by trial aerial imagery analysis and on ground assessments of vegetation coverage and soil erodability in June 2014. The aerial imagery was collected using the same UAV that collected the data for the development of the DSM and the on-ground assessments were undertaken by David Tongway using LFA methodology as supported by the SRP. LFA is a field-based monitoring procedure that aims to understand the effects of stress and disturbance on managed landscapes to be able to provide management advice for rehabilitation or maintenance of the land for specified purposes.
- The vegetation monitoring trial aims to provide a combination of on ground assessments and aerial imagery to determine vegetation coverage and soil erodability for the entire lake foreshore. If the trial proves successful, the new monitoring approach will be repeated each year to quantify changes in vegetation cover and landscape function over time in relation to different management actions or natural events. Over time, this will assist the improvement of strategies to promote foreshore vegetation growth and sediment stability, and in turn, minimise impacts on cultural heritage.



#### Observations

- Preliminary assessment of the 2014 photopoint images against historical data indicates that vegetation condition amongst the southern islands is improving. No significant changes in vegetation cover were detected around the remaining areas of the lake apart from Talgarry 2–06 where a minor loss of cover was apparent. Further interpretation of the vegetation photopoint images is being drafted by Dr Jane Roberts at the time of writing this Report. The outcomes of Dr Roberts' analysis, expected in late 2014, will determine if any further vegetation management interventions are required and will be reported on in the 2014–15 Annual Compliance Report.
- Interpretations of the aerial imagery and on ground assessment data are being drafted by David Tongway and the MDBA Geospatial team at the time of writing this Report. If the trial proves successful, the outcomes these analyses, expected in late 2014, will determine if any vegetation management interventions are required. More information regarding the vegetation monitoring trial will be reported on in the 2014–15 Annual Compliance Report.

#### Weeds

- The most significant weed of the floodplain environment is noogoora burr (*Xanthium occidentale*) and was present in large quantities. Control actions over 2013–14 appear to have been adequate.
- No other major problem weed species were noted within the AHIP area at Lake Victoria in 2013–14.
- The Cultural Heritage team continued treatment of noogoora burr, horehound (*Marrubium vulgare*), deadly nightshade (*Atropa belladoma*), scotch thistle (*Onopordum acanthium*) and spiny emex (*Emex australis*).
- Use of chemical and locations of spraying are shown in figures Figure 12 & Figure 11 respectively.
- A weed control program to mitigate spread was conducted on Talgarry in June.



Figure 10: Spraying Castor Oil plant (Ricinus communis). Photo courtesy Shaun Richardson.





Figure 11: Weed spraying coverage 2013-2014.





Figure 12: Chemical usage (litres) 2013-2014.

Total usage of Round Up: 385.6 Litres

Total usage of Synertrol: 5.05 Litres

Total usage of dye: 36.89 Litres

## Managing Non-native fauna (Conditions 35 & 36)

#### Rabbit control

- 144 kilograms of 1080 oats were laid throughout riparian areas 1 4 in October. Numbers recorded in March were low and did not reach the threshold to trigger a baiting program.
- Due to a lack of resources the agreed rabbit control plan on Talgarry was not implemented in this reporting period.

#### Pig control

- A pest animal contractor was engaged to deliver a pig destruction program. Work included camera surveillance and setting and checking of seven traps.
- 20 pigs were trapped and destroyed from Lake Victoria and Frenchman's creek frontages.





Figure 13: Feral pig control. Photo courtesy Shaun Richardson.

#### Fox control

• A pest animal contractor was engaged to deliver a fox baiting program in August. 40 of 62 baits laid were taken.

Water quality monitoring (Condition 37)

- Salinity expressed as Total Dissolved Solids concentration was monitored weekly at the Lake Victoria outlet regulator. Samples were collected by Lake Victoria Storage staff and couriered to the Australian Water Quality Centre for analysis. Total Dissolved Solids concentration was calculated using conductivity measurements obtained in the laboratory.
- Table 1 shows the 2013–14 Total Dissolved Solids concentration downstream of the Lake Victoria Outlet Regulator fluctuated in the range from 65 to 170 mg/L, falling within the normal spectrum of values observed at this location. The average salinity was marginally higher in the River Murray downstream of the Rufus River junction than at the nearest upstream River Murray location (Lock 9).

Sampling Point Description	Min	Мах	Ave
River Murray Lock 9	59	170	98
Lake Victoria Outlet	65	170	128
River Murray DS Rufus River Gauging Weir	53	360	129

#### Table 1: Total dissolved solids concentration.



## Lake Victoria Operation Strategy (Conditions 38–41)

- The LVOS continues to remain compatible with the LVCLPoM. The MDBA remained compliant with the LVOS and no significant changes to the proposed operation of the lake, as per the LVOS, occurred during the 2013–14 reporting period.
- The operational flexibility of Lake Victoria was highly constrained for much of the year due to the planning and commencement of a major works program for essential maintenance of the Rufus River Outlet Regulator. These works had the effect of restricting the level above which water could be stored in Lake Victoria as well as creating a constraint, at various times, on the amount of water that could be released from the storage to meet the South Australian entitlement flow. These factors, combined with an unusual range of weather conditions, created a particularly challenging year for managing Lake Victoria operations.
- Consistent with the LVOS, the MDBA began filling Lake Victoria at the beginning of June 2013 (Figure 14). The level rose steadily during June and early July, however heavy rainfall in the upper catchments allowed the final filling of the lake to be delayed on several occasions until it was filled to the full supply level of 27.0m AHD in late October. A decrease in upstream flows increased reliance on Lake Victoria to meet South Australian entitlement flow and the lake level began to lower again in early November.



Figure 14: Daily level at Lake Victoria Storage in m AHD and flow to South Australia for the period 1 June 2013 to 31 May 2014.

 Late 2013 and early 2014 were characterised by very hot weather and high system losses. Releases from Hume Reservoir to meet downstream demands during this period included a component for Lake Victoria transfer as the lake was otherwise forecast, under a dry scenario, to fall and remain below the end of May minimum target level (350 GL) as outlined in Clause 103 of the Murray-Darling Basin Agreement. In conflict with this objective was a need to decrease the level in Lake Victoria to below the LVOS targets during autumn. Significant rainfall in March and April resulted significant increase in instream flows along the river system. Working closely with the works contractors and by making agreed variations to the pattern of South Australian entitlement delivery, the Authority managed to draw down Lake Victoria to below the upper level LVOS limits at the



end of February (26.5 m AHD) and the end of March (25.6 m AHD) despite significantly higher flows in the River Murray during this period than had previously been forecast.

- LVOS upper level limits for the end of April and May are 'usually' set at 24.5 m AHD. However, in years such as this when there is very little water held in Menindee Lakes this rule has an exception, which allows any potential higher flows to be captured in Lake Victoria to conserve water for the future. If there had been more than 640 GL in Menindee Lakes then the water level in Lake Victoria would have been drawn down to below 24.5 m AHD during May. Instead, the Lake Victoria level at the end of April 2014 was 24.75 m AHD and at the end of May it was 24.96 m AHD.
- The conditions leading to this outcome were initially modelled to occur 16 years in 110, when the LVOS was developed in 2002. Although the lake levels were higher than usual, the LVOS was not breached.
- During the 2013–14 water year, the lake was above the 26.0 m AHD level for 205 consecutive days and above 25.0 m AHD level for 287 consecutive days. However, the foreshore about 25m was exposed between February and May. Lines of Spiny Sedge recruits were noted on the exposed shore in northern and eastern shorelines, indicating a recent (though not necessarily 2014) recruitment event. Of considerable ecological interest was that many tussocks of Spiny Sedge that were below 25 m AHD developed a thick vigorous canopy while still partly submerged: the calm conditions and clear water are believed to be factors in this. In general, Spiny Sedge tussocks generally looked quite vigorous across the shoreline, and were especially green and thick on the western shore. Recent rain may have been an influence on tussocks high on the shoreline.

#### Impact on areas outside the lake (Condition 42)

- On ground staff continues to liaise closely with neighbouring landholders to minimise impacts to their properties. However there were several incidents during 2013–14, including unauthorised access to neighbouring properties, where improvements can be made. In order to address this recurring issue, the access protocol defined in the LVCLPoM will be reviewed. All relevant agency staff and contractors were reminded to respect that some areas around the lake are private property and to ensure that the access protocol is complied with by all who are visiting or working in the area.
- To assist in quantifying the impact of the operation of Lake Victoria and Frenchmans Creek on neighbouring properties, the MDBA commenced several studies in 2014 including:
  - the mapping groundwater levels over time using data collected by the NSW Office of Water;
  - a landscape review undertaken by David Tongway; and
  - a review of the financial impacts of Lake Victoria operations on the property business.
- These studies, due to be completed by December 2014, aim to provide options for managing the salinity impacts on adjacent properties and to assist in identifying options that may lead to an enduring agreement with adjacent landholders.

#### Maintain awareness of regional planning processes (Condition 43)

• The MDBA continued to liaise with Local, State and Commonwealth agencies in order to maintain its awareness of regional planning and land management processes which may be relevant to the mitigation of any impacts of the operation of Lake Victoria. The MDBA



continues to formally share and gain information on regional planning and management processes from governmental agencies and landholders through the LVAC.

#### Groundwater salinity monitoring (Condition 44)

- MDBA continued to monitor groundwater levels in the vicinity of Lake Victoria and on adjacent land to the east and south. A summary of Brownbill (2014) Groundwater monitoring report for 2013-14 is provided below:
- Routine groundwater monitoring continued during 2013–14, with some minor changes to the previous year's activities consistent with the recommendations of the 2010-11 Annual Compliance Report and the numerical groundwater model report of 2013. The frequency of site visitation has been reduced to twice-yearly and the down-hole geophysics is now being performed infrequently (around every 5 years), so was not done in 2013–14.
- 12 groundwater bores on the lake bed and shore (Figure 15) and a further 65 bores in the wider Lake Victoria groundwater monitoring network (Figure 16) were sampled during 2013–14. The non-shoreline bores were sampled in November 2013 and February 2014 and the shoreline bores were sampled in January 2014 (with a further sampling run scheduled for July 2014).





Prepared by Spatial Services & Information, Queanbeyan, September 2011

Figure 15: Lake Victoria groundwater monitoring locations.





Figure 16: Wider-area groundwater monitoring network.

#### Summary of groundwater level and water quality

#### Groundwater Level

- Groundwater dynamics continue to be governed by the processes described in previous Annual Compliance Reports. The fluctuation in lake level drives groundwater movement close to the lake shore and diminishes away from the lake. Rainfall is the primary influence on groundwater levels otherwise.
- Groundwater levels generally declined between 1995 and early 2010. There was a significant increase in groundwater levels associated with the widespread rainfall and flooding in 2010/11, after which there has been a subsequent return to declining groundwater levels. Overall, groundwater levels are now deeper than they were in 1996.
- While a series of high rainfall years is expected to result in increased groundwater levels, the long-term data indicates that with sufficient intermittent dry years and with the guidance of the LVOS, groundwater levels may remain stabilised or continue to decline. Ongoing monitoring will continue to refine apparent trends in groundwater changes, but it is possible that the risk of further land salinisation is less than that predicted 15 years ago.
- 2013–14 was characterised by overall average rainfall, with a dryer period from July 2013 to December 2013, followed by a wetter than average period from January to June 2014. Shallow groundwater levels away from and beyond the influence of the lake are driven by rainfall.



• Groundwater levels adjacent to the lake fluctuate in unison with the lake water level. This response is replicated in other bores in the lake bed and shore, at an amplitude generally covered by the proximity of the bore to the lake and the bore depth.

#### **Groundwater Quality**

- Groundwater salinity results from the January 2014 sampling for all shoreline bores were lower than the preceding sampling run of June 2013, and lower than the average of the previous 10 sampling runs (since 2010).
- Groundwater salinity recorded for the 2013–14 period for the wide Lake Victoria groundwater monitoring network was variable in comparison with earlier results.
- The regional shallow groundwater is highly saline and is typically found in the range of 30,000 to 150,000 EC units (us/cm) although variability does occur.
- Groundwater under the lake bed and close to the shore is fresher than the surrounding regional aquifers, more so the closer to and beneath the lake. This is due to the existence of a fresh water lens that has formed and "floats" upon the denser saline groundwater (Williams and Erny 1999). Similarly to the regional system, temporal salinity trends are stable to very slightly freshening over the longer term.

#### Key Issues and Potential Future Matters

- Recommended changes to the groundwater monitoring program at Lake Victoria have been implemented following a detailed review of results for the 2011–12 Annual Compliance Report and the numerical groundwater modelling which took place thereafter.
- The logging of water levels in the wider-area network and the lake bed/shore bores has continued, however site visits have been reduced to twice-yearly. Consideration could be given to withdrawing data loggers from some of the regional monitoring network bores if resourcing is constrained.
- As recommended in earlier Annual Compliance Reports, soil salinity sampling and geophysical surveys should return periodically (say every five to 10 years) to ensure the stable trends identified in past surveys can be confirmed.

#### Cultural and natural heritage inventory (Condition 45)

 An inventory of fauna and flora species at Lake Victoria was compiled by Ecotone Ecological Consultants (1997) in order to assess any impact of salinisation, likely to be contributed to by the operation of Lake Victoria. Ecotone Ecological Consultants (1997) identified three threatened fauna and one threatened flora species occurring in the Lake Victoria area (Table 2). However, the Lake Victoria EIS (1998) suggested that operation of the lake and any subsequent dryland salinity issues would not be a threat to those species.

 Table 2: Threatened species recorded at Lake Victoria. Lake Victoria EIS - Background Report 12 Flora and

 Fauna Impact Assessment Study (1998).

Fauna	Flora
Freckled duck (Stictonetta naevosa)	Stipa (Austrostipa nullanulla)
Regent parrot (Polytelis anthopeplus)	-
Southern Bell frog (Litoria reniformis)	-



- A cultural heritage inventory of the Lake Victoria Rangelands was conducted Hope et al (2002). Aboriginal heritage material, predominantly shell, hearths and stone artefacts, were found on all landform types on the southern floodplain. Burial sites were found in one location, a red sandy raised area, Hope et al (2002) states that these burial sites are not subject to any known salinity problem. Hope et al (2002) also advises that salinity is not a predominant threat to other cultural heritage surveyed except where salinity contributes to erosion of clay sediments.
- The area likely to be adversely impacted by salinity contributed to by the operation of the lake has not changed and so it is not necessary to extend the natural and cultural heritage surveys at this time. In some areas, saline groundwater levels are declining and further work regarding groundwater levels and the impact of saline groundwater on areas outside the AHIP, as discussed in response to Conditions 42 and 44, is being undertaken in 2014–15 and may provide further insight into the extent of the likely impacted area.

#### Damage to Aboriginal objects not covered by the AHIP (Conditions 46 & 59)

 Damage to Aboriginal objects outside the AHIP area on the Nulla Lunette have been recorded in the ACID and prioritised for work programs in conjunction with OEH (as reported under conditions 27–29. No damage to other Aboriginal objects outside the AHIP area was recorded.

#### Impact on Fauna (Conditions 47 & 57)

• The LVOS continues to be implemented to contribute to mitigating the potential impacts on faunal habitat through land salinisation. Monitoring indicates that groundwater levels continue to generally decline in areas further from the lake, reducing the risk to damage of critical habitat and threatened species.

AHIP not transferable (Condition 48)

• This AHIP has not been transferred to a third party.

The MDBA to be responsible for the compliance with the AHIP (Condition 49)

• As the holder of the AHIP, the MDBA takes full responsibility for all works covered by the AHIP.

#### Access for officers of OEH (Conditions 50, 65 & 66)

 Following site inductions by managing agencies, officers of OEH have full access to all areas covered by this AHIP. No works conducted under the AHIP were accessed for examination under the authority of the Chief Executive in this reporting period. Any works that are suspected to have impacted on cultural heritage is suspended immediately pending an inspection by OEH.



### Notification of fieldwork (Conditions 54 & 70)

• All fieldwork is in accordance with the approved LVCLPoM strategies and protocols. OEH are advised of all routine works and research activities through consultation at the quarterly LVWG and LVAC meetings.

Obligations under other legislation (Conditions 55 & 71)

• Authorisation and approvals under all relevant legislation are sought prior to undertaking the works of this AHIP.

Notice to cease or restrict activity (Conditions 56 & 56)

• A notice to cease or restrict activity has not been received from the OEH Chief Executive.

#### Salvage of Aboriginal objects under this AHIP (Conditions 60 & 61)

• All salvage works permissible in Section E, were carried out under the direct supervision of the CHTL as a representative of the MDBA.

## Condition 62

• All agents, employees, contractors and staff of the MDBA who are engaged to perform work under this AHIP are suitably skilled and possess appropriate expertise for the work they are engaged to conduct. All activities have adequate skilled supervision to allow the work to be conducted in an appropriate professional manner.

## Condition 63

• A notice to vary this AHIP has not been received from the OEH Chief Executive.

## Conditions 64 (a & b)

• A notice to revoke this AHIP has not been received from the OEH Chief Executive.

#### Conditions 73–75

 No objects were recovered. Two individual 'Care and Control' permits are in force. One permit site address is described as 'SA Water Depot', Rufus River Road and the other is 'The Keeping Place', Rufus River Road. All objects in the existing inventory have been collected in compliance with the 'Community Collection' rule.

# Lake Victoria Advisory Committee Attendees 2013–14

Member name	Representative group/organisation
Dale Abdulla	BMEC
Gary Abdulla	BMEC
Kingsley Abdulla	BMEC
Timothy Abdulla	BMEC
Timothy Abdulla Jnr	BMEC
Brian Carter	BMEC
Paul Cohrs	Community
David Dreverman	MDBA
Pamela Dunrobin	NOW
Stuart Duncan	Community
Warren Duncan	Landholder
Graeme Enders	OEH
Brenton Erdmann	SA Water
Rob Gregory	Western Local Land Services
Damian Green	MDBA
John Grima	SA Water
Emma Hampton	MDBA
George Handy	BMEC
Pam Handy	Dareton Aboriginal Land Council
lan Harris	Community
Phyliss Harris	Community
Jeanette Hope	Community
Brian Hunt Jnr	Community
Digby Jacobs	NOW
Leonie Johnson	BMEC
Noel Johnson	BMEC
Harvey Johnston	OFH
Meera Jovce	MDBA
Kervn Kefos	Community
Alf Kelly	BMEC
Alf Kelly Jnr	BMEC
Pauline Kelly	Community
Frank Kirby	BMEC
Samuel Koolmatrie	BMEC
Tim Kruger	SA Water
Cora Lawson	BMEC
Kristy Lawson	BMEC
Ray Lawson	BMEC
Robyn Lawson	BMEC
Dr Jane Lennon	Chair LVAC
Steve McGlashan	NOW
John Martin	SA Water
Steven Meredith	OEH
Baden Moore	SA Water
Leigh Pyke	Western Local Land Services
Kenneth Quavle	BMEC
Shaun Richardson	NOW
Roland Rogers	BMEC
Bruce Smith	Community
Dawn Smith	BMEC
Roland J Smith	BMEC Deputy Chairperson
Wade Stidiford	SA Water
Annabel Walsh	Community
John Walsh	Community
Elayna Wilson	Community



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