SA Water Guidelines for Recycled Water Storage in the Northern Adelaide Plains
SA Water acknowledges the community and other stakeholders that contributed towards the development of these guidelines. These include the members of the NAIS Community Committee for Recycled Water Storage, Northern Adelaide Plains landowners, growers and community, Local Government (City of Playford, Adelaide Plains Council and Light Regional Council), industry associations (including HortEx, Virginia Irrigators Association, Vietnamese Farmers Association, Horticulture Coalition of SA, AusVeg SA) and relevant Government of South Australia agencies.
THE NORTHERN ADELAIDE IRRIGATION SCHEME

NAIS FALLS UNDER THE UMBRELLA OF THE PIRSA-LED NORTHERN ADELAIDE PLAINS AGRIBUSINESS INITIATIVE AND WILL BE DELIVERED BY SA WATER. IT WILL SEE THE EXPANSION OF RECYCLED WATER USE TO SUPPORT SIGNIFICANT ECONOMIC DEVELOPMENT OPPORTUNITIES AND JOBS GROWTH IN THE NORTHERN ADELAIDE REGION.

On 27 August 2015, SA Water released an Expression of Interest to the market seeking innovative proposals to make use of 20 gigalitres (GL) per annum of recycled water from the Bolivar Wastewater Treatment Plant (WWTP) that can deliver the greatest economic benefit for South Australia. Storage of recycled water is likely to be an important part of NAIS.

The SA Water Guidelines for Recycled Water Storage in the Northern Adelaide Plains has been produced as a result of a robust stakeholder engagement process and obligations set by regulators: the Department of Health and Ageing (DHA), the Environment Protection Authority (EPA), and the Department for Environment Water and Natural Resources (DEWNR).

The purpose of these Guidelines is to raise awareness in the Northern Adelaide Plains community and summarise SA Water’s commitments when seeking to develop recycled water storage in the Northern Adelaide Plains. It will guide the identification of appropriate sites for recycled water storage.

THE CRITERIA OUTLINED IN THESE GUIDELINES WILL BE CONTRACTUALLY BINDING FOR ALL NAIS PROPONENTS.

NAIS Selection Process

- **Expression of Interest**
  - SA Water approaches the market for proposals to build infrastructure to deliver and make use of full 20GL of recycled water
  - Aug to Nov 2015

- **Evaluations of Proposals**
  - Shortlisted proponents supply more detail on their plans and outline economic benefits to the State
  - Oct to Dec 2016

- **Preferred Proponent Undertakes Feasibility Study**
  - Study confirmed viability of infrastructure construction; challenges with immediate uptake of full 20GL volume
  - Aug 2017

- **State and Government Funding Secured**
  - NAIS scaled to 12GL initial phase, based on feasibility results, funding availability and industry feedback
  - Late 2017

- **New Call for Project Proposals**
  - Industry to apply to use portions of the 12GL in ways that result in greatest state economic benefit
  - Early 2018

- **Review of First Round Proposals**
  - Review of First Round Proposals
  - Feb 2018

- **Call for Second Round Proposals**
  - Increases opportunity to attract broadest range of investors
  - Early-Mid 2019

- **Water Contracts Offered**
  - Contracts offered to customers with viable and highest benefit proposals
  - Early 2018

NAIS Call for Project Proposals

NAIS construction and operation
RECYCLED WATER IN THE NORTHERN ADELAIDE PLAINS

WITHOUT NEW INFRASTRUCTURE AND STORAGE, ADDITIONAL RECYCLED WATER CANNOT BE DELIVERED TO THE REGION

RECYCLED WATER FROM THE BOLIVAR WASTEWATER TREATMENT PLANT (WWTP) IS A VALUABLE RESOURCE FOR SOUTH AUSTRALIA AND ITS USE HAS MANY ENVIRONMENTAL, SOCIAL AND ECONOMIC BENEFITS.

Recycled water schemes are used worldwide to assist with meeting the growing demand for water.

The Northern Adelaide Plains region produces approximately one third of South Australia’s Gross Domestic Product ($350M per year) for agricultural produce (PIRSA, 2015).

The existing Virginia Pipeline Scheme (VPS) has a contracted volume of 19.5 GL of recycled Bolivar water per year supplying 350 irrigators in the region. NAIS will seek investment in new infrastructure to treat and transport an additional 12 GL of recycled water to the Northern Adelaide Plains. Recycled water produced in the wetter months when irrigation is low, will require storage so that it can be used when irrigation demand is high.

There are two methods of storage that have been explored in detail with the community and other key stakeholders:

- **Below-ground** storage, in the local aquifer (likely to be the T2 aquifer), through a process called Managed Aquifer Recharge (MAR).
- **Above-ground** storage, which may consist of a number of lagoons.
LISTENING TO THE COMMUNITY

An engagement process with the Northern Adelaide Plains community commenced in July 2015 to raise awareness and address the community’s concerns about above-ground and below-ground recycled water storage options.

After a thorough selection process, the NAIS Community Committee for Recycled Water Storage was established and included representation from industry groups, local government and community members. The Committee was asked to work with SA Water to develop these guidelines. Minutes and presentations from these meetings are available on the SA Water website www.sawater.com.au.

WE ARE COMMITTED TO ENSURING EFFECTIVE CONSULTATION WITH STAKEHOLDERS AND COMMUNITY IS UNDERTAKEN DURING THE PLANNING AND CONSTRUCTION OF ANY STORAGE SOLUTION.

Ongoing engagement will ensure transparency during the project’s progression and allow for two-way communication to identify changes in community expectations and project outcomes.

NAIS proponents must follow the usual development approval process, which involves community consultation.

The community will continue to be consulted during the site selection process for recycled water storage.

The method of engagement may include surveys and face-to-face conversations with affected members of the community, information sessions, mail-outs, industry and Council briefings, public notices and media releases. The extent of engagement will depend on the potential impacts of proposed storage locations.

WHAT IS IMPORTANT TO THE COMMUNITY?

- CONSULTATION ON THE SITE SELECTION PROCESS
- BEING INFORMED ABOUT WHAT IS HAPPENING AND WHERE

Stakeholder Engagement Process

Jun to Aug 2015

- Phase 1
  - Stakeholder briefings and community information sessions

Nov 2015 to Aug 2016

- Phase 2
  - NAIS Community Committee formed to assist with development of SA Water Guidelines for Recycled Water Storage in the NAP

Sep 2016 to 2020

- Phase 3
  - Community engagement activities continue throughout the life of the project

Related activities:

- Community consultation when selecting locations for storage
- Conduct feasibility studies for storage method and location
- Adhere to additional requirements described in these guidelines
- Conduct site specific investigations
- Lodge development application
- Seek regulatory approval (DHA, EPA and DEWNR)
WHAT IS IMPORTANT TO THE COMMUNITY?

• MAKING SURE THAT PUBLIC HEALTH IS PROTECTED

• PROTECTING ENVIRONMENTAL RESOURCES FOR FUTURE GENERATIONS

PROTECTING THE HEALTH AND WELLBEING OF THE COMMUNITY REMAINS ONE OF SA WATER’S UTMOST COMMITMENTS IN DEVELOPING ANY RECYCLED WATER SCHEME.

Recycled water currently provided through the Virginia Pipeline Scheme is suitable for commercial food crop irrigation. It will continue to meet strict requirements for water quality, control and monitoring. The multiple barrier treatment process reduces viruses and bacteria by 99.9999% and protozoa by 99.999% to protect public health.

The DHA, in conjunction with the Local Government Association, EPA, DEWNR, PIRSA, SA Water and Renewal SA developed the South Australian Recycled Water Guidelines (2012). These were developed to assist proponents in recycled water scheme development and provide guidance on best practice for recycled water management and use.

SA Water is committed to the principles of sustainable use of recycled water outlined in the SA Recycled Water Guidelines: “While the use of recycled water is strongly supported, it is crucial that it is undertaken in a manner that maintains protection of public and environmental health. Application of preventive measures and requirements for water quality should be commensurate with the source of recycled water and intended use”.

If new pollutants of concern are identified, SA Water works closely with regulators to ensure the safety of the community. We have a world class laboratory (AWQC) and linkages with national and international research organisations to keep abreast of emerging issues.

The Australian Guidelines for Water Recycling (AGWR): Managing Health and Environmental Risks - Phase 1 must be addressed to gain approval from regulators to supply, store and use recycled water. Approval from the DHA is compulsory for the supply and use of recycled water, and APPROVALS WILL ONLY BE ISSUED IF THE PROPOSAL IS ASSESSED AS BEING SAFE. Applicants must submit a detailed risk management plan that meets the AGWR Recycled Water Management Framework, and includes:

• intended use and prevention of unintended use
• health and environmental risk assessment
• management of incidents and contingency plans

IN ESTABLISHING STORAGE SOLUTIONS, THE RELEVANT GUIDELINES, LEGISLATION, PLANNING APPROVALS AND REGULATORY REQUIREMENTS MUST BE ADHERED TO while also accounting for community views, in relation to:

• public safety and health
• environmental protection
• natural resource management
• land use planning
BELOW-GROUND STORAGE

There are a number of successful Managed Aquifer Recharge (MAR) schemes in South Australia that have been operating for over two decades, storing recycled water for a variety of uses including irrigation of parklands, ovals and golf courses, primary production and domestic dual reticulation. The role of MAR schemes is to store water until it is needed in drier months.

The most common type of MAR used in South Australia is Aquifer Storage and Recovery (ASR), which involves injecting and extracting from the same bore. ASR is a cost effective storage solution that requires very little land and can be increased gradually as demand grows.

Approval for ASR requires a comprehensive understanding of the aquifer and current groundwater users; this is enforced through the DHA, EPA and DEWNR approvals.

SOUTH AUSTRALIA LEADS THE WORLD IN ASR TECHNOLOGY.

Extensive trials in partnership with the Commonwealth Scientific and Industrial Organisation (CSIRO) took place at Bolivar WWTP from 1996 to 2010 to test and understand the dynamics of using MAR to store recycled water. These trials provided major input to the development of the nation-wide Australian Guidelines for Water Recycling: Managing Health and Environmental Risks (Phase 2) Managed Aquifer Recharge. The Tertiary 2 (T2) aquifer is very deep, made primarily of limestone and separated from other aquifers by thick clay layers. It extends under most of the Northern Adelaide Plains. It is preferred for ASR storage because the salinity, aquifer thickness and other physical characteristics mean that it has a greater ability to safely and cost effectively store water.

The EPA Water Quality Policy (2015) defines groundwater with less than 1,200 mg/L total dissolved solids (TDS) as suitable for drinking water supplies. THE EPA PLACES STRICT CONDITIONS ON ALL MAR SCHEMES TO PROTECT THE ENVIRONMENTAL VALUE OF AN AQUIFER.

Storages proposed in areas that may impact on groundwater that is used for domestic purposes are unlikely to gain approval.

The map opposite shows general salinity trends in the T2 aquifer. This can be used as a guide to identify areas for further investigation.

THE FOLLOWING CONDITIONS APPLY WHEN INVESTIGATING ASR STORAGE IN AREAS WITH GROUNDWATER SALINITY THAT IS BELOW 1,500 mg/L TDS. THIS IS IN ADDITION TO REGULATORY AND LEGISLATIVE OBLIGATIONS.

- Groundwater used for domestic purposes must not be adversely affected; monitoring and contingency needs to be put in place to ensure long term sustainability of drinking water supplies.
- Localised site investigations must find out whether recycled water could reach bores used for domestic purposes, the time it would take (in years) and the expected changes to water quality.
- During the site selection process, mitigation measures and monitoring must be agreed with bore owners that are within the “water quality impact zone” (see page 13) if modelling shows that they would experience changes in water quality that would not comply with the Australian Drinking Water Guidelines (2011). These bore owners have the power of veto, which means that proposed storages will not proceed without their endorsement.
- Independent peer review of groundwater models that assess the impact on existing bores.

WHAT IS IMPORTANT TO THE COMMUNITY?

- SUSTAINABLE GROUNDWATER SUPPLIES
- MAINTAINING AQUIFER HEALTH
- WATER QUALITY AFTER EXTRACTION
BELOW-GROUND STORAGE

THE DYNAMICS AND STRUCTURE OF THE LOCAL AQUIFER NEED TO BE WELL UNDERSTOOD FOR ANY MAR SCHEME

Regulatory interest and control for below-ground storage:

- EPA: Protection of receiving environment (quality of water injected into aquifer)
- DEWNR: Sustainable management of groundwater resource (volumes injected and extracted from aquifer, groundwater modelling)
- DHA: Prevent unintended use via nearby domestic bores (contingency and management plans)

There are compulsory obligations that are required to gain approval for a recycled water MAR scheme regardless of the aquifer salinity in an area.

These are in place to protect public health and the sustainability of the aquifer, which includes ongoing monitoring to protect the quality of groundwater and structure of the aquifer and clay barriers.

Test bores need to be constructed and pump testing carried out. This involves extracting groundwater and measuring flow and pressure in multiple locations (which may involve using existing bores). It enables a model of the characteristics and structure of the aquifer in the local area to be developed. It is important to define the direction and speed of groundwater flows and possible pressure or water quality impacts on nearby users.

Changes in aquifer pressure during the operation of a ASR scheme may raise or lower water levels in nearby bores. Affected bore owners will be identified through groundwater modelling and consulted to address the impacts.

Groundwater models feed into the technical risk assessments and inform the monitoring program.

Monitoring and contingency plans must be in place to protect public safety and the aquifer, this includes testing water before injection to protect the environmental value of the aquifer.

A qualified hydrogeologist must:
- supervise any drilling
- undertake pump testing and analysis of results
- prepare and use groundwater models

Groundwater modelling will be independently peer reviewed, verified with monitoring data during operation and revised if necessary. Results will be made publicly available through the consultation process.

Impact zones for ASR schemes:

- Storage zone: The storage zone contains recycled water that is fit for intended use when recovered.
- Attenuation zone: The attenuation zone is where mixing with the local groundwater occurs. Some compounds are further broken down by natural processes. Monitoring water quality and hydraulics in this area verifies modelling.
- Water quality impact zone: The injected water becomes more dilute as it moves away from the point of injection. The environmental value of the aquifer is preserved.
- Hydraulic impact zone: There are no measurable changes in groundwater quality.

Desktop studies use existing data to calculate approximate zones of hydraulic and water quality impact. These will be used to identify bore and land owners that need to be involved in site specific consultation. Once drilling and pump tests have been carried out, approximate zones are refined and validated by groundwater modelling.
Above-ground storages are common and there is extensive industry experience in constructing, operating and managing them.

Regulatory interest and control for above-ground storage

The EPA has published *Guidelines for Wastewater Lagoon Construction (2014)*. Basic lagoon construction can make use of local materials if the local soil is suitable. Synthetic liners and leak detection systems may be required depending on assessment by the EPA. The shallow groundwater table in the Northern Adelaide Plains limits the depth that lagoons can be safely constructed. This may lead to dam walls being prominent features in the landscape.

Large areas of land are needed for above-ground storages. The impact on current and future land uses need to be considered during site selection. Planned development and agricultural production areas will influence where storages are located.

Above ground storages need to have considered potential evaporation, algae and insect pests and their affect on water quality. Potential nuisances to residents also need to be managed including odour, amenity and insect pests such as midge flies.

SA Water recycled water storage lagoon at Aldinga, it stores 0.8 GL, is 13 metres deep and covers 7 hectares.
ABOVE-GROUND STORAGE

WHEN A SITE FOR LAGOON STORAGE IS PROPOSED, THE FOLLOWING GUIDELINES MUST BE CONSIDERED.

- Geotechnical investigations are required to find out the depth of the shallow groundwater table and soil structure.
- Development approval considerations include appropriate zoning, susceptibility to flooding, potential impacts on surface water flows in the area, safety measures for large dam walls (over 5m), control of public access and impacts on cultural heritage sites and native vegetation.
- The land must not be contaminated from any previous use; it is essential that both desktop studies and soil sampling are undertaken.
- Any lagoon storage must minimise leakage and have compliant leak detection systems with a regular monitoring program to satisfy EPA requirements.
- Constructing storages on prime agricultural land must be avoided wherever possible.
- Must have an effective strategy to manage pest issues and minimise the impacts to the public.
- Results of odour modelling will be shared with affected residents.
- Lagoons should not be located where they significantly detract from the surrounding aesthetic environment.
SUPPORTING SOUTH AUSTRALIAN GROWTH

WHAT IS IMPORTANT TO THE COMMUNITY?

• AFFORDABILITY OF RECYCLED WATER
• MAINTAINING THE VIABILITY OF EXISTING GROWERS
• GOVERNMENT SUPPORT TO DEVELOP AND REACH EXPORT MARKETS

WE ARE MINDFUL OF ENSURING THE PRICE OF NAIS WATER REMAINS AFFORDBALE FOR THE END USER AND HAVE SECURED STATE AND COMMONWEALTH FUNDING TO SUPPORT THE SCHEME. THIS NEEDS TO BE UNDERPINNED BY COST EFFECTIVE STORAGE AND INFRASTRUCTURE SOLUTIONS.

A number of industry associations are focused on finding new markets and increasing opportunities for their growers. The Government of South Australia is committed to supporting the existing food and wine industry by providing opportunities to increase productivity and efficiency, while increasing market access and development. South Australia has a strong focus on the export of premium food and wine, this is critical for the State’s economic growth and job creation.

THE ABILITY OF NAIS TO STIMULATE ECONOMIC GROWTH IS HEAVILY RELIANT ON WHAT GROWERS CAN PRODUCE WITH THE QUALITY OF WATER PROVIDED. Monitoring must be in place to ensure that quality of recycled water is fit for purpose and safe after it is stored.

Results of regular water quality testing (after storage) will be made available to the public to improve transparency. Water quality monitoring is likely to include salinity, organics and metals, as well as public health risks, such as pathogens and relevant persistent chemical compounds.

Cost-effective opportunities through storage and treatment that improve the quality of water available to irrigators should be sought.

WHAT IS IMPORTANT TO THE COMMUNITY?

• RECYCLED WATER IS FIT FOR PURPOSE AFTER STORAGE
• IMPROVED WATER QUALITY FOR IRRIGATION
The Northern Adelaide Irrigation Scheme may incorporate a combination of both storage types and there are advantages and disadvantages for each.

<table>
<thead>
<tr>
<th>Impacts and considerations for storage options</th>
<th>Above-ground</th>
<th>Below-ground</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaporation</td>
<td>High</td>
<td>None</td>
</tr>
<tr>
<td>Algae</td>
<td>High</td>
<td>None</td>
</tr>
<tr>
<td>Midges and mosquitos</td>
<td>High</td>
<td>None</td>
</tr>
<tr>
<td>Water quality required before storage</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Odours</td>
<td>Possible</td>
<td>None</td>
</tr>
<tr>
<td>Regulatory approvals</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Land required</td>
<td>Large</td>
<td>Small</td>
</tr>
<tr>
<td>Cost for construction (excluding land purchase)</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Ongoing operational cost</td>
<td>Low</td>
<td>High</td>
</tr>
</tbody>
</table>

These guidelines highlight additional criteria to address community concerns when planning recycled water storage in the Northern Adelaide Plains. The criteria outlined in these Guidelines along with all regulatory guidelines for recycled water set by the Department of Health, EPA and DEWNR will be followed.

SA Water is committed to acting in the best interest of our customers and the community. The sustainability of groundwater supplies and public health must be safeguarded; the Northern Adelaide Plains community has made it clear that this needs to be supported by ongoing community engagement.

**WE WILL WORK TOWARDS STORAGE SOLUTIONS FOR NAIS THAT ARE SUPPORTED BY THE COMMUNITY IN ORDER TO BOOST THE GROWTH OF SOUTH AUSTRALIA AND DELIVER ECONOMIC PROSPERITY FOR THE REGION.**
Guidelines referred to in this document are:

- Australian Guidelines for Water Recycling
  - Managing Health and Environmental Risks - Phase 1
  - Managed Aquifer Recharge - Phase 2
  Available on the Department of Environment website:

- South Australian Recycled Water Guidelines
  Available on the SA Health website:
  Protecting+public+health/Water+quality/Recycled+water/
  Recycled+water

- Wastewater Lagoon Construction
  Available on the EPA website:

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