VICTORIAN MURRAY FLOODPLAIN RESTORATION PROJECT

HEALTHY LANDSCAPES, STRONG COMMUNITIES

Groundwater Monitoring and Reporting Program

Hattah Lakes North Floodplain Restoration Project
Nyah Floodplain Restoration Project
Vinifera Floodplain Restoration Project

Australian Government | VICTORIA State Government | LOWER MURRAY WATER | Goulburn-Murray WATER | mallee catchment management authority | North Central CMA | Parks VICTORIA

Approved Action

Person to whom the approval is granted	Lower Murray Urban and Rural Water Corporation
ABN of Approval Holder	18 475 808 826

Declaration of accuracy

In making this declaration, I am aware that section 491 of the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) makes it an offence in certain circumstances to knowingly provide false or misleading information or documents to specified persons who are known to be performing a duty or carrying out a function under the EPBC Act or the Environment Protection and Biodiversity Conservation Regulations 2000 (Cth). The offence is punishable on conviction by imprisonment or a fine, or both. I am authorised to bind the approval holder to this declaration and that I have no knowledge of that authorisation being revoked at the time of making this declaration.

Signed: 

Full name (please print): ASHER SUTTON

Organisation (please print): LOWER MURRAY URBAN AND RURAL WATER CORPORATION

Date: 17/03/2026

Table of contents

Quality Information

Version	Date	Prepared by (Author)	Qualification/s and Years of Experience	Approved for submission	Qualification/s and Years of Experience
A – VMFRP and stakeholder review	22 September 2025	Michael Chendorain	Professional Civil Engineer (PE), Masters Science, 28 years	Skye Brown	BSc Hons, Masters Env Studies, 29 years
B – DCCEEW preliminary review	14 October 2025	Michael Chendorain		Skye Brown	
C – For stakeholder acceptance	26 February 2026	Kristian Sakellaris	B.Eng(Env)(Hns), 6 years	Michael Chendorain	Professional Civil Engineer (PE), Masters Science, 28 years
D – for issue to DCCEEW	05 March 2026	Kristian Sakellaris		Michael Chendorain	
0 – for issue to DCCEEW for approval	17 March 2026	Kristian Sakellaris		Michael Chendorain	

Glossary

Term	Definition
Adaptive management	An iterative process of developing a conceptual model and management hypothesis and then implementing management actions and monitoring to identify which management actions are most effective at achieving specified objectives. Adaptive management incorporates planning, management, monitoring and evaluation mechanisms to allow waterway managers to adjust their approach in response to current climatic conditions, new information and local knowledge when planning for the future. Adaptive management would be implemented during operation to ensure changes in management actions are most effective at achieving the identified benefits of the projects.
Basin Plan	Passed into law in November 2012 under the *Water Act 2007* (Cth), the Murray-Darling Basin Plan ('the Basin Plan') aims to restore the Murray-Darling Basin back to a healthier and more sustainable state while continuing to support farms and other industries that benefit local communities. The Basin Plan is managed by the Murray-Darling Basin Authority, which was established by the *Water Act 2007* to coordinate water resources within the Basin.
Containment bank	A raised embankment, predominantly constructed using earth fill, to contain environmental water on the floodplain and prevent unintended flooding. A containment bank may serve as the location of a road or access track.
Contamination	The condition of land or water where any chemical substance of waste has been added as a direct or indirect result of human activity at above background level and represents, or potentially represents, an adverse health or environmental impact (as defined in the *National Environment Protection (Assessment of Site Contamination Measure 1999).*
Dewatering	Dewatering is the action of removing groundwater or surface water during construction. Normally dewatering occurs by pumping or otherwise removing water from a construction site to lower the water level to facilitate excavation or other construction activities.
Environmental water	Water sourced through environmental entitlements that is used or managed to improve or maintain the health of rivers, wetlands and floodplains.
Inundation	The deliberate flooding of land as part of the projects.
Levee	A natural or artificial wall or embankment that restricts the flow of water and prevents flooding of a particular area. They are used as flood protection and to retain water to floodplain areas.
Lock	Locks are employed next to regulators to enable boats to move through the graded waterway. The water level in a Lock can be raised or lowered in line with the upstream and downstream water levels.
Managed inundation	Inundation of a specific location using environmental water to achieve pre-determined ecological objectives. Delivery of environmental water may occur before or in addition to a natural flood event, taking advantage of the naturally wetted conditions to extend the duration or extent of inundation.

Term	Definition
Maximum Inundation Area	The maximum area that is able to be inundated by the proposed works based on the design of the project. Inundation of private land would only occur subject to private flood agreements being established for the relevant land
Murray River floodplain	An area of low-lying ground adjacent to the Murray River, which is subject to flooding.
Operation	Operation, also known as the operational phase, refers to the period of project operation and is the longest stage of the project lifecycle and includes the maintenance of infrastructure.
Project area	The project area includes the Maximum Inundation Area and Construction Footprint required for the projects.
Regulator	A structure used to deliver, move or retain water on the floodplain to facilitate the environmental watering regime (e.g., volume and duration of flood water). The various regulator sizes include: *Very large* – major regulator structures on large waterways that will require individual design. They typically are multi-bay structures of more than 3-4m height with bridge crossings for access and will be designed as cast in situ concrete structures with sheetpile cut offs for seepage control. Some will require piled foundations for structural support and some will have fishways *Large* – intermediate sized regulator structures nominally 2-3m in height with some degree of individual design of the structure required. They will typically have box culverts for the road crossing but the remainder will be cast in situ concrete, typically with sheet pile cut offs for seepage control *Small* – control regulators that retain water less than 2m deep. The small regulators generally comprise box culvert style regulators with box culvert units up to 1.8m high, and variations of these. Non-standard small regulators consist of small irrigation type flow control structures. Some regulators will be operated so that fish passage (targeting small bodied fish) can occur both in managed release and natural flood scenarios and flow velocities are also appropriate for fish passage.
Road (see also track or access track)	Refers to existing Council or State managed public roads, comprised of formalised sealed or unsealed pavement structures consisting of a prepared subgrade with base and / or subbase layers.
Threshold	For water – A water height, or flow that defines a critical limit for transition in operational conditions. For ecology – A time or ecological health condition that defines a critical limit for transition in ecological conditions.
Track or access track	Refers to public access tracks in National Parks, State Forests or reserves and on private land.

Abbreviations

Abbreviation	Definition
AHD	Australian Height Datum
CMA	Catchment Management Authority
DCCEEW	Department of Climate Change, Energy, the Environment and Water
EC	Electrical Conductivity
EcoMRP	Ecology Monitoring Program
EES	Environment Effects Statement under the *Environment Effects Act 1978*
EPA	Environment Protection Authority (Victoria)
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cth)
GL	Gigalitres
GWMRP	Groundwater Monitoring and Reporting Program
ha	Hectares
Mallee CMA	Mallee Catchment Management Authority
MDBA	Murray-Darling Basin Authority
ML	Megalitres
MNES	Matters of National Environmental Significance
NATA	National Association of Testing Authorities
OEMP	Operation Environmental Management Plan
ORP	Oxygen Reduction Potential
REMRP	Receiving Environment Monitoring Program
SDLAM	Sustainable Diversion Limit Adjustment Mechanism (Murray-Darling Basin Plan)
VMFRP	Victorian Murray Floodplain Restoration Project

1 Introduction

1.1 Project description

The Victorian Murray Floodplain Restoration Project (VMFRP) is an environmental watering project undertaken by the Victorian Government in partnership with the Australian Government under the Murray-Darling Basin Plan (Basin Plan).

The Basin Plan was adopted in 2012 by the Commonwealth, state and territory governments of the Murray Darling Basin. Implementation of the Basin Plan was originally scheduled over twelve years to 2024. The aim of the Plan is to bring the basin back to a healthier and sustainable level, while continuing to support farming and other industries for the benefit of the Australian community.

The Basin Plan ensures that a proportion of water in the system is preserved for the environment. Sustainable diversion limits (SDLs) specify how much water, on average, can be consumed from the basin to leave enough to keep rivers and the environment healthy. The Basin Plan allows the SDL to be reduced (SDL Adjustment Mechanism) using measures that improve environmental outcomes using less water.

VMFRP is an SDLAM project to manage environmental water at eight floodplain ecosystems of high conservation significance in northern Victoria (Figure 1). The projects all aim to protect and restore floodplain ecosystem biodiversity values, function, and habitat components, including for key species and communities by:

- Better aligning the frequency, duration, and timing of managed watering events with the ecological needs of the floodplain
- Improving resilience to threats such as climate change.

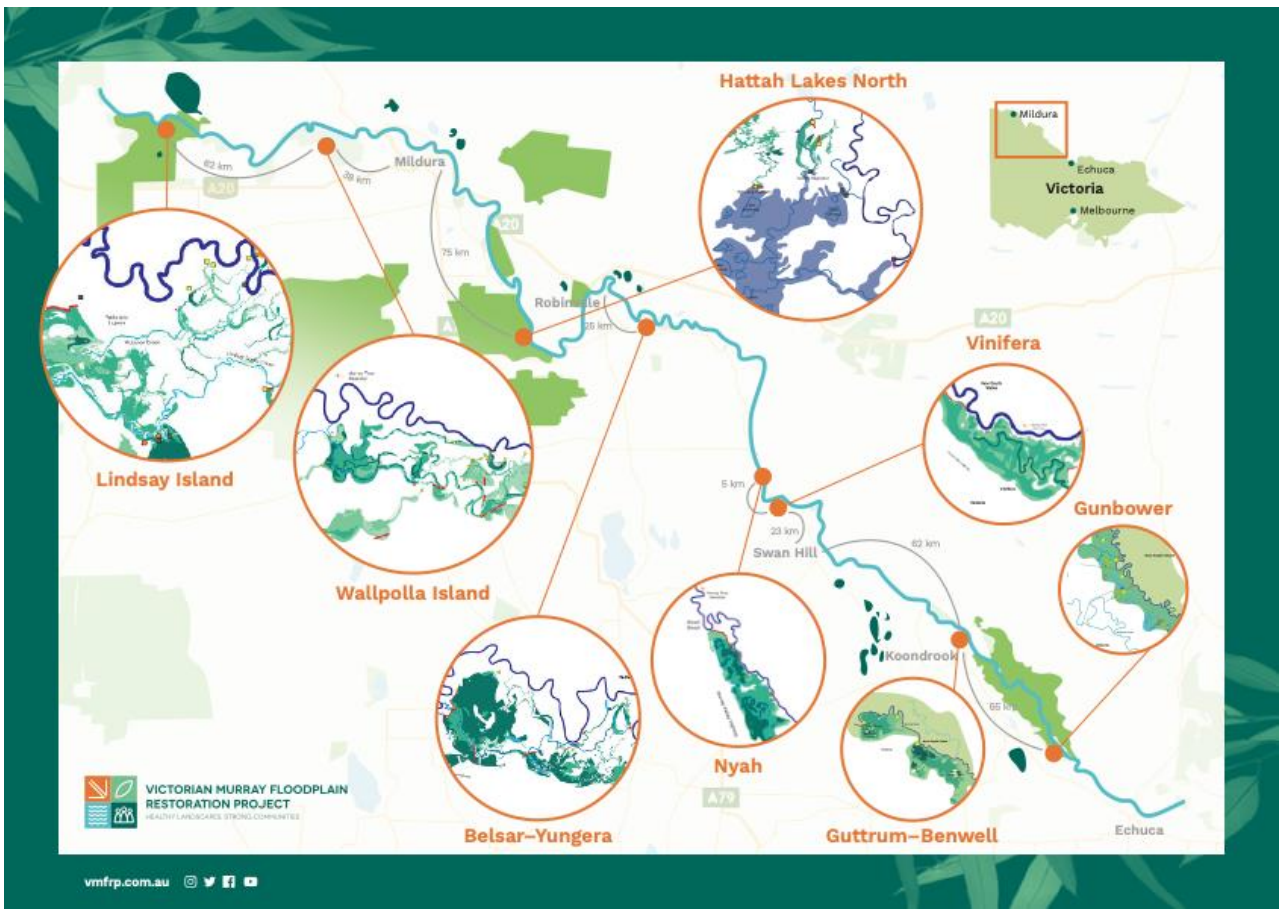


Figure 1 VMFRP Sites

The VMFRP comprises eight sites listed below:

- Guttrum-Benwell
- Gunbower
- Vinifera
- Nyah
- Belsar-Yungera
- Hattah Lakes North
- Wallpolla Island
- Lindsay Island.

This Groundwater Monitoring and Reporting Plan (GWMRP) relates to the Hattah Lakes North, Nyah, and Vinifera projects. For a more detailed description of operational project activities for Hattah Lakes North, Nyah, and Vinifera, please see the relevant addendum.

1.2 Purpose

The purpose of this GWMRP is to provide a framework to appropriately characterise the environmental impacts to receiving environments before, during and after an environmental watering event for the Hattah Lakes North, Nyah and Vinifera projects. Specifically, this Plan will satisfy the relevant Conditions of the EPBC Act Approvals, ensure project objectives are realised, and sustain stakeholder confidence in delivery of the projects.

Because identified risks (noted below in Section 5) are determined to be generally low, the groundwater monitoring plan presented in this document is intended to validate the observed impacts from changes in groundwater conditions due to the projects.

1.3 Objectives

The objectives of the GWMRP are to meet the EPBC Act approval conditions as follows:

- Provide a monitoring program for groundwater, including monitoring of groundwater levels and quality, ensuring monitoring is conducted in accordance with the EPBC Act conditions[14].
- Ensure the monitoring Plan considers how the following characteristics will be monitored:
  - Salinisation risk areas
  - Groundwater levels
  - Groundwater quality within the maximum inundation areas
  - Groundwater reference locations.
- Provide monitoring to support an appraisal of the baseline condition of groundwater at each of the sites.
- Detail the performance and condition indicators to detect and monitor groundwater impacts.
- Specify the trigger values for groundwater monitoring.
- Specify the requirements of a reporting program.

A review of the Plan against the conditions of the EPBC Act approval is provided in Addendum A.

1.4 Project delivery framework

As the Waterway Manager, the Mallee Catchment Management Authority (CMA) is responsible for the planning and identification of environmental water needs at the VMFRP sites.

The CMA approves and manages the delivery of environmental water and the monitoring and reporting of outcomes, in accordance with the ecological objectives.

Figure 2 below outlines the environmental management document framework required for the VMFRP projects.

The CMA has prepared Environmental Water Management Plans (EWMPs) that set ecological objectives and hydrological targets for each VMFRP site. The Operational Environmental Management Plan (OEMP) guides the management of the Projects operation to meet these targets and objectives.

The Ecology Monitoring Evaluation and Reporting Plan (MERP), prepared by ARI and Ecological Associates supports the EWMPs and OEMPs by reporting progress towards a broad array of ecological objectives and advising on adaptive management to optimise ecological outcomes. The Hydrology and Water Quality Monitoring Strategy

(HyWaq Monitoring Strategy) supports the EWMPs and OEMPs by outlining a water monitoring program to facilitate the planning, implementation, operation, monitoring, evaluation and reporting of managed watering events.

The VMFRP projects are Controlled Actions under the Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth) (EBPC Act) due to the potential for the projects to impact Matters of National Environmental Significance (MNES). The Controlled Actions (the projects) therefore need approval under the EPBC Act.

The EPBC Act Approvals require the projects to demonstrate effectiveness of measures to avoid, minimise and mitigate impacts to MNES. This includes the development of a Receiving Environment Monitoring and Report Plan (REMRP), Groundwater Monitoring and Reporting Plan (GWMRP) and Ecology Monitoring and Reporting Plan (EcoMRP).

The monitoring strategy specified in the Ecology MER and the HyWaq Monitoring Strategy have informed the development of the REMRP, EcoMRP and GWMRP.

This Plan is specific to conditions raised in the EPBC Act Approvals and the Environmental Management Plan Guidelines. Implementation of this monitoring should be read in conjunction with the Environmental Water Management Plan Reports [3][4][5], which covers the requirements for monitoring for compliance with Victoria Government monitoring requirements.

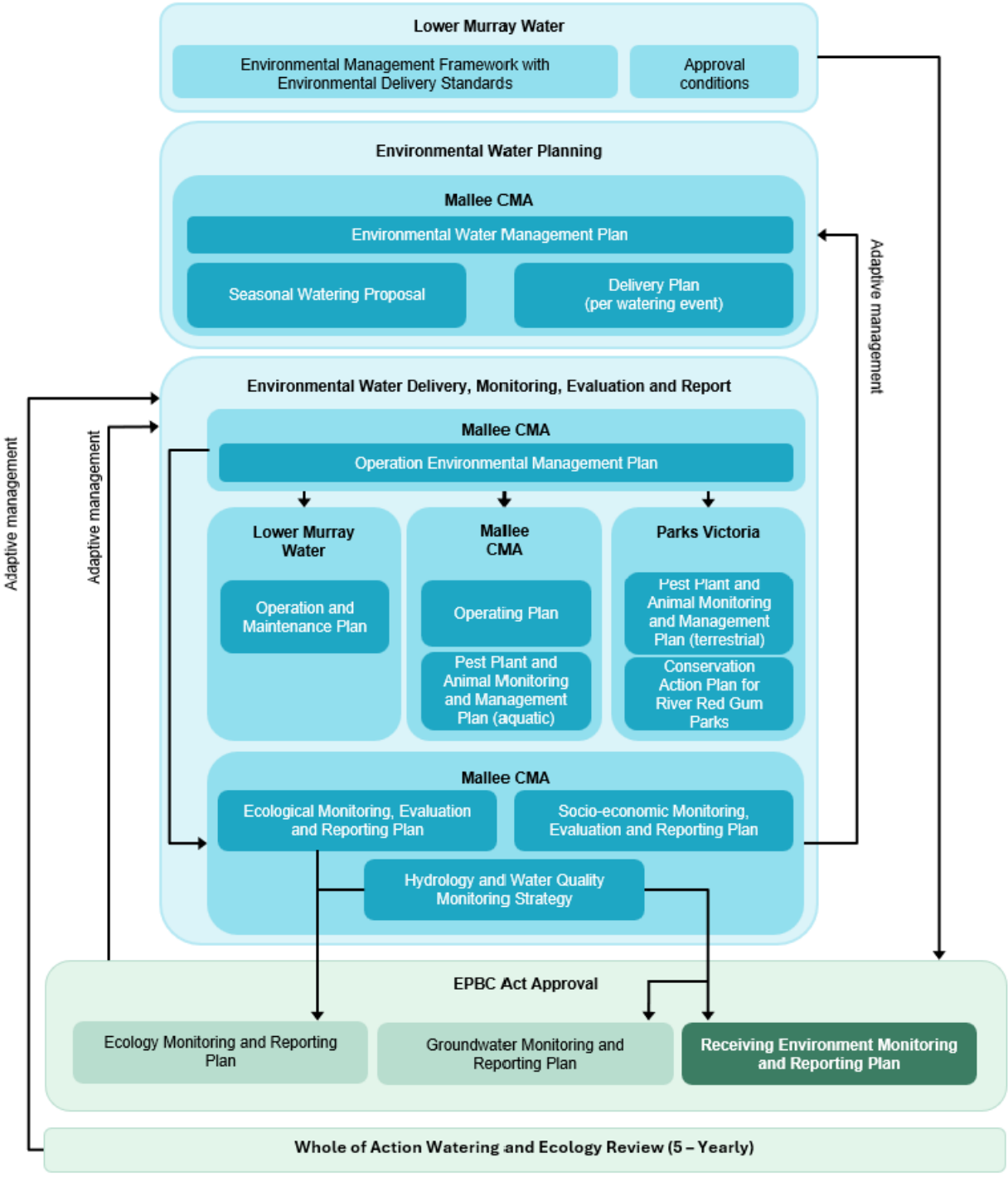


Figure 2 Environmental Management Documents (diagram adapted from the EMF[6][7])

This plan provides an overview of the project's monitoring and reporting program and will be supported by site-specific addendum reports. This Plan has been developed in line with the EPBC Act Approvals and the Environmental Management Plan Guidelines and includes the following sections:

- Project objectives
- Roles and responsibilities
- Reporting requirements
- Environmental impacts and risks
- Monitoring program and methodologies
- Corrective actions and mitigation
- Plan implementation
- Assessment against the relevant EPBC Act Conditions.

1.5 Primary potential impacts

A summary of the key potential impacts to groundwater across Hattah Lakes North, Nyah and Vinifera, including the potential effects are presented in the following summary table. Note that the project is not designed to generate adverse impacts to groundwater, groundwater dependent ecosystems (GDEs), or environmental values. However, given the presence of elevated groundwater salinity within or adjacent to some of the project areas, groundwater monitoring is needed to validate the performance of the project in terms of groundwater and to provide data to support adaptive management.

Table 1 Key potential groundwater impacts

Characteristic as per EPBC Conditions	Impacts (what)	Effects (how)
Salinisation risk area	Changes to groundwater levels or flow, due to Project activities which may impact environmental values, such as groundwater-dependent ecosystems and vegetation.	• Increase in groundwater levels, potentially causing groundwater induced stress to vegetation, through waterlogging or salinisation. • Increase in soil salinity at the site due to increased groundwater levels within or adjacent to the site area. Notably, for all three sites, project specific groundwater assessments have indicated these risks to be low[1][2].

1.6 Documents reviewed

The following documents have been reviewed in preparing this Plan:

- Environment Effects Statement (EES) / Environment Report, including specialist groundwater assessment reports[1][2]
- Minister's Assessment under the *Environment Effects Act 1978*[9][10]
- Environmental Management Framework including Environmental Delivery Standards[6][7]
- EPBC Act approval conditions[14]
- Thresholds and Triggers Report[15]
- Guidelines for Fresh & Marine Water Quality[16]
- Environmental Management Plan Guidelines, DCCEEW 2024[17].
- Hattah Lakes Environmental Water Management Plan[3]
- Nyah Environmental Water Management Plan[4]
- Vinifera Environmental Water Management Plan[5]

2 Roles and responsibilities

The table below provides a summary of the roles and responsibilities to carry out the GWMRP.

Table 2: Roles and responsibilities

Role	Responsibility
Approval of the GWMRP	Minister for the Environment[1] (Cwlth)
Implementation of GWMRP	Mallee CMA or relevant agency of Victorian Government identified by DEECA
Reporting	Mallee Catchment Management Authority (CMA)

Monitoring Supervisor (Supervisor)	Mallee Catchment Management Authority (CMA)
Management of operational impacts	Mallee Catchment Management Authority (CMA)

[1] Defined in the EPBC approval as "*Minister means the Australian Government Minister administering the EPBC Act, including any delegate thereof*"

3 Environmental training

All people involved with the GWMRP will receive relevant environmental training to ensure they understand their responsibilities when implementing the GWMRP. People to be trained include those at the sites of all project activities and operations, including contractors, subcontractors and visitors. The training will be tailored to the role of the individual in the project.

Environmental training will include:

- Site inductions
- Identification of key points of environmental value and any relevant matters of national environmental significance
- Understanding the requirements of the environmental management plan and the individual's role
- Preventing cross contamination during the implementation of the monitoring plan
- Environmental incident emergency response procedures
- Site environmental controls
- An outline of the potential consequences of not meeting their environmental responsibilities.

Records of all training conducted will be maintained and include:

- The person receiving the training
- The date the training was received
- The name of the person conducting the training
- A summary of the training.

Note that the above identified environmental training is in addition to any other required (and standard) health and safety training, inductions, and assessments.

4 Emergency contacts and procedures

The GWMRP is a component of the Operational Environmental Management Plan (OEMP) which will include procedures and responsibilities for emergency preparedness and response, including arrangements for containing environmental damage and attendance on-site in the event of an emergency. The Plans will also include details of incidents and emergency management during operation, including reporting and recording processes.

5 Potential environmental impacts and risks

This Section provides a summary of the existing conditions, environmental threats and impacts by the project on matters protected under the EPBC Act relating to receiving environments. Risks have been previously presented as part of the EES[1][2].

5.1 Existing Groundwater Conditions

The following summary of existing groundwater conditions has been adapted from the specialist groundwater assessments for the project[1][2]:

- Groundwater is present in a shallow aquifer (up to 15m below surface) with groundwater level typically less than 10m below ground level (mbgl) and in many locations within 5mbgl. This shallow aquifer is connected to the Murray River and anabranches.
- The groundwater aquifer that is closest to and connected with the inundation areas is typically not utilised for consumptive purposes, because the aquifer is almost wholly within reserves or is too saline for consumptive use.
- Deeper aquifers are separated from the shallow aquifer by either low permeability cemented layers or clay layers at the base of the shallow aquifer. Due to this separation, any changes to groundwater levels within the shallow aquifer is not expected to impact the deeper aquifer.
- Water dependent vegetation is expected to be present across parts of each of the three project areas, where groundwater is fresh enough and shallow enough to be accessible to vegetation. However, actual use of groundwater by vegetation is restricted in many areas because of existing salinity levels that range up to near sea level salinity concentrations in the vicinity of the project sites.
- The Murray River acts as an apparent hydraulic control between the shallow groundwater in the project areas (within Victoria) and to the north and east in New South Wales.
- The full range of groundwater environmental values that are recognised in Victoria are to be protected and may be present at the three project areas. This is because groundwater salinity (which is used to define the segments of groundwater that indicate possible values), is variable enough across the three sites to include all the recognised segments of the groundwater environment, as listed in the Environment Reference Standard[18].

Since this GWMP relates to the Hattah Lakes North, Nyah, and Vinifera projects, the following section provides a summary of the existing groundwater condition at these three project sites.

5.1.1 Hattah Lake North

Depth to groundwater and groundwater elevation is variable across the Hattah Lakes North project area. Depth to groundwater generally ranges from around 5 to 20 meters mbgl across most of the project area, with shallower groundwater depths of around 2 to 5 mbgl occurring in the north-western area. These groundwater depths translate to groundwater elevations which range from around 39 metre Australian Height Datum (mAHD) north of the project area to around 33m AHD near the Murray River.

Groundwater quality across the study area is characterised by variable salinity conditions. Total dissolved solids (TDS) concentrations (a surrogate for salinity) range from relatively fresh groundwater (<1,200 mg/L TDS) in the south-eastern areas near the Murray River to highly saline groundwater exceeding 35,000 mg/L TDS in the north-western areas (for context, the average global sea water salinity is around 35,000mg/L). Salinity generally increases with distance from the Murray River. Long-term groundwater monitoring data from bores screened in the Channel Sands aquifer indicates relatively fresh groundwater conditions near the Murray River (around 299 mg/L TDS at Bore 26266), while salinity increases substantially further from the river, reaching values approaching 40,000 mg/L TDS in the Colignan irrigation area.

5.1.2 Vinifera and Nyah

Across the Nyah and Vinifera projects, groundwater is present within a shallow aquifer, generally at a depth of less than 5 mbgl and is hydraulically connected to the Murray River and its anabranches. Deeper aquifers are also present, however, these are not impacted by the project due to the presence of a low permeability underlying clay aquitard beneath the shallow aquifer. Salinity within the shallow aquifer varies considerably across the project sites, ranging from fresh groundwater (with total dissolved solids below 1,200 mg/L) to highly saline groundwater (exceeding 35,000 mg/L as TDS). Fresher groundwater is typically found near the Murray River as a result of greater recharge, whereas higher salinity groundwater occurs further inland.

5.2 Threats to MNES protected under the EPBC Act

The Matters of National Environment Significance (MNES) assessments were prepared for Hattah Lakes North EES[1] and the Nyah, and Vinifera Environmental Report (ER)[2].

Changes to the groundwater condition have the potential to affect EPBC Act listed threatened species (or their habitat), threatened ecological communities and Ramsar wetlands. The groundwater specialist reports[1][2] evaluate the potential for groundwater changes that may contribute to effects on these MNES, however the nature, extent and magnitude of effects on MNES are dealt with in the ecology specialist assessment reports[1][2] and ecology monitoring and reporting program[8].

The key change in groundwater conditions that could lead to beneficial and/or adverse effects that has been identified in the EES is the potential for the operation of the projects to cause groundwater to rise. The rise in

groundwater would be via the infiltration of water from managed inundation events. Rising groundwater is expected as a result of the accumulation of direct infiltration of recharge from managed inundation, when compared to existing conditions.

A summary of specific potential groundwater effects related to identified impact pathways are outlined in Table 3 below.

Table 3 Potential groundwater effects during operation

Variable	Impact Pathway	Effect
Water quality degradation (e.g. salinity)	Rising groundwater levels during and immediately after managed inundation events can mobilise higher salinity groundwater within or adjacent to the inundation areas	Potential for higher salinity groundwater to migrate toward the Murray River or anabranches, potentially causing discharge of salt to surface waters
Salinisation of soils	Increased groundwater levels caused from managed inundation events may bring saline groundwater closer to the surface	Elevated groundwater levels can cause waterlogging and salinity stress to vegetation, and increase soil salinity within or adjacent to inundation areas
Groundwater level change	Groundwater levels may rise. Following completion of managed inundation groundwater levels will fall. A small residual increase in groundwater level may occur.	Higher groundwater levels may cause the transport of higher salinity groundwater beneath the site towards the Murray River or other waterways which in turn may cause the discharge of salt into the Murray River following events.

6 Risk assessment

As part of the EES and ER phase of the projects, an environmental risk report was developed, containing results from the environmental risk assessment completed for Hattah Lakes North, Nyah and Vinifera. A risk register was developed that provides the rationale behind risks ratings and highlights those risks which require greater consideration, as outlined within the specialist assessments. This risk assessment also informed the assessment of effects and identification of avoidance and mitigation measures, in the form of Environmental Delivery Standards.

A summary of the risk assessment process is shown in Figure 3

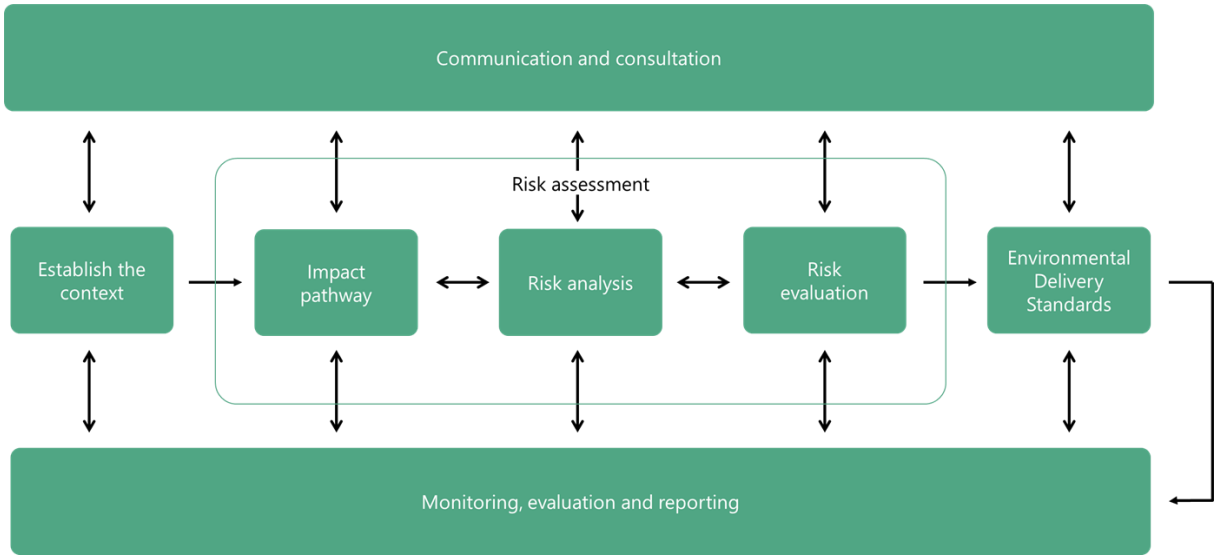


Figure 3: Risk assessment process

6.1.1 Risk analysis

The assignment of an initial level of likelihood and consequence for each of the impact pathways took into account standard construction practices and management measures. Project representatives and specialists used their professional judgment and experience to assign the appropriate consequence levels.

The VMFRP risk matrix (shown in Table 4) shows the risk rating as determined by the corresponding likelihood and consequence levels assigned to each risk item. Likelihood and generic consequence criteria, informed by the VMFRP risk matrix, are shown in Table 5 and Table 6.

The risk register including both initial and residual risk ratings for each site are documented in the relevant addendum to this Plan[22][23][24].

The residual risks relevant to the GWMRP include:

- Potential changes to groundwater levels or flows during managed inundation events on environmental values
- Potential impacts on groundwater quality resulting from managed inundation impacting on environmental values including groundwater-dependent ecosystems

All of the identified potential impacts have been assessed to be of **low risk**[1][2]. The development of corrective actions and management measures are discussed below in Section 7.6.

Table 4: Risk matrix

Likelihood	**Consequence level**				
	Insignificant	Minor	Moderate	Major	Severe
Almost Certain	Medium	Medium	High	**Extreme**	**Extreme**
Likely	Low	Medium	High	High	**Extreme**
Possible	Low	Medium	Medium	High	High
Unlikely	Low	Low	Medium	Medium	Medium
Rare	Low	Low	Low	Low	Medium

Table 5: Likelihood criteria

Likelihood	Description
Almost certain	The event is expected to occur in most circumstances
Likely	The event will probably occur in most circumstances
Possible	The event could occur
Unlikely	The event could occur but not expected
Rare	The event may occur only in exceptional circumstances

Table 6: Consequence criteria

Consequence	Description
Severe	A critical degree of impact on an environmental asset, value or use of moderate or higher significance
Major	A high degree of impact on an environmental asset, value or use of moderate or higher significance
Moderate	A moderate degree of impact on an environmental asset, value or use of moderate or higher significance
Minor	A low degree of impact on an environmental asset, value or use
Insignificant	A very low degree of impact on an environmental asset, value or use

7 Monitoring plan

7.1 Monitoring plan objectives

As outlined in Section 1.3, the objectives of the GWMRP are to meet the EPBC Act approval conditions as follows: :

- To provide a monitoring program for groundwater, including monitoring of groundwater levels and quality, ensuring monitoring is conducted in accordance with the EPBC Act conditions[14].
- Ensure the monitoring Plan considers how the following characteristics will be monitored:
  - Salinisation risk areas
  - Groundwater levels
  - Groundwater quality within the maximum inundation areas
  - Groundwater reference locations.
- Provide monitoring to support an appraisal of the baseline condition of groundwater at each of the sites.
- Detail the performance and condition indicators to detect and monitor groundwater impacts.
- Specify the trigger values for groundwater monitoring.
- Specify the requirements of a reporting program.

A review of the Plan against the conditions of the EPBC Act approval is provided in Addendum A.

7.2 Monitoring locations

The bespoke monitoring locations for each site can be found in the relevant addendum to this Plan [22], [23], and [24].

As noted above, this Plan is specific to conditions raised in the EPBC Approvals Act and the Environmental Management Plan Guidelines. Implementation of this monitoring should be read in conjunction with the Environmental Water Management Plan Reports[3][4][5], which covers the requirements for monitoring for compliance with Victoria Government monitoring requirements.

The monitoring locations satisfy the EPBC approval requirements to monitor the following conditions / purposes:

- Salinisation risk areas (SRAs): Areas which may develop a shallow, saline watertable. These areas have been identified as locations within or adjacent to the footprint of inundation areas (and within areas of existing high salinity groundwater)
- Groundwater quality change or trends within the maximum inundation areas (MIAs): Areas which are within the inundation areas (or immediately adjacent, depending on accessibility for monitoring well placement)
- Groundwater reference locations (GRLs): Areas which are generally outside of the managed inundation areas and which provide a reference for groundwater level and or quality that is regarded as unaffected by the project.

Note that monitoring wells listed as MIA are either within the inundation area or have the potential to be impacted by inundation events, due to their connectivity within adjacent water courses.

The monitoring locations were developed following the completion of the environment effects statement process and have been accepted by the Mallee Catchment Management Authority (Mallee CMA).

The monitoring programs across the sites for each area includes the collection of baseline data to ensure that trigger values are detected if they occur. General monitoring details are provided below, with specific details for each of the three projects (such as monitoring locations) in the relevant addendum to this Plan[22][23][24].

7.3 Monitoring parameters

Monitoring parameters and the monitoring frequency are summarised in Table 7.

Table 7 Monitoring parameters, locations, and frequency

Parameter		Monitoring location(s)	Monitoring frequency
1	Visual inspection of soil and vegetation for signs of salt scalds, vegetation decline, or dry period waterlogging	Within high-risk salinity areas (as defined within the terrestrial ecology reports)	A minimum of once per summer, for two summers, following a managed event.
2	Groundwater level	All Monitoring wells listed in the addendum (see above and project specific addenda).	Monthly (and more than 11 readings per year as a long-term average)[1]
3	Electrical conductivity	All Monitoring wells within 500m of the inundated area planned for any given operational scenario targeted for an inundation event. Note this may be more than 500m from the actual extent of inundation for any single event.	One time within 6 to 9 months after the completion of a managed event.[2]
4	Additional parameters as listed in Table 8	Location where measured electrical conductivity is above the 80th percentile or below the 20th percentile of the baseline distribution of data.	Following measurement of electrical conductivity which is above the 80th percentile or below the 20th percentile of the baseline distribution of data.

Parameter		Monitoring location(s)	Monitoring frequency
5	Additional Field Parameters as listed Table 9	Monitoring wells where groundwater samples are produced from the well (rather than downhole monitoring).	When groundwater samples are produced from the well (rather than downhole monitoring).

Note:

[1] Groundwater level loggers will be recording groundwater levels at a high frequency (i.e. greater than once per day). Collection of groundwater level data will be undertaken monthly.

[2] Best endeavours will be made to monitor EC at a frequency of 6 to 9 months, subject to the accessibility of monitoring well locations.

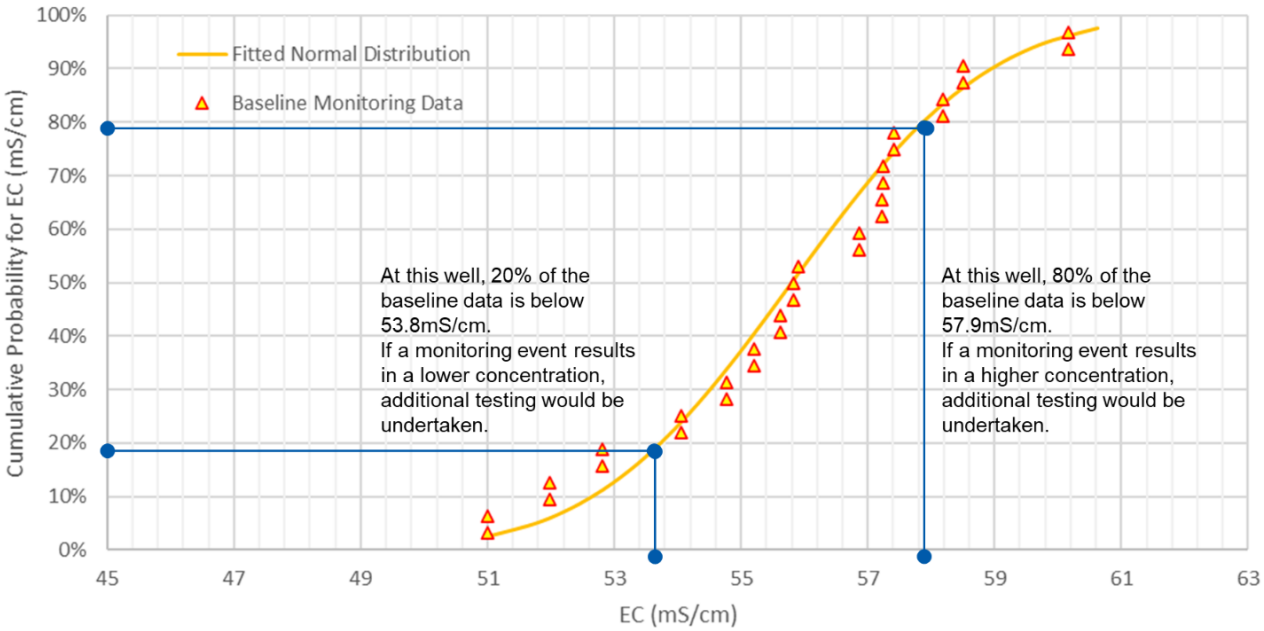


Figure 4 Example baseline dataset showing 80% and 20% probabilities

Table 8 Additional laboratory analyses

Laboratory analyte	Laboratory analyte	Laboratory analyte
Alkalinity (Bicarbonate) as $CaCO_3$	Copper	pH
Alkalinity (Hydroxide) as $CaCO_3$	Total Kjeldahl Nitrogen (TKN)	Phosphorus (Total)
Alkalinity (total) as $CaCO_3$	Lead	Reactive Phosphorus (as Phosphorus)
Ammonia as Nitrogen (Ammoniacal Nitrogen)	Magnesium	Potassium
Arsenic	Mercury	Redox Potential
Cadmium	Nickel	Sodium
Calcium	Nitrate (as Nitrogen)	Soluble Carbonate as $CaCO_3$
Chloride	Nitrite (as Nitrogen)	Sulfate as SO_4
Total Chromium (CrIII+CrVI)	Nitrogen (Total)	Zinc

Table 9 Field groundwater quality parameters

Parameter	Units	Detection limit	Degree of accuracy
pH	pH units	0.1	±0.1
Temperature	°C	0.1	±0.1
Dissolved oxygen	mgO_2/l or %	0.1	±0.1
Electrical conductivity	µS/cm	10	±2.0
Redox potential	mV	±1	±0.1

7.4 Monitoring methodology

7.4.1 Guidance

All groundwater quality monitoring will be undertaken consistent with the National Industry Guidelines for hydrometric monitoring[21], particularly:

- Part 2: Site establishment and operations (NI GL 100 02–2019)
- Part 3: Instrument and measurement systems management (NI GL 100.03-2019).

Groundwater quality monitoring is to be undertaken consistent with the following approaches:

- Groundwater sampling procedures must conform with the requirements of EPA Victoria Publication 669.1: Groundwater Sampling Guidelines (2022)[19]
- Groundwater samples must be issued to a National Association of Testing Authorities (NATA) accredited laboratory for the testing program conducted
- Quality control samples must be collected at a rate of 10%, consistent with Australian guidelines (AS4482.1 Guide to the investigation and sampling of sites with potentially contaminated soil) and best practice, and must incorporate the use of primary and secondary laboratories.

In accordance with EPA Victoria Publication 669.1[19] field parameter measurement of pH, Electrical Conductivity (EC), Dissolved Oxygen, Oxygen Reduction Potential (ORP) and Temperature is required to confirm field parameter stabilisation for all monitoring locations during all monitoring events. Measurement instrumentation will be calibrated per the manufacturer requirements, with evidence of calibration provided in the annual review reports.

The exception to this would be sampling with an approved non-purge method such as a hydra-sleeves (see Section 4.7.3 of EPA Victoria Publication 669.1[19]), however, field parameters will still be measured from the extracted non-purged sample.

7.4.2 Monitoring schedule

Readings shall be taken in all instruments and locations at the frequency and duration noted in Table 7. Monitoring results shall be issued to the Mallee CMA's appointed Supervisor (see Section 2) in a preapproved data format (such as excel, and/or AGS or similar) within a week of being undertaken.

7.4.3 Groundwater monitoring, sampling, and data collection

Upon arrival to the monitoring location, the following will be conducted:

- Purge out any water which has infilled the well box
- Document any deterioration, tampering, or other issues with the well which may compromise its use, integrity, or seal
- Confirm each well location by measuring, recording, and confirming the total depth and well diameter
- Confirm based on the sharpie written well ID at the well. When the ID starts to fade, the sampler will re-write the ID

- Measure the depth to groundwater using a groundwater level sensing 'dip' meter. Prior to use, inspect and ensure the dip meter is operating correctly and has sufficiently charged batteries. Check the measurement against the previous measurement as a check that current measurement is reasonable
- Where downhole monitoring equipment is being used:
  - Download all data and ensure there is sufficient storage to last until the next data collection event.
  - If the groundwater level logger depth appears to have shifted, resecure the level logger to avoid future movement and recalibrate (see the guide illustrated in Figure 5).
  - Remove and inspect the electrical conductivity probe (if present) to validate its calibration, and if needed recalibrate. If the probe has drifted by more than 10% of its calibrated value, collect a groundwater sample for analysis.
- Where the measured EC result is greater than the 80th percentile or below the 20th percentile of the baseline dataset (see Figure 4) a groundwater sample is to be collected for offsite laboratory analysis.
- Where groundwater sampling is needed, sampling will be performed using an appropriate groundwater sampling standard (EPA Publication 668.1[20]).
- Depth to groundwater will be measured prior to any purging or sample is undertaken.
- Insert any in-hole equipment (i.e. low flow pump or hydra-sleeve) and remove carefully to minimize disturbances within the well.
- Field testing for physico-chemical parameters (see Table 9) is to be performed using a flow cell which must be decontaminated between monitoring locations.
- Sample collection (either via low flow or hydra-sleeve) is to be collected from the midpoint of the water column to ensure the sample is representative of the natural groundwater condition.

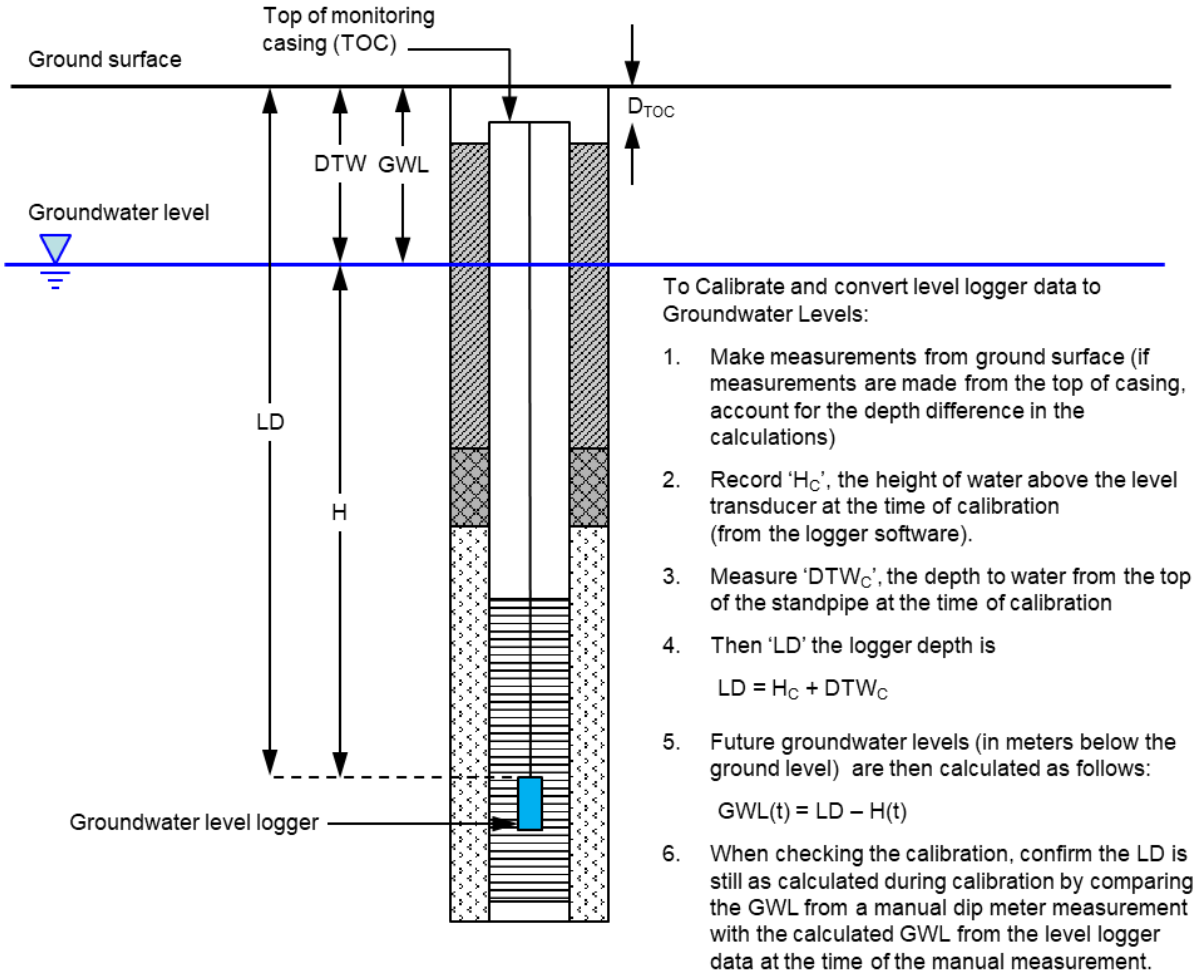


Figure 5 Relating groundwater level logger measurements to groundwater depth measurements.

Any and all equipment, tubing, etc. which has been in contact with groundwater must be sufficiently decontaminated or disposed of as appropriate prior to moving to the next well location. A new hydra-sleeve must be used for each well, as the device is single use and designed to collect only one sample from one well.

At each monitoring point, all field observations and measurements will be recorded on a Field Monitoring Record Sheet. The Field Monitoring Record Sheet will record:

- The monitoring point
- Date and time the monitoring was undertaken
- Description of the appearance of the sample (covering colour, opaqueness/transparency, any cloudiness, presence of suspended sediment or other material
- Smell (if there is a smell)
- Weather conditions.

Monitoring Record Sheets shall be collated and provided as a project deliverable together with the spreadsheet.

Where samples are collected for analysis by a laboratory, sufficient water samples (as directed by the contracted laboratory) shall be taken to allow laboratory testing within the appropriate sample holding time. Note that only an Australian certified analytical laboratory shall be used for laboratory analyses.

Care shall be taken to ensure that no cross-contamination occurs either during extraction of the water sample from the sampling well or whilst the sample is stored and handled prior to analysis, including the use of nitrile sampling gloves replaced for each new sample. If practical, photos shall be collected documenting appearance and visual evidence of turbidity in the collected groundwater samples.

The groundwater sample will be clearly labelled with sample number, date and time, and required analyses using the bottle types provided in accordance with the parameters being sampled (if needed), following all procedures with respect to pre-treatment (e.g. filtration) and sample preservation (in dedicated bottles prepared by the accredited laboratory), and taking all measures to prevent sample contamination (e.g. wearing sampling gloves whenever a sample is being collected and replacing gloves between samples).

Once the groundwater sample collection is completed, the sampler shall cap the standpipe installation and reinstate the original state of the well prior to sample collection.

7.4.4 Handling, storage and laboratory analysis

All samples shall be immediately chilled and stored at between 1°C and 5°C. Temperature of the samples will be checked upon receipt at the laboratory and recorded to demonstrate that the samples had been transferred in refrigerated conditions (cool boxes containing ice blocks).

Whilst the sampling methodology has been described above, the selected analytical laboratory shall be consulted (if laboratory analyses are included) to confirm filtration, preservation, and storage requirements in accordance with the guidance outlined above. Where the laboratory requirements differ from the detail provided above, the Investigation Supervisor shall be consulted.

The sample shall be dispatched to the laboratory on the same day. Laboratory analyses shall be carried out within the holding time for all determinants.

7.4.5 Quality control procedures

Best practice monitoring should include provisions for quality control procedures to be built into the monitoring design. The purpose of these procedures is to provide confidence that the monitoring has delivered high quality data that is suitable as baseline data against which any future environmental impact can be adequately assessed.

Quality control procedures are designed to check the effectiveness and reproducibility of the monitoring, sampling process and laboratory analytical procedures. Such procedures also help to demonstrate that correct sampling techniques have excluded the possibility of sample contamination occurring. Any exceptional results from the quality control sampling will be investigated and repeat analysis undertaken where necessary.

Where samples are collected for laboratory analyses, two main quality control procedures will be undertaken in addition to those described for physico-chemical parameters:

- Field blanks – these are samples prepared in the field using laboratory grade de-ionised water, which are analysed in the laboratory to demonstrate that no sampling contamination occurs on the monitoring round.
- Split duplicate samples – these are groundwater samples that are prepared in the field by splitting one well mixed sample into two sample bottles for analysis. The purpose of this is to demonstrate the degree of precision delivered by the laboratory analysis for all parameters monitored at a given location.

The monitoring will include 5% quality assurance samples to be collected as part of the best practice approach in water sampling (i.e. field duplicates) at a minimum frequency of one sample per monitoring event. Analytical results from these quality assurance samples will be checked by the appointed Monitoring Contractor (see Section 2). The quality assurance and quality control of these samples shall be reported separately to demonstrate they have been undertaken, and that the results are valid.

The Monitoring Contractor shall notify the Mallee CMA Supervisor immediately when monitoring installations cannot be accessed and/or sampled and shall notify the Investigation Supervisor within 24 hours of any other deviations to this specification. Following the completion of each monitoring event, a field monitoring record shall be provided within 5 days confirming which samples have been collected.

7.4.6 Data management

The management of data, including data storage and analysis, are the responsibility of Mallee CMA undertaking the monitoring and reporting as outlined within this Plan (refer to Section 2).

7.5 Limits and trigger Levels

7.5.1 Selection of trigger Level

Trigger levels will need to be selected for groundwater levels and electrical conductivity at each monitoring location. The methodology is generally as follows:

- Establish baseline conditions prior to an inundation event (see below).
- For groundwater levels: Take 2m below the lowest baseline measurement for each monitoring well as the trigger level for each monitoring well.
- For electrical conductivity: Use the maximum measurement from the baseline dataset from each well as the trigger level for each well.

7.5.2 Justification for selection of trigger levels

Justification for the selection of groundwater level and electrical conductivity trigger levels is summarised in the following sections.

7.5.2.1 Groundwater level

As outlined within the EES[1] and ER[2] groundwater technical reports, during the operational phase, the level of effect on groundwater levels is considered low. A 'low' level of effect for water dependent terrestrial vegetation and land salinisation, was defined as a rise in the groundwater above the natural range but remains more than 2 m below the surface (i.e. depth to water is below 2 mbgl). Based on this assessed level of effect, the groundwater depth during operation is anticipated to be at or below 2 mbgl.

The EES[1] and ER[2] outline that vegetation dependency on groundwater across the project area is limited to large trees with deep and extensive root systems capable of accessing groundwater. Given that the depth to groundwater across most of the project area is generally greater than 2 mbgl, most vegetation types, such as shrubs, understorey species and groundcover, do not possess root systems deep enough to reliably access groundwater and are therefore not groundwater-dependent. Conversely, large trees have extensive root systems to be able to reliably draw from groundwater and thus be dependent on groundwater, particularly in floodplain areas where groundwater may be shallower.

In addition, a review of the projects groundwater level data was undertaken which assessed the probability distribution of groundwater levels across each site based on existing available data. Addendum B presents the groundwater level probability distribution for the project, noting that obvious anomalies have been removed. These distributions indicate that over one-third of locations (10 out of 27 locations) have natural groundwater levels which are less than 5mbgl. However, only two of the 27 locations have natural groundwater levels less than 2mbgl (less than 10%). Adopting a relatively deep groundwater level as a trigger level (for example 5mbgl, would result in many false positives during implementation of the plan).

For these reasons, a trigger level of 2mbgl has been selected as an appropriate trigger level for the project.

7.5.3 Baseline monitoring

The monitoring locations will be a mixture of existing locations and locations installed specifically for this project. For existing locations, publicly available data will be utilised along with any other project related monitoring data to develop a baseline dataset. Data can be obtained from the Victorian Government WMIS portal[12], BoM Groundwater Database[13] or from records in Visualizing Victoria's Groundwater (VVG) web portal[11].

For all installations, a minimum of one monitoring event per year will be conducted prior to the start of the first inundation event.

The trigger level can be updated by increasing the dataset using results from future monitoring events. However, a trigger levels can only be selected if additional results are confirmed to be unaffected by inundation events. For example, Figure 6 presents existing EC data for an example well location. In this example:

- The trigger level would be 60.2mS/cm (the maximum EC concentration in the baseline dataset).
- If a future monitoring event returned a result of 61mS/cm, then 61mS/cm would become the new trigger value, if the higher EC value was not caused by site activities.

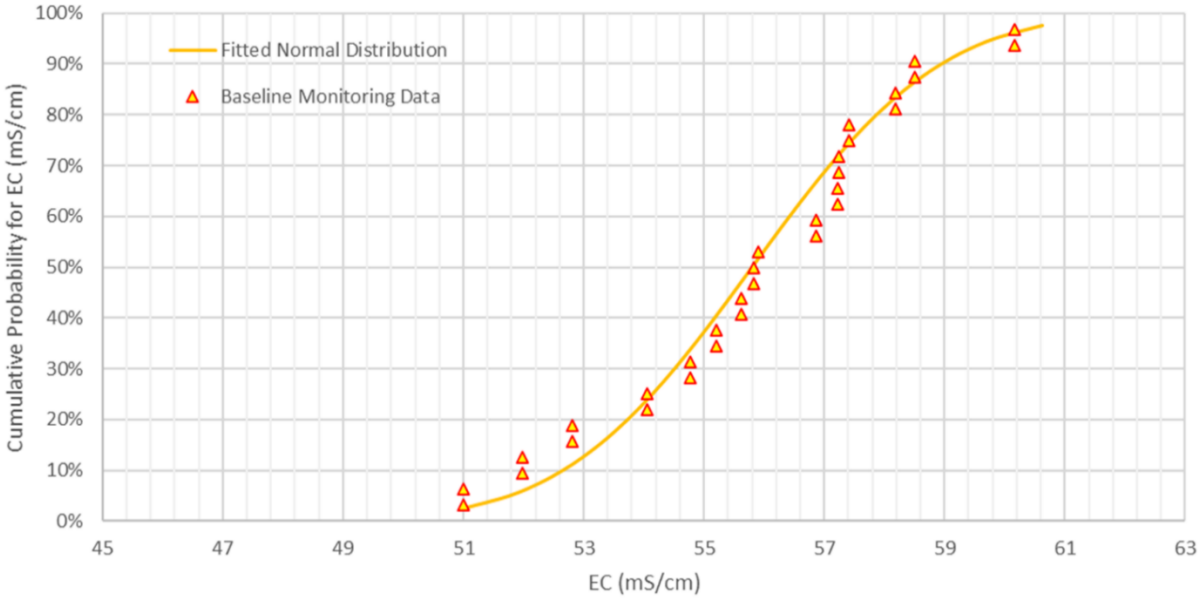


Figure 6 Example of a normalised cumulative distribution of EC data

7.6 Corrective actions

Because identified risks are low, the groundwater monitoring plan presented in this document is expected to validate the assessed lack of adverse impacts from changes in groundwater conditions. Groundwater levels and salinity will be monitored and assessed against trigger levels which have been based on baseline conditions.

Where exceedances of trigger levels are identified, measures will be implemented to evaluate the cause of the trigger and to assess what corrective actions are practical to implement to minimise the risk of future exceedances and/or bring levels back into the baseline range.

When reviewing trigger level exceedances, it is important to remember that trigger level exceedances are not conclusive evidence that project activities have caused adverse impacts. Exceedances can occur for a variety of reasons, one of which is due to project activities. Other reasons can be due to data quality issues, impacts from other groundwater users, and/or changes to climatic conditions which are not represented by the baseline data set.

For this reason, the first actions will be to:

- Verify that the exceedance is not due to error or data quality issues (while still on site and/or shortly afterwards)
- Evaluate the potential cause of the exceedance.

If there is sufficient evidence that the cause of the exceedance is due (or partially due) to project activities, a corrective action plan will be developed (such a plan may be incorporated into an adaptive management plan). The corrective action plan may include adjustments to the EWMP and/or OEMP to improve environmental outcomes from future inundation events (adaptive management).

Note that where a justified exceedance is reported, corrective action responses for subsequent inundation events may include some or all of the following:

- Management of the event by altering the volume, frequency or duration of watering[1].
- Targeted intervention including localised diversions / changes in water flow direction related to relatively small areas which may be responding poorly to managed inundation events.

Salinity impacts on groundwater and/or the downgradient Murray River will be challenging to mitigate. The most likely course of corrective action will be to evaluate the hydraulics occurring during inundation events to understand how the hydraulics differ from those modelled during the environment effects statement process, which were ultimately determined to be of low risk. The use of an adaptive management strategy to develop corrective actions is discussed in Section 8.6.

8 Implementation

8.1 Commencement and duration

This Plan will be implemented from the commencement of the Action until the expiry dates of the approvals, 30 June 2049.

8.2 Reporting

The reporting program for the GWMRP is designed to meet the requirements of condition of the EPBC Approvals[14] (Addendum A) including:

- Publication on the website of data collected in accordance with the GWMRP
- Notification of the commencement and cessation of managed watering events
- Publication of the inundation extent of managed watering events as a shapefile
- Publication of the inundation event of managed watering events as a shapefile publication of the date(s), location, parameter(s), and level(s) of event based monitoring in the floodplain environment undertaking during the reporting period, including presentation as a table
- Notification of any detection of trigger values
- Publication of the trigger action response plan identifying the corrective, mitigation, and any adaptive management measures proposed or undertaken to investigate, to undertake corrective actions and/or to implement procedural changes to prevent the recurrence of the adverse level and/or to remedy any actual or potential harm to protected matters
- Provision of links to other relevant plans or conditions of approval, including state agency and MDBA approval conditions
- Provision of a schedule of reporting and review mechanisms to demonstrate compliance with the commitments made in the GWMRP.

This Plan will be reviewed following each managed inundation event. The Plan will be reviewed sooner if implementation of the Plan identifies updates that need to be made or if new information becomes available that relates to the Plan. The Plan will also be reviewed following significant environmental incidents and/or when there is a need to improve performance in an area of environmental impact.

Any revisions to this Plan must be made in accordance with conditions of the EPBC approvals, which state '*The approval holder may, at any time, apply to the **Minister** for a variation to a **plan**, program or strategy approved by the **Minister**, by submitting an application in accordance with the requirements of section 143A of the **EPBC Act**. If the **Minister** approves a revised **plan** then, from the date specified, the approval holder must implement the plan in place of the previous **plan**.*'

[1] Stopping or changing the discharge rates will require consideration of a range of factors in the context of current and future watering events. This includes consideration of the operational ability to stop or limit discharge rates (e.g impacts on broader system and floodplain management requirements), timing of watering events, and impacts on other environmental and cultural values, community safety and overall improvements to biodiversity. In practice, stopping or changing discharge rates will most likely apply to future watering events.

As per the EDS, a report will be generated every five years and/or following monitoring of an event defined as a 'large event' within the EWMP.

Other notifications are discussed below in Section 8.4.

8.3 Publication of data

Data collected as part of the monitoring programs for the project sites must be published on the project website. This includes:

- Shapefile data of the inundation extent of managed watering events
- Details of event-based monitoring in the floodplain environment including the data, location, parameters and levels undertaken during the reporting period
- Trigger action response plan identifying the corrective, mitigation and any adaptive management measures proposed or undertaken to investigate, to undertake corrective actions and/or to implement procedural changes to prevent the recurrence of the adverse level and/or to remedy any actual or potential harm to protected matters.
- Each audit report (Section 8.5) must be submitted to the Department for review and published on the website.

8.4 Notifications and non-compliances

Non Compliance Notification: As noted above and as per the EPBC Act approval conditions, notification needs to be provided:

- At the commencement and cessation of managed watering events
- When any trigger values are detected or there are changes in the performance and condition indicators limits and when adverse events occur.
- Any incident (i.e. an event which has the potential to, or does, impact on EPBC Act protected matters), non-compliance with the EPBC Act approval conditions or non-compliance with the commitments made in this Plan must be reported to the DCCEEW within two business days of becoming aware of the incident or non-compliance.
- The details of the incident and/or potential non-compliance and/or actual non-compliance with the conditions or commitments made in the Plan must be provided in writing to DCCEEW within 12 business days of becoming aware of the incident or non-compliance.

The department is be notified via the following details:

Branch Head, Environment Assessments (Vic, Tas) and Post Approvals Branch
Environment Regulation Division (DCCEEW)
epbcmonitoring@dcceew.gov.au

8.5 Auditing and review

The Plan will be reviewed annually. The Plan will however be reviewed sooner if implementation of the Plan identifies updates that need to be made or if new information becomes available that relates to the Plan. The Plan will also be reviewed following significant environmental incidents and/or when there is a need to improve performance in an area of environmental impact.

Any revisions to this Plan must be made in accordance with conditions of EPBC approvals, which state '*The approval holder may, at any time, apply to the **Minister** for a variation to a **plan**, program or strategy approved by the **Minister**, by submitting an application in accordance with the requirements of section 143A of the **EPBC Act**. If the **Minister** approves a revised **plan** then, from the date specified, the approval holder must implement the plan in place of the previous **plan**.*'

An independent audit of compliance with the conditions of the EPBC Act Approval must be conducted every 5 years following the commencement of works. Each audit report must be submitted to the Department for review and published on the website.

8.6 Adaptive management

The GWMRP forms a core component of the adaptive management cycle for environmental water outlined in the Environmental Management Frameworks[6][7] for the project sites and in Figure 7. This Plan facilitates the monitoring,

reporting, and evaluation of project performance relative to project objectives and trigger values and incorporates new scientific and operational information into the implementation of the project.

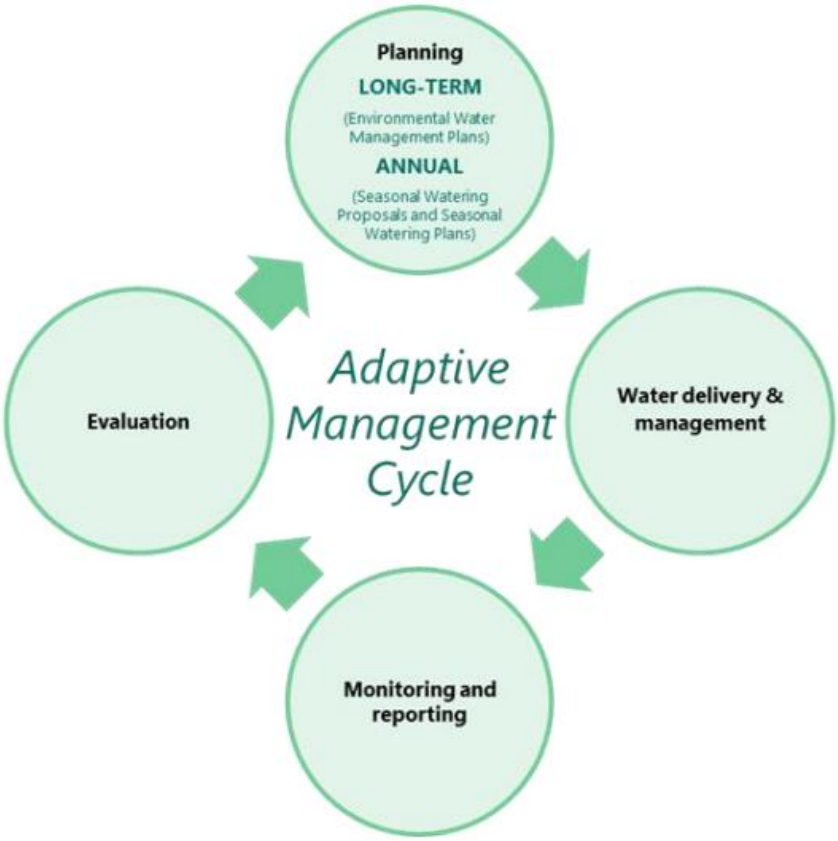


Figure 7 Adaptive management cycle for environmental water [6][7]

An adaptive management approach is essential as it recognises the inherent uncertainties and risks associated with the complex relationships between changes to hydrology and ecological responses, and the potential for a managed watering event to provide both positive and adverse outcomes. Adaptive management is informed by three main pathways (also referred to as lessons):

- Monitoring to detect exceedances of the trigger values
- Incidental observations by managers, operators or other observers that identify opportunities to reduce risk or improve outcomes
- Research or investigations into hydraulic or ecological management practices that could improve the conceptual models on which operations are based.

Should one of the three main pathways identify a need for an adaptive management response, corrective actions may include (but are not limited to) development or revision of a trigger action response plan, revision of trigger values, and/or modifying/introducing new procedural controls. All updates will be documented and incorporated into future versions of the GWMRP as per the requirements of Sections 8.2 and 8.4.

References

[1] R8, 2022. Victorian Murray Floodplain Restoration Project, Specialist Assessment D Groundwater, Environmental Effects Statement, EES Central: Belsar-Yungera and Hattah Lakes North. Document number: IS371000-SC-GW-RP-021, Dated August.

[2] R8, 2022. Victorian Murray Floodplain Restoration Project, Specialist Assessment D Groundwater, Environment Report, ER Central: Vinifera, Nyah and Burra Creek. Document number: IS371000-SC-GW-RP-022, Dated September

[3] Mallee Catchment Management Authority, 2023. *Hattah Lakes Environmental Water Management Plan*, Mallee CMA, Irymple, Victoria, Dated 2023

[4] Mallee Catchment Management Authority, 2023. *Nyah Environmental Water Management Plan*, Mallee CMA, Irymple, Victoria, Dated 2023

[5] Mallee Catchment Management Authority, 2023. *Vinifera Environmental Water Management Plan*, Mallee CMA, Irymple, Victoria, Dated 2023

[6] VMFRP, 2025a. Environmental Management Framework: Hattah Lakes North Floodplain Restoration Project and Belsar-Yungera Floodplain Restoration Project. Victorian Murray Floodplain Restoration Project, Mildura.

[7] VMFRP, 2025b. Environmental Management Framework: Vinifera Restoration Project and Nyah Floodplain Restoration Project. Victorian Murray Floodplain Restoration Project, Mildura.

[8] VMFRP, 2025c. Ecology Monitoring and Reporting Program. Victorian Murray Floodplain Restoration Project, Mildura.

[9] Department of Transport and Planning, Victoria, 2023. *Minister's Assessment: Vinifera and Nyah Floodplain Restoration Projects. Victorian Murray Floodplain Restoration Project.* Available at: https://www.planning.vic.gov.au/__data/assets/pdf_file/0024/686301/VMFRP_Vinifera-Nyah_Ministers-Assessment.pdf

[10] Department of Transport and Planning, Victoria, 2023. *Minister's Assessment: Belsar-Yungera and Hattah Lakes North Floodplain Restoration Projects.* Victorian Murray Floodplain Restoration Project. Available at: https://www.planning.vic.gov.au/__data/assets/pdf_file/0032/664556/VMFRP_EESCentral_Ministers-Assessment.pdf

[11] Visualising Victoria's Groundwater (VVG), 2025. vvg.org.au. accessed 12 September 2025.

[12] Department of Energy, Environment and Climate Action (DEECA), 2024. Victorian Water Measurement Information System (WMIS): Stations overview. Available at: https://data.water.vic.gov.au/WMIS/#/overview/stations

[13] Bureau of Meteorology (BoM) 2026, Australian Groundwater Explorer, Australian Government, https://www.bom.gov.au/water/groundwater/explorer/map.shtml.

[14] Department of Climate Change, Energy, the Environment and Water, 2022. Notification of approval: Hattah Lakes North (EPBC:2020/8632), Nyah (EPBC: 2020/8648) and Vinifera (EPBC: 2020/8647) Floodplain Restoration Project. Australian Government. March 2024

[15] Arup, 2024. VMFRP Ecological Thresholds and Ecological Triggers Summary Report. Mallee Catchment Management Authority. Document reference: 303094-ENEM-RPT-0001. 14 August 2024

[16] Australian and New Zealand Environment and Conservation Council (ANZECC), 2000. Australian and New Zealand Guidelines (ANZG) for Fresh and Marine Water Quality. Australian and New Zealand Governments and Australian state and territory governments. As amended 2018

[17] Department of Climate Change, Energy, the Environment and Water, 2024. Environmental Management Plan Guidelines. Commonwealth of Australia, Canberra. Available at: https://www.dcceew.gov.au/sites/default/files/documents/environmental-management-plan-guidelines.pdf

[18] Environment Protection Authority Victoria (EPA Victoria) 2022, Environment Reference Standard, State Government of Victoria, Melbourne, <https://www.epa.vic.gov.au/environment-reference-standard>

[19] Environment Protection Authority (EPA) Victoria, 2022. *Groundwater Sampling Guidelines: Publication 669.1.* EPA Victoria. Available at: https://www.epa.vic.gov.au/sites/default/files/epa/publications/669-1-groundwater-sampling-guidelines.pdf

[20] Environment Protection Authority Victoria (EPA) Victoria, 2022*. Hydrogeological assessment guidelines for groundwater quality, Publication 668.1,* EPA Victoria. https://www.epa.vic.gov.au/sites/default/files/epa/publications/668-1-hydrogeological-assessment-guidelines-pdf.

[21] Bureau of Meteorology (Water Monitoring Standardisation Technical Committee), 2019. National Industry Guidelines for hydrometric monitoring, February 2019

[22] Arup, 2025a. Victorian Murray Floodplain Restoration Project, Groundwater Monitoring and Reporting Program – Addendum Report: Hattah Lakes Floodplain Restoration Project
[23] Arup, 2025b. Victorian Murray Floodplain Restoration Project, Groundwater Monitoring and Reporting Program – Addendum Report: Nyah Floodplain Restoration Project
[24] Arup, 2025c. Victorian Murray Floodplain Restoration Project, Groundwater Monitoring and Reporting Program – Addendum Report: Vinifera Floodplain Restoration Project

Addendum A: EPBC Act approval conditions

Ref	Condition No. (Vinifera & Nyah)	Condition No. (Hattah)	Condition requirement	Plan reference	Demonstration of how the plan addresses condition requirements and commitments made in the plan to address condition requirements
1	18	19	The approval holder must submit a Groundwater Monitoring Program (GWMRP) to the department prior to the commencement of the Action for the Minister's approval. The approval holder must not commence the Action until the GWMRP has been approved in writing by the Minister.	This document	N/A
2	19	20	The environmental outcome of implementing the GWMRP is to ensure and demonstrate through scientific evidence that the requirements of condition 1 are met.	This document	The monitoring actions, trigger values, and corrective measures included in this Plan will be implemented to ensure and demonstrate through scientific evidence that the requirements of condition 1 are met.
3	20a	21a	The GWMRP must: a) be prepared by a suitably qualified groundwater expert.	Quality Information	Arup is a global consultancy with expertise in developing GWMRPs. The report has been authored by competent hydrogeologists and peer reviewed for quality assurance.
4	20b	21b	b) be prepared in accordance with the Environmental Management Plan Guidelines.	Addendum A	This table evidences the relevant GWMRP sections for each of the EMP guidelines.
5	20c	21c	c) reference the EPBC Act approval conditions to which the GWMRP refers.	Addendum A	This table can be used as an index, highlighting relevant sections in the GWMRP which relate to the EPBC act conditions.
6	20d	21d	d) set out and be informed by baseline data of water quality parameters.	Section 7.5 and Addenda	Section 7.5 presents the method to develop a set of baseline data. Project specific addenda present baseline data collected to date.
7	20e(i)	21e(i)	e) specify how, when and where all of the following characteristics will be monitored: i. salinisation risk areas,	Project specific Addenda	Monitoring locations are tabulated in the project specific Addenda indicating which locations are located within salinisation risk areas. Location maps are also presented in project specific Addenda.
8	20e(ii)	21e(ii)	ii. groundwater quality within the maximum inundation area.	Project specific Addenda	Monitoring locations are tabulated in the project specific Addenda indicating which locations are located within salinisation risk areas. Location maps are also presented in project specific Addenda.

Ref	Condition No. (Vinifera & Nyah)	Condition No. (Hattah)	Condition requirement	Plan reference	Demonstration of how the plan addresses condition requirements and commitments made in the plan to address condition requirements
9	20e(iii)	21e(iii)	iii. groundwater reference locations.	Project specific Addenda	Monitoring locations are tabulated in the project specific Addenda indicating which locations are located within salinisation risk areas. Location maps are also presented in project specific Addenda.
10	20f(i)	21f(i)	f) detail a monitoring program specifying: i. measurable performance indicators to detect possible groundwater impacts.	Section 6	The monitoring program is presented in Section 6 and includes the basis for and selected trigger levels.
11	20f(ii)	21f(ii)	ii. measurable condition indicators to monitor possible groundwater impacts.	Section 6	The monitoring program is presented in Section 6 and includes the basis for and selected trigger levels.
12	20f(iii)	21f(iii)	iii. baseline data of the general water quality of the groundwater environment and the groundwater environment water quality thresholds, including reference locations.	Project specific Addenda	Project specific Addenda present available baseline data.
13	20f(iv)	21f(iv)	iv. site specific water quality limits for key parameters including, but not limited to, salinity.	Project specific Addenda	Project specific Addenda present trigger levels for electrical conductivity which will be used as a surrogate for salinity.
14	20f(v)	21f(v)	v. trigger values for corrective measures.	Project specific Addenda	Project specific Addenda present trigger levels for groundwater levels and presents trigger levels for electrical conductivity which will be used as a surrogate for salinity.
15	20f(vi)	21f(vi)	vi. the timing, frequency, and depth of monitoring, ensuring monitoring is capable of detecting trigger values and changes in the performance and condition indicators.	Section 6	The monitoring program is presented in Section 6 and includes the timing, frequency, and depth of monitoring. The monitoring plan is capable of detecting trigger values.
16	20f(vii)	21f(vii)	vii. proposed corrective and mitigation measures which will be undertaken, and the timing of those measures, if trigger values or changes in the performance and condition indicators are reached.	Sections 7.6 and 8.6	Sections 7.6 and 8.6 lay out how corrective actions will be developed, including the project's adaptive management strategy.

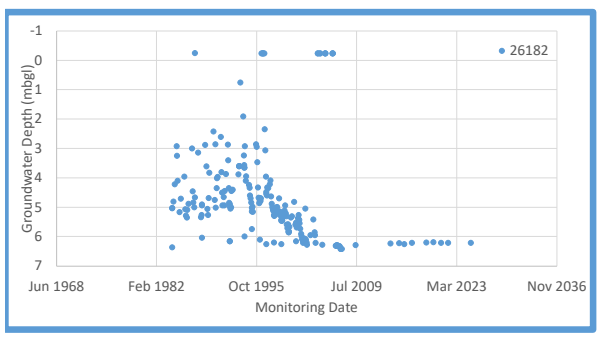
Ref	Condition No. (Vinifera & Nyah)	Condition No. (Hattah)	Condition requirement	Plan reference	Demonstration of how the plan addresses condition requirements and commitments made in the plan to address condition requirements
17	20g(i)	21g(i)	g) specify a reporting program including: i. publication on the website of data collected in accordance with the GWMRP	Section 8.3	Section 8.3 confirms that data will be published on a website.
18	20g(ii)	21g(ii)	ii. notification of the commencement and cessation of managed watering events.	Section 8.4	Section 8.4 confirms that notifications will be provided for these events.
19	20g(iii)	21g (iii)	iii. notification of detection of trigger values, changes in the performance and condition indicators limits and adverse events.	Section 8.4	Section 8.4 confirms that notifications will be provided for these events.
20	20h	21h	h) include links to other relevant plans or conditions of approval, including state and MDBA approval conditions.	Throughout this plan and Addenda	All suitable regulatory guidance documentation has been reviewed and referenced where required
21	20i	21i	i) detail the spatial extent of the floodplain environment and the governance structure applying to groundwater relevant to the Action area.	Project specific Addenda	Each of the assessment areas has an associated supplementary document which provides greater information. These should be read in conjunction with this GWMRP document.
22	20j	21j	j) include a schedule of reporting and review mechanisms to demonstrate compliance with the commitments made in the GWMRP.	Section 8.2	Section 8.2 lists the minimum reporting requirements.
23	20k	21k	k) include an assessment of risks relating to salinisation to the groundwater environment and risk management strategies and/or mitigation measures that will be applied to address identified risks.	Section 5	Section 5 summarises previously developed risk assessments.
24	21	22	The approval holder must implement the approved GWMRP from the commencement of the Action until the expiry date of this approval.	Section 8.1	Section 8.1 confirms this requirement.

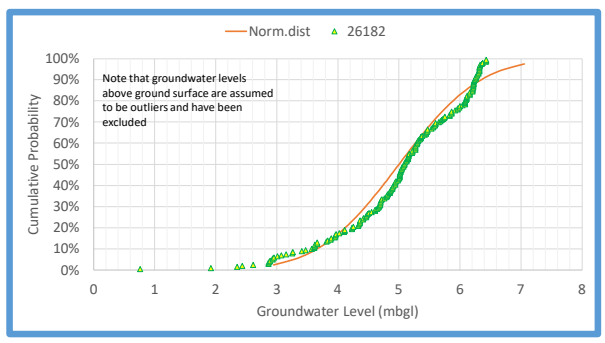
Ref	Condition No. (Vinifera & Nyah)	Condition No. (Hattah)	Condition requirement	Plan reference	Demonstration of how the plan addresses condition requirements and commitments made in the plan to address condition requirements
25	22	23	If the Minister is not satisfied with the availability of monitoring data provided under the GWMRP conditions or, if an adverse level was detected and the Minister is not satisfied that implemented corrective actions and/or procedural changes will remedy, or have remedied, any actual or potential harm to protected matters, the Minister may direct in writing that the approval holder: a) provide specified additional data and/or evidence, b) implement specified corrective actions and/or procedural changes at the expense of the approval holder, c) within a timeframe specified by the Minister submit to the department, for the Minister's written approval, an Offset Management Plan (OMP) that details how specified residual harm to protected matters as a result of the Action will be compensated for, and/or d) pause the taking of a specified part of the Action until the Minister subsequently advises in writing that the approval holder may resume taking the specified part of the Action. The approval holder must comply with any such reasonable direction.	Section 1.1	Section 1.1 acknowledges this requirement.

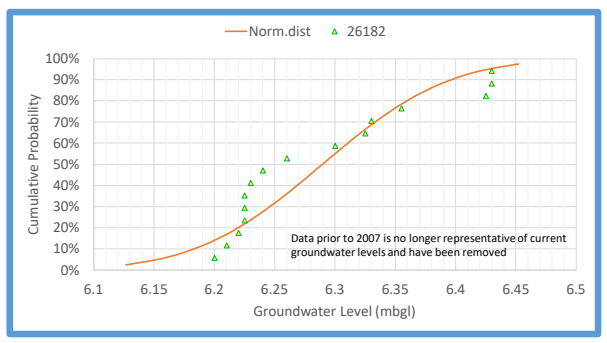
Addendum B: Statistical analysis for trigger levels

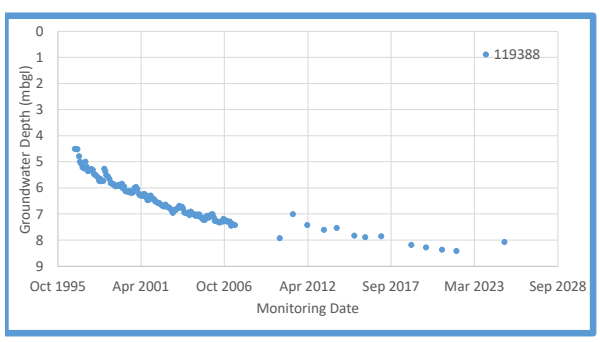
Timeseries data | **All data** | **Final dataset**

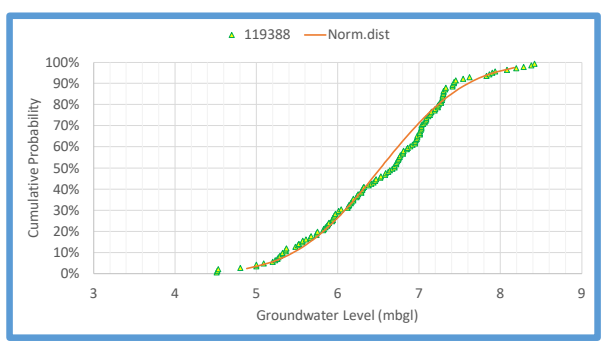
Site Name: Vinifera

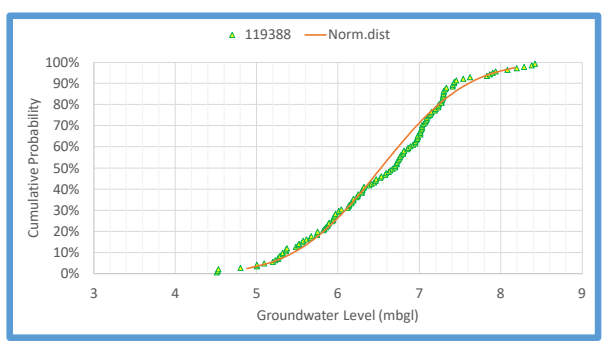


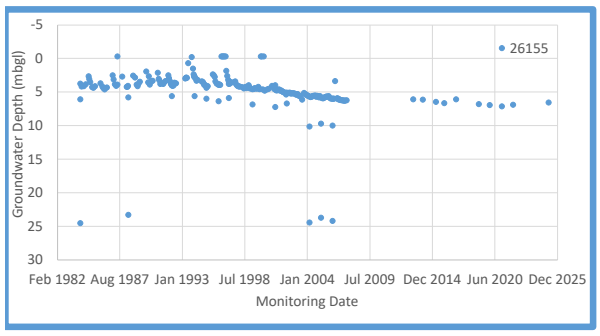


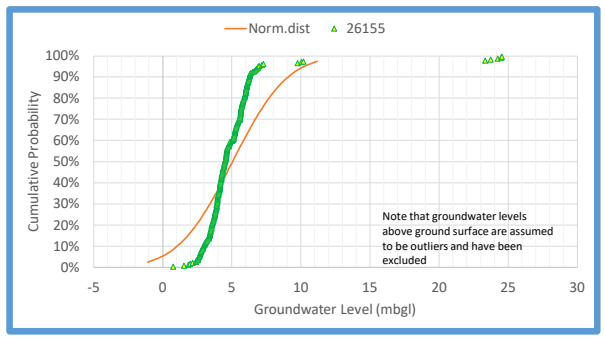


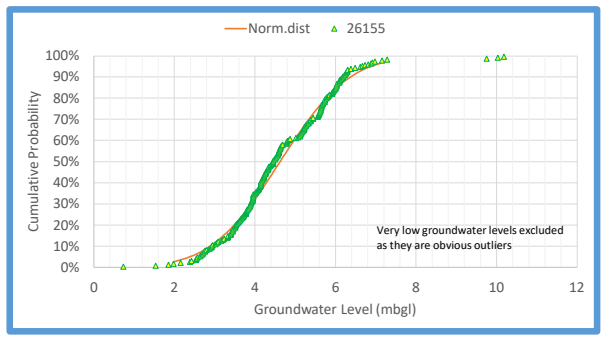


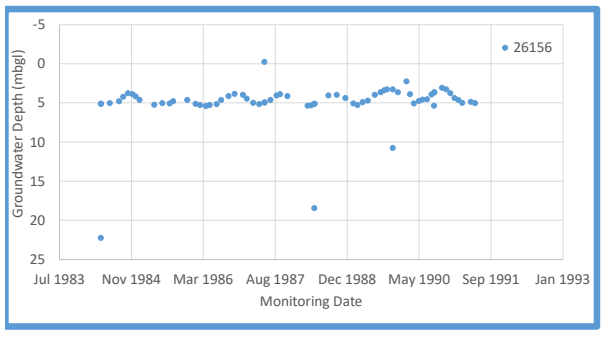


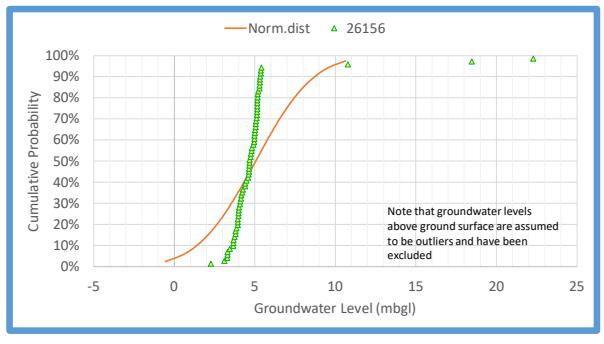


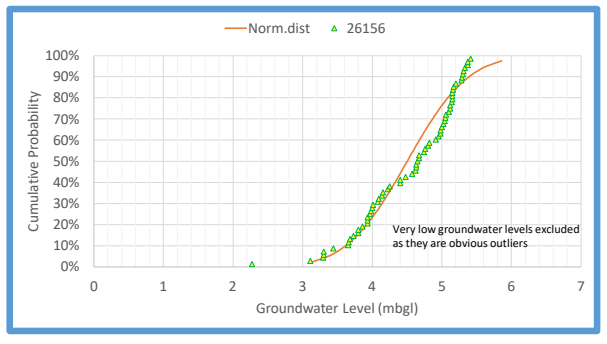


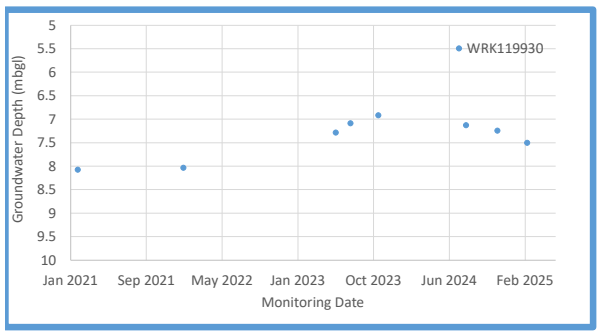


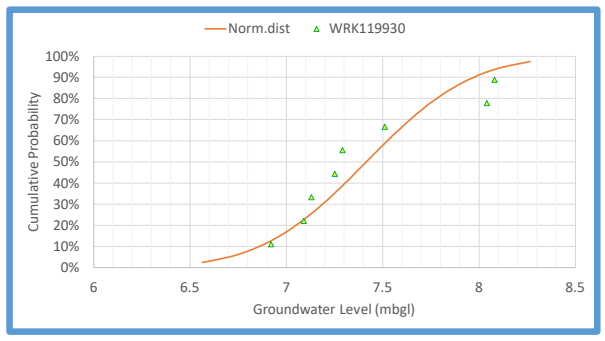


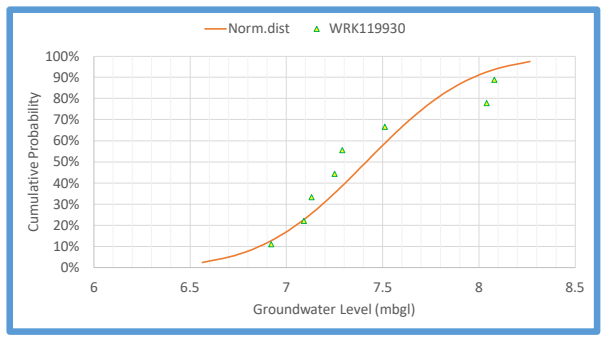


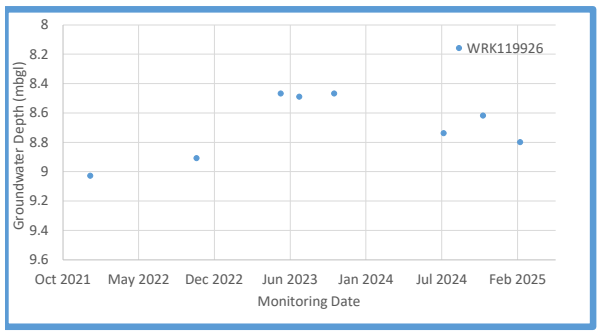


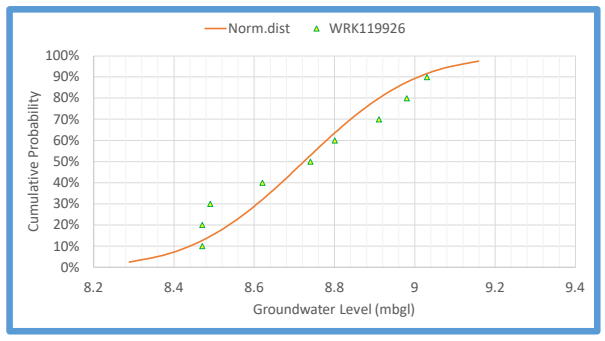


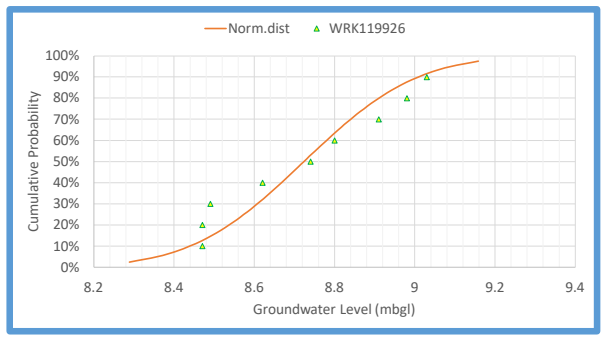


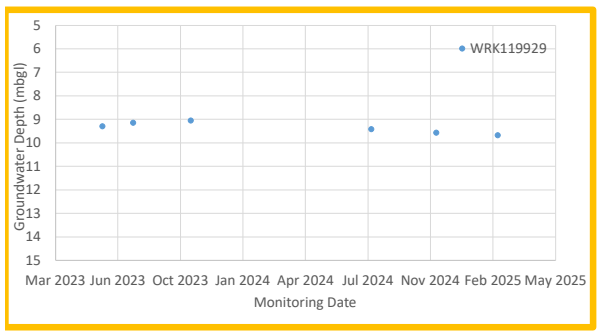
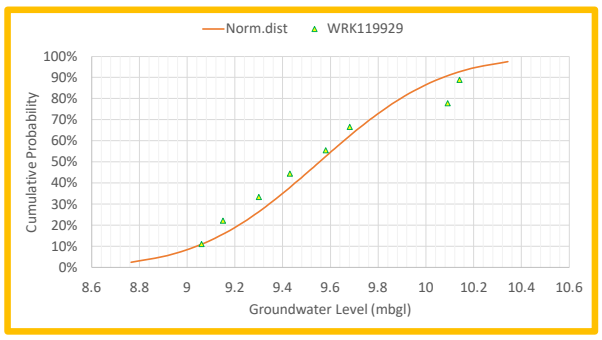
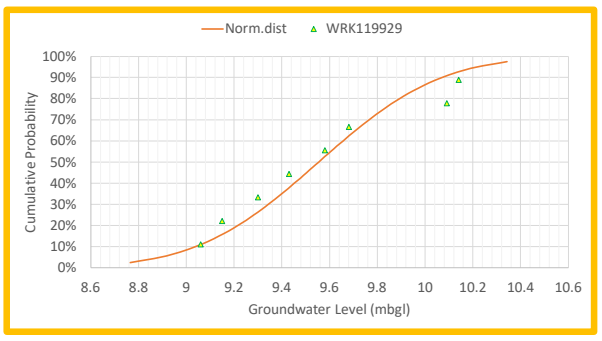
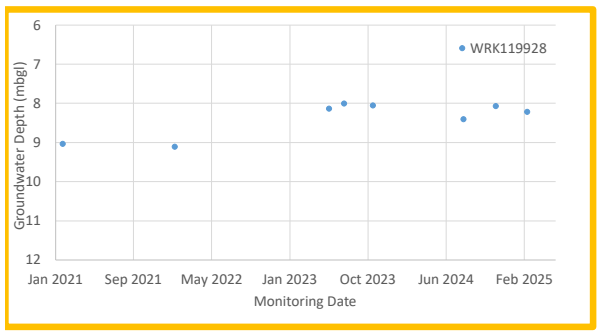
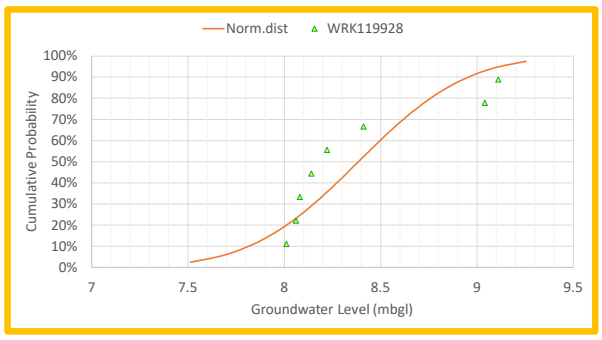
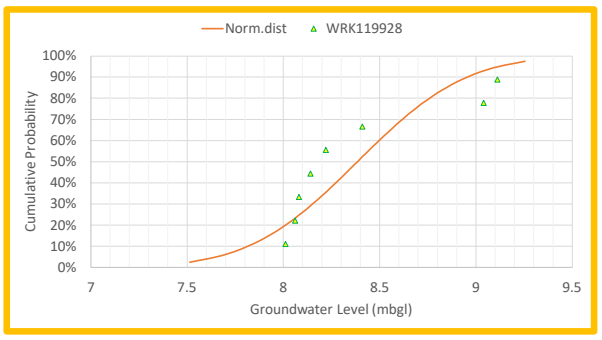
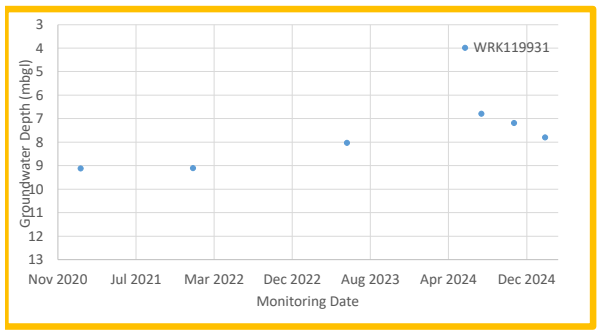
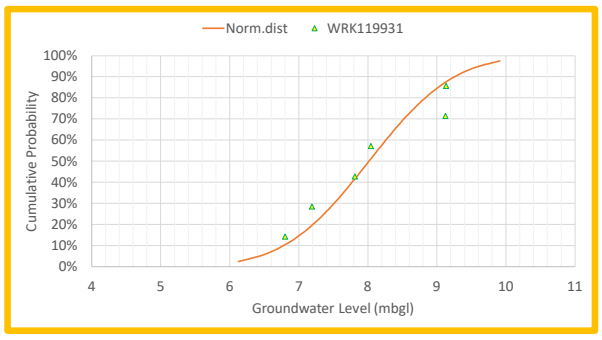






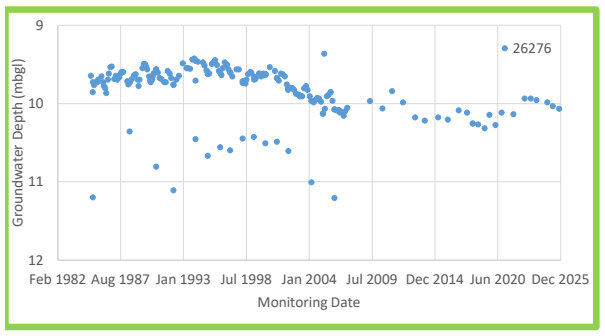


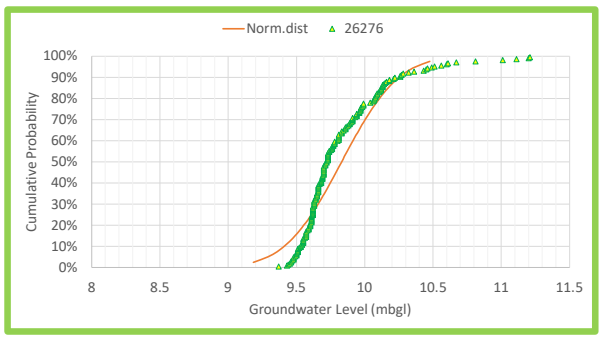


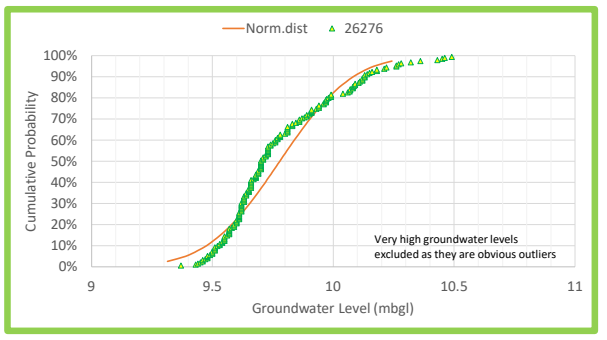
Timeseries data	All data	Final dataset
Site Name: Nyah		
		
		
		

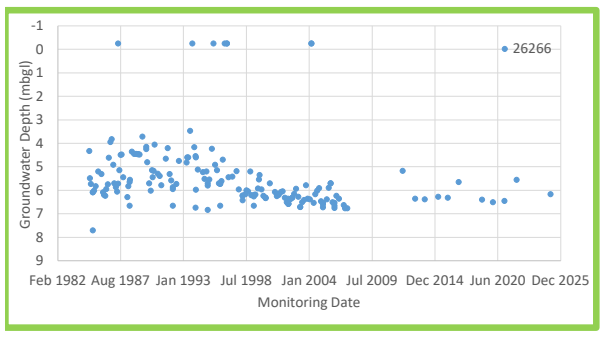
Timeseries data | **All data** | **Final dataset**

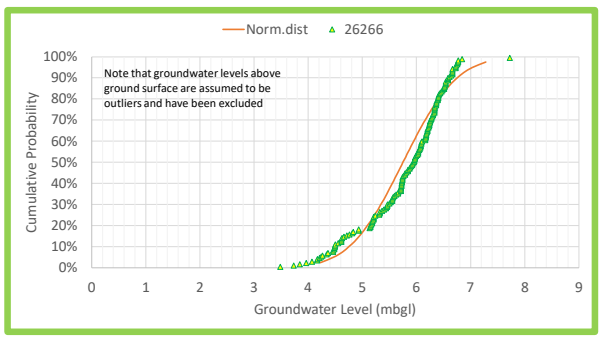
Site Name: Hattah Lake North

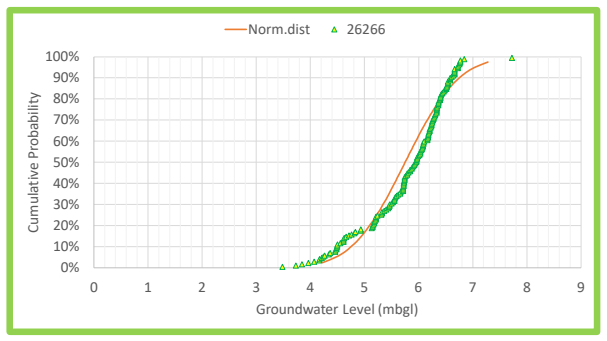


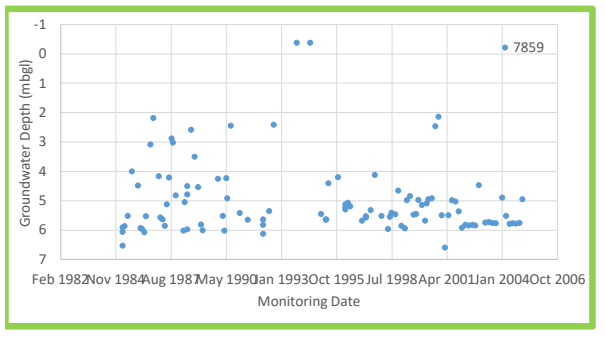


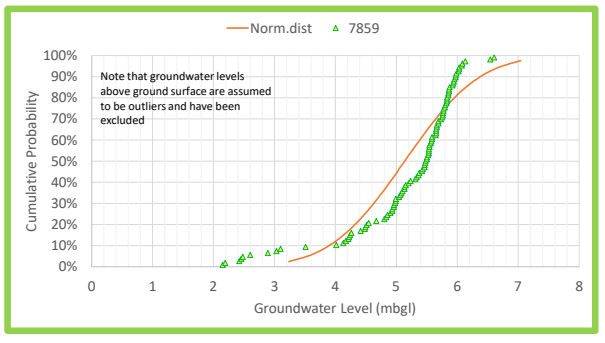


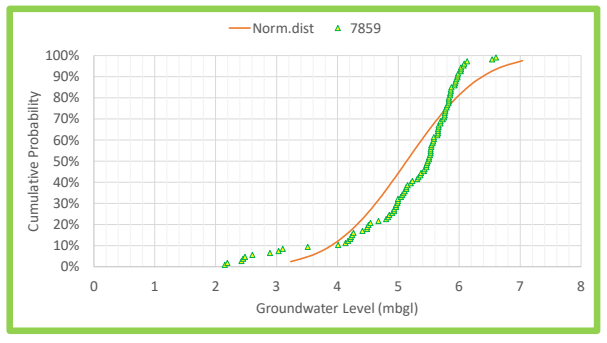


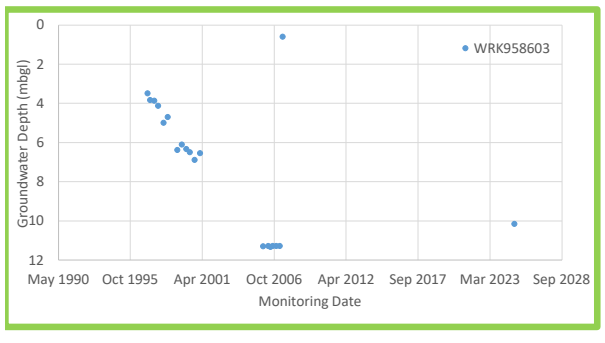


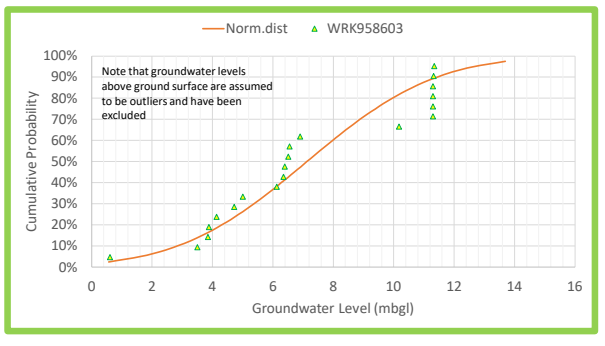


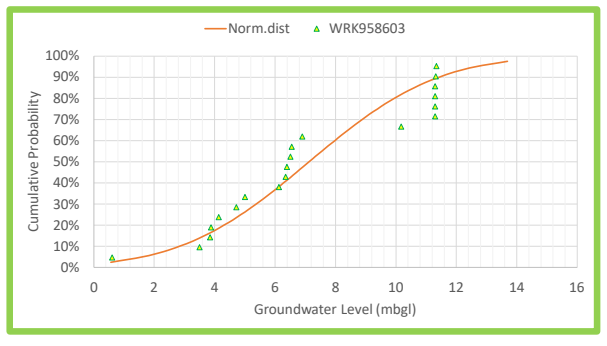


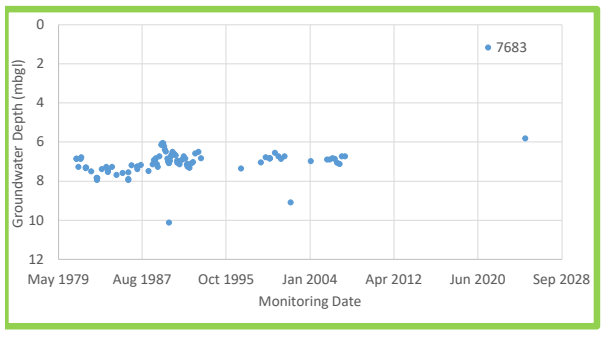


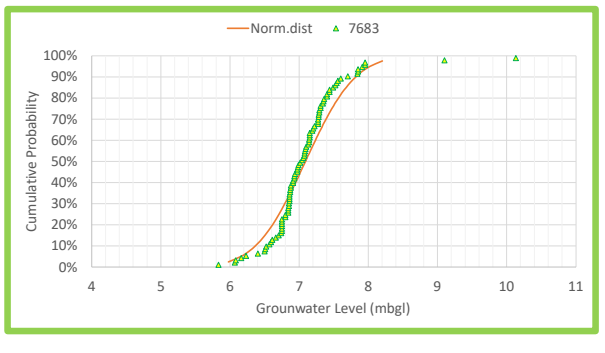


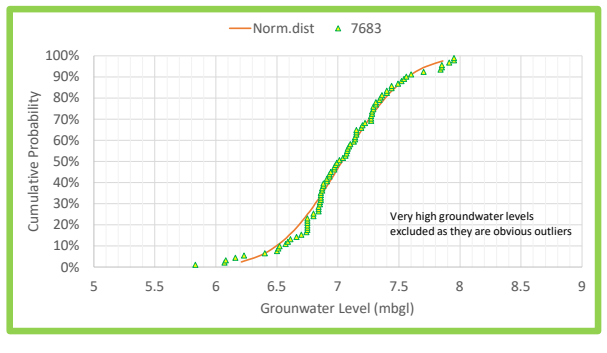


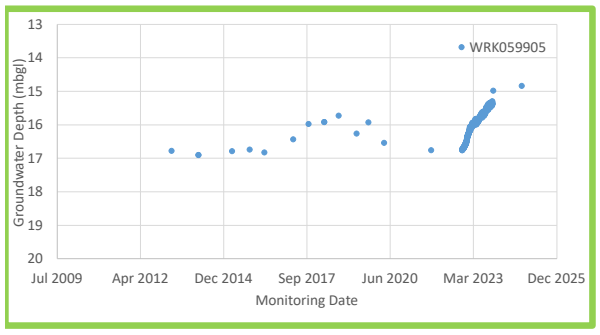


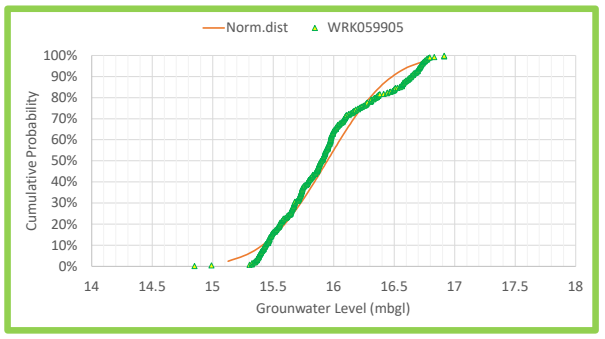


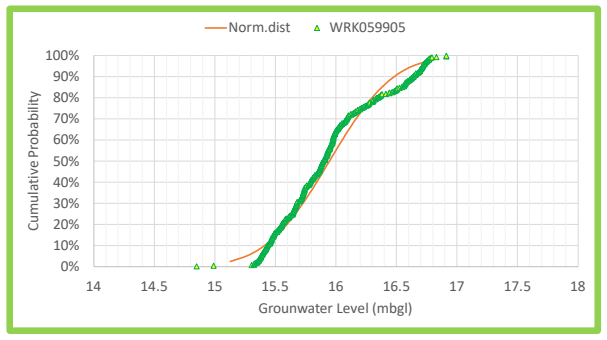


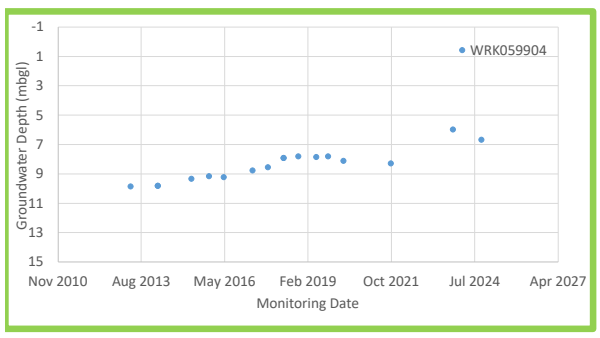






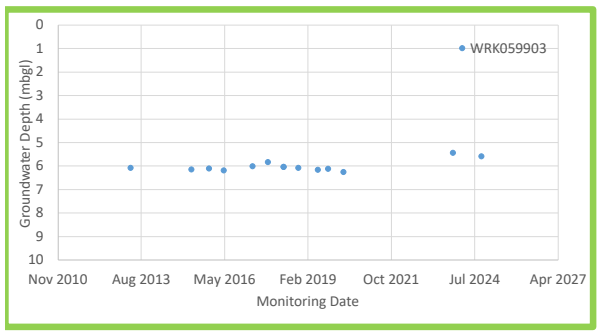


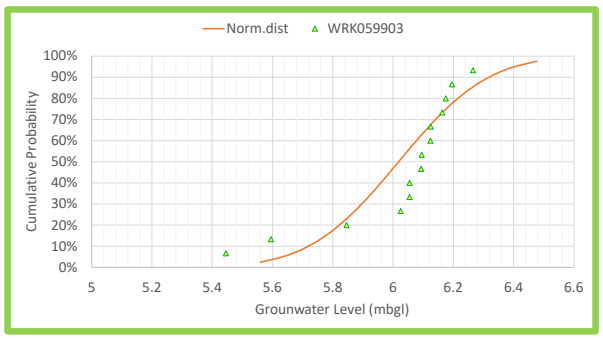


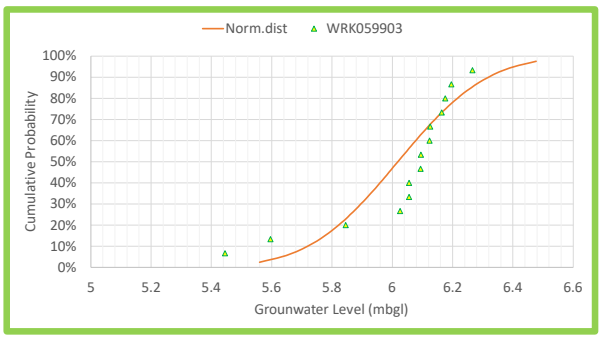


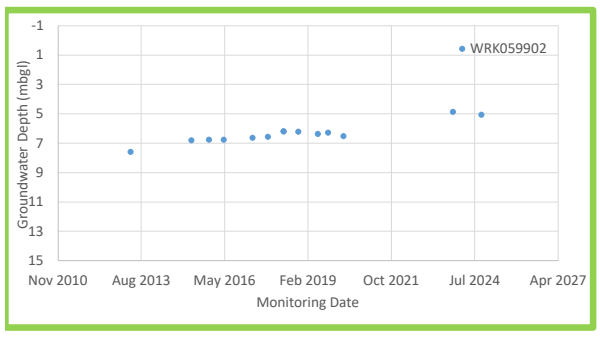
Timeseries data | **All data** | **Final dataset**

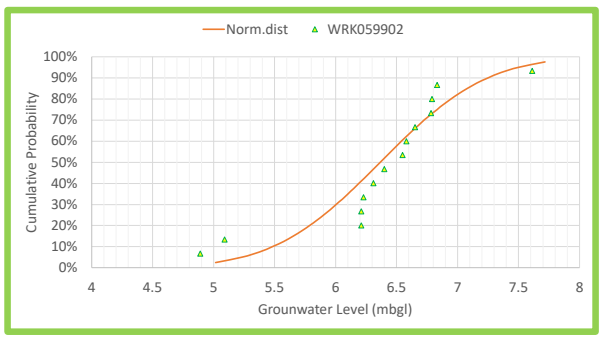
Site Name: Hattah Lake North

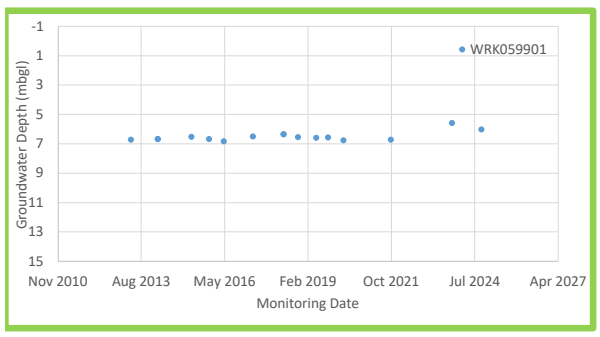


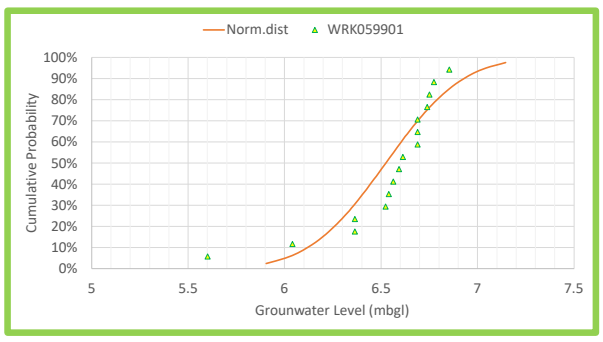


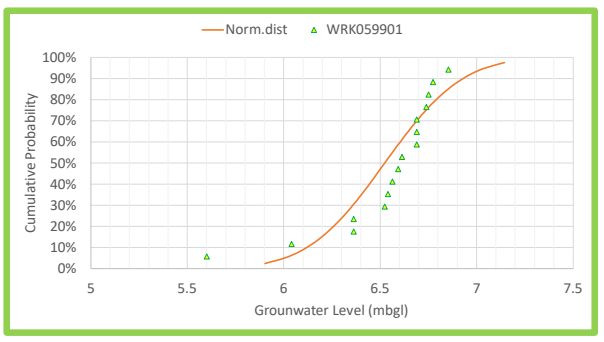


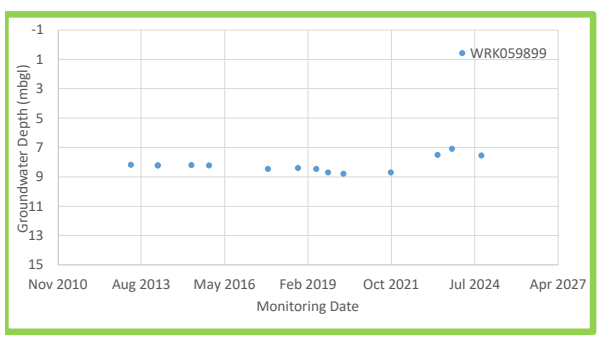


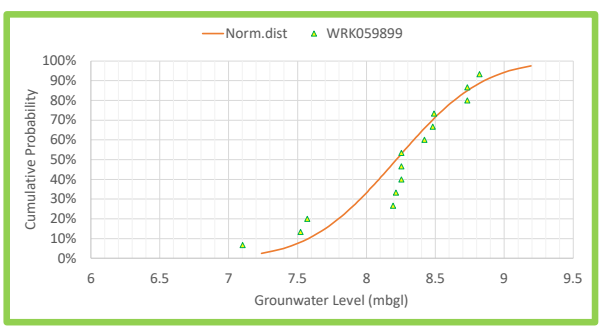


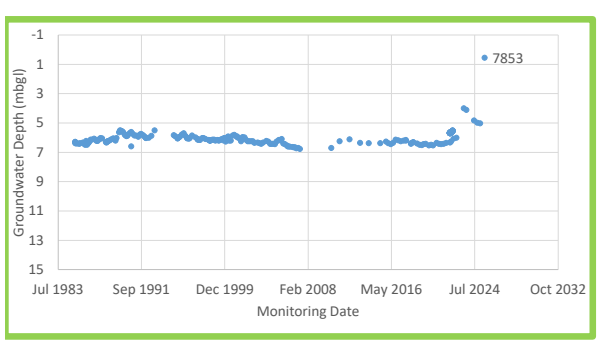


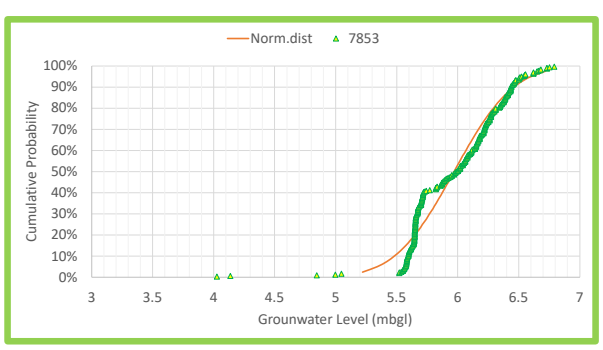


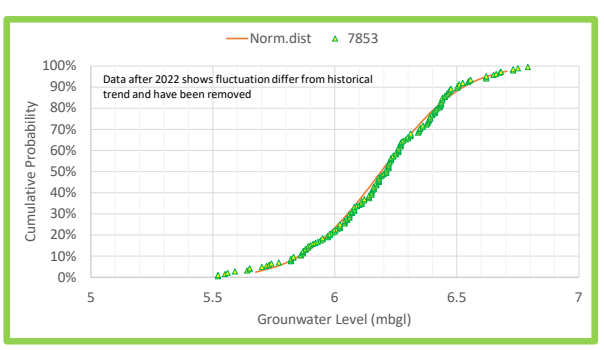


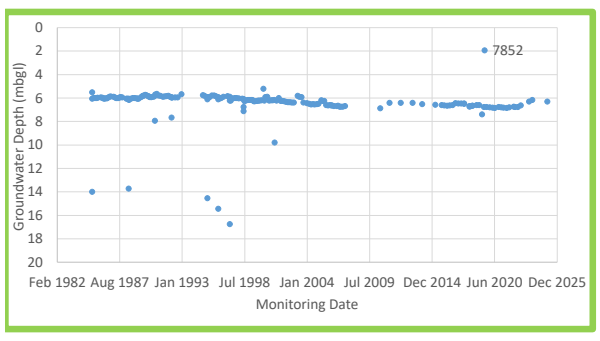


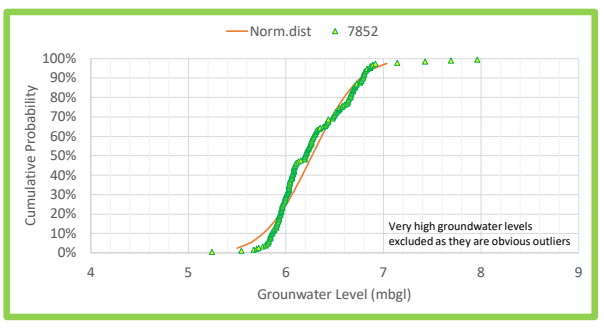


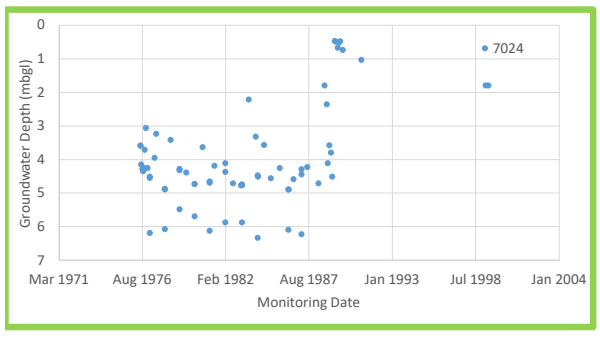


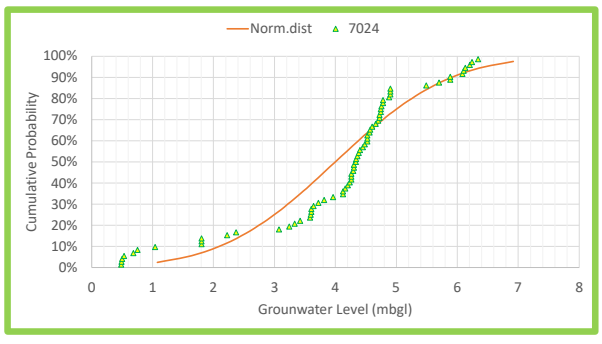






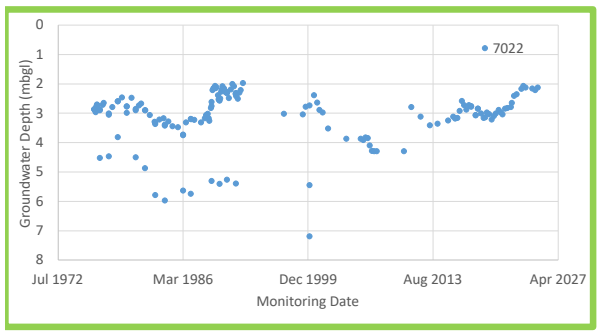


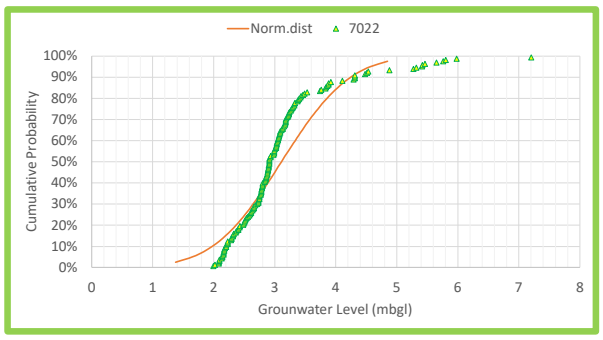


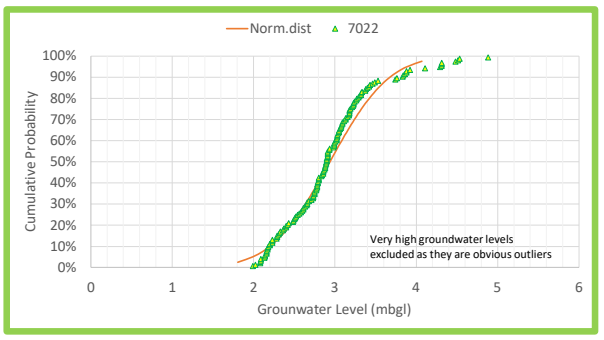


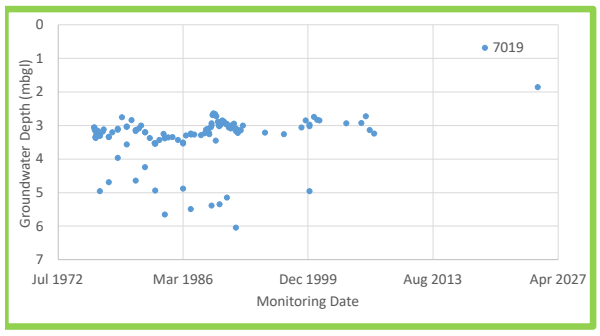
Timeseries data | **All data** | **Final dataset**

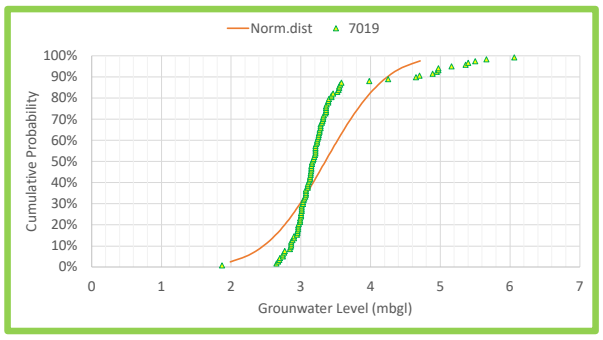
Site Name: Hattah Lake North

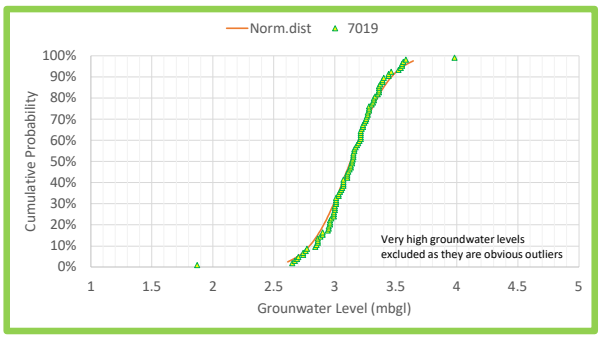


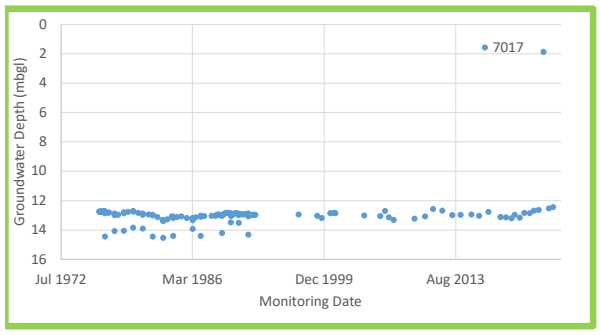


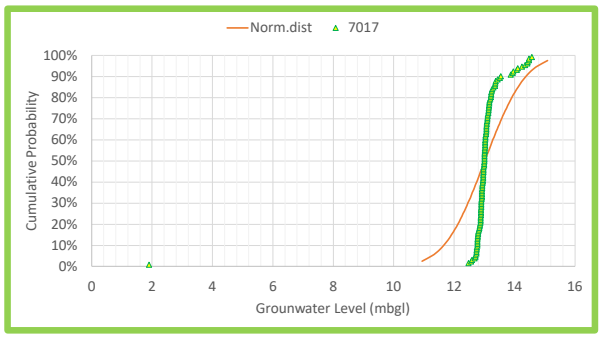


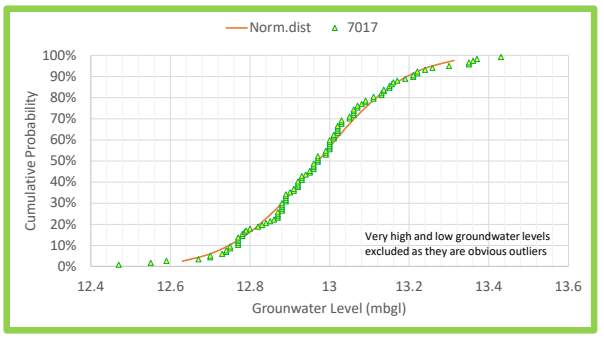


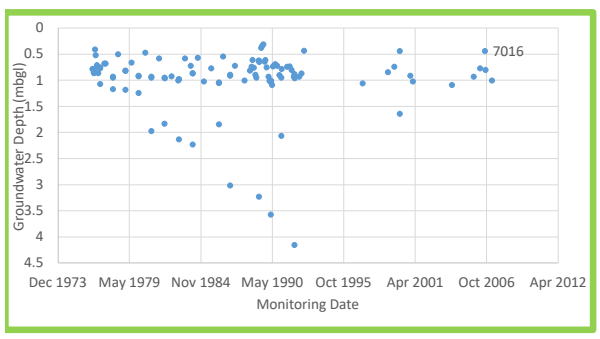


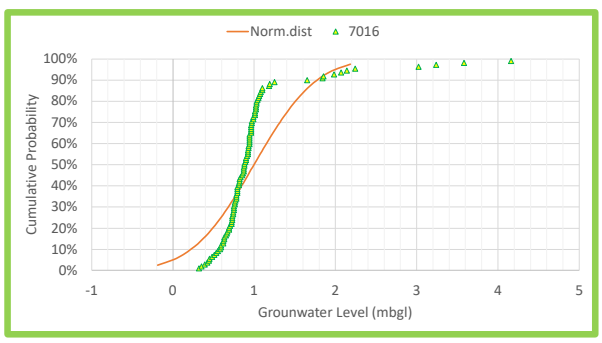


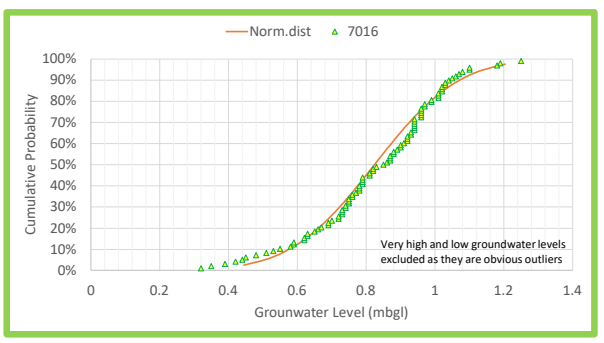






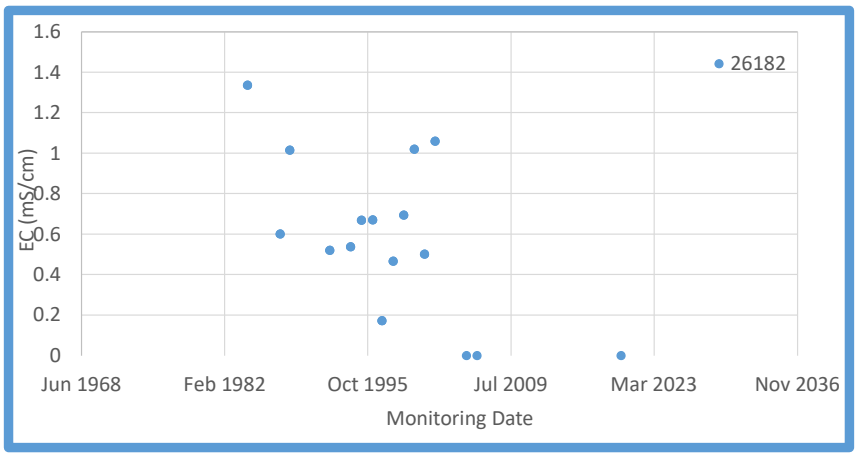


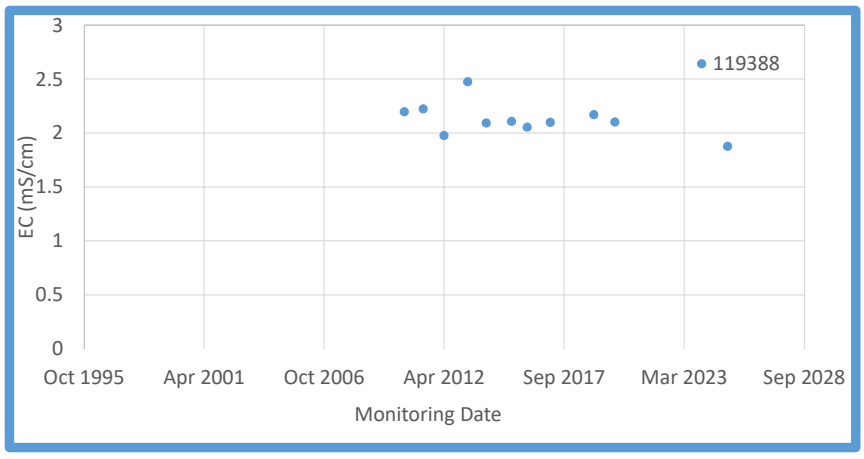


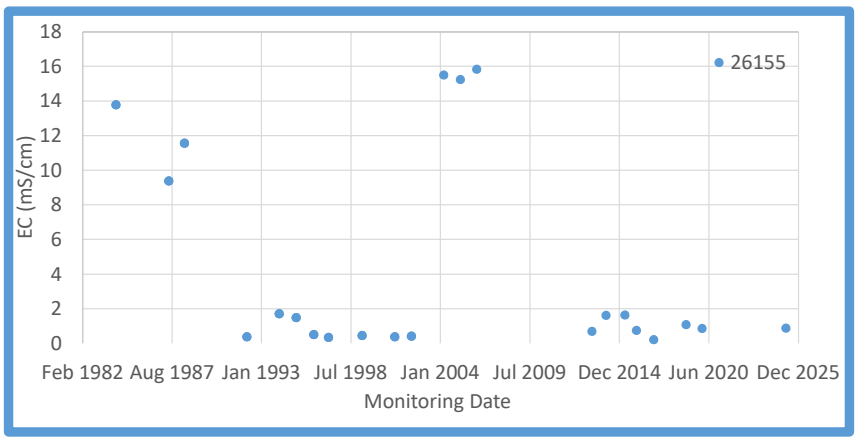


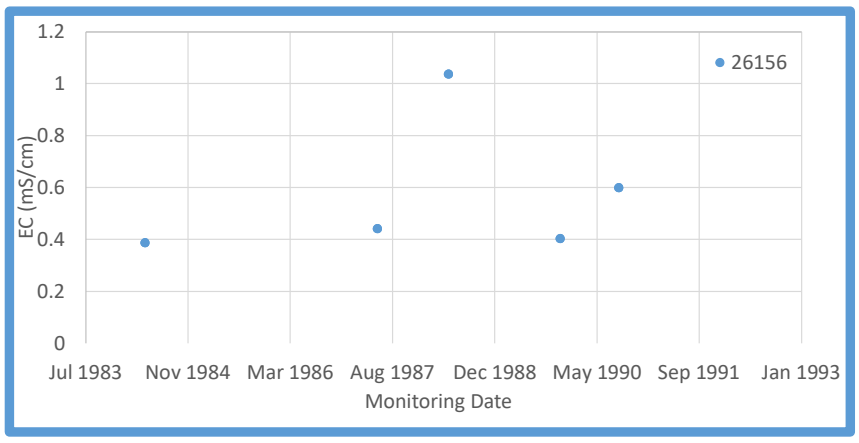
Timeseries data

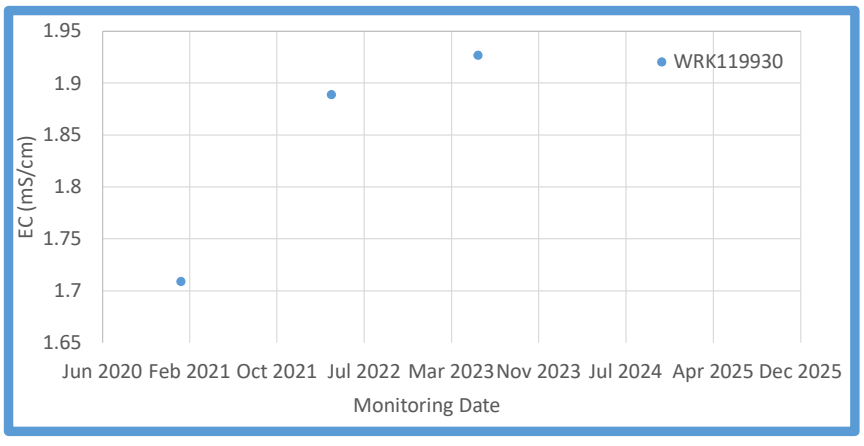
Site Name: Vinifera

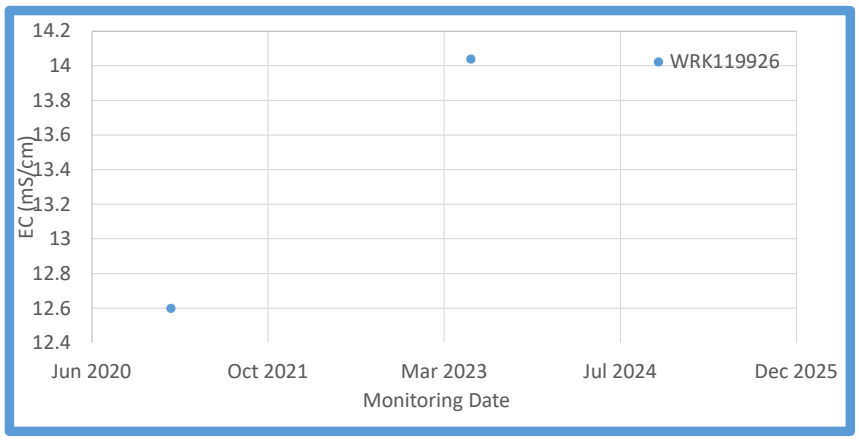






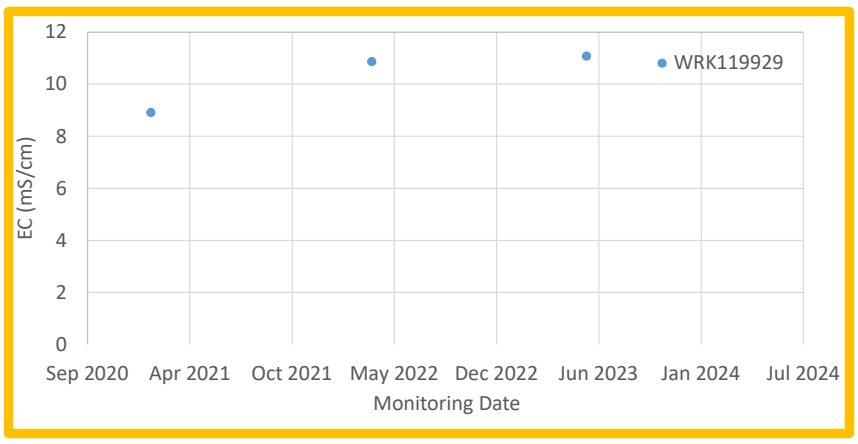


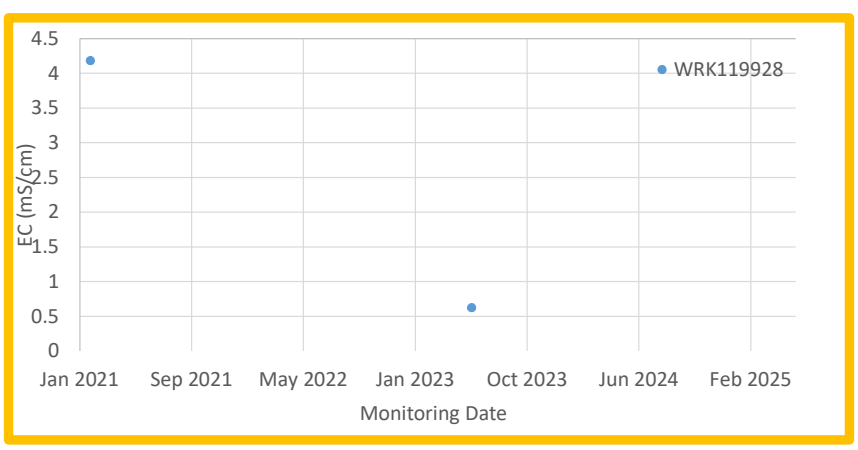


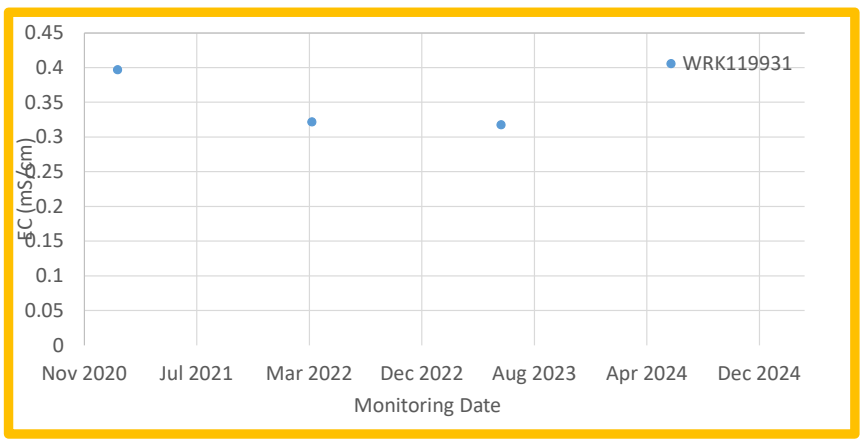


Timeseries data

Site Name: Nyah

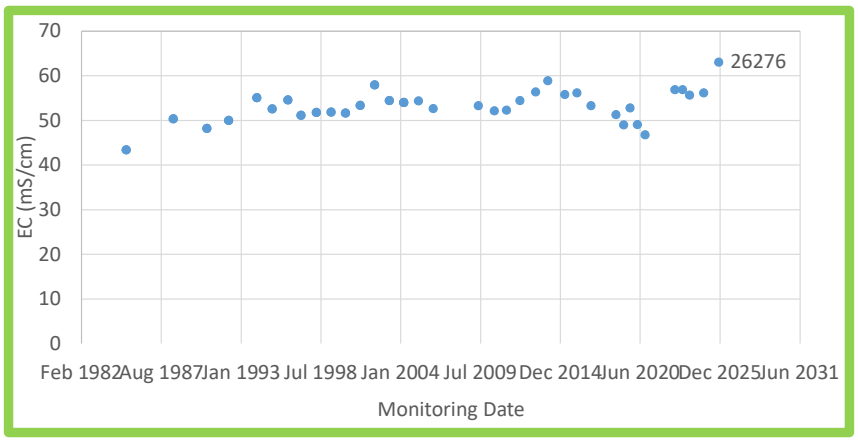


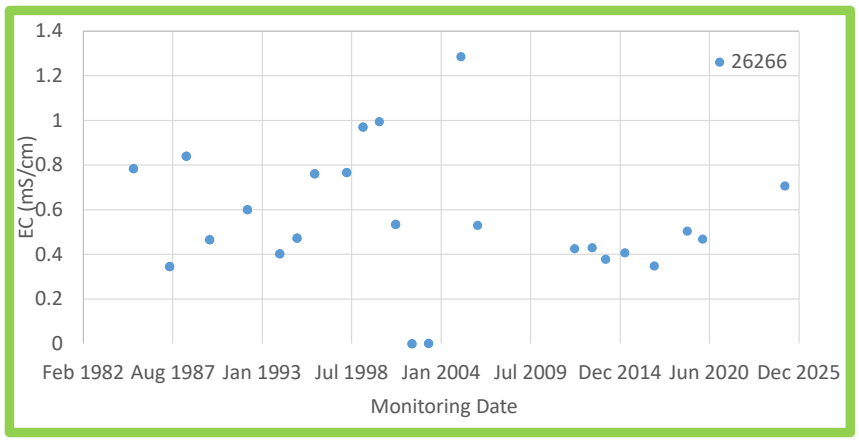


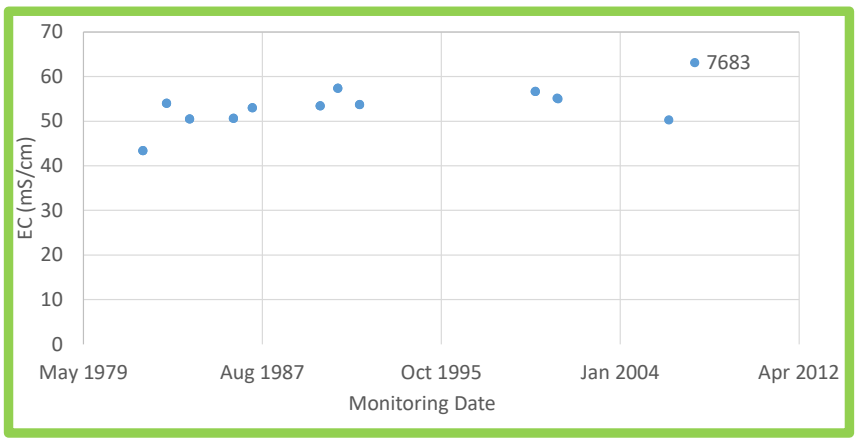


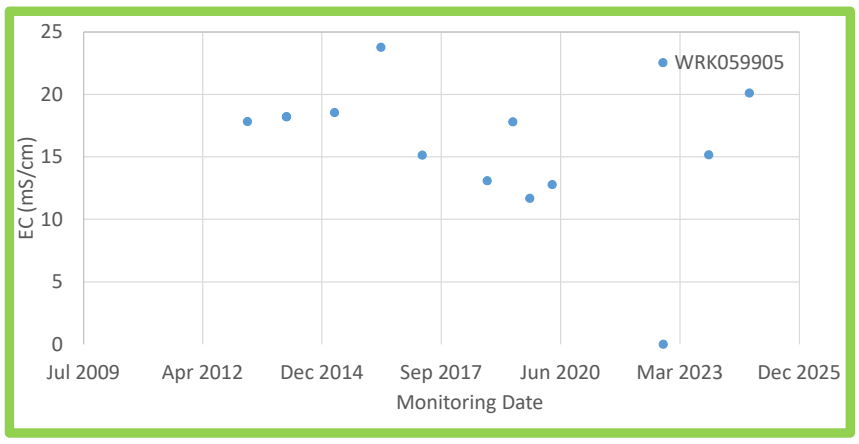
Timeseries data

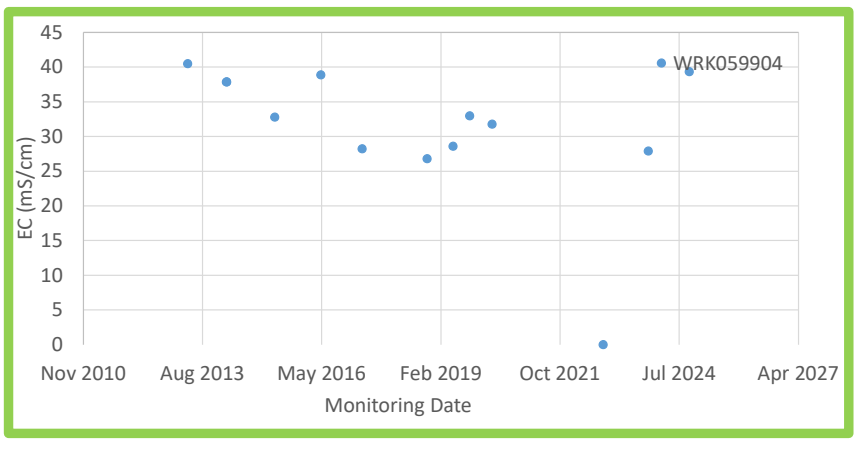
Site Name: Hattah Lake North

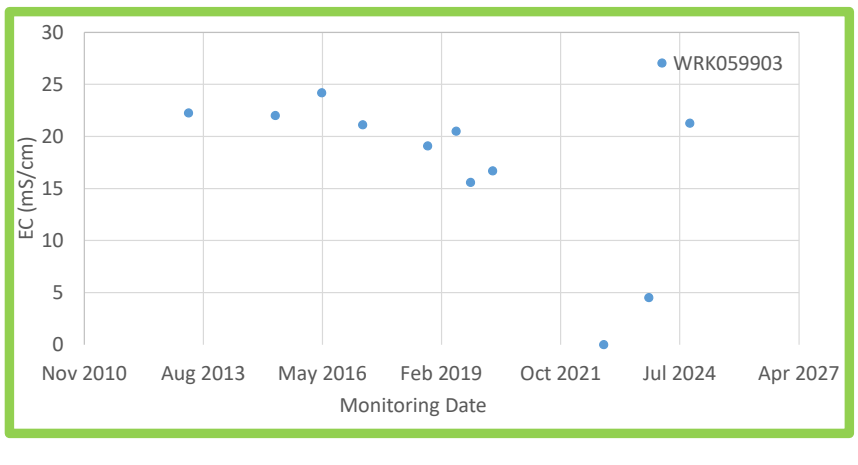


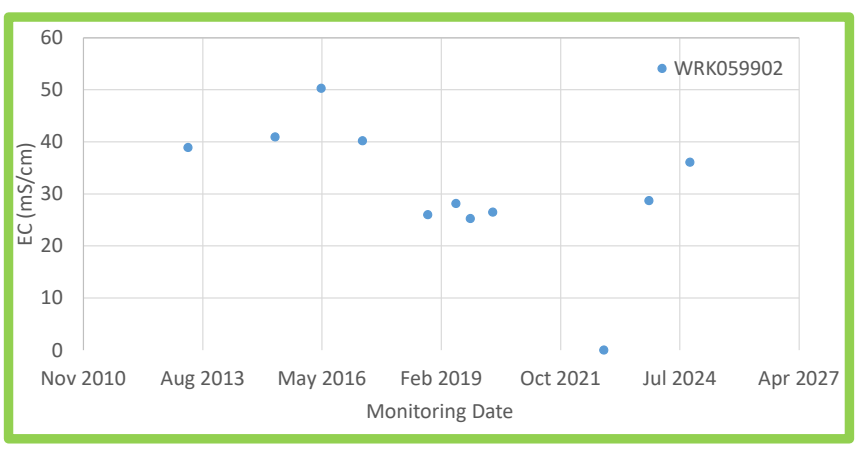


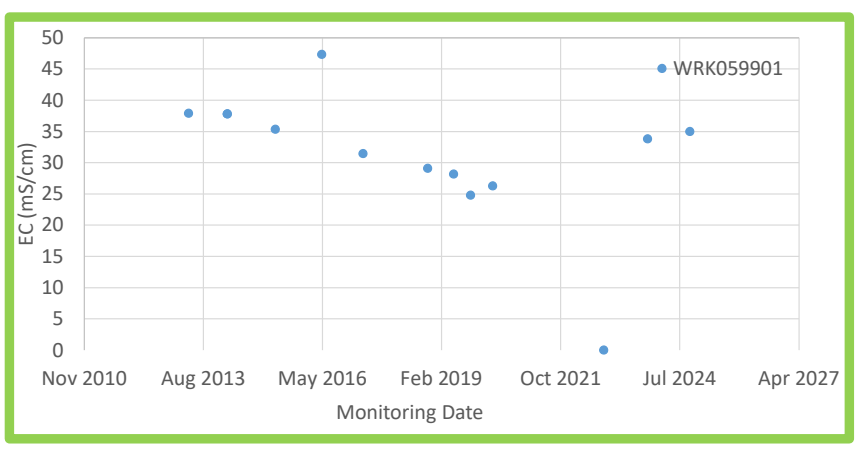






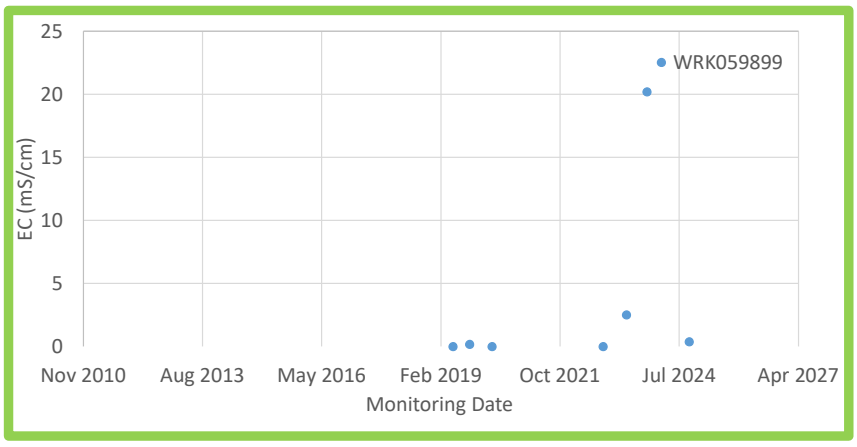


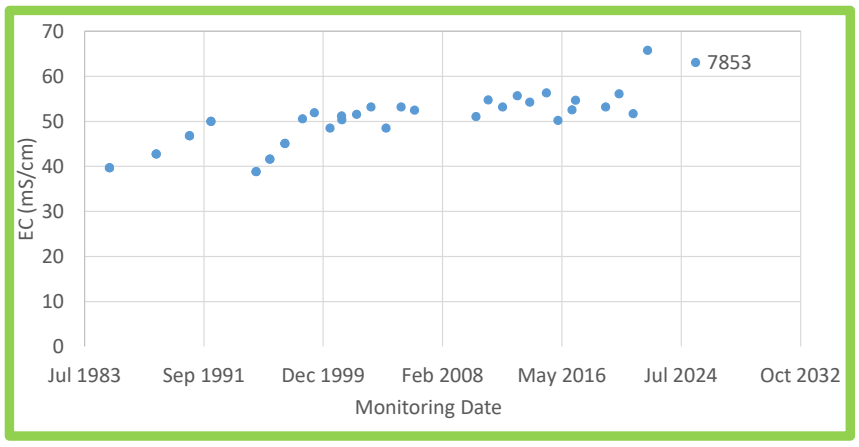


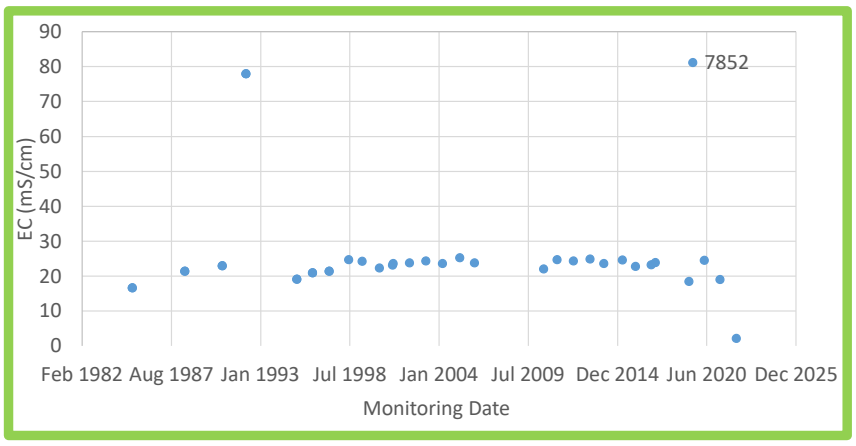


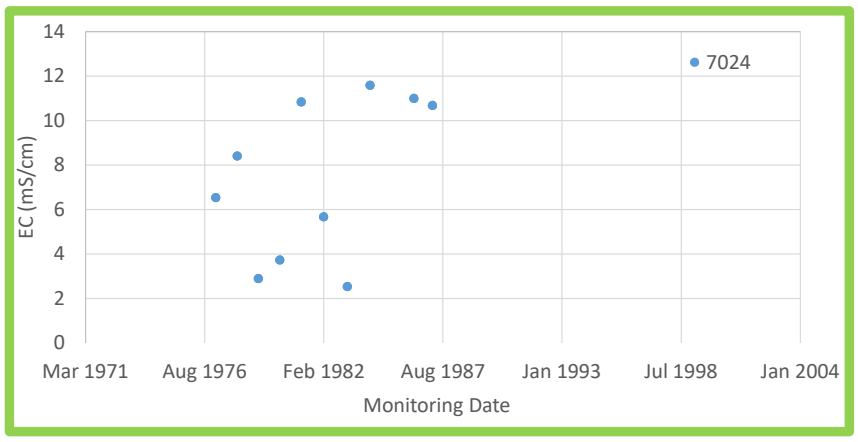
Timeseries data

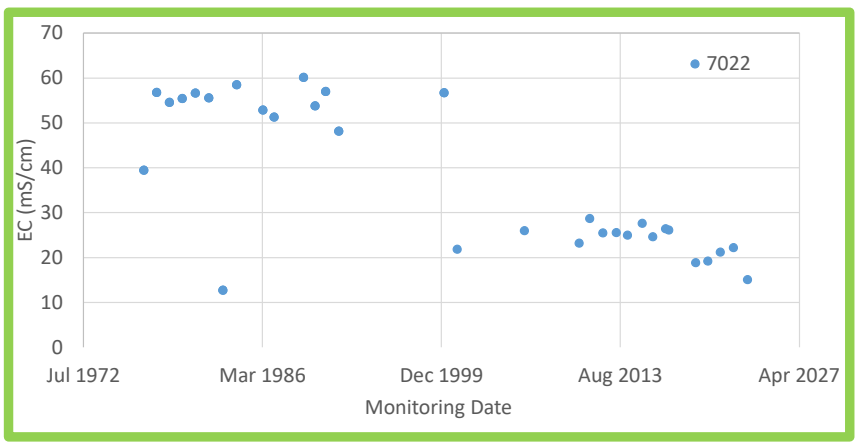
Site Name: Hattah Lake North

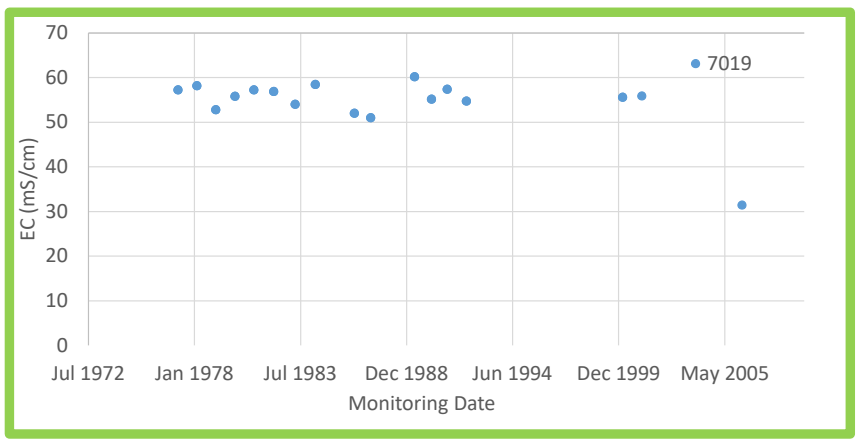


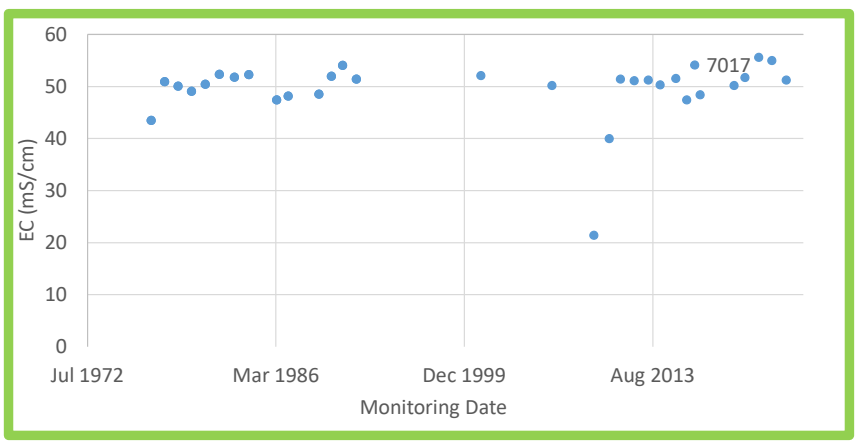


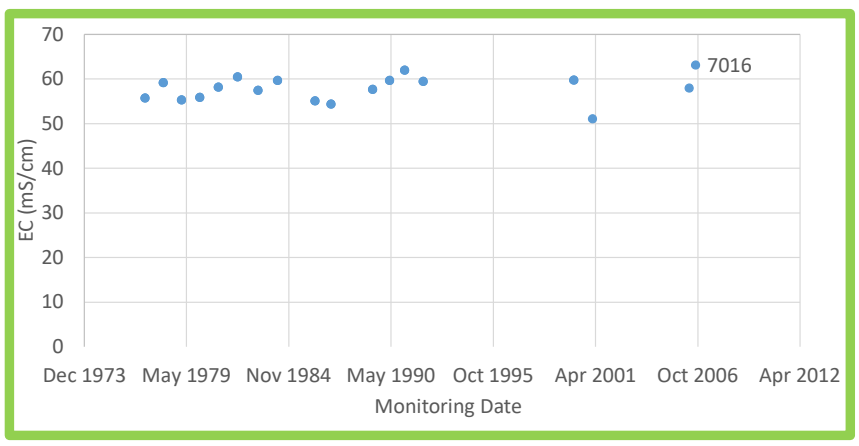












Addendum C: Hattah Lakes North Floodplain Restoration Project

VICTORIAN MURRAY FLOODPLAIN RESTORATION PROJECT

HEALTHY LANDSCAPES, STRONG COMMUNITIES

Groundwater Monitoring and Reporting Program – Addendum C

Hattah Lakes North Floodplain Restoration Project

Hattah Lakes North EPBC: 2020/8632 (Conditions 19 – 23)

Australian Government

VICTORIA State Government

LOWER MURRAY WATER

Goulburn-Murray WATER

mallee catchment management authority

North Central CMA

Parks VICTORIA

Approved Action

Person to whom the approval is granted	Lower Murray Urban and Rural Water Corporation
ABN of Approval Holder	18 475 808 826
Action	
Hattah Lakes North Floodplain Restoration Project (EPBC: 2020/8632)	To build and operate four regulating structures (K10 Regulator, K10 Causeway Regulator, Bitterang Containment Bank Regulator, Dry Creek Regulator), 1.8km of raised access tracks (containment banks/levees), and maintenance of 16.9km of existing access tracks to allow extra inundation of Chalka North Area and Lake Boolca Area: See EPBC Act referral 2020/8632 subject to the variation of the Action accepted by the Minister under section 156B on 27 September 2022.

Declaration of accuracy

In making this declaration, I am aware that section 491 of the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) makes it an offence in certain circumstances to knowingly provide false or misleading information or documents to specified persons who are known to be performing a duty or carrying out a function under the EPBC Act or the Environment Protection and Biodiversity Conservation Regulations 2000 (Cth). The offence is punishable on conviction by imprisonment or a fine, or both. I am authorised to bind the approval holder to this declaration and that I have no knowledge of that authorisation being revoked at the time of making this declaration.

Signed: 

Full name (please print): ASHER SUTTON

Organisation (please print): LOWER MURRAY URBAN AND RURAL WATER CORPORATION

Date 17/03/2026

Table of contents

Quality Information

Version	Date	Prepared by (Author)	Qualification/s and Years of Experience	Approved for submission	Qualification/s and Years of Experience
A – VMFRP and stakeholder review	22 September 2025	Michael Chendorain	Professional Civil Engineer (PE), Masters Science, 28 years	Skye Brown	BSc Hons, Masters Env Studies, 29 years
B – DCCEEW preliminary review	14 October 2025	Michael Chendorain		Skye Brown	
C – For stakeholder acceptance	26 February 2026	Kristian Sakellaris	B.Eng(Env)(Hns), 6 years	Michael Chendorain	Professional Civil Engineer (PE), Masters Science, 28 years
D – For issue to DCCEEW	05 March 2026	Kristian Sakellaris	B.Eng(Env)(Hns), 6 years	Michael Chendorain	Professional Civil Engineer (PE), Masters Science, 28 years
0 – For issue to DCCEEW for approval	17 March 2026	Kristian Sakellaris		Michael Chendorain	

Abbreviations

Abbreviation	Definition
CMA	Catchment Management Authority
EES	*Environment Effects Statement under the Environment Effects Act 1978*
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999 (Cth)*
GWMRP	Groundwater Monitoring and Reporting Program
GRLs	Groundwater reference locations
ha	Hectares
Mallee CMA	Mallee Catchment Management Authority
MIAs	Groundwater quality within the maximum inundation areas
SRAs	Salinisation risk areas
TLM	The Living Murray
VMFRP	Victorian Murray Floodplain Restoration Project

1 Introduction

The purpose of this addendum report is to provide the site-specific monitoring requirements for the Groundwater Monitoring and Reporting Plan (GWMRP) for Hattah Lakes North (the site).

The EPBC Approval for the Site was received on 22 February 2024 and includes condition relating to the preparation of a GWMRP. Refer to the GWMRP for additional details.

The Hattah Lakes North Floodplain Restoration Project will build and operate the K10 Regulator, K10 Causeway Regulator, Bitterang Containment Bank Regulator, along with 1.8 km of raised access tracks functioning as containment banks/levees and the maintenance of 16.9 km of existing access tracks, as shown in Figure 1. The works are to facilitate managed inundation across two Water Management Areas (Chalka North and Lake Boolca).

The Hattah Lakes North project has been designed to replicate key components of the natural hydrology of the system, provide maximum operational flexibility and complement basin river flows to achieve environmental outcomes. The infrastructure has been designed to operate under several flow regimes to achieve environmental watering targets and support improved biodiversity.

Figure 1 depicts the indicative inundation areas (depicted as the Maximum Inundation Area) and flow paths (watercourses). Environmental watering events will occur in response to seasonal triggers, ecological need, water availability and operational risks, with timing generally aligned to late-winter and spring flow cues and adjusted through adaptive management. Additional details are provided in Section 1.1 and Section 1.2 below.

Chalka North Water Management Area

The project builds on existing infrastructure to create a second tier of inundation using water released via the existing Oatey's Regulator. Water will be delivered either through natural flood capture or by capitalising on existing The Living Murray (TLM) infrastructure release events, enabling inundation of up to 420 ha of floodplain. The new infrastructure to be constructed and operated within the Chalka North Water Management Area include the K10 Regulator and K10 Causeway Regulator (shown in Figure 1). Operating scenarios vary depending on seasonal conditions, flow availability and ecological priorities. Three potential operating scenarios have been developed:

- **Flood operation**: regulators remain open during natural floods to maintain connectivity between the Murray River and the floodplain
- **Flood plus intervention**: infrastructure to retain water within the floodplain to the inundation extent
- **Retention in Hattah North area**: water pumped from the existing TLM infrastructure into the floodplain.

The indicative flow thresholds below show how different Murray River flow events influence inundation frequency, duration and the operating scenarios:

- 80,000 ML/day flow event – inundation approximately six times every 10 years, median duration 1.6 months, environmental objectives can be achieved under flood operation, flood plus intervention, or retention within the Hattah North area.
- 120,000 ML/day flow event – inundation approximately 1.5 times every 10 years, median duration one month, environmental objectives can be achieved under flood operation, flood plus intervention, or retention within the Hattah North.

Lake Boolca Water Management Area

The project seeks to restore the flooding regime to the Lake Boolca Water Management Area by increasing the frequency and duration of inflows via the Bitterang floodway. Water will be delivered primarily by gravity, supported by temporary pumping when required. The works, reliant on high Murray River flow events, will enable inundation of up to 710 ha of floodplain north of the Bitterang containment bank through to Lake Boolca. The new infrastructure to be constructed and operated within the Lake Boolca Water Management Area include the Bitterang Containment Bank Regulator and Dry Lakes Regulator (shown in Figure 1). Four potential operating scenarios have been developed:

- **Flood operation:** regulators remain open during natural floods to maintain connectivity between the Murray River and the floodplain

- **Flood plus intervention:** water detained in the Lake Boolca area by closing the Bitterang Containment Bank Regulator
- **Managed inundation – gravity release**: Bitterang Containment Bank Regulator opened to allow water to naturally flow (via gravity release) from the Bitterang containment bank into the Lake Boolca area
- **Managed inundation – pumped:** water pumped from the Bitterang containment bank into the Lake Boolca area.

The indicative flow thresholds below show how different Murray River flow events influence inundation frequency, duration and the operating scenarios:

- 120,000 ML/day flow event – inundation approximately 2.5 times every 10 years, median duration 1 month, and the environmental objectives achieved under flood operation, flood plus intervention, managed inundation – gravity release, managed inundation – pumped
- 140,000 ML/day flow event – inundation approximately 1.5 times every 10 years, median duration of one month, and the environmental objectives achieved under flood operation, flood plus intervention, managed inundation – gravity release, managed inundation – pumped.

1.1 Hattah Lakes North project description

The Hattah Lakes North project is located on the western side of the Murray River in north-west Victoria, between Robinvale and Red Cliffs, approximately 75km south of Mildura. It involves works to facilitate inundation of approximately 1,130ha of high ecological value Murray River floodplain, including the Chalka North area and Lake Boolca Water Management Areas. The Hattah Lakes North project area is shown in Figure 1.

The Hattah Lakes North project has been designed to build on the benefits of The Living Murray (TLM) initiative, constructed in 2013, which allows watering of approximately 6,000ha of the central and southern Hattah Lakes floodplain. The project is expected to deliver a substantial net improvement to biodiversity and ecosystem function across the floodplain. By restoring more natural water regimes, better aligning the frequency, duration, and timing of inundation with ecological needs, the project aims to enhance habitat quality for threatened species, improve the health and diversity of native vegetation, and strengthen resilience to climate change.

The construction of the Hattah Lakes North Project involves:

- Confirmation of the final Construction Footprint
- Preparatory works
- Earthworks
- Civil and structure works
- Establishment of a coffer dam
- Reinstatement and rehabilitation
- Dry commissioning.

The infrastructure works include:

- One large regulator (K10)
- One small regulator (Bitterang Regulator)
- One containment bank (K10 River Track Containment Bank)
- 1.8km of containment banks with access tracks on top
- Use of existing access tracks, including for maintenance activities during construction (approximately 16.9km).

Existing TLM infrastructure would be used, including Oatey's Regulator and Bitterang Regulator. There are no permanent pumps proposed as part of the project.

1.2 Operation

The Hattah Lakes North project aims to respond to the declining health of degraded floodplain habitats due to river regulation and the future effects of climate change. The proposed Maximum Inundation Area includes mostly Crown land within the Hattah-Kulkyne National Park, some private land including Kulkyne Station to the east, and a parcel of private land adjoining the northern boundary of the Hattah-Kulkyne National Park. Inundation of private land can be avoided through operation of the proposed works (for example, close K10 Containment Bank Regulator or limit pumping from the Bitterang Regulator) and would only be undertaken subject to agreement with the relevant private landowners.

The Mallee CMA manages the operation of the environmental watering, and the project infrastructure provides a high degree of operational flexibility to enable the implementation of adaptive management principles. Adaptability

and flexibility of project operations is critical to the successful operation of the Hattah Lakes North project enabling the project to respond to varying seasonal conditions and take account of lessons learned from each operation event.

The adaptive management process for the Hattah Lakes North project is incorporated into the existing operational management documentation, including the Environmental Water Management Plan for the Hattah Lakes project. Monitoring undertaken in accordance with this EcoMRP is used to provide the data required to guide adaptive management.

The decision to initiate an environmental watering event as part of the project are based on:

- Water availability (based on seasonal water allocations determined by storage operators)
- The floodplain water requirements, to ensure consistency with the watering regime, ecological objectives and targets
- Operational risks (such as risks associated with blackwater, algae and salinity – as detailed in the Environmental Water Management Plan for the project and seasonal watering proposals)
- The regional context (such as the need for survival watering, recruitment watering and maintenance watering) and other river operations that may occur within the river reach.

Timing of each environmental watering event considers late winter and spring flow triggers, such as upstream rainfall or the need for environmental watering to facilitate ecological events. The extent of inundation is managed according to the equivalent flow rate in the Murray River. For further detail about operations and environmental watering scenarios, please see Chapter 6 Project description of the Environment Effects Statement.

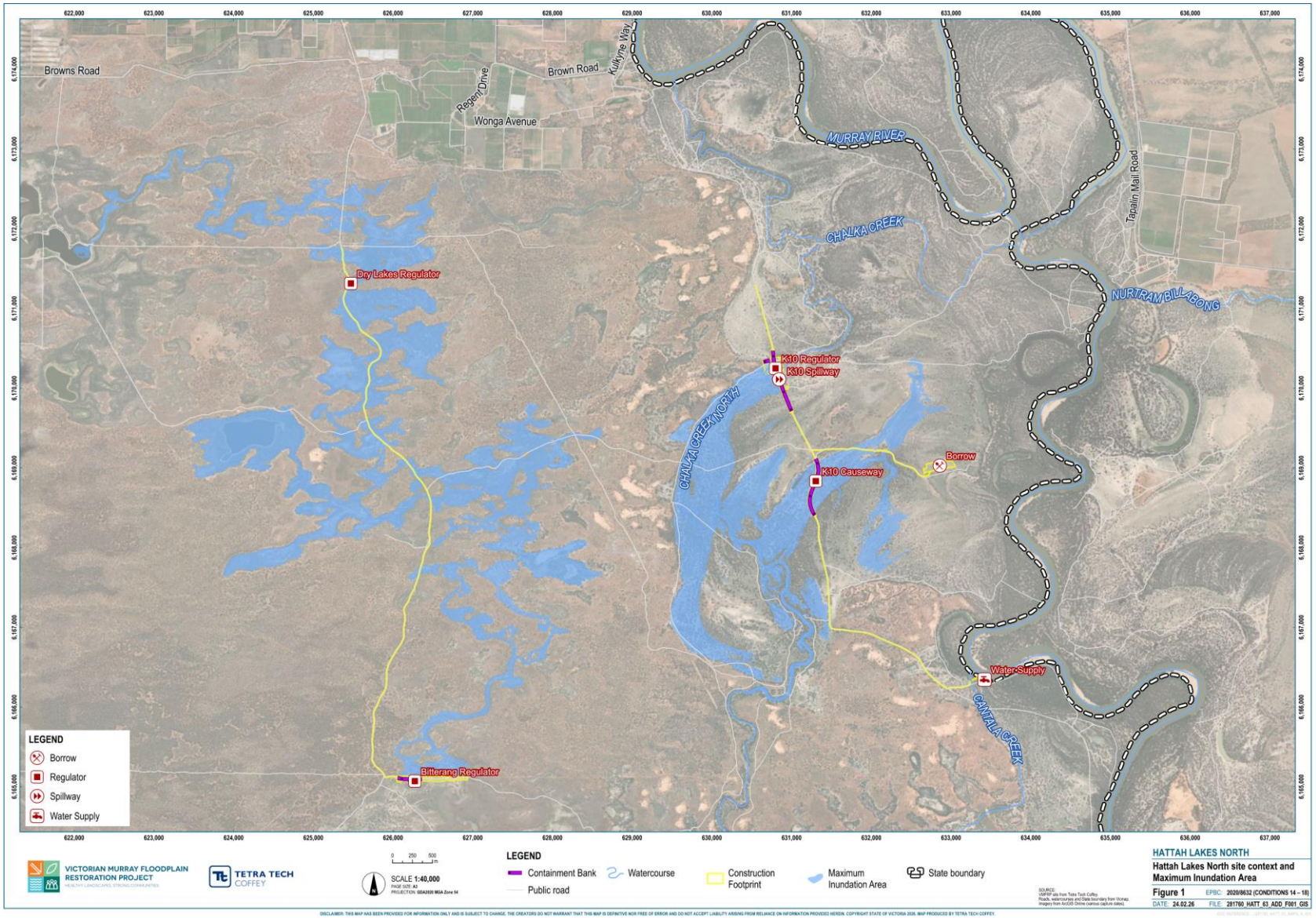


Figure 1 Hattah Lakes North site context and maximum inundation area

2 Potential environmental impacts

Refer to the main plan document for a summary of potential environmental impacts[1].

3 Risk assessment

The outcomes of the environmental risk assessment have directly informed the monitoring requirements for Hattah Lakes North. In particular, groundwater risks identified as having medium or higher residual risk, following the application of Environmental Delivery Standards, have guided the selection of monitoring parameters, locations and frequencies. The monitoring program is intended to assess the effectiveness of mitigation measures, detect any unanticipated groundwater impacts, and provide information to support adaptive management of environmental watering operations.

The relevant risks associated with the Hattah Lakes North project are included in Appendix A.

4 Monitoring

4.1 Methodology

The EPBC Approval requires the monitoring program to address the following areas:

- Salinisation risk areas
- Groundwater reference location(s)
- Groundwater quality within the maximum inundation area.

The monitoring programs across the sites for each area includes the collection of baseline data (that is, data prior to any project activities) to ensure that trigger values can be appropriately set and then can be detected if they are met during operation.

Groundwater monitoring locations are presented in Figure 2. For existing wells, details are provided based on information from Government data bases as documented within the Visualising Victoria's Groundwater (VVG) web portal[3]. The monitoring locations were developed following the completion of the environment effects statement process and have been accepted by the Mallee Catchment Management Authority (MCMA).

The monitoring locations satisfy the requirements to monitor the following conditions / purposes:

- Salinisation risk areas (SRAs): Areas which were identified through the EES/EPBC assessment as having elevated risk of developing shallow groundwater or soil salinity.
- Groundwater quality within the maximum inundation areas (MIAs): Areas which are within the inundation areas (or immediately adjacent); and
- Groundwater reference locations (GRLs): Areas which are generally sufficiently removed from the project to serve as reference sites of the groundwater inundation areas.

Note that monitoring wells listed as MIA are either within the inundation area or have the potential to be impacted by inundation events, due to their connectivity with adjacent water courses.

The detailed methodology and further information are presented in the Groundwater Monitoring and Reporting Plan (GWMRP)[1]. This addendum document should be read in conjunction with the GWMRP.

4.1.1 Monitoring locations and parameters

Table 1 presents well monitoring location details. Figure 2 presents the locations of the groundwater monitoring bores. Table 1 provides further details on the relevant monitoring purpose (i.e. the aspect monitored) for each bore. The procedures for groundwater data collection and selection of trigger levels are defined in the GWMRP[1].

Table 1 Monitoring locations

Well ID	Monitoring purpose[1]	Coordinates		Response zone[2]	Well status	GWL (mbgl)[3]	EC (mS/cm)[3]
		Lat.	Long.	(mbgl)			
Hattah Lakes North							
7016	GRL	-34.56338	142.239773	3.1 to 5.1	Existing	0.85	58.00
7017	GRL	-34.60465	142.271739	14 to 16	Existing	12.97	50.89
7019	GRL	-34.55876	142.312012	5 to 7	Existing	3.14	55.83
7022	GRL	-34.56763	142.356515	5 to 7	Existing	2.90	24.98
7024	GRL	-34.567007	142.405330	5 to 7	Existing	4.45	8.41
7852	MIA	-34.587661	142.366807	47 to 49	Existing	6.20	23.20
7853	MIA	-34.58767	142.366809	10.1 to 12.1	Existing	6.21	50.60
WRK059899	GRL	-34.653045	142.470446	9.5 to 11.5	Existing	8.25	N/A
WRK059901	GRL	-34.68701	142.440092	9.0 to 12.0	Existing	6.61	34.98
WRK059902	MIA	-34.664980	142.407453	16 to 18	Existing	6.55	36.08
WRK059903	MIA	-34.66494	142.40749	45.0 to 48.0	Existing	6.10	21.13
WRK059904	MIA	-34.68586	142.383637	9.0 to 15.0	Existing	8.32	33.00
WRK059905	GRL	-34.698762	142.338936	21 to 23	Existing	15.90	17.84
7683	GRL	-34.60001	142.326139	16.0 to 16.5	Existing	7.01	53.45
WRK958603	GRL	-34.757698	142.353902	10 to 12	Existing	6.50	6.46
7859	MIA	-34.587110	142.458069	TBD	Replace	5.48	0.60
26266	GRL	-34.740031	142.500383	7 to 9	Existing	5.95	0.53
26276	GRL	-34.769916	142.376342	9 to 11	Existing	9.70	52.80
H1C	MIA	-34.61162	142.433484	TBD	Planned	N/A	N/A
H2C	MIA	-34.61232	142.413993	TBD	Planned	N/A	N/A
H4C	MIA	-34.595586	142.446683	TBD	Planned	N/A	N/A
H5B	MIA	-34.595844	142.367992	TBD	Planned	N/A	N/A
H6B	MIA	-34.605272	142.370365	TBD	Planned	N/A	N/A
H7B	MIA	-34.608170	142.348676	TBD	Planned	N/A	N/A
H8B	MIA	-34.601358	142.393686	TBD	Planned	N/A	N/A
H9S	SRA	-34.665498	142.413089	TBD	Planned	N/A	N/A
H10S	SRA	-34.674201	142.350491	TBD	Planned	N/A	N/A
H11S	SRA	-34.663664	142.382805	TBD	Planned	N/A	N/A

Notes:

1. Monitoring purpose is described above where: SRA = salinity risk area; MIA = maximum inundation area; and GRL = groundwater reference location.
2. Not identified indicates that data was not available from the data source (VVG); TBD = to be defined, which means the monitoring screened interval will be documented after installation of the planned monitoring wells.

Well ID	Monitoring purpose[1]	Coordinates		Response zone[2]	Well status	GWL (mbgl)[3]	EC (mS/cm)[3]
		Lat.	Long.	(mbgl)			

3. Baseline data for groundwater level and electrical conductivity include data from 17th July 1976 up to 22nd Oct 2025. The value provided is the median value taken from available observed data.

Two bores identified in original EES recommendations and included in the Ministerial Response have been unable to be successfully located or are in unsuitable condition and cannot be used. In this case replacement nearby bores that provide equivalent coverage have been included in this table.

Bore 7859 originally included in the EES cannot be located and is assumed to have been destroyed. A new well in proximity and monitoring the same aquifer will be constructed.

Bore 26289 cannot be located and has been substituted by bore 26276 which is nearby and monitors the same aquifer.

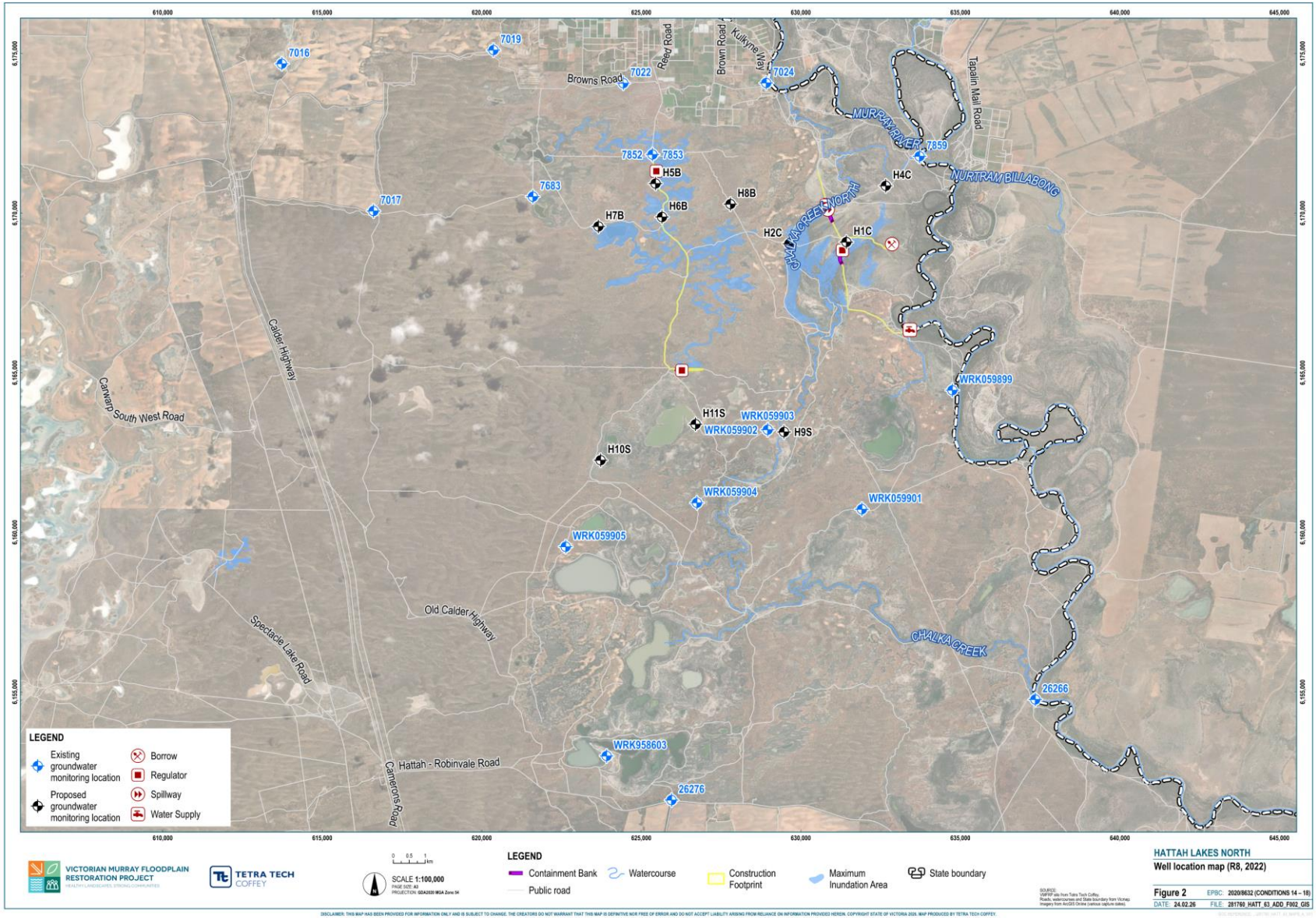


Figure 2 Well location map

References

[1] Arup (2025). Victorian Murray Floodplain Restoration Project, Groundwater Monitoring and Reporting Program, Hattah Lakes North Floodplain Restoration Project, Nyah Floodplain Restoration Project, Vinifera Floodplain Restoration Project. Document number VMFRP-REP-CEN-0001.

[2] R8 (2022). Victorian Murray Floodplain Restoration Project, Specialist Assessment D Groundwater, Environmental Effects Statement, EES Central: Belsar-Yungera and Hattah Lakes North. Document number: IS371000-SC-GW-RP-021, Dated August.

[3] Visualising Victoria's Groundwater (VVG) (2025). vvg.org.au. accessed 12 September 2025.

Appendix A: Risk register

			Initial Risk					Residual Risk					
Aspect	**Impact Pathway**	**Activity**	**Likelihood**	**Consequence**	**Inherent Risk Rating**	**Environmental Delivery Standards**	**EDS No.**	**Likelihood**	**Consequence**	**Residual Risk Rating**	**Rationale**	**State of knowledge**	**Reasonably practicable**
Groundwater – Flow	Potential changes to groundwater levels or flows during managed inundation events on environmental values	Operation	Rare	Minor	Low	Operational groundwater management Monitor and manage the risk of salinity in accordance with the relevant Catchment Management Authority's salinity management program.	GW2	Rare	Minor	Low	The initial and residual risk ratings are based on the likelihood and consequence definitions in the VMFRP Guide to Environmental Risk Management, with residual risk rating informed by the revised EDS and state of knowledge. The risk is considered low because the Environmental Water Management Plan improves the management of groundwater quality through monitoring and	EES Central Groundwater Specialist Assessment	In the context of the state of knowledge for the Hattah Lakes North project, the risk of harm to human health and the environment was assessed, controls to eliminate or otherwise reduce those risks were then identified, and the preferred controls determined based on what is reasonably practicable to be undertaken as part of the Hattah Lakes North project. The preferred controls are documented in the Environmental Delivery Standard.

											adaptive management.		
Groundwater – Quality	Potential impacts on groundwater quality (e.g. increased salinity) during managed inundation impacting on environmental values including groundwater-dependent ecosystems	Operation	Rare	Minor	Low	Operational groundwater management Monitor and manage the risk of salinity in accordance with the relevant Catchment Management Authority's salinity management program.	GW2	Rare	Minor	Low	The initial and residual risk ratings are based on the likelihood and consequence definitions in the VMFRP Guide to Environmental Risk Management, with residual risk rating informed by the revised EDS and state of knowledge. The risk is considered low because the Environmental Water Management Plan improves the management of groundwater quality through monitoring and adaptive management.	EES Central Groundwater Specialist Assessment	In the context of the state of knowledge for the Hattah Lakes North project, the risk of harm to human health and the environment was assessed, controls to eliminate or otherwise reduce those risks were then identified, and the preferred controls determined based on what is reasonably practicable to be undertaken as part of the Hattah Lakes North project. The preferred controls are documented in the Environmental Delivery Standard.

Addendum D: Nyah Floodplain Restoration Project

VICTORIAN MURRAY FLOODPLAIN RESTORATION PROJECT
HEALTHY LANDSCAPES, STRONG COMMUNITIES

Groundwater Monitoring and Reporting Program – Addendum D

Nyah Floodplain Restoration Project

Nyah EPBC: 2020/8648 (Conditions 18 – 22)

Australian Government
VICTORIA State Government
LOWER MURRAY WATER
Goulburn-Murray WATER
mallee catchment management authority
North Central CMA
Parks VICTORIA

Approved Action

Person to whom the approval is granted	Lower Murray Urban and Rural Water Corporation
ABN of Approval Holder	18 475 808 826
Action	
Nyah Floodplain Restoration Project (EPBC: 2020/8648)	To construct and operate water regulating structures, construct a borrow pit, and decommission two existing structures to facilitate managed inundation of approximately 475 ha of the Nyah floodplain at Nyah Vinifera Park, Victoria. [See EPBC Act referral 2020/8648 and variation request dated 21 September 2022].

Declaration of accuracy

In making this declaration, I am aware that section 491 of the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) makes it an offence in certain circumstances to knowingly provide false or misleading information or documents to specified persons who are known to be performing a duty or carrying out a function under the EPBC Act or the Environment Protection and Biodiversity Conservation Regulations 2000 (Cth). The offence is punishable on conviction by imprisonment or a fine, or both. I am authorised to bind the approval holder to this declaration and that I have no knowledge of that authorisation being revoked at the time of making this declaration.

Signed: 

Full name (please print): ASHER SUTTON

Organisation (please print): LOWER MURRAY URBAN AND RURAL WATER CORPORATION

Date 17/03/2026

Table of contents

Quality Information

Version	Date	Prepared by (Author)	Qualification/s and Years of Experience	Approved for submission	Qualification/s and Years of Experience
A – VMFRP and stakeholder review	22 September 2025	Michael Chendorain	Professional Civil Engineer (PE), Masters Science, 28 years	Skye Brown	BSc Hons, Masters Env Studies, 29 years
B – DCCEEW preliminary review	14 October 2025	Michael Chendorain		Skye Brown	
C – For stakeholder acceptance	26 February 2026	Kristian Sakellaris	B.Eng(Env)(Hns), 6 years	Michael Chendorain	Professional Civil Engineer (PE), Masters Science, 28 years
D – for issue to DCCEEW	05 March 2026	Kristian Sakellaris	B.Eng(Env)(Hns), 6 years	Michael Chendorain	Professional Civil Engineer (PE), Masters Science, 28 years
0 – for issue to DCCEEW for approval	17 March 2026	Kristian Sakellaris		Michael Chendorain	

Abbreviations

Abbreviation	Definition
CMA	Catchment Management Authority
EES	*Environment Effects Statement under the Environment Effects Act 1978*
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999 (Cth)*
GWMRP	Groundwater Monitoring and Reporting Program
GRLs	Groundwater reference locations
ha	Hectares
Mallee CMA	Mallee Catchment Management Authority
MIAs	Groundwater quality within the maximum inundation areas
SRAs	Salinisation risk areas
TLM	The Living Murray
VMFRP	Victorian Murray Floodplain Restoration Project

1 Introduction

The purpose of this addendum report is to provide the site-specific monitoring requirements for the Groundwater Monitoring and Reporting Plan (GWMRP) for Nyah (the site).

The EPBC Approval for the Site was received on 22 February 2024 and includes condition relating to the preparation of a GWMRP. Refer to the GWMRP for additional details.

The Nyah Floodplain Restoration Project will construct and operate water regulating structures, construct a borrow pit, and decommission two existing structures (as shown in Figure 1) to facilitate managed inundation of approximately 475 ha of the Nyah floodplain at Nyah-Vinifera Park, Victoria, which is across the Nyah Water Management Area.

The Nyah project has been designed to replicate key components of the natural hydrology of the system, to provide maximum operational flexibility and to complement basin river flows to deliver environmental outcomes. Figure 1 depicts the indicative inundation areas (depicted as the Maximum Inundation Area) and flow paths (watercourses) and regulating structures. Environmental watering events will occur in response to seasonal triggers, ecological need, water availability and operational risks, with timing generally aligned to late winter and spring flow cues and adjusted through adaptive management. Additional details are provided in Section 1.1 and Section 1.2 below.

The infrastructure has been designed to be operated in several possible flow regimes. Five potential scenarios have been developed to illustrate how the structures can be used to achieve environmental watering targets, which would contribute to an overall improvement for biodiversity:

- **Default:** this scenario is the default configuration for Nyah water management structures, in normal regulated river conditions when environmental watering is not required. All regulating structures will be open
- **Seasonal Fresh**: this scenario allows high river flow to generate through-flow in Parnee Malloo Creek. All regulating structures will be open
- **Vinifera Intermediate**: this scenario increases the frequency and duration of Seasonal Wetland inundation. Close N1a, N1b, N2, N5, N7 Regulators. Structures set to the height required to achieve operational objectives, (between open and 63.2 m AHD)
- **Vinifera Maximum:** this scenario increases the frequency and duration of Red Gum Swamp Forest inundation. N1a, N1b, N2, N5, N7 – set maximum level 63.2 m AHD
- **Natural Inundation / Flood Operation.**

The operating scenarios would rely on high Murray River flow events and temporary pumps to deliver water to the Nyah project. Under the Seasonal Fresh, Nyah Intermediate and Nyah Maximum scenarios temporary pumps may be used to augment inflows or provide flows entirely in the absence of inundation directly from the Murray River, to achieve environmental watering targets. Pump infrastructure would not be permanent; pumps would be brought in on a temporary basis for watering events.

The indicative flow thresholds below show how different Murray River flow events influence inundation frequency, duration and the operating scenarios:

- 19,000 ML/day flow event – inundation approximately 9.4 times every 10 years, median duration 4 months, environmental objectives can be achieved under Seasonal Fresh operating scenario
- 22,500 ML/day flow event – inundation approximately 9.5 times every 10 years, median duration 3.6 months, environmental objectives can be achieved under Nyah Intermediate operating scenario
- 27,500 ML/day flow event – inundation approximately 6 times every 10 years, median duration 1.3 months, environmental objectives can be achieved under Nyah Maximum operating scenario.

1.1 Nyah Project Description

The Nyah project is on the western side of the Murray River in the Nyah-Vinifera Park (managed by Parks Victoria), approximately 30 km north of Swan Hill in the north-west region of Victoria, between Nyah and Wood Wood. The Nyah project area is shown in Figure 1.

The Nyah project will involve works to facilitate inundation of approximately 475 ha of high ecological value Murray River floodplain. The project is expected to deliver a substantial net improvement to biodiversity and ecosystem

function across the floodplain. By restoring more natural water regimes, better aligning the frequency, duration, and timing of inundation with ecological needs, the project aims to enhance habitat quality for threatened species, improve the health and diversity of native vegetation, and strengthen resilience to climate change.

The infrastructure works to enable the operation of the Nyah project would include:

- One large regulator (N2 Regulator)
- Four small regulators (N1a Regulator, N1b Regulator, N5 Regulator and N7 Regulator)
- Containment banks (1.6 km)
- One drop structure to provide erosion control for flows returning from the floodplain to the Murray River
- One permanent hardstand area, for temporary pumps to transfer environmental water, as required
- Upgrades to existing access track (approximately 0.3 km)
- Creation of new access tracks (approximately 2.8 km)
- Use of existing access tracks, including for maintenance activities during operation (approximately 4.3 km)
- Decommissioning and removal of two redundant structures (N4 Bank and Pipe) and a block bank (N6 Regulator) in Parnee Malloo Creek.

The project is almost entirely in the Rural City of Swan Hill, the Mallee CMA region, and Crown land within the Nyah-Vinifera Park, except for the drop structure. The drop structure would extend into the banks and bed of the Murray River within New South Wales, in the Murray River Council local government area. There are no permanent pumps proposed as part of the project. The park is managed by Parks Victoria in accordance with the objectives of the Crown Land (Reserves) Act 1978 (Vic.).

1.2 Operation

The Nyah project has been designed to respond to the declining health of high-value floodplains from river regulation and the future effects of climate change. The Maximum Inundation Area of the project includes River Red Gum and Black Box forests and woodlands.

Operation of the environmental watering is managed by the Mallee CMA. The project infrastructure provides a high degree of operational flexibility enabling adaptive management principles to be implemented. Adaptability and flexibility of project operations is critical to the successful operation of the Nyah project, enabling it to respond to varying seasonal conditions and learn from each operation event. The adaptive management process is detailed in the site-specific Environmental Water Management Plan for the Nyah project. Monitoring would provide the data required to guide adaptive management. Monitoring undertaken in accordance with this EcoMRP is used to provide the data required to guide adaptive management.

The decision to initiate an environmental watering event as part of the project is based on:

- Water availability, based on seasonal water allocations determined by storage operators
- The floodplain water requirements, to ensure consistency with the watering regime, ecological objectives and targets
- Operational risks, such as risks associated with blackwater, algae and salinity, as detailed in the Environmental Water Management Plan for the project and seasonal watering proposals
- The regional context, such as the need for survival watering, recruitment watering, maintenance watering, and other river operations that may occur within the river reach.

Timing of each environmental watering event considers late winter and spring flow triggers, such as upstream rainfall or the need for environmental watering to facilitate ecological events. The extent of inundation is managed according to the equivalent flow rate in the Murray River. For further detail about operations and environmental watering scenarios, please see Chapter 6 Project description of the Environment Report.

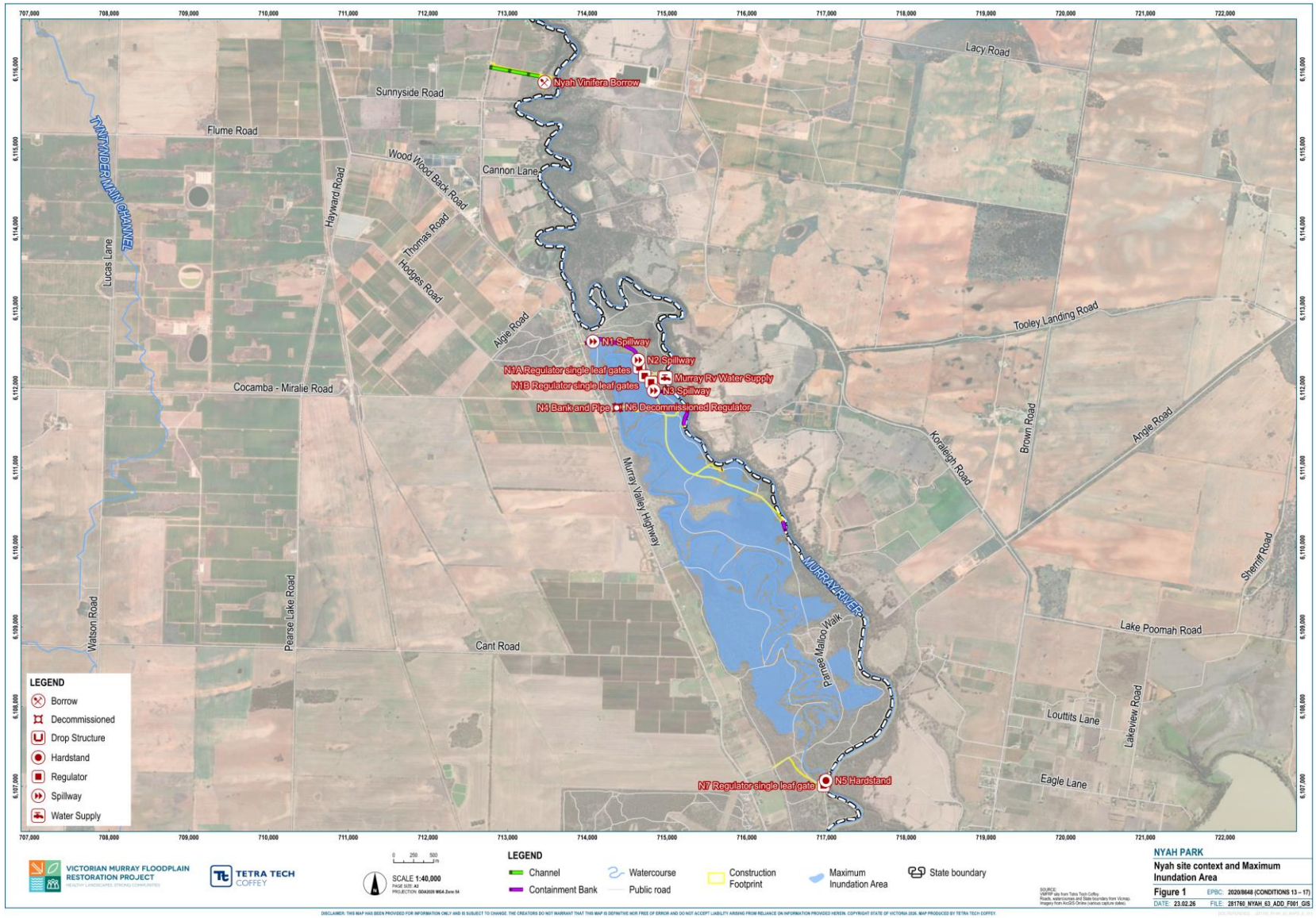


Figure 1 Nyah site context and maximum inundation area

2 Potential Environmental Impacts

Refer to the main plan document for a summary of potential environmental impacts[1].

3 Risk assessment

The outcomes of the environmental risk assessment have directly informed the monitoring requirements for Nyah. In particular, groundwater identified as having medium or higher residual risk, following the application of Environmental Delivery Standards, have guided the selection of monitoring parameters, locations and frequencies. The monitoring program is intended to assess the effectiveness of mitigation measures, detect any unanticipated groundwater impacts, and provide information to support adaptive management of environmental watering operations.

The relevant risks associated with the Nyah project are included in Appendix A.

4 Monitoring

4.1 Methodology

The EPBC Approval requires the monitoring program to address the following areas:

- Salinisation risk areas
- Groundwater reference location
- Groundwater quality within the maximum inundation area.

The monitoring programs across the sites for each area includes the collection of baseline data to ensure that trigger values are detected if they occur.

Groundwater monitoring locations are presented in Table 1 with details as documented within the Visualising Victoria's Groundwater (VVG) database[3]. The monitoring locations were developed following the completion of the environment effects statement process and have been accepted by the Mallee Catchment Management Authority (MCMA).

The monitoring locations satisfy the requirements to monitor the following conditions / purposes:

- Salinisation risk areas (SRAs): Areas which are downgradient from identified areas of higher salinity. These areas have been identified as locations within the footprint of inundation areas (and downgradient of high salinity groundwater) and/or locations adjacent to the Murray River.
- Groundwater quality within the maximum inundation areas (MIAs): Areas which are within the inundation areas (or adjacent); and
- Groundwater reference locations (GRLs): Areas which are generally upgradient of the groundwater inundation areas.

The detailed methodology and further information is presented in the GWMRP[1]. This addendum document should be read in conjunction with the GWMRP.

Note that monitoring wells listed as MIA are either within the inundation area or have the potential to be impacted by inundation events, due to their connectivity with adjacent water courses.

4.1.1 Monitoring locations and parameters

Table 1 presents well monitoring location details. Figure 2 presents the locations of the groundwater monitoring bores. Table 1 provides further details on the relevant monitoring parameters (i.e. the purpose) for each bore. The procedures for groundwater data collection and selection of trigger levels are defined in the GWMRP[1].

Table 1 Monitoring locations

Well ID	Monitoring Purpose[1]	Coordinates		Monitoring screened interval[2]	Well status	GWL (mbgl)[3]	EC (mS/cm)[3]
		Lat.	Long.	(mbgl)			
Nyah							
WRK119931	SRA, MIA	-35.11501	143.359661	7 to 9	Existing	8.04	0.322
WRK119928	MIA	-35.14340	143.370501	6 to 8	Existing	8.22	N/A
WRK119929	MIA	-35.15116	143.377146	6 to 8	Existing	9.58	10.87
N1	MIA	-35.108112	143.349911	TBD	Planned	N/A	N/A
N2	MIA	-35.148033	143.3736	TBD	Planned	N/A	N/A

Notes:

1. Monitoring purpose is described above where: SRA = salinity risk area; MIA = maximum inundation area; and GRL = groundwater reference location.
2. Not identified indicates that data was not available from the data source (VVG); TBD = to be defined, which means the response zones will be documented after installation of the planned monitoring wells.
3. Baseline data for groundwater level and electrical conductivity include data from 27th Jan 2021 up to 19th Feb 2025. The value provided is the median value taken from available observed data.

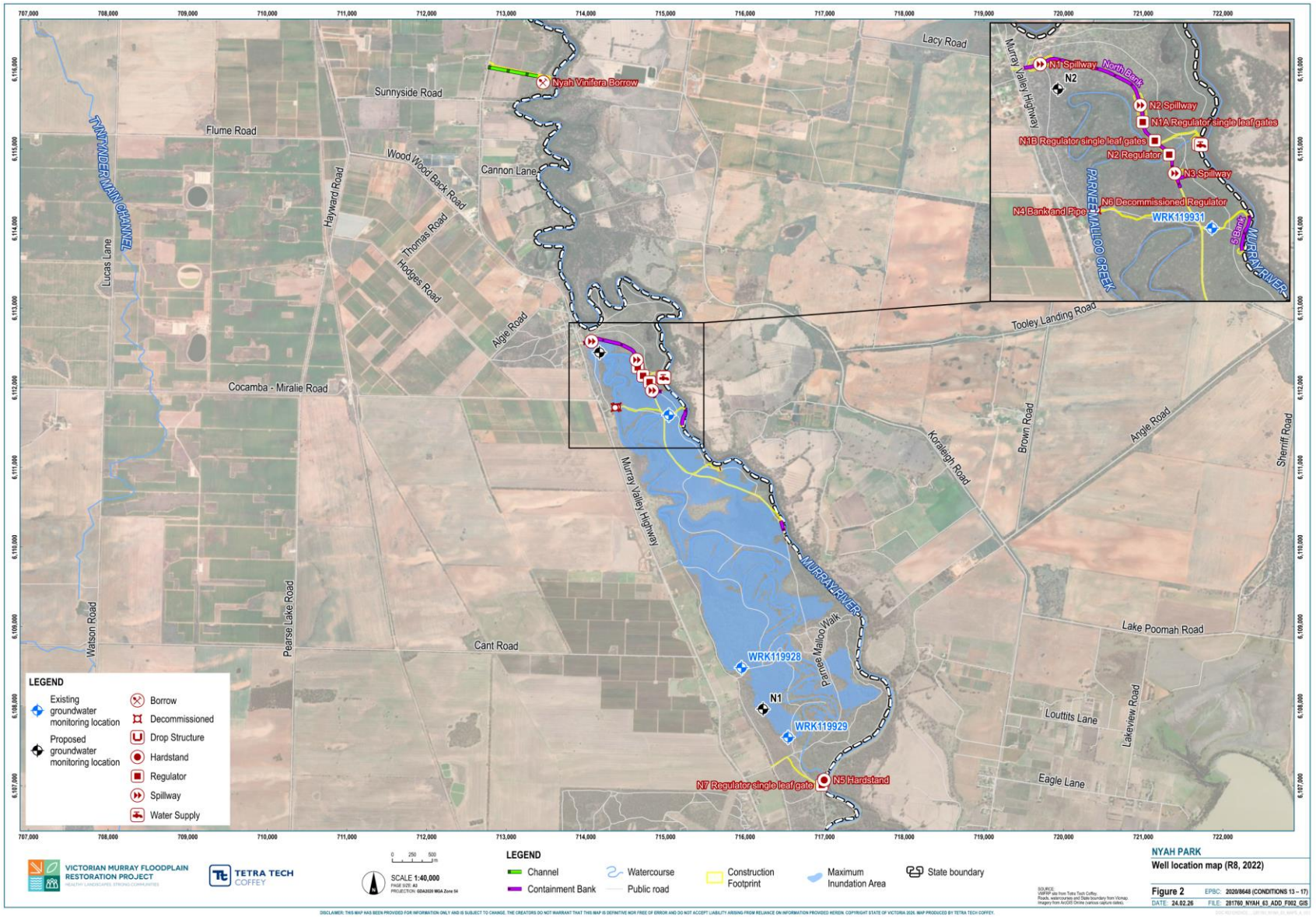


Figure 2 Well location map

References

[1] Arup, 2025. Victorian Murray Floodplain Restoration Project, Groundwater Monitoring and Reporting Program, Hattah Lakes North Floodplain Restoration Project, Nyah Floodplain Restoration Project, Vinifera Floodplain Restoration Project. Document number VMFRP-REP-CEN-0001.

[2] R8, 2022. Victorian Murray Floodplain Restoration Project, Specialist Assessment D Groundwater, Environmental Effects Statement, EES Central: Belsar-Yungera and Hattah Lakes North. Document number: IS371000-SC-GW-RP-021, Dated August.

[3] Visualising Victoria's Groundwater (VVG), 2025. vvg.org.au. accessed 12 September 2025.

Appendix A: Risk register

			Initial Risk					Residual Risk					
Aspect	**Impact Pathway**	**Activity**	**Likelihood**	**Consequence**	**Inherent Risk Rating**	**Environmental Delivery Standards**	**EDS No.**	**Likelihood**	**Consequence**	**Residual Risk Rating**	**Rationale**	**State of knowledge**	**Reasonably practicable**
Groundwater – Flow	Potential changes to groundwater levels or flows during managed inundation events on environmental values	Operation	Unlikely	Insignificant	Low	**Operational groundwater management** Monitor and manage the risk of salinity in accordance with the relevant Catchment Management Authority's salinity management program.	GW2	Unlikely	Insignificant	Low	The risk is considered Low, as the Environmental Water Management Plan improves the management of changes to groundwater flow as a result of operation	Draft Groundwater assessment	In the context of the state of knowledge for the Vinifera project, the risk of harm to human health and the environment was assessed, controls to eliminate or otherwise reduce those risks were then identified, and the preferred controls determined based on what is reasonably practicable to be undertaken as part of the Vinifera project. The preferred controls are documented in the Initial Environmental Delivery Standard.

Groundwater – Quality	Potential impacts on groundwater quality resulting from managed inundation impacting on environmental values including groundwater-dependent ecosystems	Operation	Unlikely	Insignificant	Low	**Operational groundwater management** Monitor and manage the risk of salinity in accordance with the relevant Catchment Management Authority's salinity management program.	GW2	Unlikely	Insignificant	Low	The risk is considered Low, as the Environmental Water Management Plan improves the management of changes to groundwater flow as a result of operation	Draft Groundwater assessment	In the context of the state of knowledge for the Vinifera project, the risk of harm to human health and the environment was assessed, controls to eliminate or otherwise reduce those risks were then identified, and the preferred controls determined based on what is reasonably practicable to be undertaken as part of the Vinifera project. The preferred controls are documented in the Initial Environmental Delivery Standard.

Addendum E: Vinifera Floodplain Restoration Project

VICTORIAN MURRAY FLOODPLAIN RESTORATION PROJECT
HEALTHY LANDSCAPES, STRONG COMMUNITIES

Groundwater Monitoring and Reporting Program – Addendum E

Vinifera Floodplain Restoration Project

Vinifera EPBC: 2020/8647 (Conditions 18 – 22)

Australian Government | VICTORIA State Government | LOWER MURRAY WATER | Goulburn-Murray WATER | mallee catchment management authority | North Central CMA | Parks VICTORIA

Approved Action

Person to whom the approval is granted	Lower Murray Urban and Rural Water Corporation
ABN of Approval Holder	18 475 808 826
Action	
Vinifera Floodplain Restoration Project (EPBC: 2020/8647)	To construct and operate water regulating structures to facilitate managed inundation of up to 335 ha of the Vinifera floodplain, Nyah Vinifera Park, Victoria [See EPBC Act referral 2020/8647 and variation request dated 4 November 2022].

Declaration of accuracy

In making this declaration, I am aware that section 491 of the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) makes it an offence in certain circumstances to knowingly provide false or misleading information or documents to specified persons who are known to be performing a duty or carrying out a function under the EPBC Act or the Environment Protection and Biodiversity Conservation Regulations 2000 (Cth). The offence is punishable on conviction by imprisonment or a fine, or both. I am authorised to bind the approval holder to this declaration and that I have no knowledge of that authorisation being revoked at the time of making this declaration.

Signed: 

Full name (please print): ASHER SUTTON

Organisation (please print): LOWER MURRAY URBAN AND RURAL WATER CORPORATION

Date 17/03/2026

Table of contents

Quality Information

Version	Date	Prepared by (Author)	Qualification/s and Years of Experience	Approved for submission	Qualification/s and Years of Experience
A – VMFRP and stakeholder review	22 September 2025	Michael Chendorain	Professional Civil Engineer (PE), Masters Science, 28 years	Skye Brown	BSc Hons, Masters Env Studies, 29 years
B – DCCEEW preliminary review	14 October 2025	Michael Chendorain		Skye Brown	
C – For stakeholder acceptance	26 February 2026	Kristian Sakellaris	B.Eng(Env)(Hns), 6 years	Michael Chendorain	Professional Civil Engineer (PE), Masters Science, 28 years
D – for issue to DCCEEW	05 March 2026	Kristian Sakellaris	B.Eng(Env)(Hns), 6 years	Michael Chendorain	Professional Civil Engineer (PE), Masters Science, 28 years
0 – for issue to DCCEEW for approval	17 March 2026	Kristian Sakellaris		Michael Chendorain	

Abbreviations

Abbreviation	Definition
CMA	Catchment Management Authority
EES	*Environment Effects Statement under the Environment Effects Act 1978*
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999 (Cth)*
GMP	Groundwater Monitoring and Reporting Program
GRLs	Groundwater reference locations
ha	Hectares
Mallee CMA	Mallee Catchment Management Authority
MIAs	Groundwater quality within the maximum inundation areas
SRAs	Salinisation risk areas
TLM	The Living Murray
VMFRP	Victorian Murray Floodplain Restoration Project

1 Introduction

The purpose of this addendum report is to provide the site-specific monitoring requirements for the Groundwater Monitoring and Reporting Plan (GWMRP) for Vinifera (the site).

The EPBC Approval for the Site was received on 22 February 2024 and includes condition relating to the preparation of a GWMRP. Refer to the GWMRP for additional details.

The Vinifera Floodplain Restoration Project will construct and operate water regulating structures (as shown in Figure 1) to facilitate managed inundation of up to 335 ha of the Vinifera floodplain, Nyah-Vinifera Park, Victoria, which is across the Vinifera Water Management Area.

The Vinifera project has been designed to replicate key components of the natural hydrology of the system, to provide maximum operational flexibility and to complement basin river flows to deliver environmental outcomes. Figure 1 depicts the indicative inundation areas (depicted as the Maximum Inundation Area) and flow paths (watercourses) and regulating structures. Environmental watering events will occur in response to seasonal triggers, ecological need, water availability and operational risks, with timing generally aligned to late-winter and spring flow cues and adjusted through adaptive management. Additional details are provided in Section 1.2 below.

The infrastructure has been designed to be operated in several possible flow regimes. Five potential scenarios have been developed to illustrate how the structures can be used to achieve environmental watering targets, which would contribute to an overall improvement for biodiversity:

- **Default:** this scenario is the default configuration for Vinifera water management structures, in normal regulated river conditions when environmental watering is not required. All regulating structures will be open
- **Seasonal Fresh**: this scenario increases the frequency and duration of watering into Vinifera Creek and seasonal wetlands. All regulating structures open except V3, which may be open or closed depending on private landholder arrangements. V4 closed if pumping
- **Vinifera Intermediate**: this scenario increases the frequency and duration of Red Gum Swamp Forest. V1, V2, V4regulating structures set to height required to achieve operational objectives, (between open and 64.4 m Australian Height Datum (AHD), with through flow maintained and V3 closed
- **Vinifera Maximum:** this scenario increases the frequency and duration of Red Gum Swamp Forest and Red Gum Forest and Woodland. V1, V2, V4 structures set to maximum operating level 64.4 m AHD, with through flow maintained and V3 closed.
- **Natural Inundation / Flood Operation.**

The operating scenarios rely on high Murray River flow events and temporary pumps to deliver water from the Murray River to the Vinifera project. Pump infrastructure will not be permanent; pumps will be brought in on a temporary basis for watering events. The infrastructure can be operated to hold the water on the floodplain, this can then be topped up or additional areas can be inundated, using temporary pumping.

The indicative flow thresholds below show how different Murray River flow events influence inundation frequency, duration and the operating scenarios:

- 15,000 ML/day flow event – inundation approximately 10 times every 10 years, median duration 4.9 months, environmental objectives can be achieved under Seasonal Fresh operating scenario
- 17,500 ML/day flow event – inundation approximately 9.5 times every 10 years, median duration 4.7 months, environmental objectives can be achieved under Vinifera Intermediate operating scenario
- 20,000+ ML/day flow event – inundation approximately 8.1 times every 10 years, median duration 2.6 months, environmental objectives can be achieved under Vinifera Maximum operating scenario.

1.1 Vinifera Project Description

The Vinifera project is located on the western side of the Murray River in the Nyah-Vinifera Park (managed by Parks Victoria), approximately 25 km north of Swan Hill in the north-west region of Victoria, between Swan Hill and Nyah. The Vinifera project area, which includes the Construction Footprint, Maximum Inundation Area (MIA) and proposed operational infrastructure, is shown in Figure 1.

The Vinifera project will involve works to facilitate inundation of approximately 335 ha of significant floodplain at the northern and southern end of Vinifera Creek. The project is expected to deliver a substantial net improvement to

biodiversity and ecosystem function across the floodplain. By restoring more natural water regimes, better aligning the frequency, duration, and timing of inundation with ecological needs, the project aims to enhance habitat quality for threatened species, improve the health and diversity of native vegetation, and strengthen resilience to climate change.

The infrastructure works to enable the operation of the Vinifera project would include:

- One large regulator (V1 Box culvert regulator)
- Two small regulators (V2 Box culvert regulator and V4 Regulator)
- One pipe culvert regulator (V3 Pipe culvert regulator)
- Containment banks (2.3 km) incorporating seven spillways
- A drop structure to provide erosion control for flows returning from the floodplain to the Murray River
- One permanent hardstand, for temporary pumps to transfer environmental water as required
- Upgrades to existing access tracks (approximately 1 km)
- Creation of new access tracks (approximately 2 km)
- Use of existing access tracks, including for maintenance activities during operation (approximately 1.7 km).

The project is almost entirely in the Rural City of Swan Hill, the Mallee CMA region, and Crown land within the Nyah-Vinifera Park, except for the drop structure. The drop structure would extend into the banks and bed of the river on the New South Wales border, in the Murray River Council local government area. There are no permanent pumps proposed as part of the project. The park is managed by Parks Victoria in accordance with the objectives of the Crown Land (Reserves) Act 1978 (Vic.).

1.2 Operation

The Vinifera project has been designed to respond to the declining health of high-value floodplains from river regulation and the future effects of climate change. The Maximum Inundation Area of the project includes River Red Gum and Black Box forests and woodlands.

Operation of the environmental watering is managed by the Mallee CMA. The project infrastructure provides a high degree of operational flexibility enabling adaptive management principles to be implemented. Adaptability and flexibility of project operations is critical to the successful operation of the Vinifera project, enabling it to respond to varying seasonal conditions and learn from each operation event. The adaptive management process is detailed in the site-specific Environmental Water Management Plan for the Vinifera project. Monitoring would provide the data required to guide adaptive management. Monitoring undertaken in accordance with this EcoMRP is used to provide the data required to guide adaptive management.

The decision to initiate an environmental watering event as part of the project is based on:

- Water availability, based on seasonal water allocations determined by storage operators
- The floodplain water requirements, to ensure consistency with the watering regime, ecological objectives and targets
- Operational risks, such as risks associated with blackwater, algae and salinity, as detailed in the Environmental Water Management Plan for the project and seasonal watering proposals
- The regional context, such as the need for survival watering, recruitment watering, maintenance watering, and other river operations that may occur within the river reach.

Timing of each environmental watering event considers late winter and spring flow triggers, such as upstream rainfall or the need for environmental watering to facilitate ecological events. The extent of inundation is managed according to the equivalent flow rate in the Murray River. For further detail about operations and environmental watering scenarios, please see Chapter 6 Project description of the Environment Report.

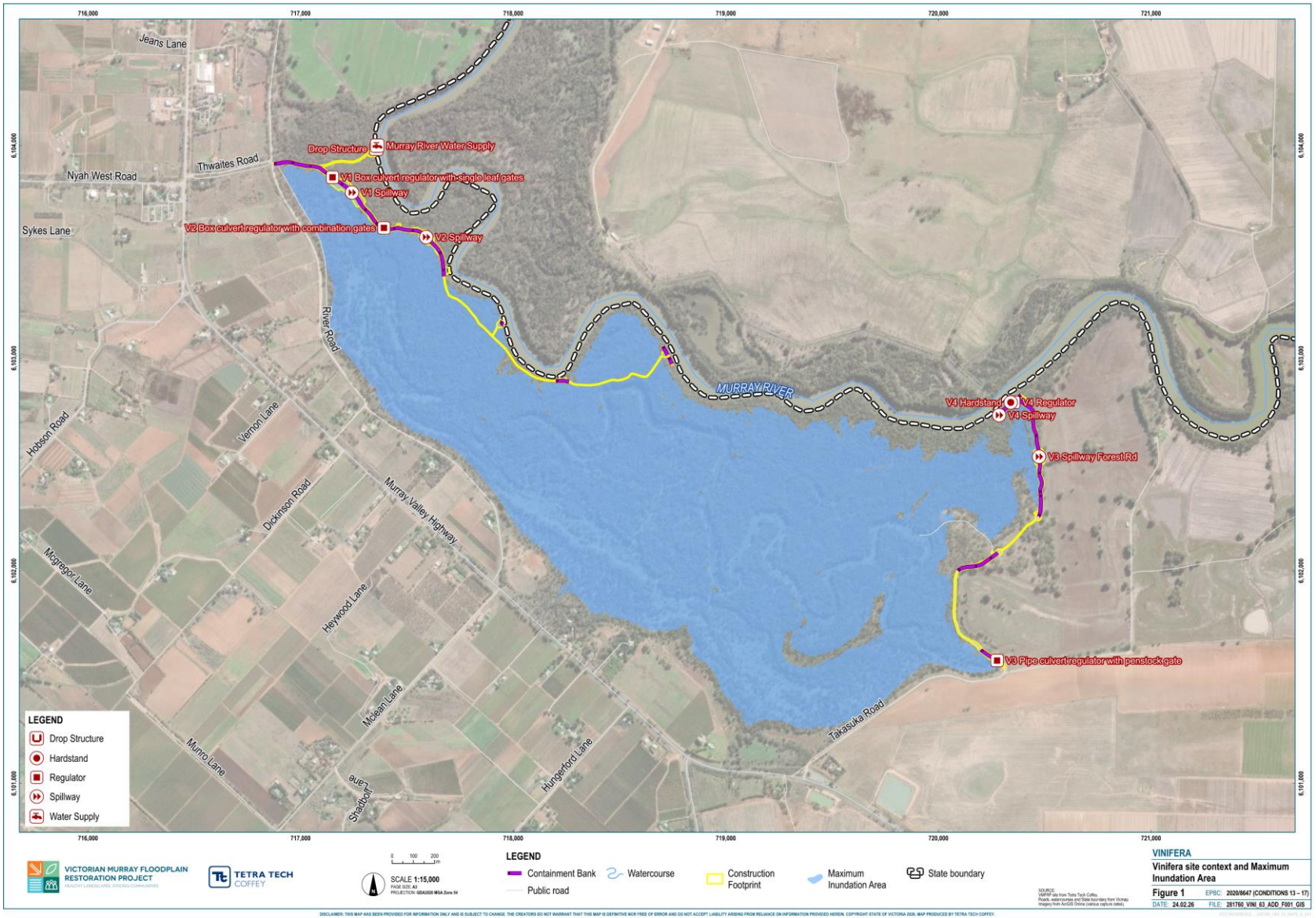


Figure 1 Vinifera site context and maximum inundation area

2 Potential Environmental Impacts

Refer to the main plan document for a summary of potential environmental impacts

3 Risk assessment

The outcomes of the environmental risk assessment have directly informed the monitoring requirements for Vinifera. In particular, groundwater identified as having medium or higher residual risk, following the application of Environmental Delivery Standards, have guided the selection of monitoring parameters, locations and frequencies. The monitoring program is intended to assess the effectiveness of mitigation measures, detect any unanticipated groundwater impacts, and provide information to support adaptive management of environmental watering operations.

The relevant risks associated with the Vinifera project are included in Appendix A.

4 Monitoring

4.1 Methodology

The EPBC Approval requires the monitoring program to address the following areas:

- Salinisation risk areas
- Groundwater reference location
- Groundwater quality within the maximum inundation area.

The monitoring programs across the sites for each area includes the collection of baseline data to ensure that trigger values are detected if they occur.

Groundwater monitoring locations are presented in Figure 2 with details as documented within the Visualising Victoria's Groundwater (VVG) database[3]. The monitoring locations were developed following the completion of the environment effects statement process and have been accepted by the Mallee Catchment Management Authority (MCMA).

The monitoring locations satisfy the requirements to monitor the following conditions / purposes:

- Salinisation risk areas (SRAs): Areas which are downgradient from identified areas of higher salinity. These areas have been identified as locations within the footprint of inundation areas (and downgradient of high salinity groundwater) and/or locations adjacent to the Murray River.
- Groundwater quality within the maximum inundation areas (MIAs): Areas which are within the inundation areas (or adjacent).
- Groundwater reference locations (GRLs): Areas which are generally upgradient of the groundwater inundation areas. The detailed methodology and further information is presented in the Groundwater Monitoring and Reporting Plan (GWMRP)[1]. This addendum document should be read in conjunction with the GWMRP.

Note that monitoring wells listed as MIA are either within the inundation area or have the potential to be impacted by inundation events, due to their connectivity with adjacent water courses.

4.1.1 Monitoring locations and parameters

Table 1 presents well monitoring location details. Figure 2 presents the locations of the groundwater monitoring bores. Table 1 provides further details on the relevant monitoring parameters (i.e. the purpose) for each bore. The procedures for groundwater data collection and selection of trigger levels are defined in the GWMRP[1].

Table 1: Monitoring locations

Well ID	Monitoring Purpose[1]	Coordinates		Monitored screened interval[2]	Well status	GWL (mbgl)[3]	EC (mS/cm)[3]
		Lat.	Long.	(mbgl)			
Vinifera							
WRK119926	SRA	-35.19966	143.3941	Not identified	Existing	8.74	N/A
WRK119930	MIA	-35.1999	143.418849	Not identified	Existing	7.29	1.89
119388	MIA	-35.19454	143.386968	14.0 to 16.0	Existing	6.70	2.10
26182	GRL	-35.18396	143.386135	5.9 to 6.4	Existing	6.26	0.67
26156	GRL	-35.184439	143.381985	TBD	Replace	4.65	0.44
V1	MIA	-35.195694	143.391028	TBD	Planned	N/A	N/A
V2	MIA	-35.206527	143.41324	TBD	Planned	N/A	N/A
V3	MIA	-35.197046	143.421189	TBD	Planned	N/A	N/A
V4	MIA	-35.184439	143.381985	TBD	Planned	N/A	N/A

Notes:

1. Monitoring purpose is described above where: SRA = salinity risk area; MIA = maximum inundation area; and GRL = groundwater reference location.
2. Not identified indicates that data was not available from the data source (VVG); TBD = to be defined, which means the response zones will be documented after installation of the planned monitoring wells.
3. Baseline data for groundwater level and electrical conductivity include data from 29th Feb 1984 up to 4th Mar 2025. The value provided is the median value taken from available observed data.

Some bores identified in the original Environment Report[2] and then in the Ministers Assessment have not been able to be located.

Bore 26271 could not be found and is assumed to be destroyed. As this bore is close to existing bores 26182 the need has been re-assessed and no replacement is required.

Bore 26156 could not be found and is assumed to be destroyed. A replacement bore is to be drilled nearby.

Bore 119389 could not be found and is assumed to be destroyed. As this bore is close to existing bore 119388 the need has been re-assessed and no replacement is required.

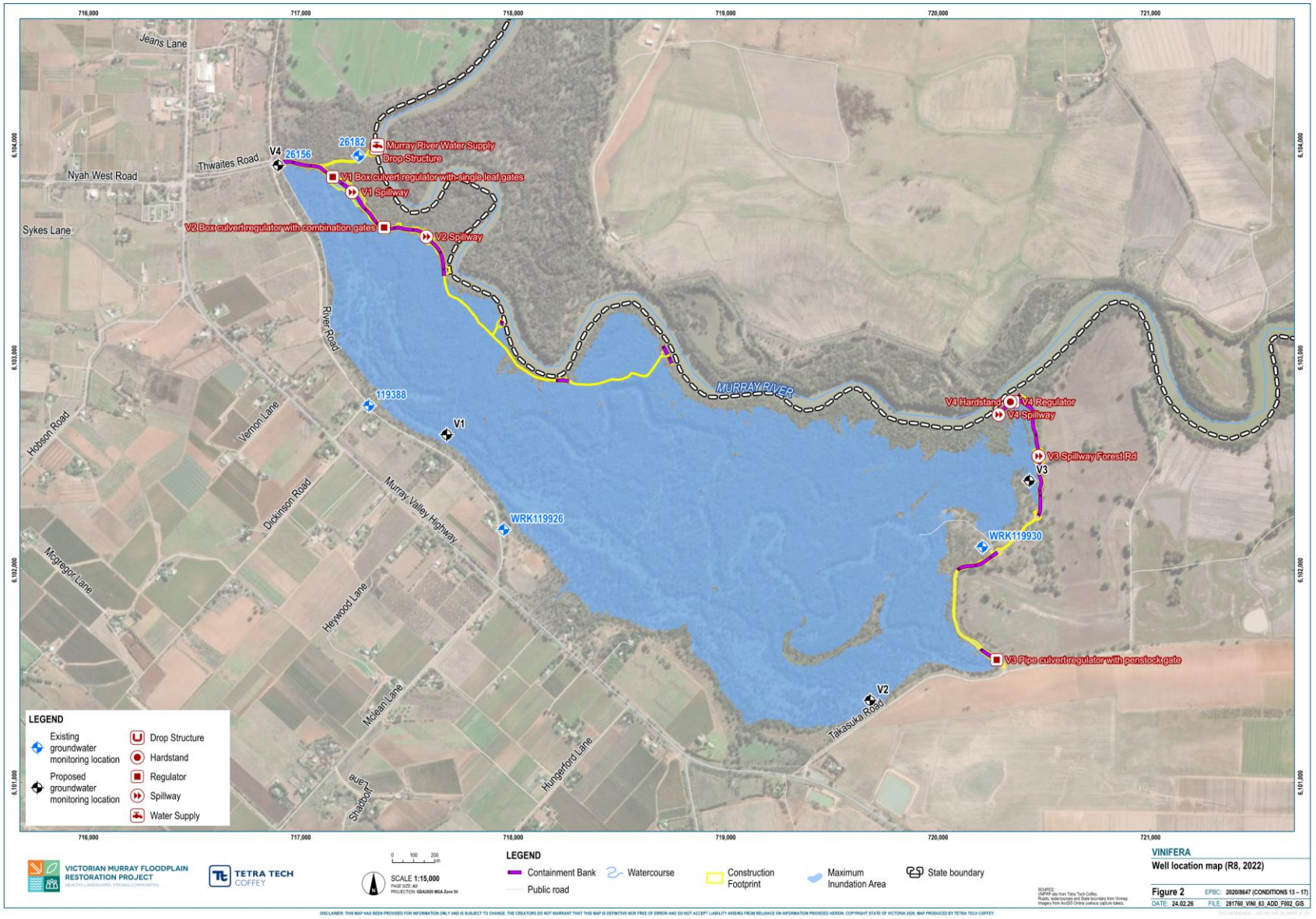


Figure 2 Well location map

References

[1] Arup (2025). Victorian Murray Floodplain Restoration Project, Groundwater Monitoring and Reporting Program, Hattah Lakes North Floodplain Restoration Project, Nyah Floodplain Restoration Project, Vinifera Floodplain Restoration Project. Document number VMFRP-REP-CEN-0001.

[2] R8 (2022). Victorian Murray Floodplain Restoration Project, Specialist Assessment D Groundwater, Environmental Effects Statement, EES Central: Belsar-Yungera and Hattah Lakes North. Document number: IS371000-SC-GW-RP-021, Dated August.

[3] Visualising Victoria's Groundwater (VVG) (2025). vvg.org.au. accessed 12 September 2025.

Appendix A: Risk register

			Initial Risk					Residual Risk					
Aspect	**Impact Pathway**	**Activity**	**Likelihood**	**Consequence**	**Inherent Risk Rating**	**Environmental Delivery Standards**	**EDS No.**	**Likelihood**	**Consequence**	**Residual Risk Rating**	**Rationale**	**State of knowledge**	**Reasonably practicable**
Groundwater – Flow	Potential changes to groundwater levels or flows during managed inundation events on environmental values	Operation	Rare	Insignificant	Low	Operational groundwater management: Monitor and manage the risk of salinity in accordance with the relevant Catchment Management Authority's salinity management program.	GW2	Rare	Insignificant	Low	The risk is considered Low, as the Environmental Water Management Plan improves the management of changes to groundwater flow as a result of operation	Draft Groundwater assessment	In the context of the state of knowledge for the Vinifera project, the risk of harm to human health and the environment was assessed, controls to eliminate or otherwise reduce those risks were then identified, and the preferred controls determined based on what is reasonably practicable to be undertaken as part of the Vinifera project. The preferred controls are documented in the Initial Environmental Delivery Standard.

Groundwater – Quality	Potential impacts on groundwater quality resulting from managed inundation impacting on environmental values including groundwater-dependent ecosystems	Operation	Rare	Insignificant	Low	Operational groundwater management Monitor and manage the risk of salinity in accordance with the relevant Catchment Management Authority's salinity management program.	GW2	Rare	Insignificant	Low	The likelihood has been reduced because the Environmental Water Management Plan improves the management of groundwater quality through monitoring and adaptive management.	Draft Groundwater assessment	In the context of the state of knowledge for the Vinifera project, the risk of harm to human health and the environment was assessed, controls to eliminate or otherwise reduce those risks were then identified, and the preferred controls determined based on what is reasonably practicable to be undertaken as part of the Vinifera project. The preferred controls are documented in the Initial Environmental Delivery Standard.