Sydney Drinking Water Catchment Audit 2019 – Volume 3

WaterNSW

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Project Name	Sydney Drinking Water Catchment Audit 2019
Project Number	19SUT-12363
Project Manager	Beth Medway
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Reviewed by	Beth Medway
Approved by	Beth Medway
Status	**Final**
Version Number	**3**
Last saved on	**1 June 2020**

This report should be cited as 'Eco Logical Australia 2020. *Sydney Drinking Water Catchment Audit 2019 – Volume 3*. Prepared for WaterNSW.'

Template 2.8.1

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Abbreviations

Abbreviation	Description
AS/NZS	Australian Standard / New Zealand Standard
ELA	Eco Logical Australia
ISO	International Organisation for Standardisation
SDWC	Sydney Drinking Water Catchment

Appendix A Audit team

Eco Logical Australia is certified to Australian Standard / New Zealand Standard (AS/NZS) ISO 14001: 2015 Environmental Management Systems, AS/NZS 4801:2001 Occupational Health and Safety Management Systems and AS/NZS ISO 9001:2015 Quality Management Systems.

Members of the audit team are listed below.

Table 1: Audit team

Name	Qualifications
Dr Richard Cresswell (Project Director)	Doctorate (Geology and Meteoritics), University of Toronto 1993 Master of Science (Geology and Archaeometry), University of Toronto 1987 Bachelor of Science (Geology), Sheffield University 1984
Beth Medway (Project Manager)	Graduate Certificate in Change Management (AGSM UNSW) 2017 Master of Environmental Engineering Science (UNSW) 2000 Master of Environmental Studies (UNSW) 1992 Bachelor of Science (Applied Physical Geography) (1st Class Hons) (UNSW) 1991
Alastair Jones	MPhil in Conservation Leadership, University of Cambridge, United Kingdom 2018 Master of Science (Environmental Science), University of Melbourne, Australia 2011 Bachelor of Science (Major in Zoology), University of Melbourne, Australia 2007
Andrew Herron	Bachelor of Environmental Engineering (Hons), Monash University, 2007
Brian Keogh	Bachelor of Social Work (Community Development) UNSW Master of Business Administration AGSM UNSW & USyd
Claire Wheeler	Graduate Certificate River Restoration and Management, Charles Sturt University Bachelor of Environmental Management, Macquarie University Certificate III Conservation & Land Management, Ryde TAFE
Deanne Hickey	Bachelor Science (Honours 1) University of Sydney Master of Science (Research) University of Sydney
Emily Messer	Graduate Certificate of Environmental Management and Sustainability: University of Newcastle 2016 Bachelor of Marine Science - Biology: University of Wollongong - 2012
Ian Dixon	RIVERSTYLES (Provisional) – 2019 AUSRIVAS Accreditation (Australian River Assessment System) – 2011 Master of Tropical Environmental Management - 2006 Graduate Diploma of Tropical Environmental Management – 2001 Bachelor of Landscape Architecture: Regeneration strategy for the Snowy River – 1999
Katy Wilkins	Bachelor of Science in Biodiversity and Conservation, Macquarie University – 2010
Kris Rixon	Bachelor of Environmental Science and Management (Earth Systems) (University of Newcastle, 2015)
Lauren Stephens	Bachelor of Science (Honours) in Hydrogeology, Flinders University
Mick George	Bachelor of Science (Forestry) Masters of Bushfire Protection 2020

Name	Qualifications
Nathan Kearnes	Graduate Diploma in Bushfire Protection - University of Western Sydney, 2020 Planning for Bushfire Prone Areas – University of Technology Sydney, 2006 Bachelor of Science - Macquarie University 1998 Majors in Resource and Environmental Management, Geographic Information Systems (GIS) and Physical Geography
Richard Heath	Bachelor of Design Studies
Scott Chrystal	Bachelor of Science in Spatial Information Science 2017

Appendix B Stakeholder consultation

B1 Stakeholder consultation process

Initial phone contact (Sept 2019)

- Reviewed 2016 audit recommendations for stakeholders
- Established key contacts within stakeholder groups
- Contact also established with other groups that were likely to have an interest or knowledge

Print / online advertising (19 Sept – 14 Oct 2019)

- State-wide: Sydney Morning Herald Public Notices Sat 28 Sept 2019
- Local media: 19-25 Sept 2019
- National Indigenous Times 26 Sept – 14 Oct 2019

Notification letters (Oct 2019)

- Letters sent to stakeholders, individualised to different segments
- Direct email contact with copy of letter
- 68 organisations notified

Letter follow-up (4 Nov 2019 – 6 March 2020)

- Phone follow-up with organization records section
- Direct follow-up with appointed officer
- Additional follow-up with referred data custodian specialists

Enquiry follow-up (1 Oct 2019 – 6 March 2020)

- Enquiries received from advertisements through central contact
- Central contact followed through with detail from data specialists

Direct data follow-up (4 Nov 2019 – 6 March 2020)

- Case study lists created
- Case study site visits organized
- Site visits and further data follow-up on specific issues

Key agencies invited to review draft audit and discuss recommendations (April – May 2020)

Figure 1: Stakeholder consultation process

B2 Notification letters

Notification letters were adjusted slightly depending on stakeholder segments. However, the information contained within was similar. All letters gave a list of the indicators being used and a link to previous audits. A sample is provided below.

eco logical AUSTRALIA
A TETRA TECH COMPANY

Suite 2, Level 3
668 Old Princes Highway
Sutherland NSW 2232
t: (02) 8536 8600

xx September 2019

Our ref: xxxx

Dear xxxx

2019 Sydney Drinking Water Catchment Audit – Request for Information

Every three years an audit is undertaken to assess the state or health of the Sydney Drinking Water Catchment under the *Water NSW Act 2014*. This audit is an important measure of changing catchment condition over time, so the assistance of your organization would be greatly appreciated.

Sydney's Drinking Water Catchment is over 16,000 km^2 and extends from north of Lithgow in the upper Blue Mountains, to the source of the Shoalhaven River near Cooma in the south.

The 2019 Catchment Audit will assess the state of the catchment against 18 key indicators of catchment health over the period from 1 July 2016 to 30 June 2019. A full list of the approved indicators, and a link to previous audits, is provided in Attachment A.

If your organisation holds relevant and suitable data that can be shared, we would appreciate it if you could send it to the auditor by 25 October 2019 via email catchmentaudit2019@ecoaus.com.au or posted to Sydney Drinking Water Catchment Audit 2019, Eco Logical Australia, PO Box 12, Sutherland, NSW 1499.

The auditor contact is Brian Keogh on 0408 028 269. He would be happy to answer any questions about the audit.

Regards,

Beth Medway
Principal Environmental Consultant and Lead Auditor

Figure 2: Example of notification letter

B3 Notifications

A total of 68 organisations were notified of the audit and invited to make submissions.

Segments of Interest Groups for the Sydney Drinking Water Catchment Audit 2019 are tabulated below.

Table 2: Interest group segments

Interest Group segment	Number of organisations notified
Data custodians	9
Local councils	14
Aboriginal organisations	9
WaterNSW customers	2
National Parks and conservation groups	12
Government functional agencies	7
Professional water industry associations	4
Farming industry groups	3
Mining industry groups and companies	5
Energy providers	3
TOTAL	68

Table 3: Organisations consulted

Interest Group Segment	Organisation
Data Custodians	WaterNSW
	Local catchment councils (see below)
	South East, Central Tablelands and Metropolitan Local Land Services
	Australian Bureau of Statistics
	Department of Planning, Industry, and Environment
	Department of Primary Industries
	NSW Environment, Energy and Science
	NSW Rural Fire Service

Interest Group Segment	Organisation
Local Councils	Blue Mountains
	Campbelltown
	Eurobodalla
	Goulburn Mulwaree
	Kiama
	Lithgow
	Oberon
	Queanbeyan Palerang
	Shoalhaven
	Sutherland
	Upper Lachlan
	Wingecarribee
	Wollondilly
	Wollongong
Customers	Sydney Water Corporation
	Other water supply customers
Aboriginal organisations	NSW Aboriginal Land Council
	Deerubbin Local Aboriginal Land Council
	Gandangarra Local Aboriginal Land Council
	Tharawal Local Aboriginal Land Council
	Illawarra Local Aboriginal Land Council
	Nowra Local Aboriginal Land Council
	Pejar Local Aboriginal Land Council
	Batemans Bay Local Aboriginal Land Council
	Gundungurra Tribal Council
	Other organisations with Aboriginal knowledge
National Parks and Conservations Groups	National Parks Association of NSW
	Nature Conservation Council of NSW
	Blue Mountains Conservation Society
	Colong Foundation for Wilderness
	Greater Blue Mountains Heritage Advisory Committee
	Robertson Environmental Protection Society
	Total Environment Centre
	Blue Mountains World Heritage Institute
	Sutherland Shire Environment Centre
	Knitting Nannas Against Coal
	Coal Free Southern Highlands
	Lock the Gate
	Other Local environment, conservation and community associations

Interest Group Segment	Organisation
Government functional agencies	The Bureau of Meteorology Roads and Maritime Services Natural Resources Commission NSW Police Force State Emergency Service NSW Ministry of Health NSW Public Works
Professional water industry associations	Stormwater NSW and The Stormwater Industry Australian Water Association and Water Services Association of Australia
Farming Industry Groups	NSW Farmers Federation Dairy NSW Dairy Industry Association of Australia
Energy Providers	Energy Australia Endeavour Energy Transgrid
Mining groups and companies	Minerals Council Peabody Energy South 32 Illawarra Coal Centennial Coal Wollongong Coal Limited

B4 Print advertising

State and regional based print media were used to reach a broader audience.

- A notice was placed in the Sydney Morning Herald, Public Notices section on Saturday, 28th September 2019. Actual print size was 6.35cm x 4.2cm. The layout and wording are given in Figure 3.
- Notices were placed in the regional publications as listed in Table 4 below. The layout and wording are given in Figure 4.
- The National Indigenous Times is an online publication. A notice inviting submissions was displayed on the front page from 26th September – 14th October 2019. A screen shot is given in Figure 5.

2019 AUDIT OF SYDNEY'S DRINKING WATER CATCHMENT

The Minister has appointed Eco Logical Australia Pty Ltd to undetake this audit. An independent audit of Sydney's drinking water catchment is conducted every three years on behalf of the Minister for Water, Property and Housing in accordance with the Water NSW Act 2014. The 2019 audit will assess the state of the catchment against key indicators of catchment health over the period from the 1st of July 2016 to the 30th June 2019. The following is a link to previous audits and indicators use:

http://www.watemsw.com.au/about/legislation/catchment-audits

The AUDITOR is contacting government agencies, business and community organisations to request relevant data for the audit. Members of the general community are invited to contact the auditor if they have information. If you have information or data that may be relevant to the catchment audit, please send your contact details to the following by Friday 25th October 2019:

catchmentaudit2019@ecoaus.com.au

or Sydney Drinking Water Catchment Audit, Eco Logical Australia, PO Box 12 Sutherland NSW, 1499. The auditor will then contact you.

Figure 3: Notice in Sydney Morning Herald

Table 4: List of regional newspapers

Publication	Run date	Size
Blue Mountains Gazette	25/09/2019	9cm x 2columns (linear style)
South Coast Register	25/09/2019	9cm x 2columns (linear style)
Southern Highland News	20/09/2019	9cm x 2columns (linear style)
Wollondilly Advertiser	25/09/2019	9cm x 2columns (linear style)
Oberon Review	19/09/2019	9cm x 2columns (linear style)
Crookwell Gazette	19/09/2019	9cm x 2columns (linear style)
Goulburn Post	20/09/2019	9cm x 2columns (linear style)
Lithgow Mercury	20/09/2019	9cm x 2columns (linear style)
Shoalhaven and Nowra News	20/09/2019	9cm x 2columns (linear style)
Braidwood Tallaganda Times	25/09/2019	9cm x 2columns (linear style)
Illawarra Mercury	20/09/2019	9cm x 2columns (linear style)

2019 Audit of Sydney's Drinking Water Catchment

The Minister has appointed ECO Logical Australia PTY Ltd to undertake this Audit

An independent audit of Sydney's Drinking Water Catchment is conducted every three years on behalf of the Minister for Water, Property and Housing in accordance with the Water NSW Act 2014. The 2019 audit will assess the state of the catchment against key indicators of catchment health over the period from 1 July 2016 to 30 June 2019.

The following is a link to previous audits and the indicators used: http://www.waternsw.com.au/about/legislation/catchment-audits

The Auditor is contacting Government agencies, businesses and community organisations to request relevant data for the audit. Members of the general community are invited to contact the Auditor if they have relevant information.
If you have information or data that may be relevant to the catchment audit, please send your contact details to the following by Friday 25 October 2019:

catchmentaudit2019@ecoaus.com.au **OR**
Sydney Drinking Water Catchment Audit, Eco Logical Australia, PO Box 12 Sutherland NSW 1499
The Auditor will then contact you.

Figure 4: Notice in regional newspapers

Figure 5: Notice on front page of the National Indigenous Times

B5 Field visits

The audit team is grateful to the participants in the site inspections and for landholders who provided access to their properties. The following organisations facilitated site visits and provided in-depth information for case studies (participants are listed in Table 5):

- WaterNSW
- Central Tablelands Local Land Service
- Lithgow Council
- Blue Mountains Council
- South East Local Land Council
- Wingecarribee Council
- Moss Vale – Private Landholder

- Parkesbourne – Private Landholder
- Goulburn – Private Landholder
- NSW Department of Planning, Industry and Environment

Table 5: Participants in site inspections for the audit

Organisation	Name	Date
Blue Mountains City Council	Amy St Lawrence	11/12/19
Blue Mountains City Council	Eric Mahony	11/12/19
Department of Planning, Industry & Environment	Martin Krogh	11/12/19
Department of Planning, Industry & Environment	Paul Freeman	11/12/19
Eco Logical Australia	Beth Medway	11/12/19 23/1/20 20/2/20
Eco Logical Australia	Ian Dixon	11/12/19 23/1/20 20/2/20
Eco Logical Australia	Brian Keogh	11/12/19 23/1/20 20/2/20
Eco Logical Australia	Alastair Jones	20/2/20
Lithgow City Council	Craig Brown	11/12/19
Lithgow City Council	Matt Johnson	11/12/19
Lithgow City Council	Richard Hols	11/12/19
Local Land Services	Huw Evans	11/12/19
Local Land Services	Aaron Smith	20/2/20
Local Land Services	Jacqueline Holland	20/2/20
Local Land Services	Shane Laverty	20/2/20
WaterNSW	Akash Argwal	11/12/19 20/2/20
WaterNSW	Jessie Evans	11/12/19
WaterNSW	Malcolm Hughes	11/12/19 23/1/20
WaterNSW	Stuart Naylor	20/2/20
WaterNSW	Jacob Adams	23/1/20
Wingecarribee Council	Ian Perkins	23/1/20
Wingecarribee Council	Jen Slattery	23/1/20

B6 Issues raised by the community

Matters raised by the community are summarised below with responses provided based on the findings of the audit.

Table 6: Issues of community interest

Matters raised by the community	Audit comments
Implementation of 2016 audit recommendations: "It is hard for the public to confirm whether and to what extent the 2016 SDWC audit recommendations have been implemented"	The WaterNSW website (https://www.waternsw.com.au/about/legislation/catchment-audits) states: "WaterNSW is required to report to the Minister on its progress to achieve improvements in catchment health, to prevent degradation of existing catchment health and to maintain existing catchment health, having regard to the findings. Such a report must be provided within two years after the catchment audit report is received by the Minister. The report in response to the 2016 Catchment Audit is due in July 2019." Reports are provided to the Minister that address audit recommendations, however these were not publicly available for the 2016 audit at this time. **Recommendation**: It is recommended that the WaterNSW website post annual updates on implementation progress for audit recommendations that include all government departments, not just the recommendations to be implemented by WaterNSW.

Mining in the Catchment

Mining in the Catchment was by far the greatest issue of community concern expressed to the auditors via submissions, including petitions.

9/8/2016 - 10000 plus signature petition "… requesting legislation to halt and exclude coal exploration and extraction on and below the land surface near Berrima and in the Southern Highlands, and a moratorium on current or proposed mining or extraction activity in the area" https://www.parliament.nsw.gov.au/hansard/pages/home.aspx?tab=Browse&s=1

1/5/2018 - 10000 plus signature petition "…requesting the Legislative Assembly establish a parliamentary inquiry into the risks associated with coal mining in the Sydney Water Catchment, introduce a moratorium on current or proposed mining activity in the area and conduct an audit of all discharge into the catchment from coal mines"

https://www.parliament.nsw.gov.au/hansard/pages/home.aspx?tab=Browse&s=1

At the end of 2019, total signatures on a petition to the Legislative Assembly of NSW had reached 10,000. This petition to "Please stop mining under Woronora Dam" will be debated in the NSW Parliament shortly.

Specific issues raised regarding mining in the Catchment related to:

- Woronora Dam – long wall mining, mining under the storage areas. Irreparable long-term heavy metal pollution.
- Hume Coal mine (proposal) - An enormous outpouring of opposition to this coal mine. There is a lack of trust in relation to green field coal projects based on previous experience.
- The drainage of water bodies and wetlands such as Thirlmere Lakes associated with longwall mining
- Concern over long term discharge of heavy metals (iron, manganese and aluminium) from coal mines and the impacts on raw water quality
- Springvale – Carne west swamp. The drying out of upland swamps on the Newnes Plateau.
- Berrima/Southern Highlands – moratorium on mining and extractive industries

The Independent Expert Panel for Mining in the Catchment was established in February 2018 to advise the NSW Government on the impact of mining activities in the Greater Sydney Water Catchment Special Areas, with a particular focus on risks to the quantity of water in the Catchment. The Panel issued the following reports:

- Initial report on specific mining activities at the Metropolitan and Dendrobium coal mines (Dec 2018)
- Final reports (Oct 2019):
  - Part 1 – Review of specific mining activities at the Metropolitan and Dendrobium coal mines
  - Part 2 – Coal mining impacts in the Special Areas of the Greater Sydney Water Catchment

The Independent Panel concluded that, despite advances in recent years, there are still deficiencies and gaps in knowledge, particularly regarding groundwater modelling. Further studies and a precautionary, risk-based approach that it independently facilitated is needed regarding current and future mining operations.

Recommendation: The auditor supports the recommendations of the Independent Expert Panel for Mining in the Catchment

Volume 2 Chapter 7 of this audit discusses results of water quality monitoring by WaterNSW, with detail in Volume 3 Appendix C. Total Iron concentrations in storages was good or very good in all storages except DLM1 in the Blue Mountains. Total Iron concentrations in Woronora Dam were rated at A2 (very good water quality with results during the audit period similar to historic records). Results for Total Aluminium tend to be poorer than Total Iron for most storages and streams, which may reflect natural difference in the Catchment landscape.

Compliance monitoring reports are publicly available for individual mines and were considered by the Independent Expert Panel for Mining in the Catchment.

Boral Berrima Colliery closure is an example of a successful closure with no discharge of heavy metals at present. The mine ran from 1867 to 2013 (care and maintenance). In 2018 and 2019 they installed seven bulkheads that reduced discharge by 95%. This mine closure was presented as an example of best practice by Dr Ian Wright, Western Sydney University (4 December, 2019).

Matters raised by the community	Audit comments
	Recommendation: Review the obligations and capacity of mines in the Catchment to undertake rehabilitation and restoration works once operations cease, noting that: "Remediation should not be relied upon for features, including watercourses and swamps, that are highly significant or of special significance (as per the guidance provided by the Planning Assessment Commission Panels for the Metropolitan Coal Project and the Bulli Seam Operations Project)".p.viii Report of the Independent Expert Panel for Mining in the Catchment: Part 2 Coal Mining Impacts in the Special Areas of the Greater Sydney Water Catchment 14 October 2019 **Recommendation**: Undertake a detailed risk assessment for all swamp types in the Catchment to prioritise protection or restoration and identify swamps that may be vulnerable to future development.
Springvale water treatment plant Springvale Mount Piper Power Station water treatment plant (WTP) is perceived as a good outcome for the health of the Cox's River. The WTP treats water from Springvale mine and delivers it to the power station for beneficial reuse.	Environmental monitoring as required under the development consent conditions will determine if desired outcomes for the health of the Catchment are achieved. **Recommendation**: Results of compliance monitoring for the Springvale WTP be made available to the community.

NorBE (neutral or beneficial effects) test for development

Concerns were raised regarding the application of NorBE in relation to urban development (e.g. Wollondilly local government area) and mining proposals (see example below):

"Community group 4nature, represented by EDO NSW, challenged the consent for the extension to the Springvale coal mine on the grounds that the NorBE test had not been met. The Land and Environment Court dismissed the case but on appeal the NSW Court of Appeal found that the test had not been applied correctly and therefore the consent was invalid. The Court of Appeal remitted the matter back to the Land and Environment Court to hear submissions from both parties before making orders that will determine the future of the mine."

Following this decision, the NSW Government passed legislation to permit the mine to continue operating. These laws were introduced on the basis that Springvale mine is the current sole provider of coal to the Mt Piper Power Station, and if ordered to close, Mt Piper would need to find an alternative source of coal which may impact on energy supply. The Government claimed this would lead to an energy crisis and drive up the cost of energy for consumers.

Judgements are below:

4nature Incorporated v Centennial Springvale Pty Ltd [2016] NSWLEC 121

4nature Incorporated v Centennial Springvale Pty Ltd [2017] NSWCA 191

https://www.parliament.nsw.gov.au/bills/DBAssets/bills/BillText/3445/b2017-110-d08_House.pdf

The EDO outlined how this changes how the NorBE test is applied to existing developments that are seeking to expand. Those developments, referred to as 'continuing developments', are taken to have a neutral or beneficial effect on water quality if they will have the same or lesser adverse impact on water quality as the existing development.

This new legislation means that while new developments must have a neutral or beneficial effect on water quality, existing developments wishing to expand can continue to pollute at their current levels, no matter how out of date those standards might be. This will not only prevent continuous improvement in pollution management (a key element of our pollution laws) in Sydney's drinking water catchment, it places existing polluting industries at an advantage over any new developments within the catchment which must meet a

Development within the Catchment needs to satisfy NorBE requirements. There are some examples of best practice water sensitive urban design being applied during design and construction (e.g. Renwick residential estate, commercial developments in Moss Vale). However, longer-term benefits may not be realised without ongoing appropriate maintenance.

Recommendation: NorBE principles need to be applied to development proposals more rigorously and consistently across the Catchment by all regulators, supported by strong compliance monitoring and enforcement.

Matters raised by the community	Audit comments
higher standard under the NorBE test. This is particularly problematic where a mine or other development is operating under old and out of date consent conditions that do not meet modern standards of technology, efficiency or environmental compliance. There is currently no legal mechanism in place to ensure consent conditions evolve with available technology, monitoring data and community expectations and these changes remove an opportunity for existing industries to come up to date with more environmental and community standards.	
Recreational activities Sustainable recreation use – recreational use of natural areas centred on water	There have been not changes to restrictions on recreation within the Catchment during the audit period. Riparian improvements such as the Wingecarribee River weed control program "The Wall to Wollondilly" Project (Greening Australia, supported by Wingecarribee Council) will increase passive water recreation opportunities.
Erosion and weeds Lithgow-Oberon Landcare concern about: • the return of willows e.g. *Salix cinerea* and *S. fragilis* along the Coxs River • erosion at the eastern headwaters of the Upper Coxs reaches of the River Lett	WaterNSW has invested considerable resources in controlling erosion and willows in the Coxs River (2004-2008). Maintenance weed control and revegetation with native species will be essential to prevent re-establishment of willows. **Recommendation**: Undertake maintenance weed control and revegetation with native species where there has been investment of primary weed and erosion control.
Warragamba dam wall Warragamba – proposal to raise the dam wall	This is a future proposal, and outside the scope of this audit.

B7 Community engagement with local councils

The Community Strategic Plan is the highest level of strategy planning in a local government area. It represents the community aspirations for all other planning. The following table is a broad review of each plan in relation to water and catchment care. Further information was sought for several councils which have a bigger impact on the Catchment. All councils responded positively to the initial request for information.

Table 7: Responses from local councils regarding community engagement in the Catchment

Council, Community Strategic Plan (CSP), other source documents	Themes
Campbelltown Council ***"Campbelltown 2027" and*** ***"Campbelltown CC Sustainability Strategy"***	The dominant themes for water relate to supply. There is no direct mention of water in the community strategic plan. Reference is made to Council's sustainability strategy. This strategy has a sustainable water section (4.2). The sustainability of water is concerned with reducing consumption. *"There is very little water catchment area in the Campbelltown LGA and virtually none that is Council owned/managed"* (Campbelltown Council, Coordinator of Natural Areas, Feb. 2020)
Goulburn Mulwaree Council **Upper Lachlan Shire Council** ***"The Tablelands 2016-2036*** ***Regional Community Strategic Plan"*** **This is a joint CSP with Upper Lachlan, Goulburn Mulwaree and Yass Shire Councils**	The plan has a community water management priority for catchment and waterway protection. This has begun to be included in the Local Environment Plan, and particularly the Development Control Plan. Mentions: • Inclusion of water sensitive urban design for stormwater runoff • Adopt environmental sustainability practices • To encourage the use of environmentally sustainable practices in suppliers' and Council services, for example water sensitive urban design (WSUD) in local designs • Protect and rehabilitate waterways and catchments • Water quality at key nominated sites Goulburn has a separate waterways strategy "Goulburn Mulwaree Waterways Plan 2014" At present there is no Integrated Water Management Strategy.

Council, Community Strategic Plan (CSP), other source documents	Themes
Blue Mountains (BMCC) **Sustainable Blue Mountains 2025 updated with community and renamed** ***"Blue Mountains Community Strategic Plan 2035"*** **(2017 edition)** ***"Water Sensitive Blue Mountains Strategic Plan",* September 2019 (formed during audit period)**	BMCC has a dominant theme of catchment and waterway protection. BMCC has been the most proactive council within the Catchment in working on a more integrated water management strategy. Elements include: • A water sensitive city managing its water resources in an integrated, sustainable way • Runoff from urban areas and other disturbed areas is managed to ensure it is of appropriate quality • Water catchments managed to support quality of streams • Healthy waterways supporting Sydney's drinking water catchments They have completed numerous projects in the areas where stormwater runoff is most a problem. They release water quality charts every year. • 2019 Blue Mountains Waterways Health Report • 2018 Waterways health report • 2017 waterways health report BMCC engaged the Cooperative Research Centre for Water Sensitive Cities (CRCWSC) benchmarking, visioning and transition strategy process with target councils to assess current water management performance, set new targets for improvements against indicators. This was completed in 2019. Site visit by audit team on Wednesday 11 December 2019 – stormwater program

Council, Community Strategic Plan (CSP), other source documents	Themes
Lithgow ***"Our Place, Our Future Community Strategic Plan 2030"*, January 2017** ***Farmers Creek Master Plan 2017***	The Lithgow community was mostly concerned with strategies to ensure supply. Secure water supplies and ongoing sewerage upgrades were the main strategies. A closer look at Lithgow showed a growing community that is concerned with catchment and waterway protection. The Farmers Creek masterplan is seen as an important step in moving more strongly in this direction. Indicators included: • Development of a Flood Strategy for the Vale of Clwydd Creek. • Channel improvement of the Vale of Clwydd Creek is undertaken in line with a long-term voluntary acquisition program. • Increased use of alternative water sources. • Improved standards of water quality in our waterways. • Reduce consumption of potable water by 10% per capita. **Site visit:** Farmers Creek has had a major restoration (this runs into the Coxs River). This has been a positive move by Council in protecting waterways. From Farmers Creek Precinct Masterplan …(The creek has a) "chequered history – it was largely cleared of its original native vegetation, has been a valuable local water supply, was previously used as a convenient drain for the town's residential and industrial waste, and posed a serious flood threat".(p.1)
QUEANBEYAN-PALERANG ***"Community Strategic Plan 2018-2028"*** ***[DRAFT]***	The dominant themes for water are supply. The community themes are to support public and environmental health through integrated water cycle management and the safe and equitable treatment of sewage and stormwater, the delivery of recycled water supply to residents and businesses in the Local Government Area, and improved water quality flows into the regional environment The indicator is Community satisfaction with the state of the sewage and stormwater systems

Council, Community Strategic Plan (CSP), other source documents	Themes
Wingecarribee ***Community Strategic Plan, June 2017*** ***Wingecarribee Council website*** ***Wingecarribee Counicl submission to audit***	The CSP has the smallest number of mentions in relation to catchment and waterway protection. It is principally about supply. However, a closer look shows the Wingecarribee community, led by Council, has an impressive bushcare program with 15 active groups and 170 volunteers. Rivercare directly impacts on riparian health along the Wingecarribee River. Projects include Cecil Hoskins Nature Reserve, Bong Bong Common and Cycleway. The groups are well organised and can measure cumulative impact. Council has invested over $60m in sewerage network upgrades in the last audit period. In relation to stormwater, new commercial and greenfield developments conform to best practice water sensitive urban design. Water sensitive urban design (WSUD) is not a priority in other areas: The majority of projects included in council's capital works program this year do not include WSUD features. C ouncil is presently updating engineering specifications. The specifications were not available for review by the auditor. The community, and Council represents this opinion, is very concerned about the impact of all extractive industry on groundwater and catchments. In particular the Shire has declared itself a 'Coal Mine Free Shire' and has place this declaration on signs at the Shire's entry points. **Site visit:** Bong Bong Common – Railway Pde crossing of the Wingecarribee River – Council initiated Wall to Wollondilly project (Wingecarribee Reservoir Wal) https://www.wsc.nsw.gov.au/environment/get-involved/rivercare (Natural Resource Project Coordinator at Wingecarribee Council)

Council, Community Strategic Plan (CSP), other source documents	Themes
Wollondilly ***"Create Wollondilly Community Strategic Plan 2033"*** **2017** **Wollondilly Council also provided the results of community consultation related to the development of the Integrated Water Management Plan**	Wollondilly has some mentions of catchment protection. "Strategy EN1 – Protect and enhance biodiversity, waterways and groundwaters • Maintain and enhance the condition of biodiversity including the condition of water sources (both surface and groundwater)." p. 53 The Council is presently in the process of creating an integrated water management strategy. Community engagement was undertaken through both surveys and direct outreach. There were 115 responses to survey, finalised in middle of 2019. Issues mentioned were: • Potential negative impacts of development of water supply and quality • The negative impacts associated with longwall mining • The drainage of water bodies such as Thirlmere Lakes • The general deterioration of water quality • Opposition to raising the Warragamba Dam wall • Interest in reusing water and harvesting rainwater in order to reduce demand on the current supply • Desire for clear information – in the process of developing this strategy the work of the strategy itself, and in a water-wise education campaign • Interest in maintaining sustainable recreational use of natural areas centred on water The Council is developing Water Sensitive Urban design elements as they aim for any development have zero impact to waterways. This is planned to be embedded in planning documents. Principal LESP (local strategic planning statement – leads to LEP) followed by an update to their DCP

Council, Community Strategic Plan (CSP), other source documents	Themes
Wollongong **"Our Wollongong 2028 Community Strategic Plan"** **Also reviewed:** **Environmental Sustainability Strategy 2014-22** **Illawarra Escarpment Strategic Management Plan 2015** ***Wollongong submission to IEP for Mining in the Catchment***	Water concerns are principally water quality at beaches and decreasing water consumption "Wollongong City Council does not monitor any of the nominated indicators with the Drinking Water Catchment Area. The vast majority of the catchment area within the Wollongong LGA is managed by WaterNSW and forms the headwaters to the drinking catchment dams." **21/2/2019 Wollongong submission to Independent Expert Panel for Mining in the Catchment** "Council is concerned about the loss of water to our reservoirs due to mining, especially water losses to Cordeaux, Avon and Woronora Reservoirs…future mining should be supported by robust independent peer review and/or a demonstrated history of reliability"
Oberon ***"Oberon Council Community Strategic Plan 2019-2040"***	Water security is a key theme under environment concerns. However, actions to ensure the care of the natural waterways, rivers and streams are important. 3.1 Protect and manage local air quality, waterways, rivers and streams 4.5 Provide secure and safe water supply, and manage wastewater Largely a rural council, with 5300 people and no special water quality monitoring.
Shoalhaven ***Integrated Strategic Plan 2018*** ***Chapter 1: Our Priorities (Community Strategic Plan)***	Water security is the key theme. The community is concerned with the delivery of reliable services (including water). There is no special indicators around the waterways environment. They wish to: "Look after and where possible improve our unique environments". The indicator they will use is "Waterway environments are improving", information to be sourced from "Council records".
Sutherland Shire ***"Our Community Plan" 2017***	Water supply and catchment protection both are important issues. The community is concerned with improving 'the cleanliness, health and biodiversity of our waterways'. The Shire caries out water quality monitoring, however this is not in the SDWC. They provided three years of Woronora River's physical and chemical raw data. The sample site location is below the Woronora Dam wall (not in the catchment).

Council, Community Strategic Plan (CSP), other source documents	Themes
Kiama ***'Community Strategic Plan 2017-2027'***	Water is not specifically mentioned. The closest reference is the following: "Our community and natural environments are adaptive, resilient and sustainable and informed of predicted climate change impacts" and "The principles of ecologically sustainable development and compliance underpin town planning and local development"
Eurobodalla ***"One Community: Eurobodalla Community Strategic Plan, 2017"***	The SDWC is on the western edge of Eurobodalla Shire, and the catchment land is not subject to any Council care and control. The community has a strategy to "Maintain clean healthy waterways and catchments". The council sees its role as undertaking bush and wetland regeneration.

B8 Community engagement with Local Land Services

SOUTH EAST LOCAL LAND SERVICES

Wingecarribee Council advised that Bushcare and Rivercare in Wingecarribee Shire is thriving, with 15 active groups and 160 active volunteers. A couple of the groups that work around creeks and wetlands completed work and are in recess (Currabunda Wetland & Reedy Creek in Bundanon) as sites are showing good resilience. Wingecarribee Rivercare Group have been active since 2018 working to restore the riparian zone along the Wingecarribee River, with Berrima Bushcare. "The Wall to Wollondilly Project" (led by Greening Australia) is a major project along this river. Leaver Park Bushcare work along Paddys River, Moss Vale Bushcare work on Whites Creek.

Wingecarribee also has a large private land conservation program – 130 'Land for Wildlife properties'. Three of these properties began to actively manage higher order waterways (fenced stock out, revegetated, weed control) during the audit period in Glenquarry, East Kangaloon and Robertson.

CENTRAL TABLELANDS LOCAL LAND SERVICES

Central Tablelands LLS advised that four community organisations are involved in on-ground works for natural resource management activities in the catchments including Lithgow and Oberon Landcare Association; Lithgow Oberon Pest Management Group; Lithgow and Districts Community Nursery; Lithgow Environment Group.

Central Tablelands LLS advised that three community organisations are actively involved in natural resource management advocacy in the catchments including Colong Foundation for Wilderness, Blue Mountains Conservation Society and Lithgow Environment Network.

GREATER SYDNEY LOCAL LAND SERVICES

Greater Sydney LLS advised that the Blue Mountains LGA has approximately 70 Bushcare/Landcare groups and Wollondilly Shire has 4. It is difficult for them to say which groups work on Sydney Drinking Water Catchment areas specifically.

They advise that the number of these groups has been stable over the audit period.

B9 Review of recommendations

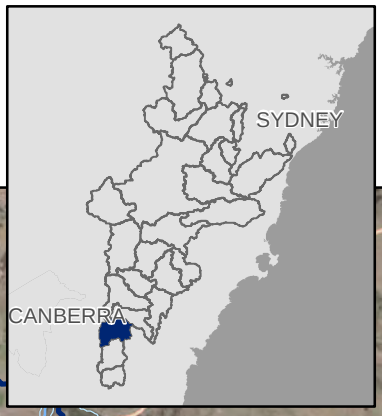
The public authorities below provided comment on the draft audit documents and were consulted on the appropriateness and feasibility of recommended responses:

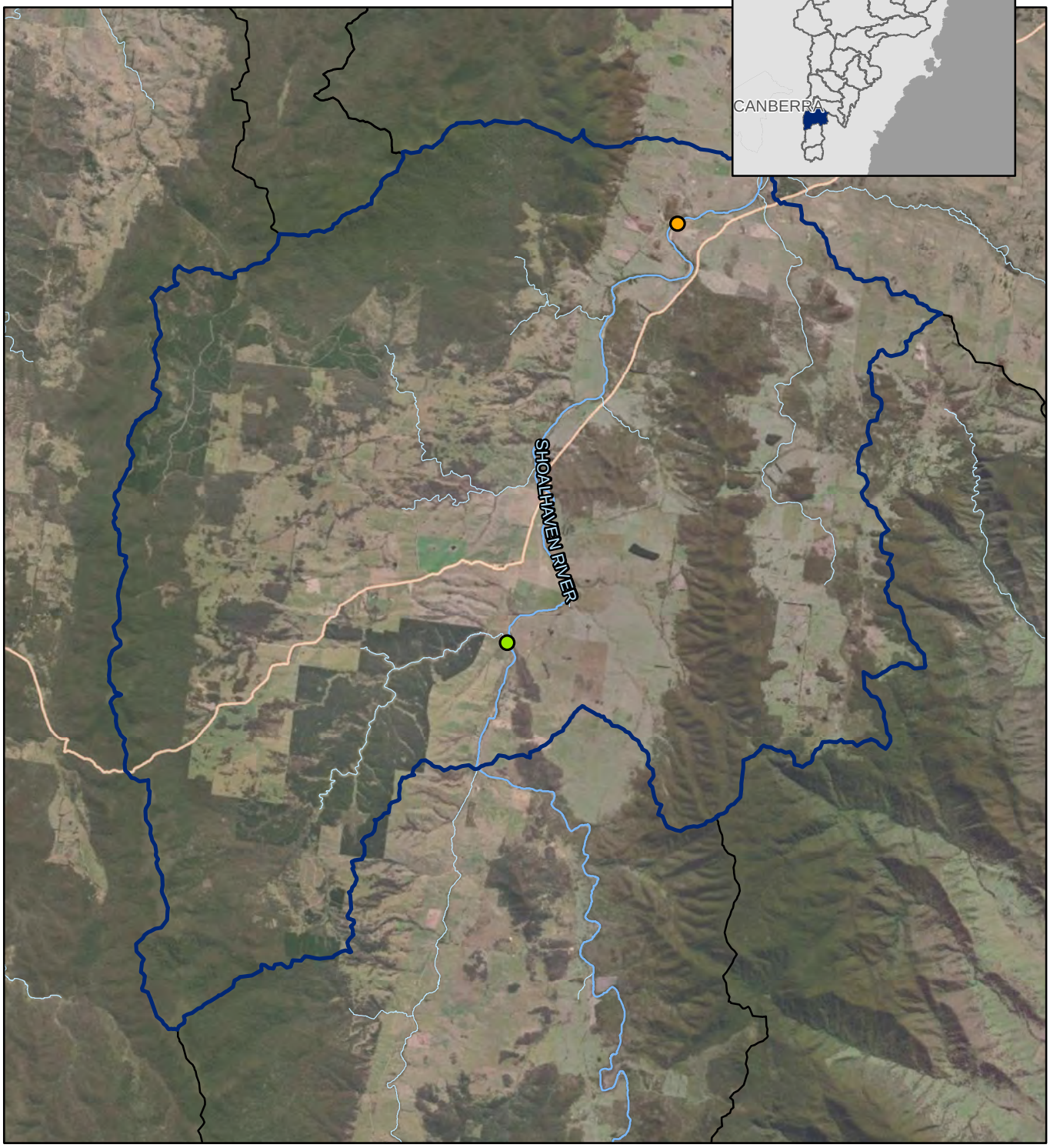
- WaterNSW
- DPIE - WaterNSW
- DPIE - Water
- DPIE - EES
- DPIE - EPA
- DPIE - Planning & Assessment
- DPIE - LLS
- Wingecarribee Shire Council

Appendix C Water quality

BACK & ROUND MOUNTAIN CREEKS

CATCHMENT





Legend

- Sub Catchment Boundary
- Major Roads

Water Quality Monitoring Stations

- MMP16
- MMP17

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

0 2,550 5,100

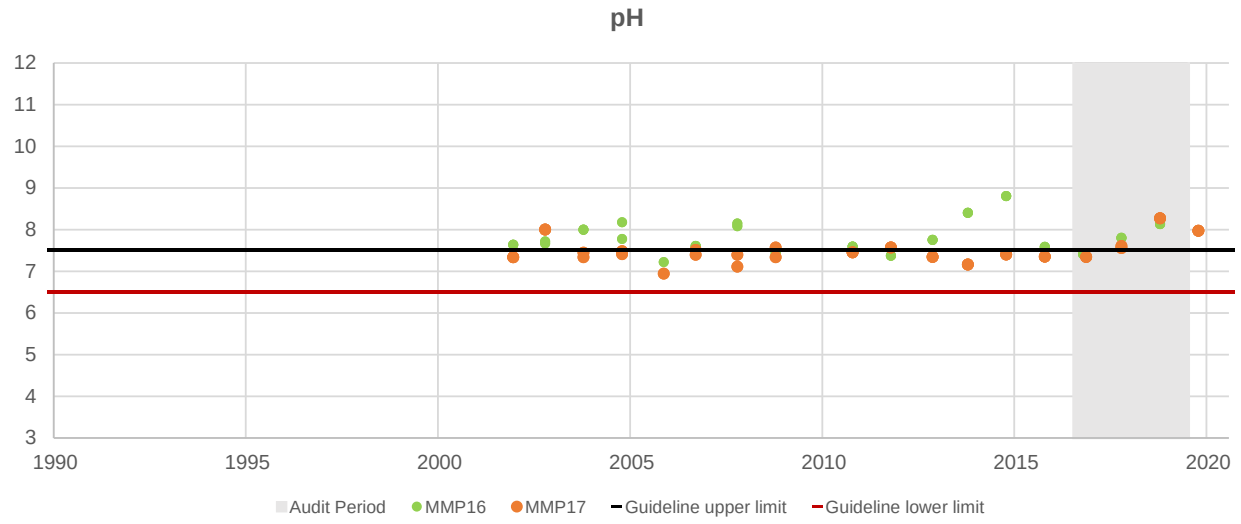
Metres

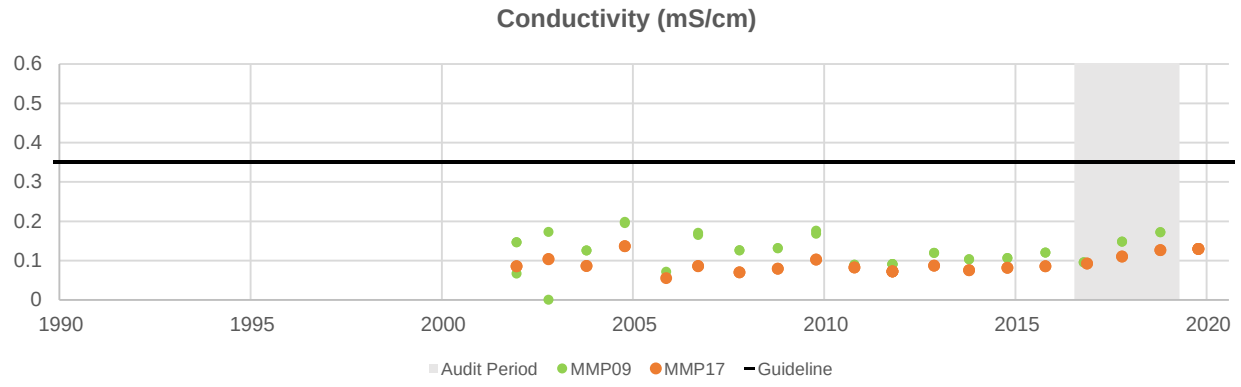
Datum/Projection:
GDA 1994 MGA Zone 56

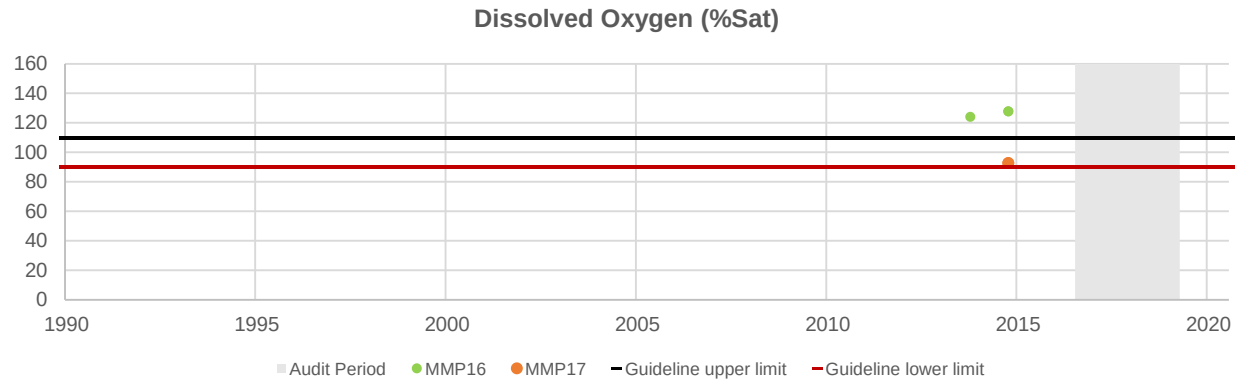
N

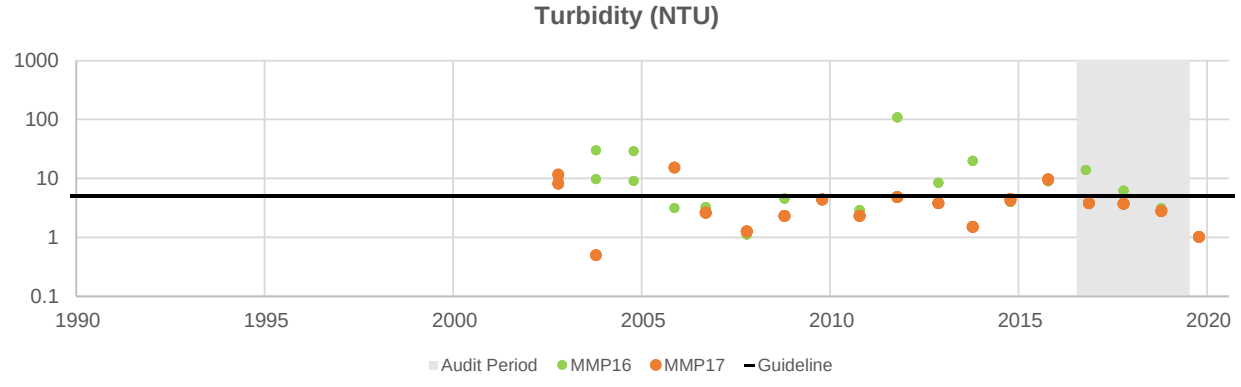
eco logical AUSTRALIA
A TETRA TECH COMPANY

Prepared by: SC Date: 18/03/2020


pH
12
11
10
9
8
7
6
5
4
3
1990
1995
2000
2005
2010
2015
2020
Audit Period
MMP16
MMP17
Guideline upper limit
Guideline lower limit

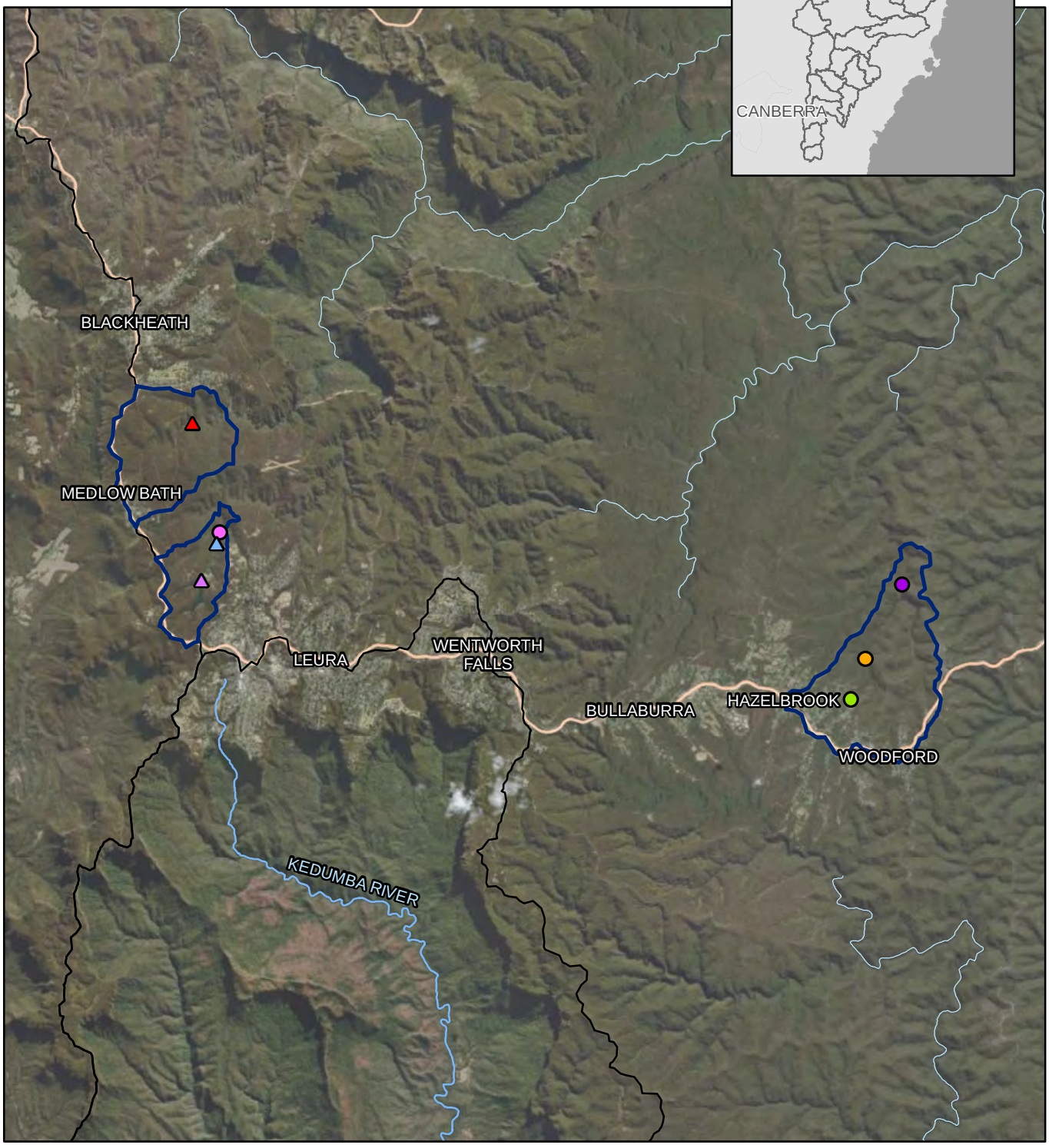

Conductivity (mS/cm)
0.6
0.5
0.4
0.3
0.2
0.1
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
MMP09
MMP17
Guideline


Dissolved Oxygen (%Sat)
160
140
120
100
80
60
40
20
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
MMP16
MMP17
Guideline upper limit
Guideline lower limit


Turbidity (NTU)
1000
100
10
1
0.1
1990
1995
2000
2005
2010
2015
2020
Audit Period
MMP16
MMP17
Guideline

BLUE MOUNTAINS

CATCHMENT



Legend

- Sub Catchment Boundary
- Major Roads

Water Quality Monitoring Stations

- E915
- MMP246
- MMP39
- MMP60

Water Quality Monitoring Stations (Storage)

- DLC1
- DTC1
- DLM1

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

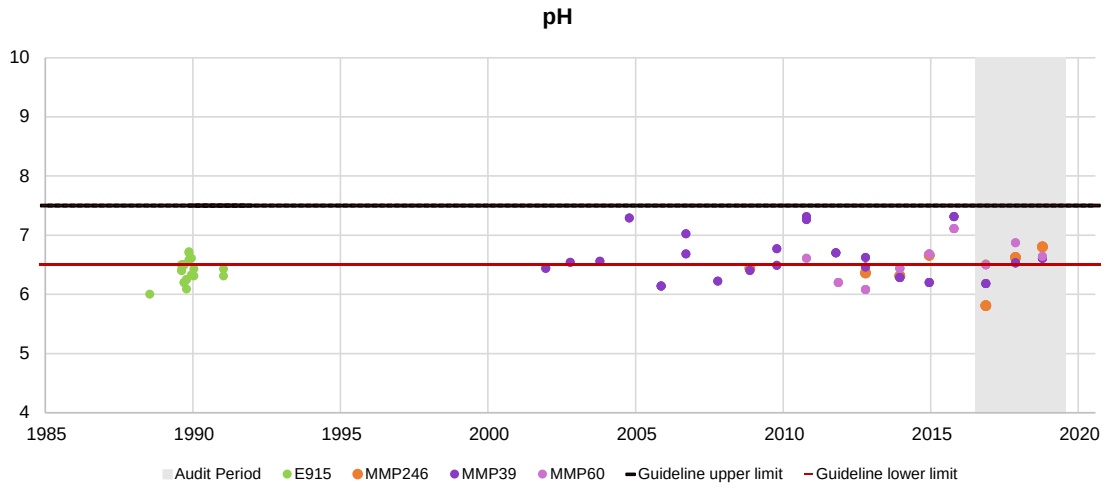
0 2,300 4,600

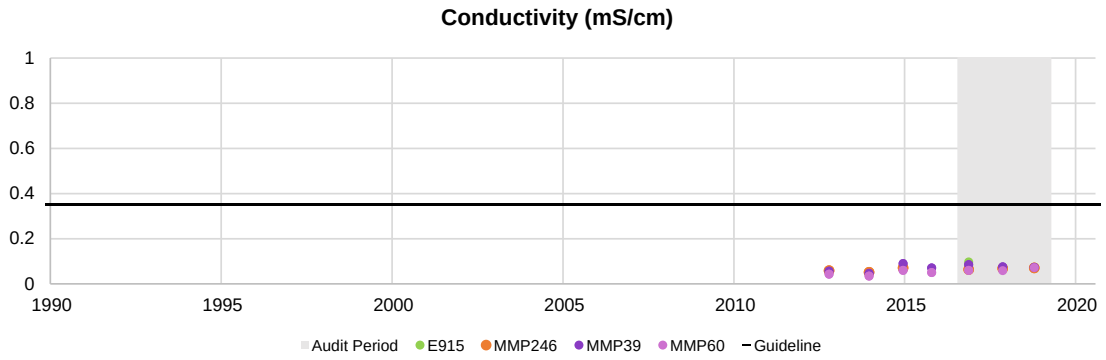
Metres

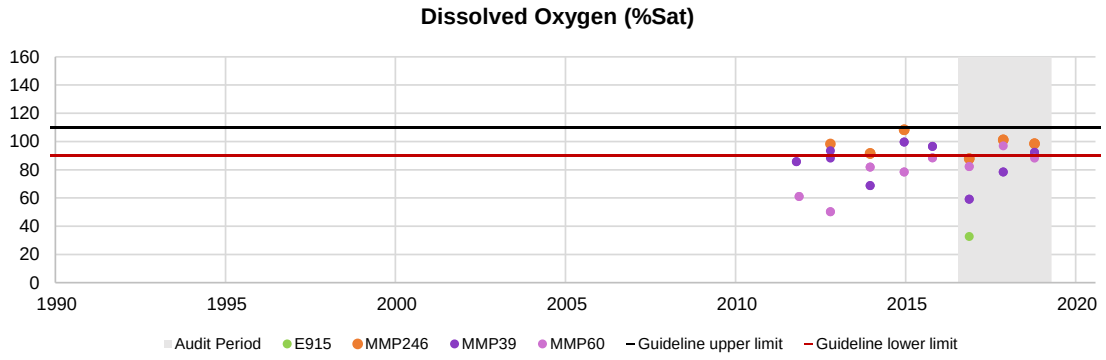
Datum/Projection:
GDA 1994 MGA Zone 56

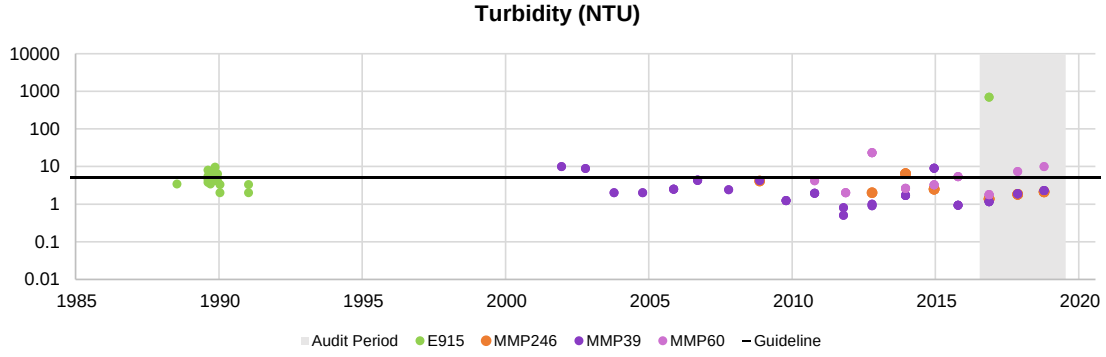
N

Prepared by: SC Date: 18/03/2020


pH
10
9
8
7
6
5
4
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
E915
MMP246
MMP39
MMP60
Guideline upper limit
Guideline lower limit


Conductivity (mS/cm)
1
0.8
0.6
0.4
0.2
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
E915
MMP246
MMP39
MMP60
Guideline


Dissolved Oxygen (%Sat)
160
140
120
100
80
60
40
20
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
E915
MMP246
MMP39
MMP60
Guideline upper limit
Guideline lower limit


Turbidity (NTU)
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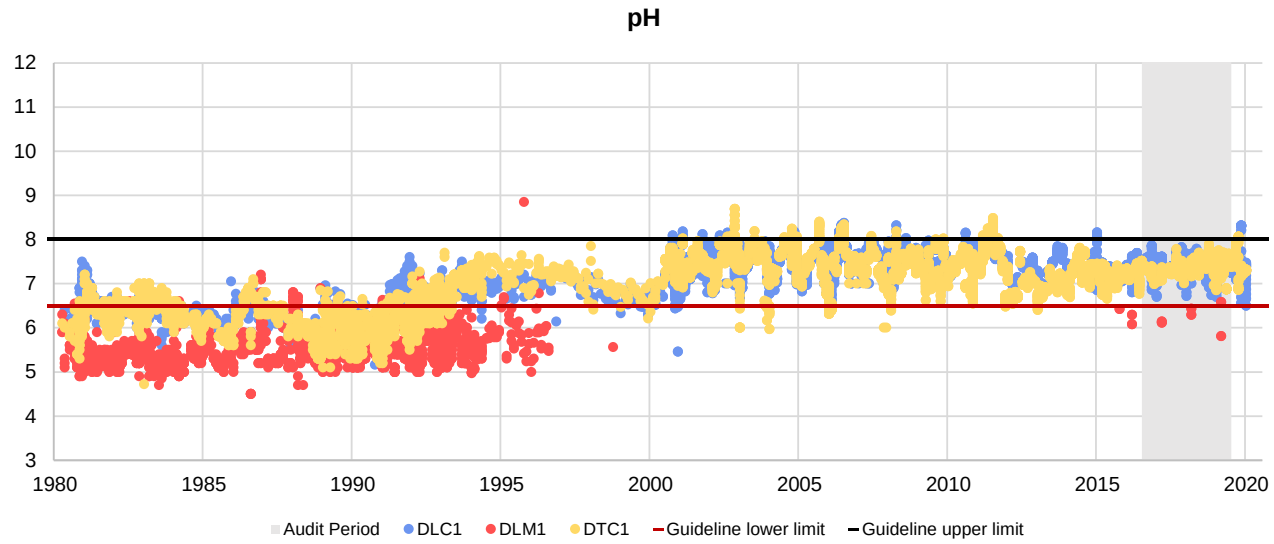
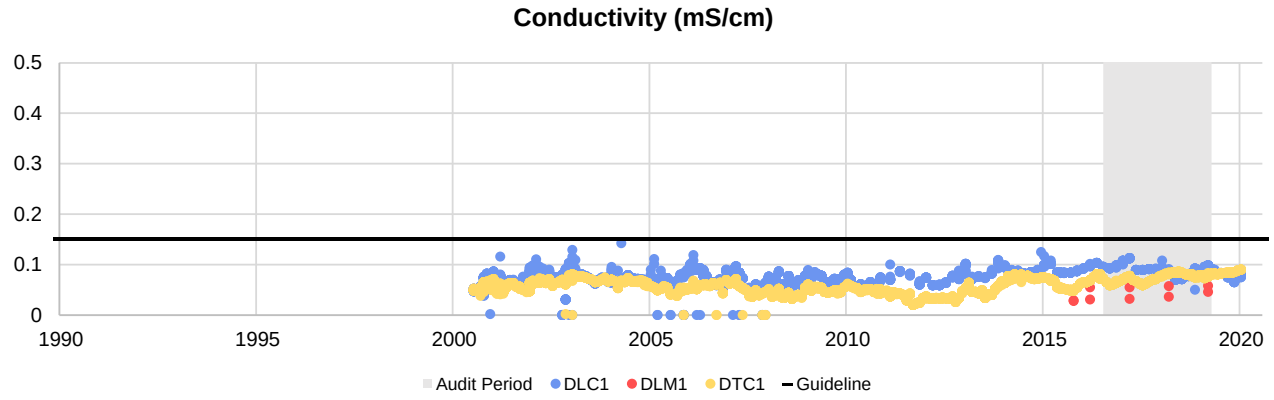
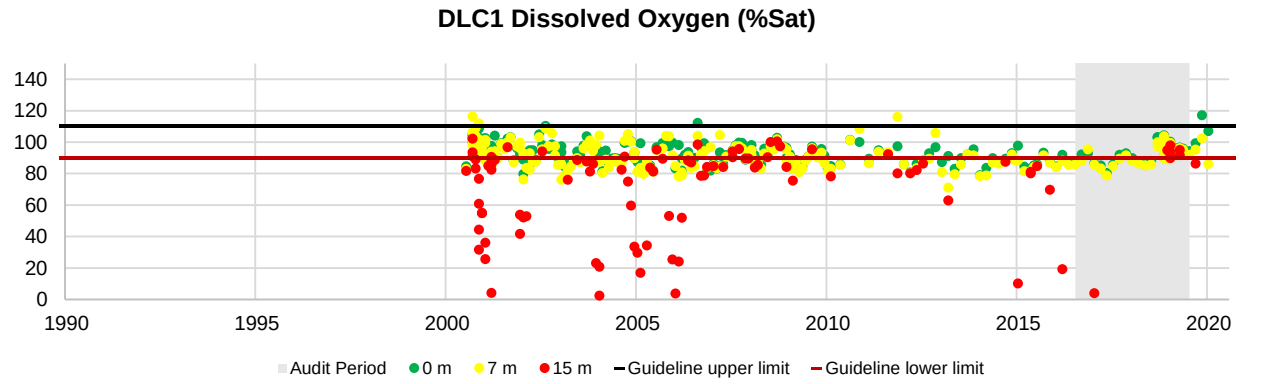
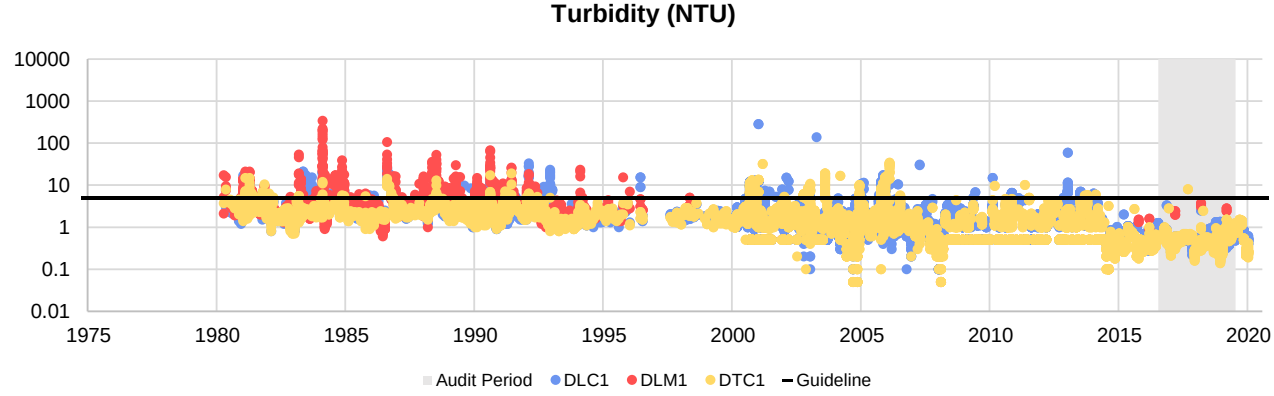
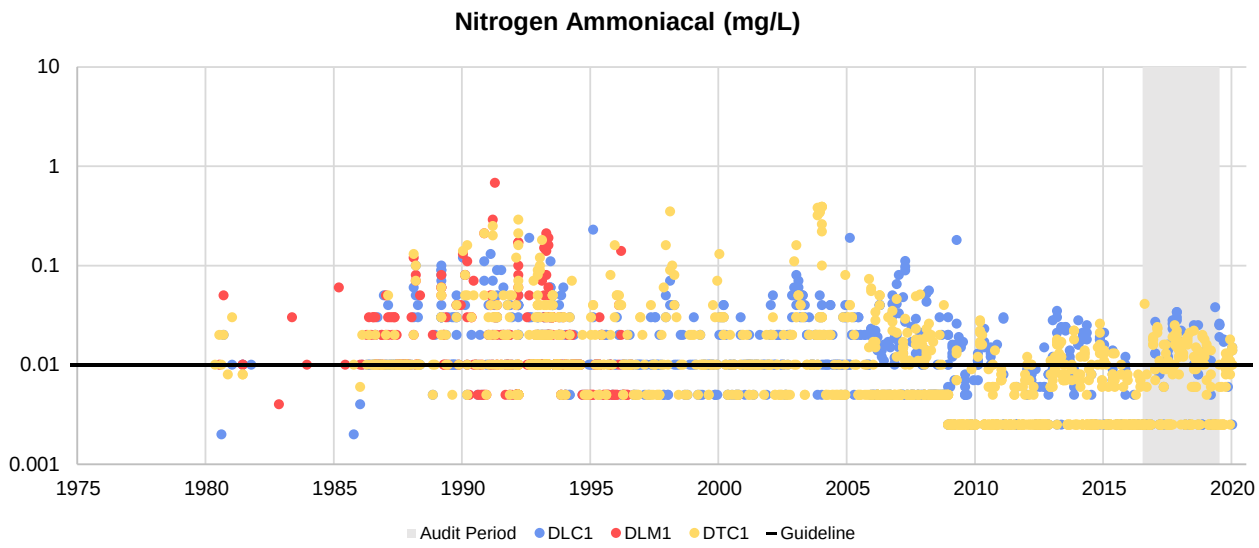
1000
100
10
1
0.1
0.01
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
E915
MMP246
MMP39
MMP60
Guideline

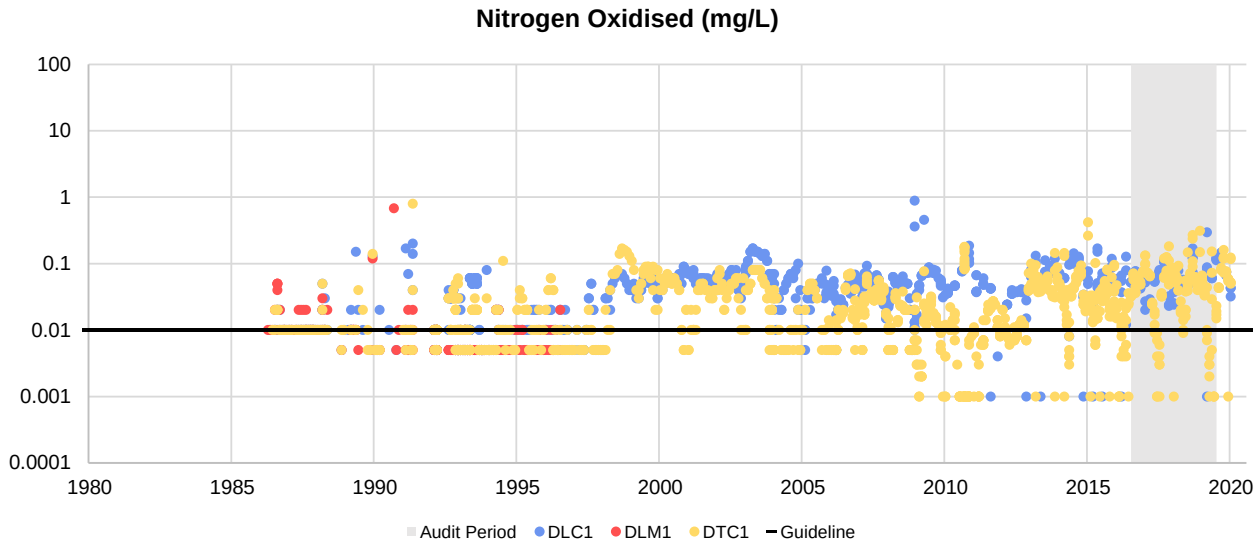

pH
12
11
10
9
8
7
6
5
4
3
1980
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
DLC1
DLM1
DTC1
Guideline lower limit
Guideline upper limit

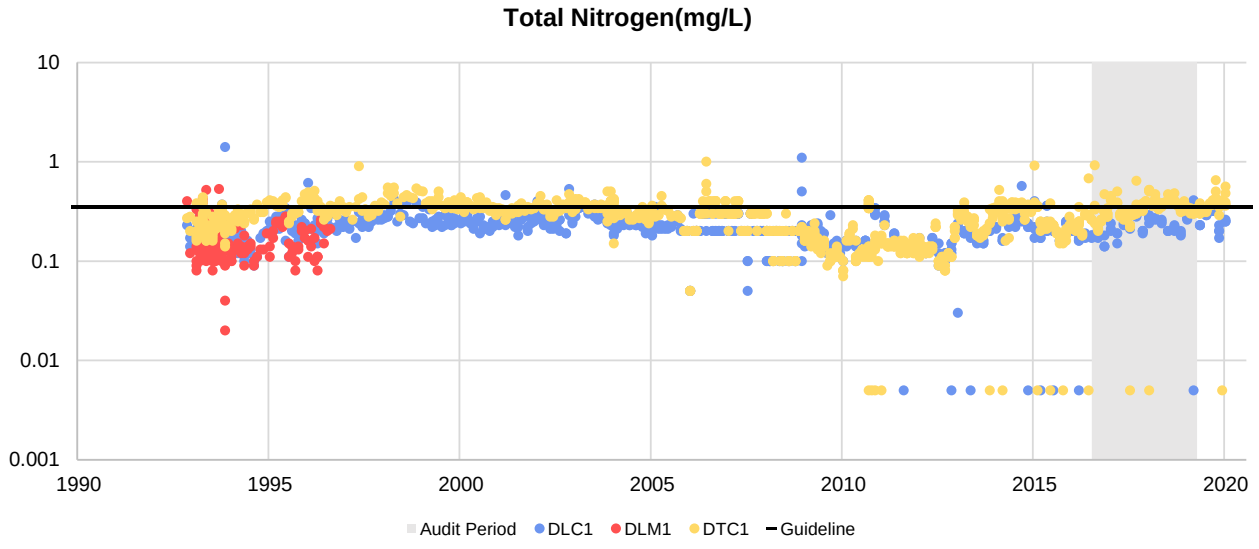

Conductivity (mS/cm)
0.5
0.4
0.3
0.2
0.1
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
DLC1
DLM1
DTC1
Guideline

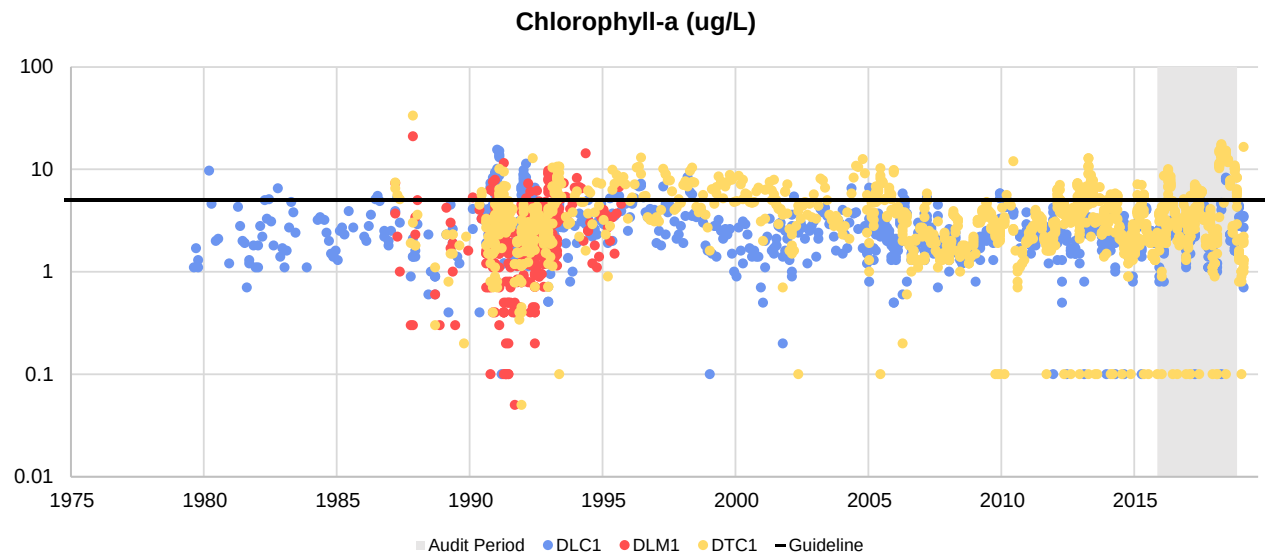

DLC1 Dissolved Oxygen (%Sat)
140
120
100
80
60
40
20
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
0 m
7 m
15 m
Guideline upper limit
Guideline lower limit

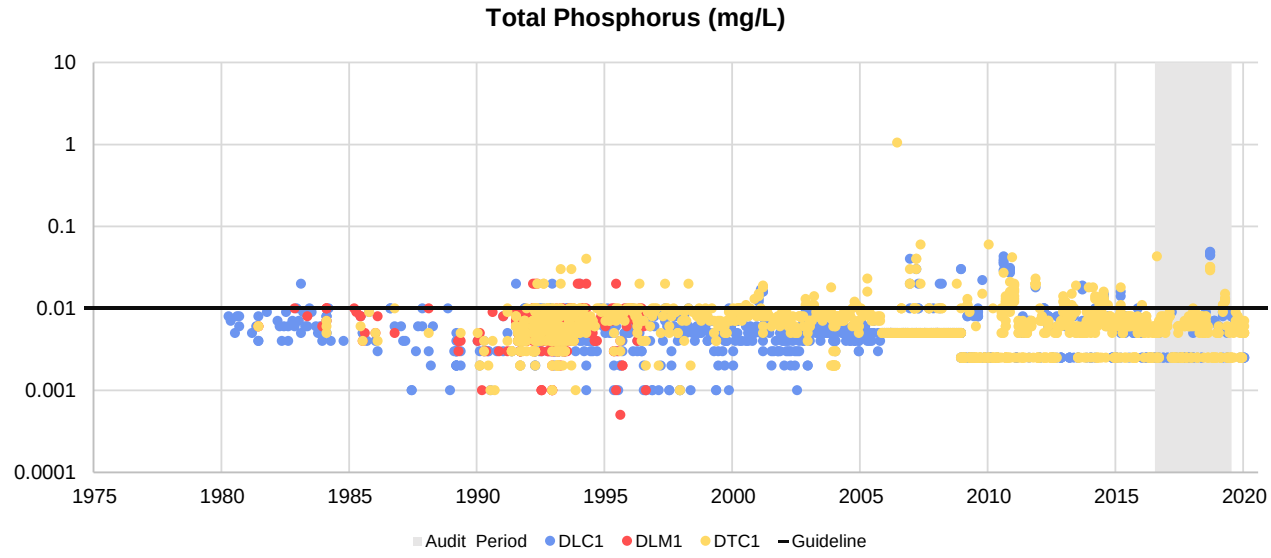

Turbidity (NTU)
10000
1000
100
10
1
0.1
0.01
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
DLC1
DLM1
DTC1
Guideline

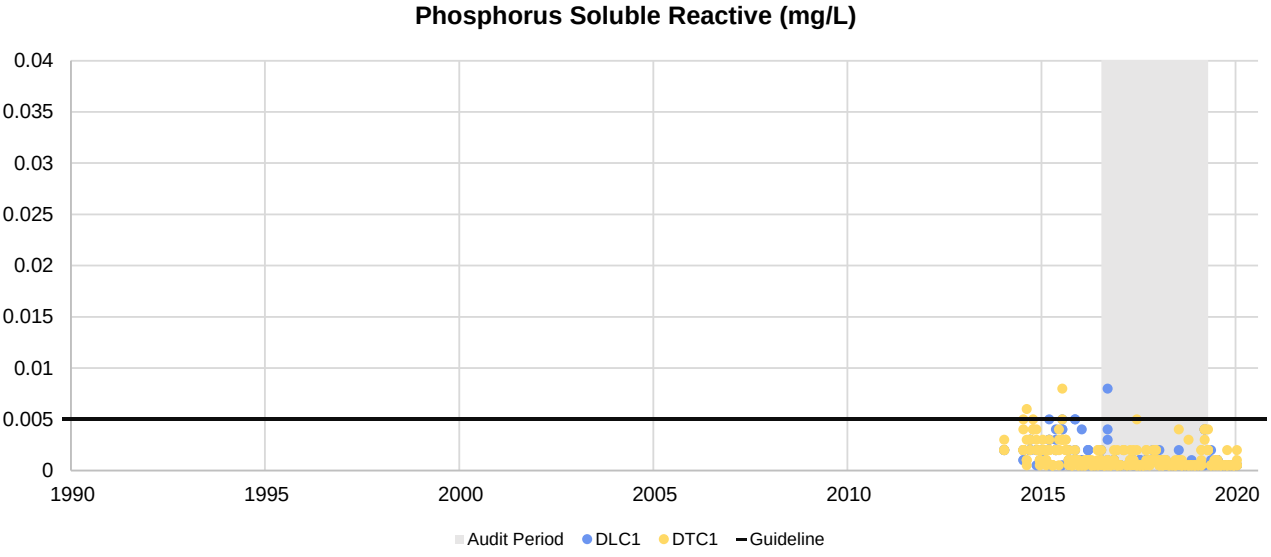

Nitrogen Ammoniacal (mg/L)
10
1
0.1
0.01
0.001
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
DLC1
DLM1
DTC1
Guideline


Nitrogen Oxidised (mg/L)
100
10
1
0.1
0.01
0.001
0.0001
1980
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
DLC1
DLM1
DTC1
Guideline


Total Nitrogen(mg/L)
10
1
0.1
0.01
0.001
1990
1995
2000
2005
2010
2015
2020
Audit Period
DLC1
DLM1
DTC1
Guideline


Chlorophyll-a (ug/L)
100
10
1
0.1
0.01
1975
1980
1985
1990
1995
2000
2005
2010
2015
Audit Period
DLC1
DLM1
DTC1
Guideline


Total Phosphorus (mg/L)
10
1
0.1
0.01
0.001
0.0001
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
DLC1
DLM1
DTC1
Guideline


Phosphorus Soluble Reactive (mg/L)
0.04
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
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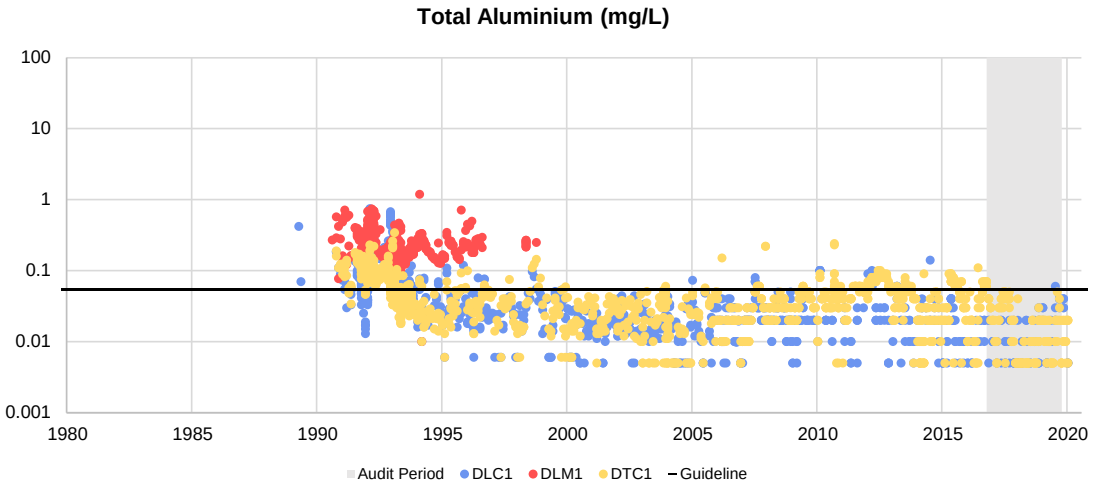
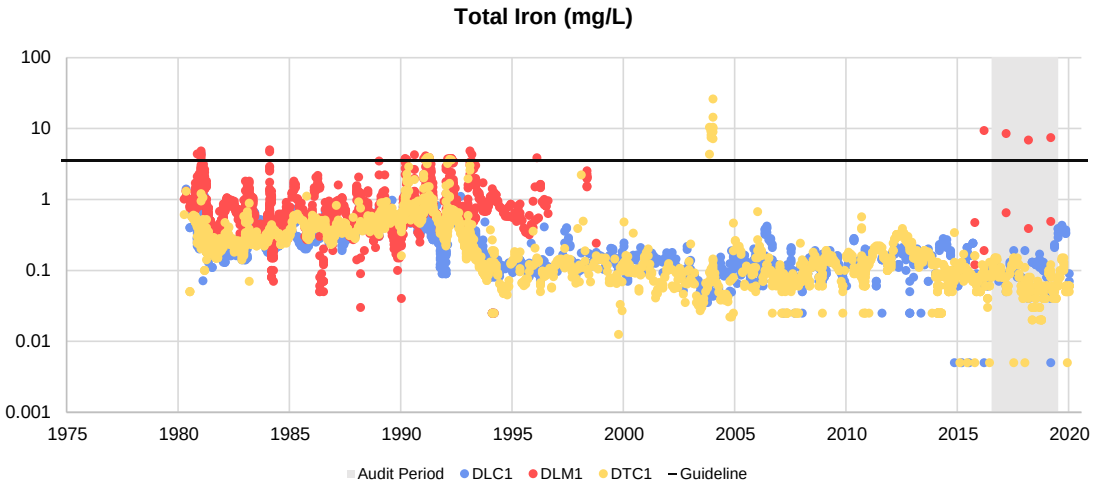
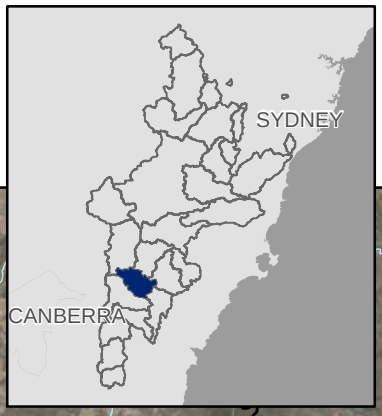
1995
2000
2005
2010
2015
2020
Audit Period
DLC1
DTC1
Guideline

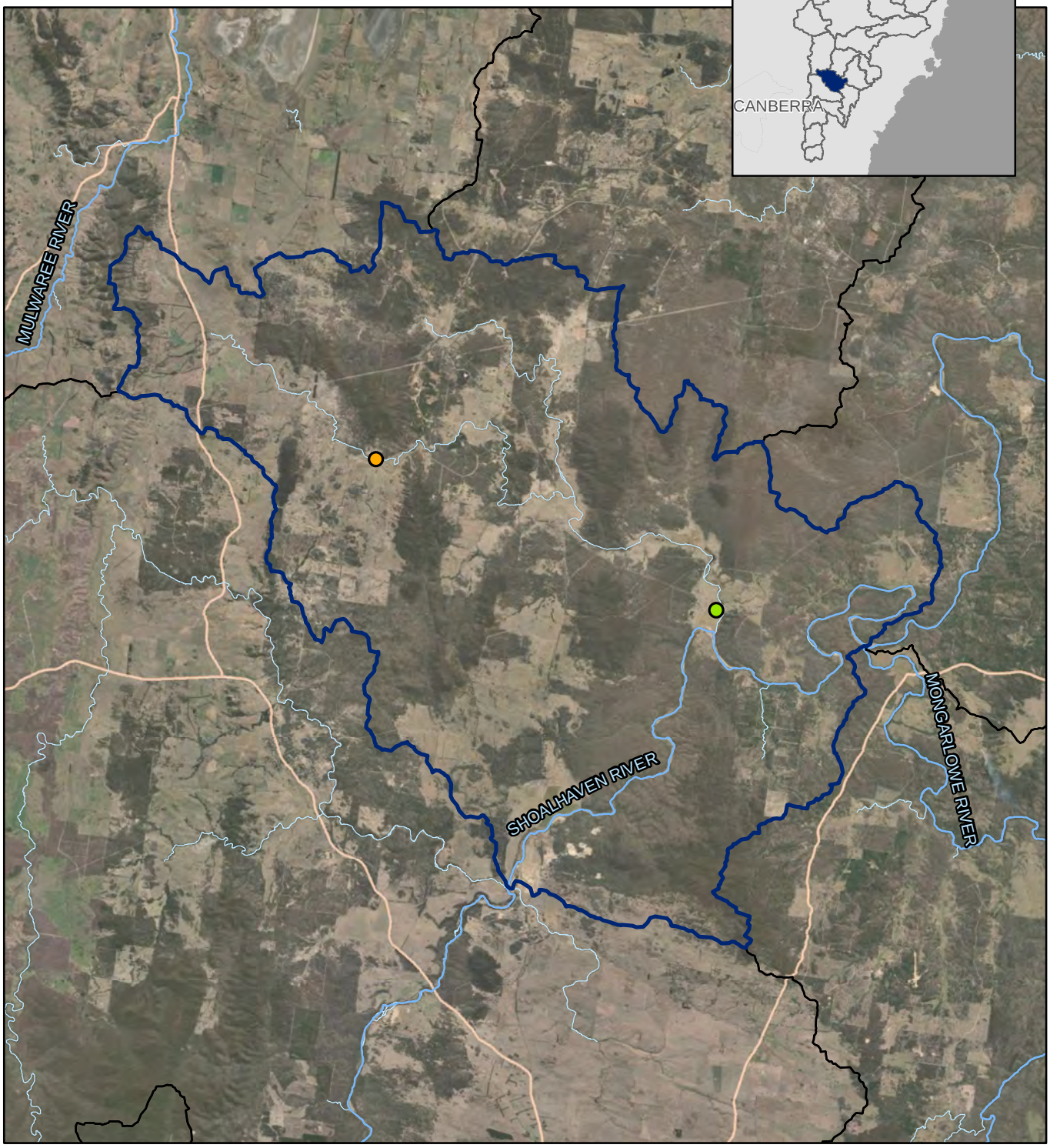

Total Aluminium (mg/L)
100
10
1
0.1
0.01
0.001
1980
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
DLC1
DLM1
DTC1
Guideline


Total Iron (mg/L)
100
10
1
0.1
0.01
0.001
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
DLC1
DLM1
DTC1
Guideline

BORO CREEK

CATCHMENT





Legend

- Sub Catchment Boundary
- Major Roads

Water Quality Monitoring Stations

- E890
- MMP33

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

0 3,200 6,400

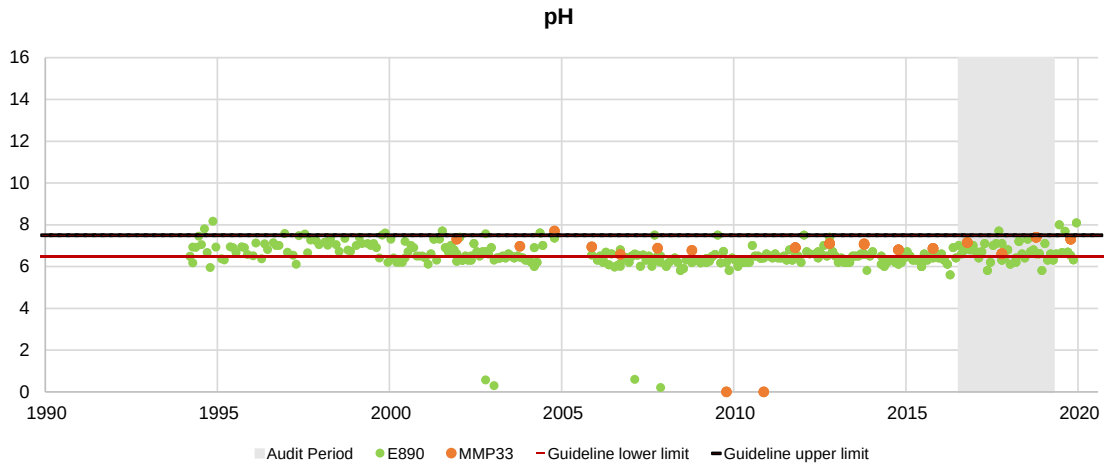
Metres

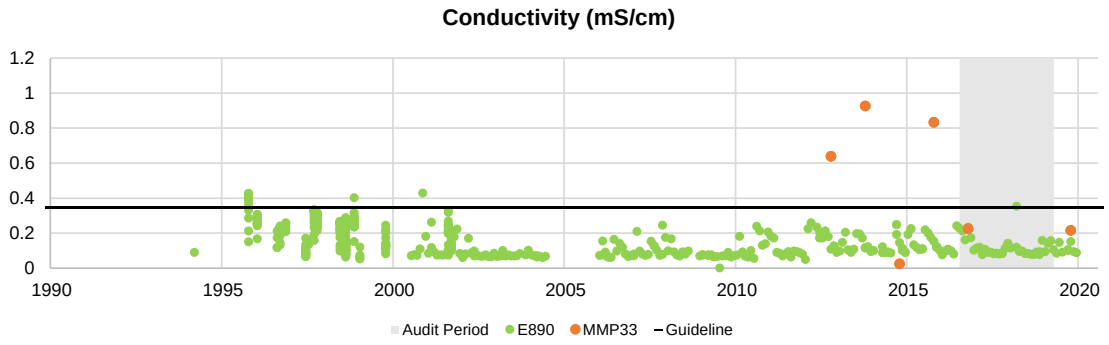
Datum/Projection:
GDA 1994 MGA Zone 56

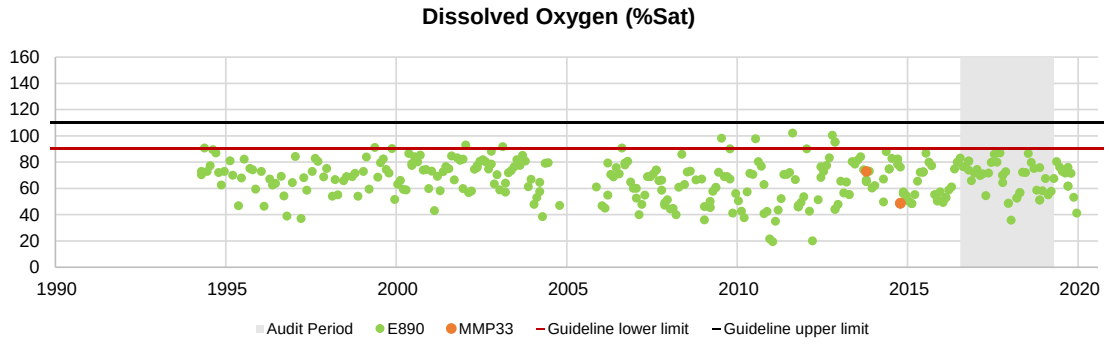
N

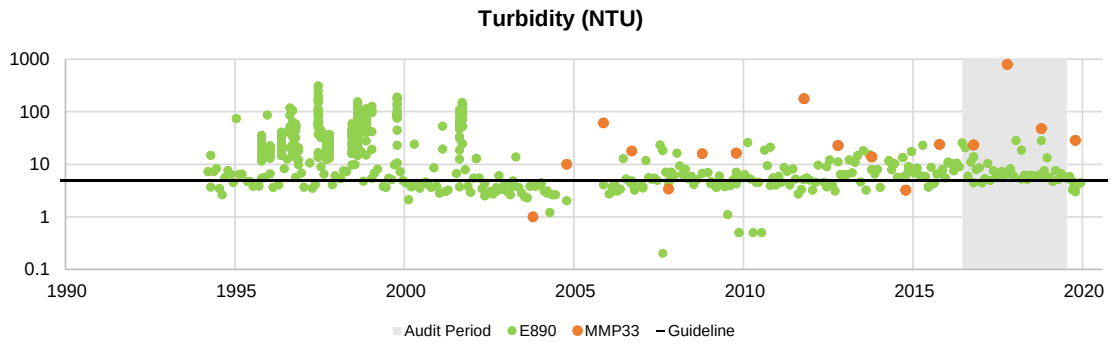
eco logical AUSTRALIA A TETRA TECH COMPANY

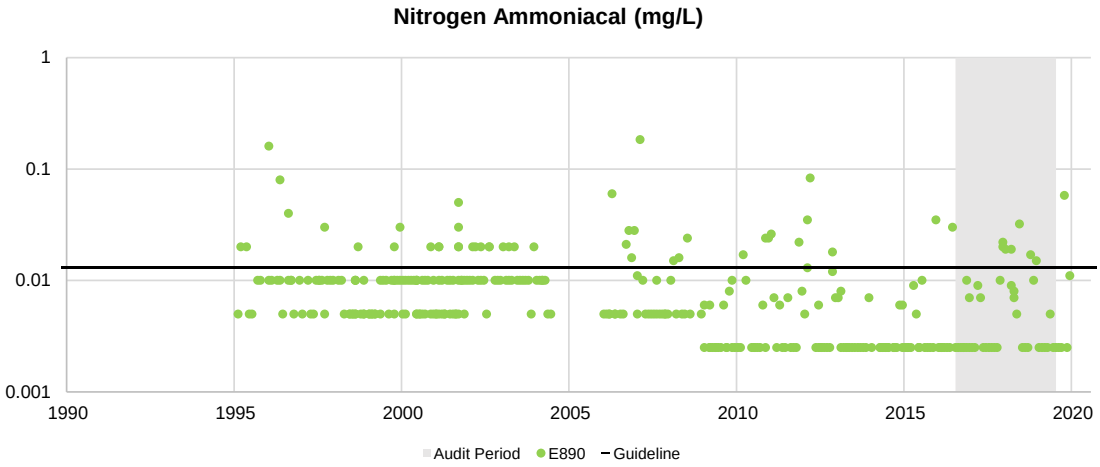
Prepared by: SC Date: 18/03/2020

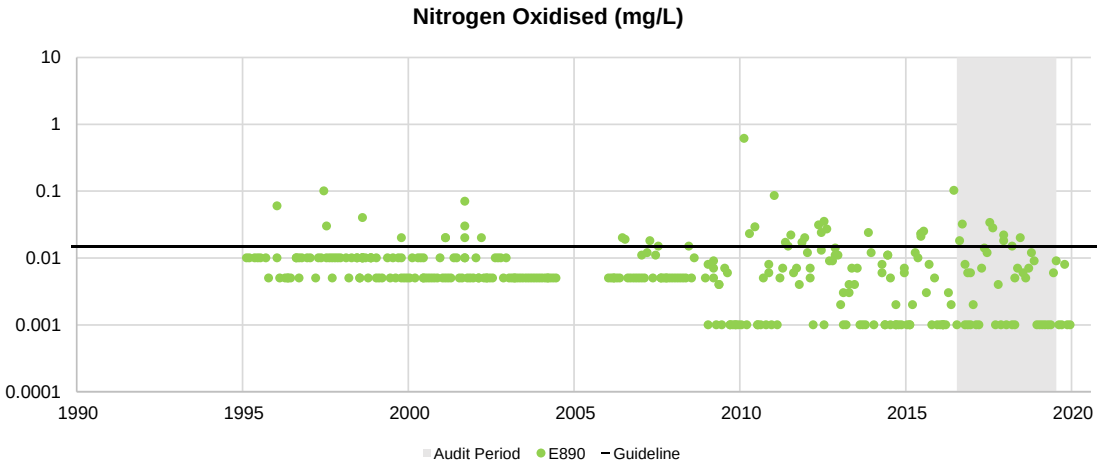

pH
16
14
12
10
8
6
4
2
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
E890
MMP33
Guideline lower limit
Guideline upper limit

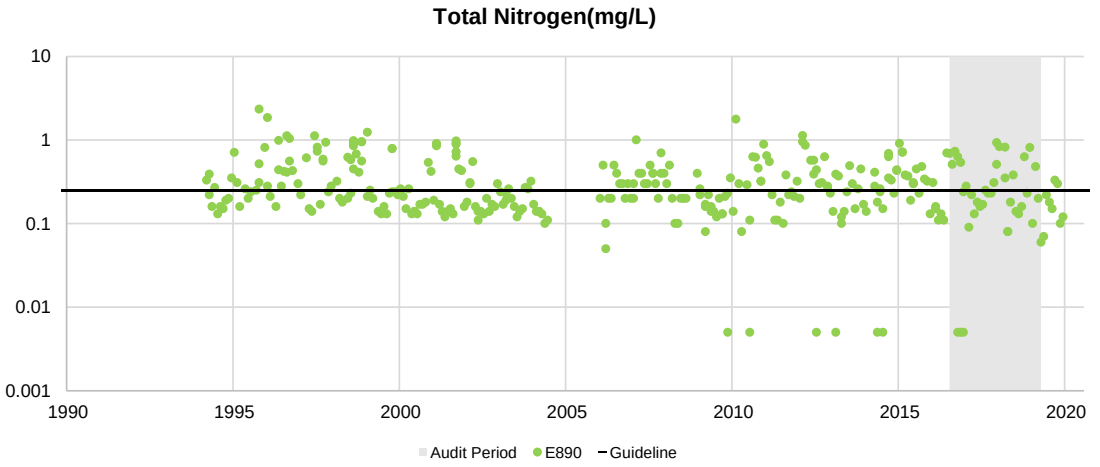

Conductivity (mS/cm)
1.2
1
0.8
0.6
0.4
0.2
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
E890
MMP33
Guideline

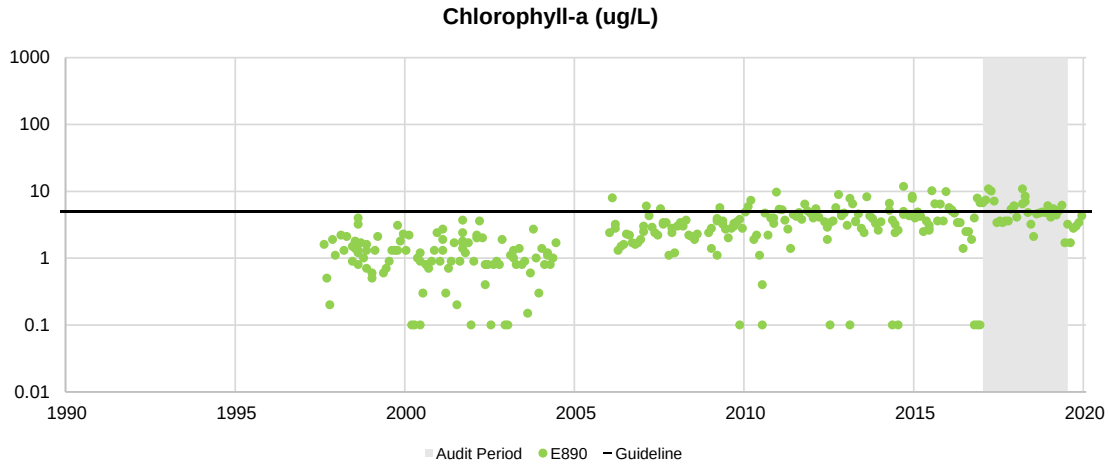

Dissolved Oxygen (%Sat)
160
140
120
100
80
60
40
20
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
E890
MMP33
Guideline lower limit
Guideline upper limit

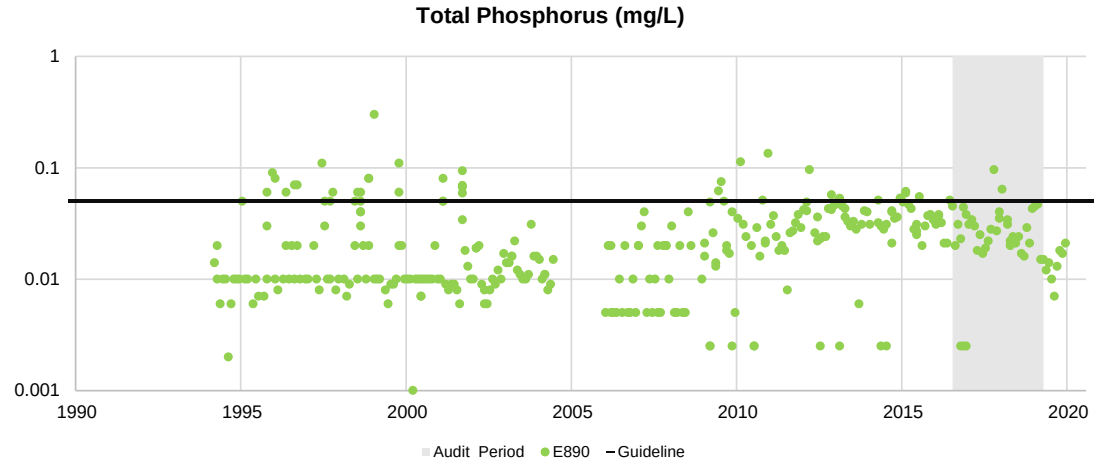

Turbidity (NTU)
1000
100
10
1
0.1
1990
1995
2000
2005
2010
2015
2020
Audit Period
E890
MMP33
Guideline

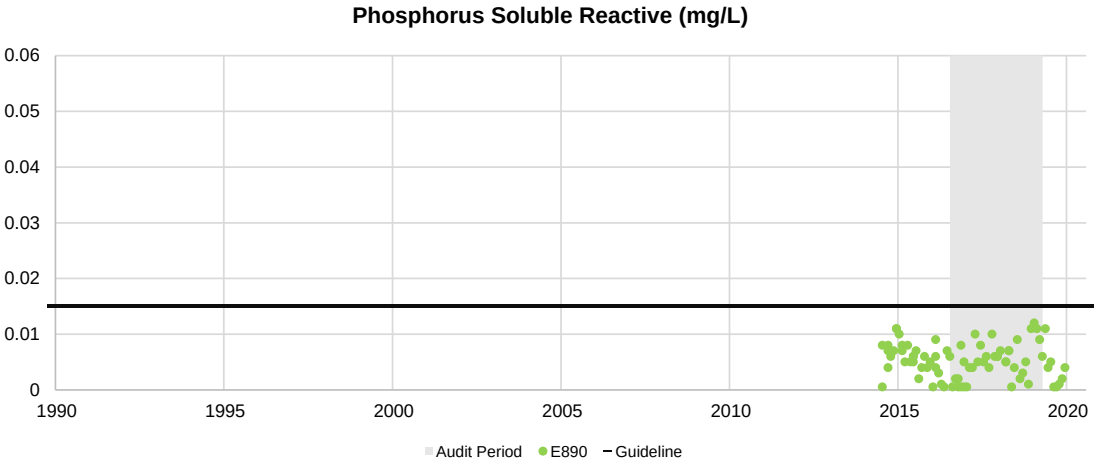

Nitrogen Ammoniacal (mg/L)
1
0.1
0.01
0.001
1990
1995
2000
2005
2010
2015
2020
Audit Period
E890
Guideline

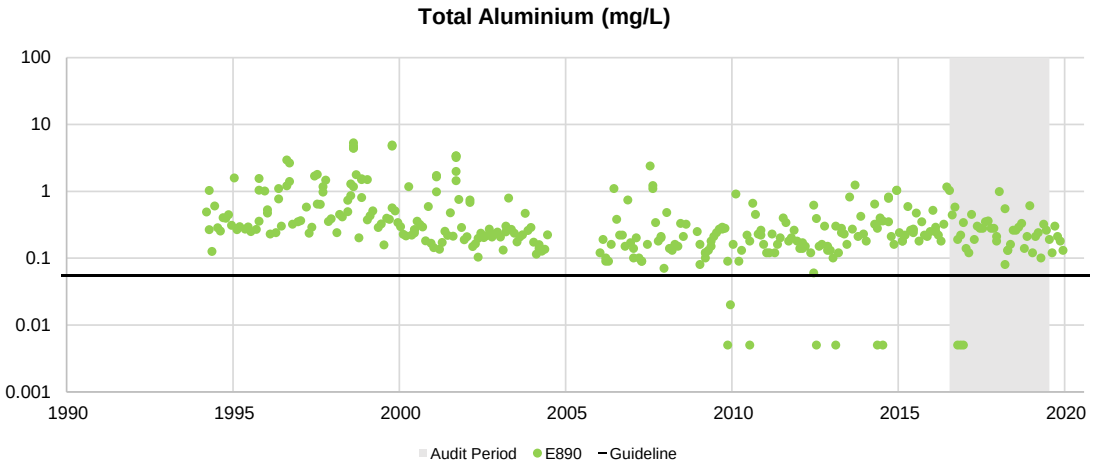

Nitrogen Oxidised (mg/L)
10
1
0.1
0.01
0.001
0.0001
1990
1995
2000
2005
2010
2015
2020
Audit Period
E890
Guideline

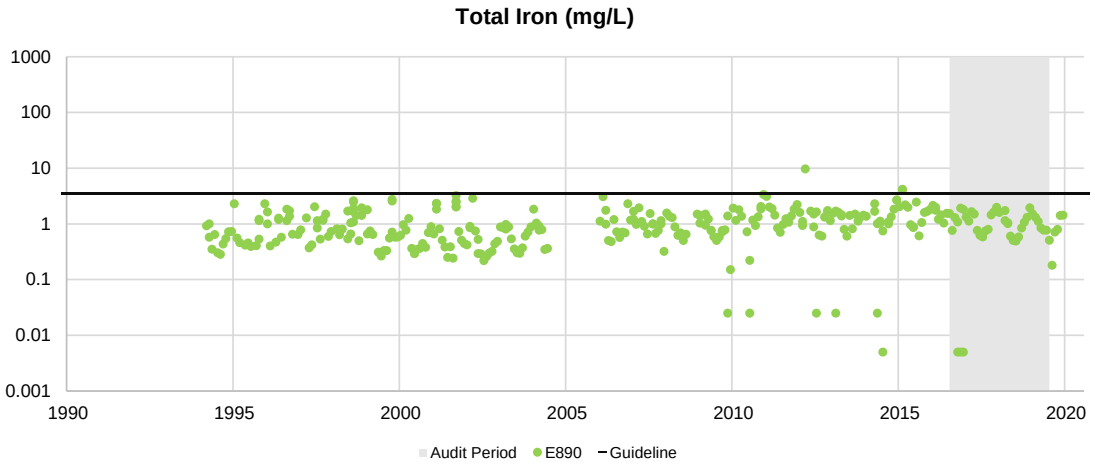

Total Nitrogen(mg/L)
10
1
0.1
0.01
0.001
1990
1995
2000
2005
2010
2015
2020
Audit Period
E890
Guideline


Chlorophyll-a (ug/L)
1000
100
10
1
0.1
0.01
1990
1995
2000
2005
2010
2015
2020
Audit Period
E890
Guideline


Total Phosphorus (mg/L)
1
0.1
0.01
0.001
1990
1995
2000
2005
2010
2015
2020
Audit Period
E890
Guideline

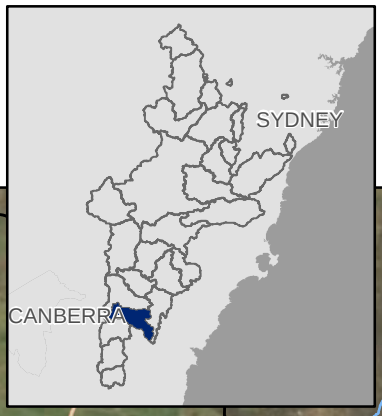

Phosphorus Soluble Reactive (mg/L)
0.06
0.05
0.04
0.03
0.02
0.01
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
E890
Guideline

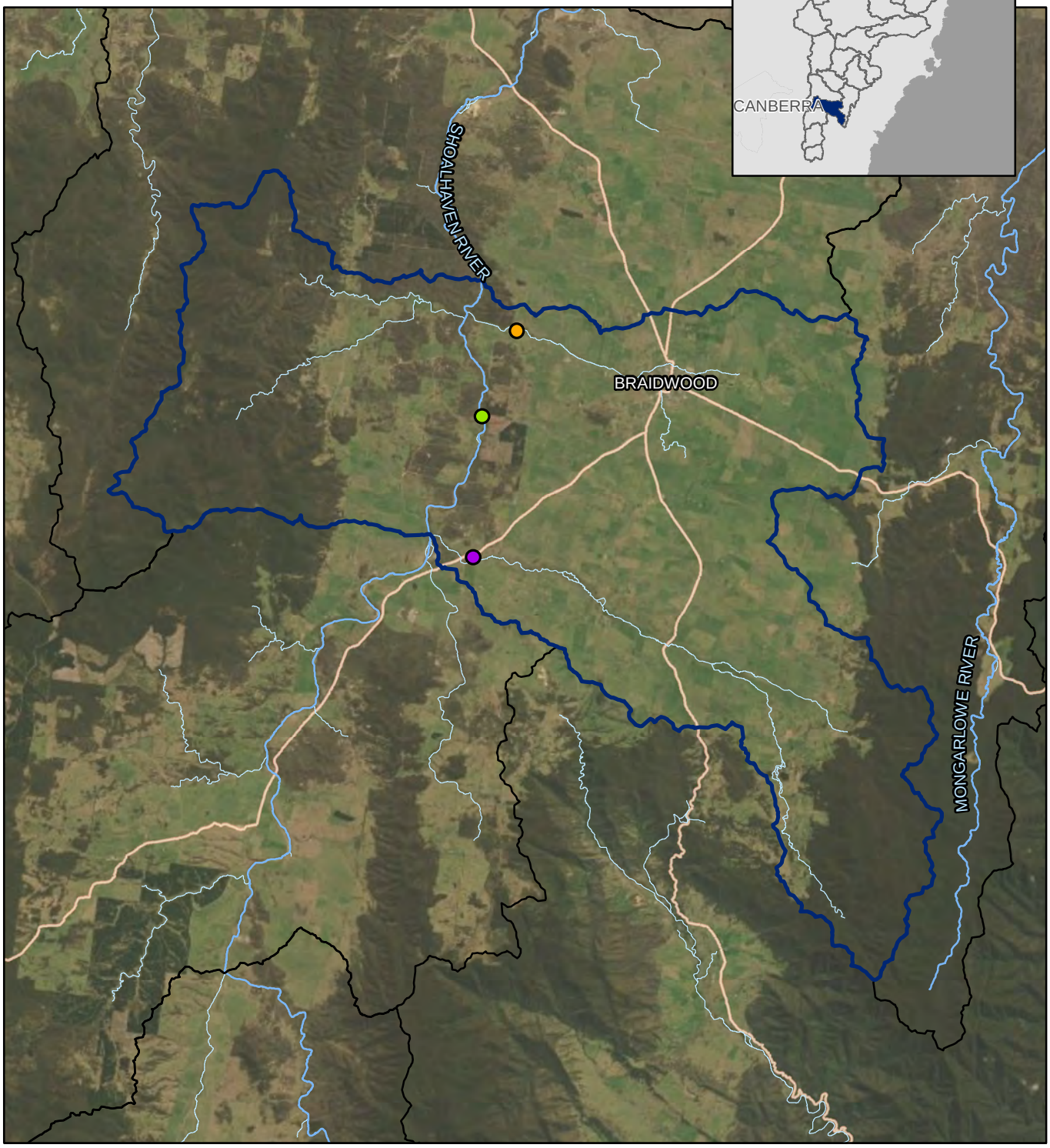

Total Aluminium (mg/L)
100
10
1
0.1
0.01
0.001
1990
1995
2000
2005
2010
2015
2020
Audit Period
E890
Guideline


Total Iron (mg/L)
1000
100
10
1
0.1
0.01
0.001
1990
1995
2000
2005
2010
2015
2020
Audit Period
E890
Guideline

BRAIDWOOD

CATCHMENT





Legend

- Sub Catchment Boundary
- Major Roads

Water Quality Monitoring Stations

- E860
- E891
- MMP62

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

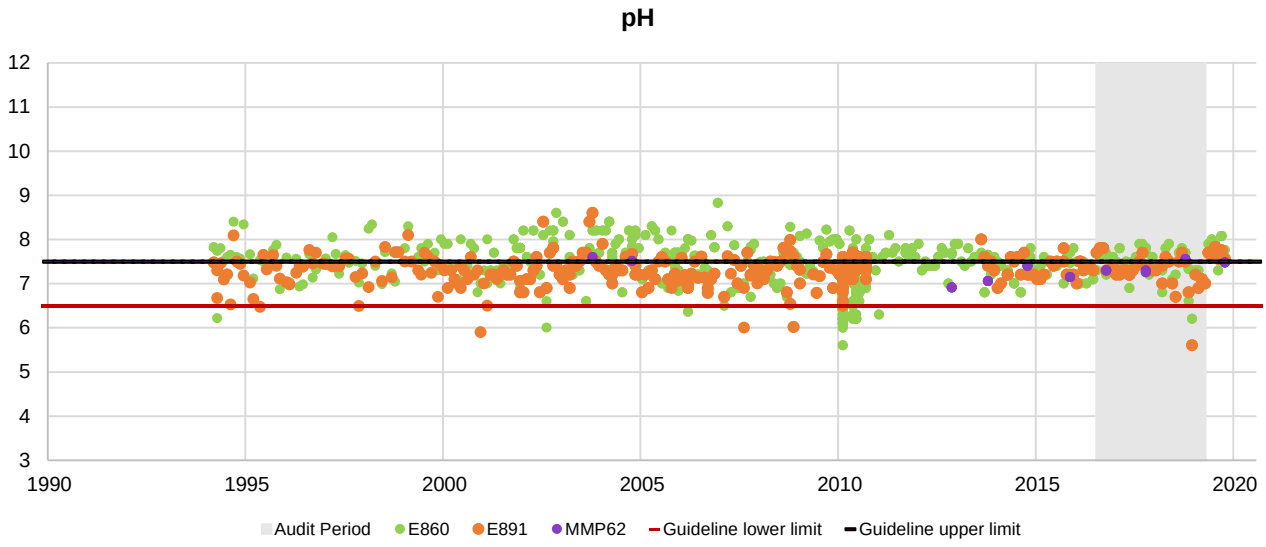
0 3,600 7,200

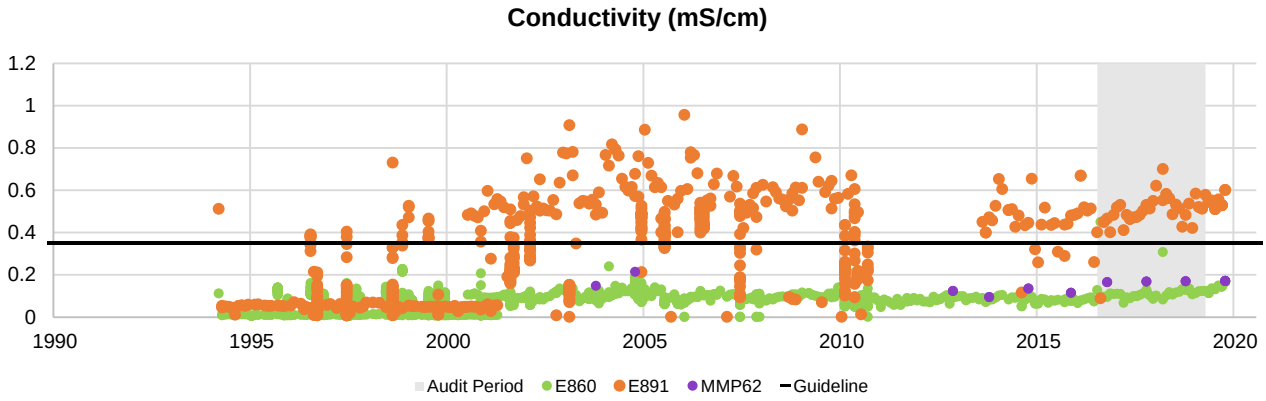
Metres

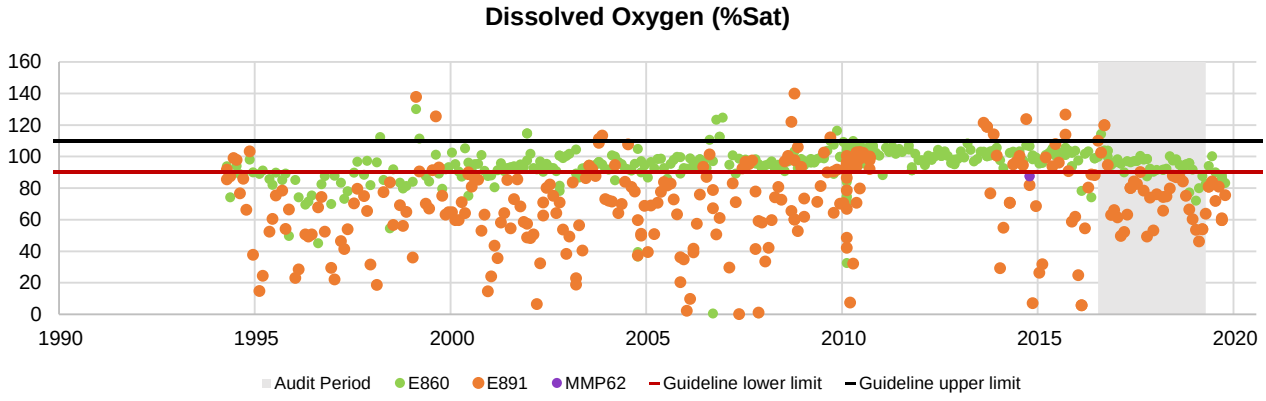
Datum/Projection:
GDA 1994 MGA Zone 56

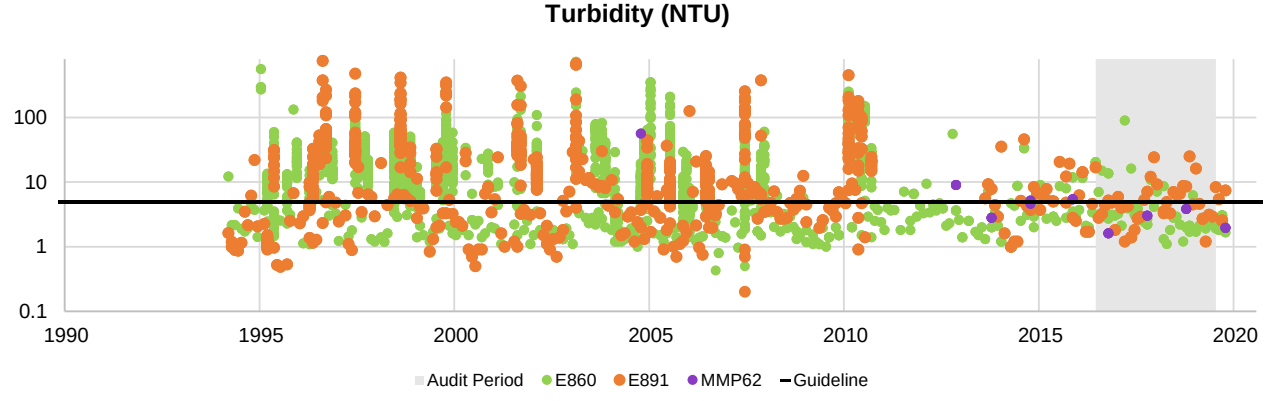
N

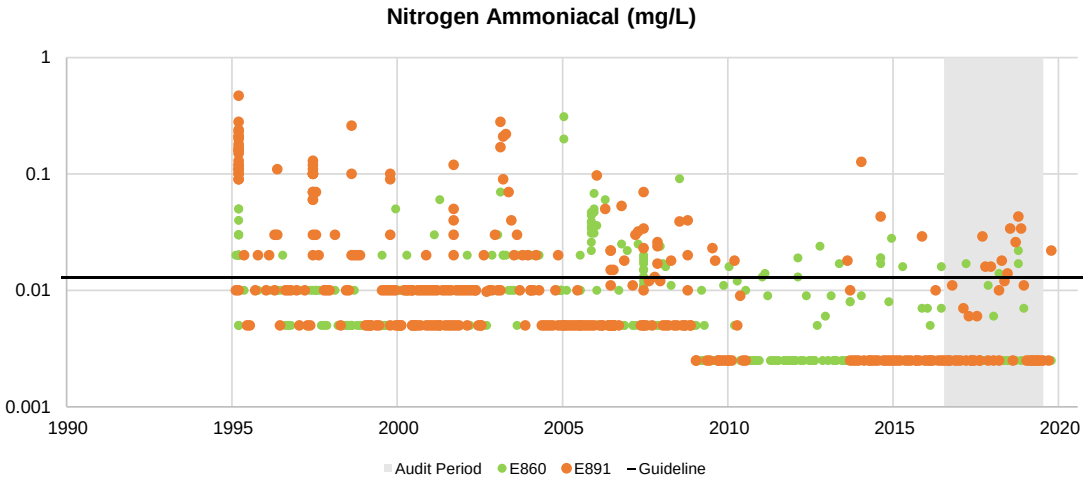
Prepared by: SC Date: 18/03/2020

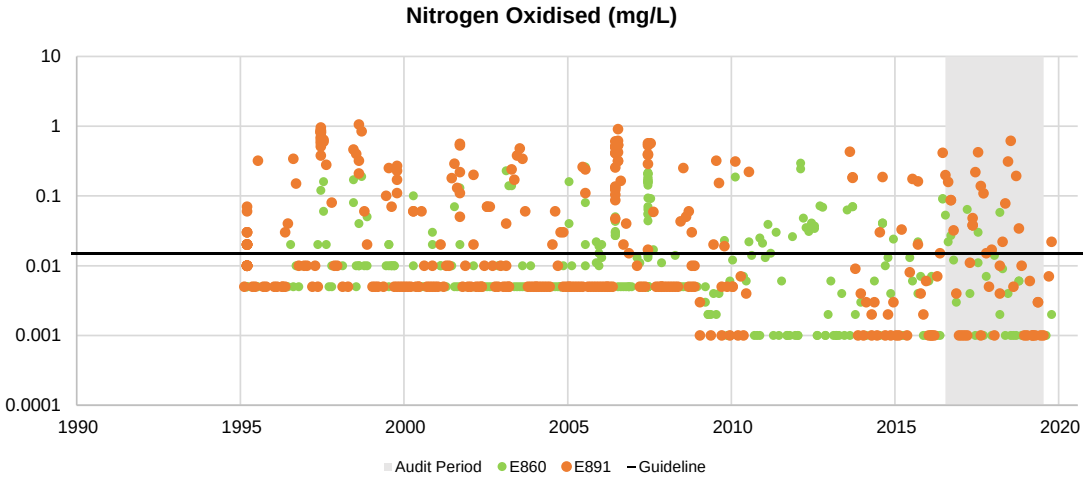

pH
12
11
10
9
8
7
6
5
4
3
1990
1995
2000
2005
2010
2015
2020
Audit Period
E860
E891
MMP62
Guideline lower limit
Guideline upper limit

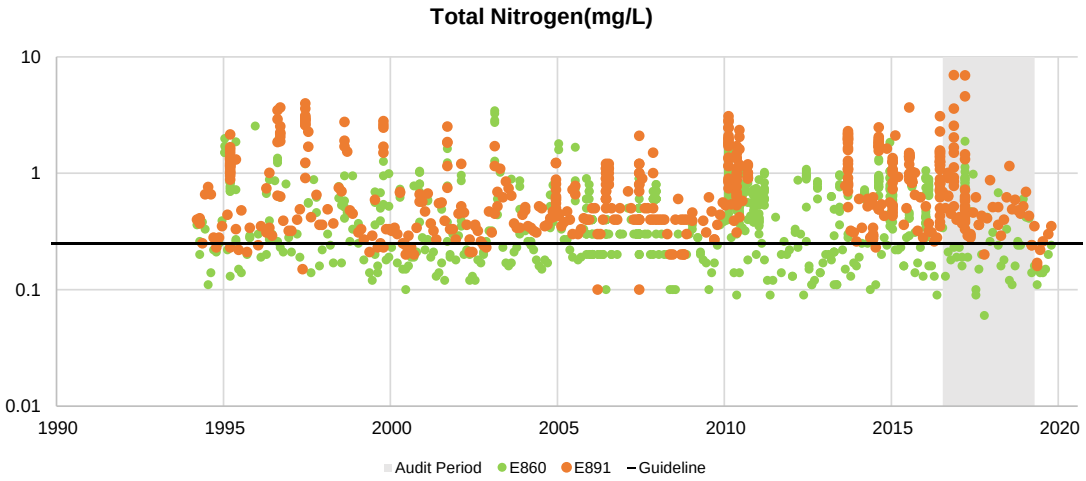

Conductivity (mS/cm)
1.2
1
0.8
0.6
0.4
0.2
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
E860
E891
MMP62
Guideline

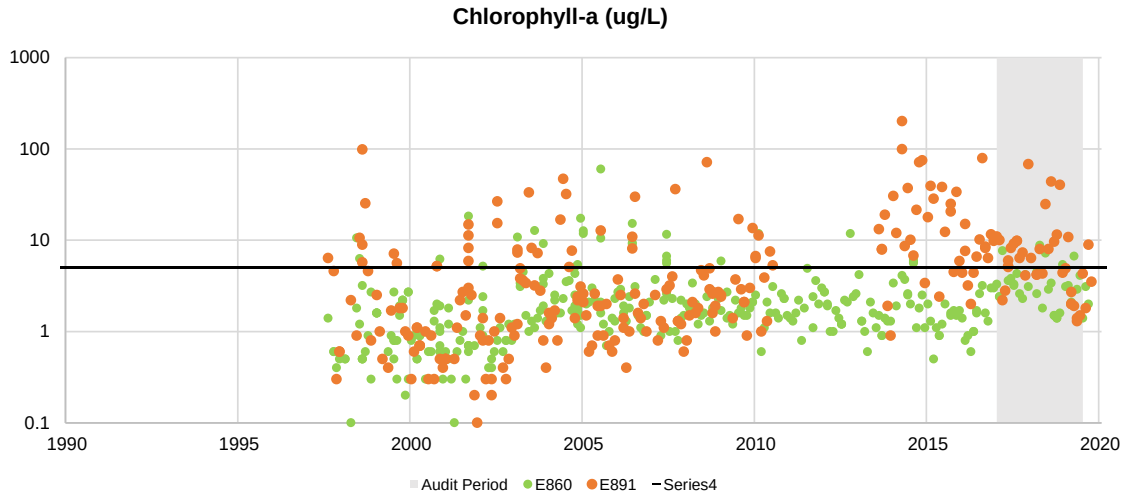

Dissolved Oxygen (%Sat)
160
140
120
100
80
60
40
20
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
E860
E891
MMP62
Guideline lower limit
Guideline upper limit

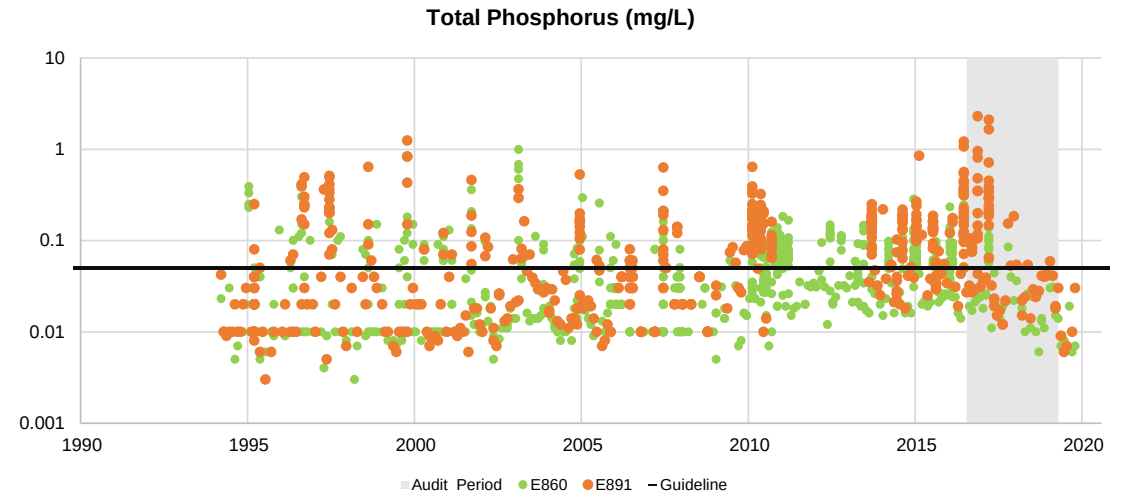

Turbidity (NTU)
100
10
1
0.1
1990
1995
2000
2005
2010
2015
2020
Audit Period
E860
E891
MMP62
Guideline

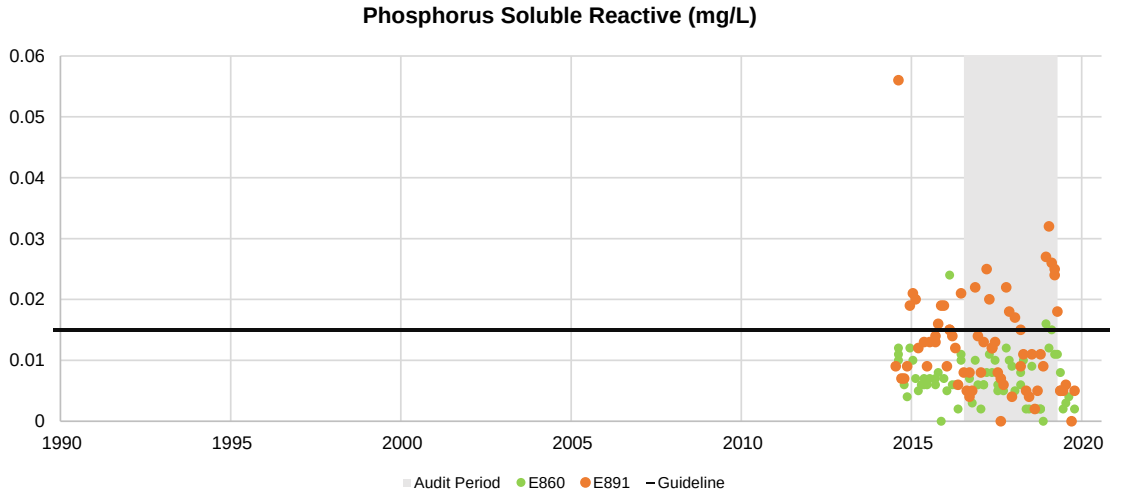

Nitrogen Ammoniacal (mg/L)
1
0.1
0.01
0.001
1990
1995
2000
2005
2010
2015
2020
Audit Period
E860
E891
Guideline

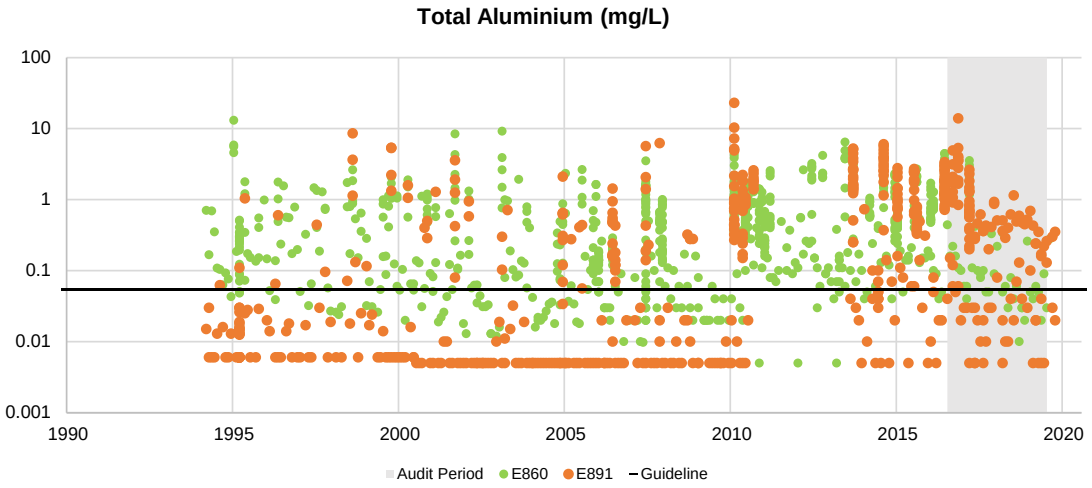

Nitrogen Oxidised (mg/L)
10
1
0.1
0.01
0.001
0.0001
1990
1995
2000
2005
2010
2015
2020
Audit Period
E860
E891
Guideline

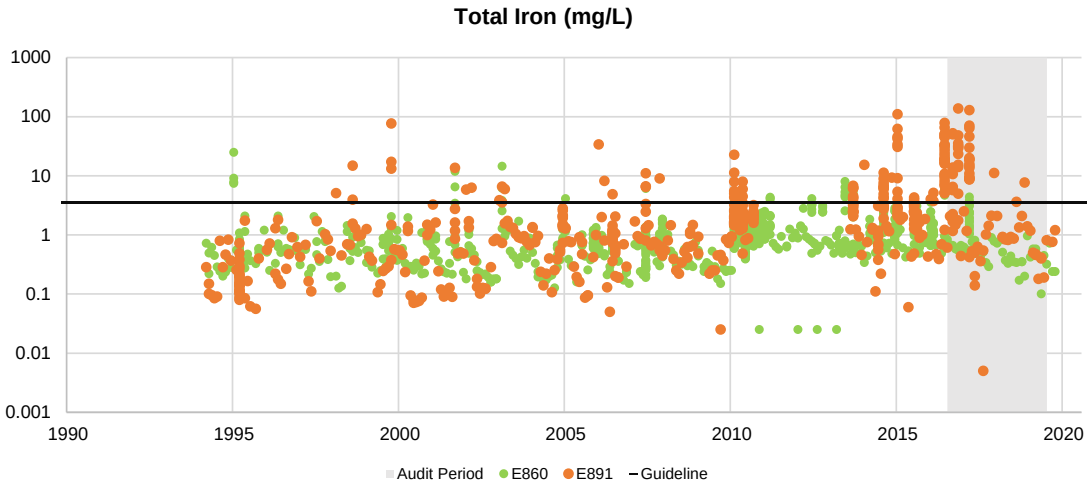

Total Nitrogen(mg/L)
10
1
0.1
0.01
1990
1995
2000
2005
2010
2015
2020
Audit Period
E860
E891
Guideline


Chlorophyll-a (ug/L)
1000
100
10
1
0.1
1990
1995
2000
2005
2010
2015
2020
Audit Period
E860
E891
Series4


Total Phosphorus (mg/L)
10
1
0.1
0.01
0.001
1990
1995
2000
2005
2010
2015
2020
Audit Period
E860
E891
Guideline

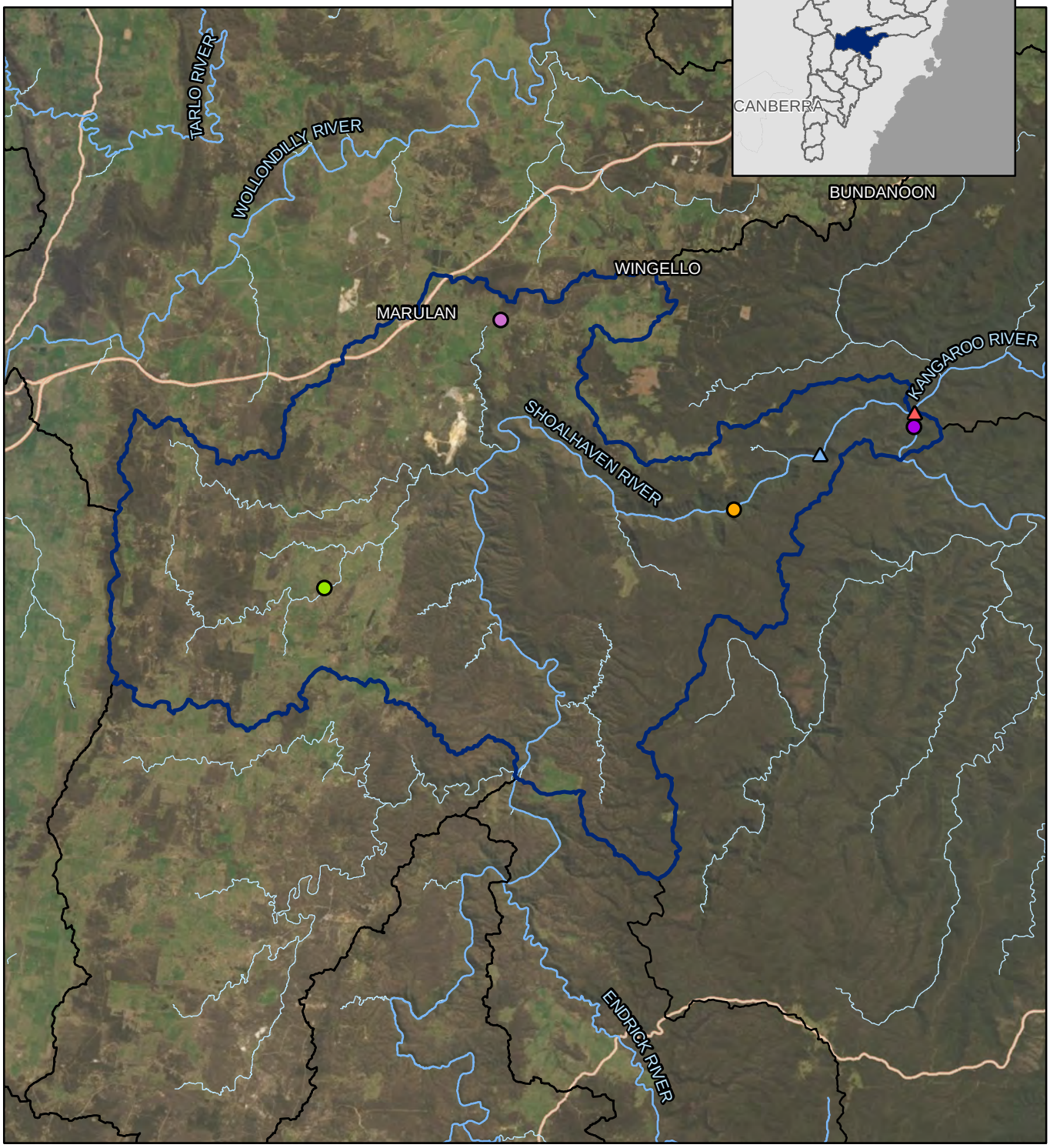

Phosphorus Soluble Reactive (mg/L)
0.06
0.05
0.04
0.03
0.02
0.01
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
E860
E891
Guideline


Total Aluminium (mg/L)
100
10
1
0.1
0.01
0.001
1990
1995
2000
2005
2010
2015
2020
Audit Period
E860
E891
Guideline


Total Iron (mg/L)
1000
100
10
1
0.1
0.01
0.001
1990
1995
2000
2005
2010
2015
2020
Audit Period
E860
E891
Guideline

BUNGONIA CREEK

CATCHMENT



Legend

- Sub Catchment Boundary
- Major Roads

Water Quality Monitoring Stations

- A8
- E847
- E851
- MMP98

Water Quality Monitoring Stations (Storage)

- DTA5
- DSTAVL1

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

0 5,000 10,000

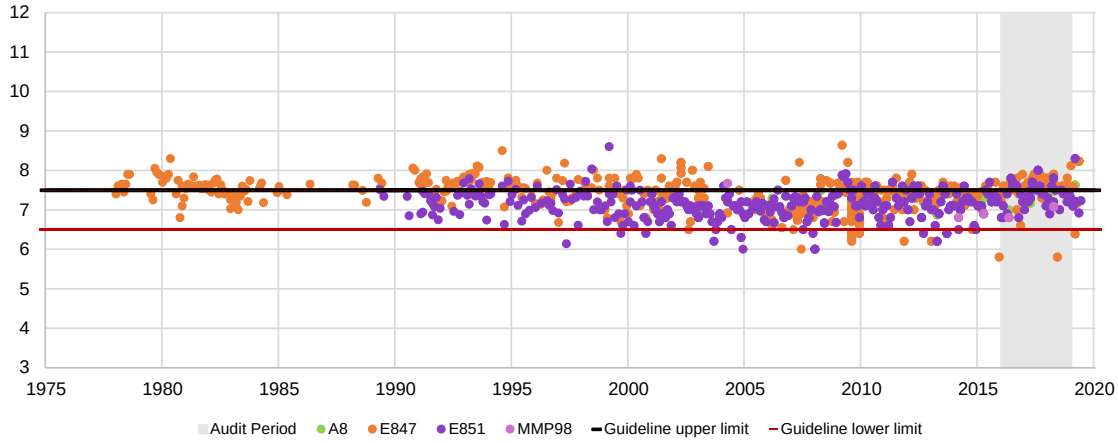
Metres

Datum/Projection:
GDA 1994 MGA Zone 56

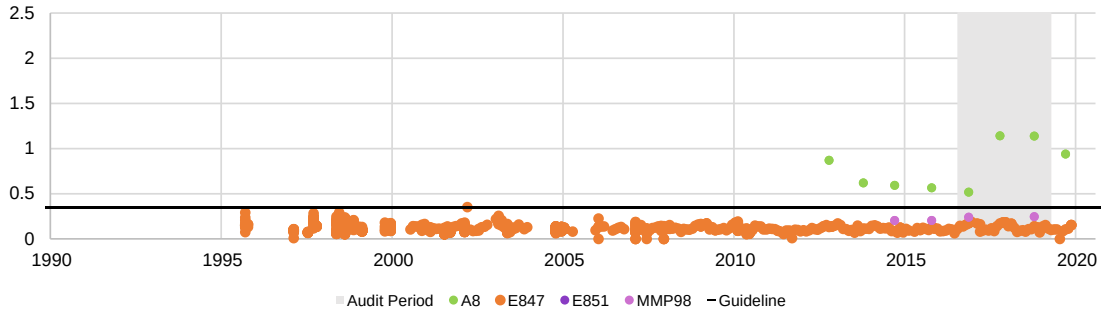
N

Prepared by: SC Date: 18/03/2020

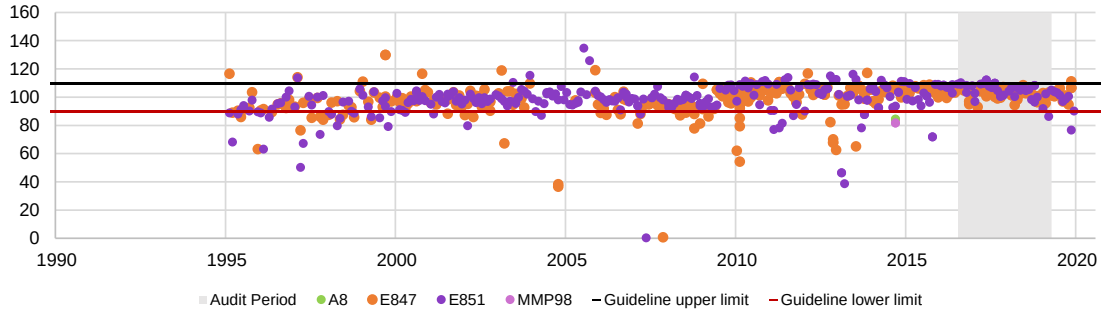
pH



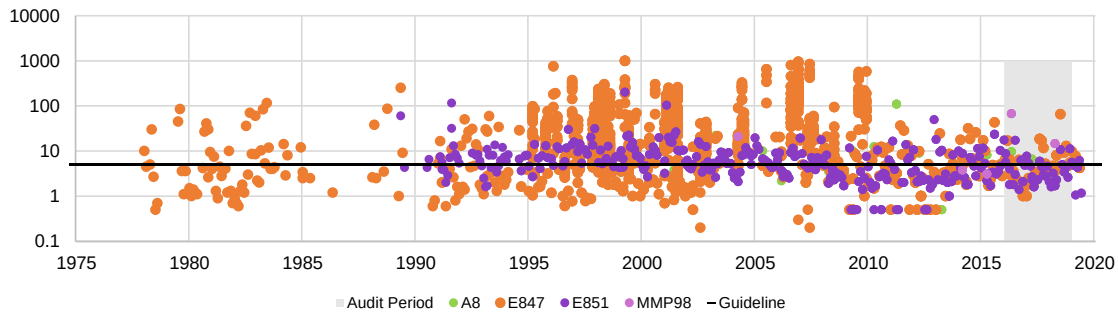
Conductivity (mS/cm)



Dissolved Oxygen (%Sat)

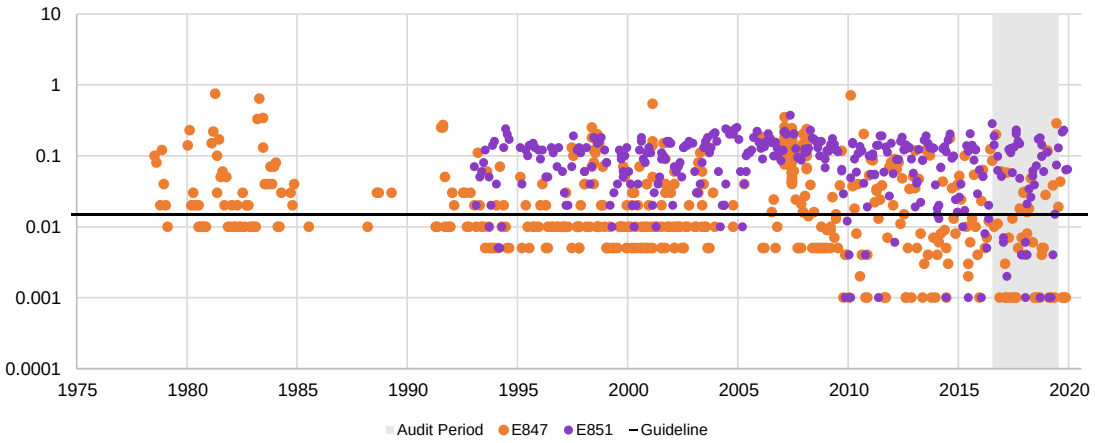


Turbidity (NTU)

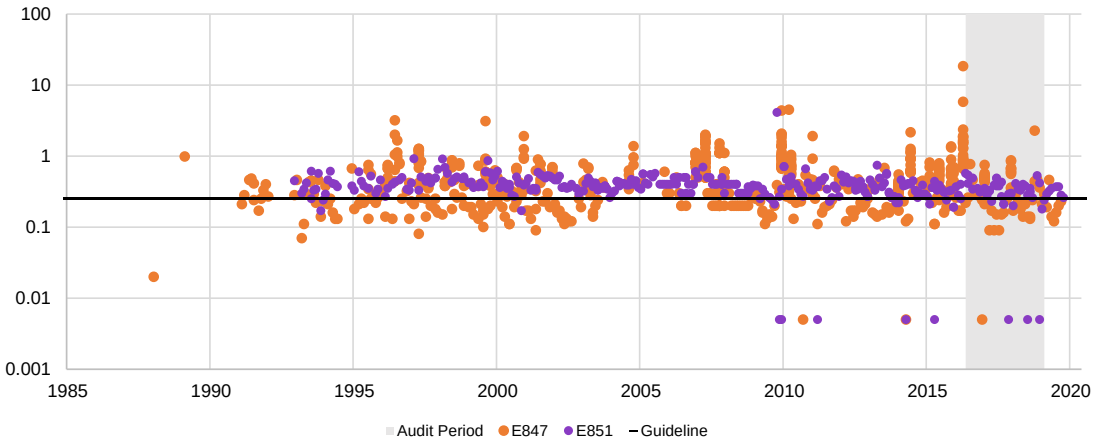


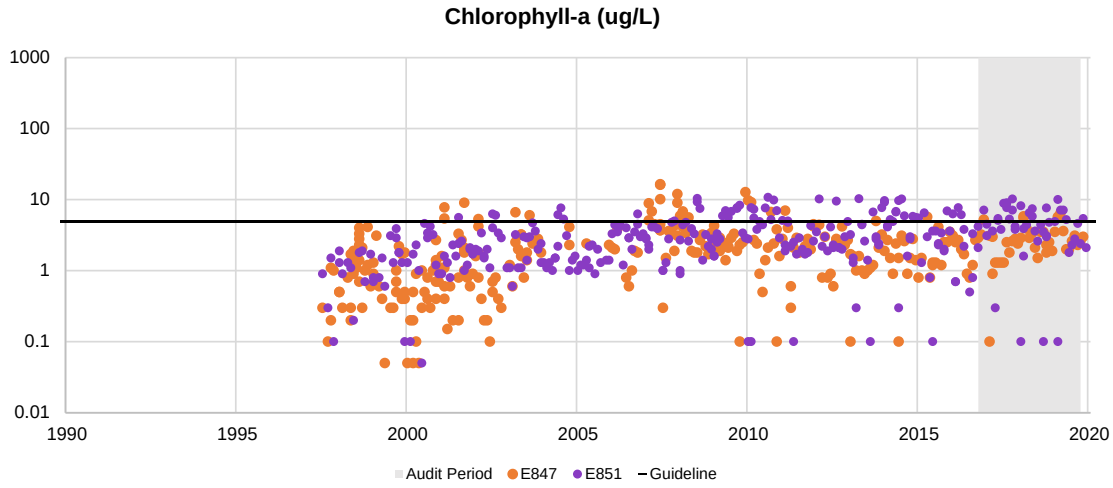
Nitrogen Ammoniacal (mg/L)

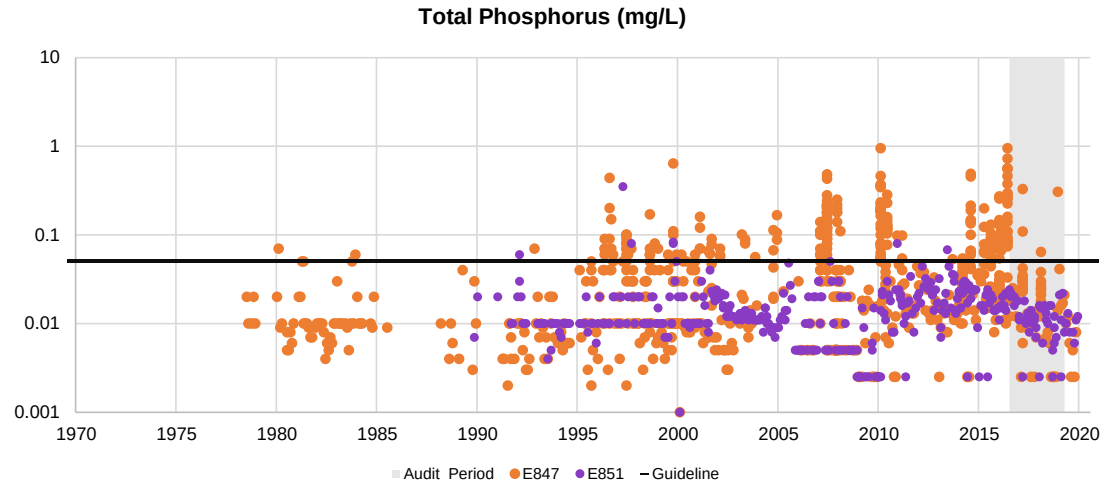
Nitrogen Oxidised (mg/L)

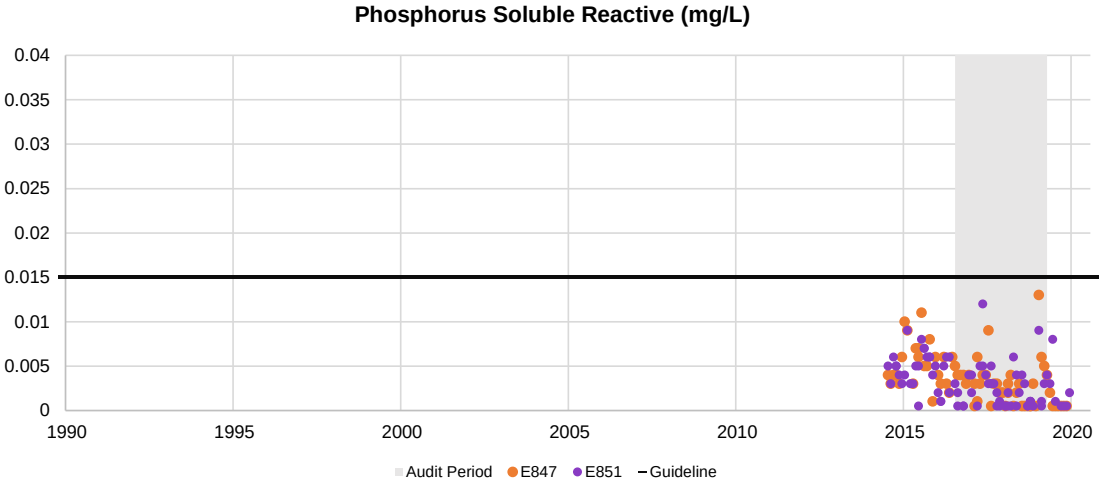


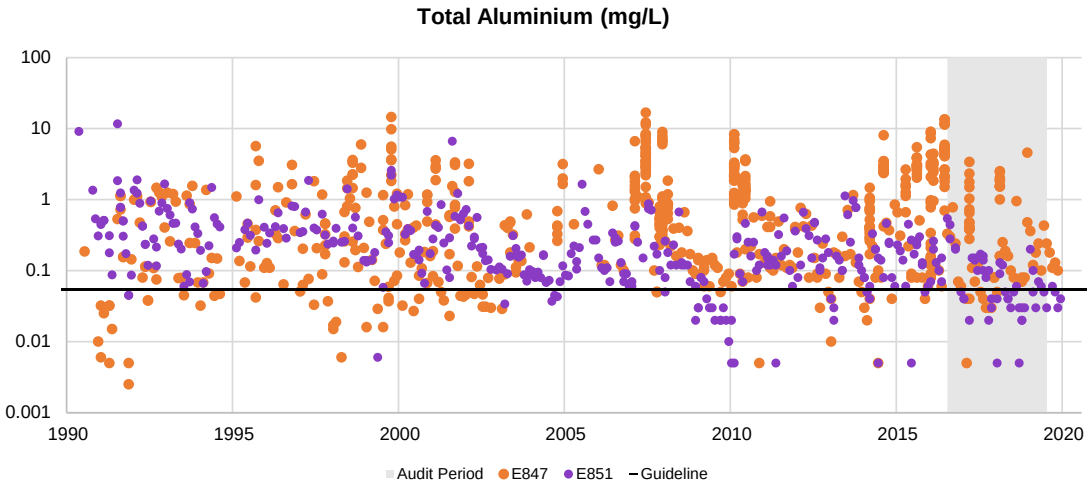
Total Nitrogen(mg/L)

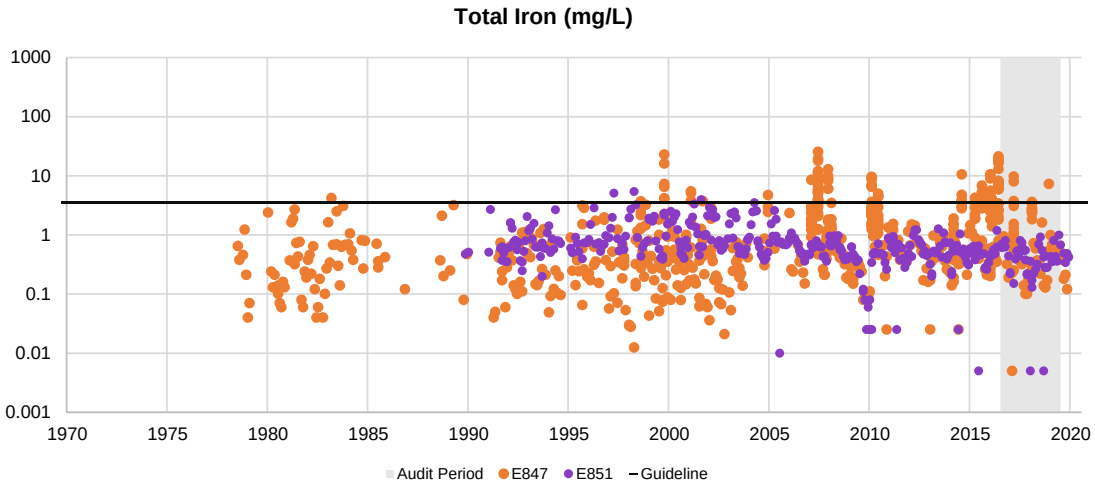


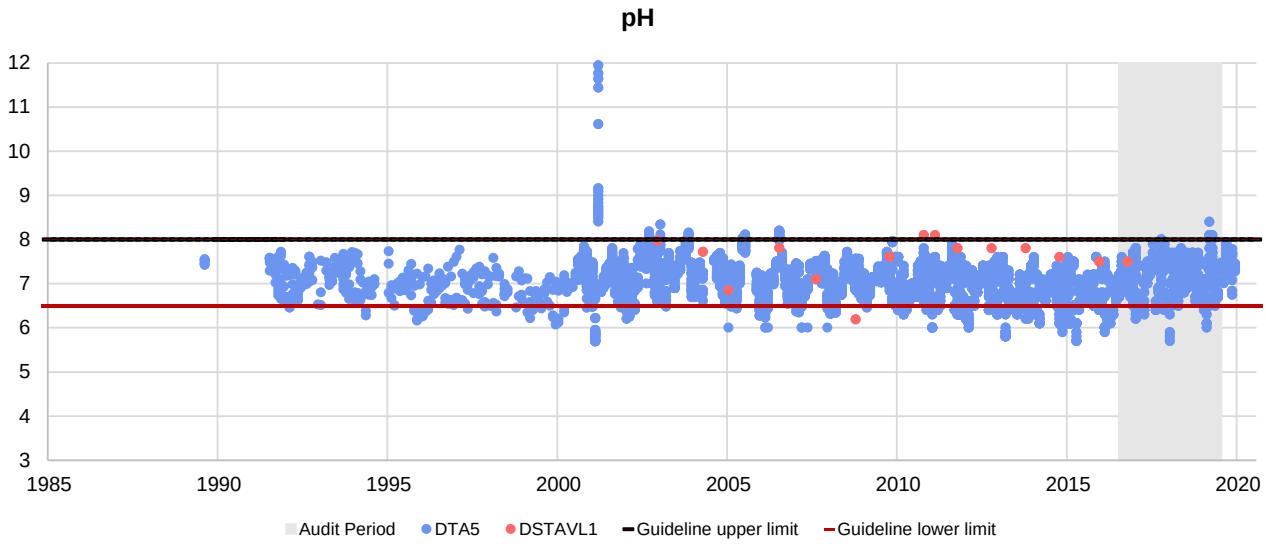

Chlorophyll-a (ug/L)
1000
100
10
1
0.1
0.01
1990
1995
2000
2005
2010
2015
2020
Audit Period
E847
E851
Guideline

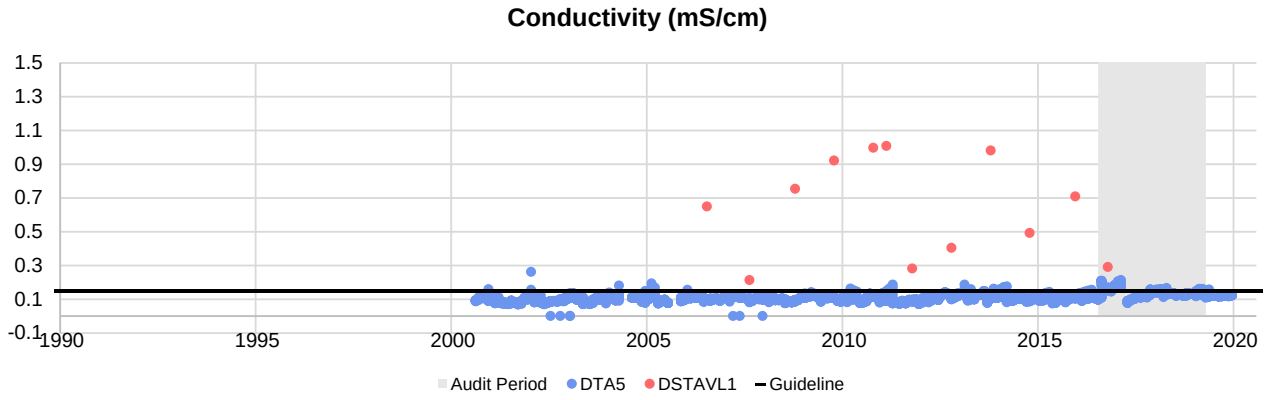

Total Phosphorus (mg/L)
10
1
0.1
0.01
0.001
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
E847
E851
Guideline

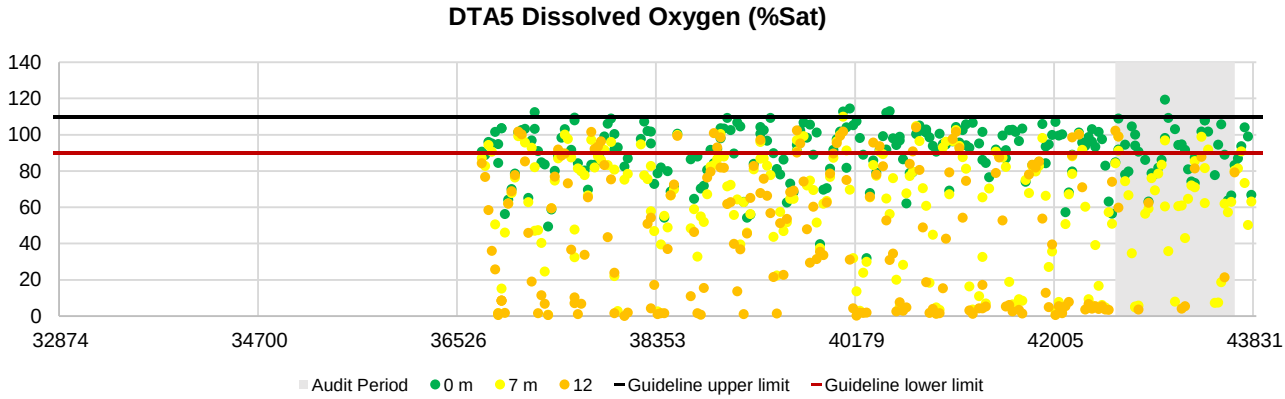

Phosphorus Soluble Reactive (mg/L)
0.04
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
E847
E851
Guideline

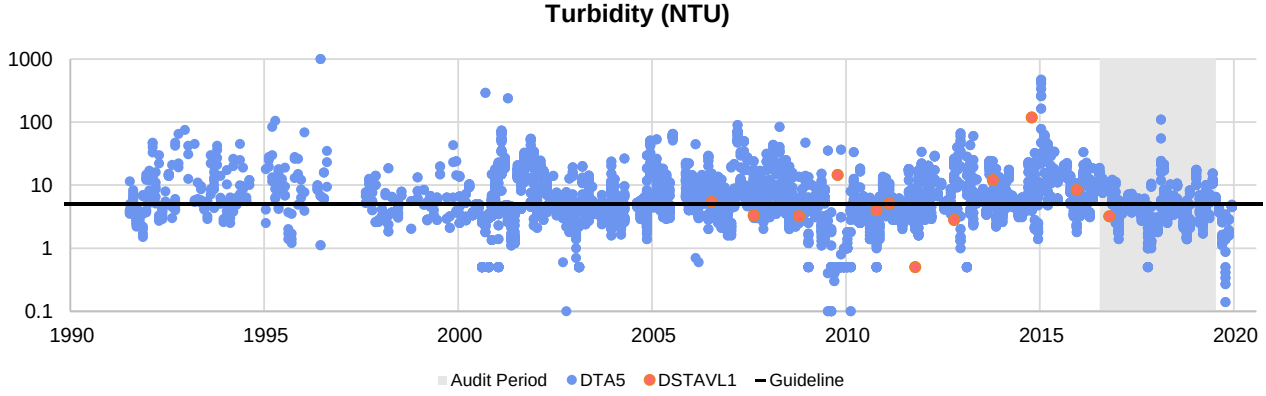

Total Aluminium (mg/L)
100
10
1
0.1
0.01
0.001
1990
1995
2000
2005
2010
2015
2020
Audit Period
E847
E851
Guideline

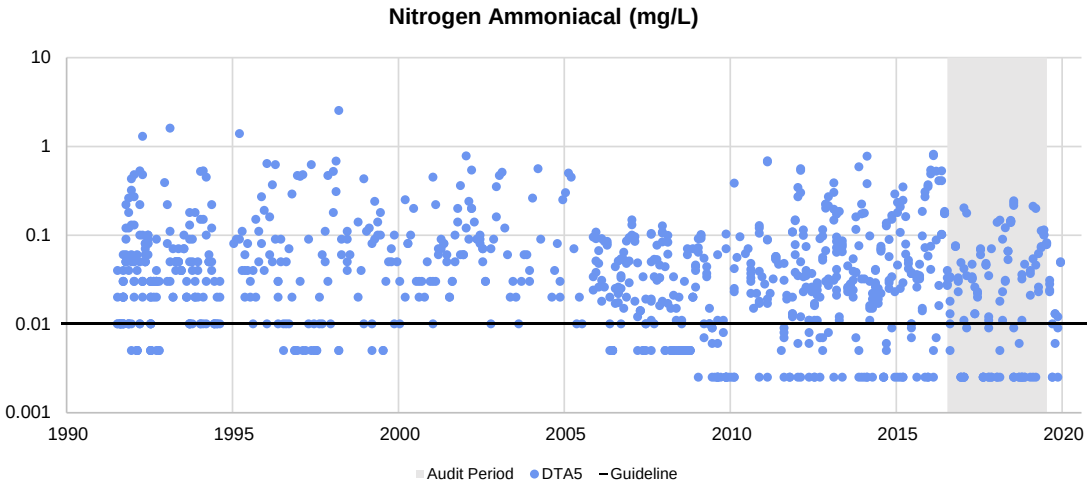

Total Iron (mg/L)
1000
100
10
1
0.1
0.01
0.001
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
E847
E851
Guideline

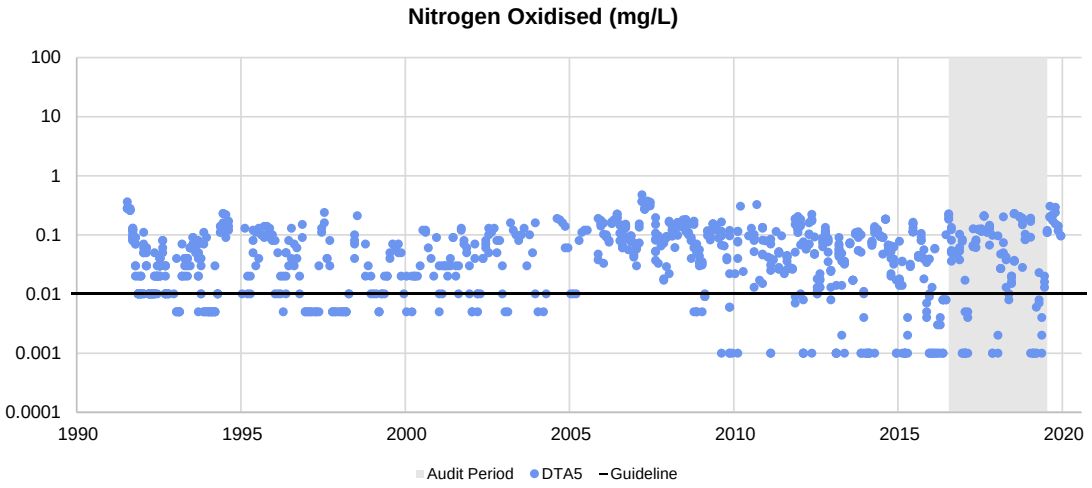

pH
12
11
10
9
8
7
6
5
4
3
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
DTA5
DSTAVL1
Guideline upper limit
Guideline lower limit

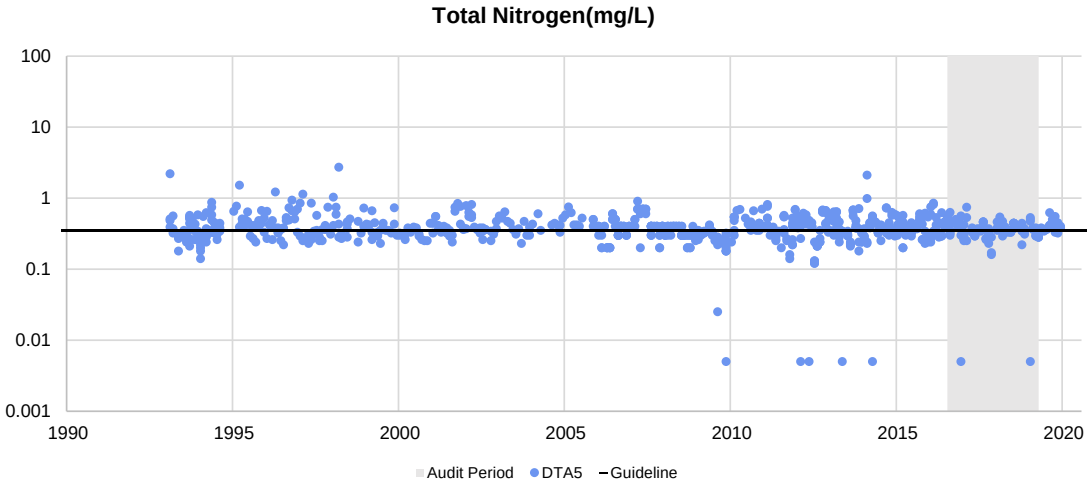

Conductivity (mS/cm)
1.5
1.3
1.1
0.9
0.7
0.5
0.3
0.1
-0.1
1990
1995
2000
2005
2010
2015
2020
Audit Period
DTA5
DSTAVL1
Guideline


DTA5 Dissolved Oxygen (%Sat)
140
120
100
80
60
40
20
0
32874
34700
36526
38353
40179
42005
43831
Audit Period
0 m
7 m
12
Guideline upper limit
Guideline lower limit

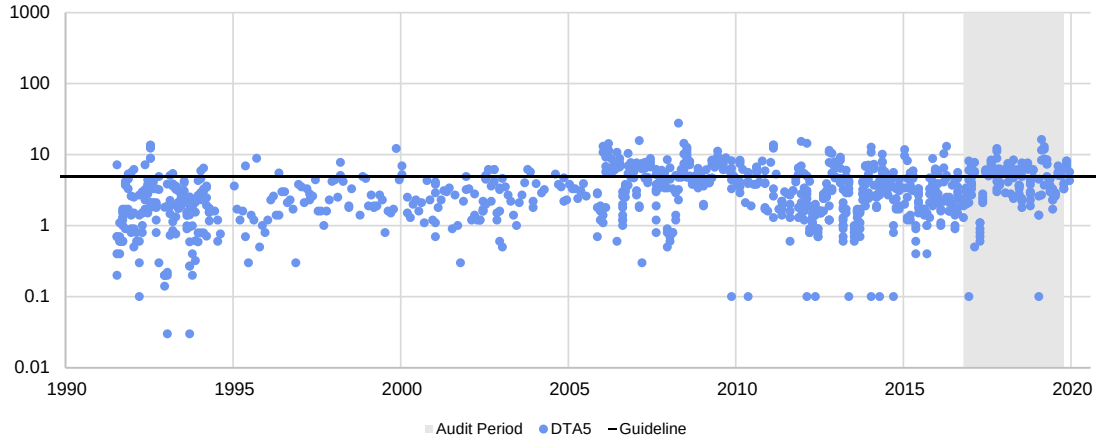

Turbidity (NTU)
1000
100
10
1
0.1
1990
1995
2000
2005
2010
2015
2020
Audit Period
DTA5
DSTAVL1
Guideline


Nitrogen Ammoniacal (mg/L)
10
1
0.1
0.01
0.001
1990
1995
2000
2005
2010
2015
2020
Audit Period
DTA5
Guideline

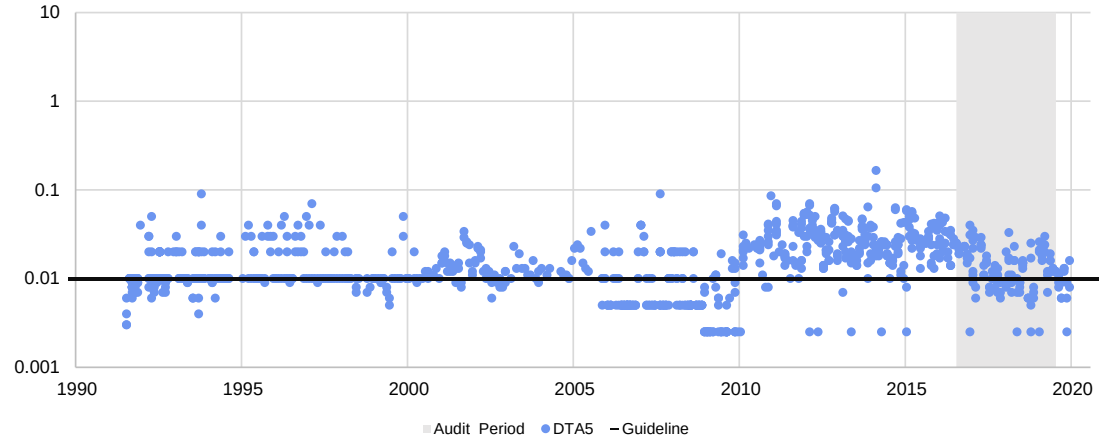

Nitrogen Oxidised (mg/L)
100
10
1
0.1
0.01
0.001
0.0001
1990
1995
2000
2005
2010
2015
2020
Audit Period
DTA5
Guideline


Total Nitrogen(mg/L)
100
10
1
0.1
0.01
0.001
1990
1995
2000
2005
2010
2015
2020
Audit Period
DTA5
Guideline

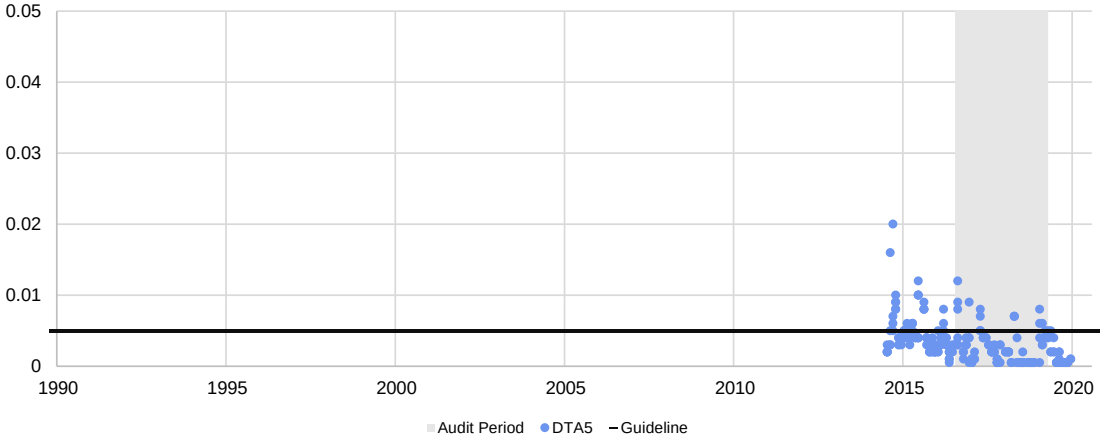
Chlorophyll-a (ug/L)

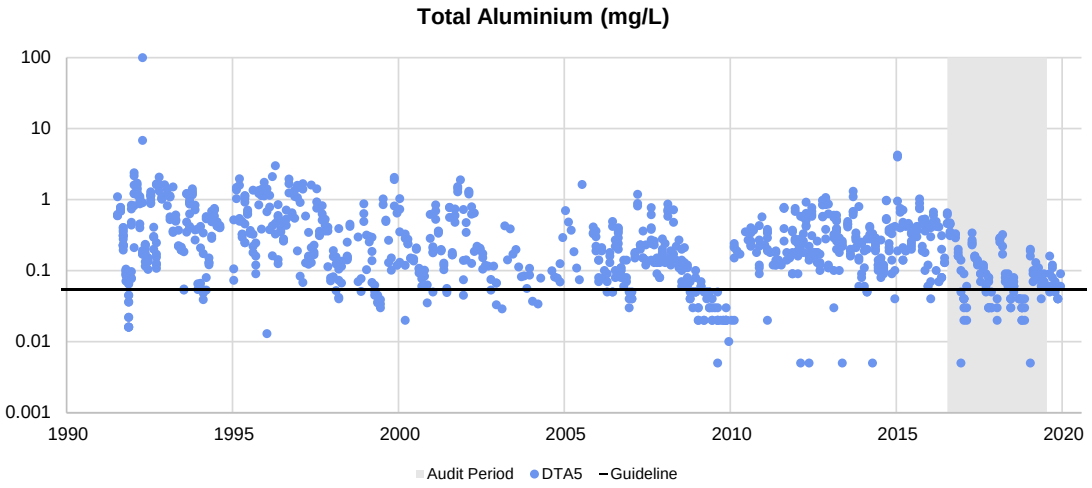


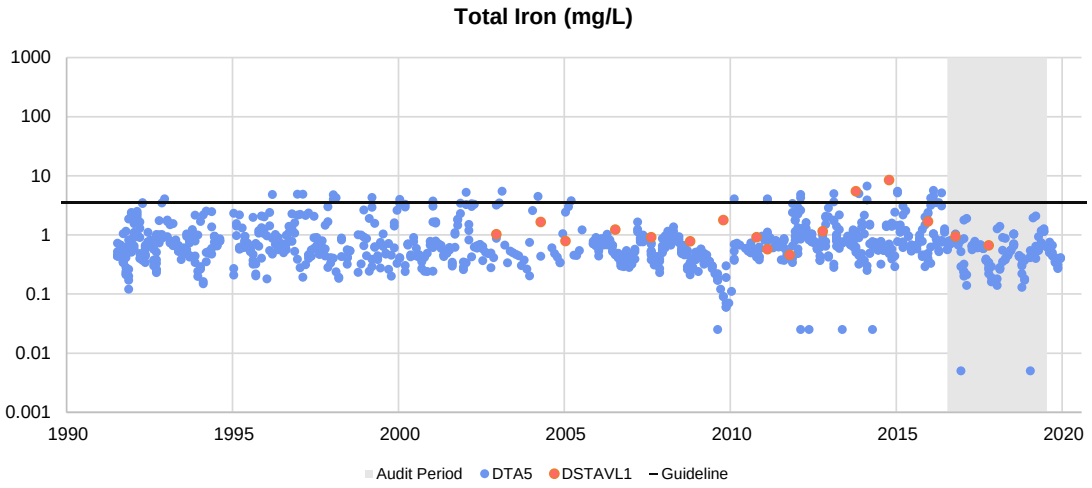
Total Phosphorus (mg/L)



Phosphorus Soluble Reactive (mg/L)

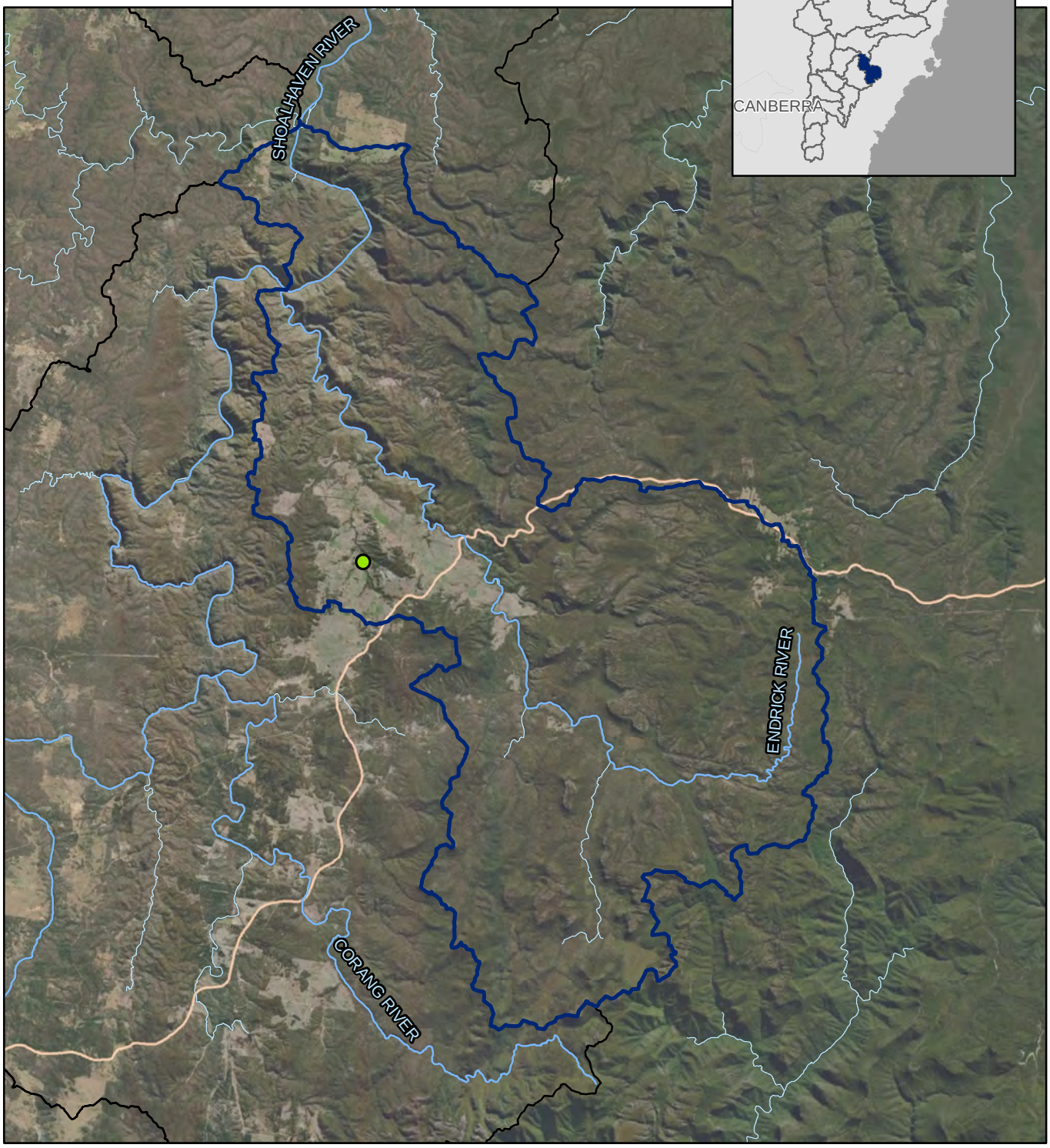



Total Aluminium (mg/L)
100
10
1
0.1
0.01
0.001
1990
1995
2000
2005
2010
2015
2020
Audit Period
DTA5
Guideline


Total Iron (mg/L)
1000
100
10
1
0.1
0.01
0.001
1990
1995
2000
2005
2010
2015
2020
Audit Period
DTA5
DSTAVL1
Guideline

ENDRICK RIVER

CATCHMENT



Legend

- Sub Catchment Boundary
- Major Roads

Water Quality Monitoring Stations

- MMP11

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

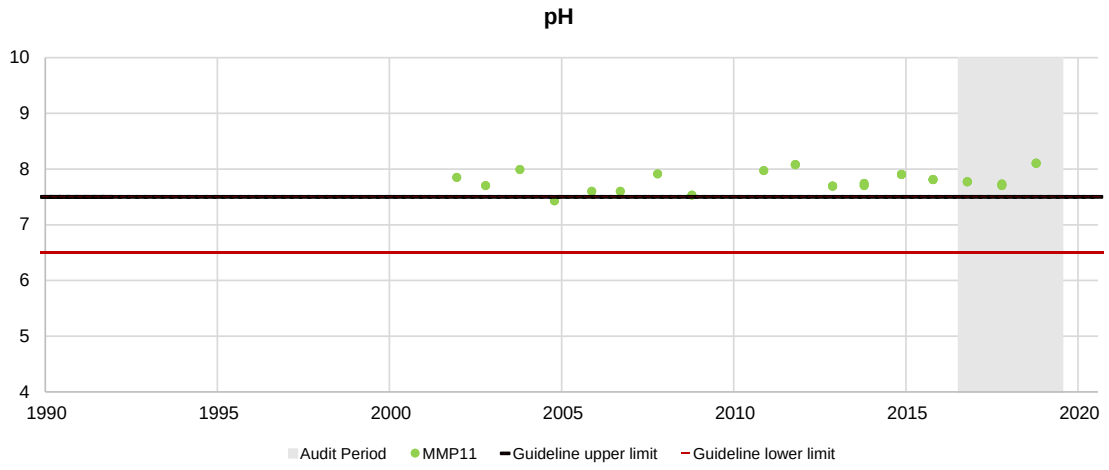
0 3,450 6,900

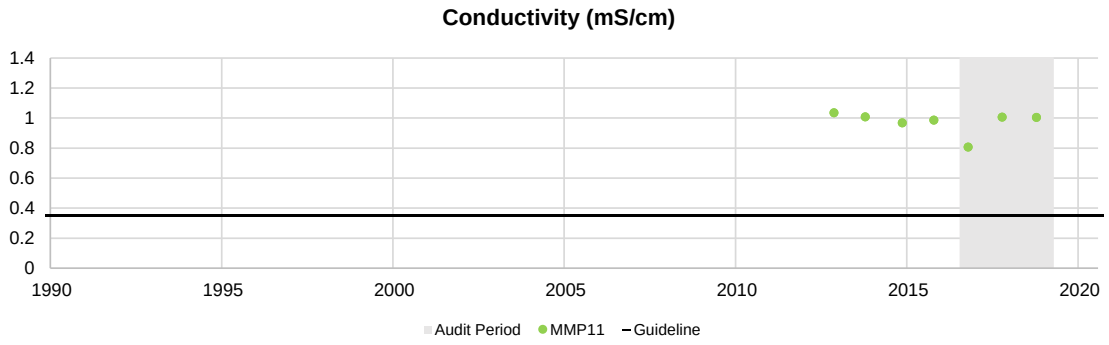
Metres

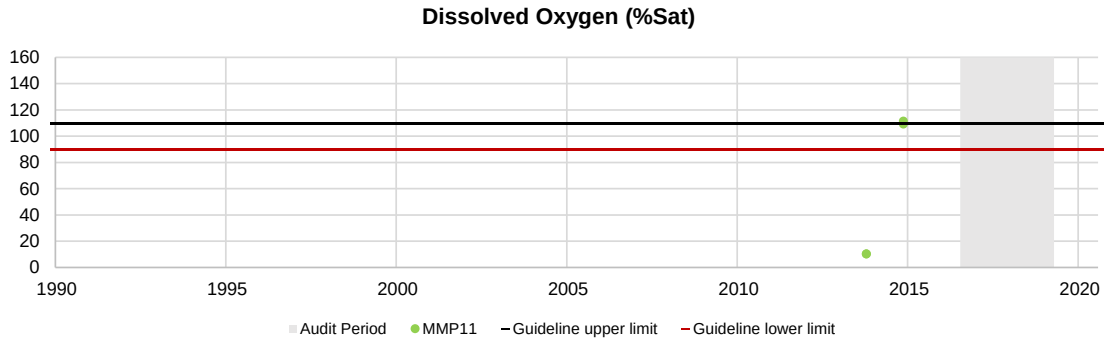
Datum/Projection:
GDA 1994 MGA Zone 56

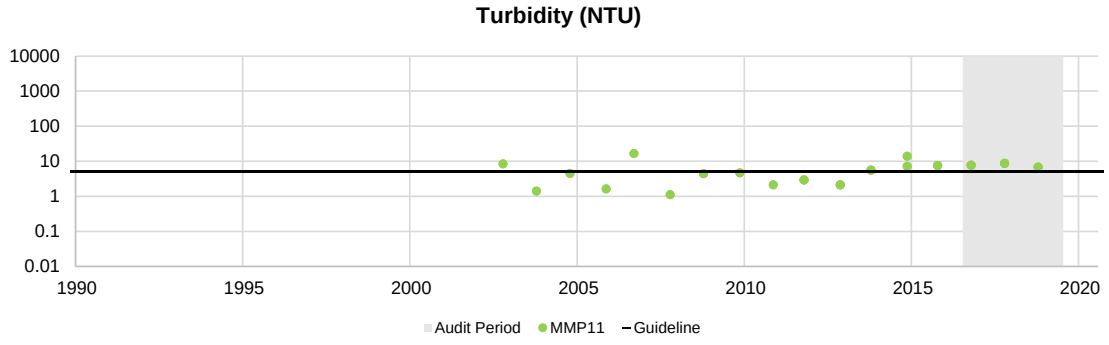
N

Prepared by: SC Date: 18/03/2020


pH
10
9
8
7
6
5
4
1990
1995
2000
2005
2010
2015
2020
Audit Period
MMP11
Guideline upper limit
Guideline lower limit

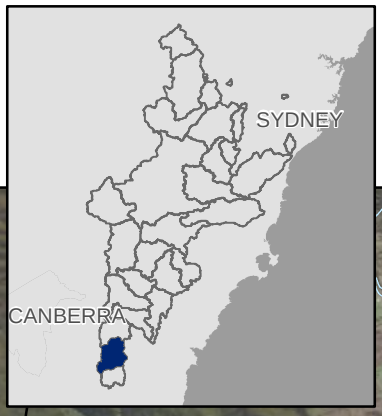

Conductivity (mS/cm)
1.4
1.2
1
0.8
0.6
0.4
0.2
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
MMP11
Guideline

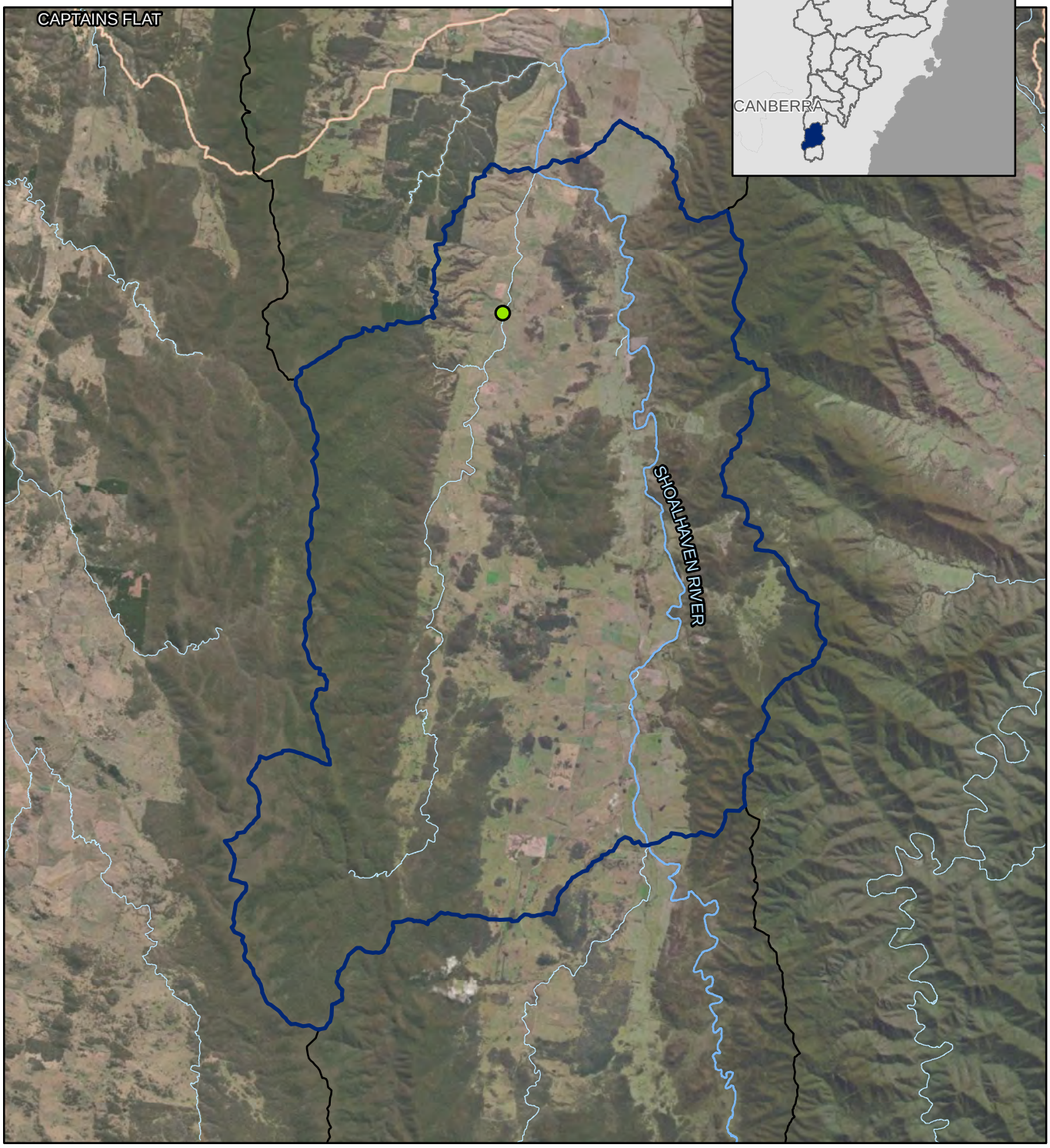

Dissolved Oxygen (%Sat)
160
140
120
100
80
60
40
20
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
MMP11
Guideline upper limit
Guideline lower limit


Turbidity (NTU)
10000
1000
100
10
1
0.1
0.01
1990
1995
2000
2005
2010
2015
2020
Audit Period
MMP11
Guideline

JERRABATTAGULLA CREEK

CATCHMENT





Legend

- Sub Catchment Boundary
- Major Roads

Water Quality Monitoring

- MMP09

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

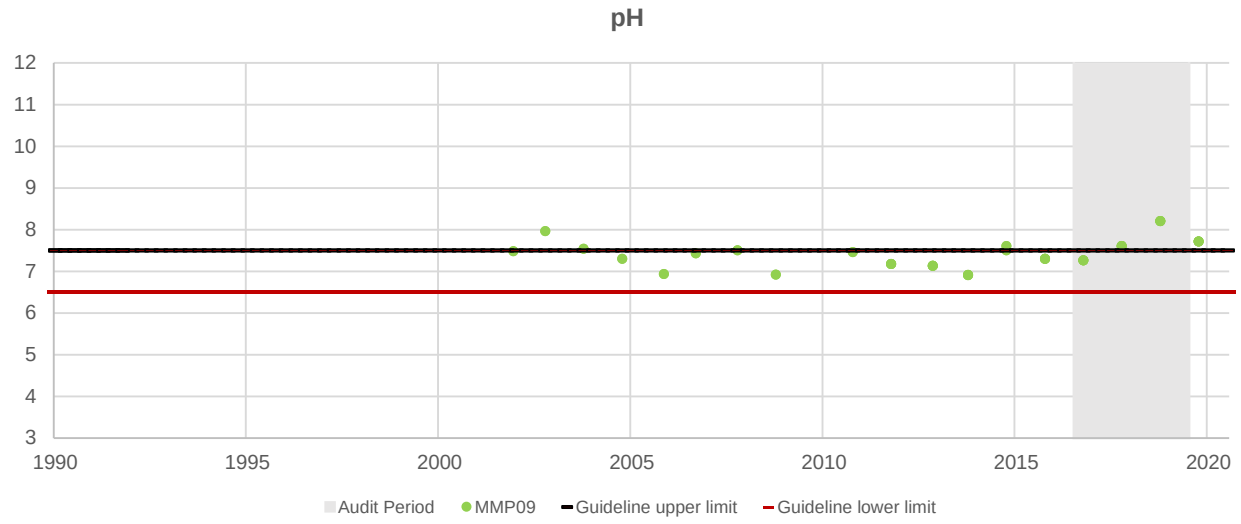
0 3,200 6,400

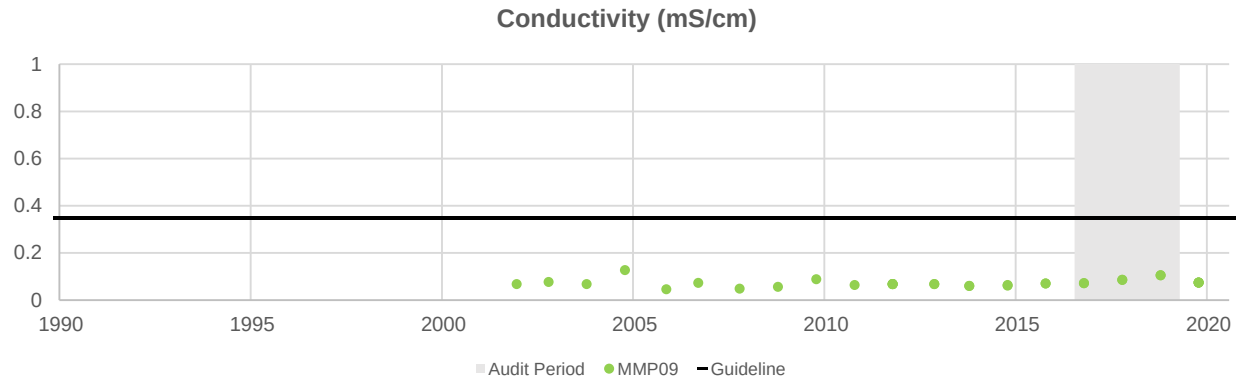
Metres

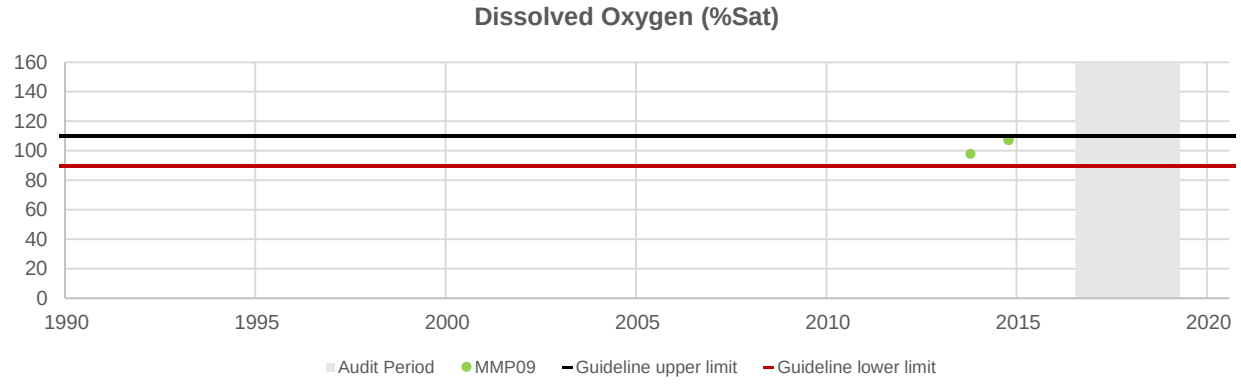
Datum/Projection:
GDA 1994 MGA Zone 56

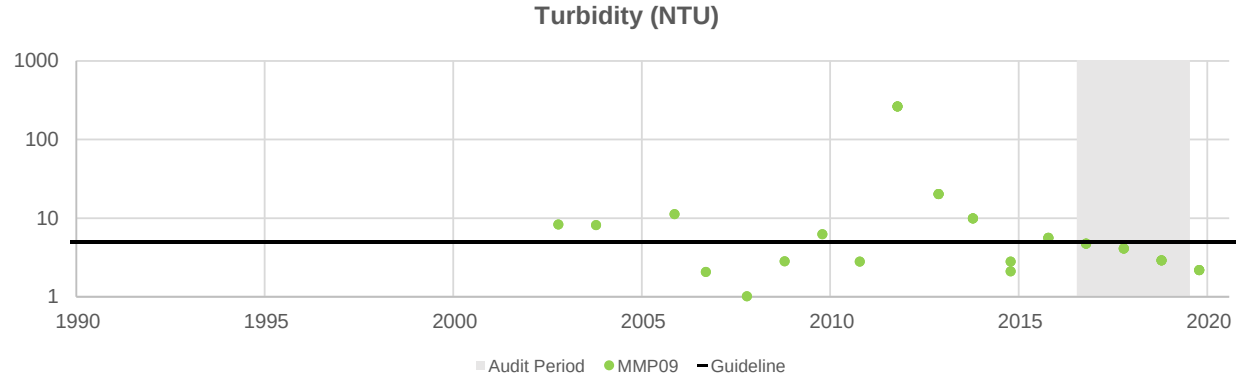
N

Prepared by: SC Date: 18/03/2020


pH
12
11
10
9
8
7
6
5
4
3
1990
1995
2000
2005
2010
2015
2020
Audit Period
MMP09
Guideline upper limit
Guideline lower limit

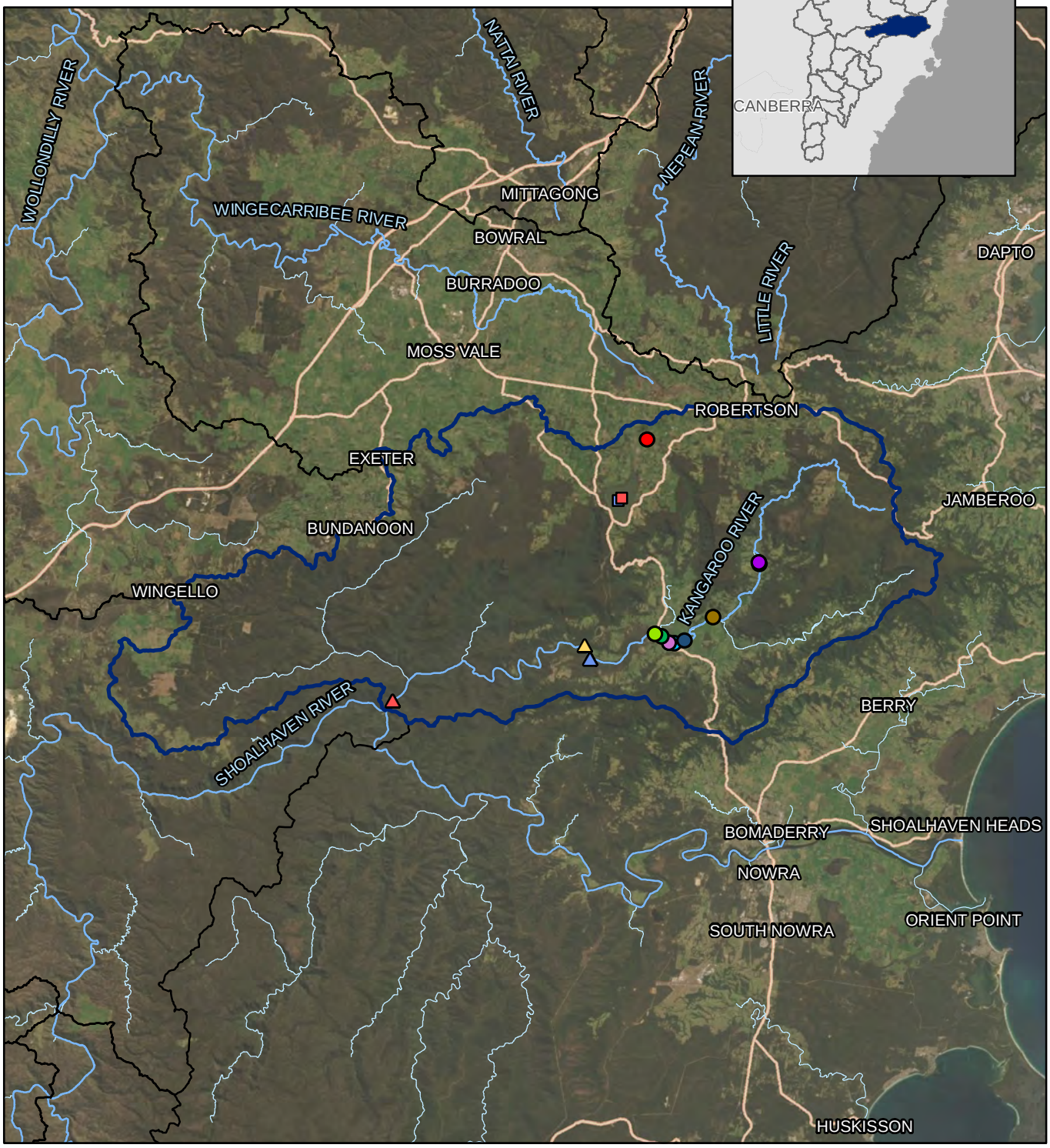

Conductivity (mS/cm)
1
0.8
0.6
0.4
0.2
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
MMP09
Guideline


Dissolved Oxygen (%Sat)
160
140
120
100
80
60
40
20
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
MMP09
Guideline upper limit
Guideline lower limit


Turbidity (NTU)
1000
100
10
1
1990
1995
2000
2005
2010
2015
2020
Audit Period
MMP09
Guideline

KANGAROO RIVER

CATCHMENT



Legend

- Sub Catchment Boundary
- Major Roads

Water Quality Monitoring Stations

- E300
- E706
- MMP43
- MMP45
- SCI090
- SCI091
- SCI092
- SCI151
- SCI152

Water Quality Monitoring Stations (Storage)

- DTA1
- DTA8
- DPAE
- DFF6
- DFF

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

0 6,500 13,000

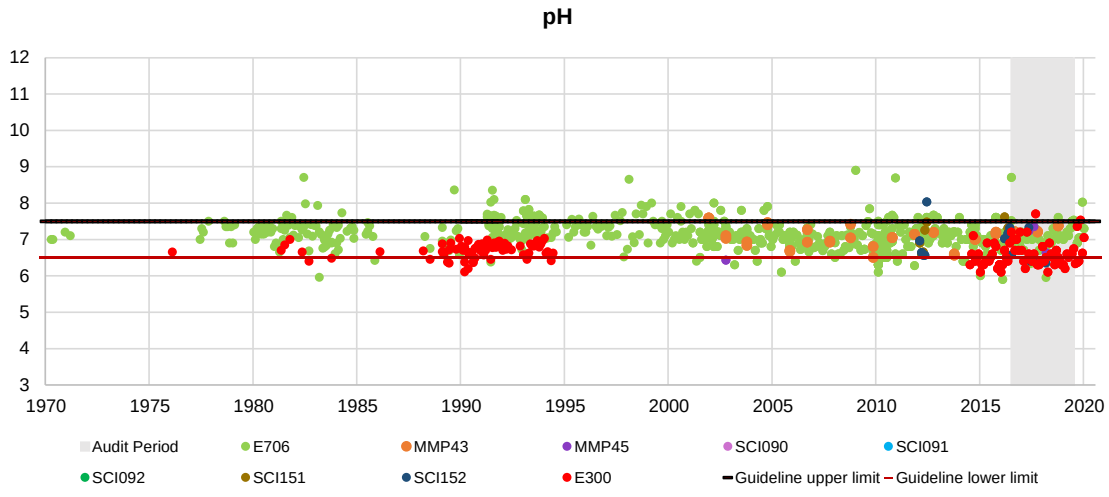
Metres

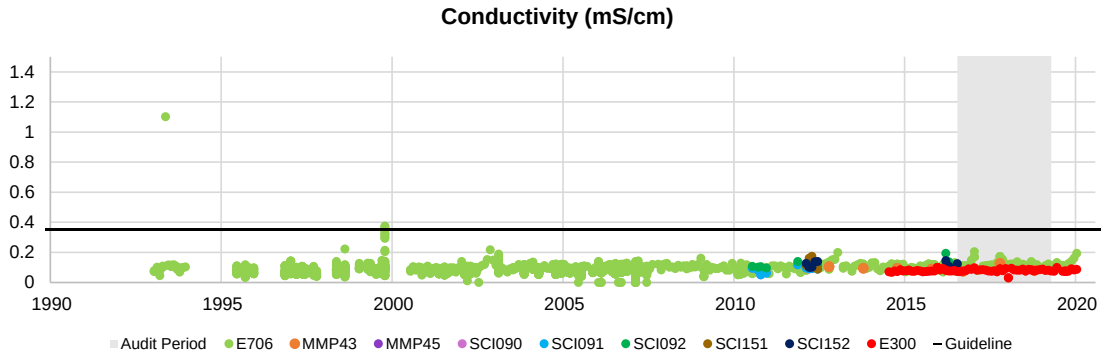
Datum/Projection:
GDA 1994 MGA Zone 56

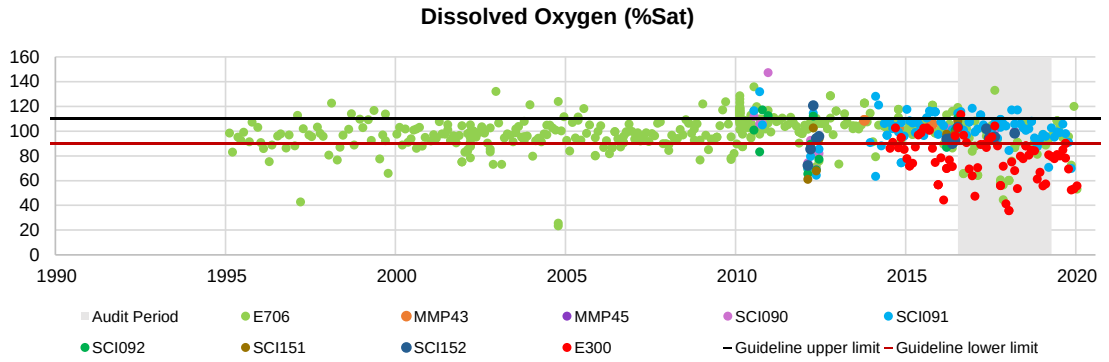
N

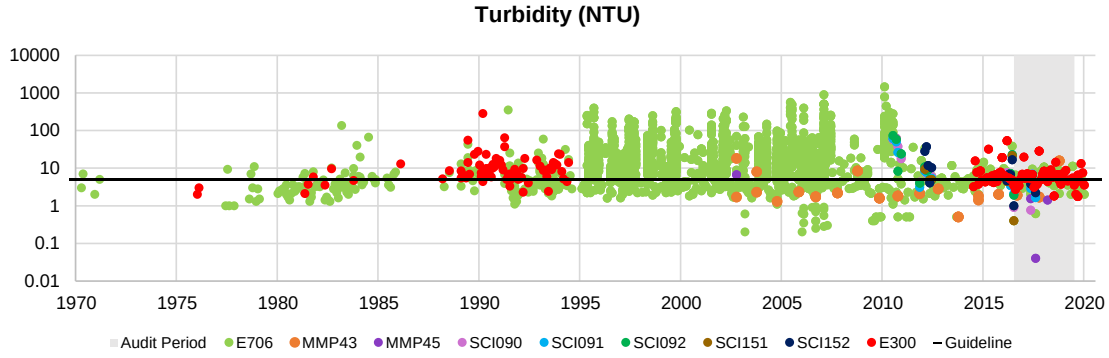
eco logical AUSTRALIA
A TETRA TECH COMPANY

Prepared by: SC Date: 18/03/2020

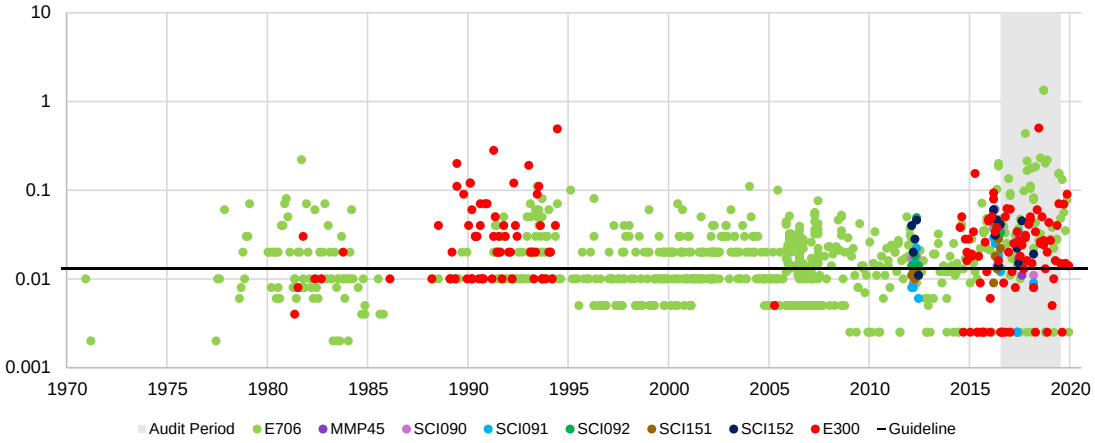

pH
12
11
10
9
8
7
6
5
4
3
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
E706
MMP43
MMP45
SCI090
SCI091
SCI092
SCI151
SCI152
E300
Guideline upper limit
Guideline lower limit


Conductivity (mS/cm)
1.4
1.2
1
0.8
0.6
0.4
0.2
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
E706
MMP43
MMP45
SCI090
SCI091
SCI092
SCI151
SCI152
E300
Guideline

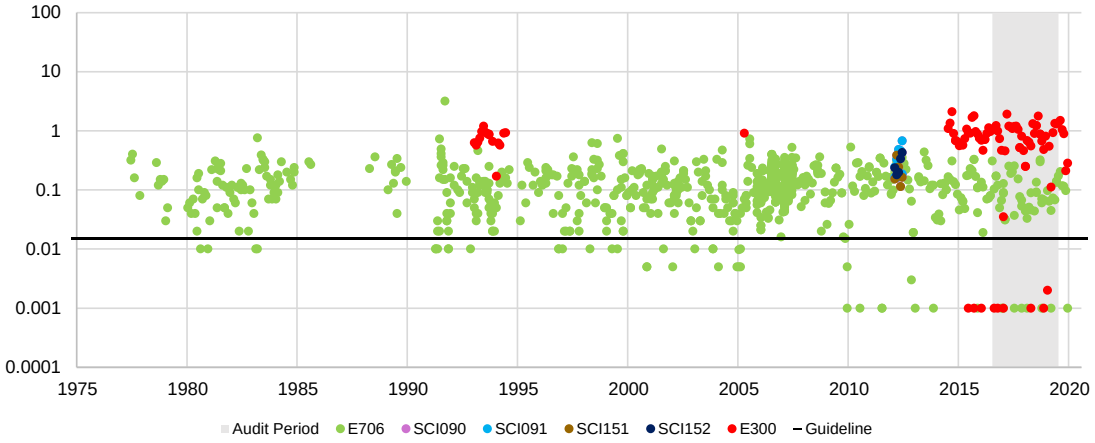

Dissolved Oxygen (%Sat)
160
140
120
100
80
60
40
20
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
E706
MMP43
MMP45
SCI090
SCI091
SCI092
SCI151
SCI152
E300
Guideline upper limit
Guideline lower limit


Turbidity (NTU)
10000
1000
100
10
1
0.1
0.01
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
E706
MMP43
MMP45
SCI090
SCI091
SCI092
SCI151
SCI152
E300
Guideline

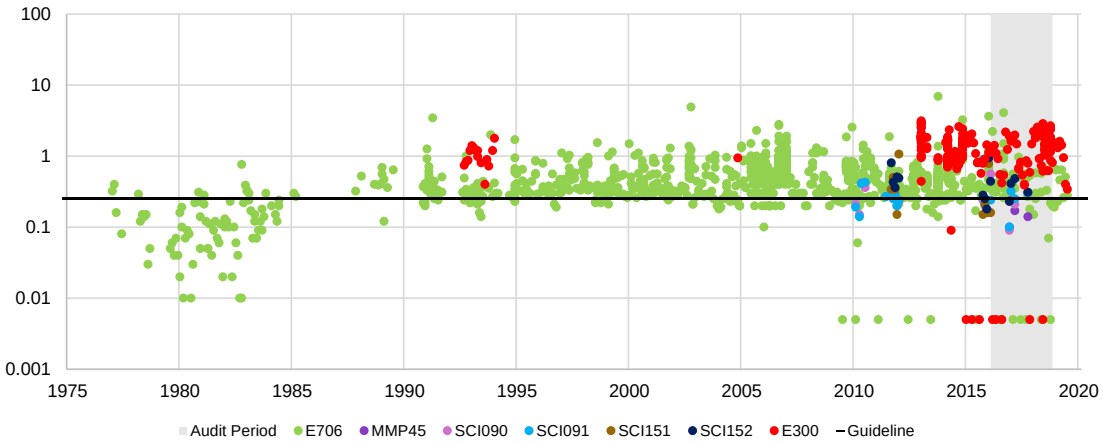
Nitrogen Ammoniacal (mg/L)

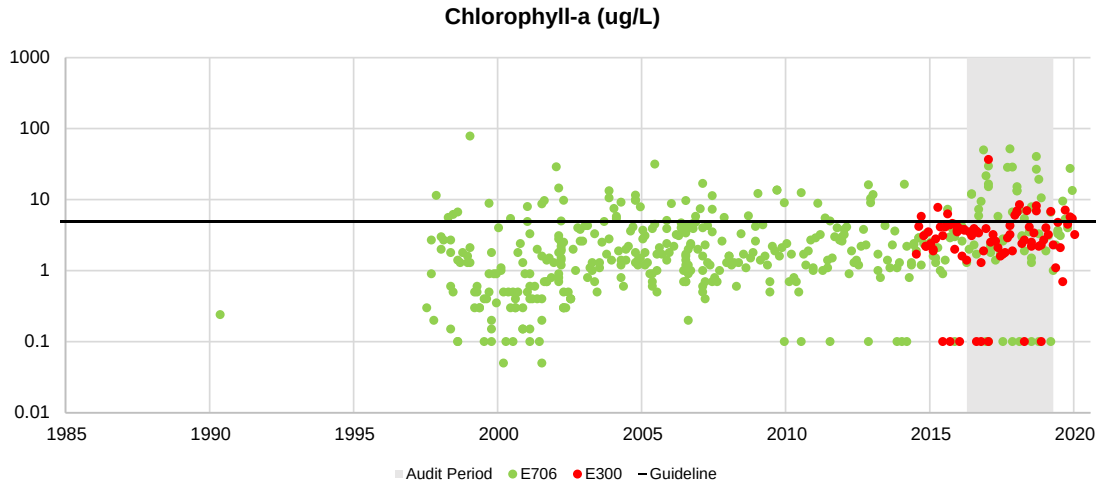


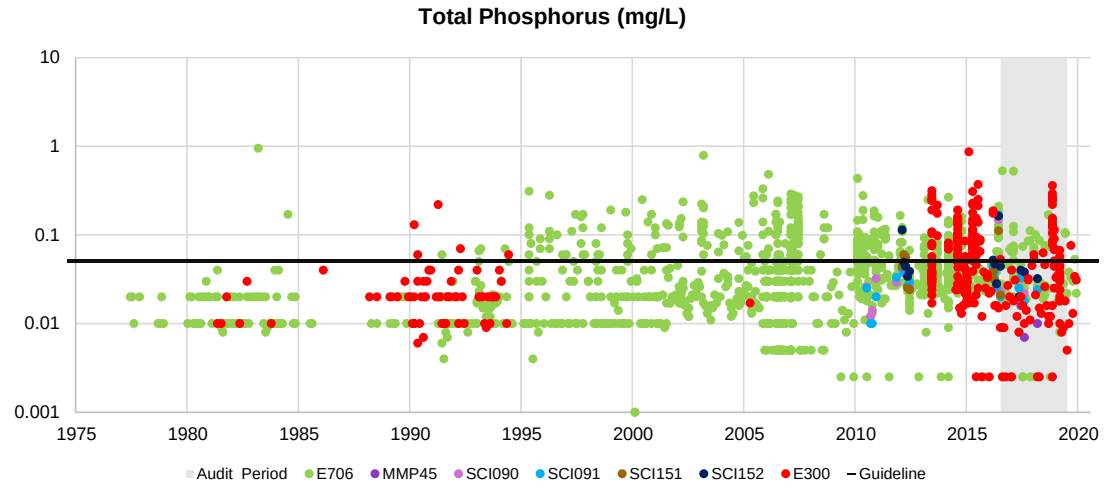
Nitrogen Oxidised (mg/L)

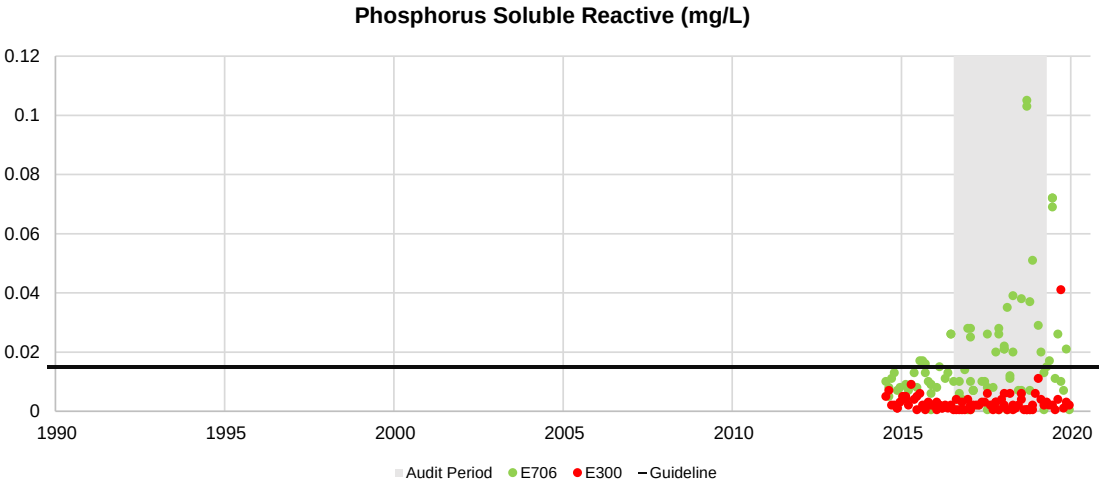


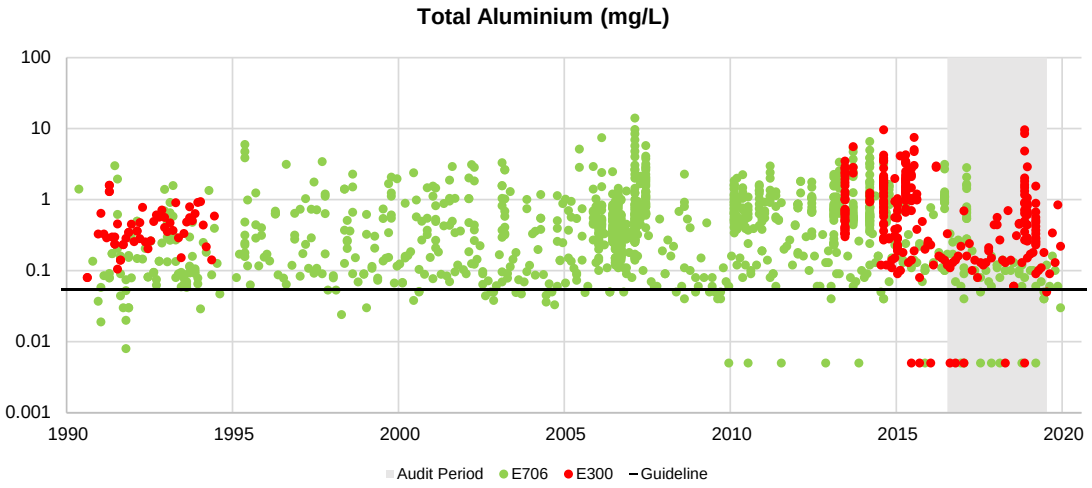
Total Nitrogen(mg/L)

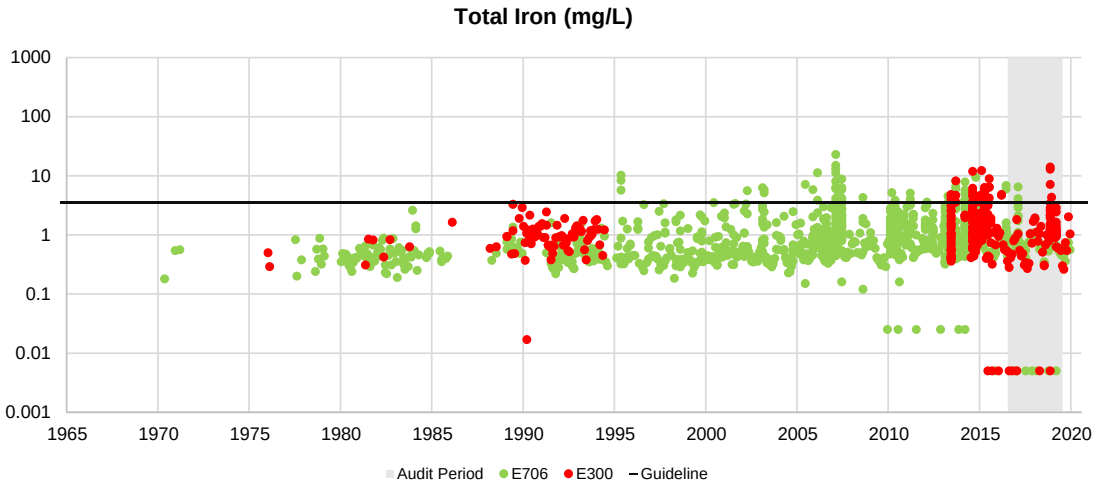


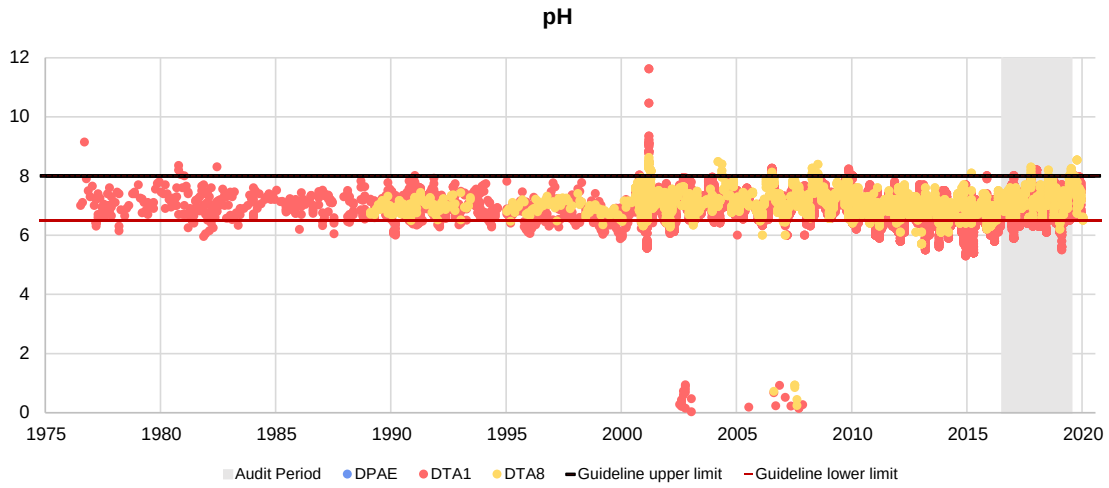

Chlorophyll-a (ug/L)
1000
100
10
1
0.1
0.01
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
E706
E300
Guideline

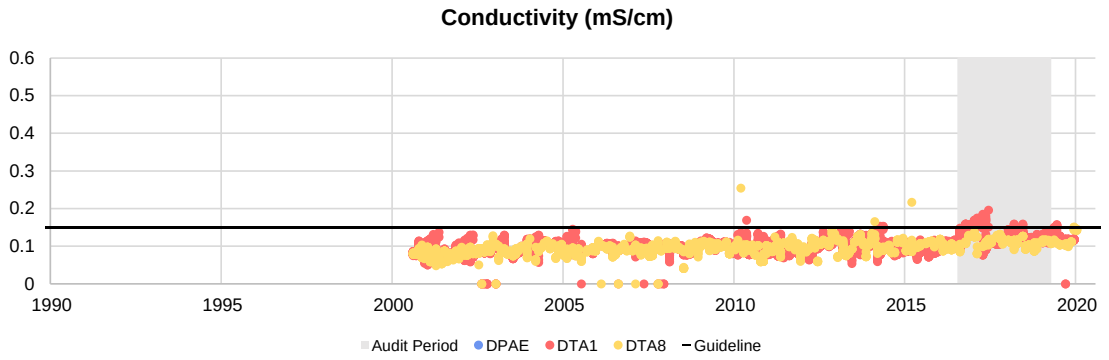

Total Phosphorus (mg/L)
10
1
0.1
0.01
0.001
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
E706
MMP45
SCI090
SCI091
SCI151
SCI152
E300
Guideline

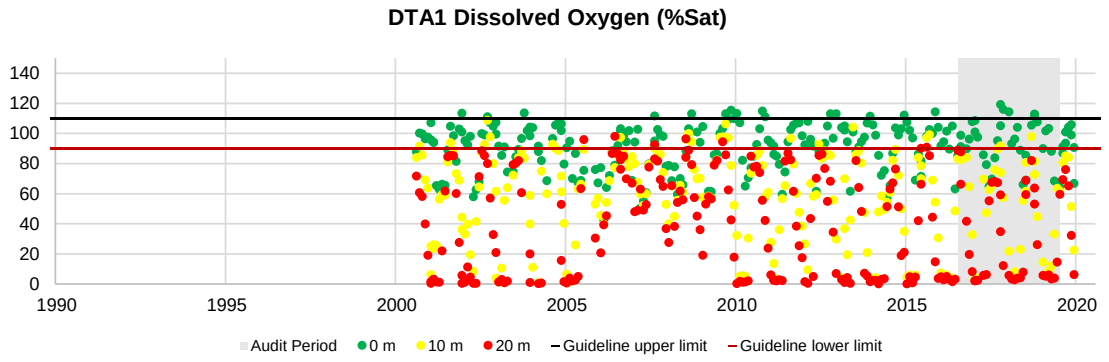

Phosphorus Soluble Reactive (mg/L)
0.12
0.1
0.08
0.06
0.04
0.02
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
E706
E300
Guideline

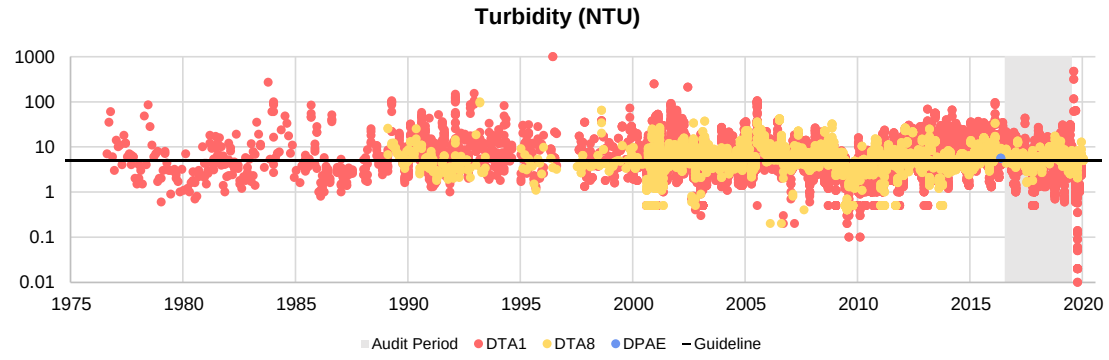

Total Aluminium (mg/L)
100
10
1
0.1
0.01
0.001
1990
1995
2000
2005
2010
2015
2020
Audit Period
E706
E300
Guideline


Total Iron (mg/L)
1000
100
10
1
0.1
0.01
0.001
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
E706
E300
Guideline

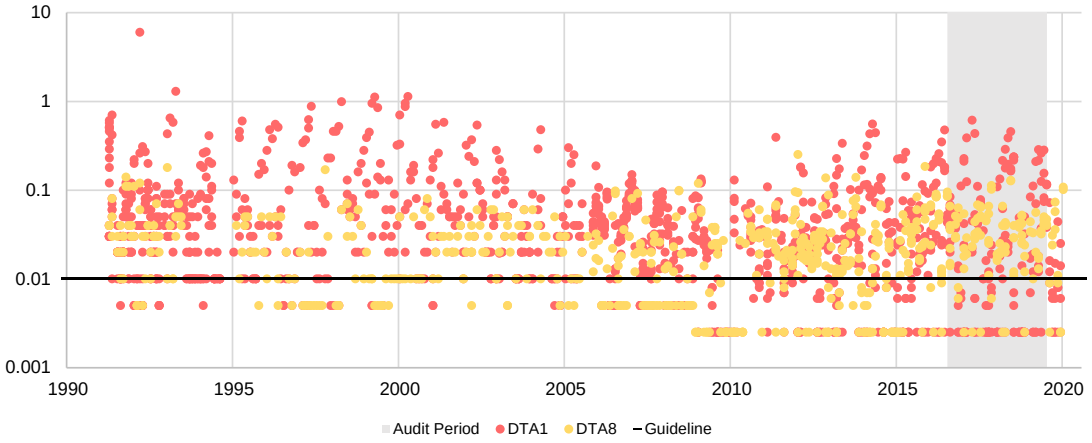

pH
12
10
8
6
4
2
0
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
DPAE
DTA1
DTA8
Guideline upper limit
Guideline lower limit


Conductivity (mS/cm)
0.6
0.5
0.4
0.3
0.2
0.1
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
DPAE
DTA1
DTA8
Guideline

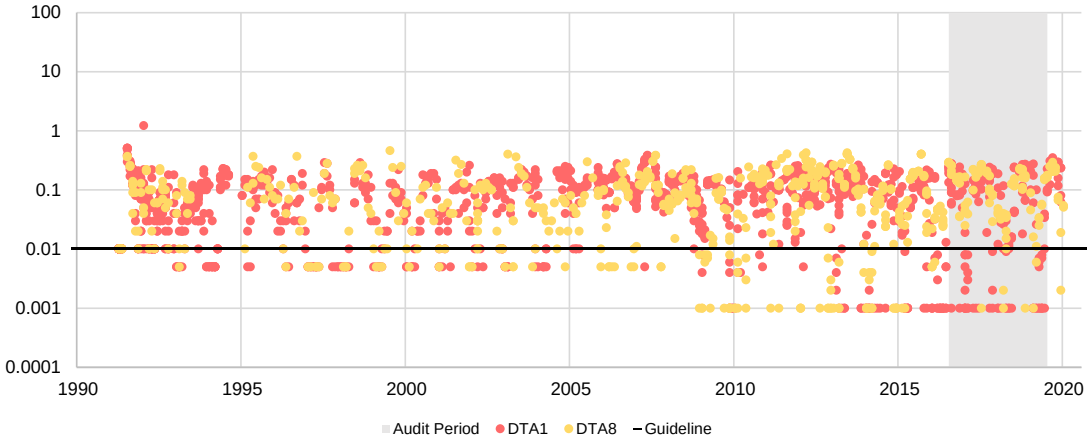

DTA1 Dissolved Oxygen (%Sat)
140
120
100
80
60
40
20
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
0 m
10 m
20 m
Guideline upper limit
Guideline lower limit


Turbidity (NTU)
1000
100
10
1
0.1
0.01
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
DTA1
DTA8
DPAE
Guideline

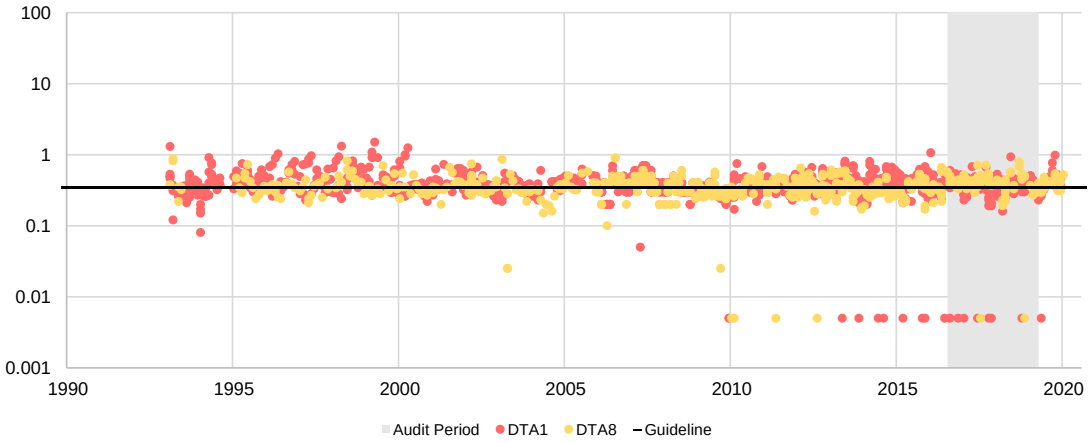
Nitrogen Ammoniacal (mg/L)

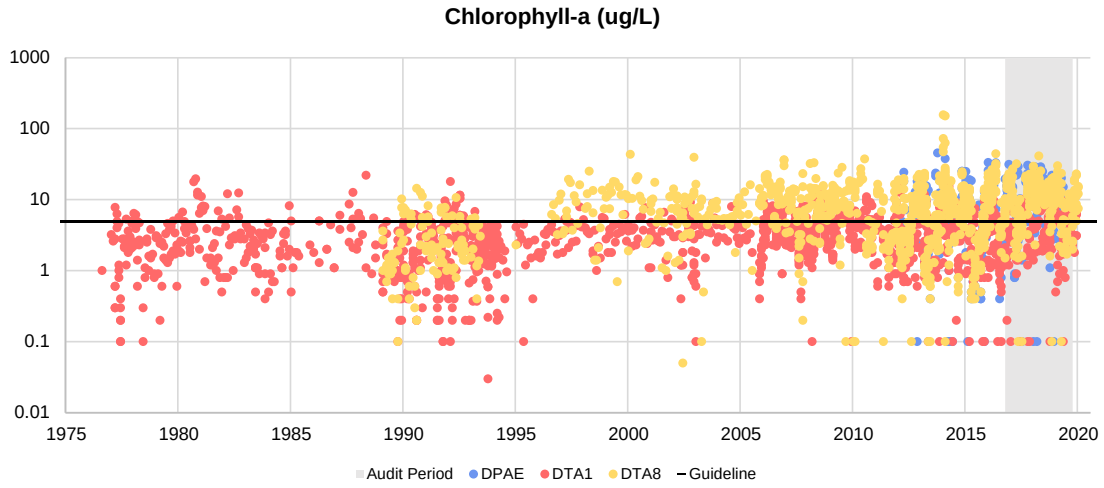


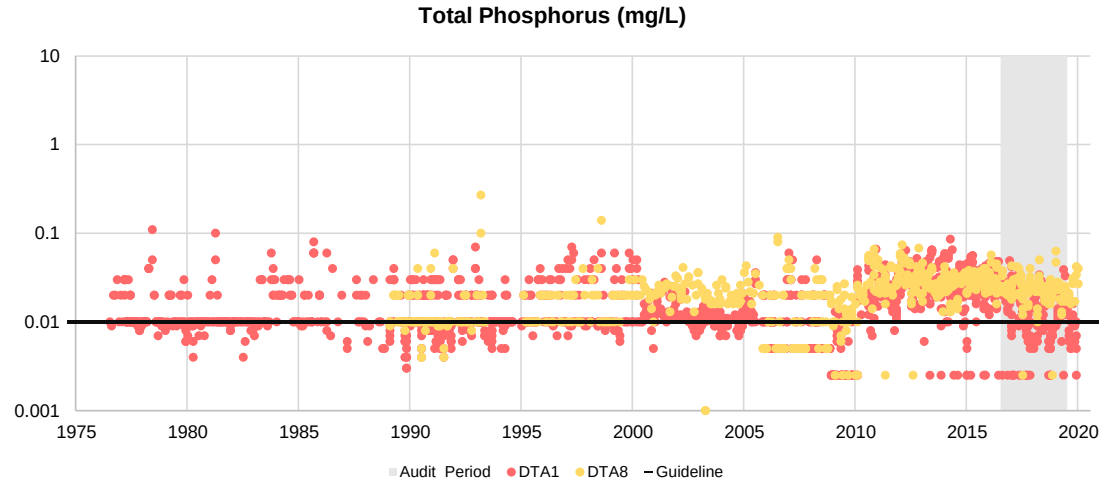
Nitrogen Oxidised (mg/L)

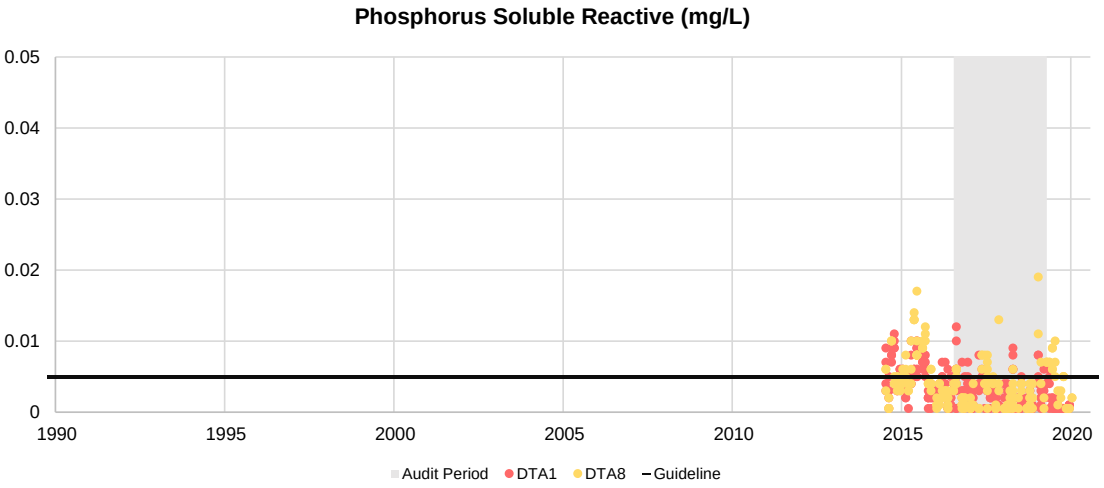


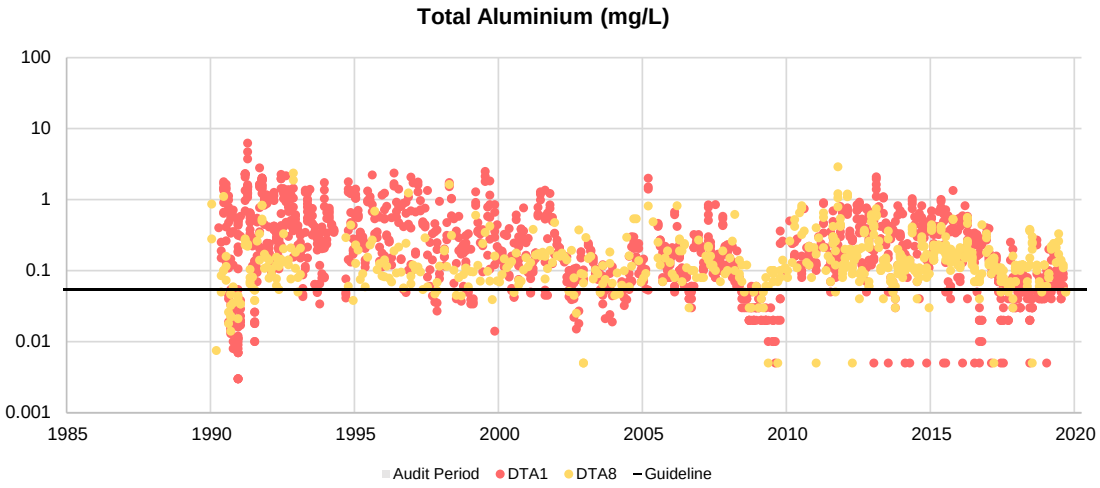
Total Nitrogen(mg/L)

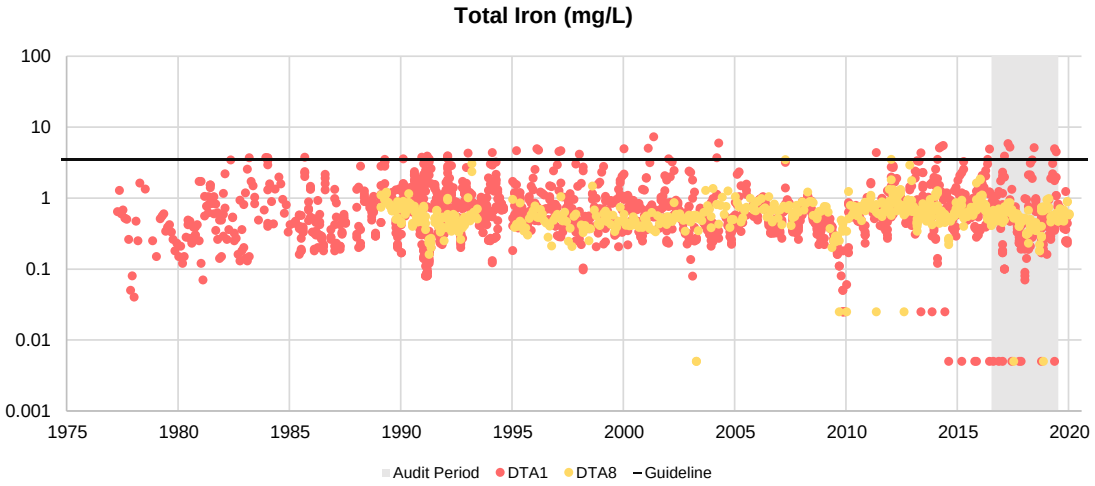


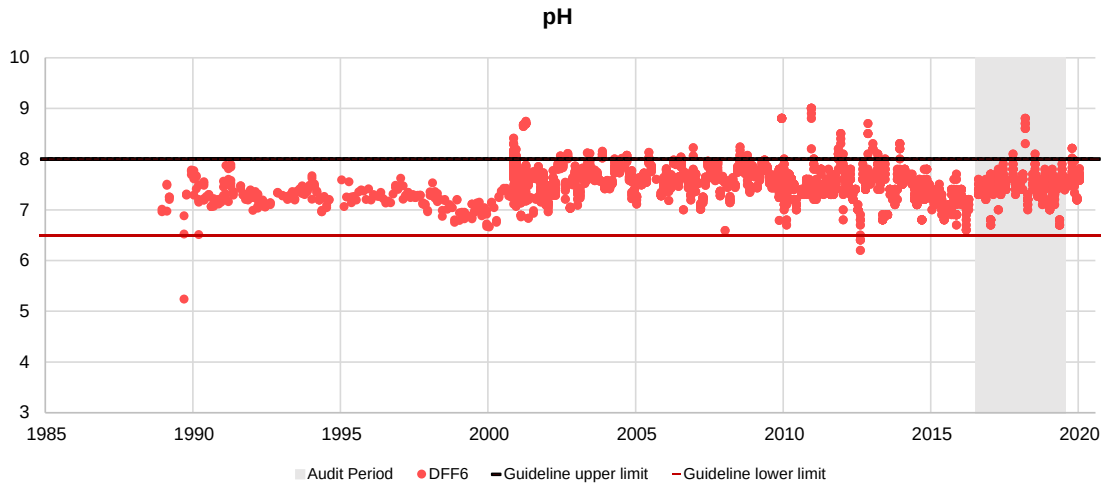

Chlorophyll-a (ug/L)
1000
100
10
1
0.1
0.01
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
DPAE
DTA1
DTA8
Guideline

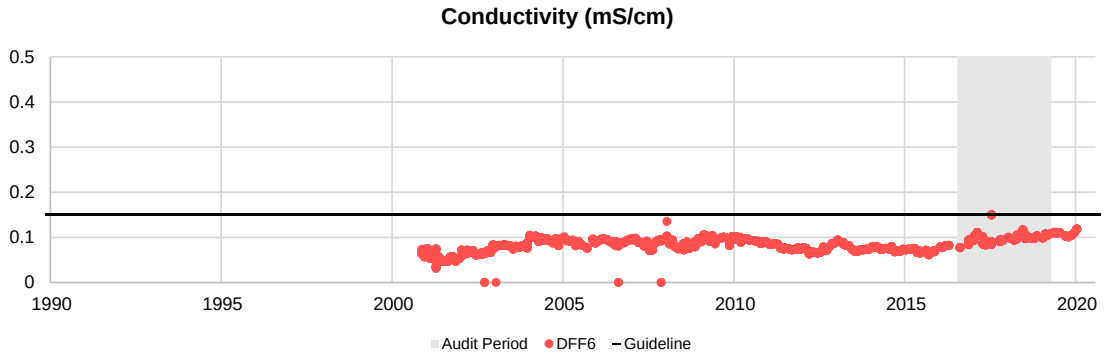

Total Phosphorus (mg/L)
10
1
0.1
0.01
0.001
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
DTA1
DTA8
Guideline

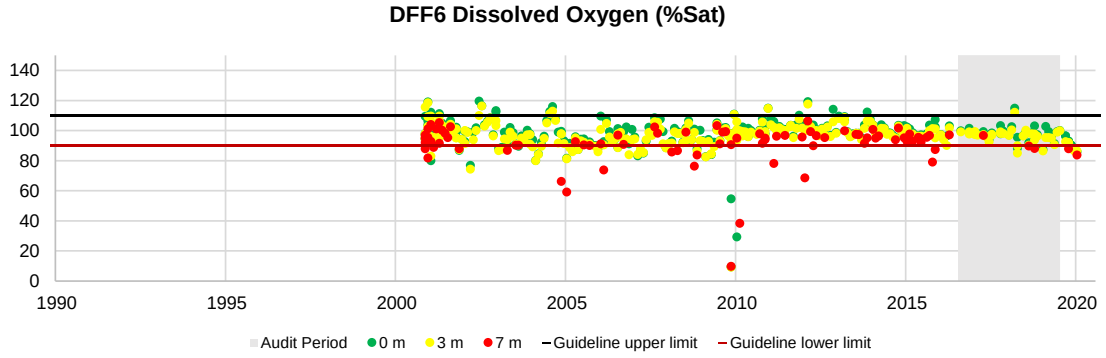

Phosphorus Soluble Reactive (mg/L)
0.05
0.04
0.03
0.02
0.01
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
DTA1
DTA8
Guideline

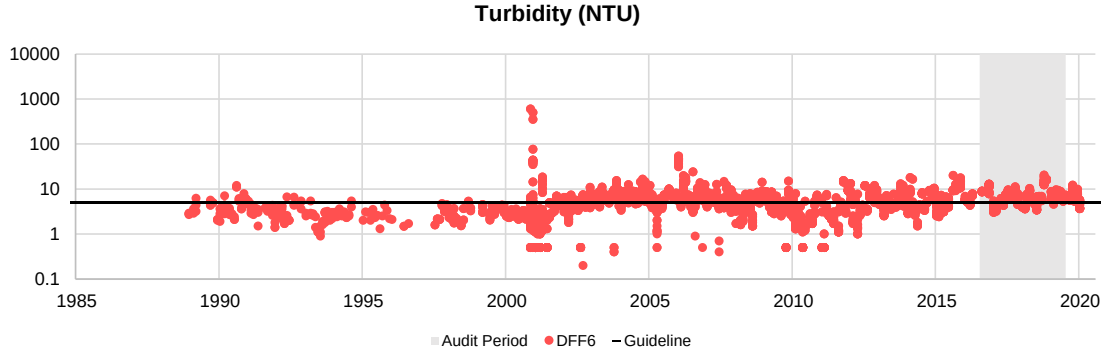

Total Aluminium (mg/L)
100
10
1
0.1
0.01
0.001
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
DTA1
DTA8
Guideline


Total Iron (mg/L)
100
10
1
0.1
0.01
0.001
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
DTA1
DTA8
Guideline


pH
10
9
8
7
6
5
4
3
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
DFF6
Guideline upper limit
Guideline lower limit

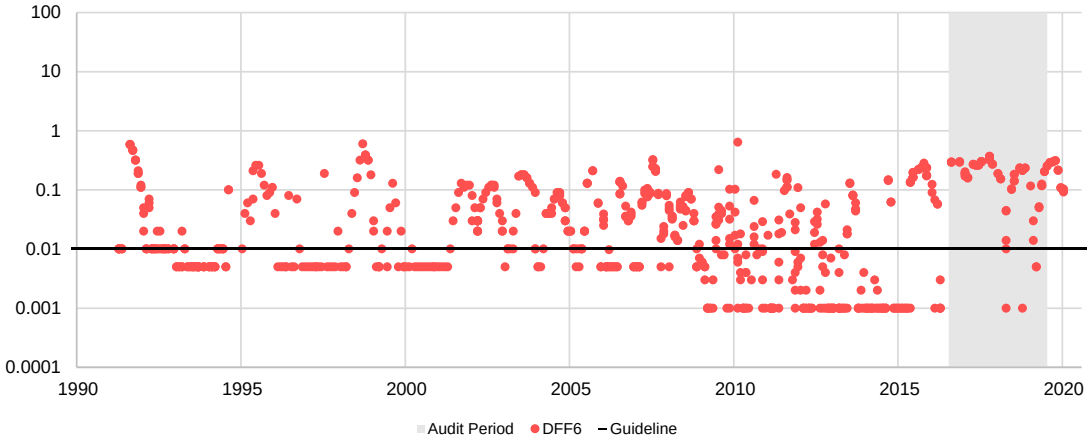

Conductivity (mS/cm)
0.5
0.4
0.3
0.2
0.1
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
DFF6
Guideline


DFF6 Dissolved Oxygen (%Sat)
140
120
100
80
60
40
20
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
0 m
3 m
7 m
Guideline upper limit
Guideline lower limit

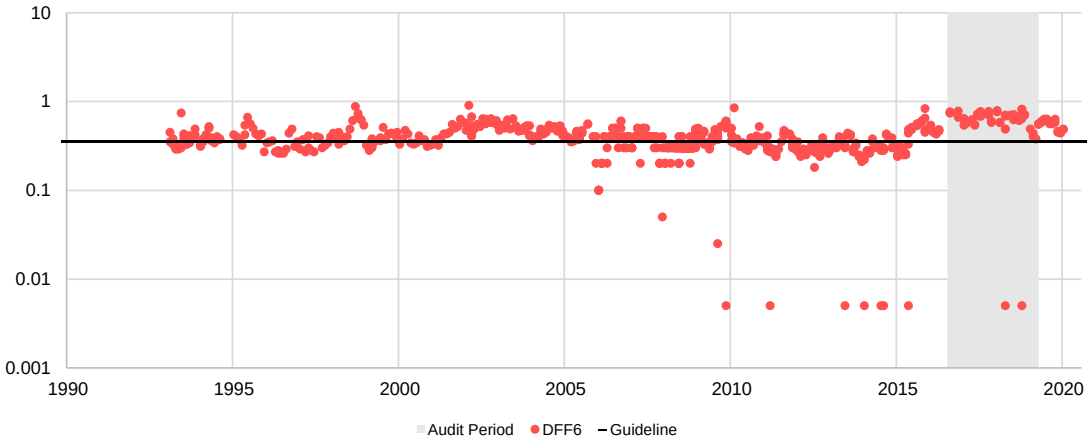

Turbidity (NTU)
10000
1000
100
10
1
0.1
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
DFF6
Guideline

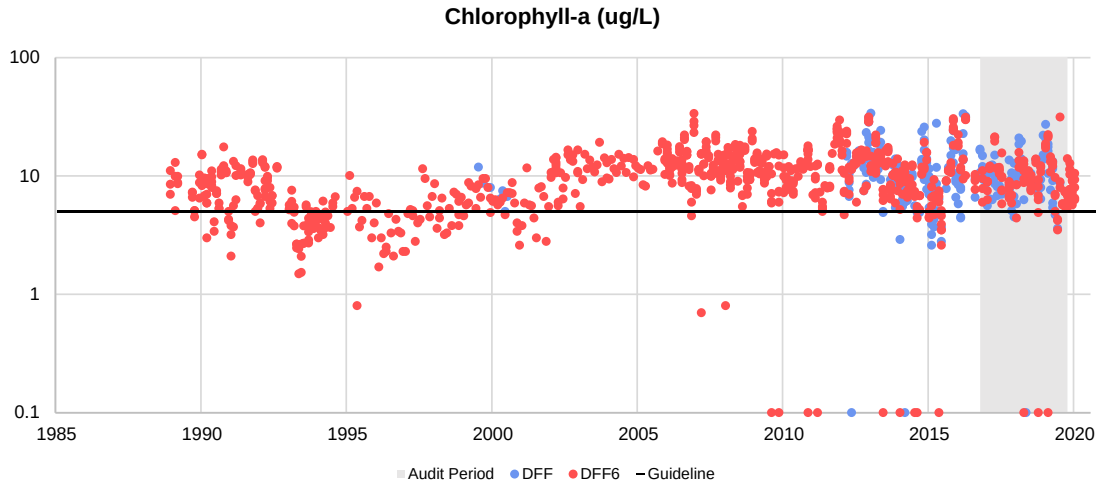
Nitrogen Ammoniacal (mg/L)

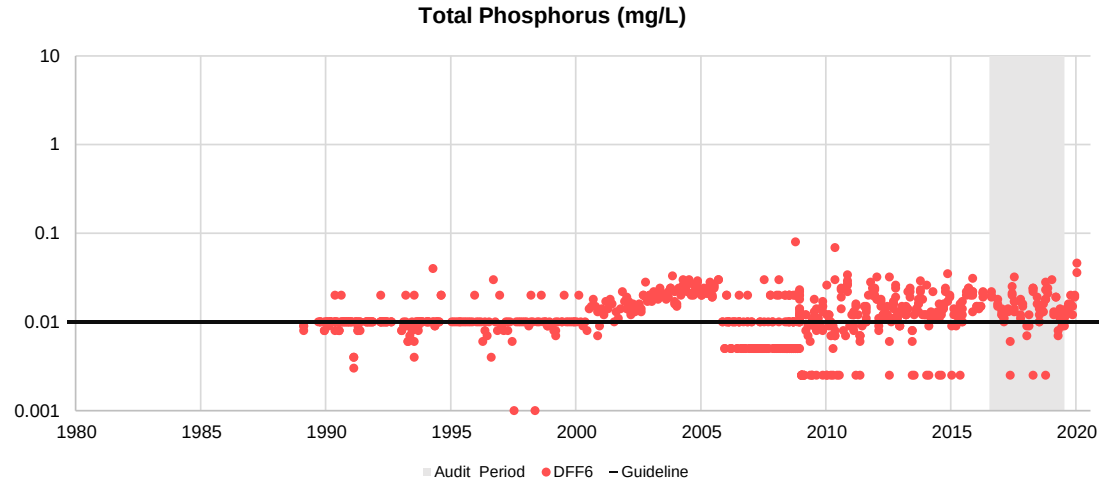
Nitrogen Oxidised (mg/L)

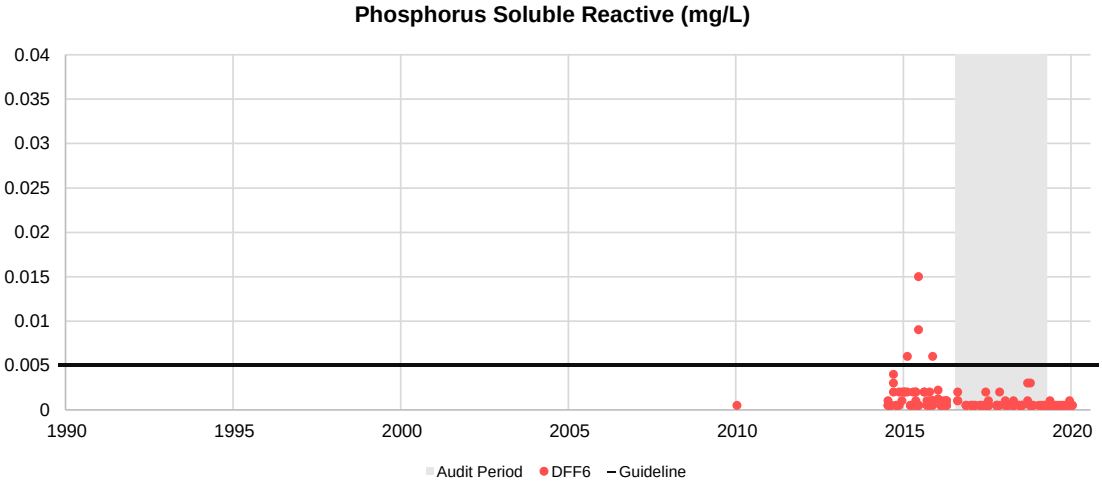


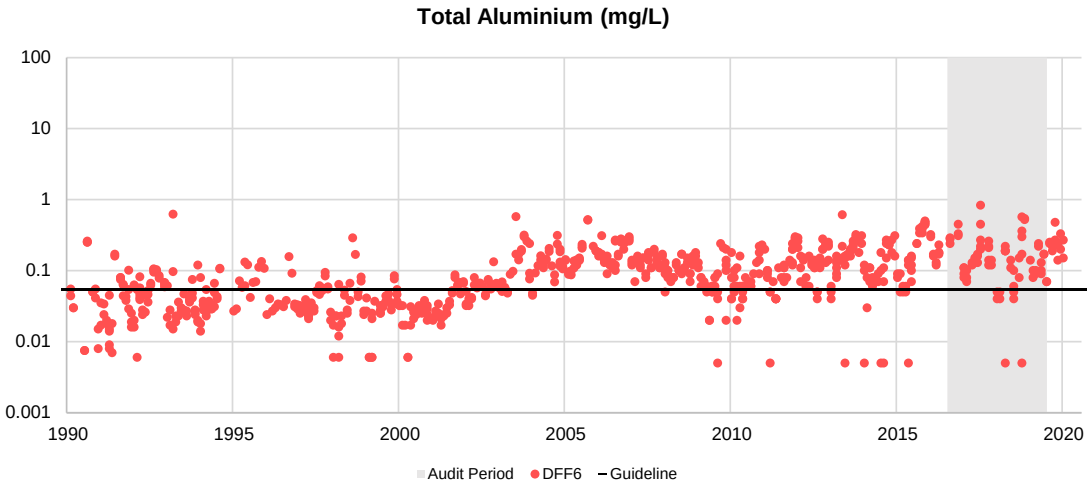
Total Nitrogen(mg/L)

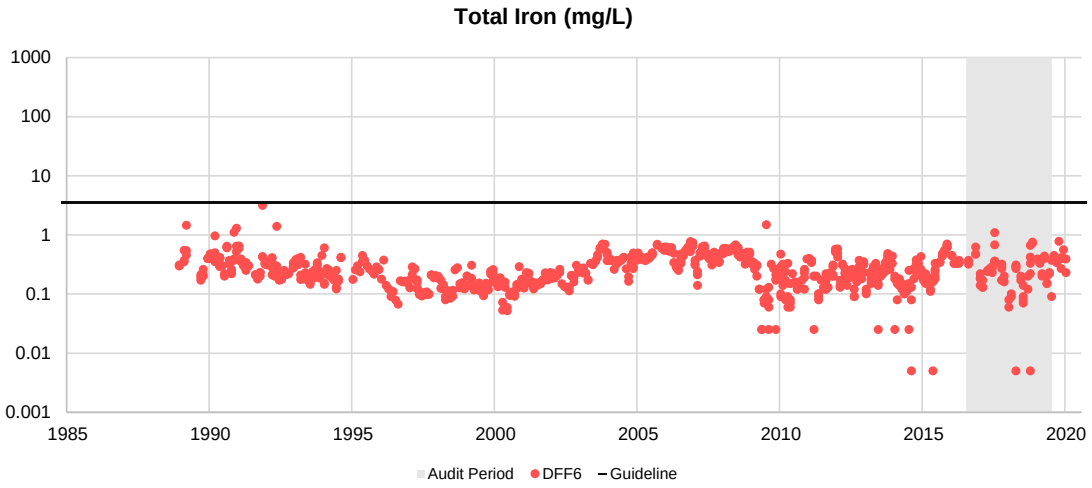



Chlorophyll-a (ug/L)
100
10
1
0.1
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
DFF
DFF6
Guideline


Total Phosphorus (mg/L)
10
1
0.1
0.01
0.001
1980
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
DFF6
Guideline

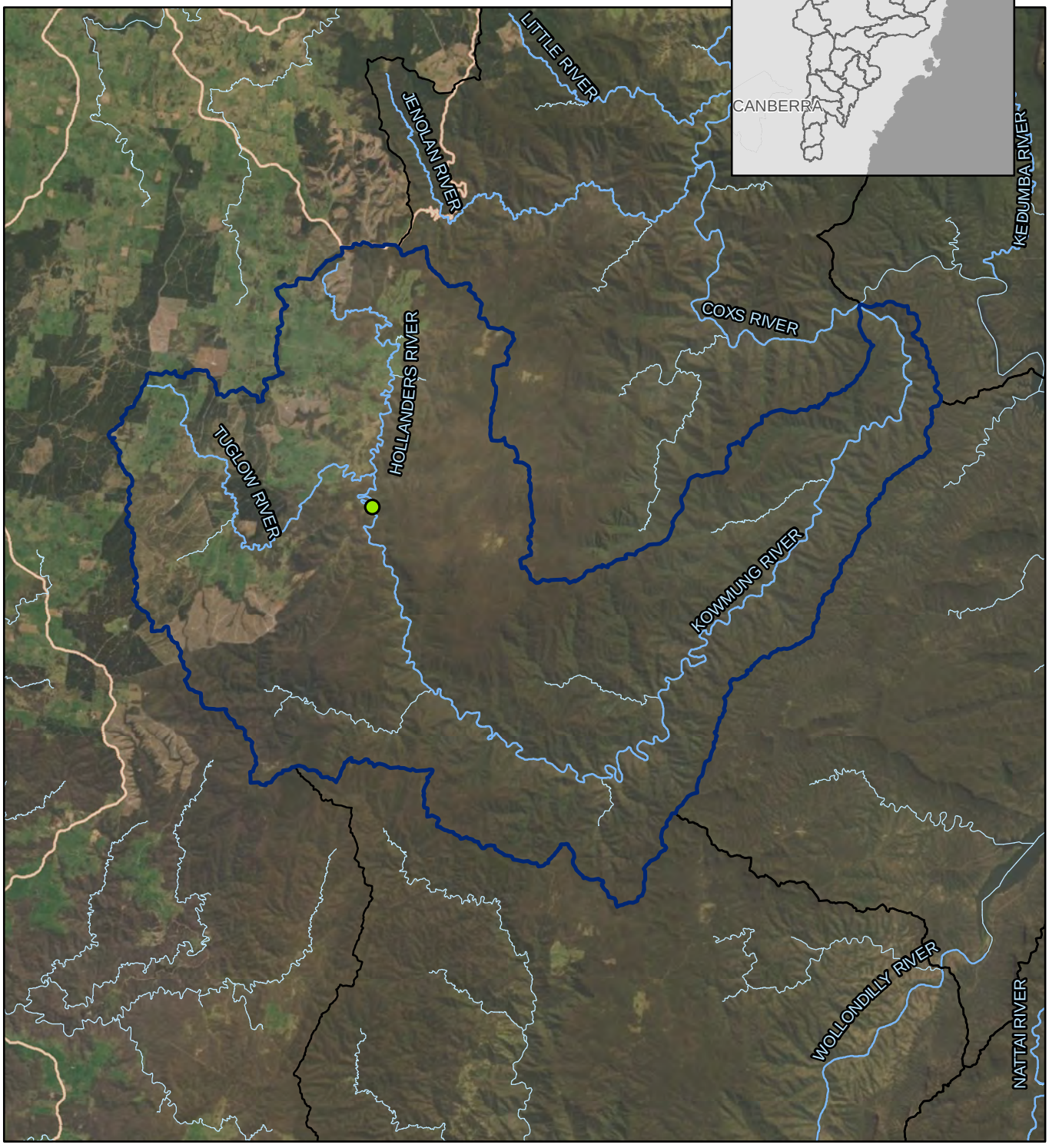

Phosphorus Soluble Reactive (mg/L)
0.04
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
DFF6
Guideline


Total Aluminium (mg/L)
100
10
1
0.1
0.01
0.001
1990
1995
2000
2005
2010
2015
2020
Audit Period
DFF6
Guideline


Total Iron (mg/L)
1000
100
10
1
0.1
0.01
0.001
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
DFF6
Guideline

KOWMUNG RIVER

CATCHMENT



Legend

- Sub Catchment Boundary
- Major Roads

Water Quality Monitoring Stations

- MMP14

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

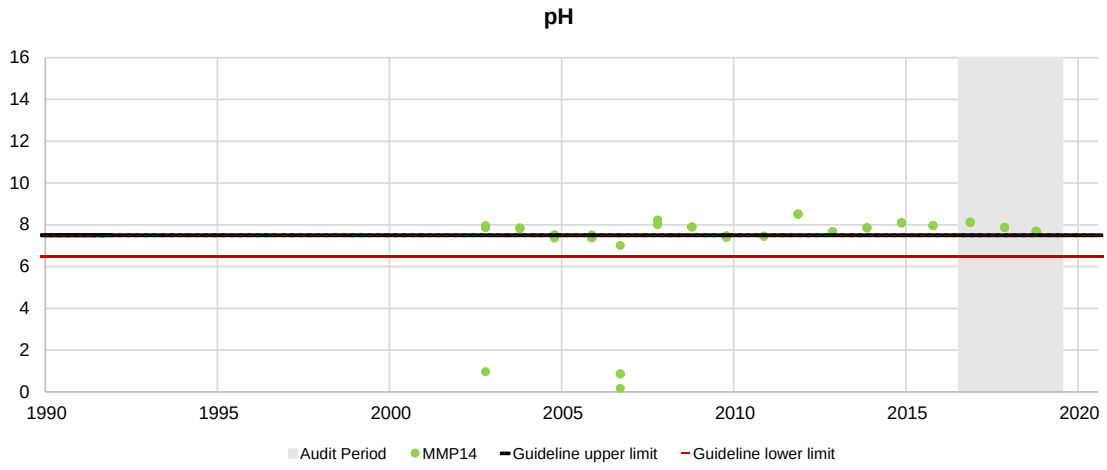
0 4,950 9,900

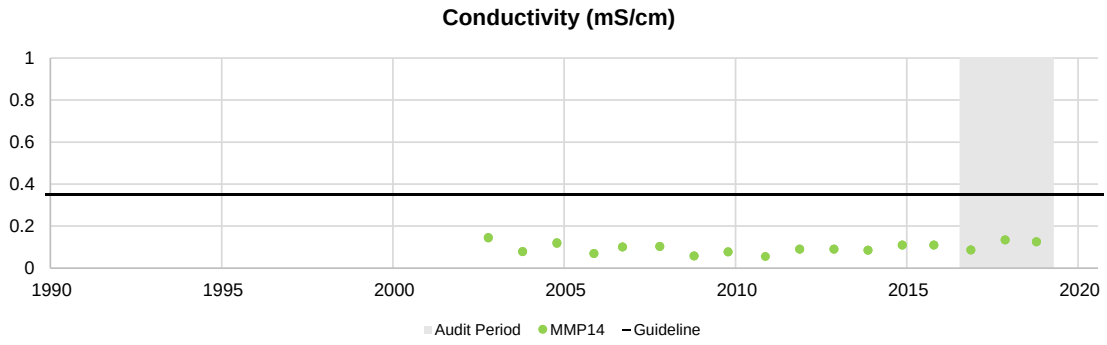
Metres

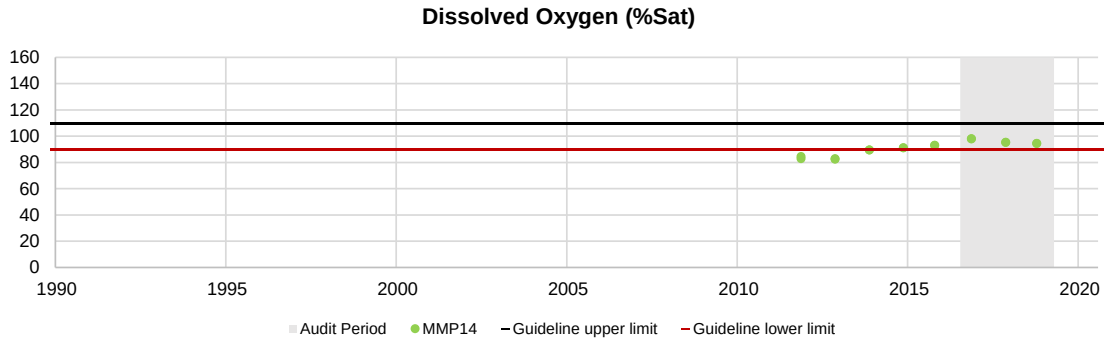
Datum/Projection:
GDA 1994 MGA Zone 56

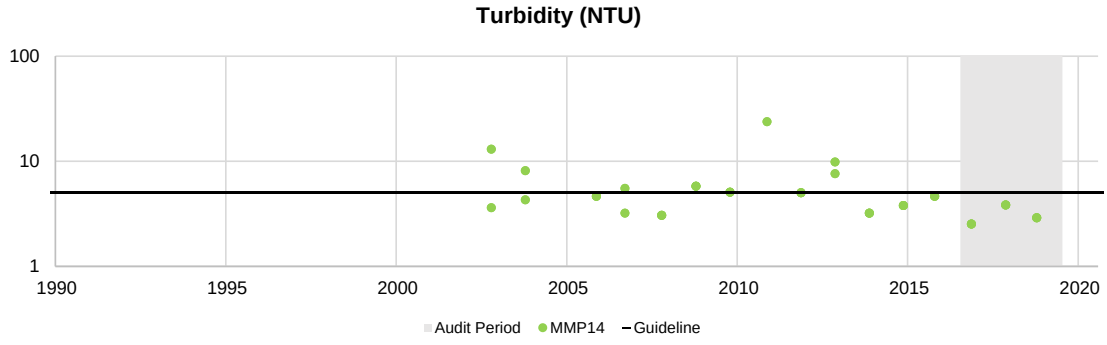
N

Prepared by: SC Date: 18/03/2020


pH
16
14
12
10
8
6
4
2
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
MMP14
Guideline upper limit
Guideline lower limit

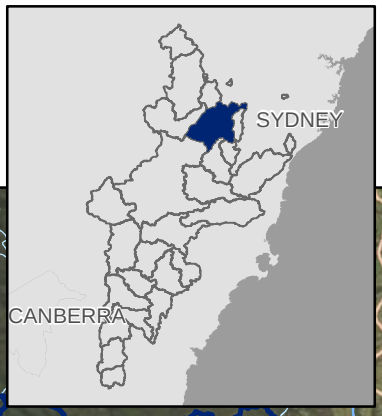

Conductivity (mS/cm)
1
0.8
0.6
0.4
0.2
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
MMP14
Guideline

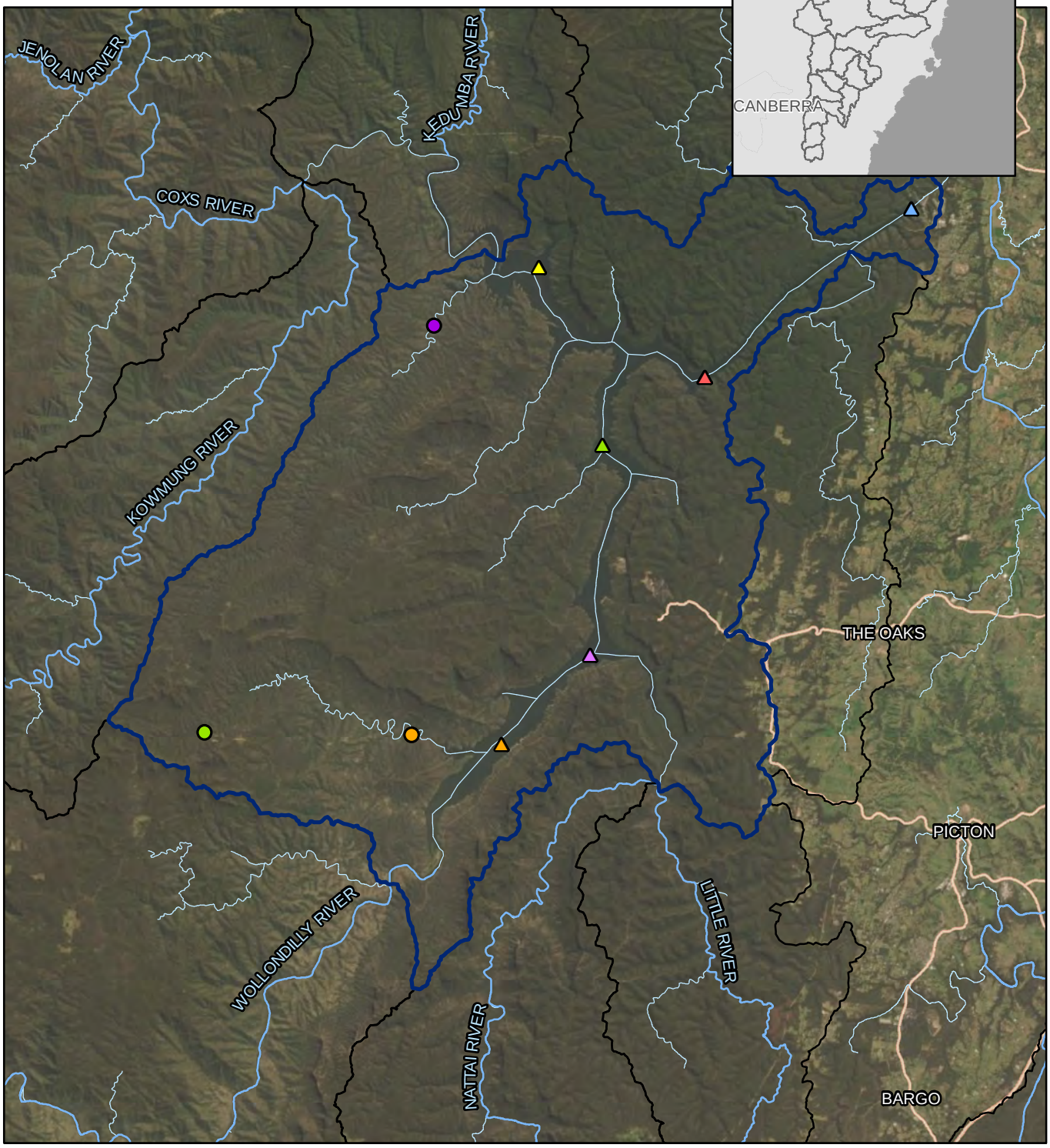

Dissolved Oxygen (%Sat)
160
140
120
100
80
60
40
20
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
MMP14
Guideline upper limit
Guideline lower limit


Turbidity (NTU)
100
10
1
1990
1995
2000
2005
2010
2015
2020
Audit Period
MMP14
Guideline

LAKE BURRAGORANG

CATCHMENT





Legend

- Sub Catchment Boundary
- Major Roads

Water Quality Monitoring Stations

- E551
- MMP251
- MMP59

Water Quality Monitoring Stations (Storage)

- DWA12
- DWA2
- DWA39
- DWA311
- DWA9
- DWA27

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

0 4,800 9,600

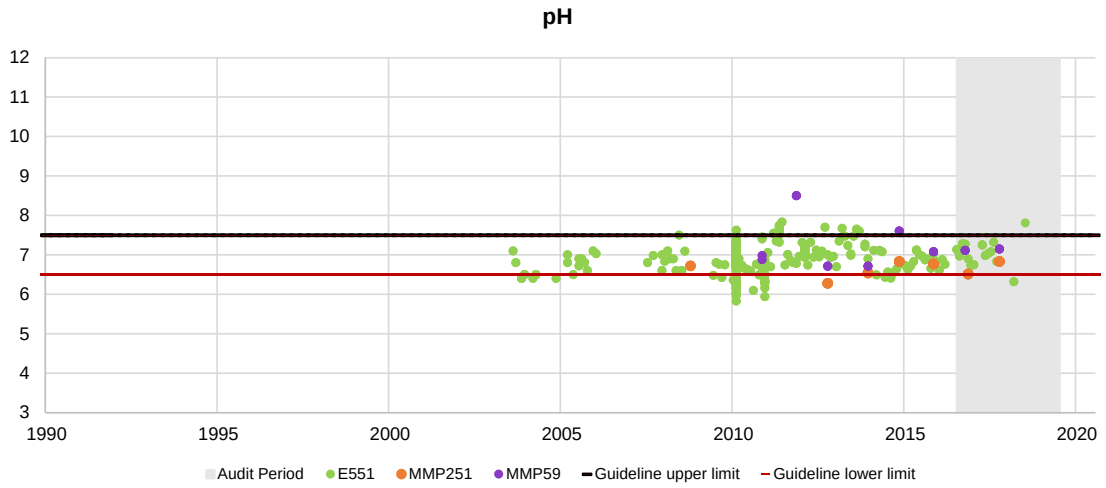
Metres

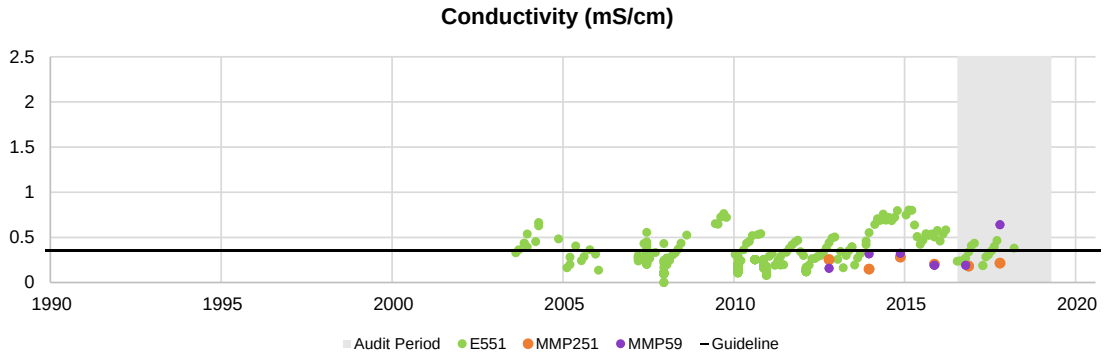
Datum/Projection:
GDA 1994 MGA Zone 56

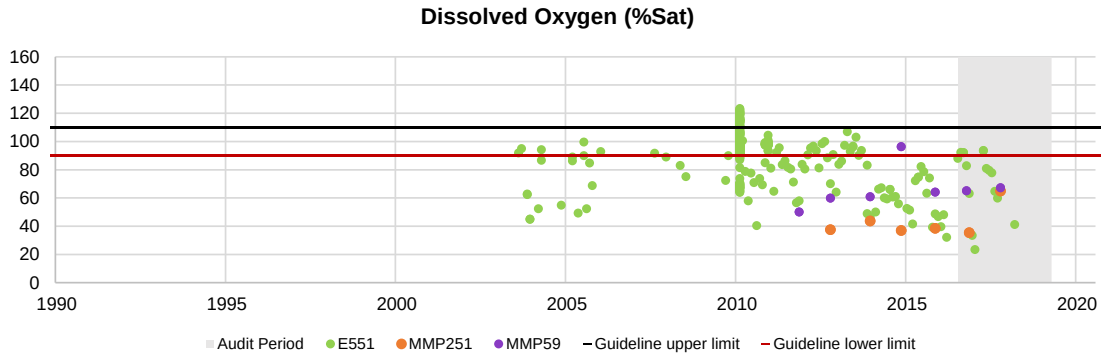
N

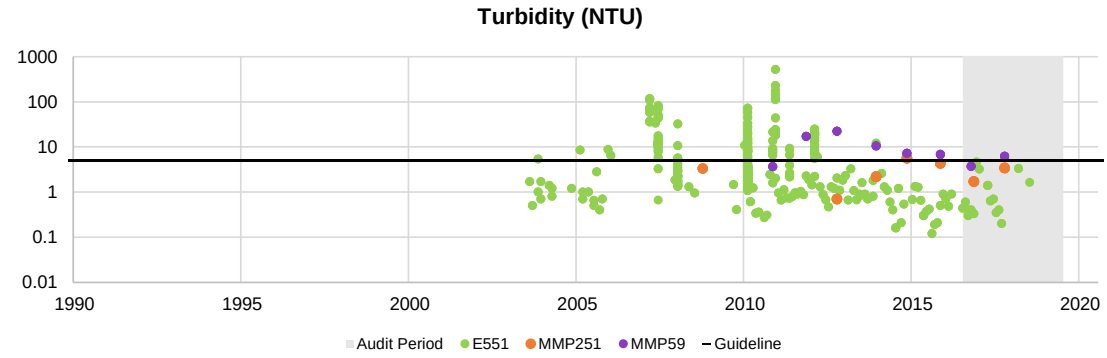
eco logical AUSTRALIA A TETRA TECH COMPANY

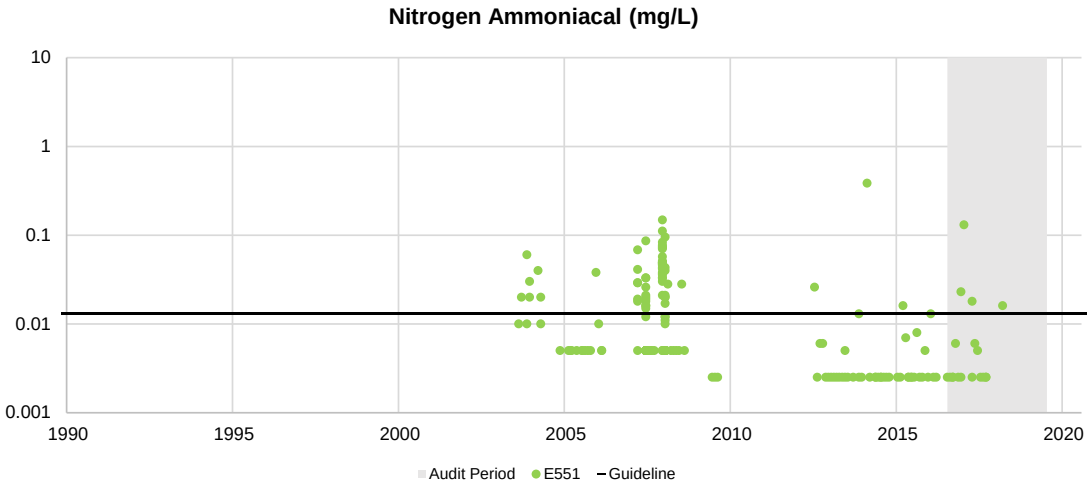
Prepared by: SC Date: 18/03/2020

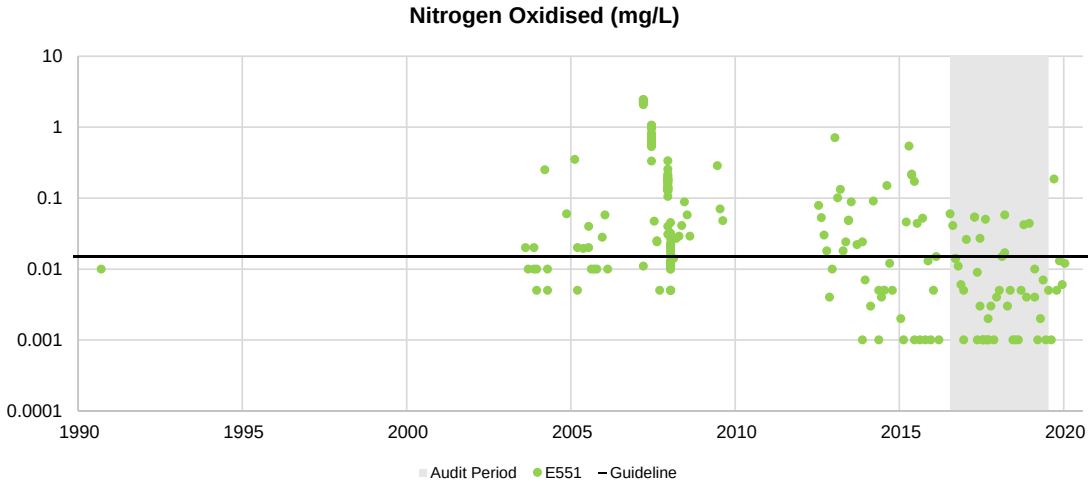

pH
12
11
10
9
8
7
6
5
4
3
1990
1995
2000
2005
2010
2015
2020
Audit Period
E551
MMP251
MMP59
Guideline upper limit
Guideline lower limit

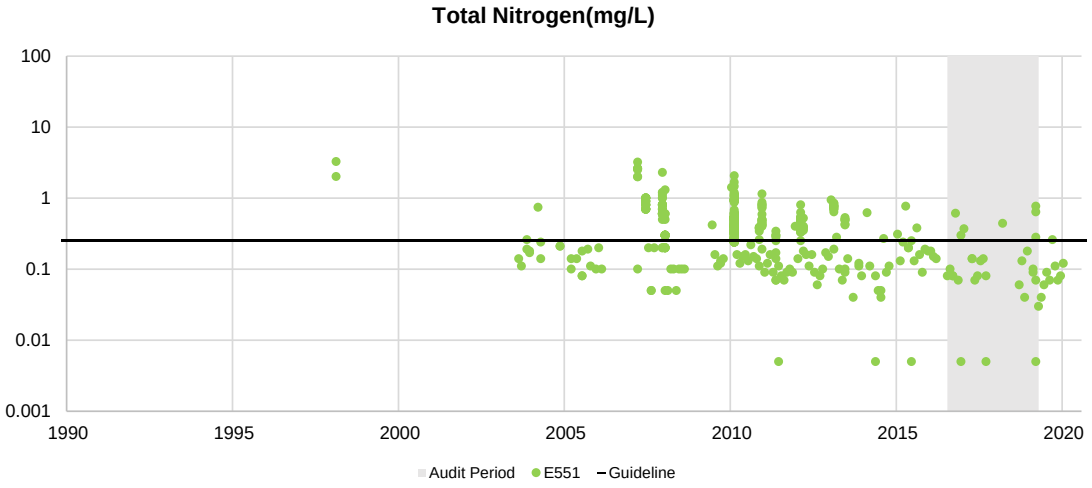

Conductivity (mS/cm)
2.5
2
1.5
1
0.5
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
E551
MMP251
MMP59
Guideline

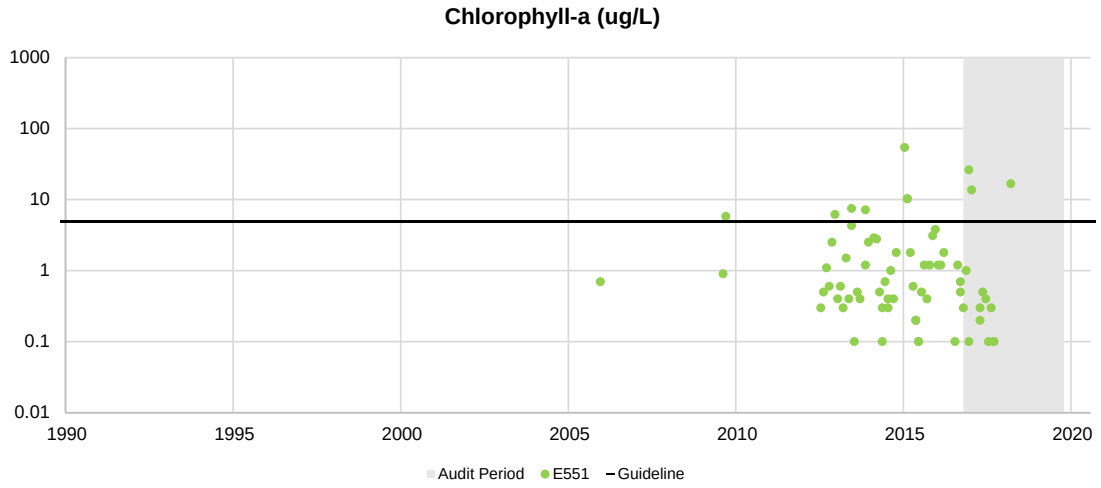

Dissolved Oxygen (%Sat)
160
140
120
100
80
60
40
20
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
E551
MMP251
MMP59
Guideline upper limit
Guideline lower limit

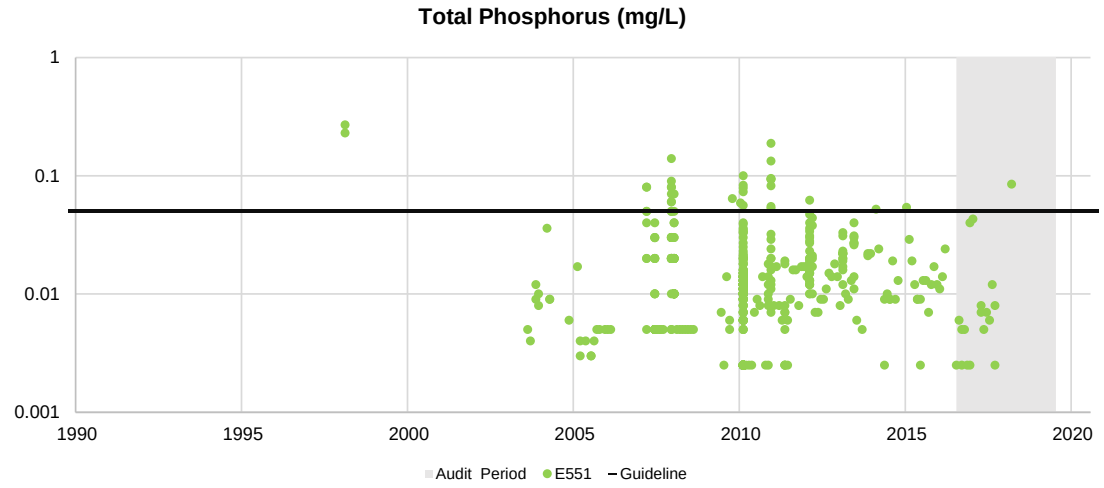

Turbidity (NTU)
1000
100
10
1
0.1
0.01
1990
1995
2000
2005
2010
2015
2020
Audit Period
E551
MMP251
MMP59
Guideline

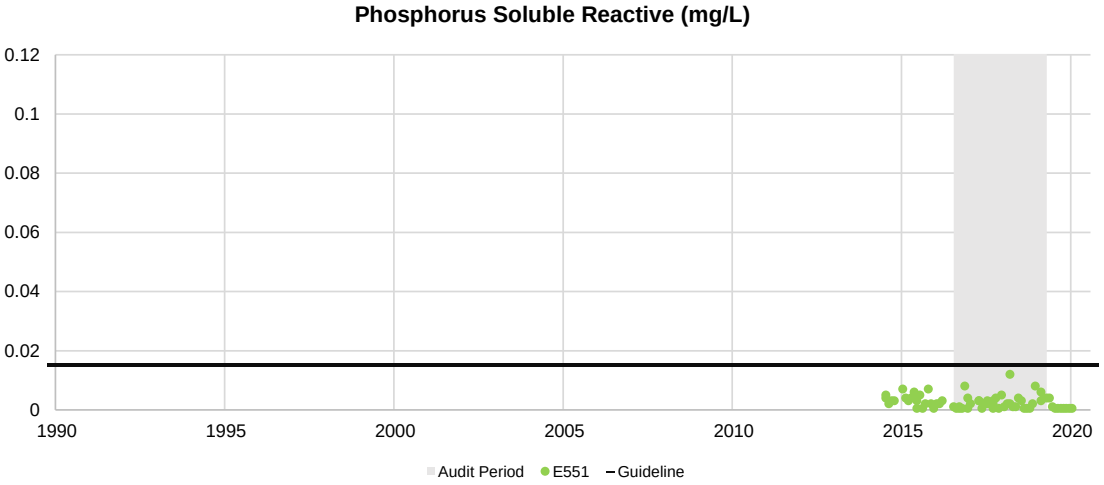

Nitrogen Ammoniacal (mg/L)
10
1
0.1
0.01
0.001
1990
1995
2000
2005
2010
2015
2020
Audit Period
E551
Guideline

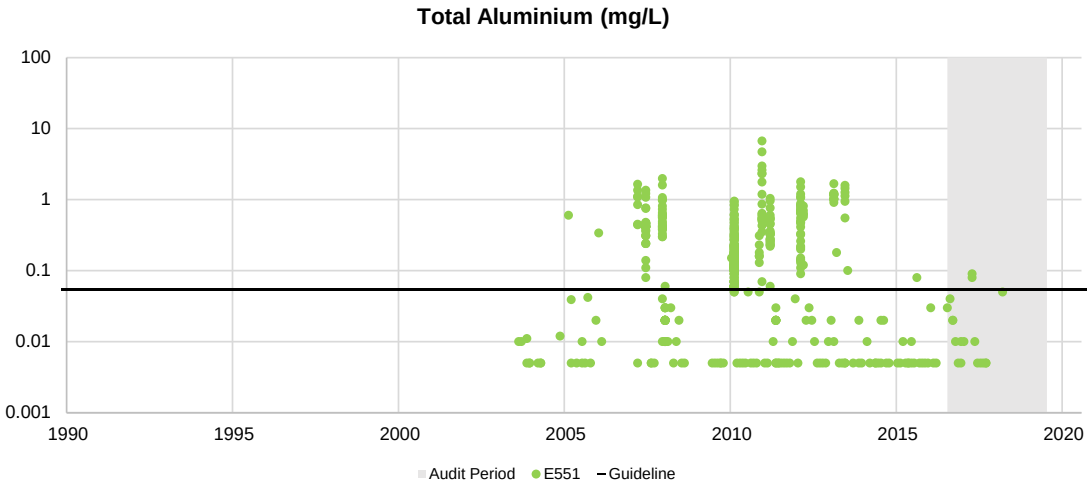

Nitrogen Oxidised (mg/L)
10
1
0.1
0.01
0.001
0.0001
1990
1995
2000
2005
2010
2015
2020
Audit Period
E551
Guideline

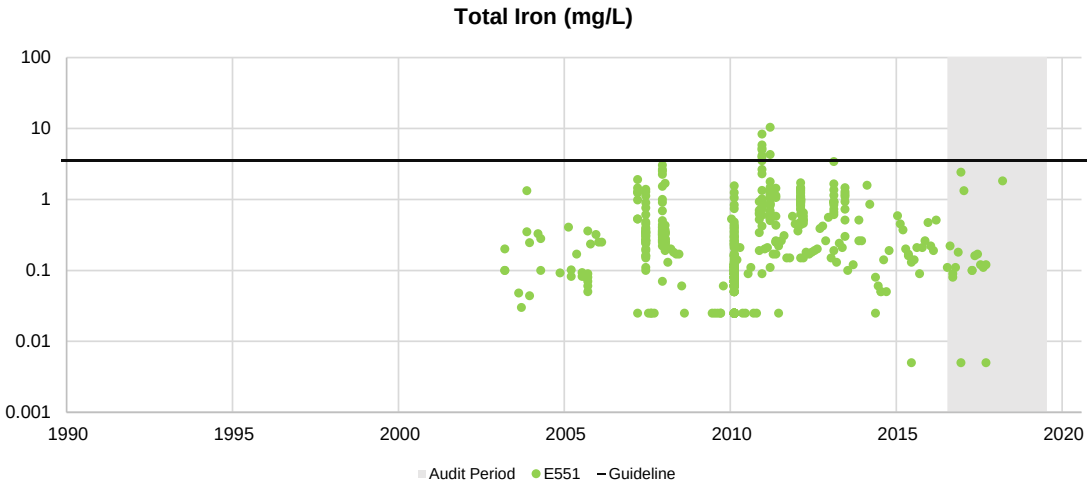

Total Nitrogen(mg/L)
100
10
1
0.1
0.01
0.001
1990
1995
2000
2005
2010
2015
2020
Audit Period
E551
Guideline


Chlorophyll-a (ug/L)
1000
100
10
1
0.1
0.01
1990
1995
2000
2005
2010
2015
2020
Audit Period
E551
Guideline

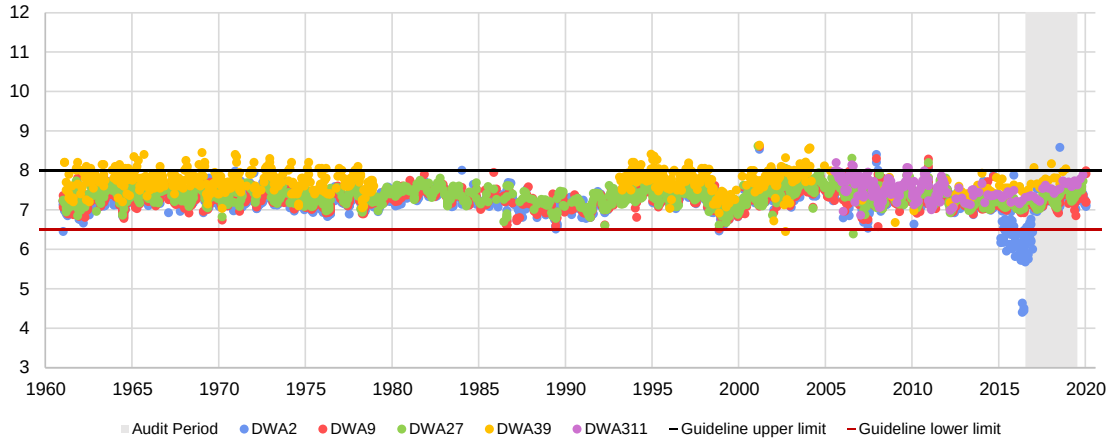

Total Phosphorus (mg/L)
1
0.1
0.01
0.001
1990
1995
2000
2005
2010
2015
2020
Audit Period
E551
Guideline


Phosphorus Soluble Reactive (mg/L)
0.12
0.1
0.08
0.06
0.04
0.02
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
E551
Guideline

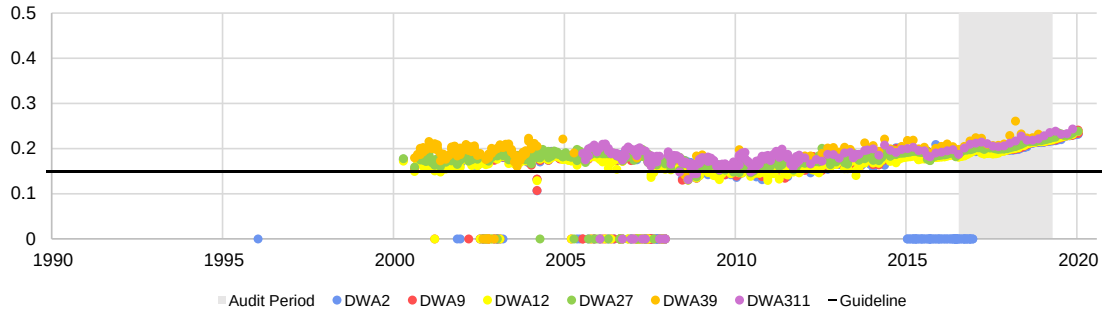

Total Aluminium (mg/L)
100
10
1
0.1
0.01
0.001
1990
1995
2000
2005
2010
2015
2020
Audit Period
E551
Guideline


Total Iron (mg/L)
100
10
1
0.1
0.01
0.001
1990
1995
2000
2005
2010
2015
2020
Audit Period
E551
Guideline

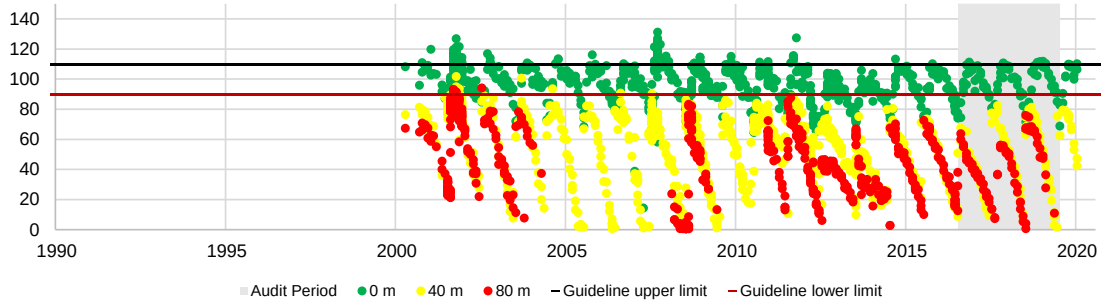
pH (daily average)



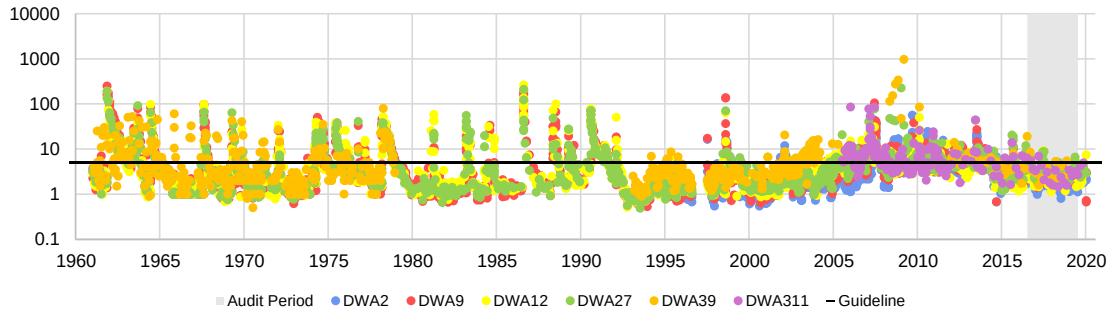
Conductivity (mS/cm) (daily average)

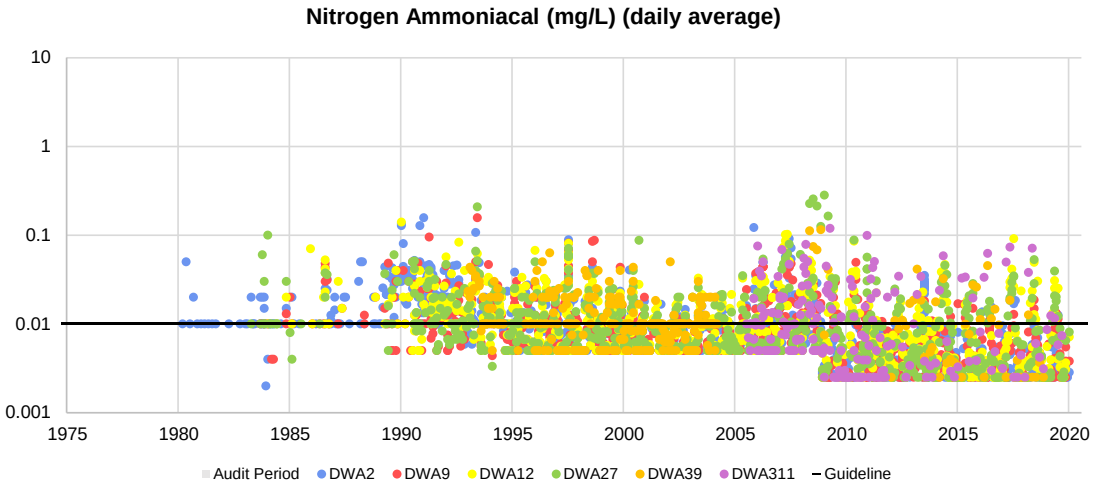


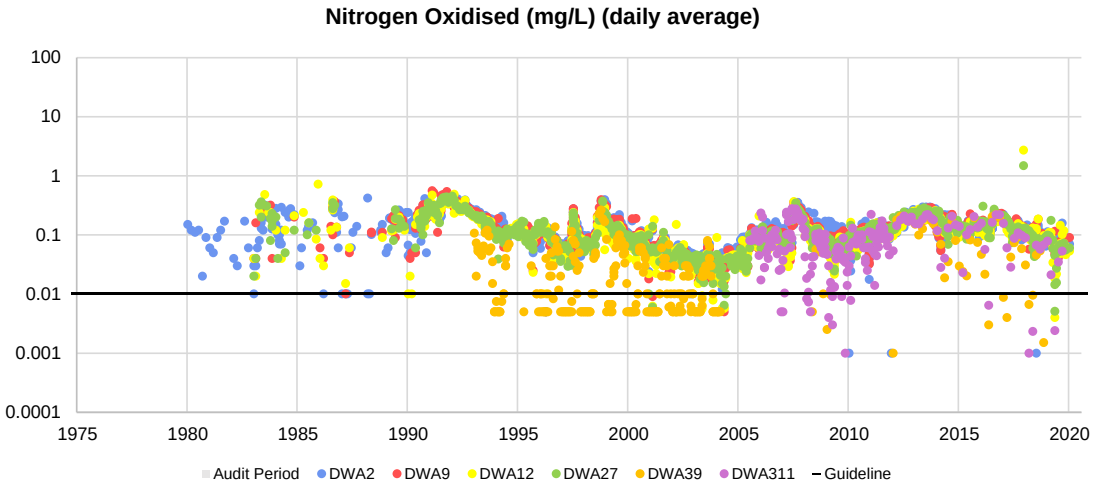
Dissolved Oxygen (%Sat) (daily average)

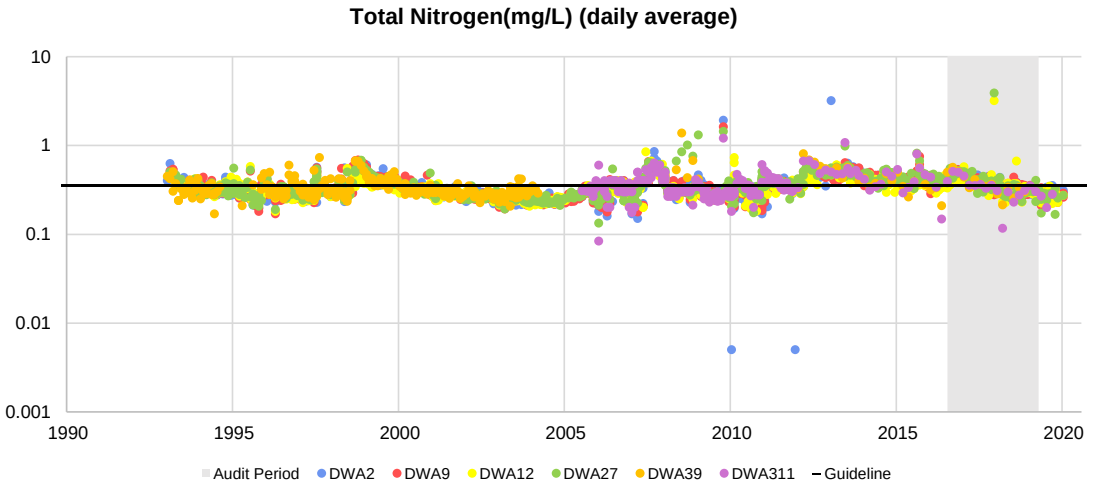


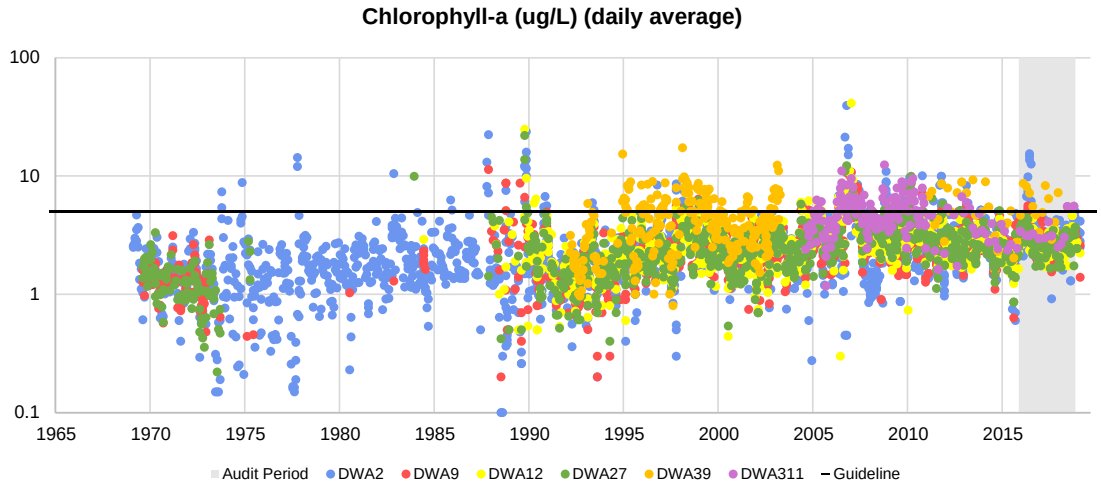
Turbidity (NTU) (daily average)

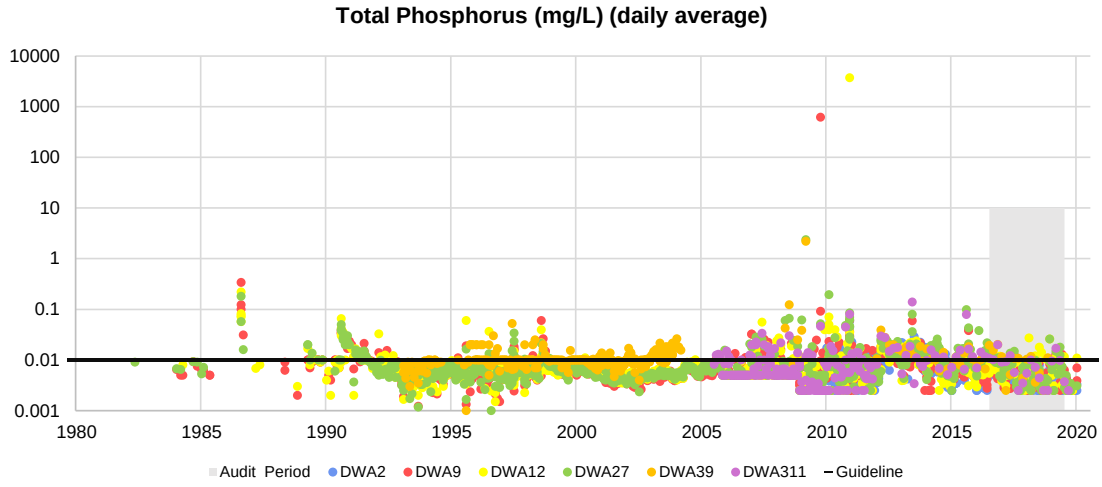


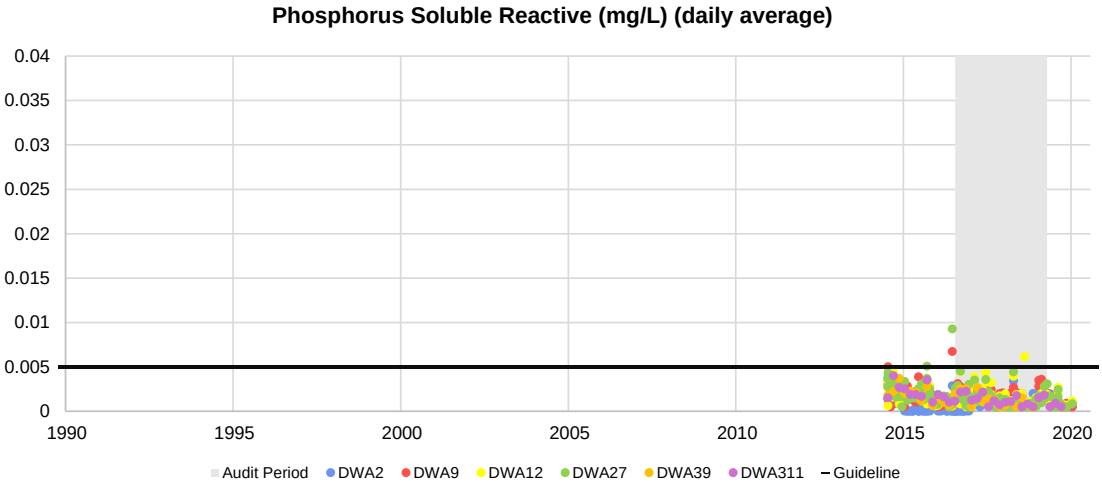

Nitrogen Ammoniacal (mg/L) (daily average)
10
1
0.1
0.01
0.001
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
DWA2
DWA9
DWA12
DWA27
DWA39
DWA311
Guideline

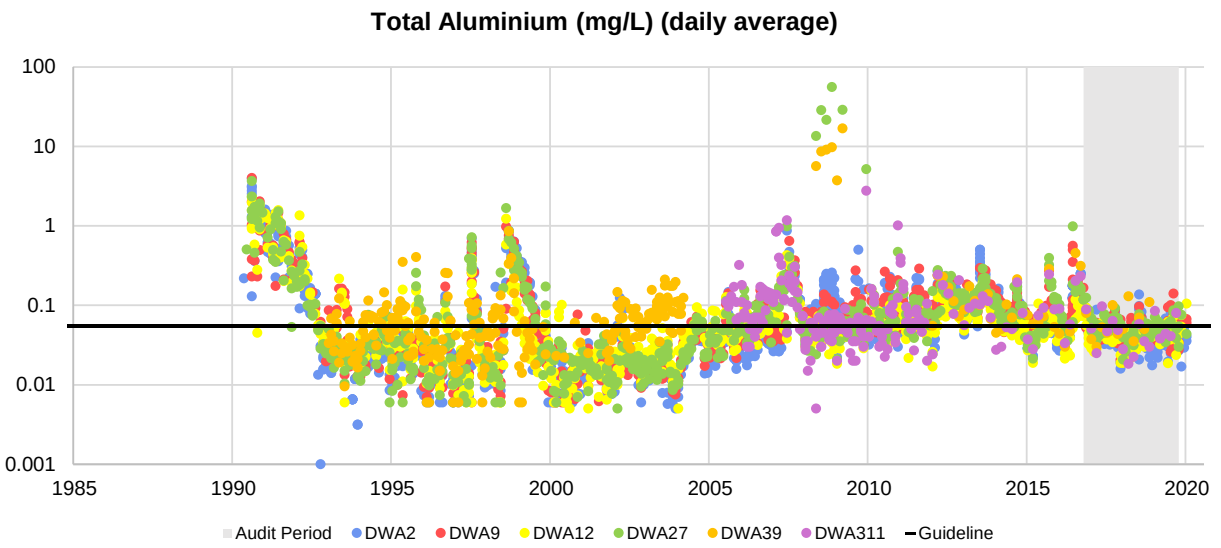

Nitrogen Oxidised (mg/L) (daily average)
100
10
1
0.1
0.01
0.001
0.0001
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
DWA2
DWA9
DWA12
DWA27
DWA39
DWA311
Guideline

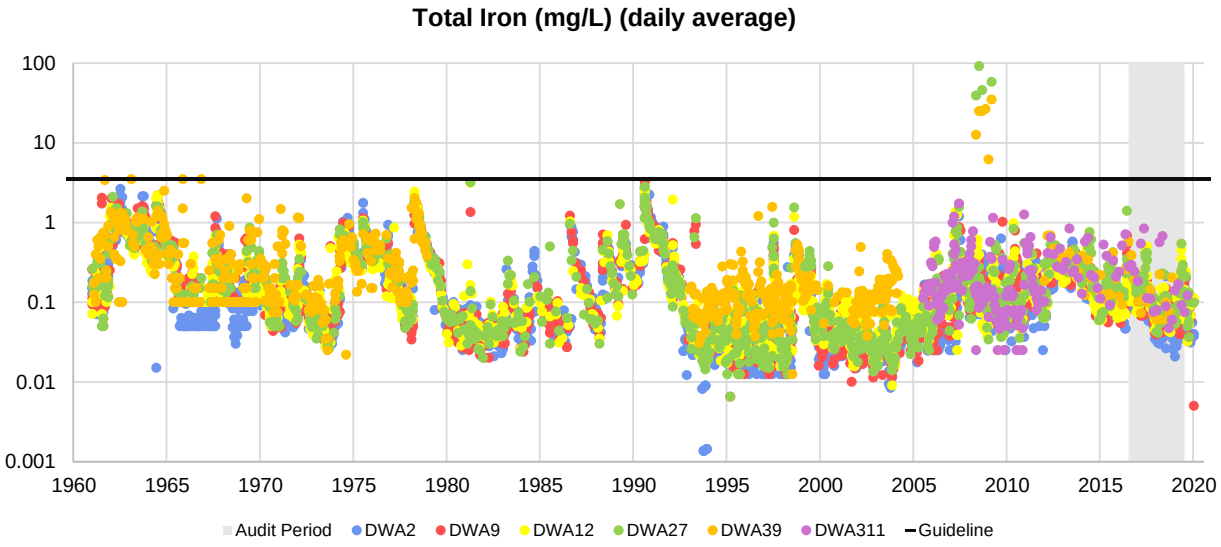

Total Nitrogen(mg/L) (daily average)
10
1
0.1
0.01
0.001
1990
1995
2000
2005
2010
2015
2020
Audit Period
DWA2
DWA9
DWA12
DWA27
DWA39
DWA311
Guideline


Chlorophyll-a (ug/L) (daily average)
100
10
1
0.1
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
Audit Period
DWA2
DWA9
DWA12
DWA27
DWA39
DWA311
Guideline


Total Phosphorus (mg/L) (daily average)
10000
1000
100
10
1
0.1
0.01
0.001
1980
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
DWA2
DWA9
DWA12
DWA27
DWA39
DWA311
Guideline

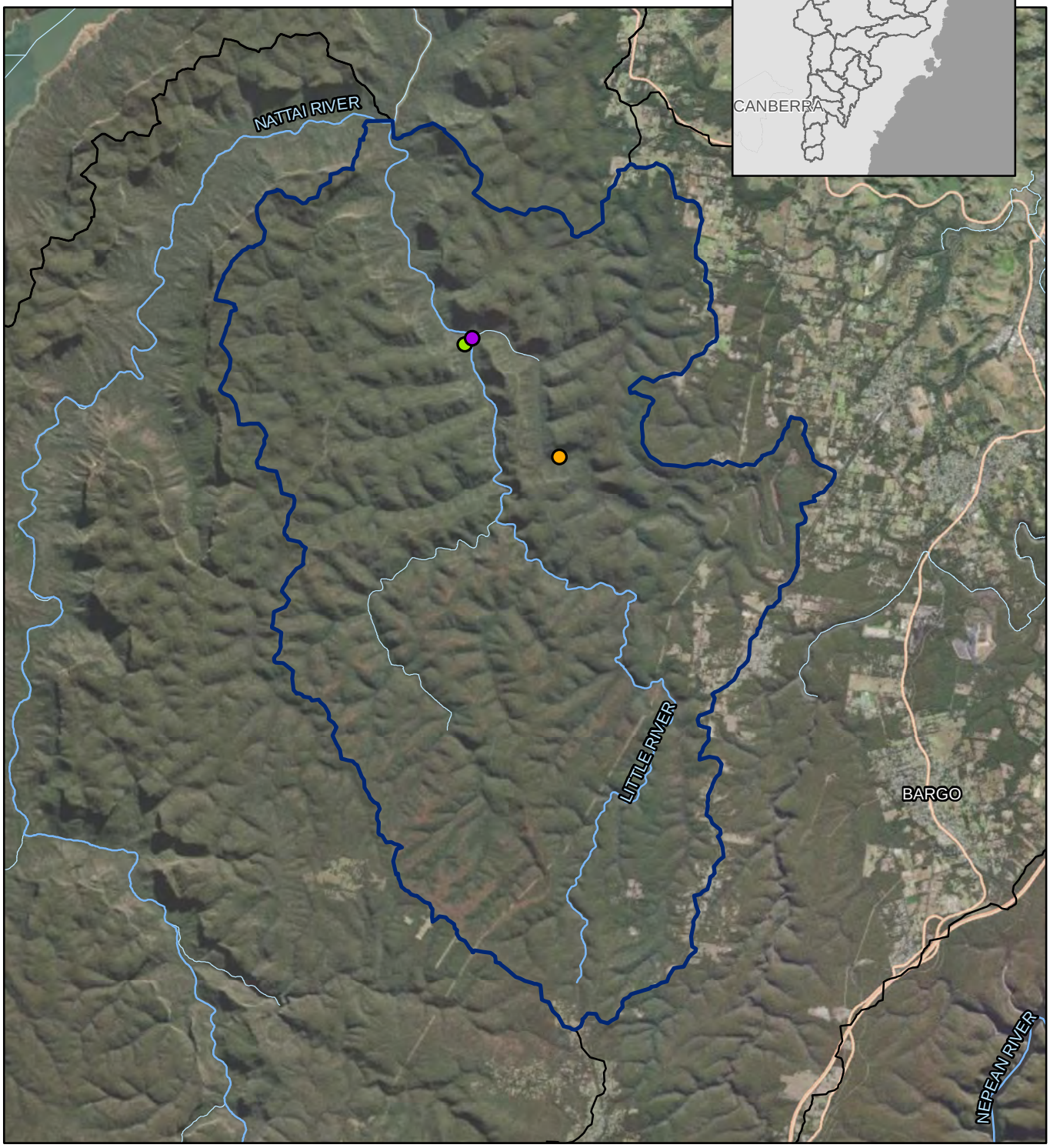

Phosphorus Soluble Reactive (mg/L) (daily average)
0.04
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
DWA2
DWA9
DWA12
DWA27
DWA39
DWA311
Guideline


Total Aluminium (mg/L) (daily average)
100
10
1
0.1
0.01
0.001
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
DWA2
DWA9
DWA12
DWA27
DWA39
DWA311
Guideline


Total Iron (mg/L) (daily average)
100
10
1
0.1
0.01
0.001
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
DWA2
DWA9
DWA12
DWA27
DWA39
DWA311
Guideline

LITTLE RIVER

CATCHMENT



Legend

- Sub Catchment Boundary
- Major Roads

Water Quality Monitoring Stations

- E243
- MMP04
- MMP05

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

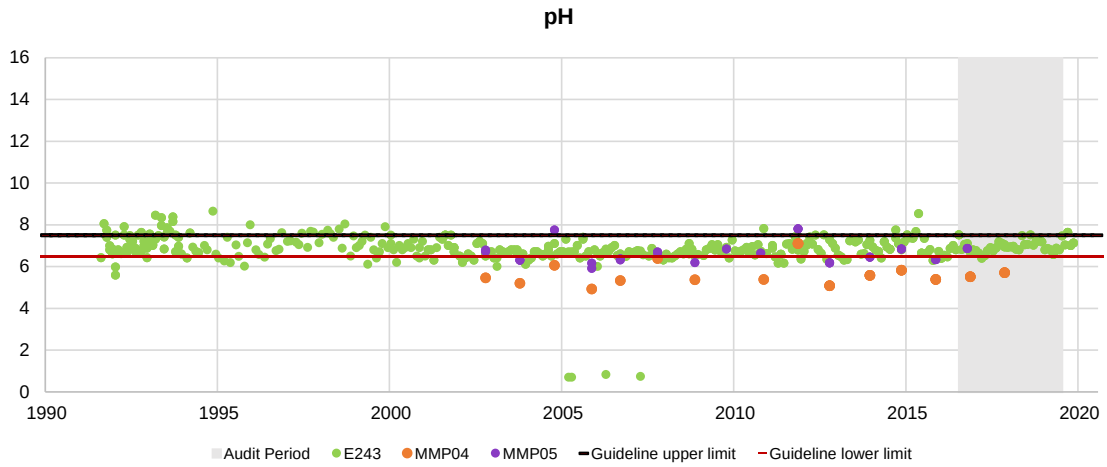
0 2,250 4,500

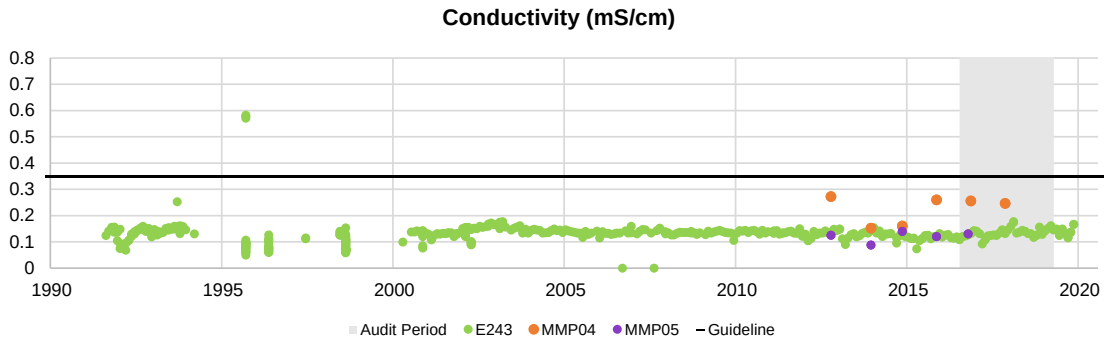
Metres

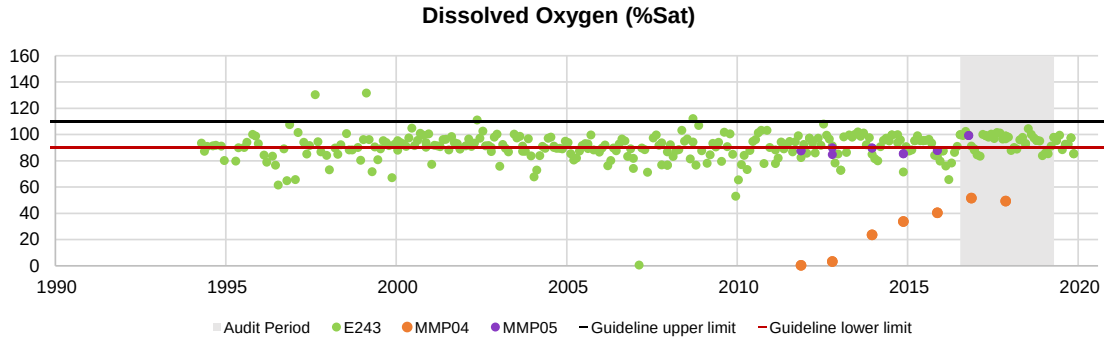
Datum/Projection:
GDA 1994 MGA Zone 56

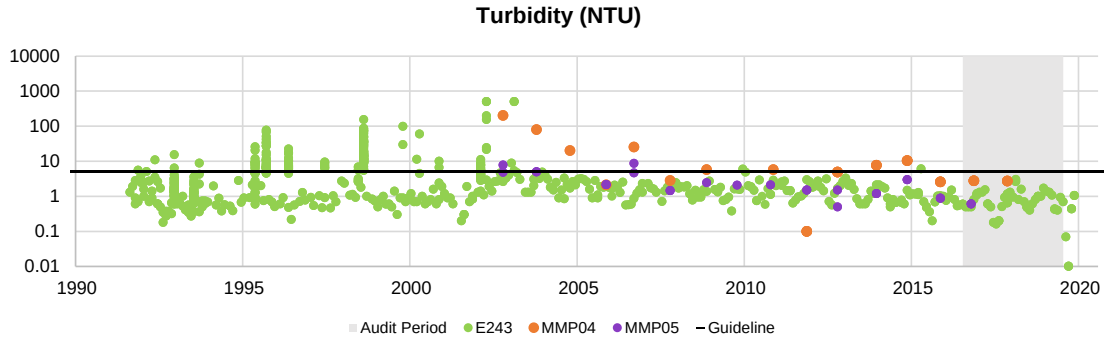
N

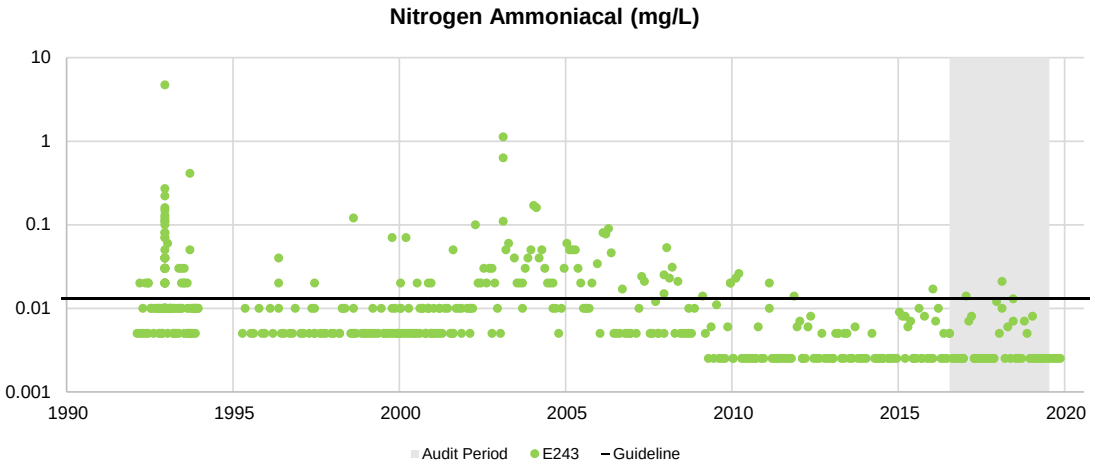
Prepared by: SC Date: 18/03/2020

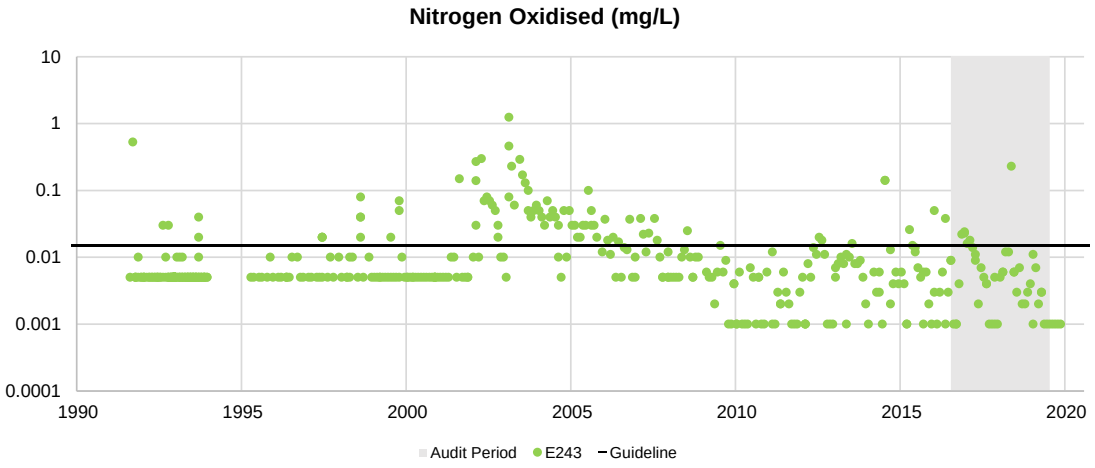

pH
16
14
12
10
8
6
4
2
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
E243
MMP04
MMP05
Guideline upper limit
Guideline lower limit

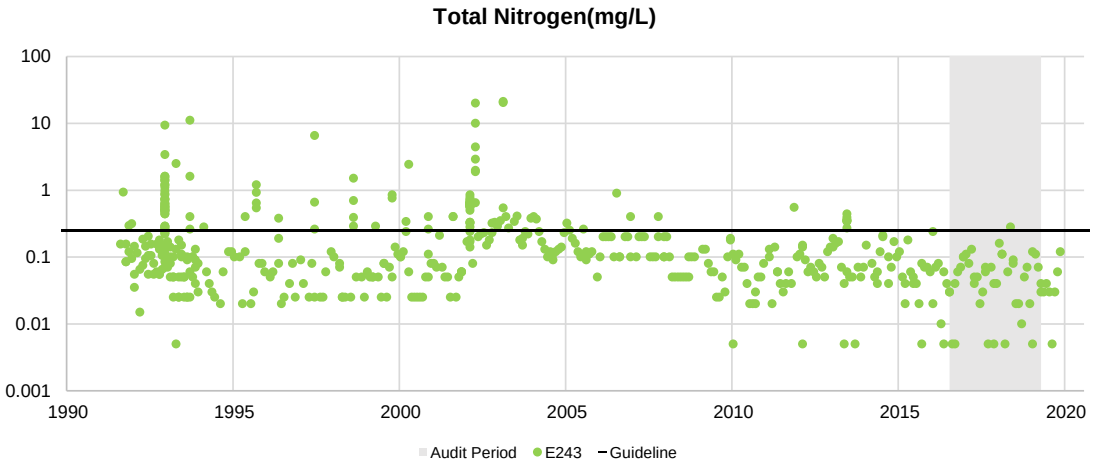

Conductivity (mS/cm)
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
E243
MMP04
MMP05
Guideline

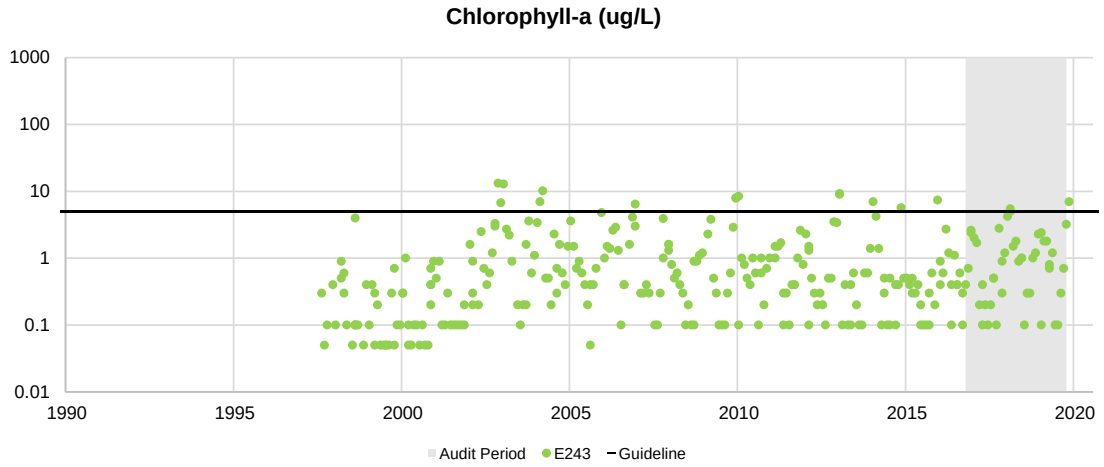

Dissolved Oxygen (%Sat)
160
140
120
100
80
60
40
20
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
E243
MMP04
MMP05
Guideline upper limit
Guideline lower limit

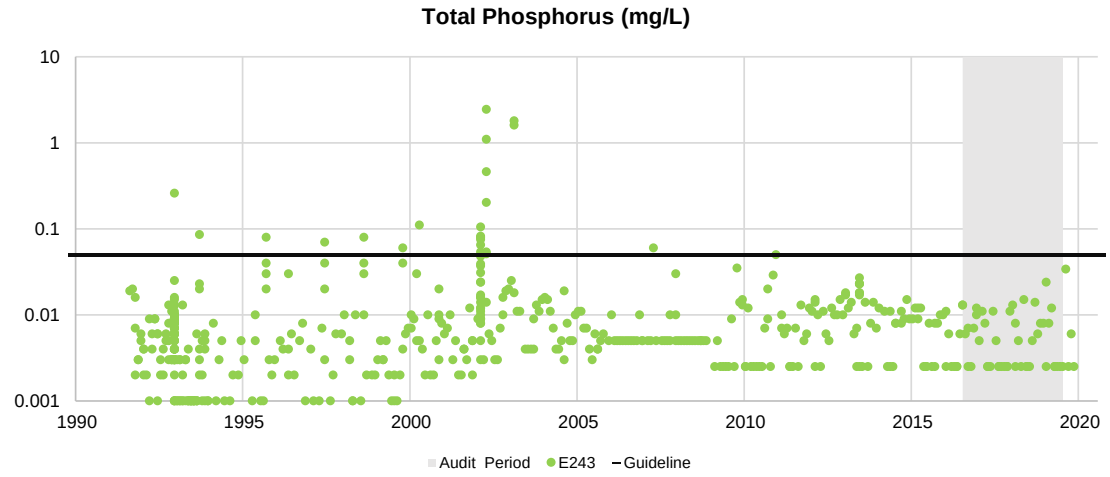

Turbidity (NTU)
10000
1000
100
10
1
0.1
0.01
1990
1995
2000
2005
2010
2015
2020
Audit Period
E243
MMP04
MMP05
Guideline

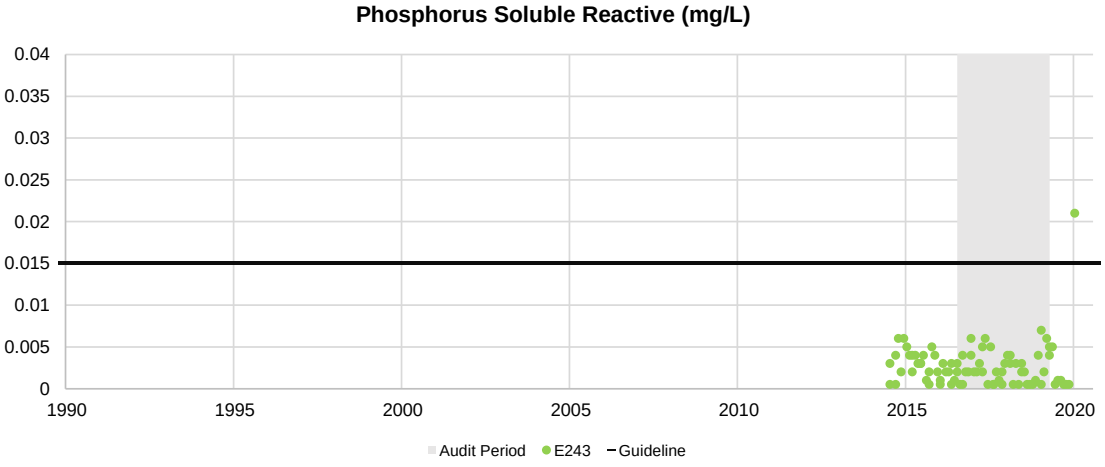

Nitrogen Ammoniacal (mg/L)
10
1
0.1
0.01
0.001
1990
1995
2000
2005
2010
2015
2020
Audit Period
E243
Guideline

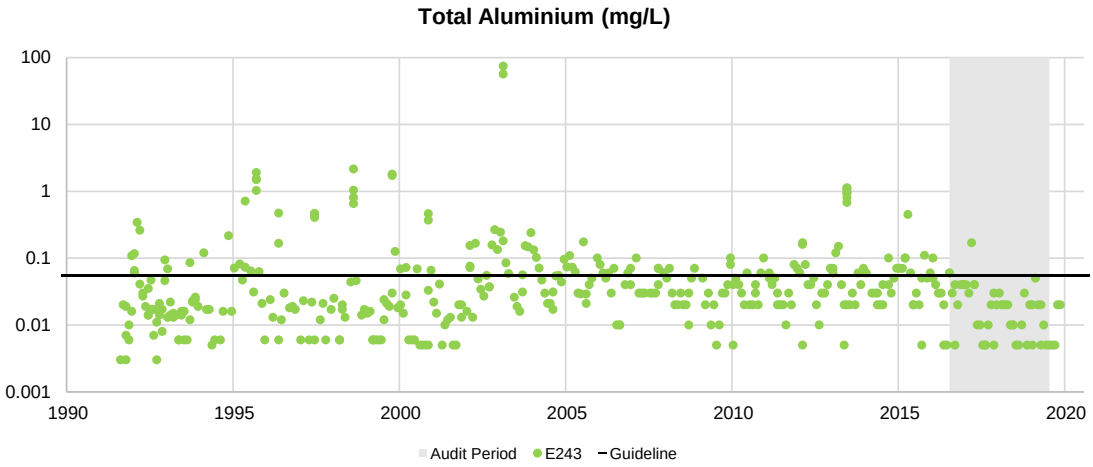

Nitrogen Oxidised (mg/L)
10
1
0.1
0.01
0.001
0.0001
1990
1995
2000
2005
2010
2015
2020
Audit Period
E243
Guideline

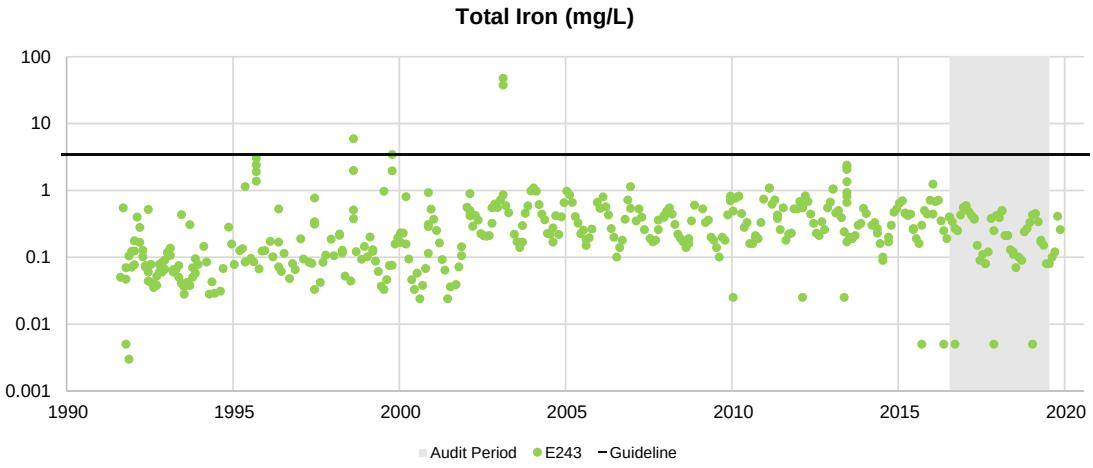

Total Nitrogen(mg/L)
100
10
1
0.1
0.01
0.001
1990
1995
2000
2005
2010
2015
2020
Audit Period
E243
Guideline


Chlorophyll-a (ug/L)
1000
100
10
1
0.1
0.01
1990
1995
2000
2005
2010
2015
2020
Audit Period
E243
Guideline


Total Phosphorus (mg/L)
10
1
0.1
0.01
0.001
1990
1995
2000
2005
2010
2015
2020
Audit Period
E243
Guideline

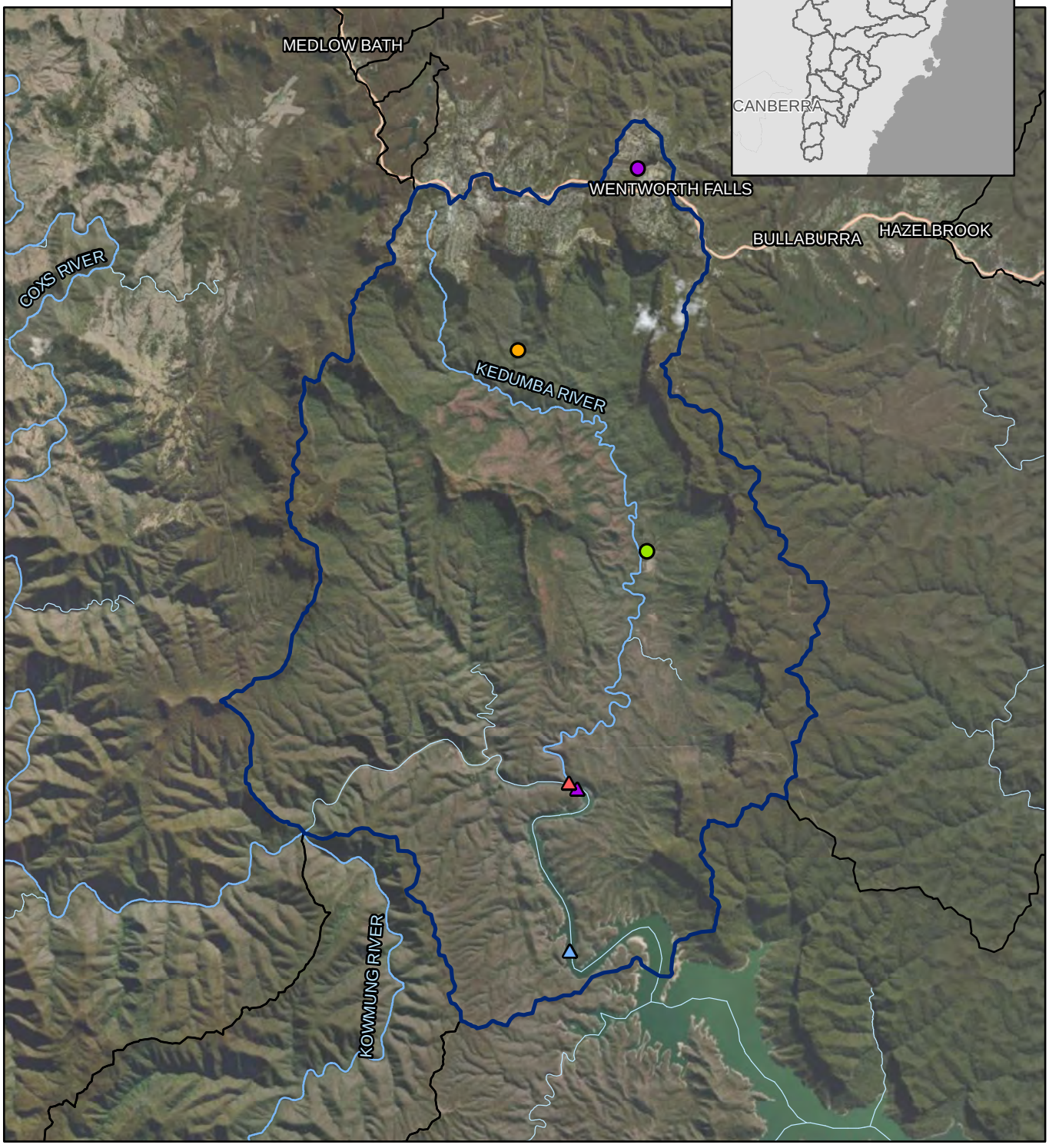

Phosphorus Soluble Reactive (mg/L)
0.04
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
E243
Guideline


Total Aluminium (mg/L)
100
10
1
0.1
0.01
0.001
1990
1995
2000
2005
2010
2015
2020
Audit Period
E243
Guideline


Total Iron (mg/L)
100
10
1
0.1
0.01
0.001
1990
1995
2000
2005
2010
2015
2020
Audit Period
E243
Guideline

LOWER COXS RIVER

CATCHMENT



Legend

- Sub Catchment Boundary
- Major Roads

Water Quality Monitoring Stations

- E157
- MMP76
- R1

Water Quality Monitoring Stations (Storage)

- DWA15
- DWA21
- DWA19

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

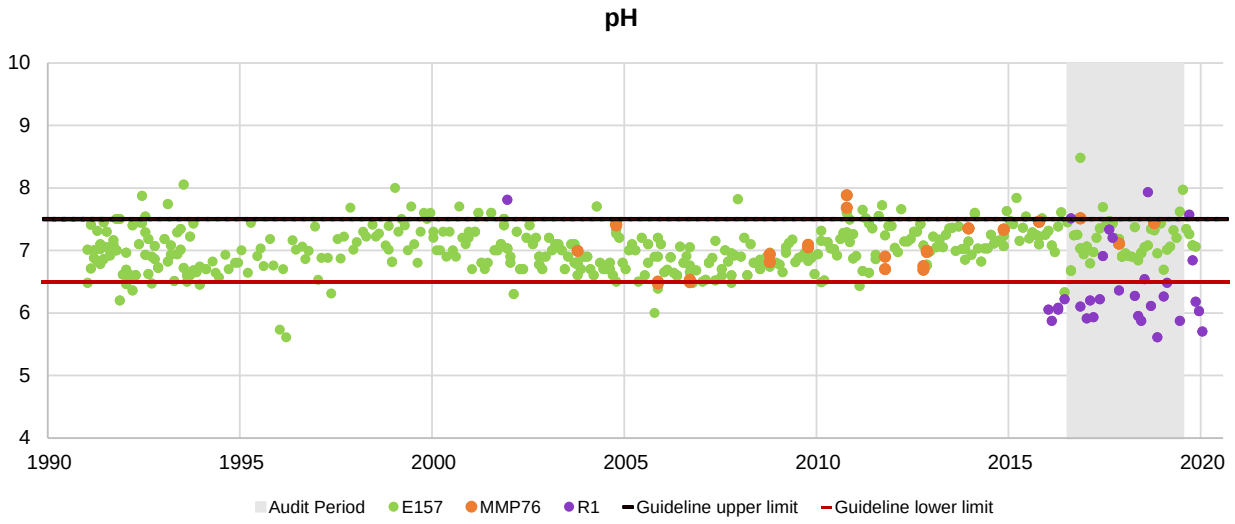
0 2,600 5,200

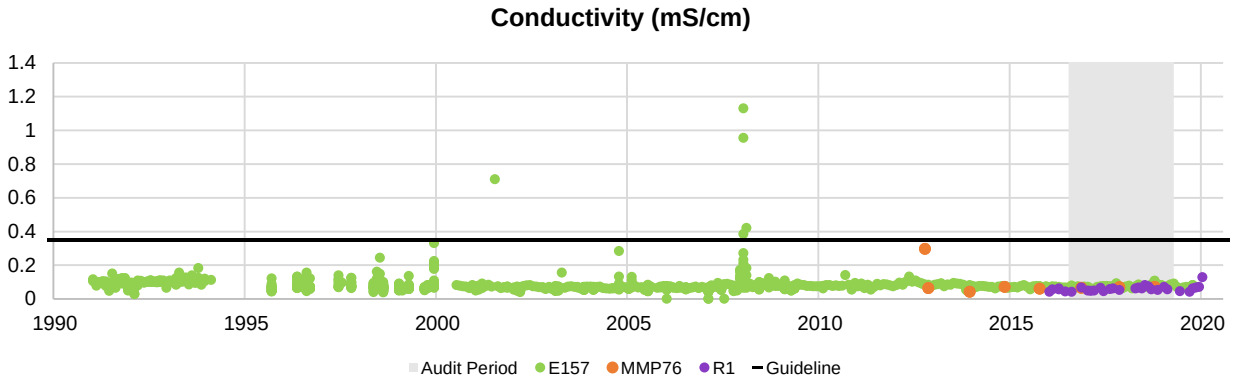
Metres

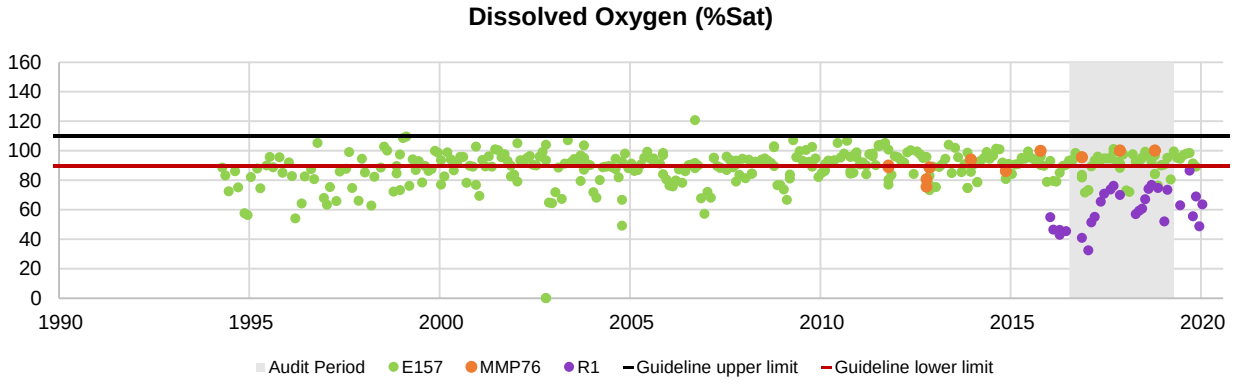
Datum/Projection:
GDA 1994 MGA Zone 56

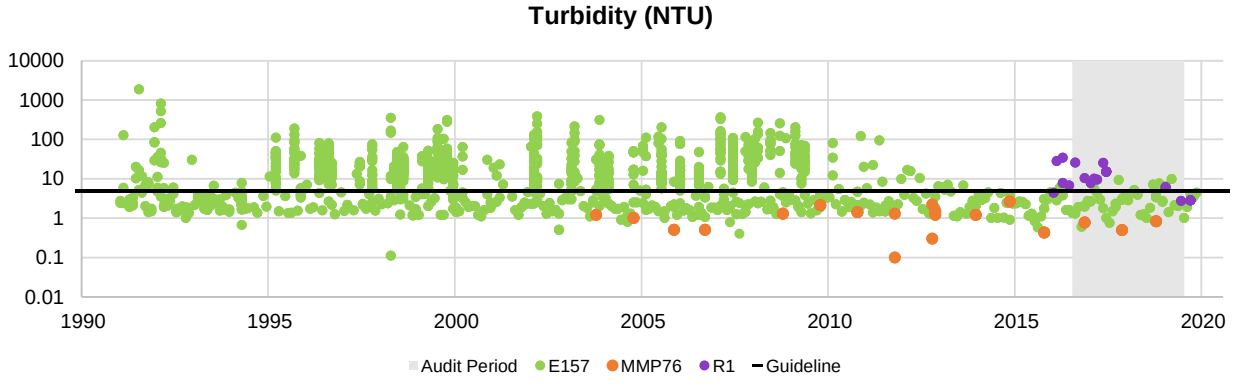
N

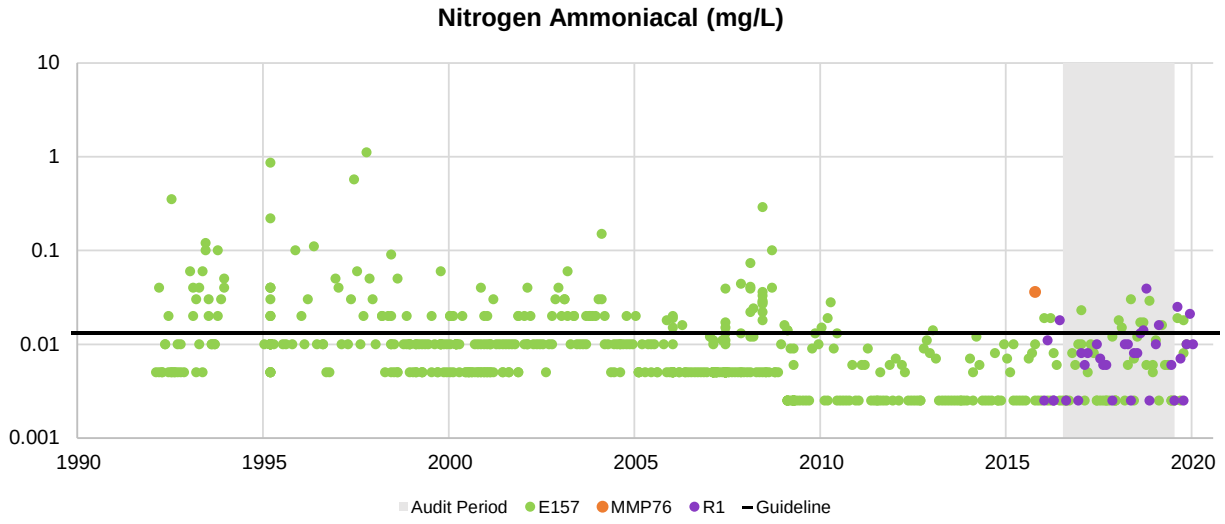
Prepared by: SC Date: 18/03/2020

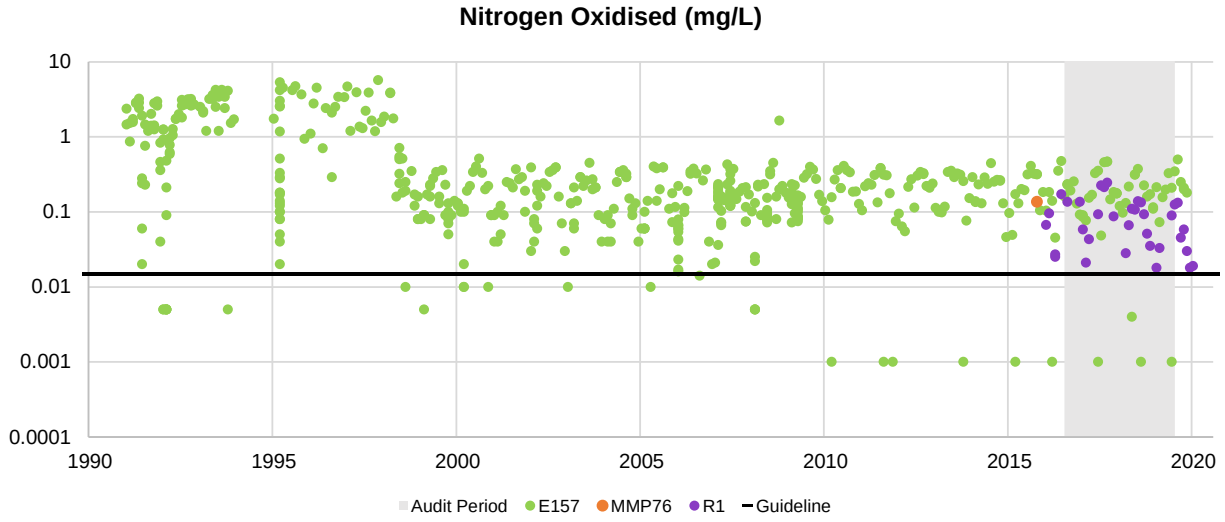

pH
10
9
8
7
6
5
4
1990
1995
2000
2005
2010
2015
2020
Audit Period
E157
MMP76
R1
Guideline upper limit
Guideline lower limit

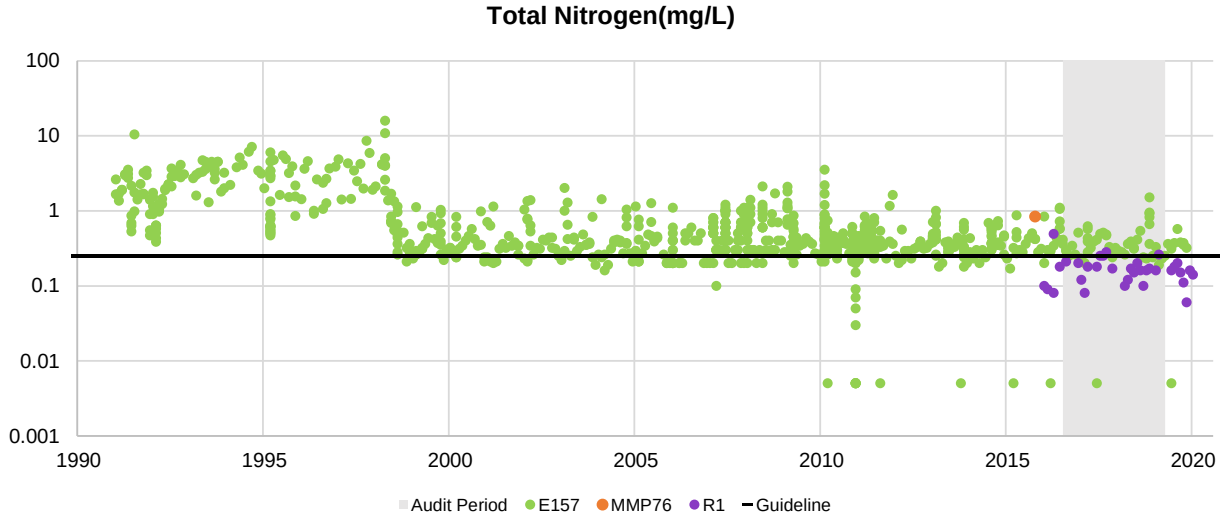

Conductivity (mS/cm)
1.4
1.2
1
0.8
0.6
0.4
0.2
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
E157
MMP76
R1
Guideline

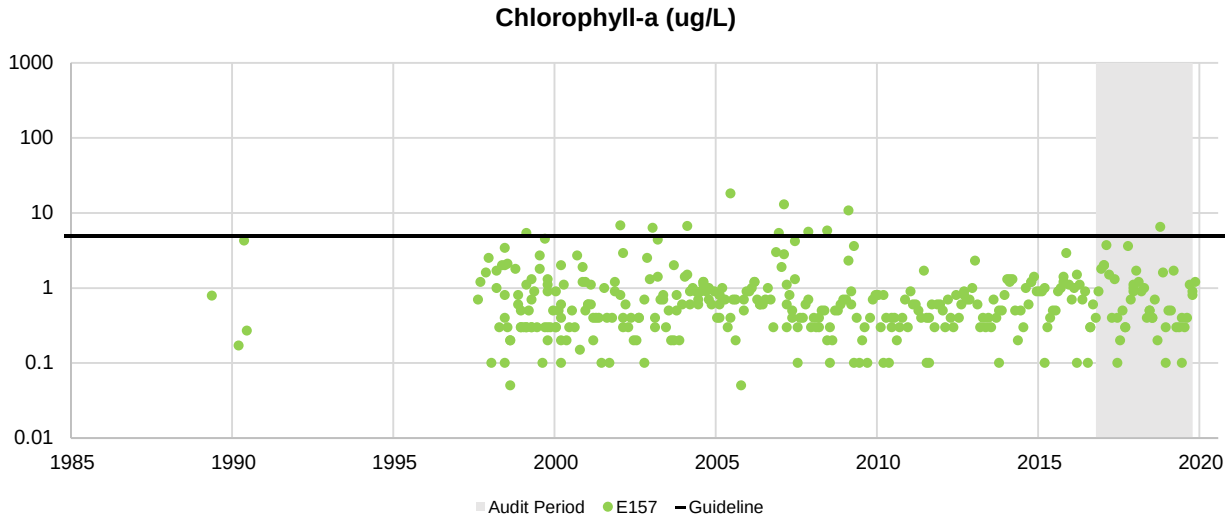

Dissolved Oxygen (%Sat)
160
140
120
100
80
60
40
20
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
E157
MMP76
R1
Guideline upper limit
Guideline lower limit

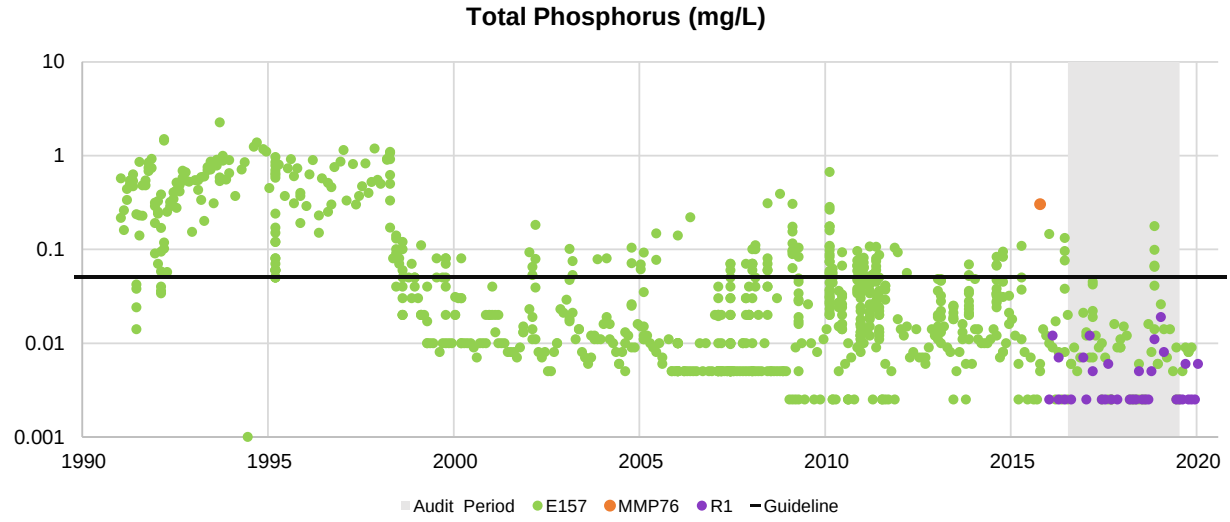

Turbidity (NTU)
10000
1000
100
10
1
0.1
0.01
1990
1995
2000
2005
2010
2015
2020
Audit Period
E157
MMP76
R1
Guideline

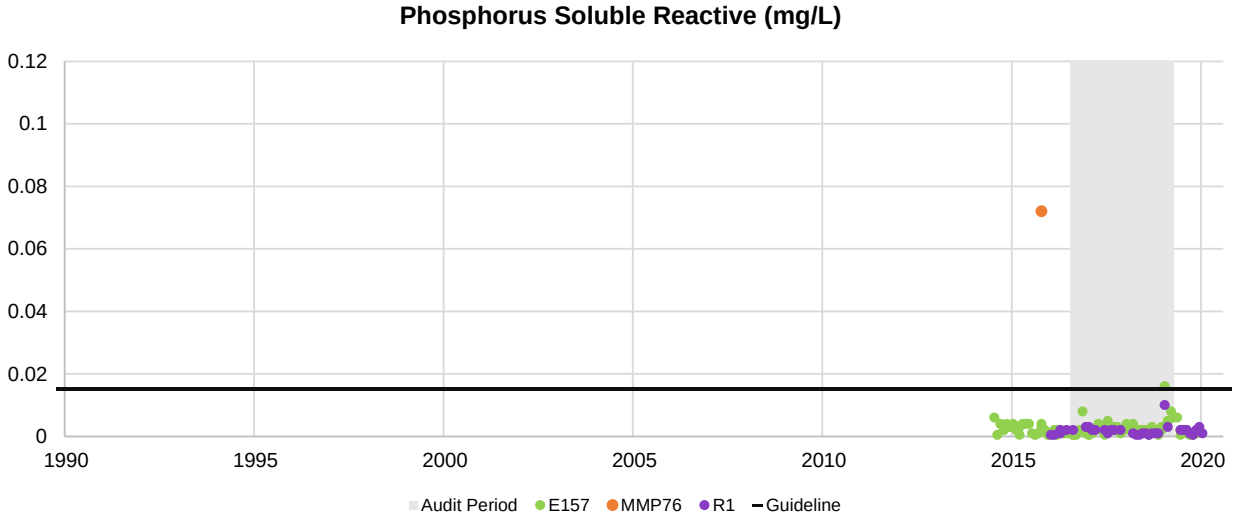

Nitrogen Ammoniacal (mg/L)
10
1
0.1
0.01
0.001
1990
1995
2000
2005
2010
2015
2020
Audit Period
E157
MMP76
R1
Guideline

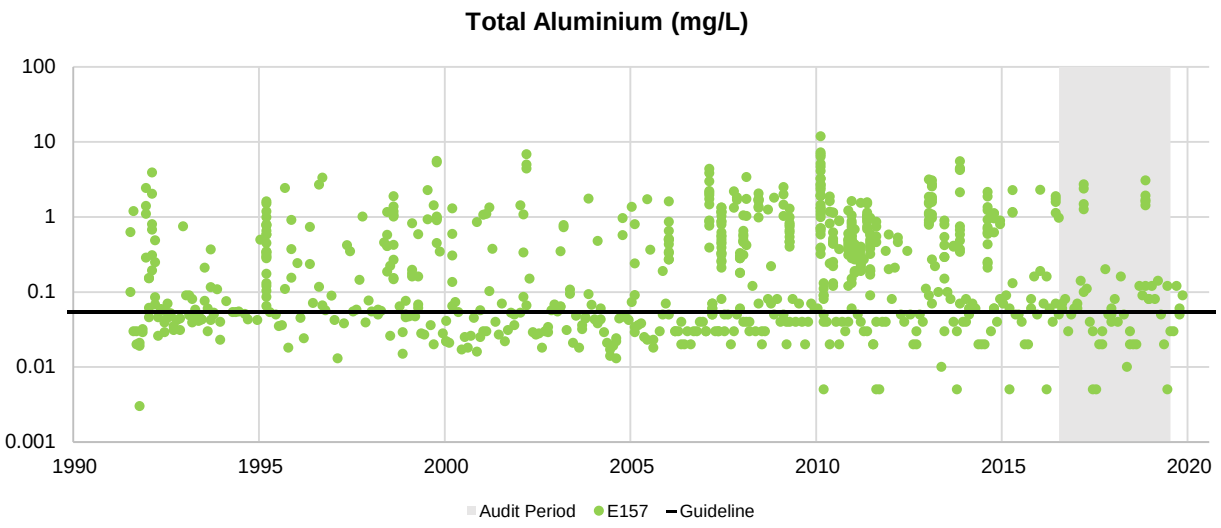

Nitrogen Oxidised (mg/L)
10
1
0.1
0.01
0.001
0.0001
1990
1995
2000
2005
2010
2015
2020
Audit Period
E157
MMP76
R1
Guideline

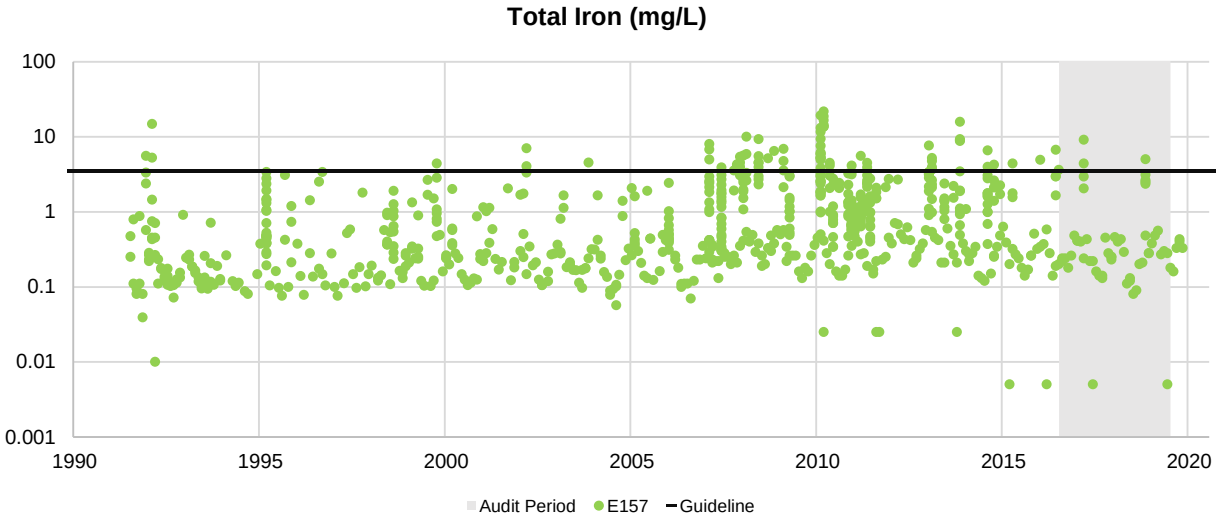

Total Nitrogen(mg/L)
100
10
1
0.1
0.01
0.001
1990
1995
2000
2005
2010
2015
2020
Audit Period
E157
MMP76
R1
Guideline

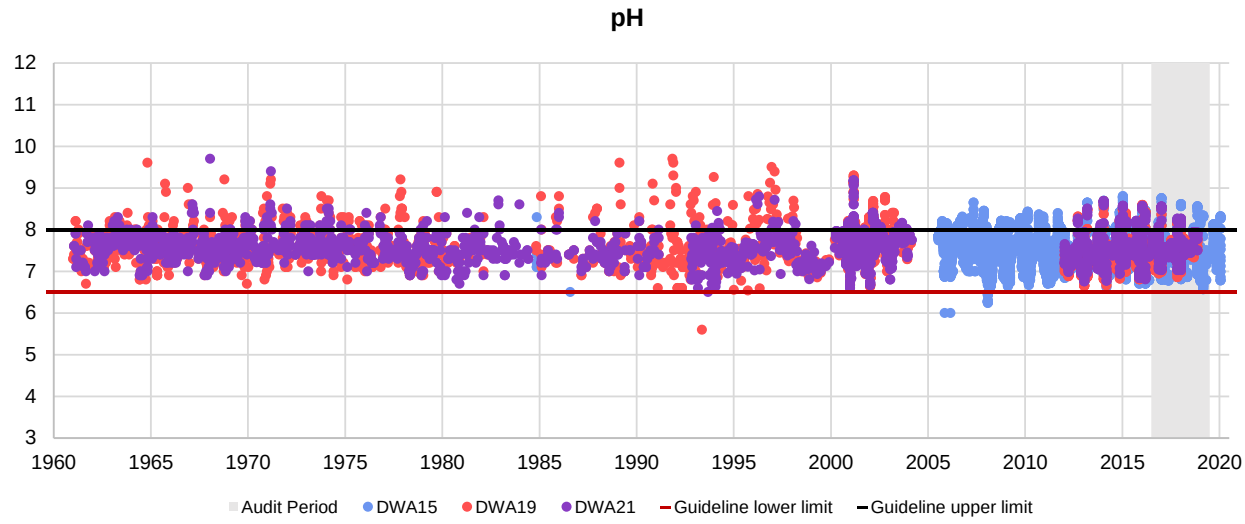

Chlorophyll-a (ug/L)
1000
100
10
1
0.1
0.01
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
E157
Guideline

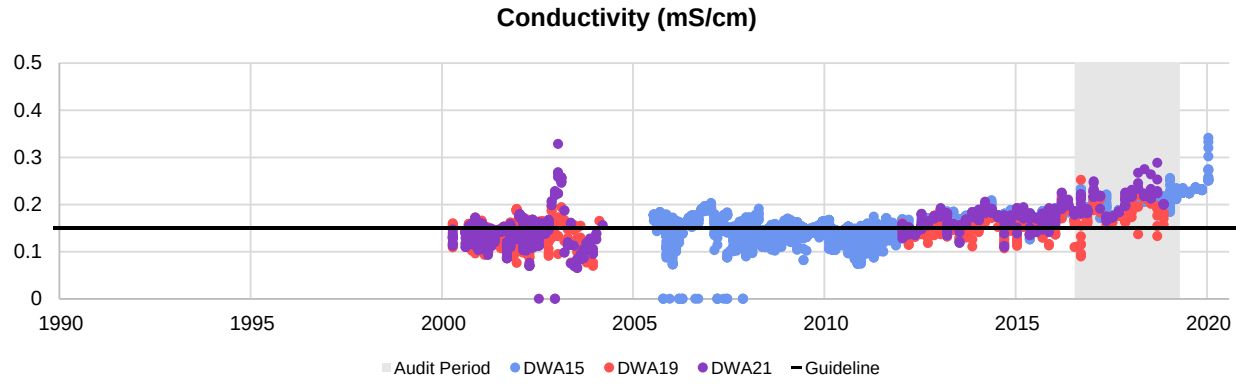

Total Phosphorus (mg/L)
10
1
0.1
0.01
0.001
1990
1995
2000
2005
2010
2015
2020
Audit Period
E157
MMP76
R1
Guideline

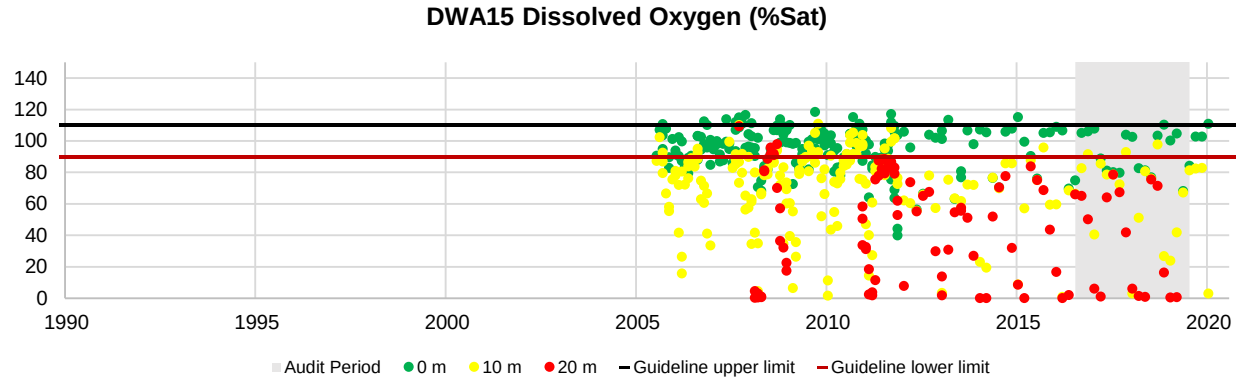

Phosphorus Soluble Reactive (mg/L)
0.12
0.1
0.08
0.06
0.04
0.02
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
E157
MMP76
R1
Guideline

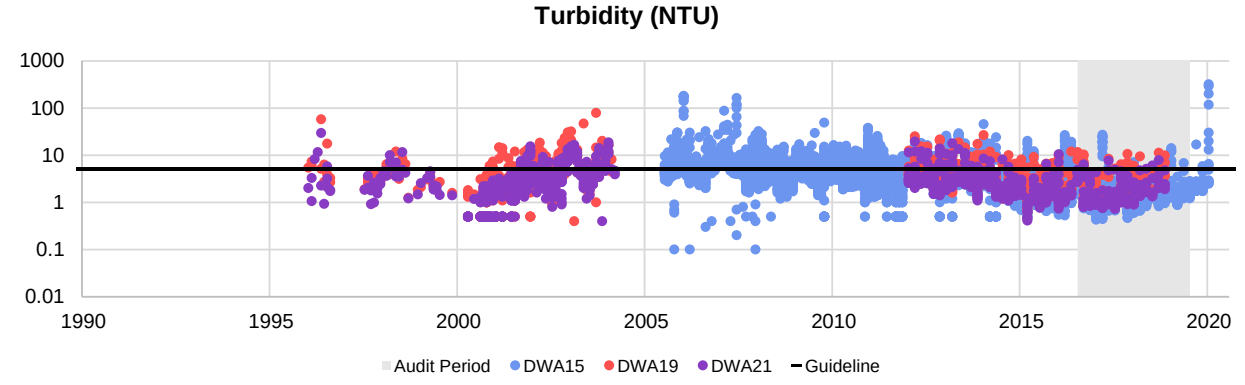

Total Aluminium (mg/L)
100
10
1
0.1
0.01
0.001
1990
1995
2000
2005
2010
2015
2020
Audit Period
E157
Guideline

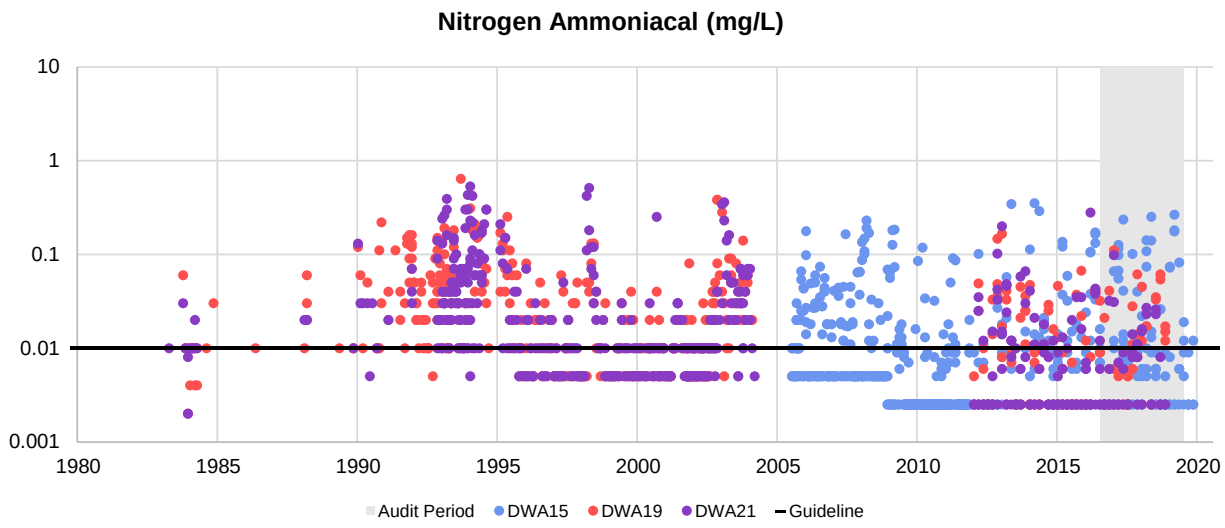

Total Iron (mg/L)
100
10
1
0.1
0.01
0.001
1990
1995
2000
2005
2010
2015
2020
Audit Period
E157
Guideline

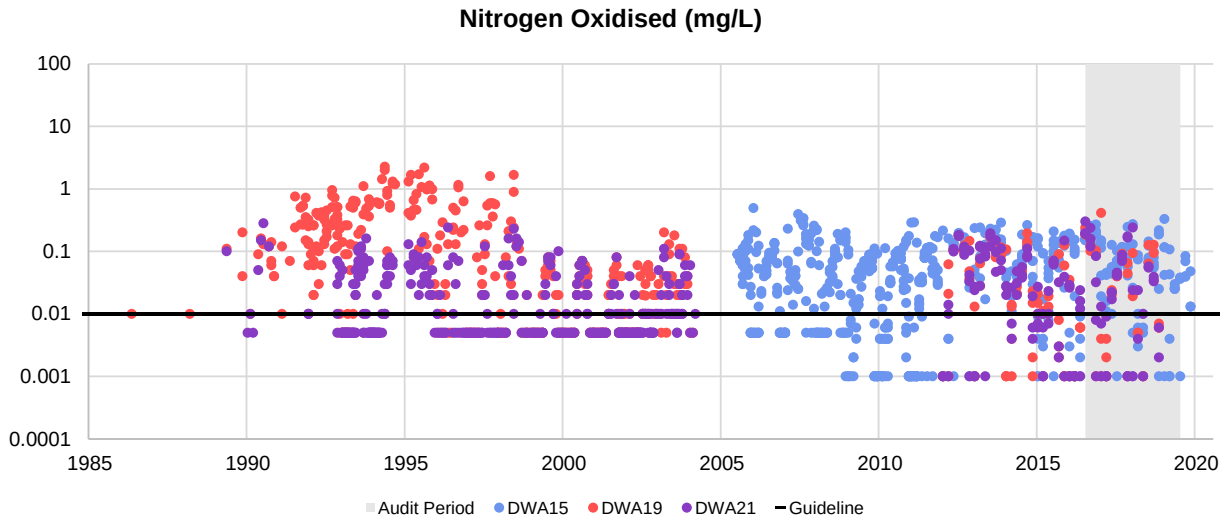

pH
12
11
10
9
8
7
6
5
4
3
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
DWA15
DWA19
DWA21
Guideline lower limit
Guideline upper limit

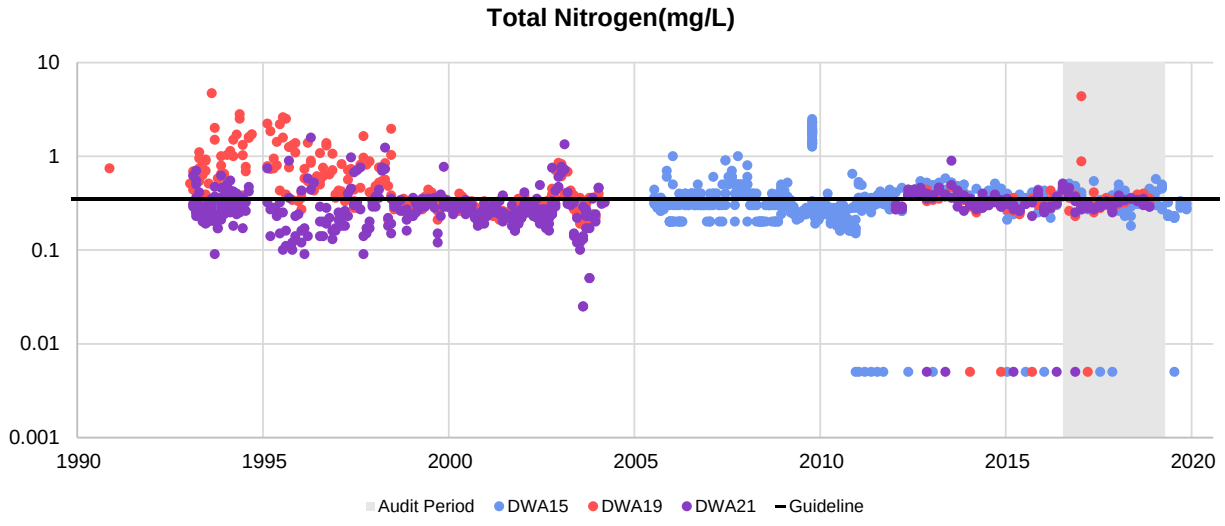

Conductivity (mS/cm)
0.5
0.4
0.3
0.2
0.1
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
DWA15
DWA19
DWA21
Guideline

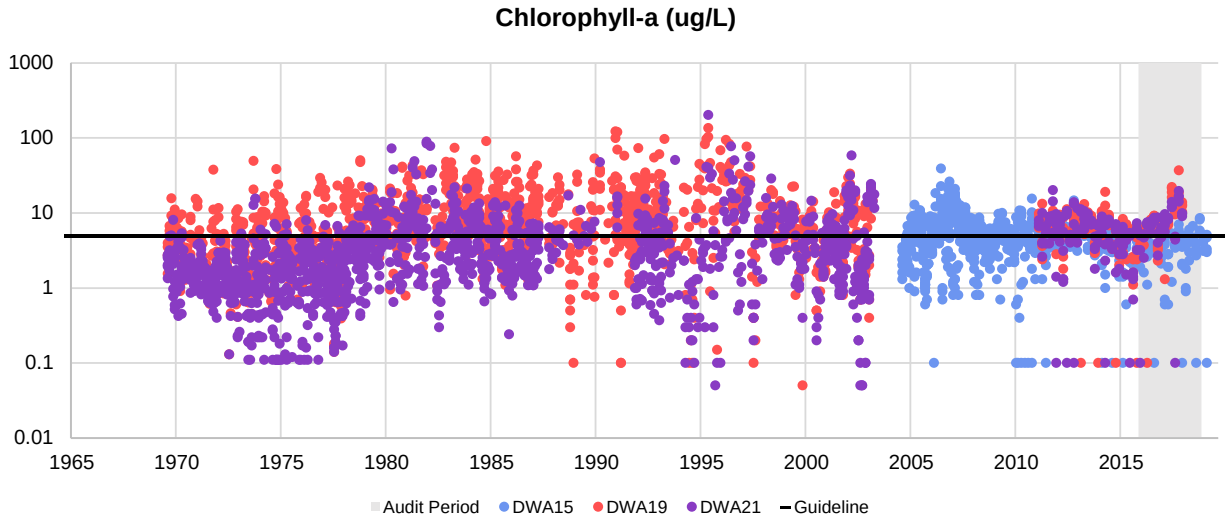

DWA15 Dissolved Oxygen (%Sat)
140
120
100
80
60
40
20
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
0 m
10 m
20 m
Guideline upper limit
Guideline lower limit

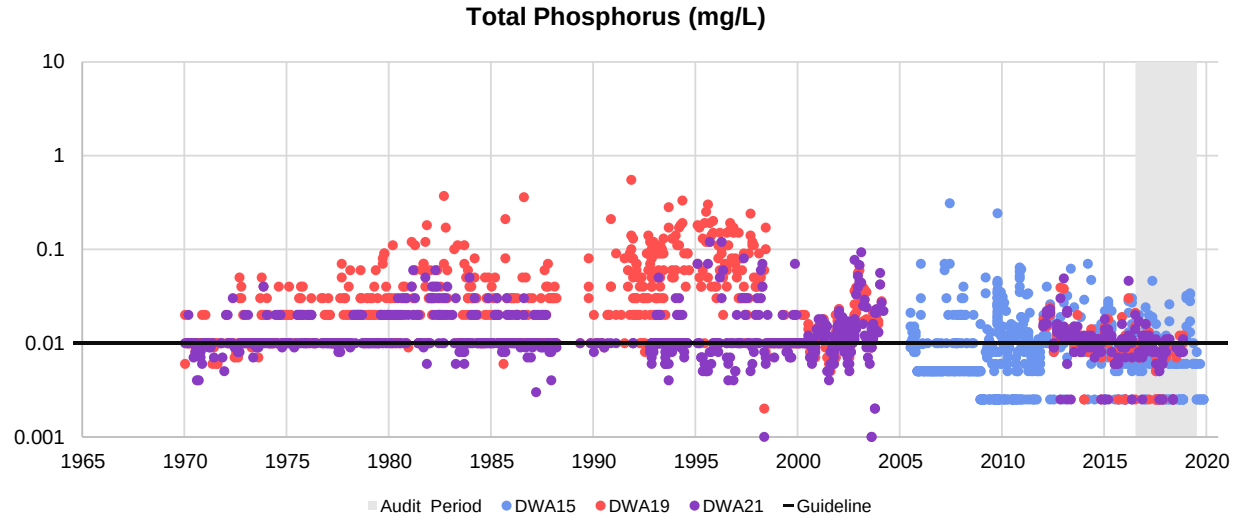

Turbidity (NTU)
1000
100
10
1
0.1
0.01
1990
1995
2000
2005
2010
2015
2020
Audit Period
DWA15
DWA19
DWA21
Guideline

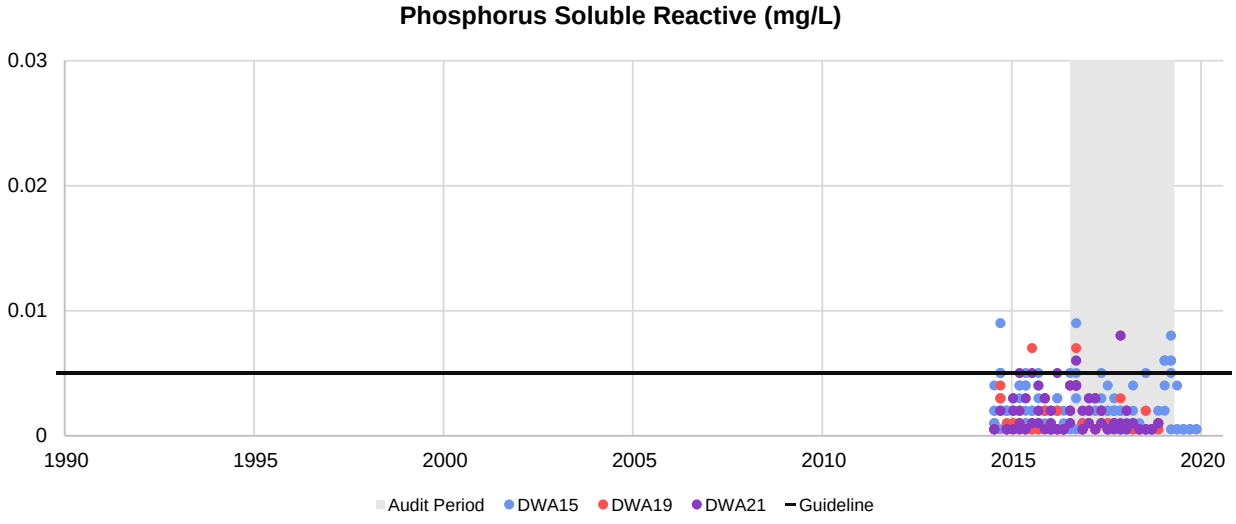

Nitrogen Ammoniacal (mg/L)
10
1
0.1
0.01
0.001
1980
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
DWA15
DWA19
DWA21
Guideline

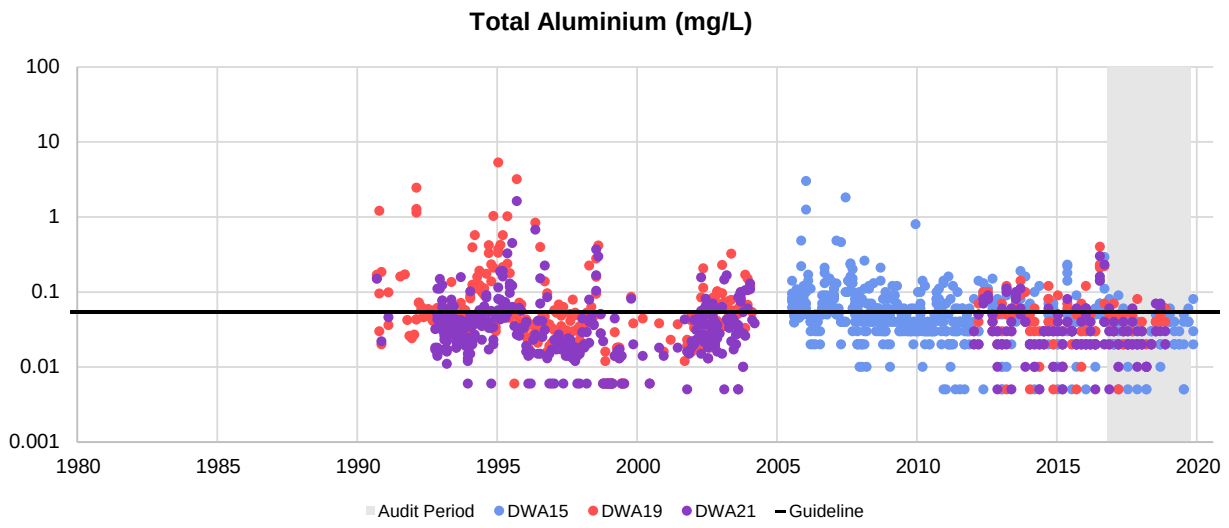

Nitrogen Oxidised (mg/L)
100
10
1
0.1
0.01
0.001
0.0001
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
DWA15
DWA19
DWA21
Guideline

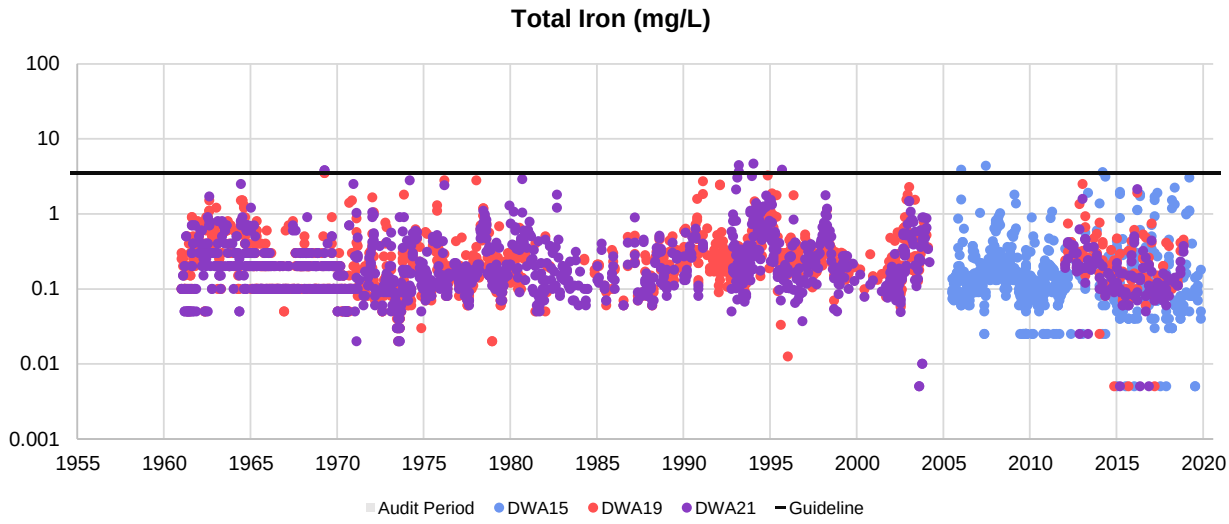

Total Nitrogen(mg/L)
10
1
0.1
0.01
0.001
1990
1995
2000
2005
2010
2015
2020
Audit Period
DWA15
DWA19
DWA21
Guideline


Chlorophyll-a (ug/L)
1000
100
10
1
0.1
0.01
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
Audit Period
DWA15
DWA19
DWA21
Guideline


Total Phosphorus (mg/L)
10
1
0.1
0.01
0.001
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
DWA15
DWA19
DWA21
Guideline

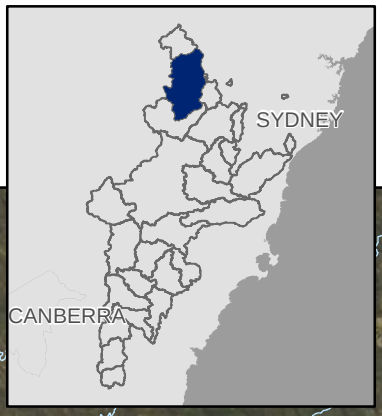

Phosphorus Soluble Reactive (mg/L)
0.03
0.02
0.01
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
DWA15
DWA19
DWA21
Guideline

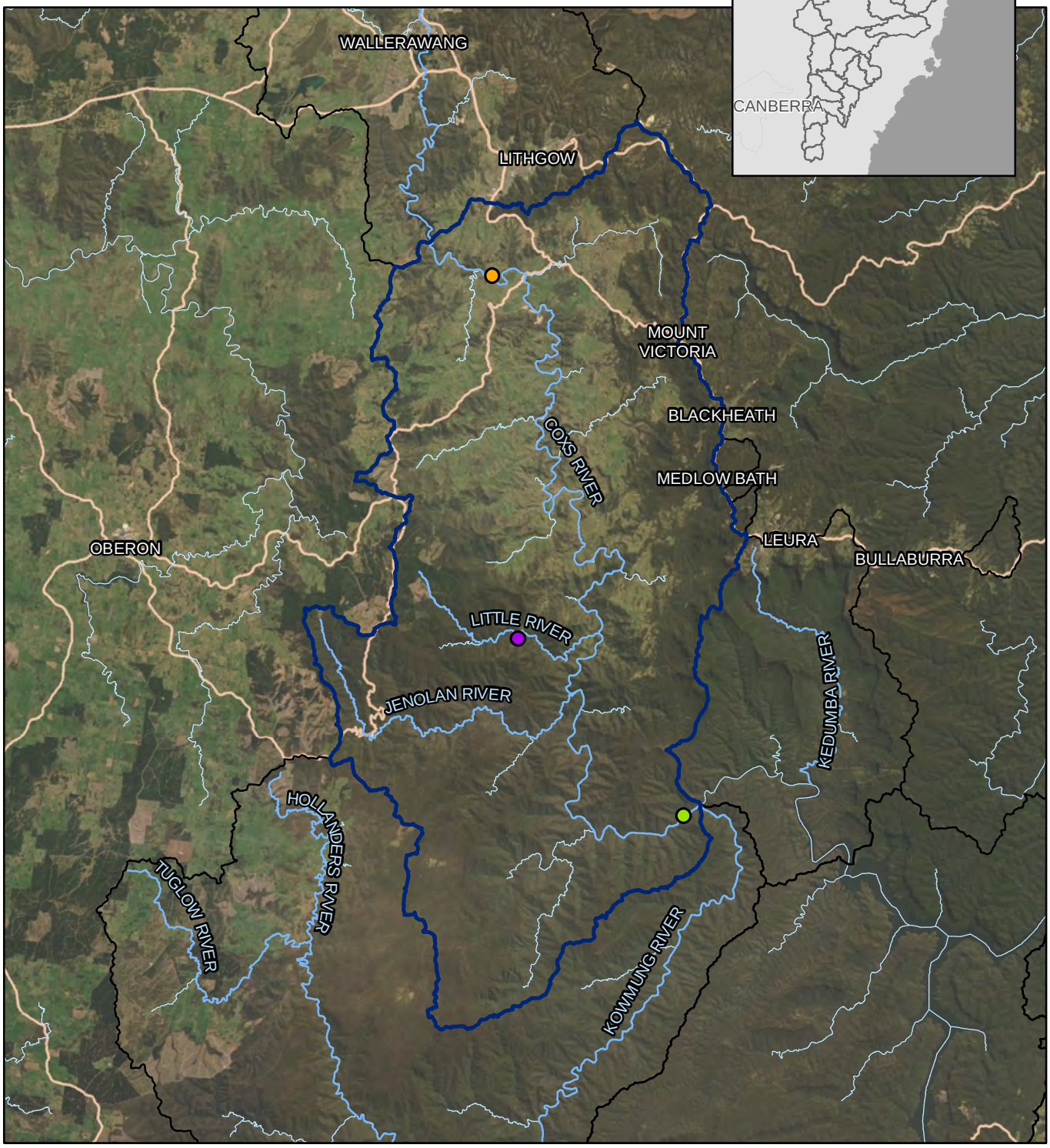

Total Aluminium (mg/L)
100
10
1
0.1
0.01
0.001
1980
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
DWA15
DWA19
DWA21
Guideline


Total Iron (mg/L)
100
10
1
0.1
0.01
0.001
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
DWA15
DWA19
DWA21
Guideline

MID COXS RIVER

CATCHMENT





Legend

- Sub Catchment Boundary
- Major Roads

Water Quality Monitoring Stations

- E083
- MMP37
- MMP55

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

0 6,000 12,000

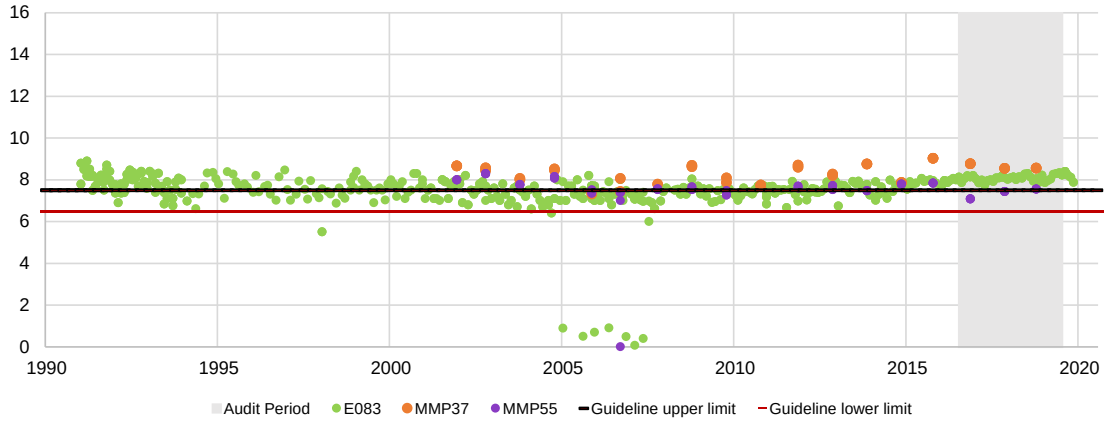
Metres

Datum/Projection:
GDA 1994 MGA Zone 56

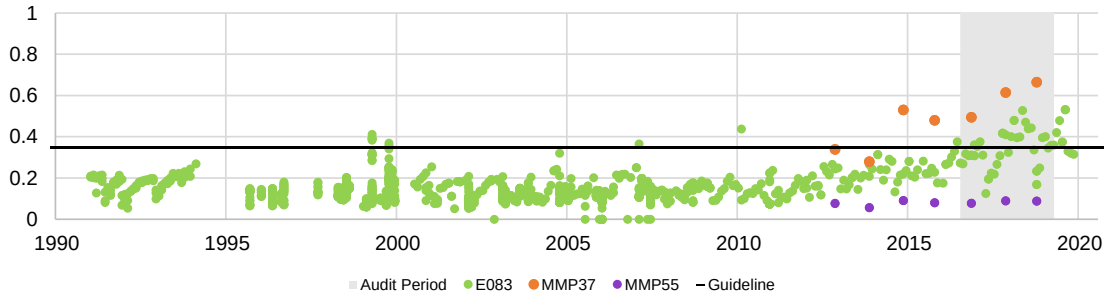
N

Prepared by: SC Date: 18/03/2020

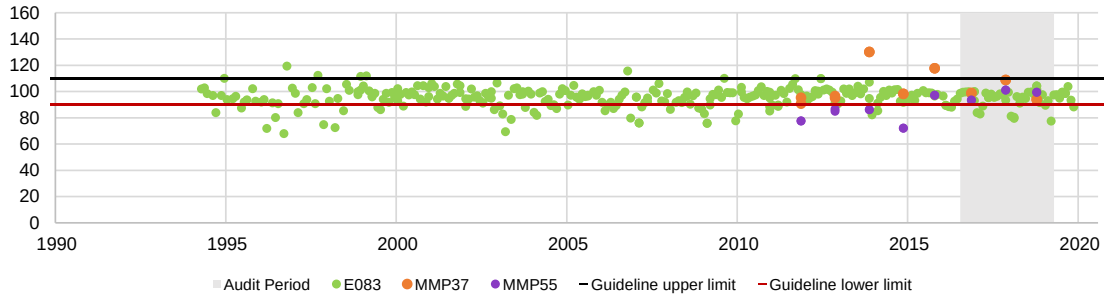
pH



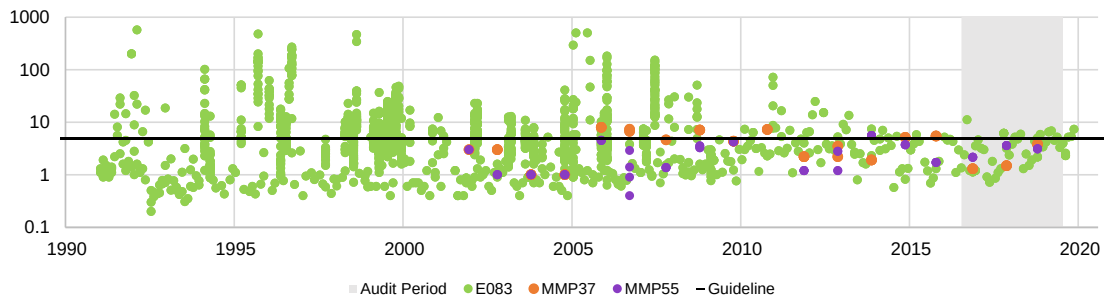
Conductivity (mS/cm)

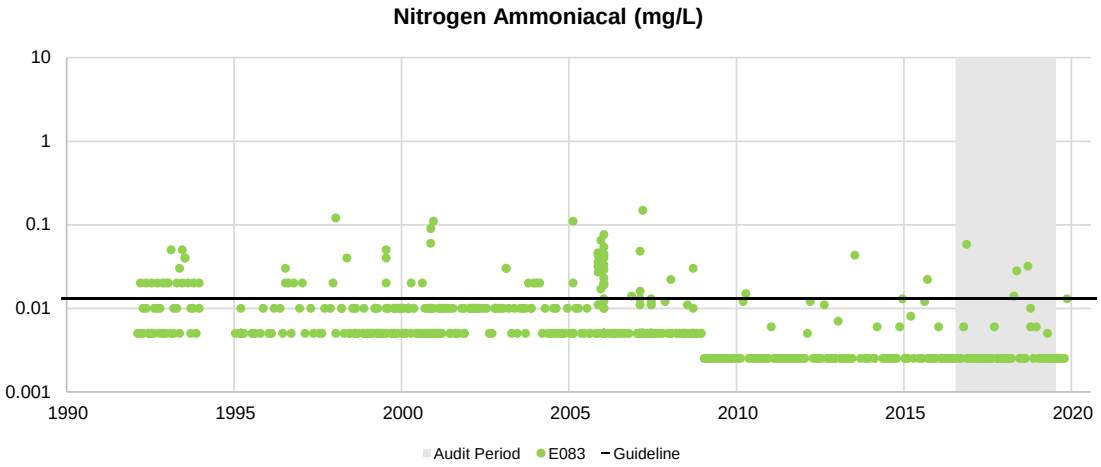


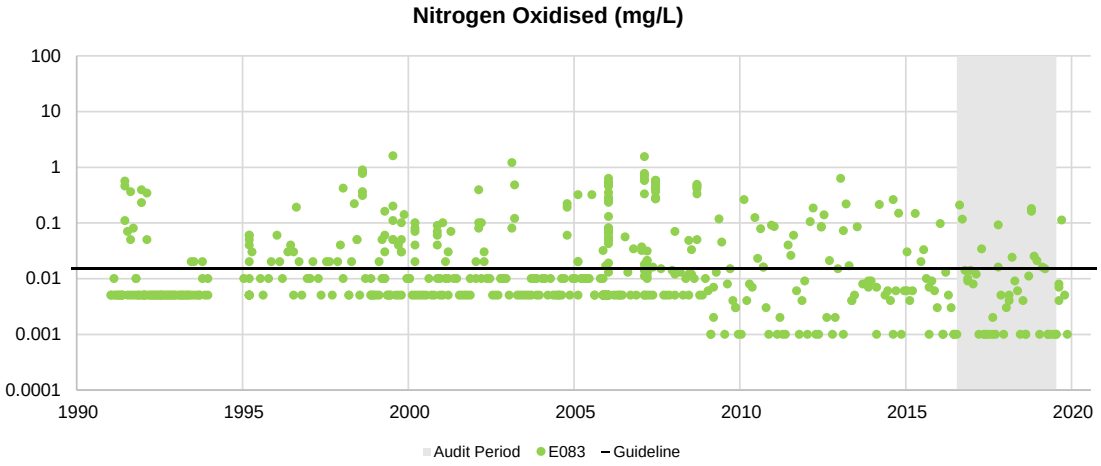
Dissolved Oxygen (%Sat)

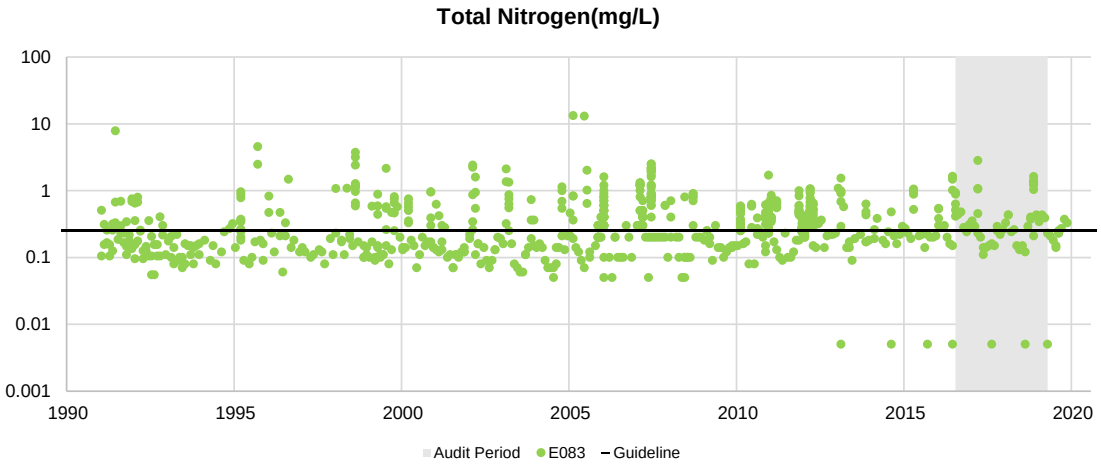


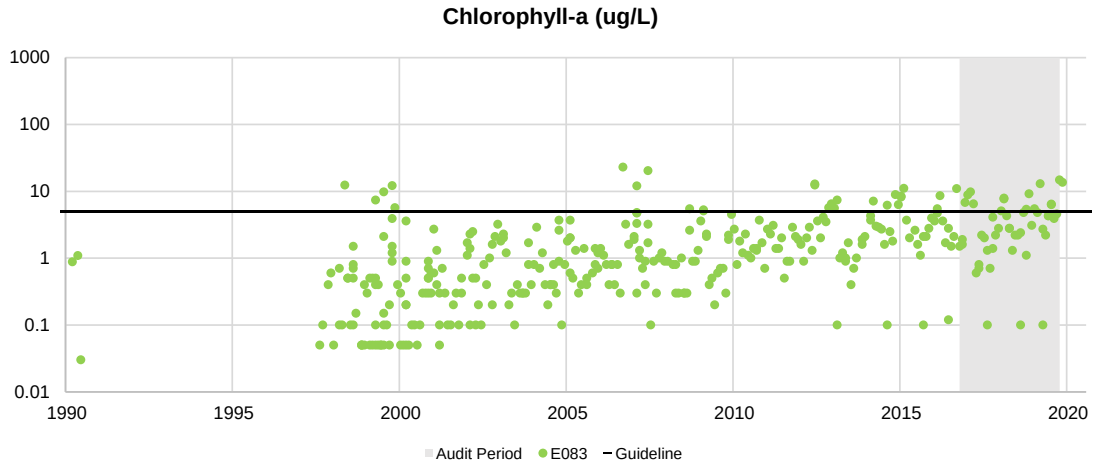
Turbidity (NTU)

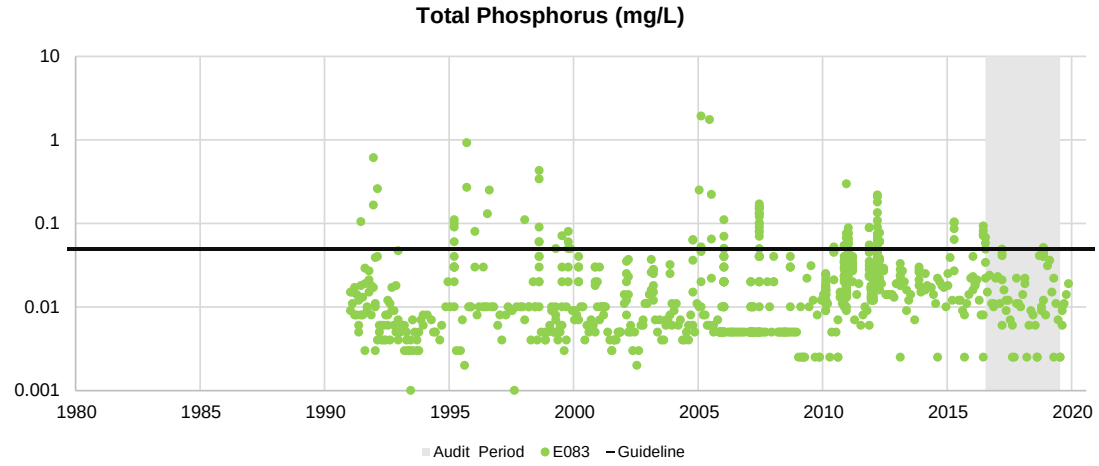


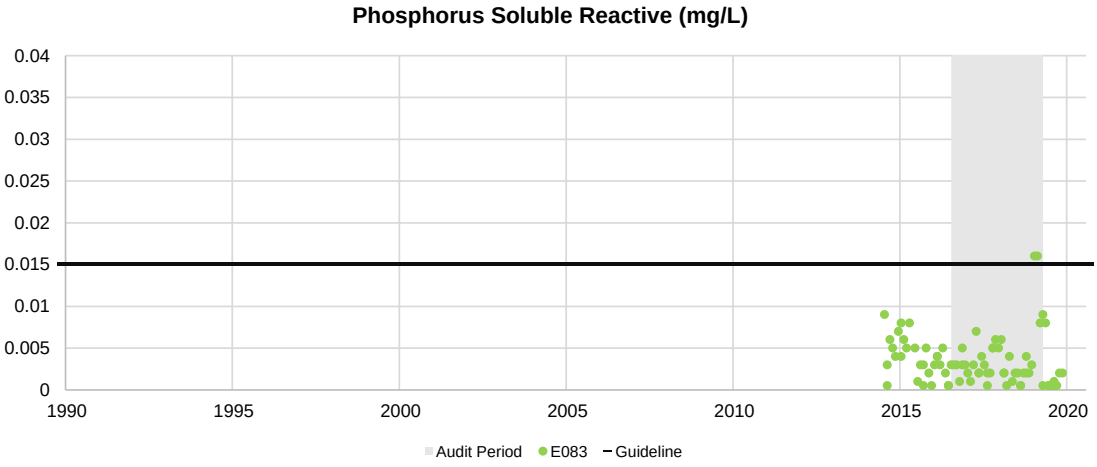

Nitrogen Ammoniacal (mg/L)
10
1
0.1
0.01
0.001
1990
1995
2000
2005
2010
2015
2020
Audit Period
E083
Guideline

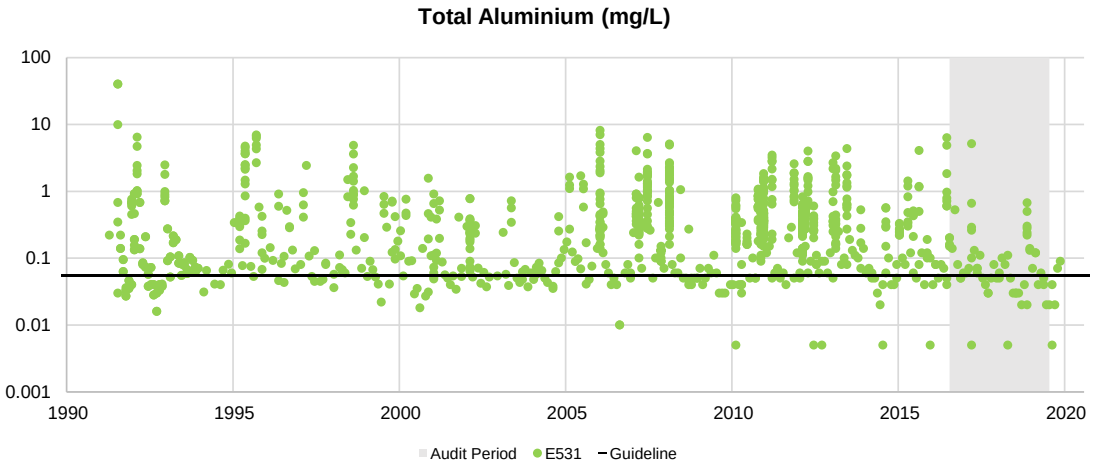

Nitrogen Oxidised (mg/L)
100
10
1
0.1
0.01
0.001
0.0001
1990
1995
2000
2005
2010
2015
2020
Audit Period
E083
Guideline

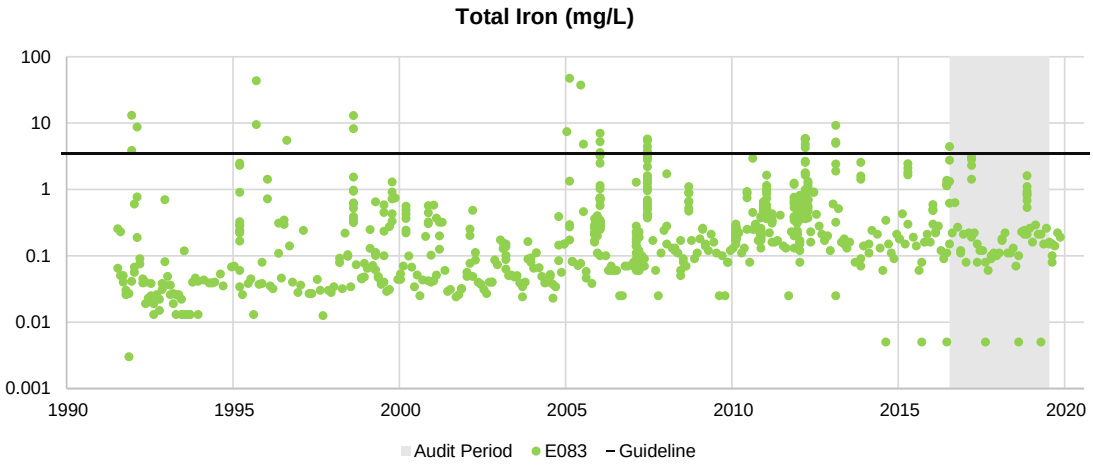

Total Nitrogen(mg/L)
100
10
1
0.1
0.01
0.001
1990
1995
2000
2005
2010
2015
2020
Audit Period
E083
Guideline


Chlorophyll-a (ug/L)
1000
100
10
1
0.1
0.01
1990
1995
2000
2005
2010
2015
2020
Audit Period
E083
Guideline


Total Phosphorus (mg/L)
10
1
0.1
0.01
0.001
1980
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
E083
Guideline

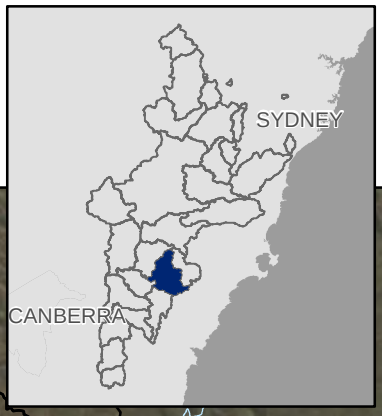

Phosphorus Soluble Reactive (mg/L)
0.04
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
E083
Guideline

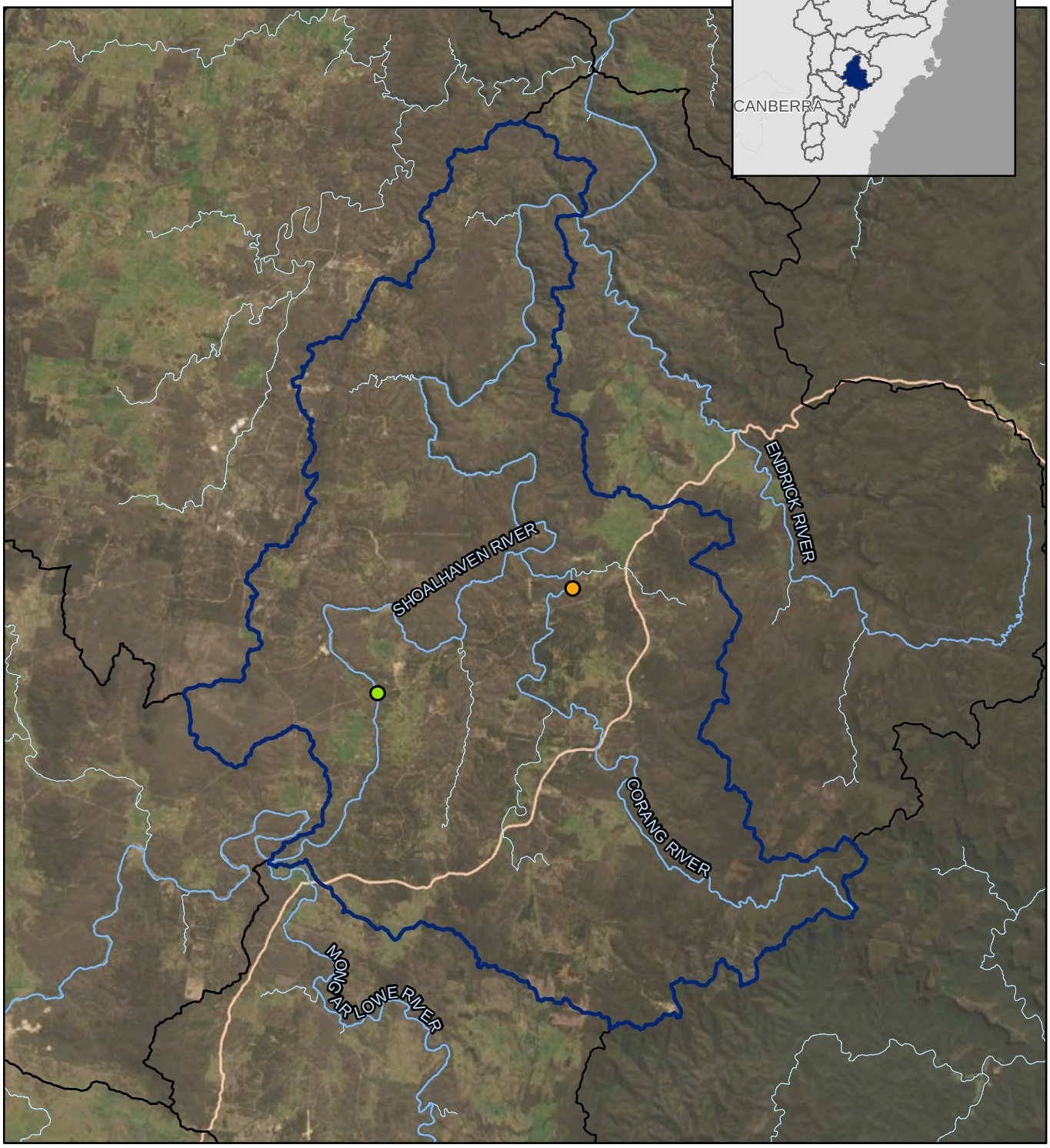

Total Aluminium (mg/L)
100
10
1
0.1
0.01
0.001
1990
1995
2000
2005
2010
2015
2020
Audit Period
E531
Guideline


Total Iron (mg/L)
100
10
1
0.1
0.01
0.001
1990
1995
2000
2005
2010
2015
2020
Audit Period
E083
Guideline

MID SHOALHAVEN RIVER

CATCHMENT





Legend

- Sub Catchment Boundary
- Major Roads

Water Quality Monitoring Stations

- E8311
- E861

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

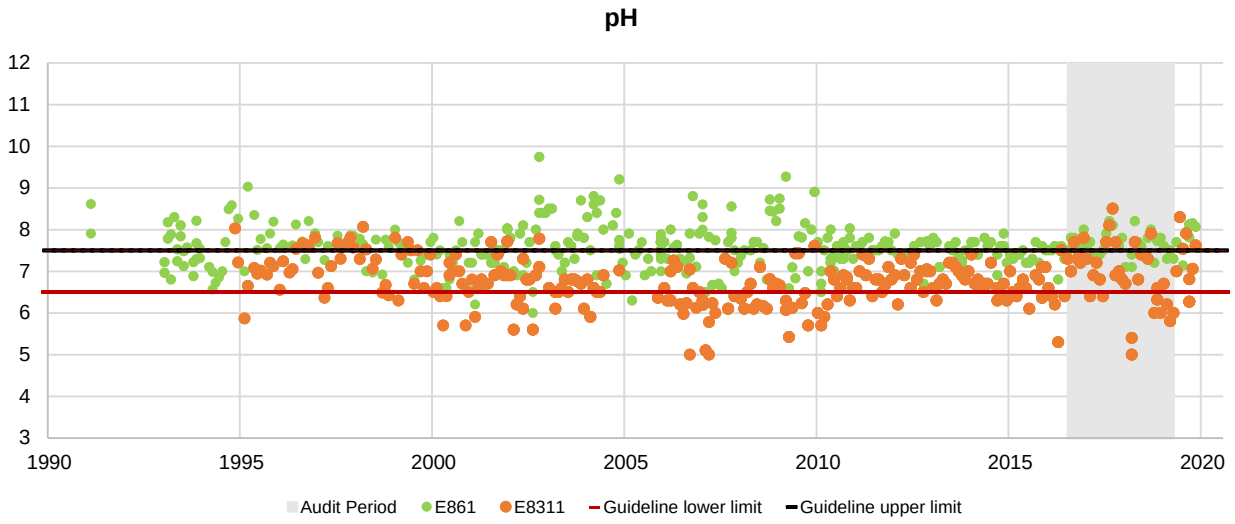
0 3,950 7,900

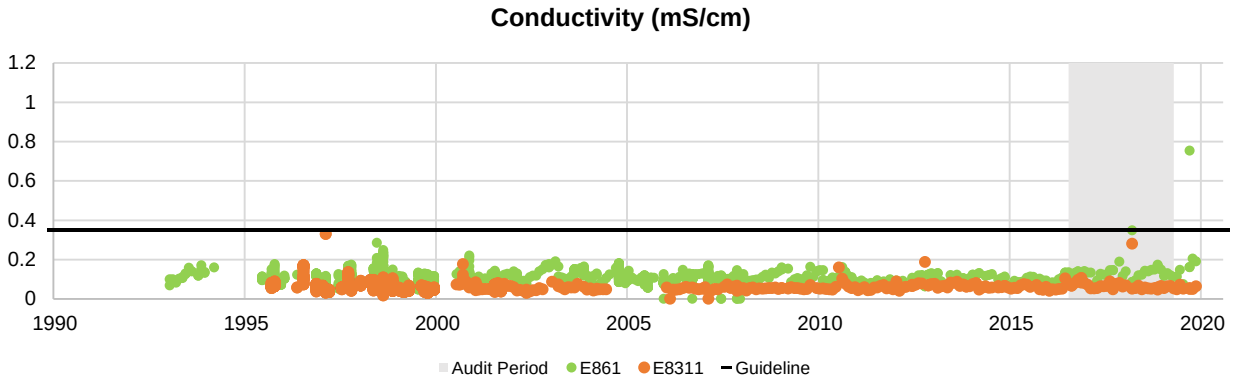
Metres

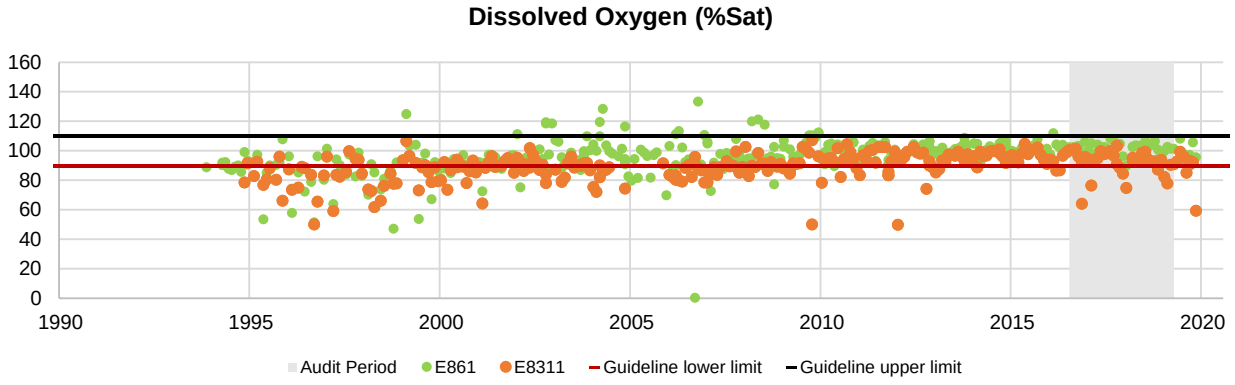
Datum/Projection:
GDA 1994 MGA Zone 56

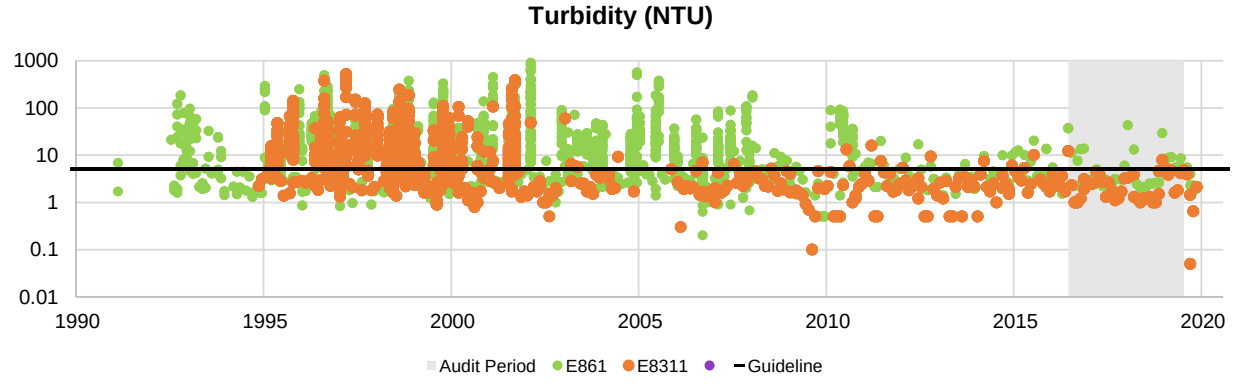
N

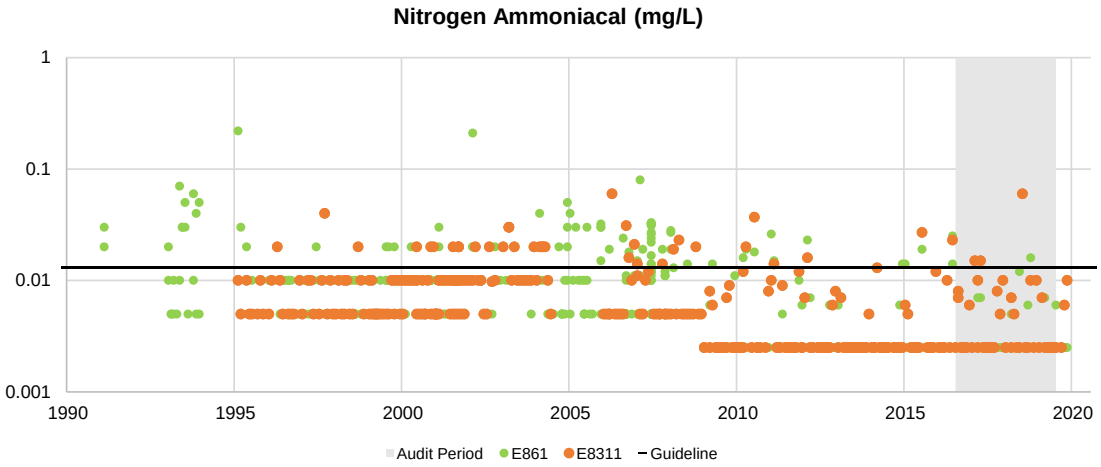
Prepared by: SC Date: 18/03/2020

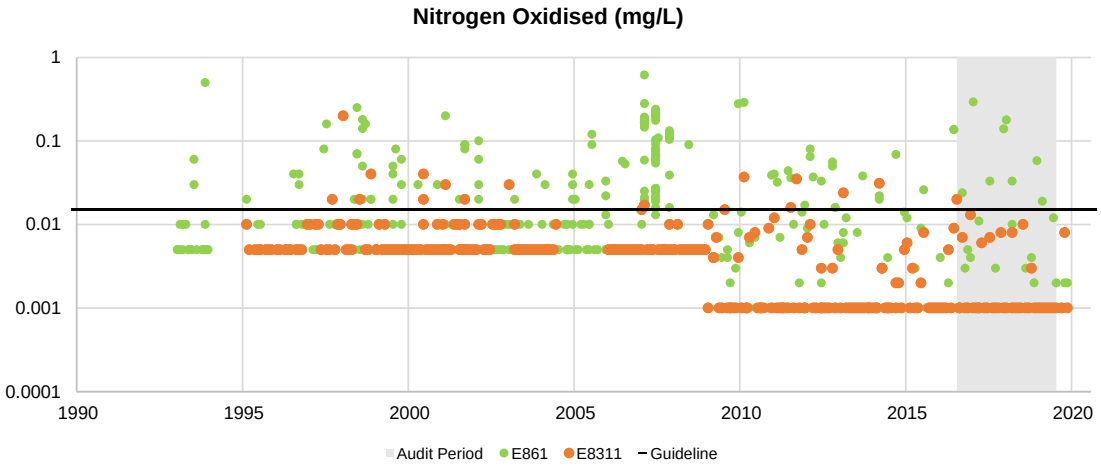

pH
12
11
10
9
8
7
6
5
4
3
1990
1995
2000
2005
2010
2015
2020
Audit Period
E861
E8311
Guideline lower limit
Guideline upper limit

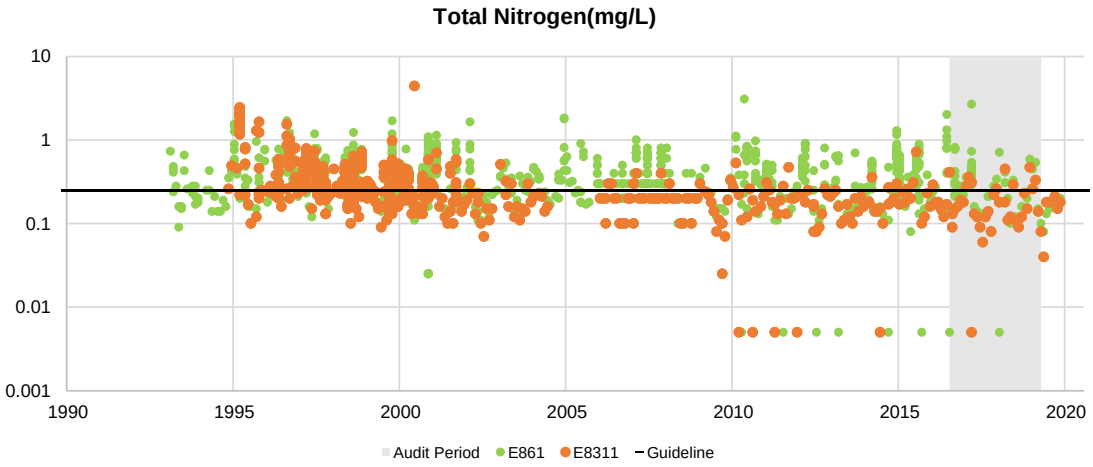

Conductivity (mS/cm)
1.2
1
0.8
0.6
0.4
0.2
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
E861
E8311
Guideline

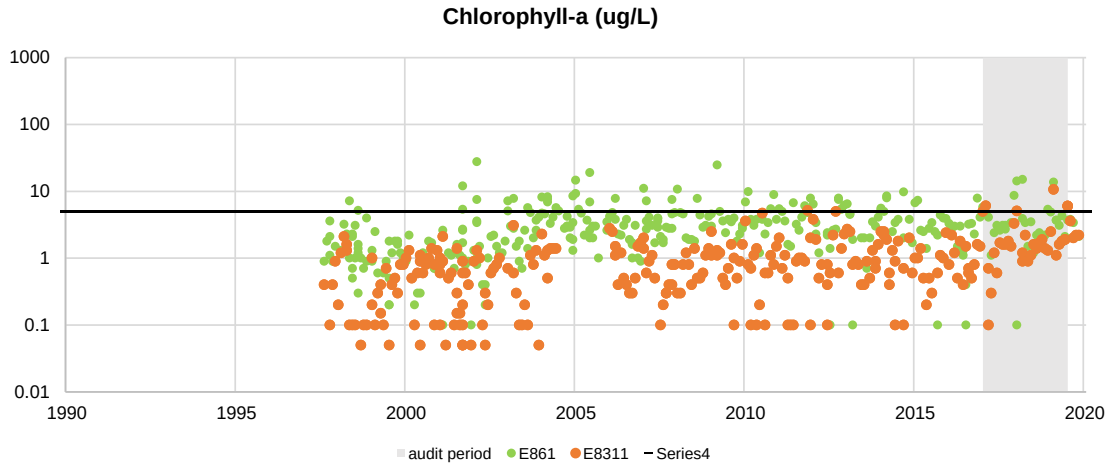

Dissolved Oxygen (%Sat)
160
140
120
100
80
60
40
20
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
E861
E8311
Guideline lower limit
Guideline upper limit

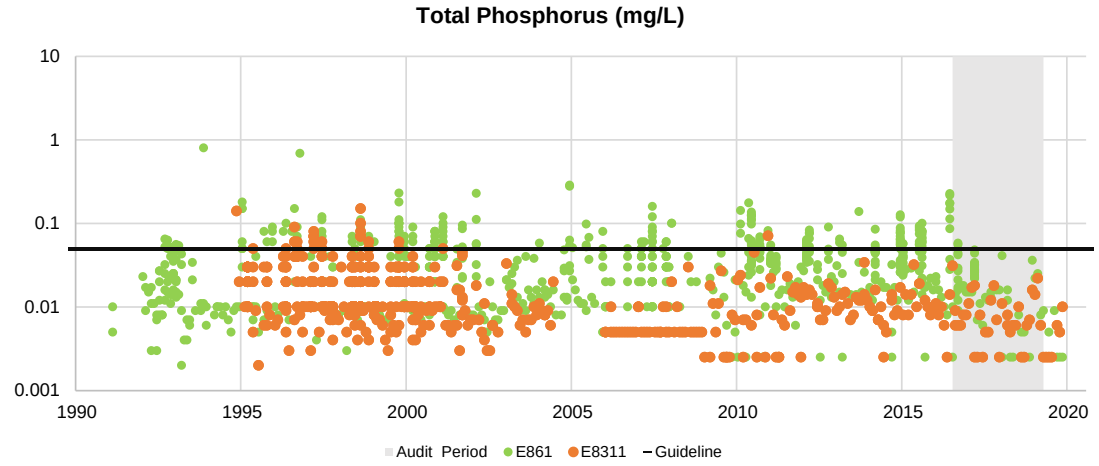

Turbidity (NTU)
1000
100
10
1
0.1
0.01
1990
1995
2000
2005
2010
2015
2020
Audit Period
E861
E8311
Guideline

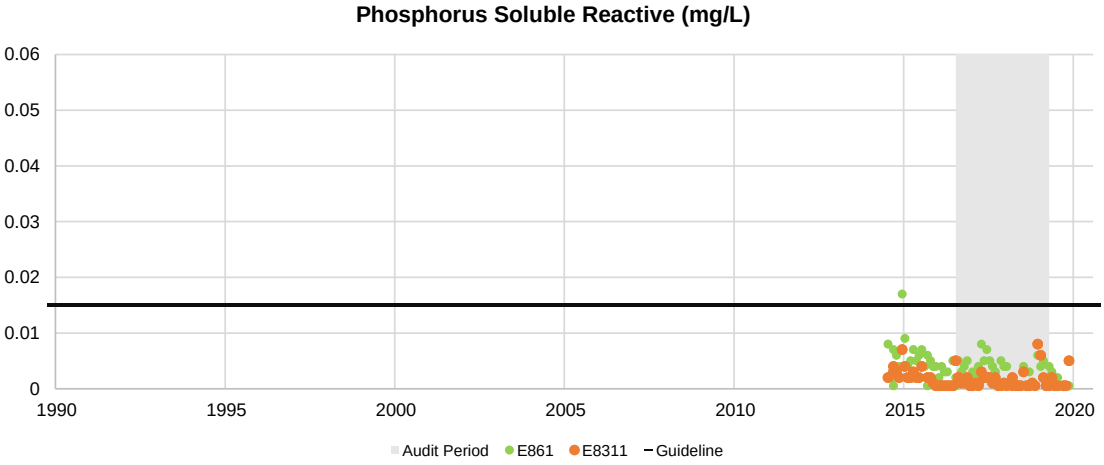

Nitrogen Ammoniacal (mg/L)
1
0.1
0.01
0.001
1990
1995
2000
2005
2010
2015
2020
Audit Period
E861
E8311
Guideline

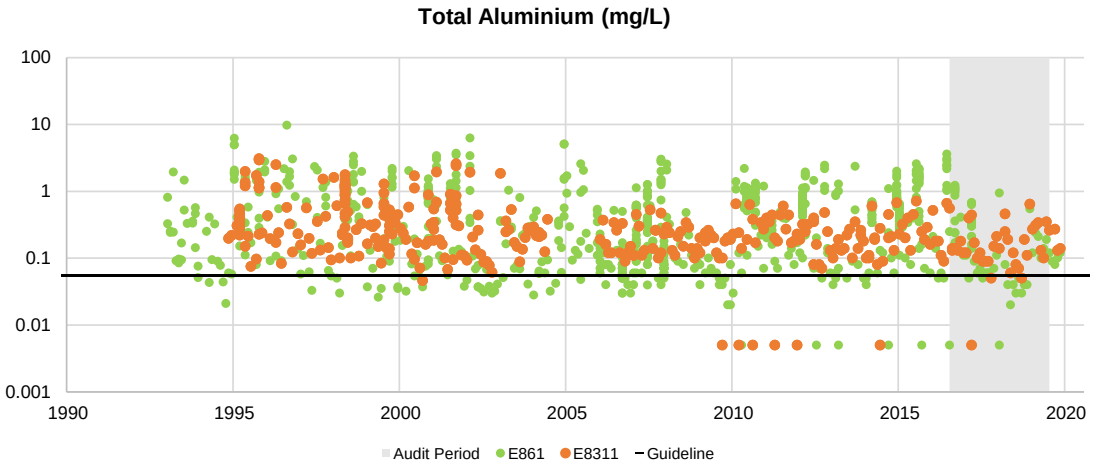

Nitrogen Oxidised (mg/L)
1
0.1
0.01
0.001
0.0001
1990
1995
2000
2005
2010
2015
2020
Audit Period
E861
E8311
Guideline

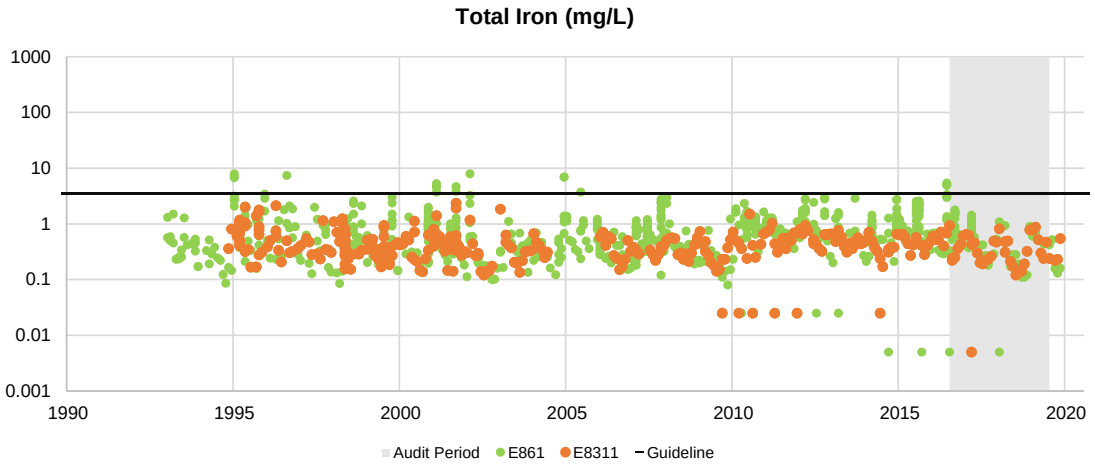

Total Nitrogen(mg/L)
10
1
0.1
0.01
0.001
1990
1995
2000
2005
2010
2015
2020
Audit Period
E861
E8311
Guideline


Chlorophyll-a (ug/L)
1000
100
10
1
0.1
0.01
1990
1995
2000
2005
2010
2015
2020
audit period
E861
E8311
Series4


Total Phosphorus (mg/L)
10
1
0.1
0.01
0.001
1990
1995
2000
2005
2010
2015
2020
Audit Period
E861
E8311
Guideline

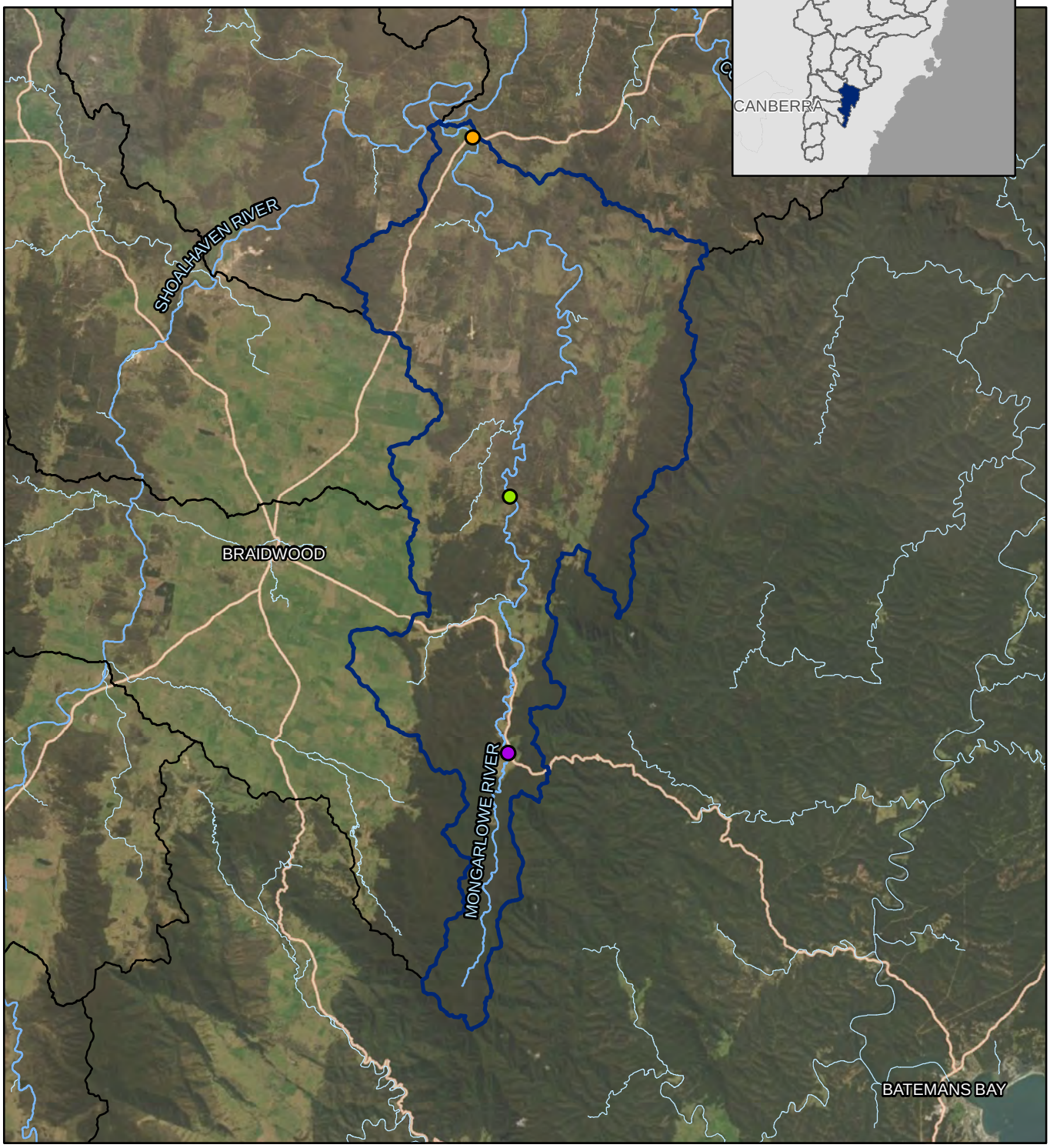

Phosphorus Soluble Reactive (mg/L)
0.06
0.05
0.04
0.03
0.02
0.01
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
E861
E8311
Guideline


Total Aluminium (mg/L)
100
10
1
0.1
0.01
0.001
1990
1995
2000
2005
2010
2015
2020
Audit Period
E861
E8311
Guideline


Total Iron (mg/L)
1000
100
10
1
0.1
0.01
0.001
1990
1995
2000
2005
2010
2015
2020
Audit Period
E861
E8311
Guideline

MONGARLOWE RIVER

CATCHMENT



Legend

- Sub Catchment Boundary
- Major Roads

Water Quality Monitoring Stations

- E822
- Mong1
- R13

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

0 4,875 9,750

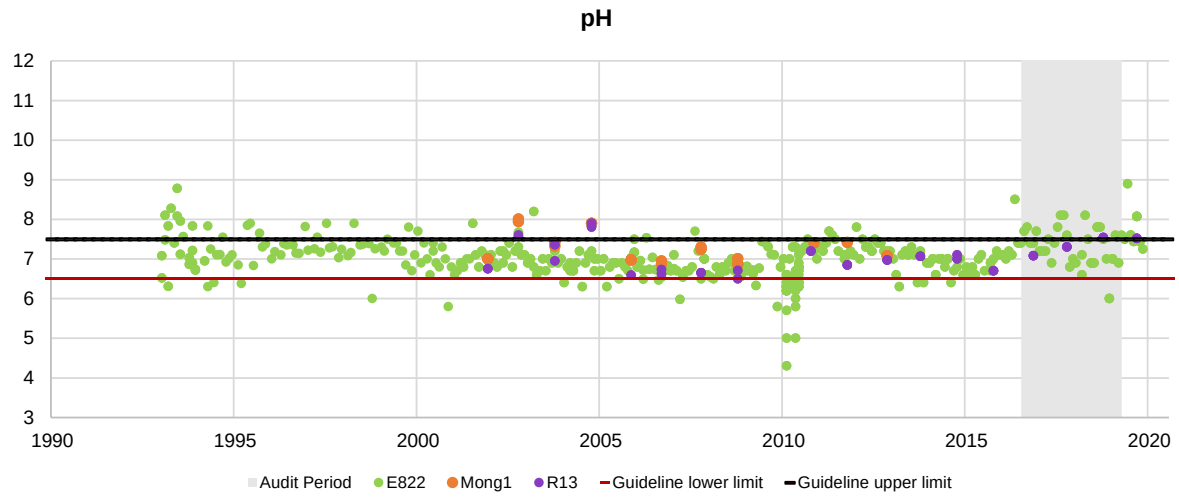
Metres

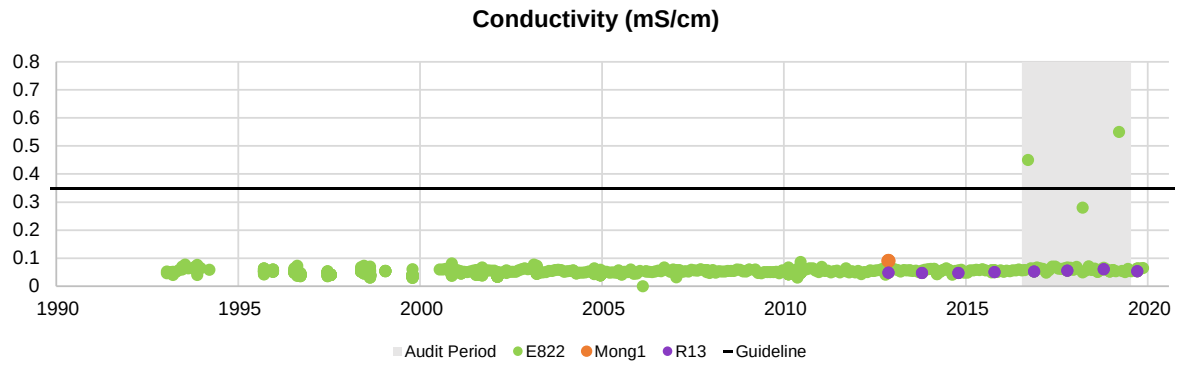
Datum/Projection:
GDA 1994 MGA Zone 56

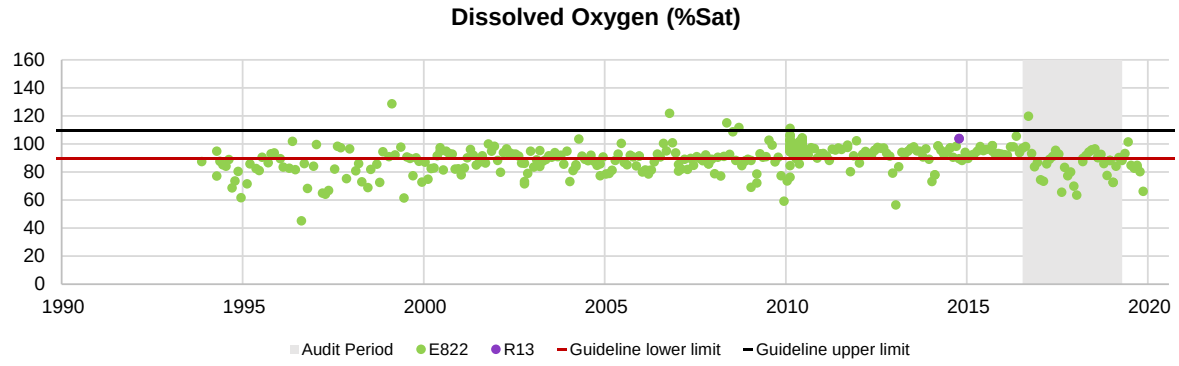
N

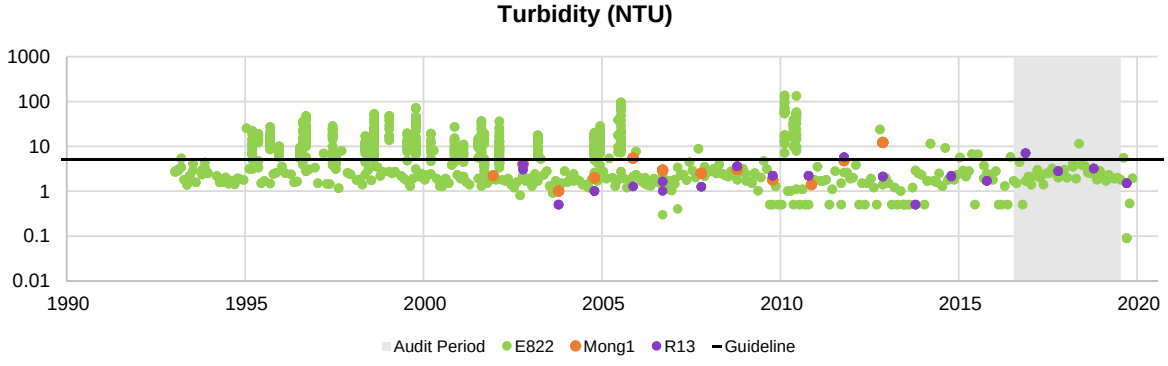
eco logical AUSTRALIA A TETRA TECH COMPANY

Prepared by: SC Date: 18/03/2020


pH
12
11
10
9
8
7
6
5
4
3
1990
1995
2000
2005
2010
2015
2020
Audit Period
E822
Mong1
R13
Guideline lower limit
Guideline upper limit

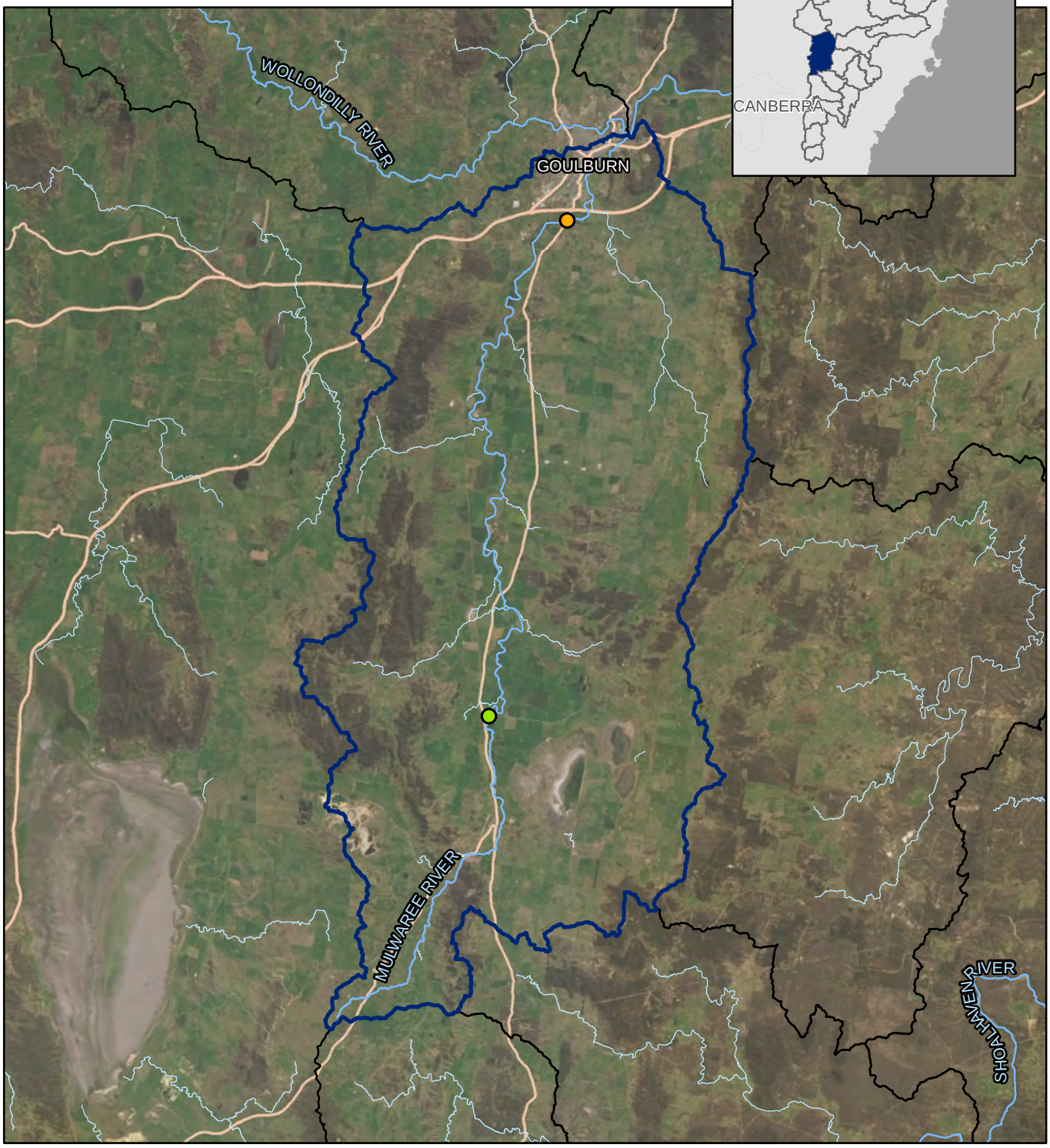

Conductivity (mS/cm)
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
E822
Mong1
R13
Guideline


Dissolved Oxygen (%Sat)
160
140
120
100
80
60
40
20
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
E822
R13
Guideline lower limit
Guideline upper limit


Turbidity (NTU)
1000
100
10
1
0.1
0.01
1990
1995
2000
2005
2010
2015
2020
Audit Period
E822
Mong1
R13
Guideline

MULWAREE RIVER

CATCHMENT



Legend

- Sub Catchment Boundary
- Major Roads

Water Quality Monitoring Stations

- A5
- E457

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

0 5,000 10,000

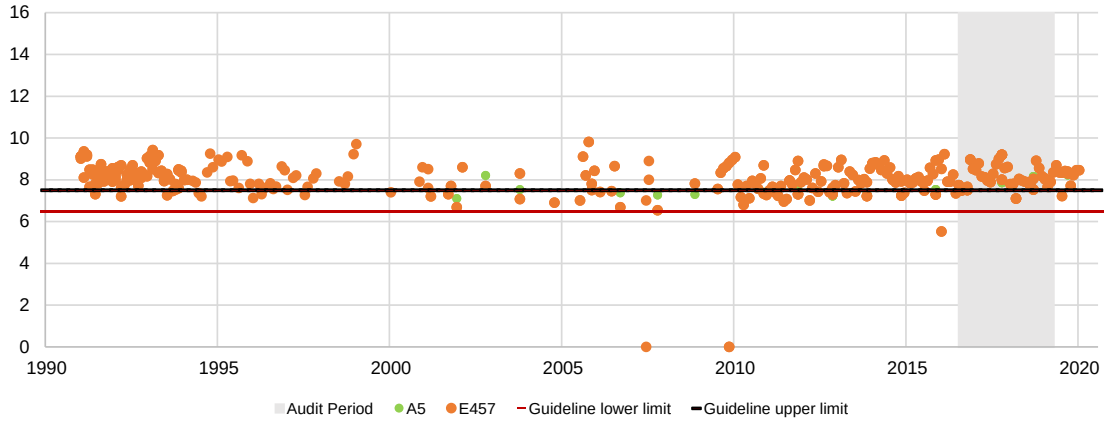
Metres

Datum/Projection:
GDA 1994 MGA Zone 56

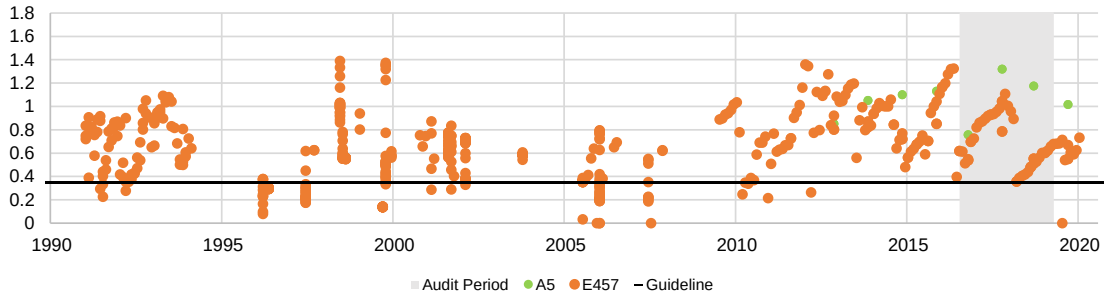
N

Prepared by: SC Date: 18/03/2020

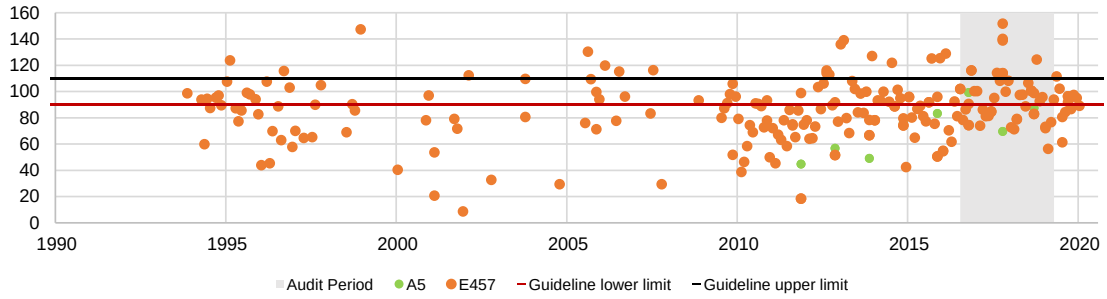
pH



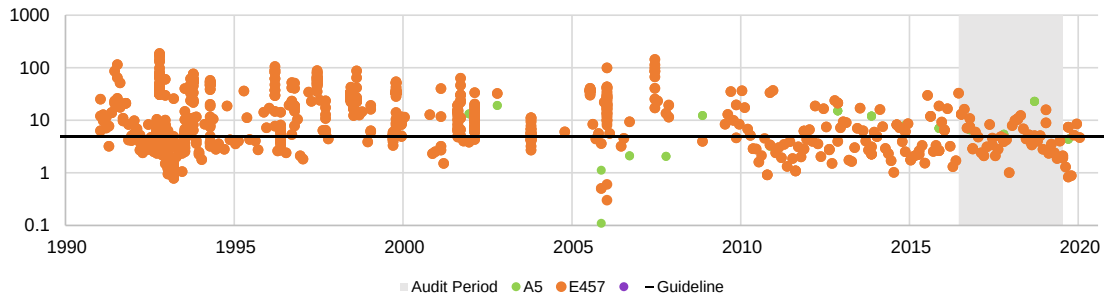
Conductivity (mS/cm)

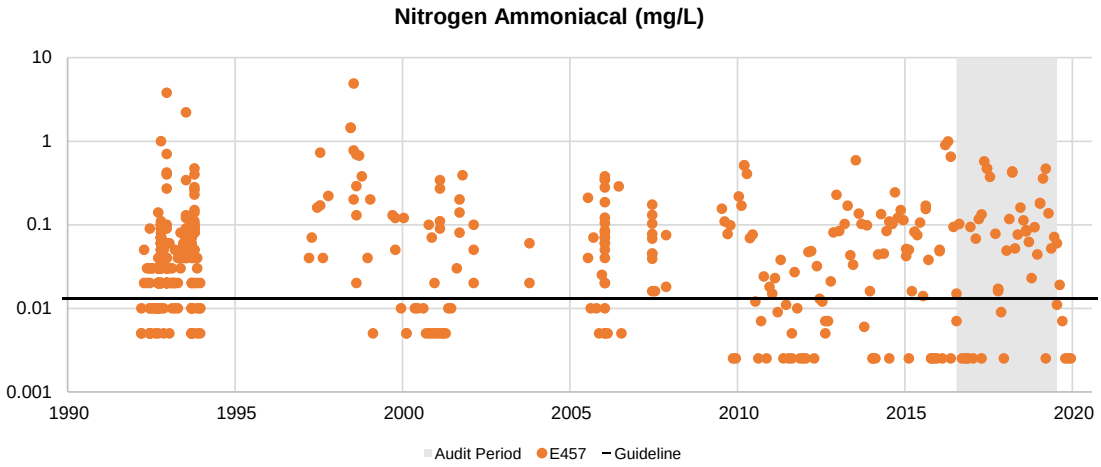


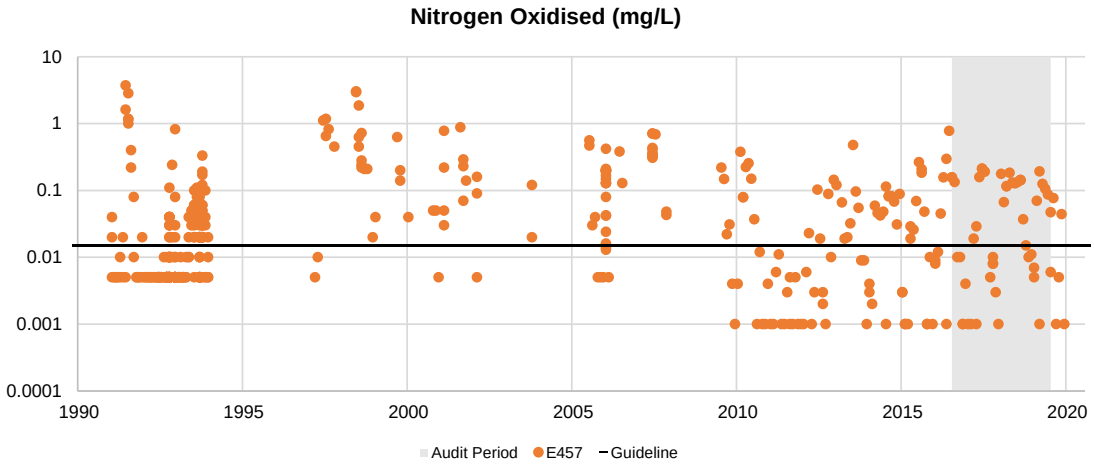
Dissolved Oxygen (%Sat)

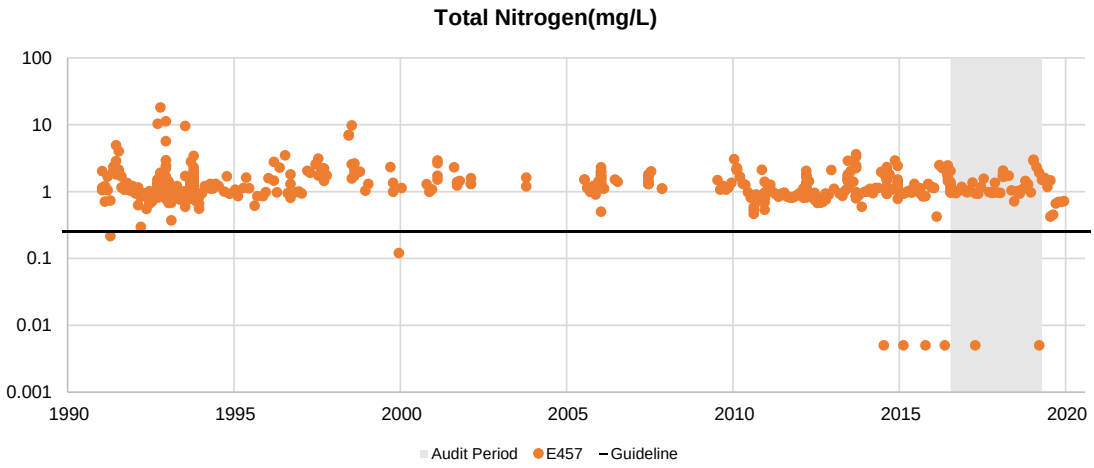


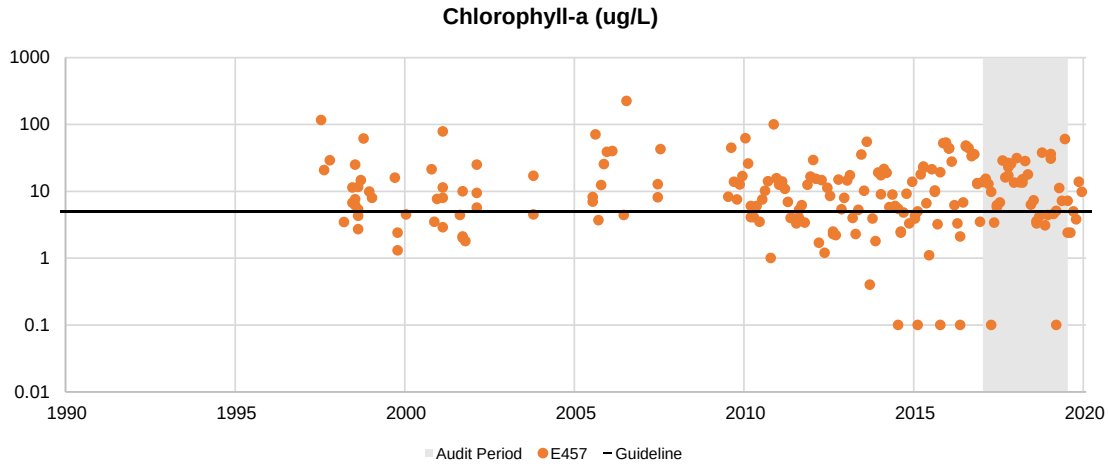
Turbidity (NTU)

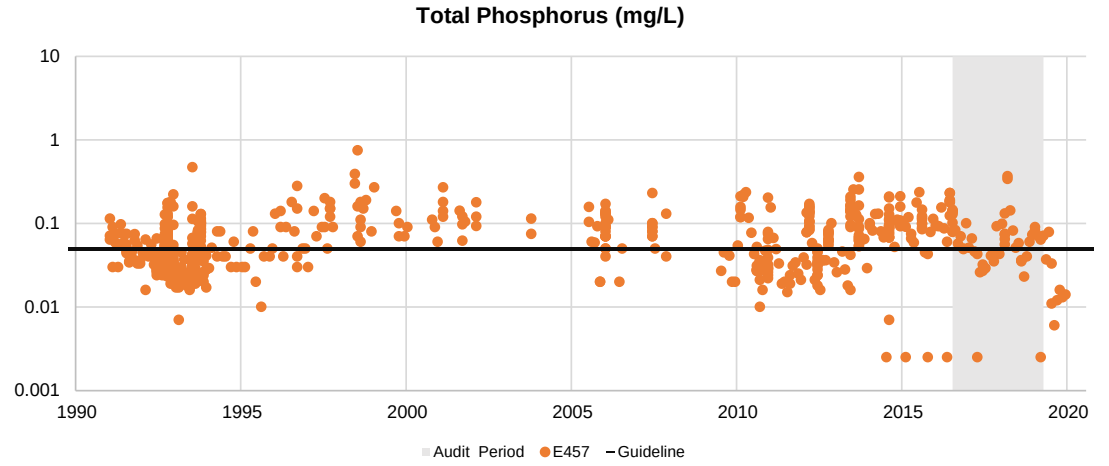


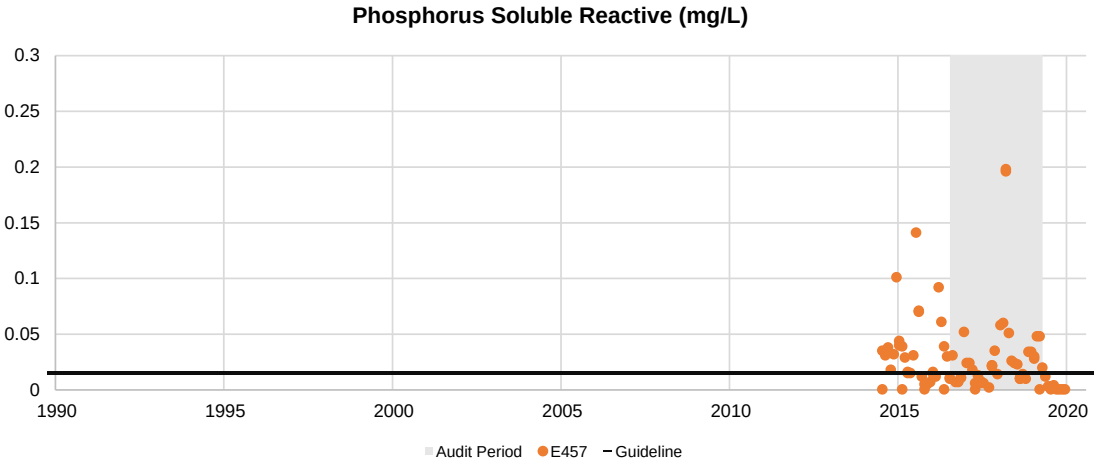

Nitrogen Ammoniacal (mg/L)
10
1
0.1
0.01
0.001
1990
1995
2000
2005
2010
2015
2020
Audit Period
E457
Guideline

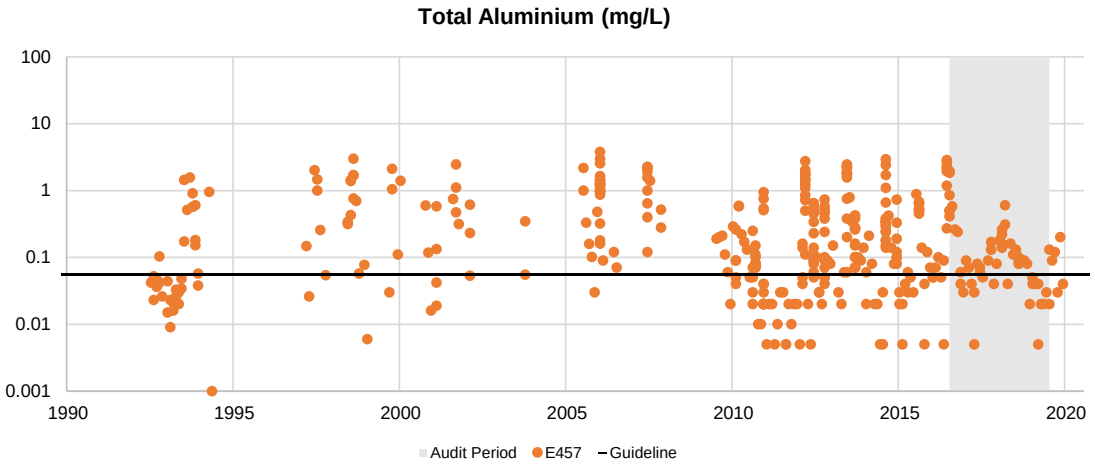

Nitrogen Oxidised (mg/L)
10
1
0.1
0.01
0.001
0.0001
1990
1995
2000
2005
2010
2015
2020
Audit Period
E457
Guideline

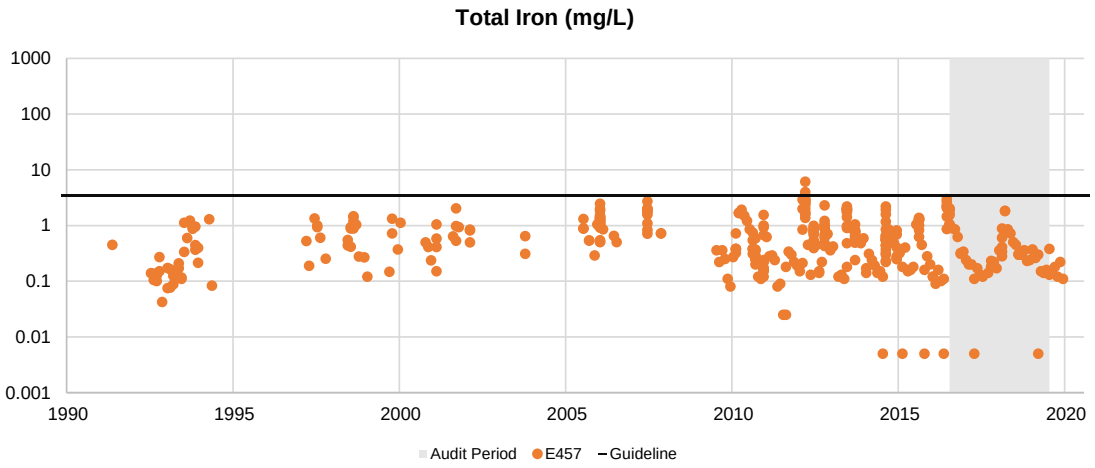

Total Nitrogen(mg/L)
100
10
1
0.1
0.01
0.001
1990
1995
2000
2005
2010
2015
2020
Audit Period
E457
Guideline


Chlorophyll-a (ug/L)
1000
100
10
1
0.1
0.01
1990
1995
2000
2005
2010
2015
2020
Audit Period
E457
Guideline


Total Phosphorus (mg/L)
10
1
0.1
0.01
0.001
1990
1995
2000
2005
2010
2015
2020
Audit Period
E457
Guideline

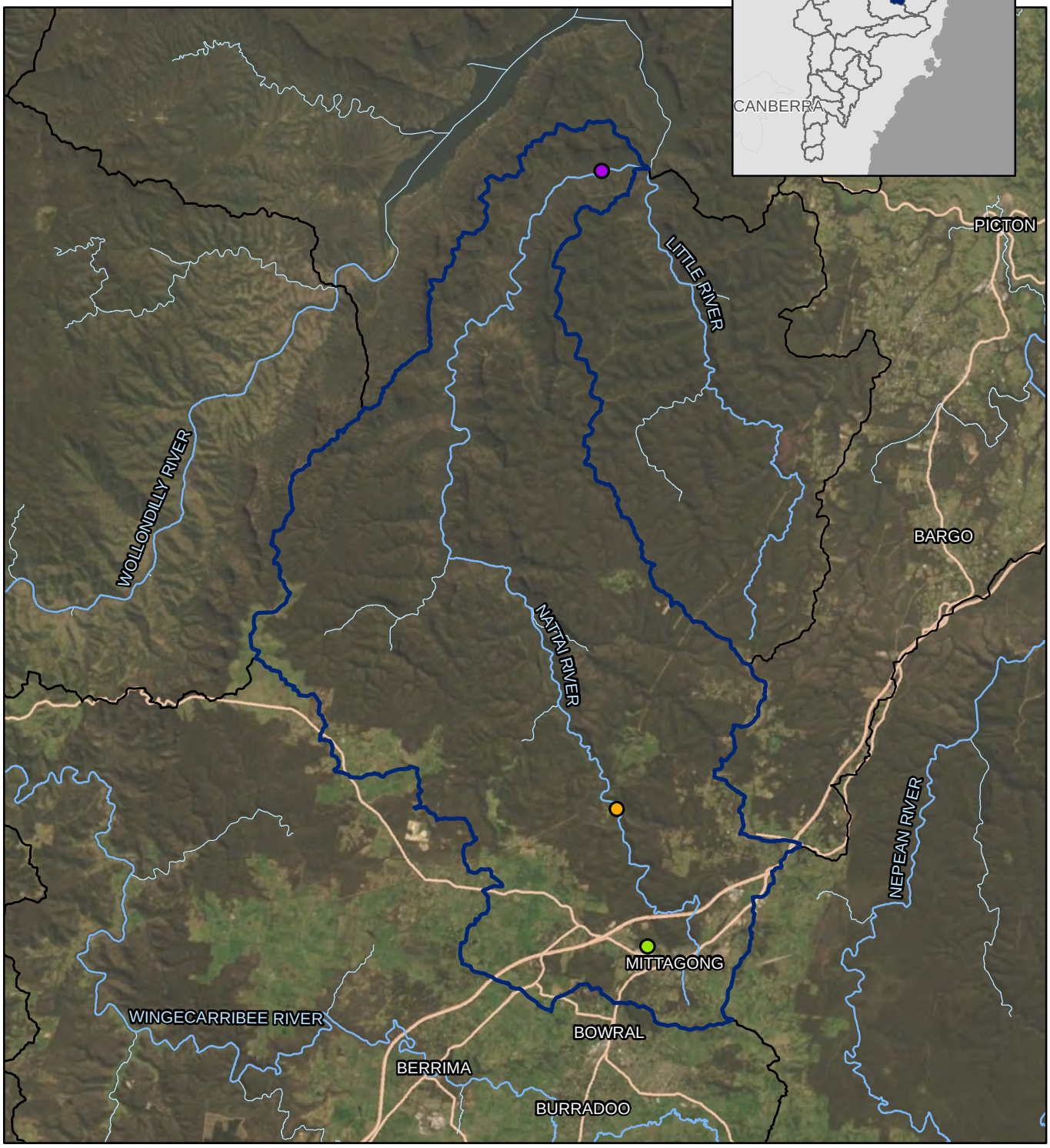

Phosphorus Soluble Reactive (mg/L)
0.3
0.25
0.2
0.15
0.1
0.05
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
E457
Guideline


Total Aluminium (mg/L)
100
10
1
0.1
0.01
0.001
1990
1995
2000
2005
2010
2015
2020
Audit Period
E457
Guideline


Total Iron (mg/L)
1000
100
10
1
0.1
0.01
0.001
1990
1995
2000
2005
2010
2015
2020
Audit Period
E457
Guideline

NATTAI RIVER

CATCHMENT



Legend

- Sub Catchment Boundary
- Major Roads

Water Quality Monitoring Stations

- E203
- E206
- E210

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

0 4,100 8,200

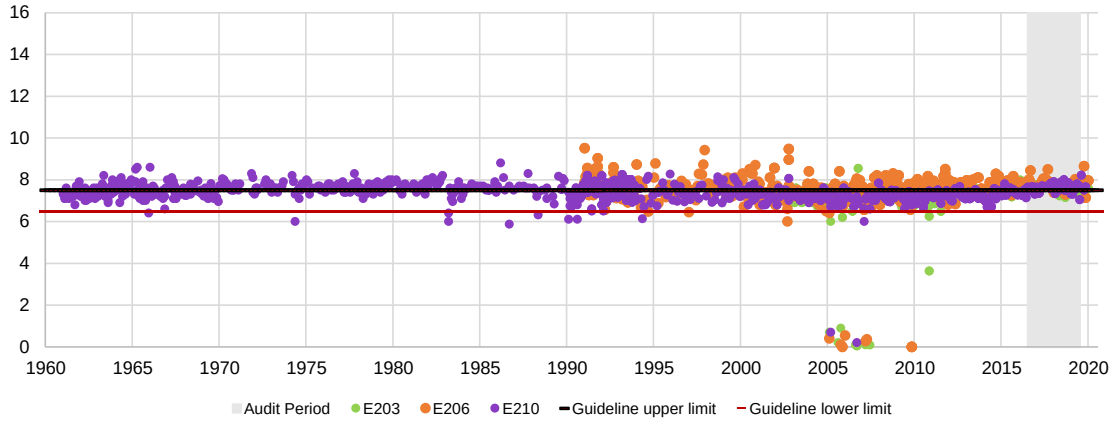
Metres

Datum/Projection:
GDA 1994 MGA Zone 56

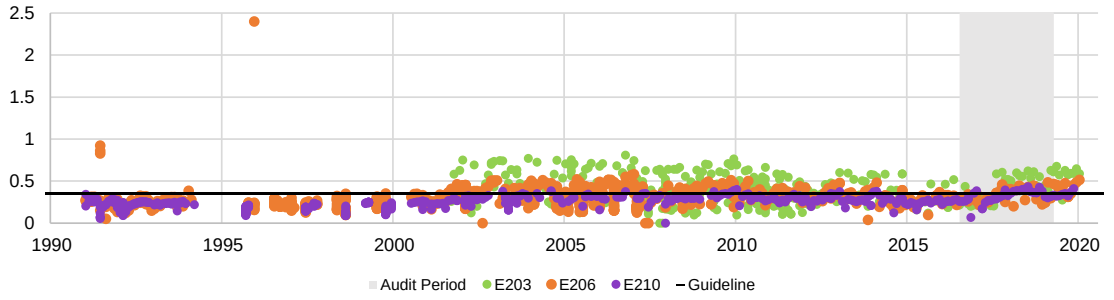
N

Prepared by: SC Date: 18/03/2020

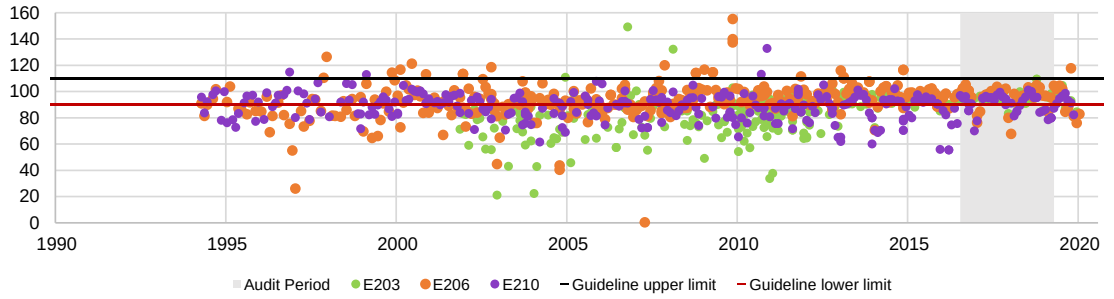
pH



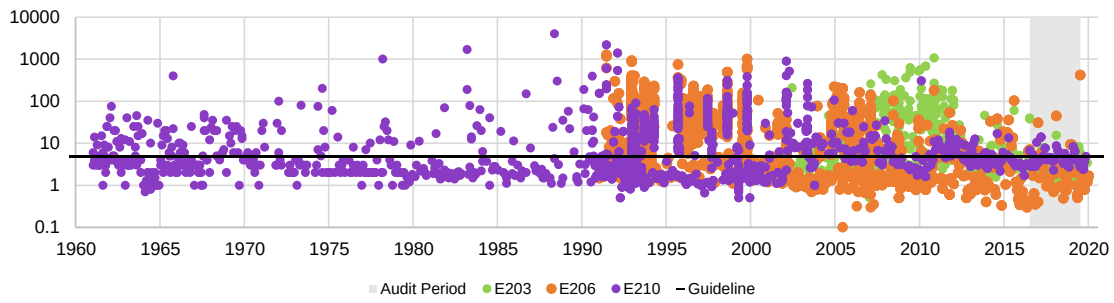
Conductivity (mS/cm)



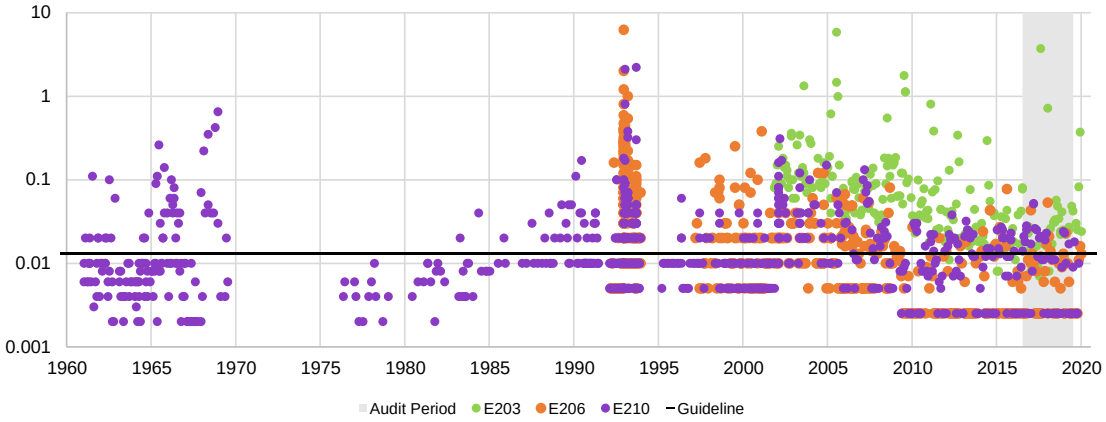
Dissolved Oxygen (%Sat)



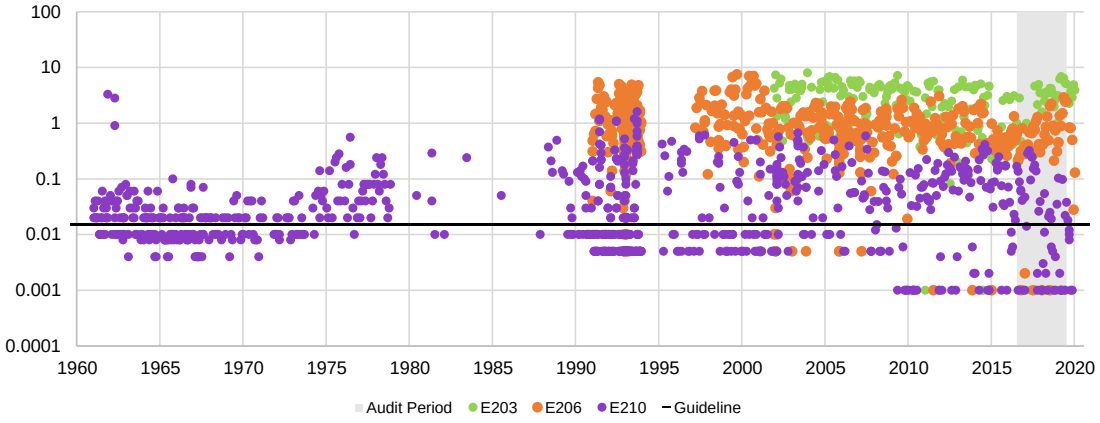
Turbidity (NTU)



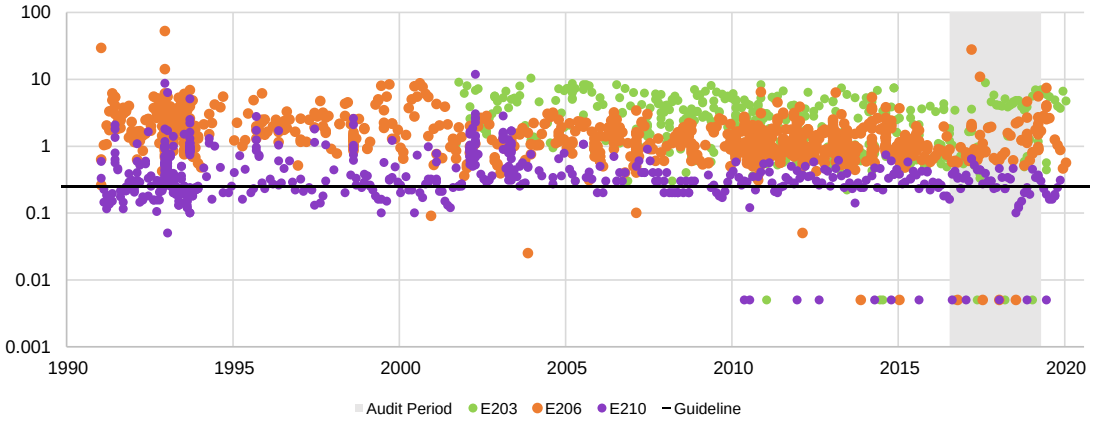
Nitrogen Ammoniacal (mg/L)

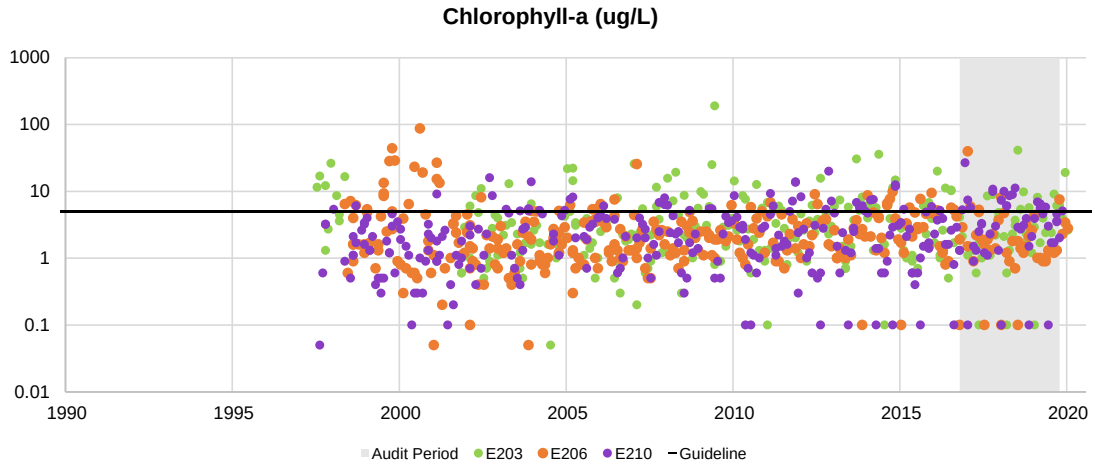


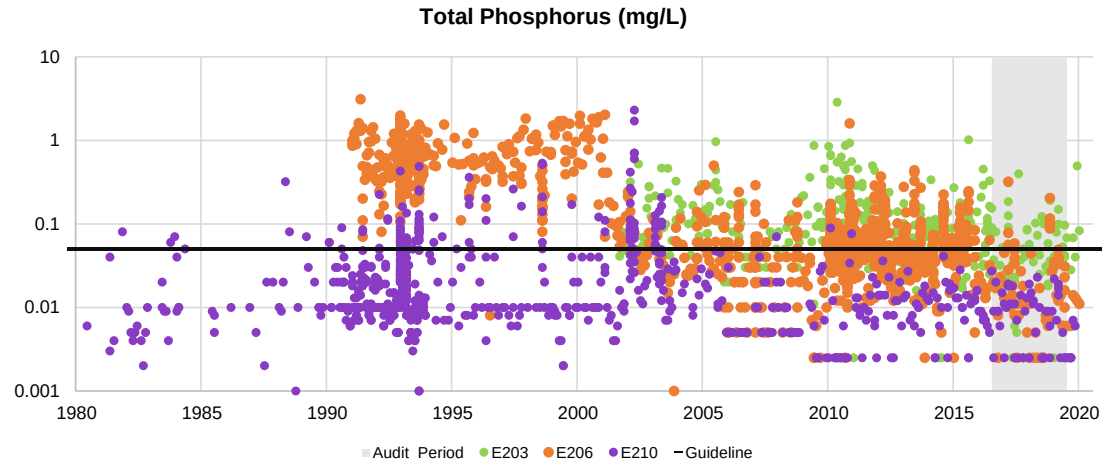
Nitrogen Oxidised (mg/L)

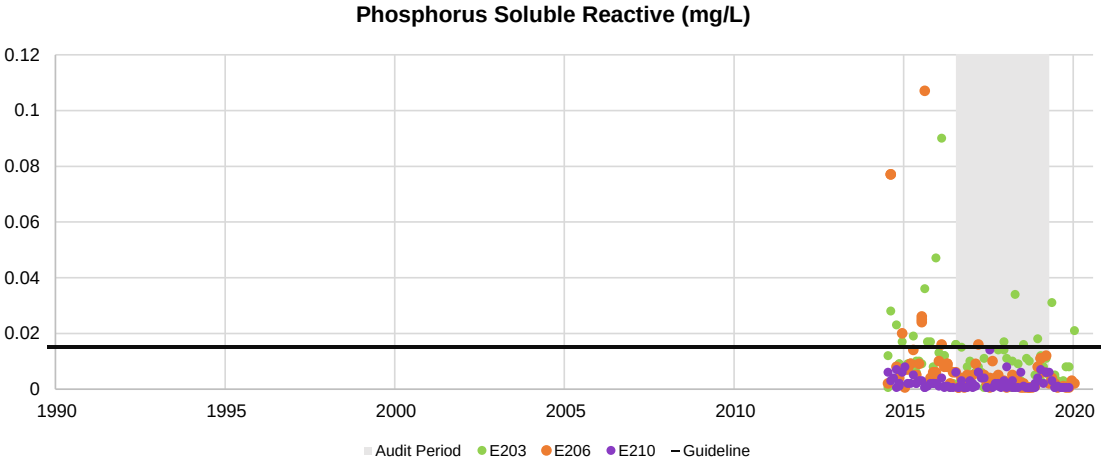


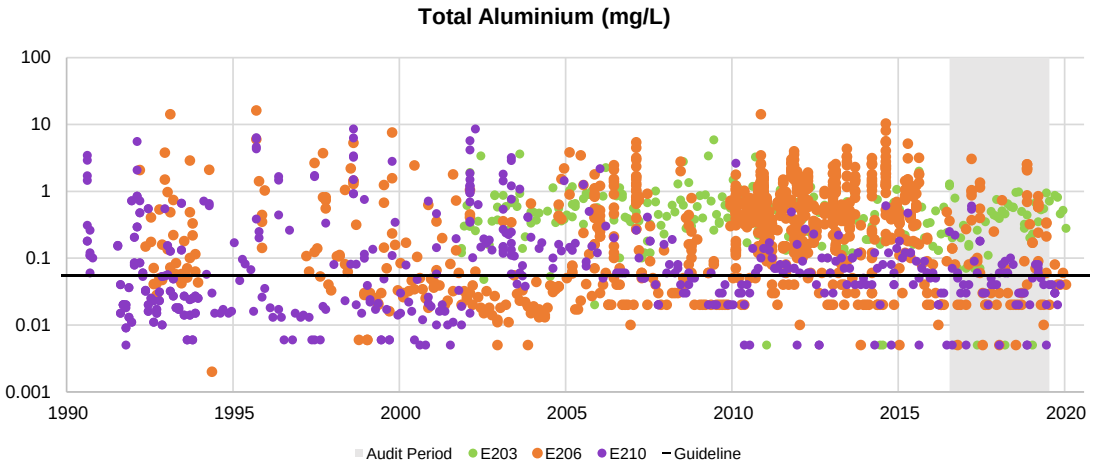
Total Nitrogen(mg/L)

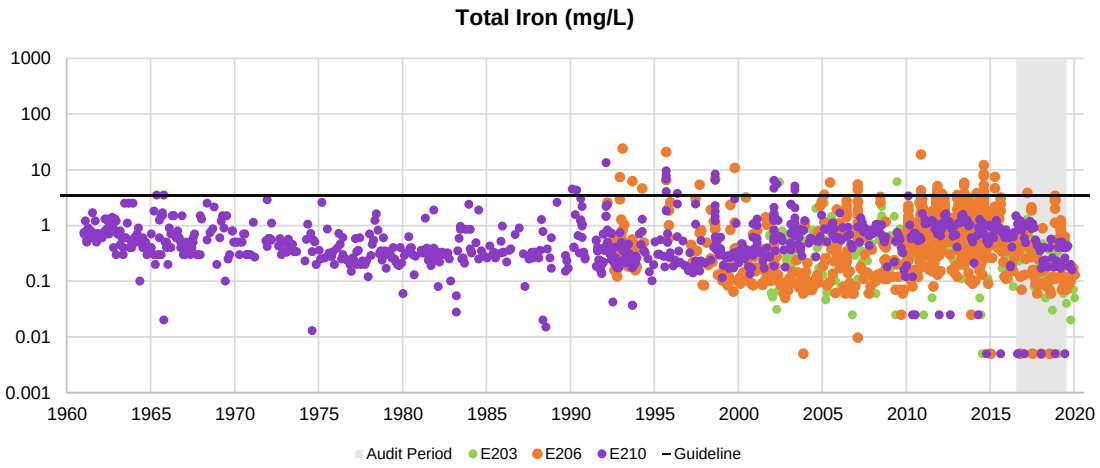



Chlorophyll-a (ug/L)
1000
100
10
1
0.1
0.01
1990
1995
2000
2005
2010
2015
2020
Audit Period
E203
E206
E210
Guideline


Total Phosphorus (mg/L)
10
1
0.1
0.01
0.001
1980
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
E203
E206
E210
Guideline

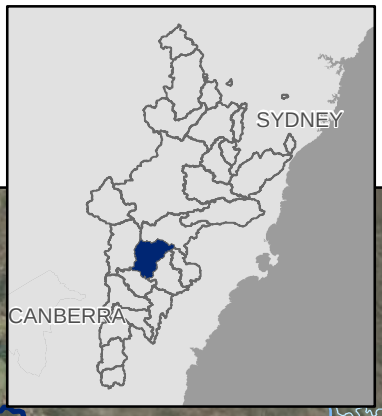

Phosphorus Soluble Reactive (mg/L)
0.12
0.1
0.08
0.06
0.04
0.02
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
E203
E206
E210
Guideline

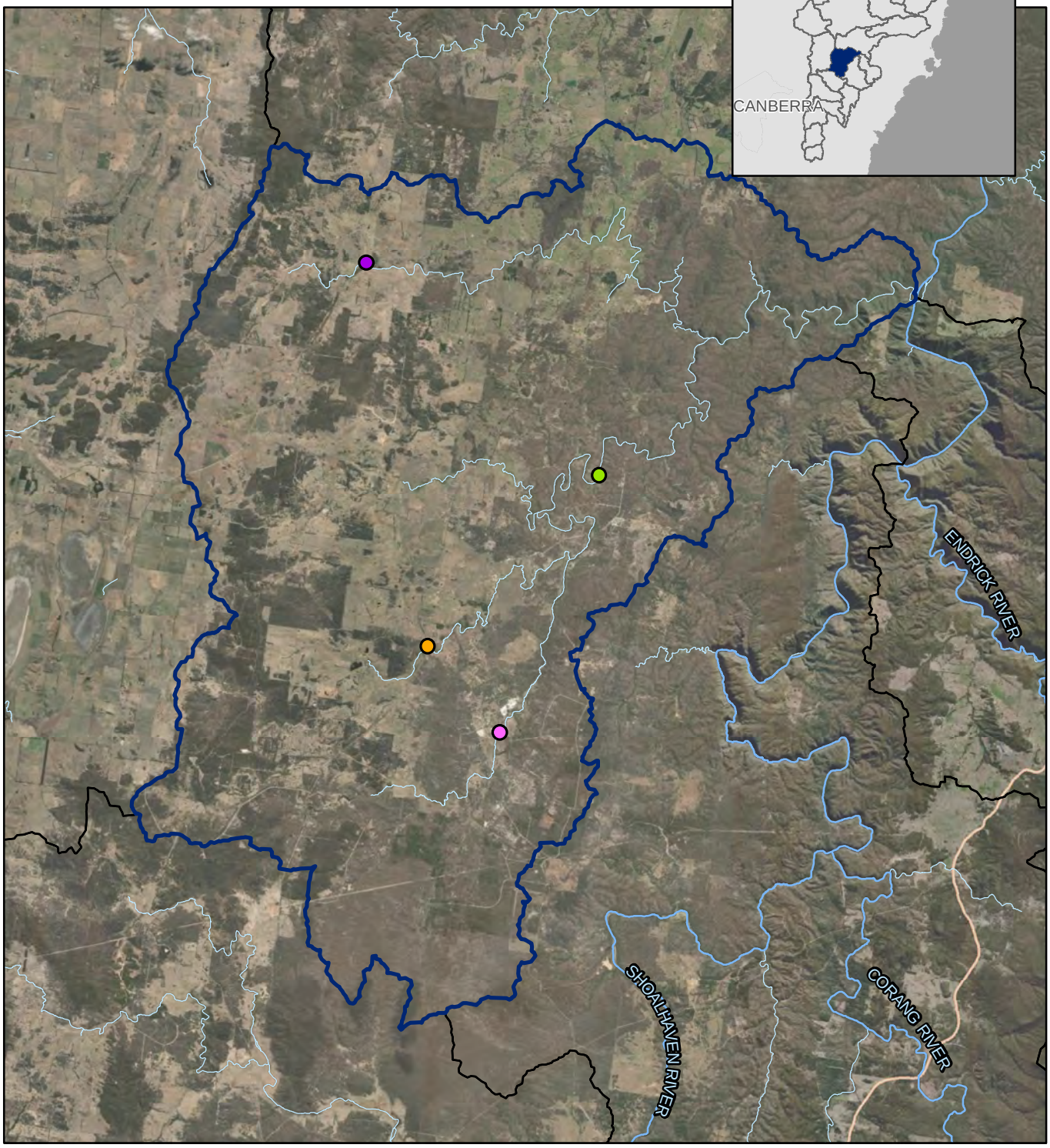

Total Aluminium (mg/L)
100
10
1
0.1
0.01
0.001
1990
1995
2000
2005
2010
2015
2020
Audit Period
E203
E206
E210
Guideline


Total Iron (mg/L)
1000
100
10
1
0.1
0.01
0.001
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
E203
E206
E210
Guideline

NERRIMUNGA RIVER

CATCHMENT





Legend

- Sub Catchment Boundary
- Major Roads

Water Quality Monitoring Stations

- E8361
- MMP192
- MMP51
- MMP52

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

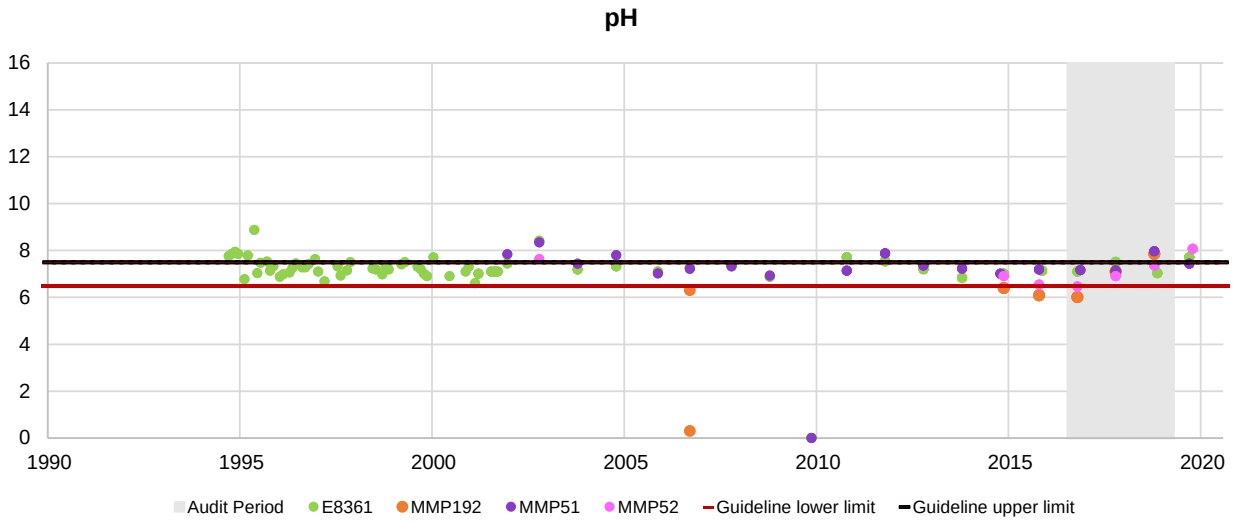
0 3,400 6,800

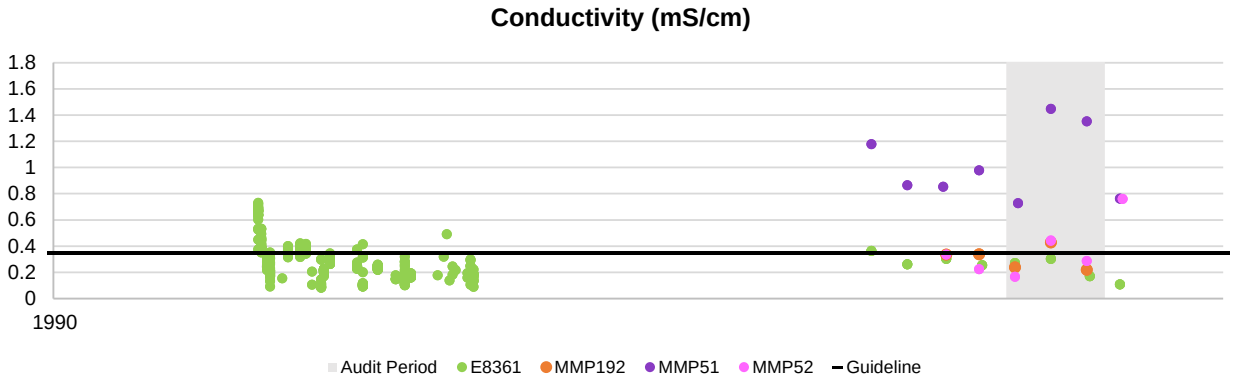
Metres

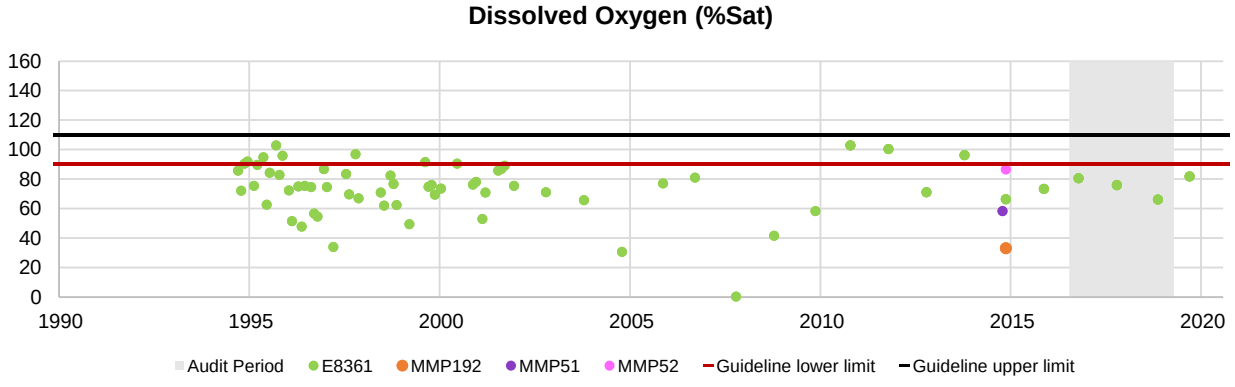
Datum/Projection:
GDA 1994 MGA Zone 56

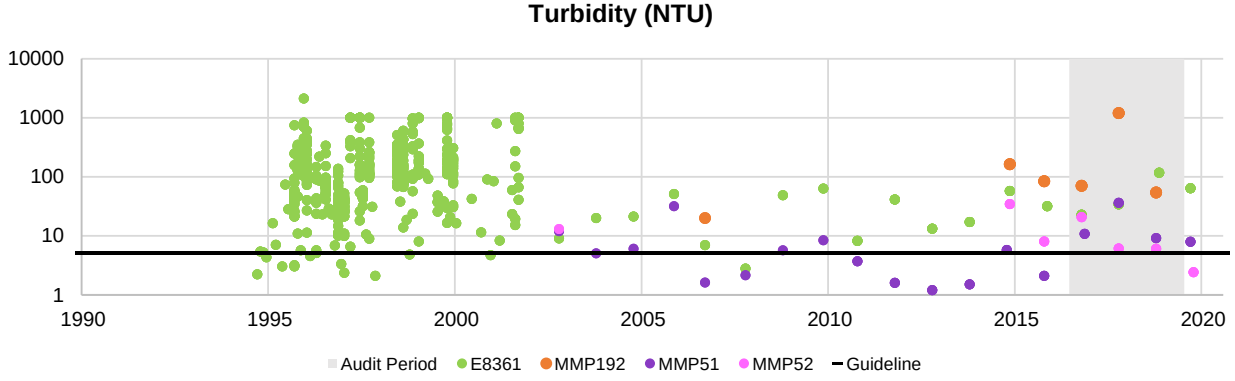
N

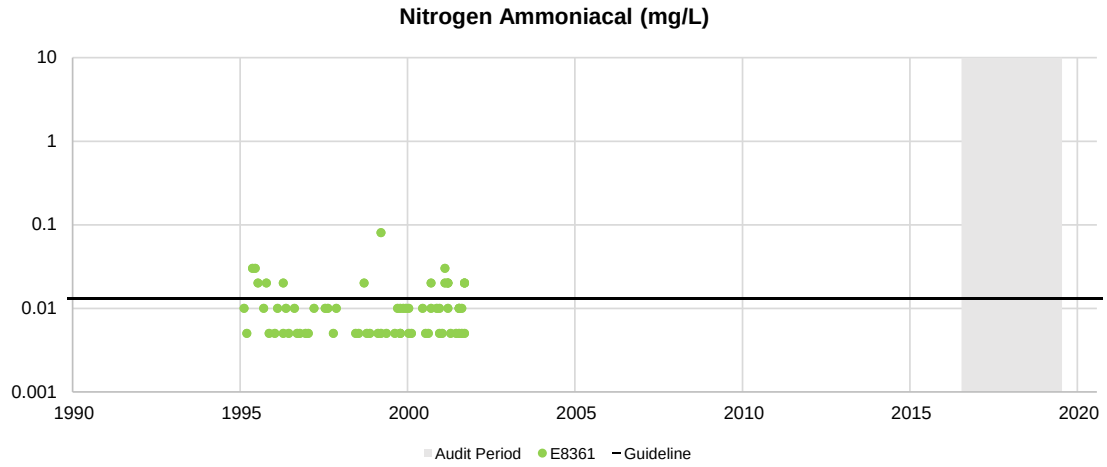
Prepared by: SC Date: 18/03/2020

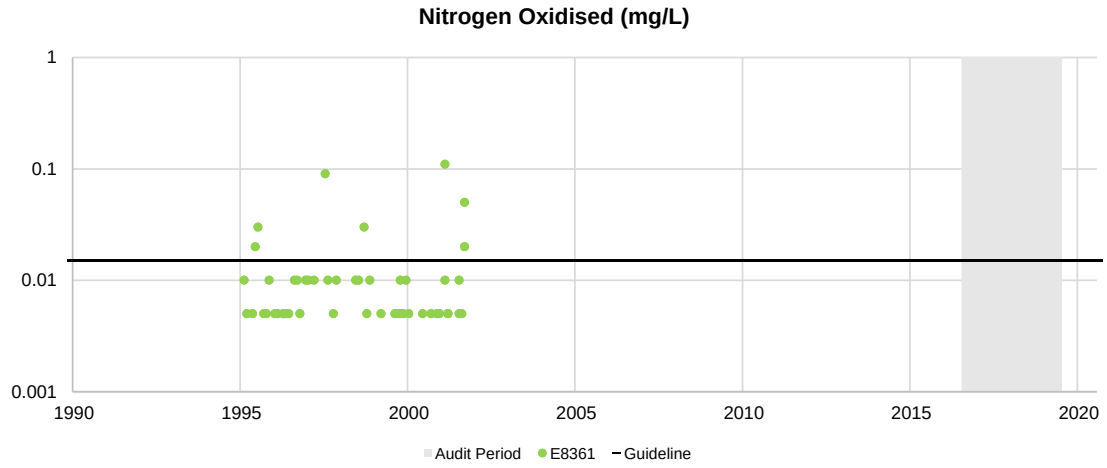

pH
16
14
12
10
8
6
4
2
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
E8361
MMP192
MMP51
MMP52
Guideline lower limit
Guideline upper limit

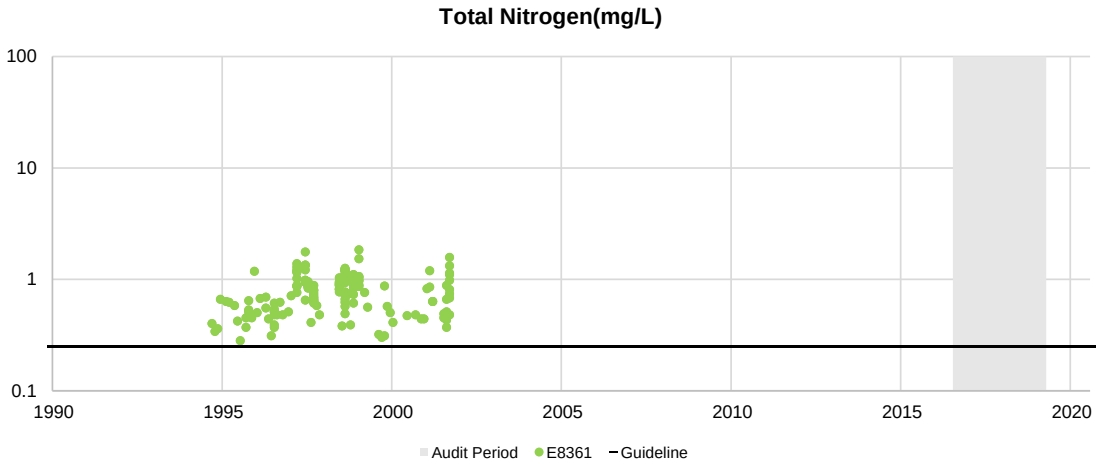

Conductivity (mS/cm)
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
1990
Audit Period
E8361
MMP192
MMP51
MMP52
Guideline

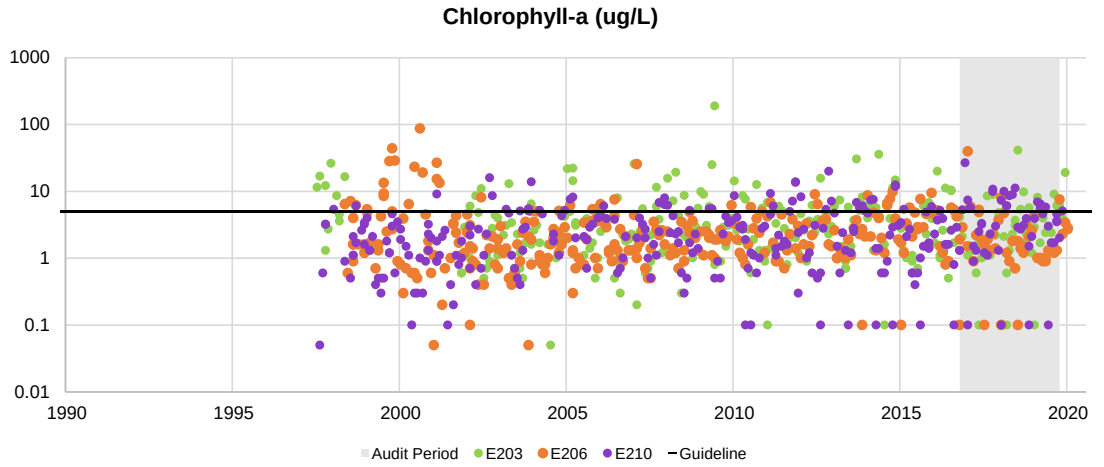

Dissolved Oxygen (%Sat)
160
140
120
100
80
60
40
20
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
E8361
MMP192
MMP51
MMP52
Guideline lower limit
Guideline upper limit

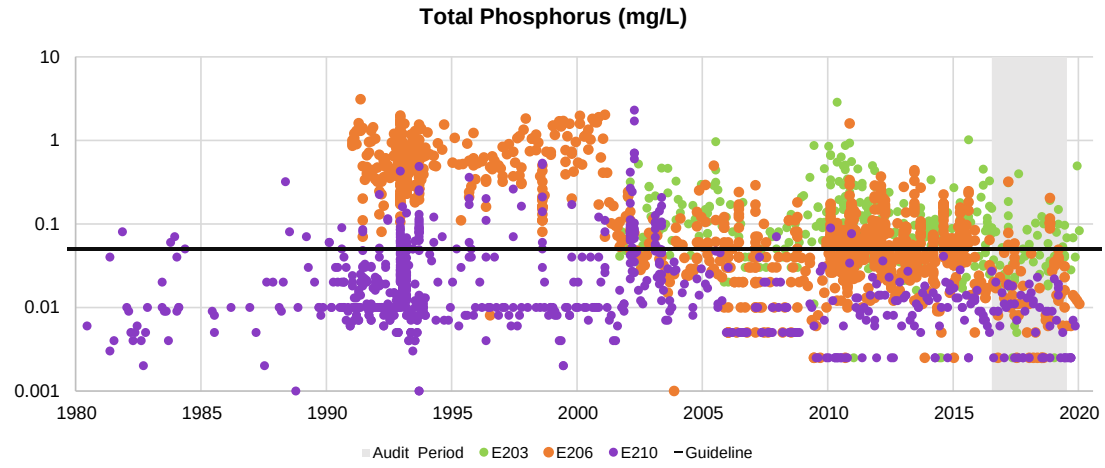

Turbidity (NTU)
10000
1000
100
10
1
1990
1995
2000
2005
2010
2015
2020
Audit Period
E8361
MMP192
MMP51
MMP52
Guideline

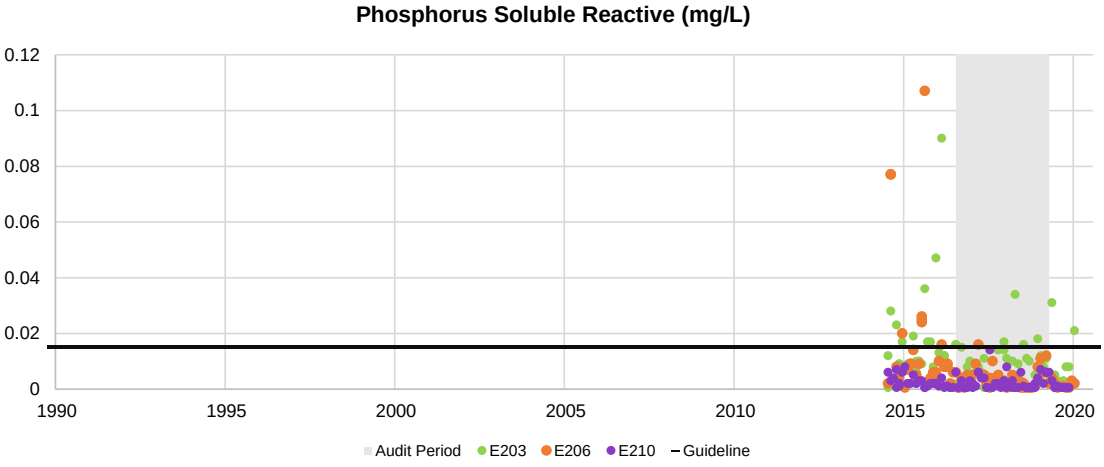

Nitrogen Ammoniacal (mg/L)
10
1
0.1
0.01
0.001
1990
1995
2000
2005
2010
2015
2020
Audit Period
E8361
Guideline

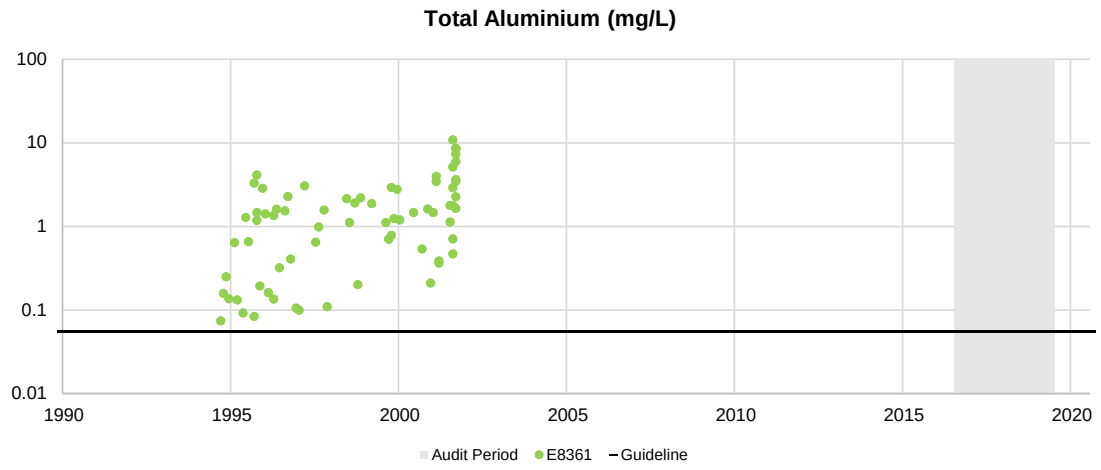

Nitrogen Oxidised (mg/L)
1
0.1
0.01
0.001
1990
1995
2000
2005
2010
2015
2020
Audit Period
E8361
Guideline

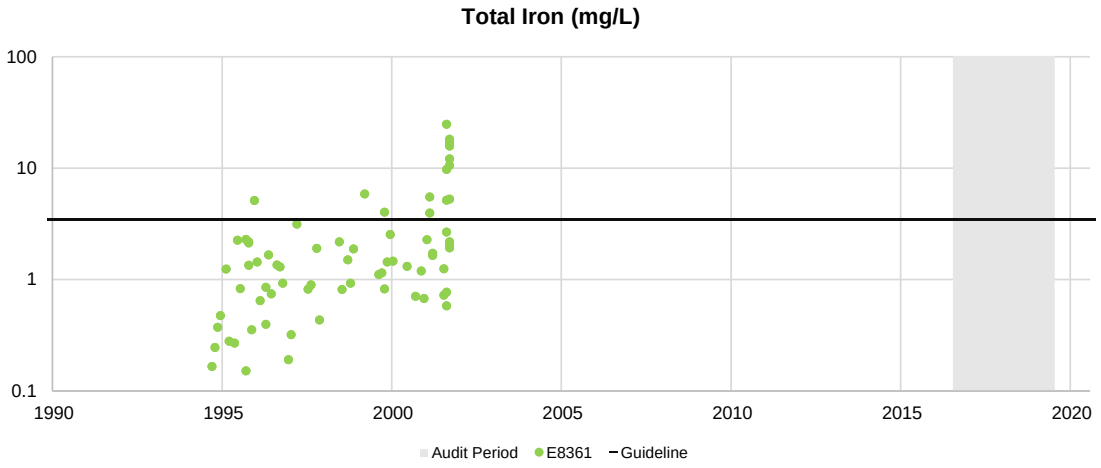

Total Nitrogen(mg/L)
100
10
1
0.1
1990
1995
2000
2005
2010
2015
2020
Audit Period
E8361
Guideline


Chlorophyll-a (ug/L)
1000
100
10
1
0.1
0.01
1990
1995
2000
2005
2010
2015
2020
Audit Period
E203
E206
E210
Guideline


Total Phosphorus (mg/L)
10
1
0.1
0.01
0.001
1980
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
E203
E206
E210
Guideline

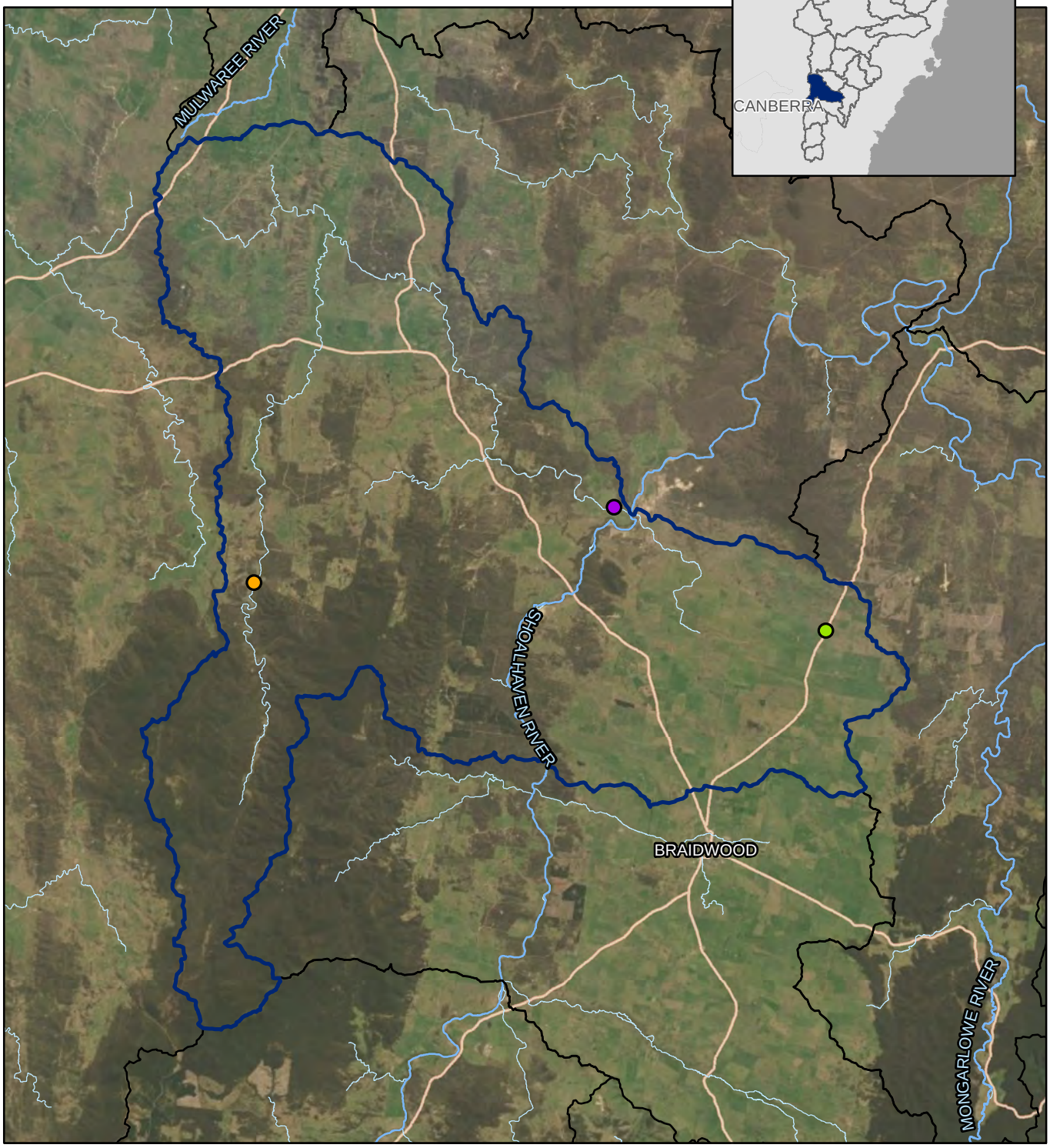

Phosphorus Soluble Reactive (mg/L)
0.12
0.1
0.08
0.06
0.04
0.02
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
E203
E206
E210
Guideline


Total Aluminium (mg/L)
100
10
1
0.1
0.01
1990
1995
2000
2005
2010
2015
2020
Audit Period
E8361
Guideline


Total Iron (mg/L)
100
10
1
0.1
1990
1995
2000
2005
2010
2015
2020
Audit Period
E8361
Guideline

REEDY CREEK

CATCHMENT



Legend

- Sub Catchment Boundary
- Major Roads

Water Quality Monitoring Stations

- MMP258
- R7
- Reed1

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

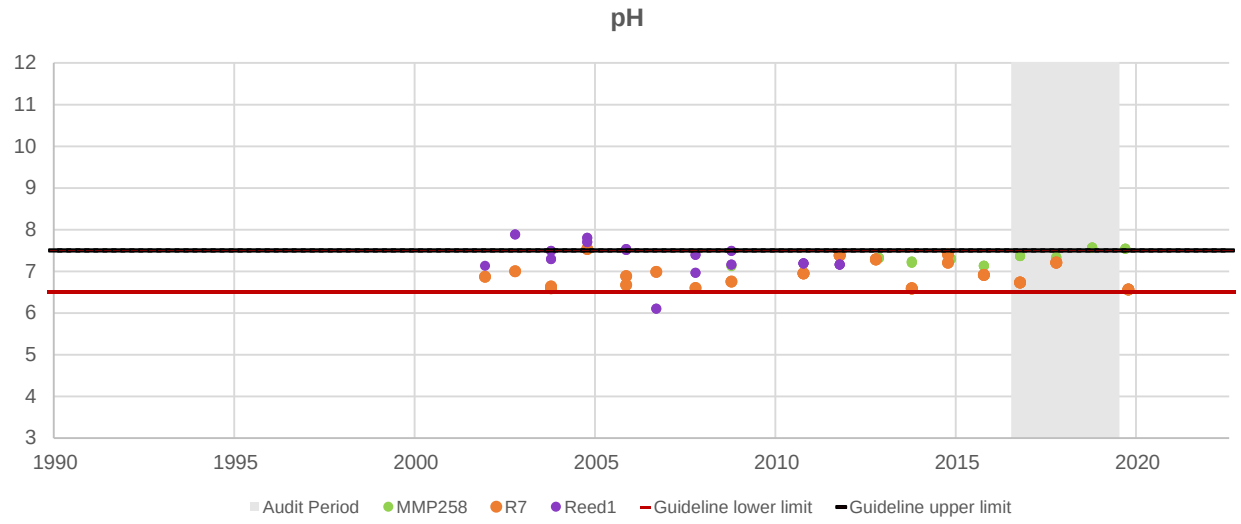
0 4,150 8,300

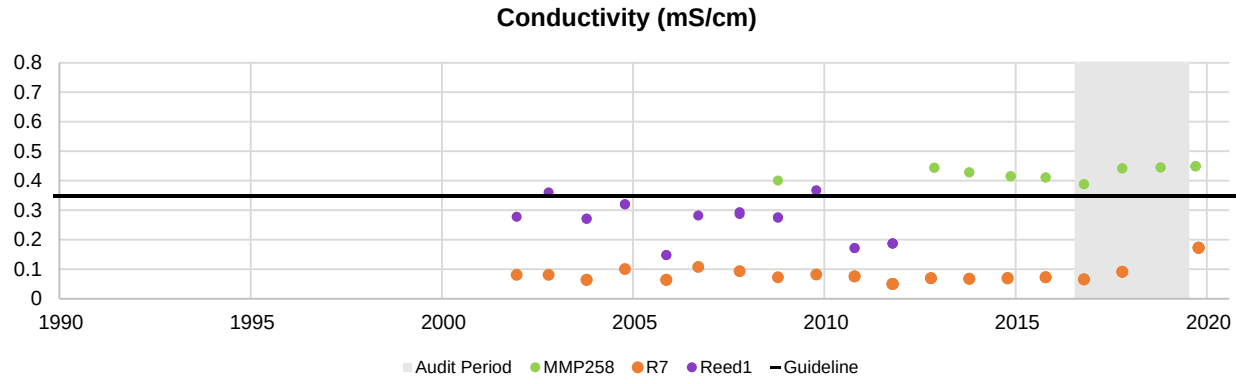
Metres

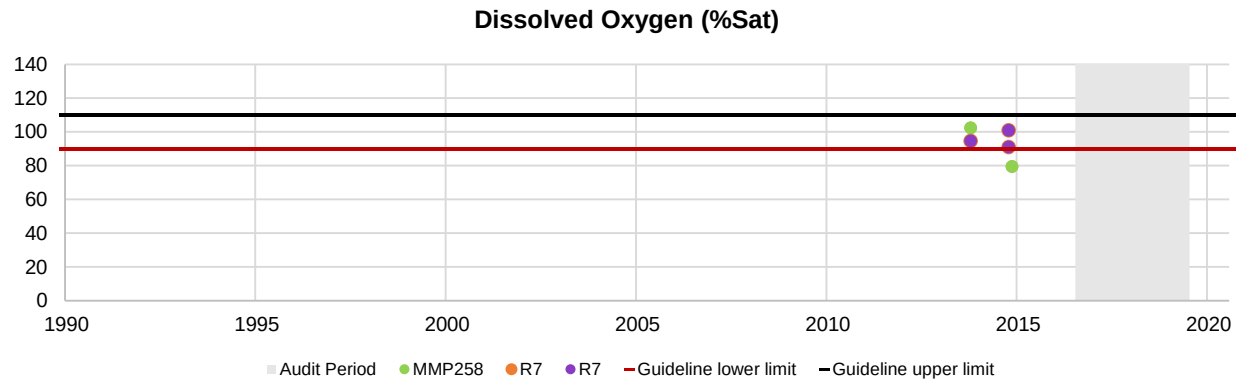
Datum/Projection:
GDA 1994 MGA Zone 56

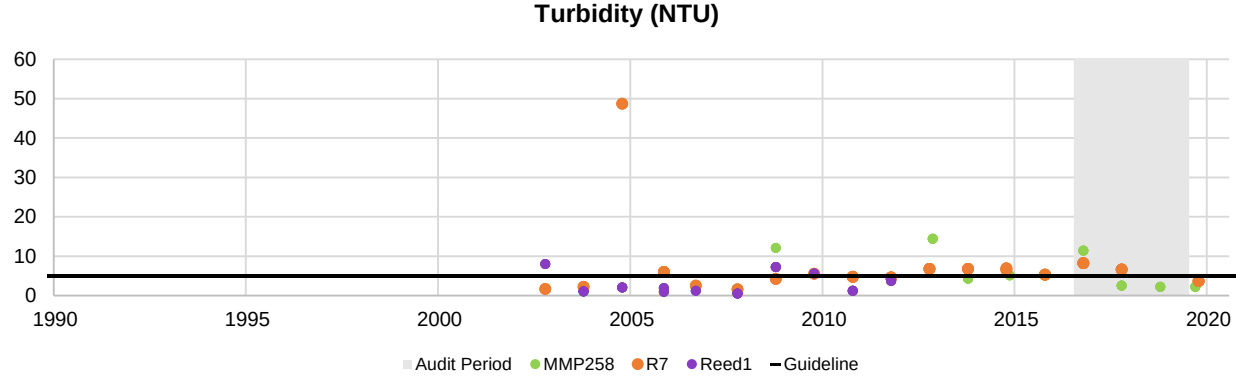
N

Prepared by: SC Date: 18/03/2020


pH
12
11
10
9
8
7
6
5
4
3
1990
1995
2000
2005
2010
2015
2020
Audit Period
MMP258
R7
Reed1
Guideline lower limit
Guideline upper limit

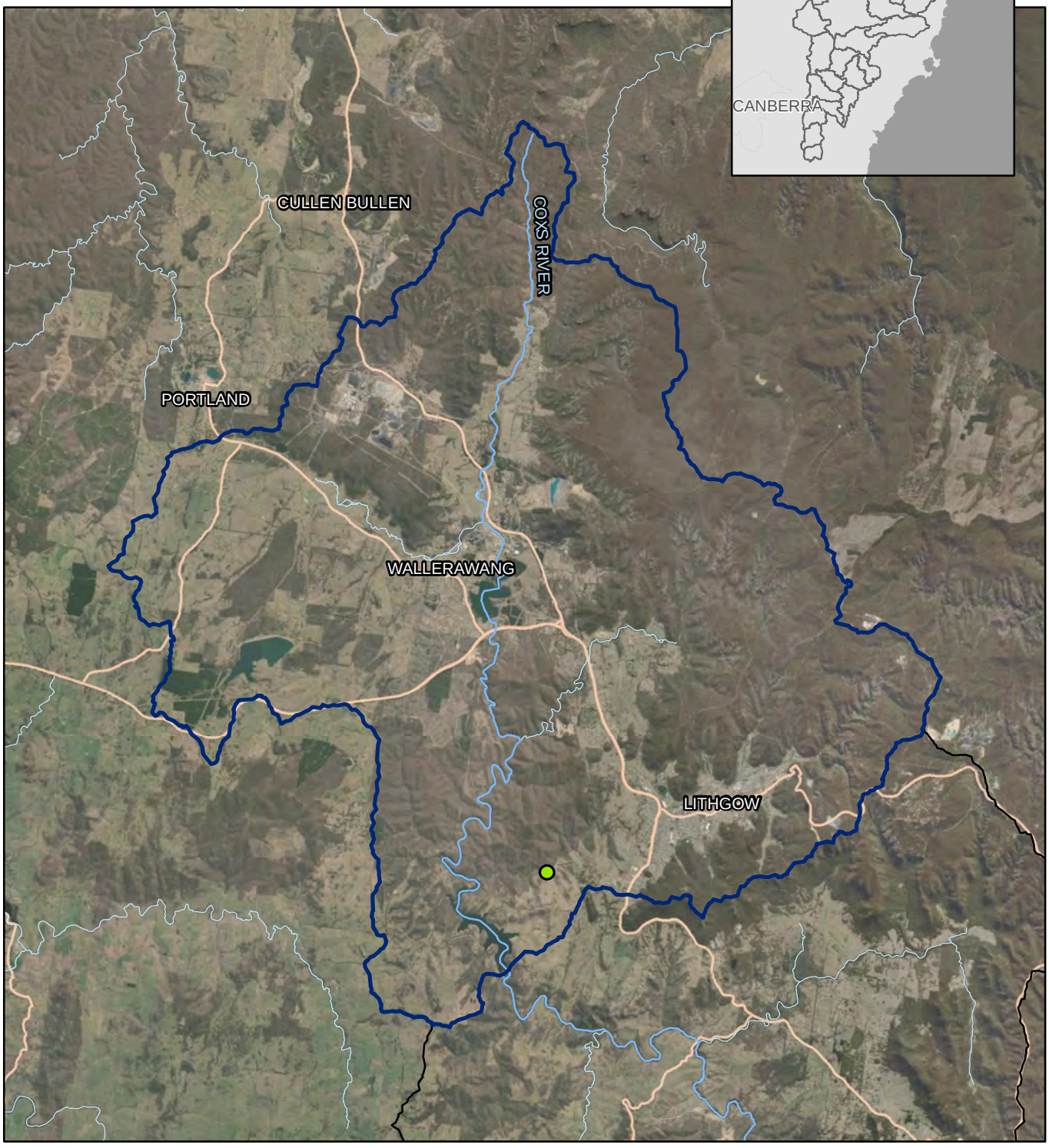

Conductivity (mS/cm)
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
MMP258
R7
Reed1
Guideline


Dissolved Oxygen (%Sat)
140
120
100
80
60
40
20
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
MMP258
R7
R7
Guideline lower limit
Guideline upper limit


Turbidity (NTU)
60
50
40
30
20
10
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
MMP258
R7
Reed1
Guideline

UPPER COXS RIVER

CATCHMENT



Legend

- Sub Catchment Boundary
- Major Roads

Water Quality Monitoring Stations

- E046

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

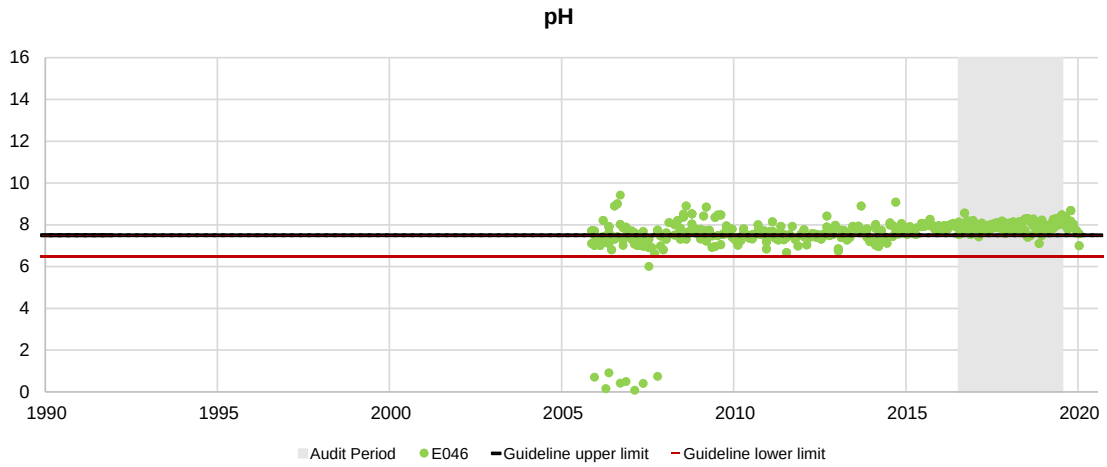
0 3,100 6,200

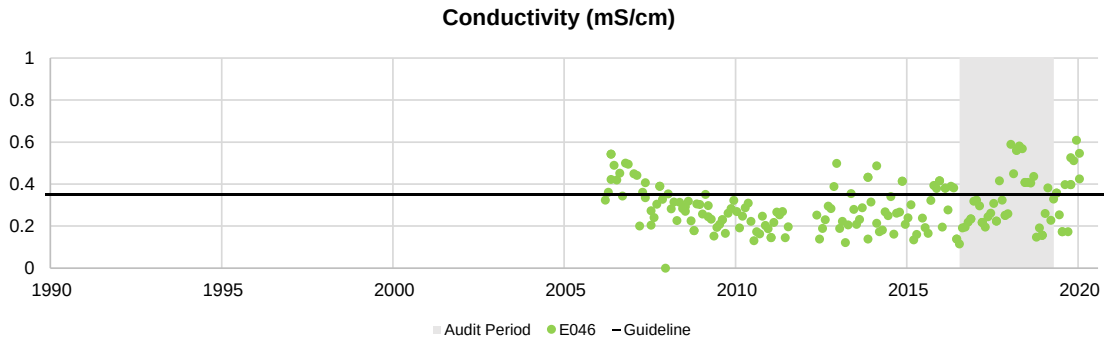
Metres

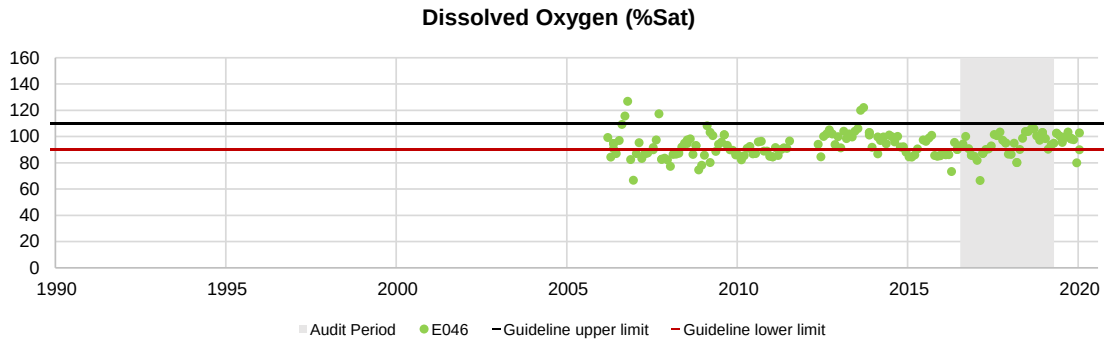
Datum/Projection:
GDA 1994 MGA Zone 56

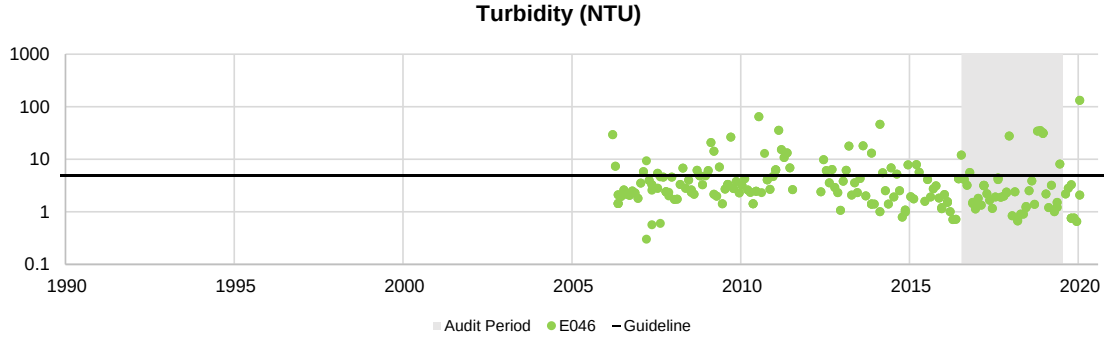
N

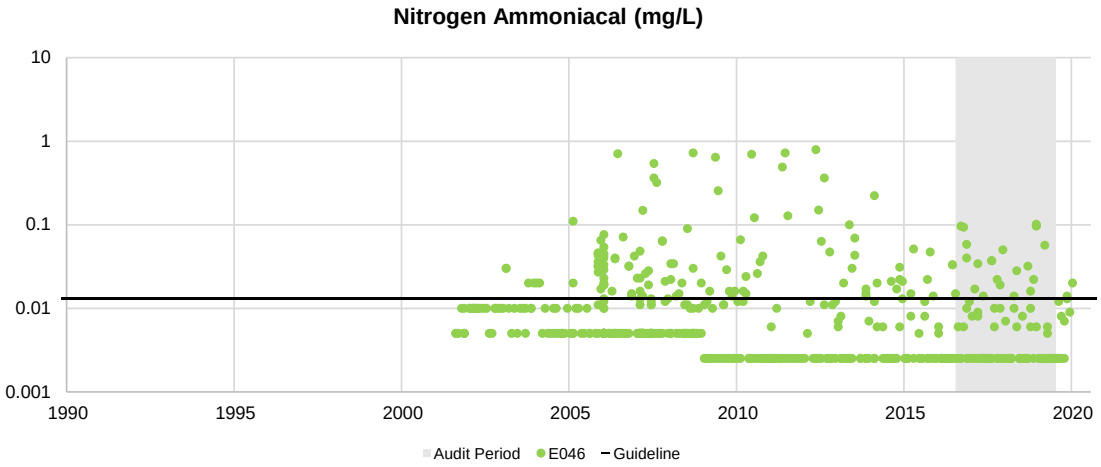
Prepared by: SC Date: 18/03/2020

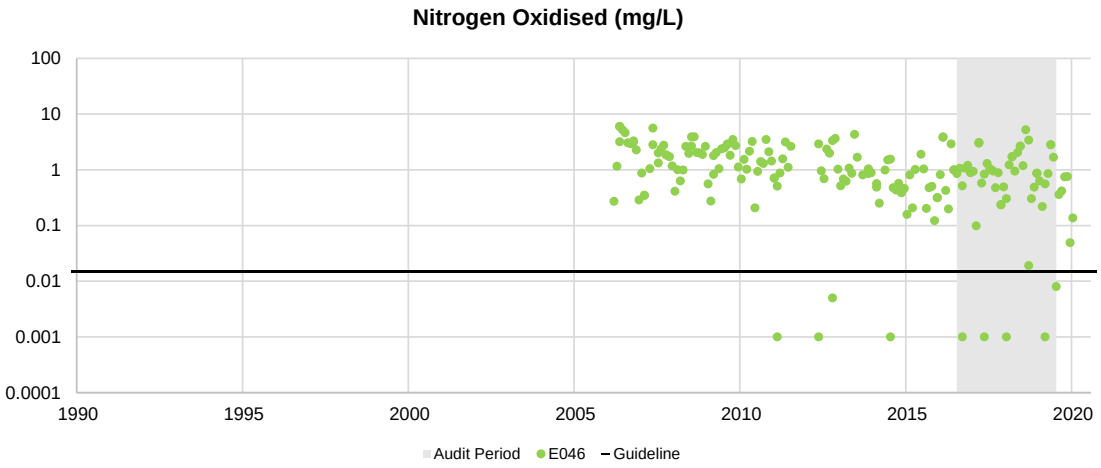

pH
16
14
12
10
8
6
4
2
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
E046
Guideline upper limit
Guideline lower limit

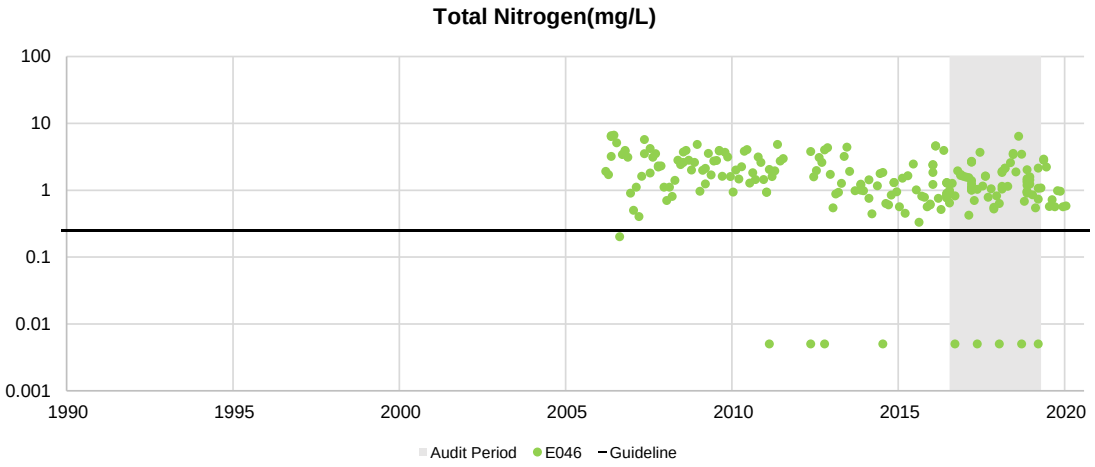

Conductivity (mS/cm)
1
0.8
0.6
0.4
0.2
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
E046
Guideline

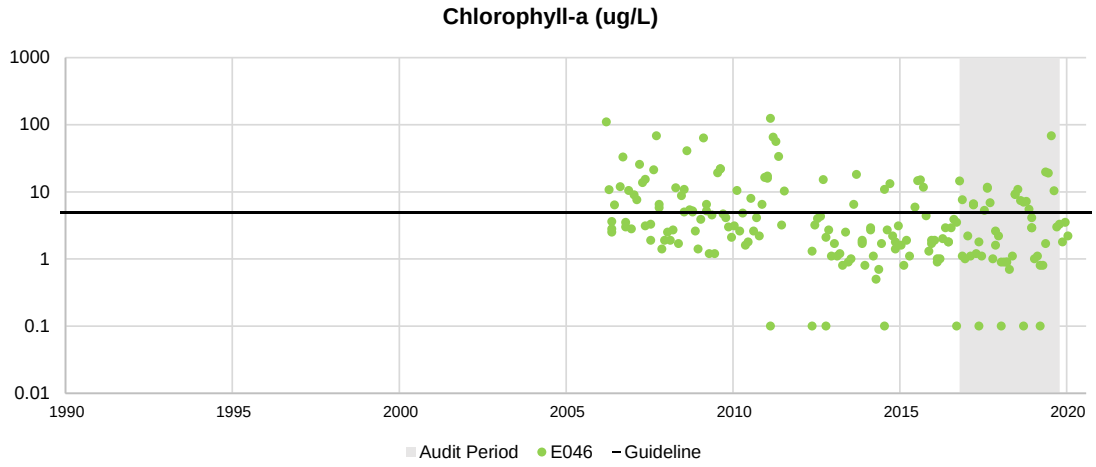

Dissolved Oxygen (%Sat)
160
140
120
100
80
60
40
20
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
E046
Guideline upper limit
Guideline lower limit

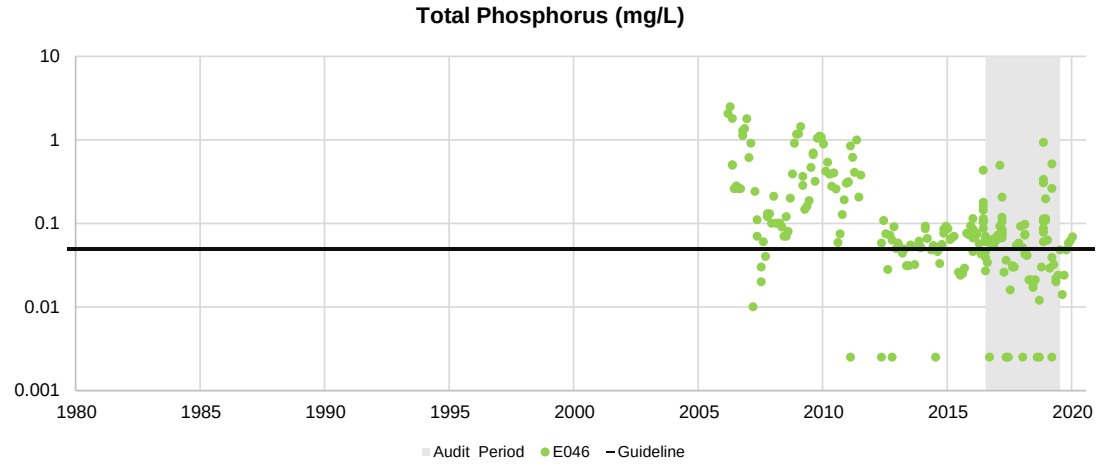

Turbidity (NTU)
1000
100
10
1
0.1
1990
1995
2000
2005
2010
2015
2020
Audit Period
E046
Guideline

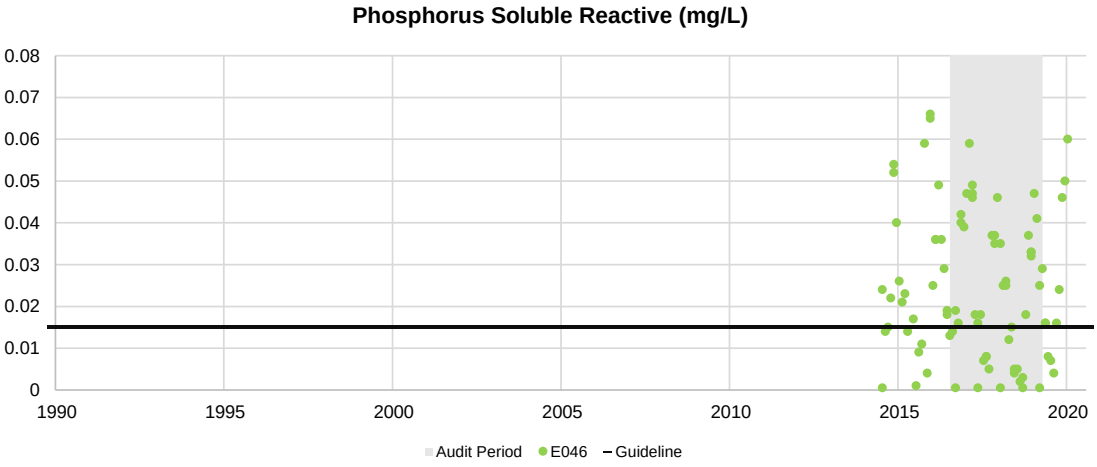

Nitrogen Ammoniacal (mg/L)
10
1
0.1
0.01
0.001
1990
1995
2000
2005
2010
2015
2020
Audit Period
E046
Guideline

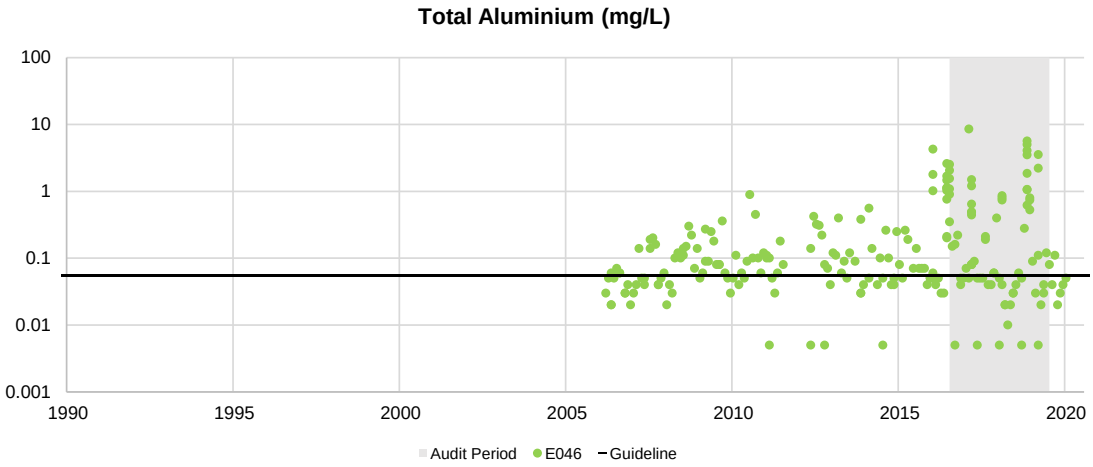

Nitrogen Oxidised (mg/L)
100
10
1
0.1
0.01
0.001
0.0001
1990
1995
2000
2005
2010
2015
2020
Audit Period
E046
Guideline

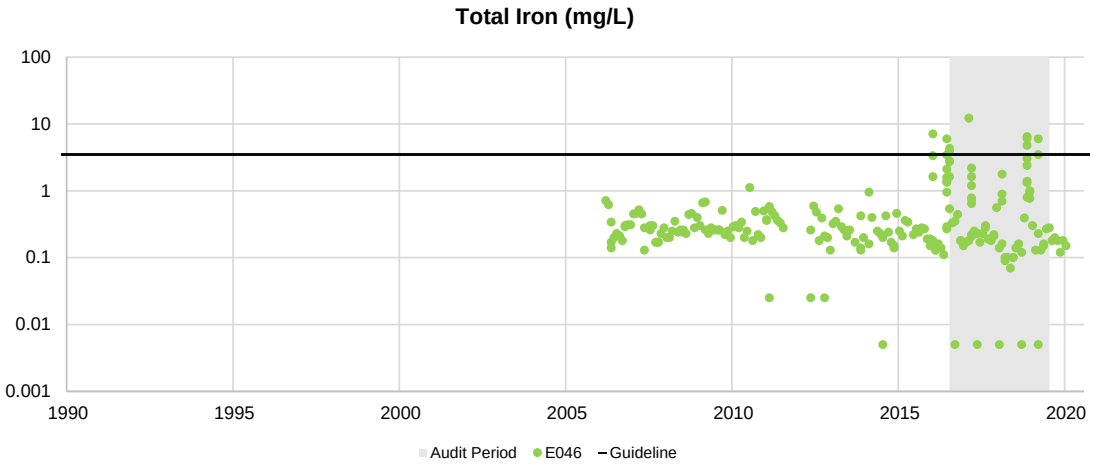

Total Nitrogen(mg/L)
100
10
1
0.1
0.01
0.001
1990
1995
2000
2005
2010
2015
2020
Audit Period
E046
Guideline


Chlorophyll-a (ug/L)
1000
100
10
1
0.1
0.01
1990
1995
2000
2005
2010
2015
2020
Audit Period
E046
Guideline


Total Phosphorus (mg/L)
10
1
0.1
0.01
0.001
1980
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
E046
Guideline

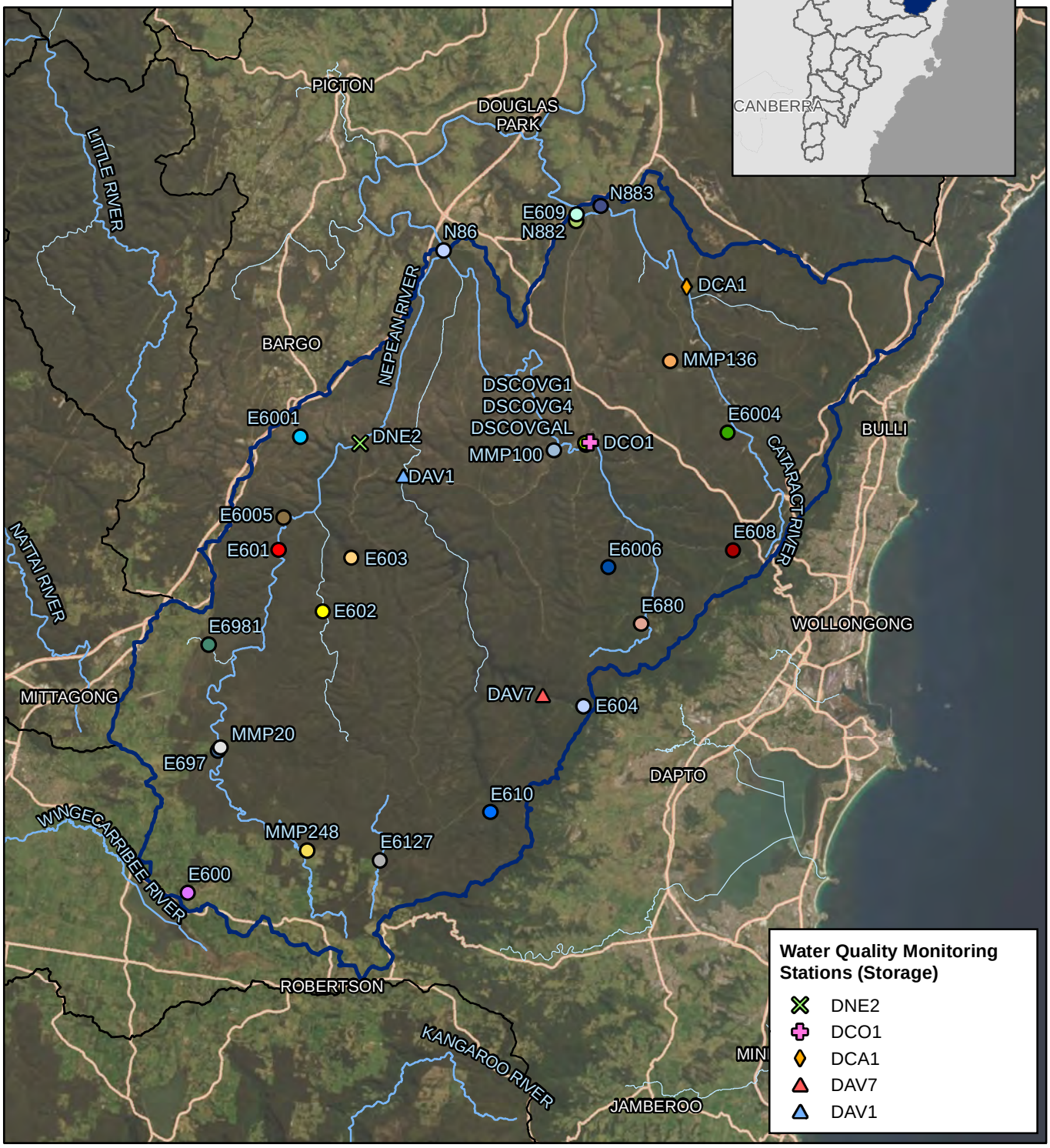

Phosphorus Soluble Reactive (mg/L)
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
E046
Guideline


Total Aluminium (mg/L)
100
10
1
0.1
0.01
0.001
1990
1995
2000
2005
2010
2015
2020
Audit Period
E046
Guideline


Total Iron (mg/L)
100
10
1
0.1
0.01
0.001
1990
1995
2000
2005
2010
2015
2020
Audit Period
E046
Guideline

UPPER NEPEAN RIVER

CATCHMENT



Legend

- Sub Catchment Boundary
- Major Roads

Water Quality Monitoring Stations

- DSCOVG1
- DSCOVG4
- DSCOVGAL
- E600
- E6001
- E6004
- E6005
- E6006
- E601
- E602
- E603
- E604
- E608
- E609
- E610
- E6127
- E680
- E697
- E6981
- MMP100
- MMP136
- MMP20
- MMP248
- N86
- N882
- N883

0 4,950 9,900

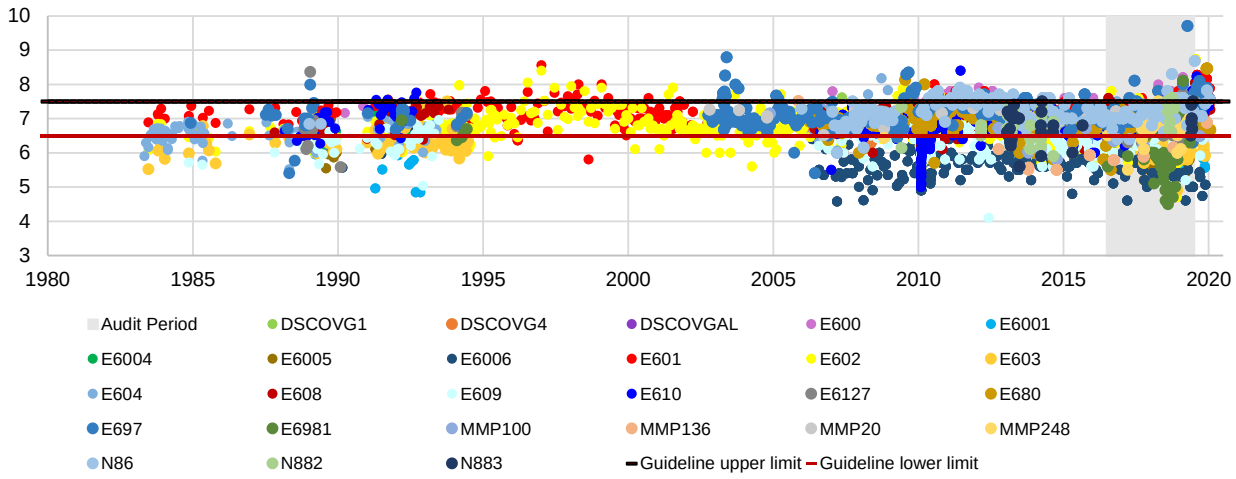
Metres

Datum/Projection:
GDA 1994 MGA Zone 56

N

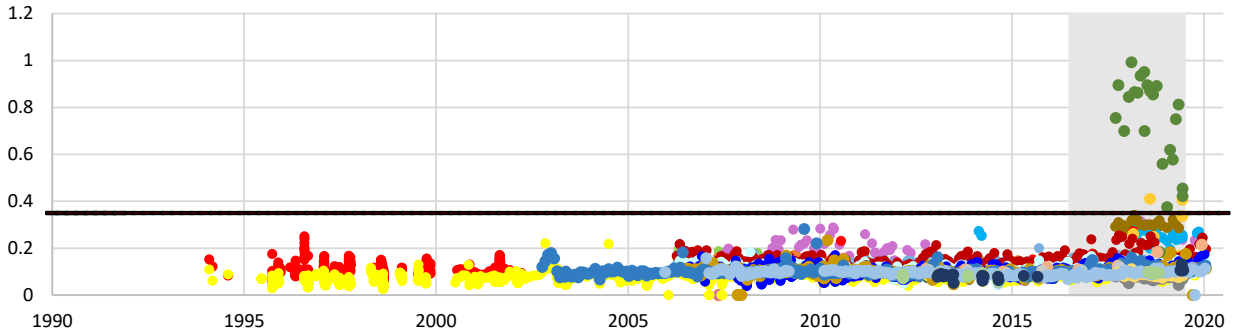
Prepared by: SC Date: 18/03/2020

pH

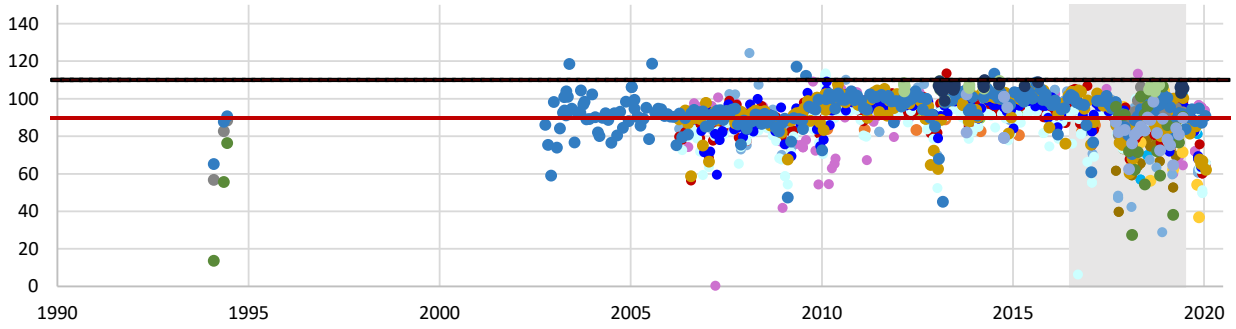


Audit Period, DSCOVG1, DSCOVG4, DSCOVGAL, E600, E6001, E6004, E6005, E6006, E601, E602, E603, E604, E608, E609, E610, E6127, E680, E697, E6981, MMP100, MMP136, MMP20, MMP248, N86, N882, N883, Guideline upper limit, Guideline lower limit

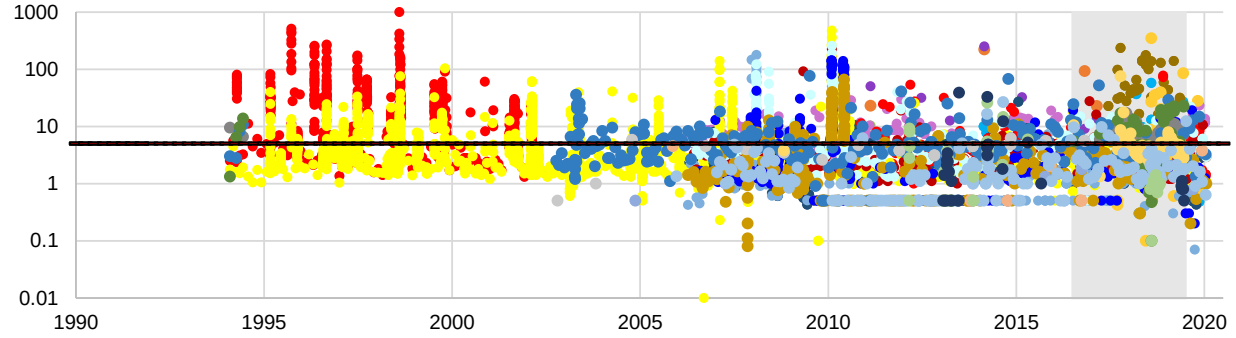
Conductivity (mS/cm)



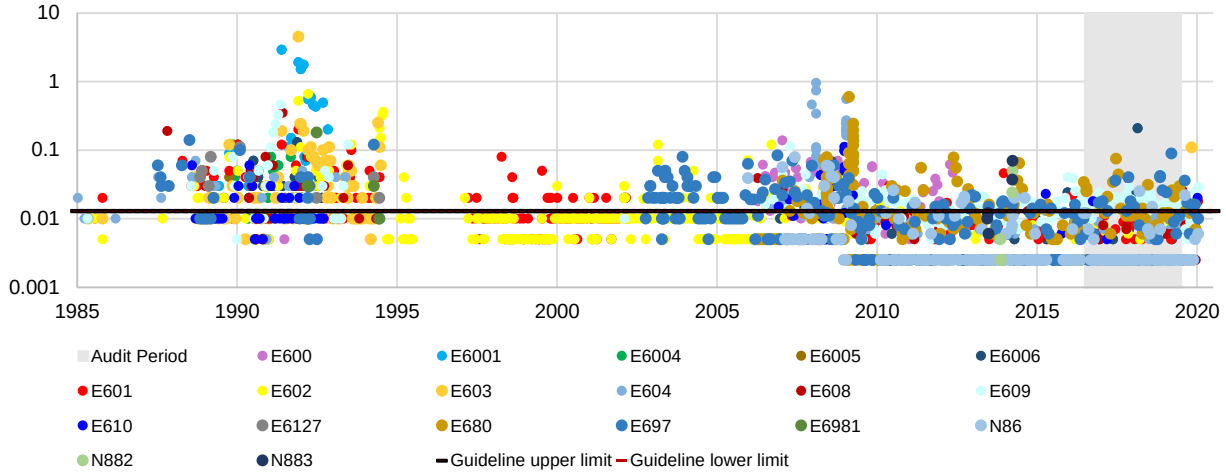
Dissolved Oxygen (%Sat)



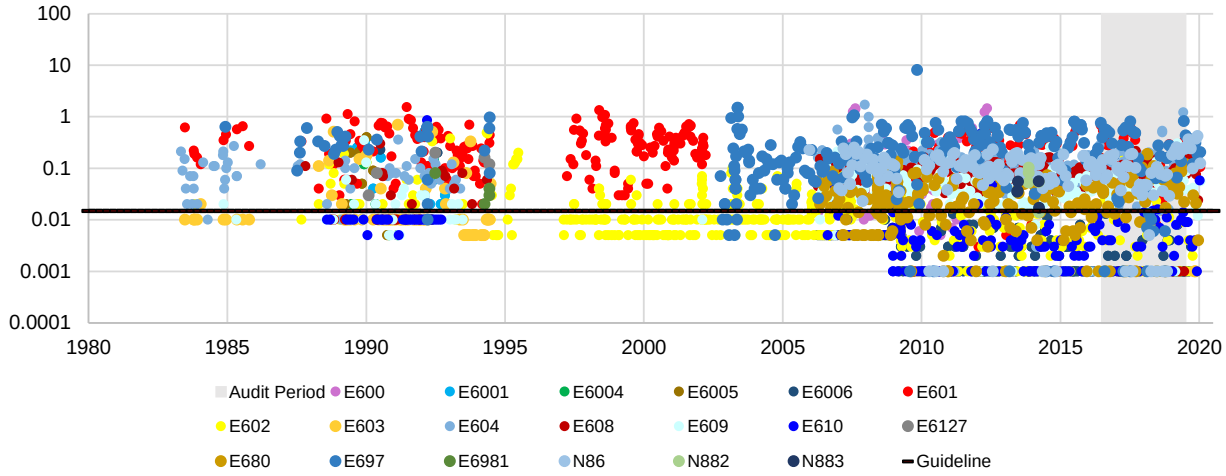
Turbidity (NTU)



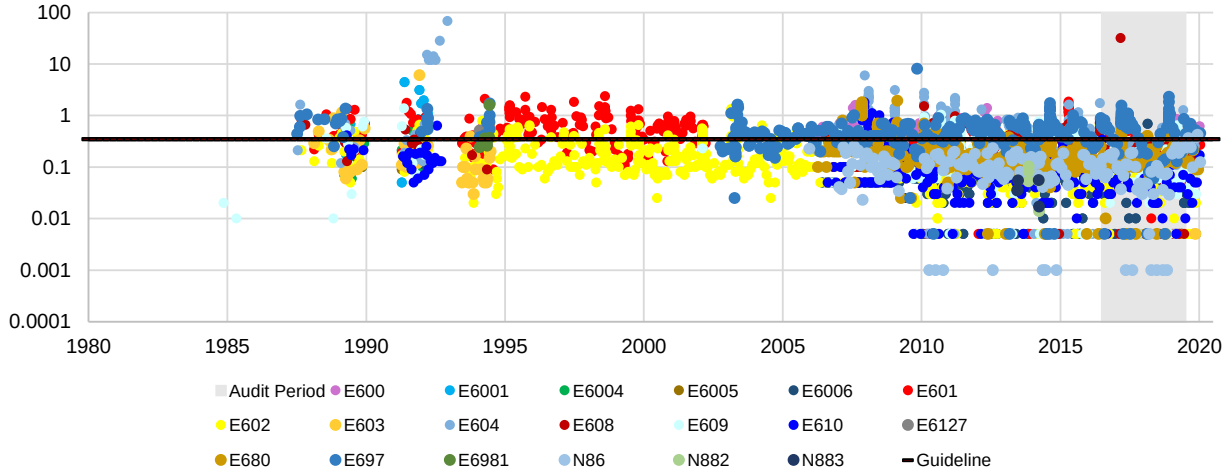
Nitrogen Ammoniacal (mg/L)



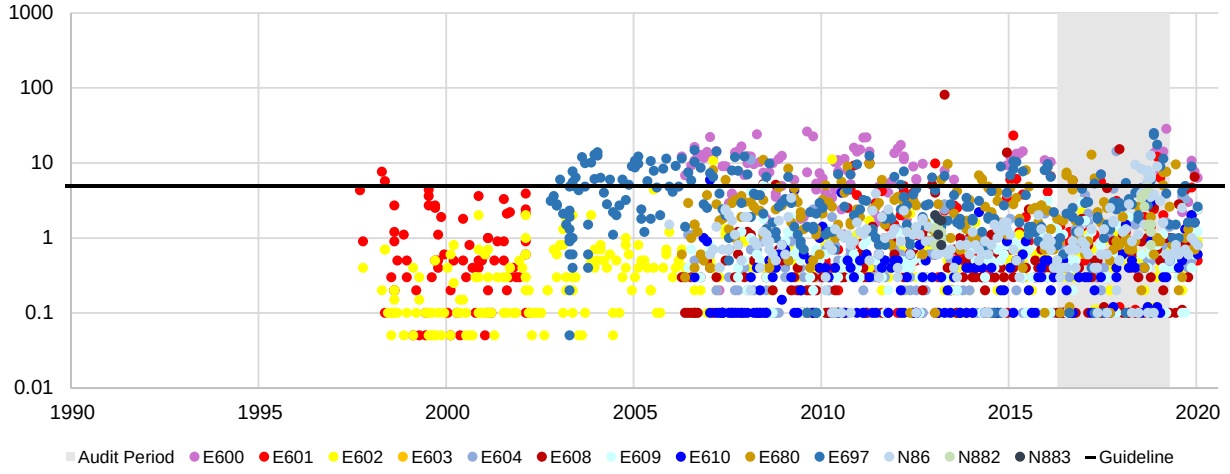
Nitrogen Oxidised (mg/L)



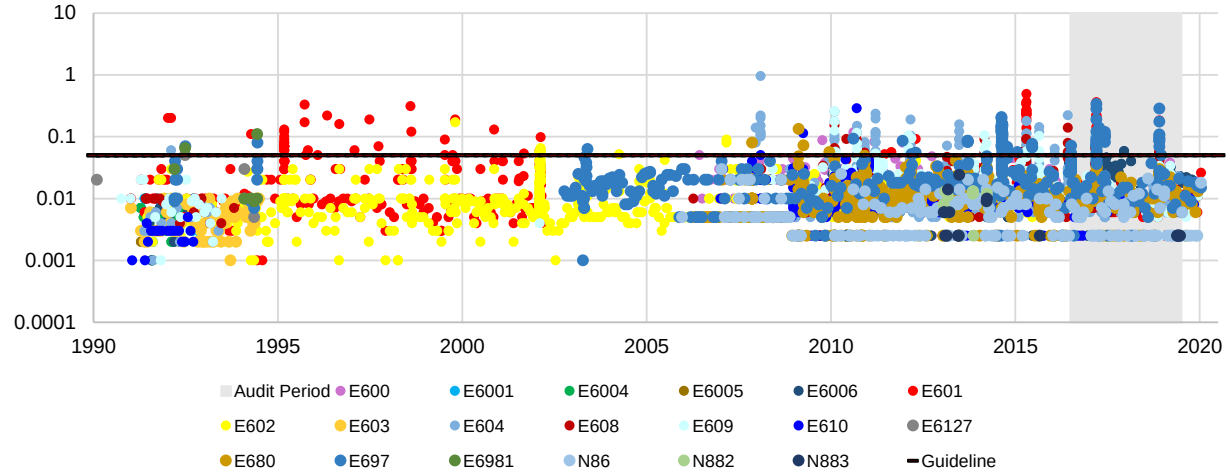
Total Nitrogen (mg/L)



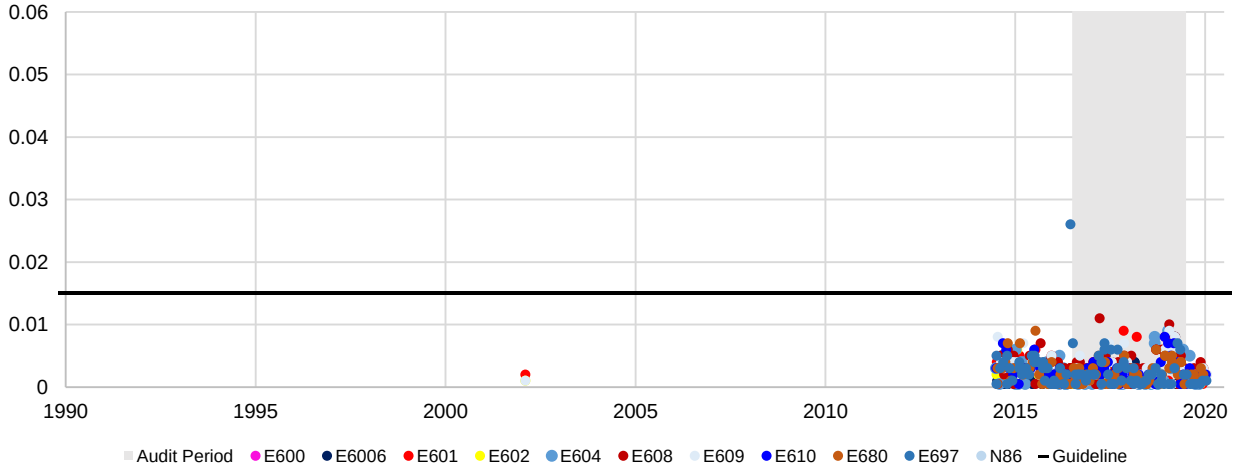
Chlorophyll-a (ug/L)

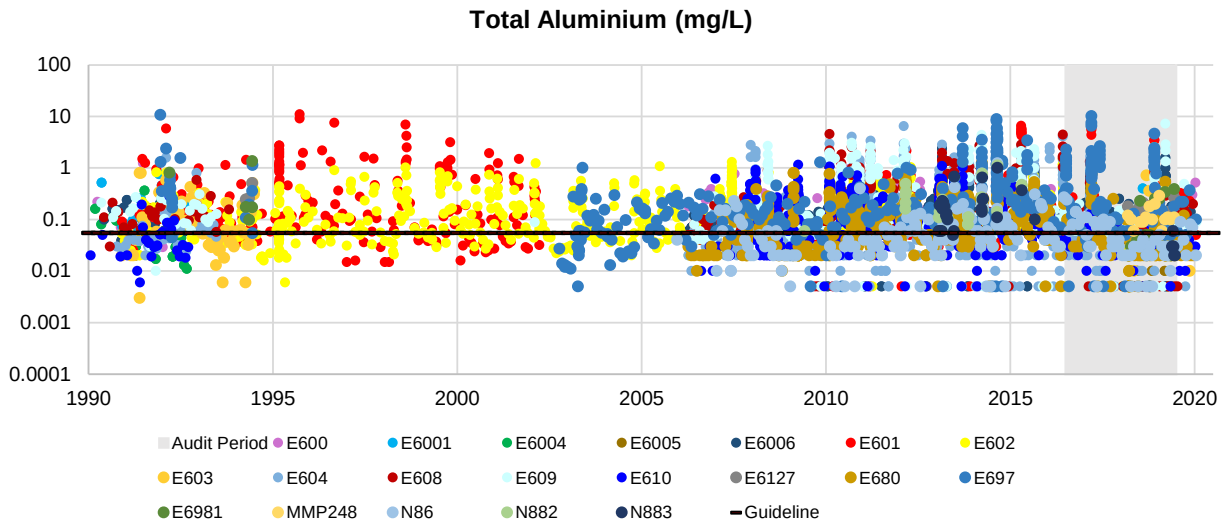


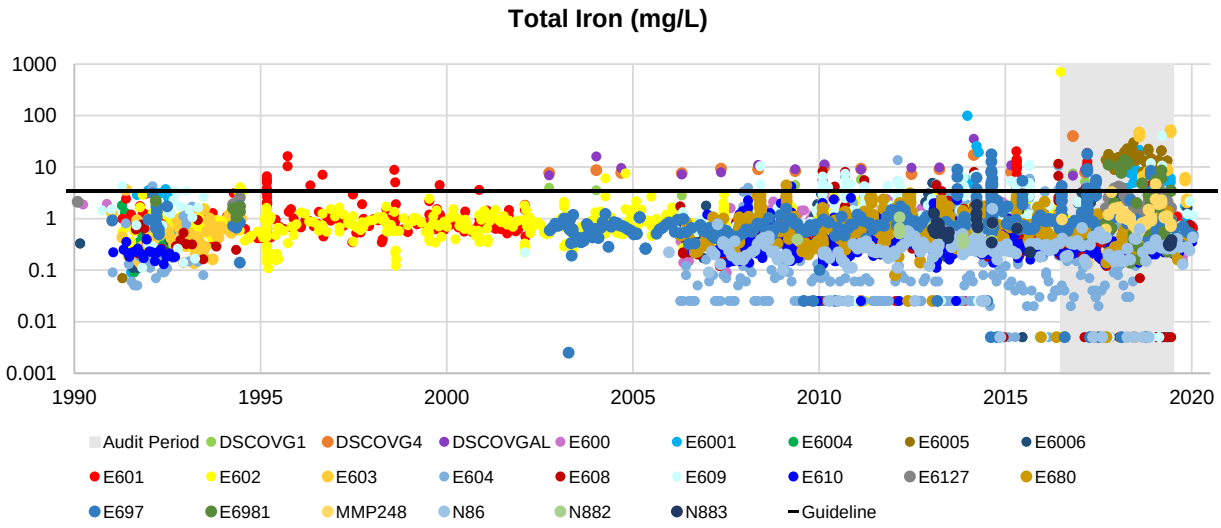
Total Phosphorus (mg/L)

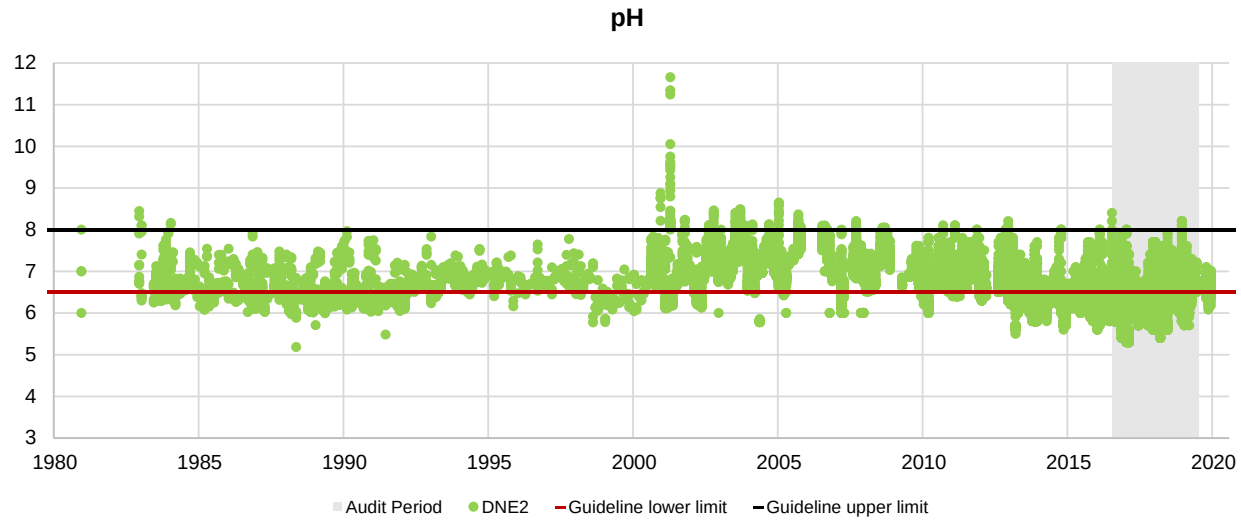


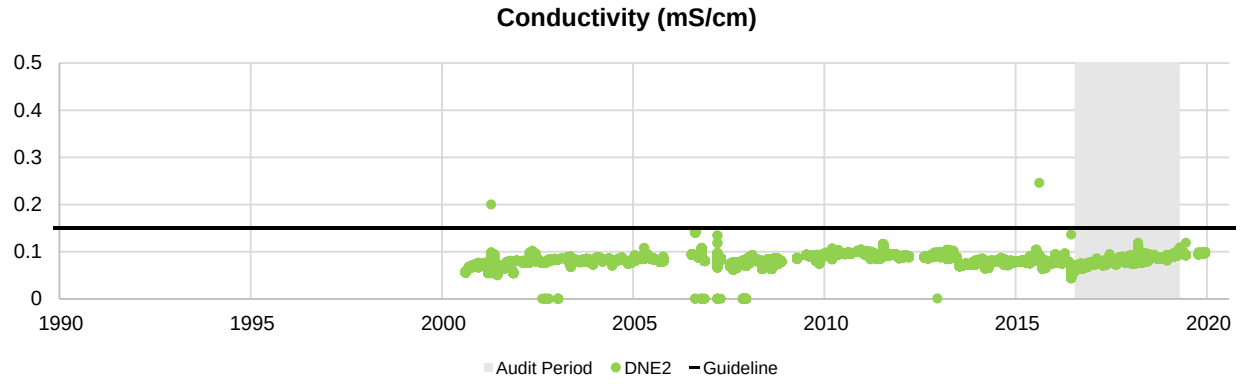
Phosphorus Soluble Reactive (mg/L)

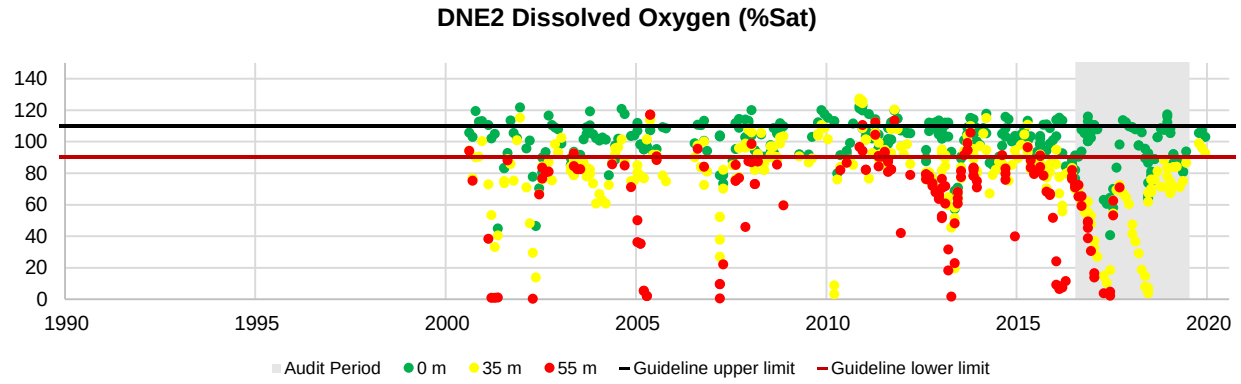


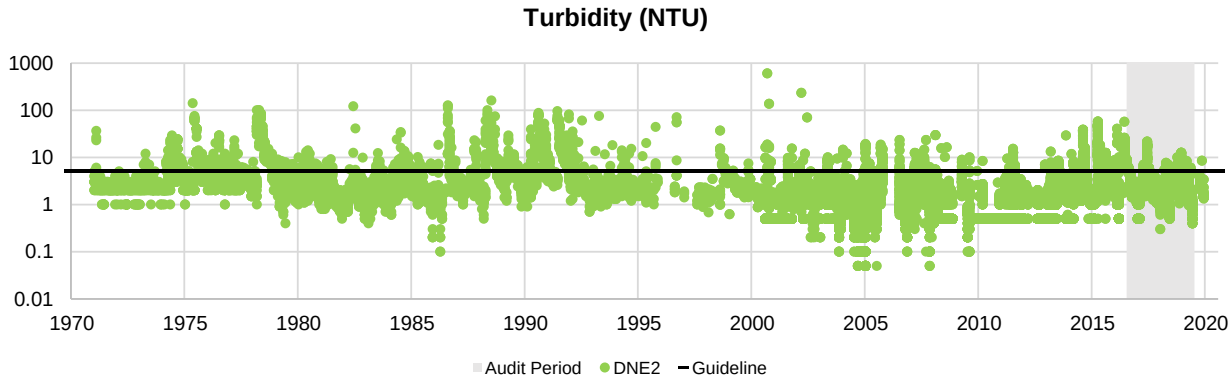

Total Aluminium (mg/L)
100
10
1
0.1
0.01
0.001
0.0001
1990
1995
2000
2005
2010
2015
2020
Audit Period
E600
E6001
E6004
E6005
E6006
E601
E602
E603
E604
E608
E609
E610
E6127
E680
E697
E6981
MMP248
N86
N882
N883
Guideline


Total Iron (mg/L)
1000
100
10
1
0.1
0.01
0.001
1990
1995
2000
2005
2010
2015
2020
Audit Period
DSCOVG1
DSCOVG4
DSCOVGAL
E600
E6001
E6004
E6005
E6006
E601
E602
E603
E604
E608
E609
E610
E6127
E680
E697
E6981
MMP248
N86
N882
N883
Guideline

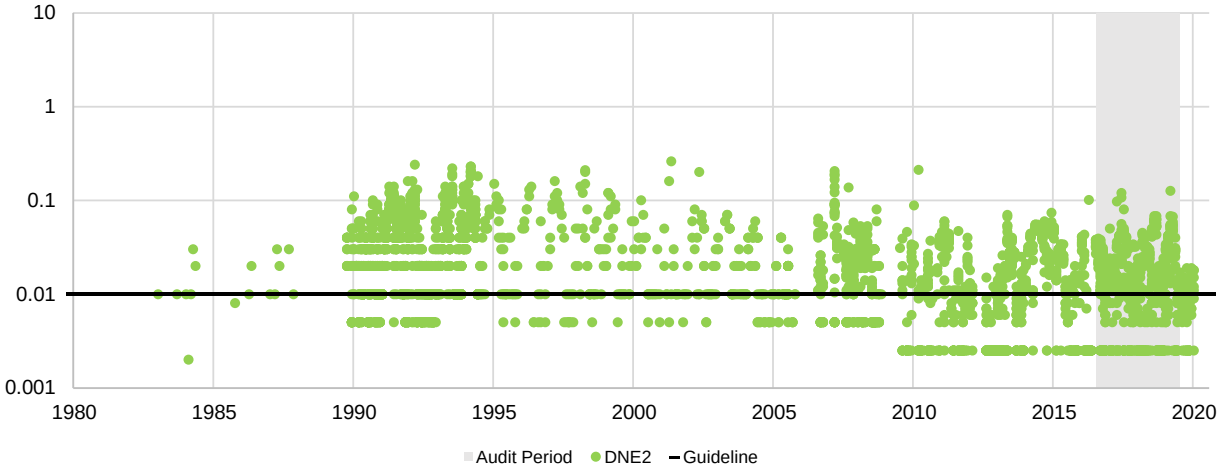

pH
12
11
10
9
8
7
6
5
4
3
1980
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
DNE2
Guideline lower limit
Guideline upper limit


Conductivity (mS/cm)
0.5
0.4
0.3
0.2
0.1
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
DNE2
Guideline

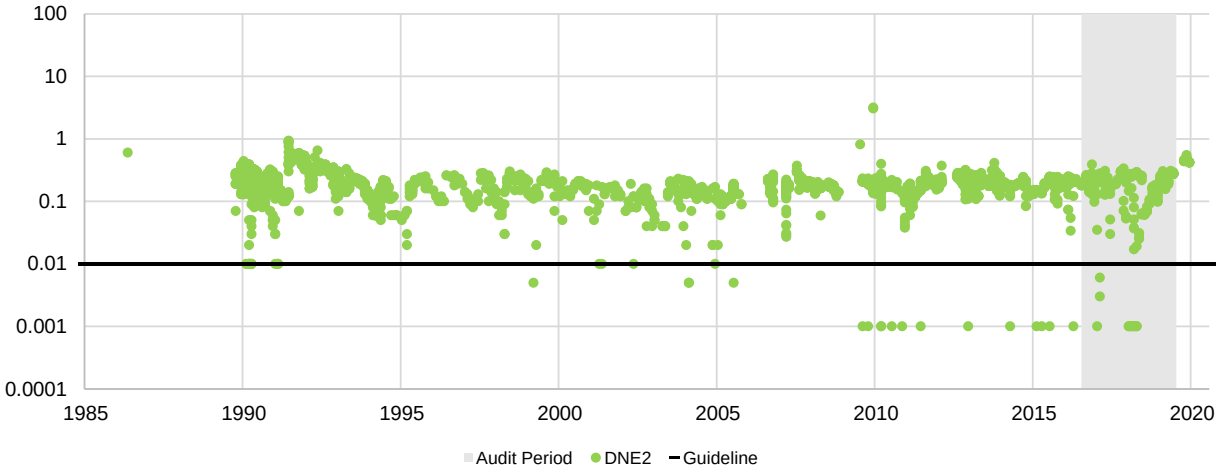

DNE2 Dissolved Oxygen (%Sat)
140
120
100
80
60
40
20
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
0 m
35 m
55 m
Guideline upper limit
Guideline lower limit


Turbidity (NTU)
1000
100
10
1
0.1
0.01
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
DNE2
Guideline

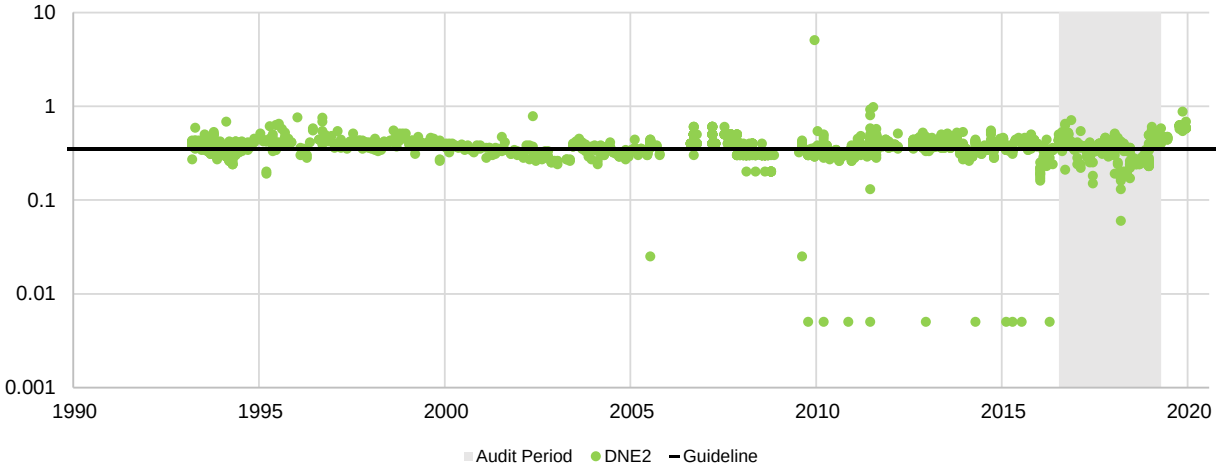
Nitrogen Ammoniacal (mg/L)

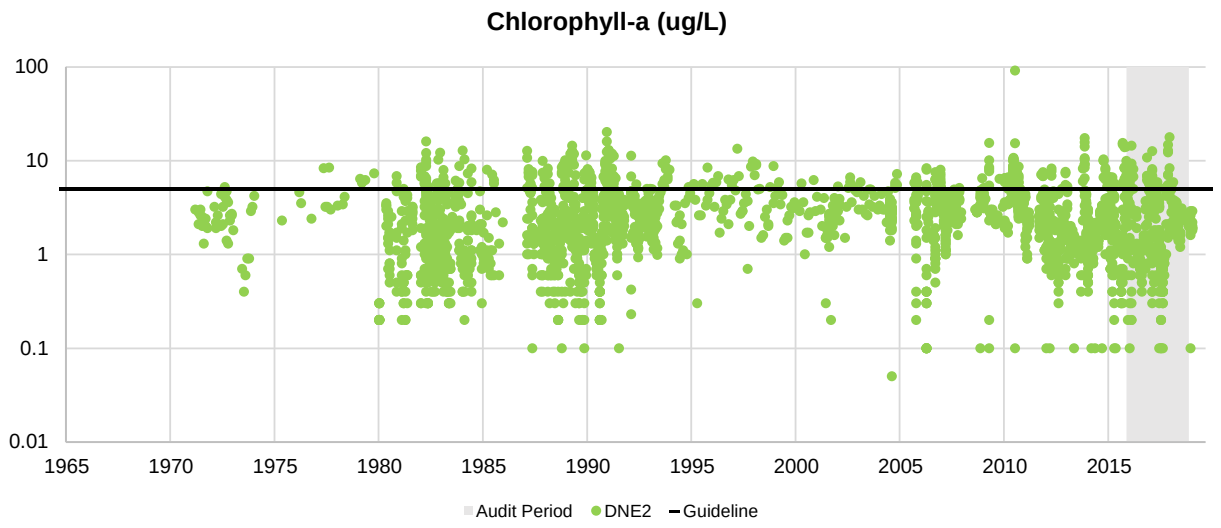


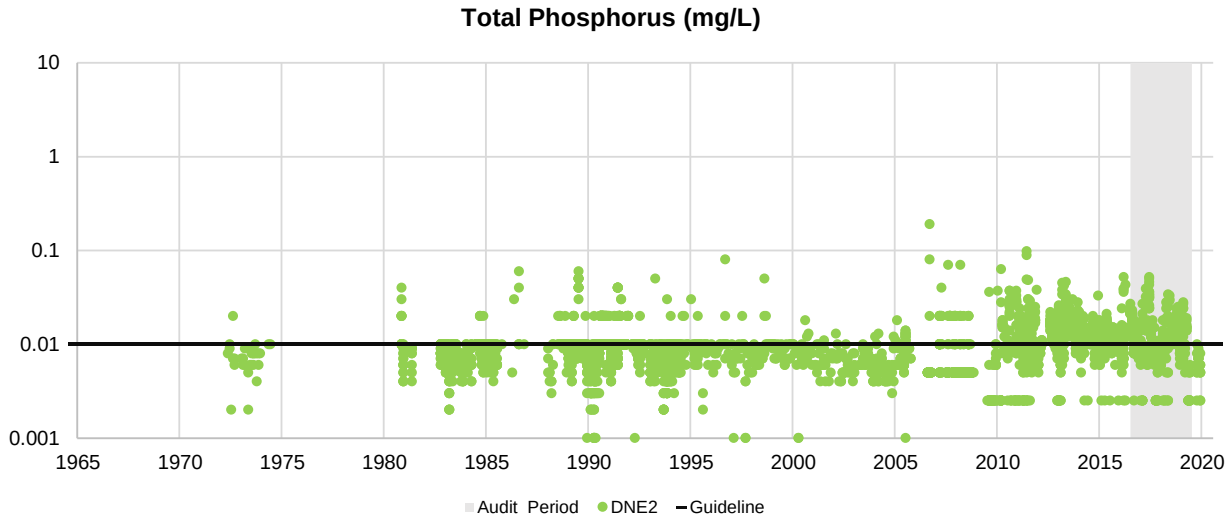
Nitrogen Oxidised (mg/L)

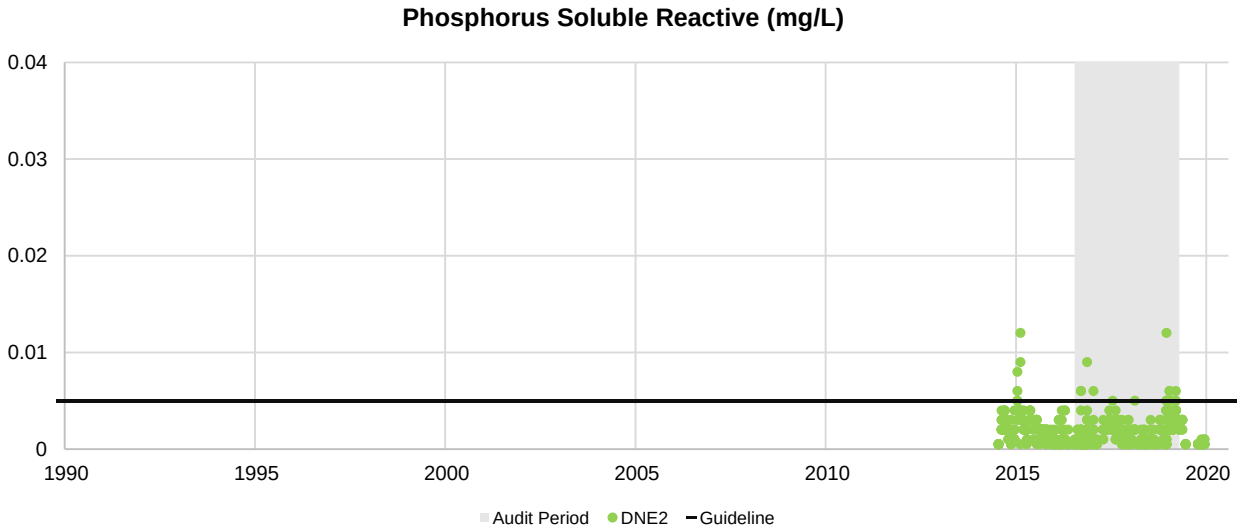


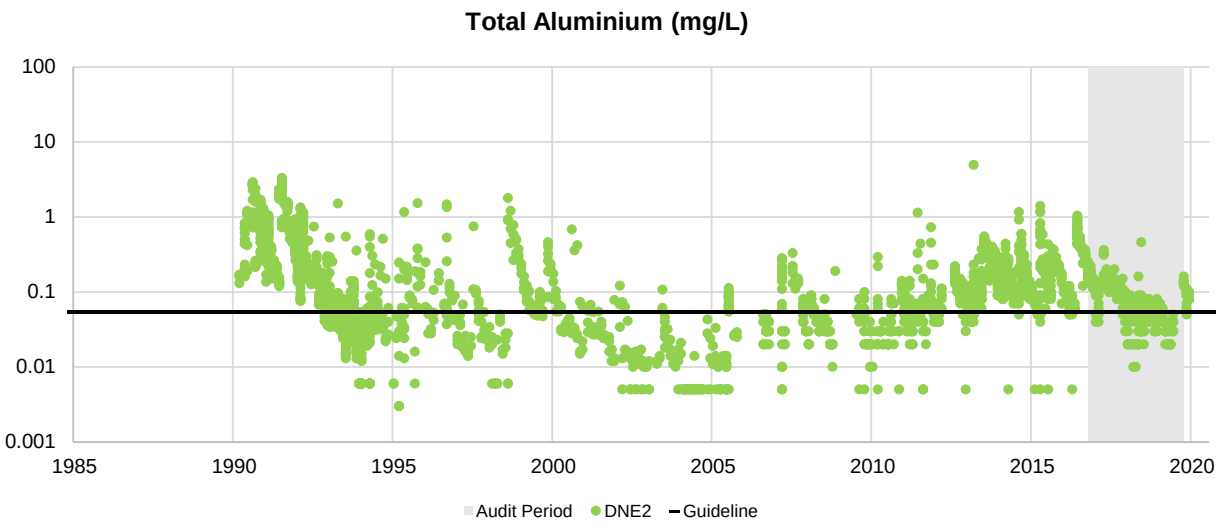
Total Nitrogen(mg/L)

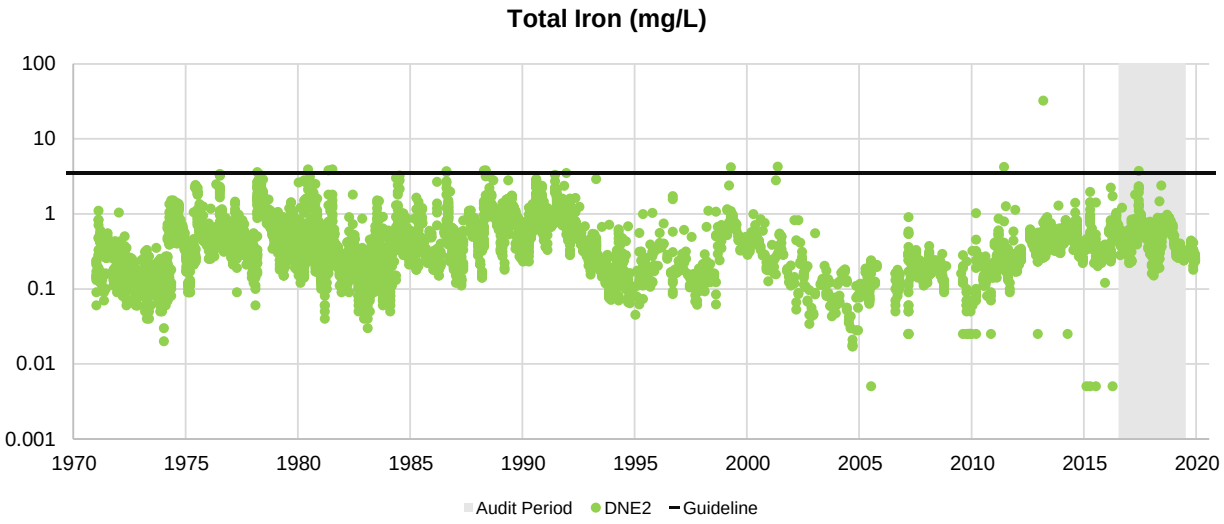


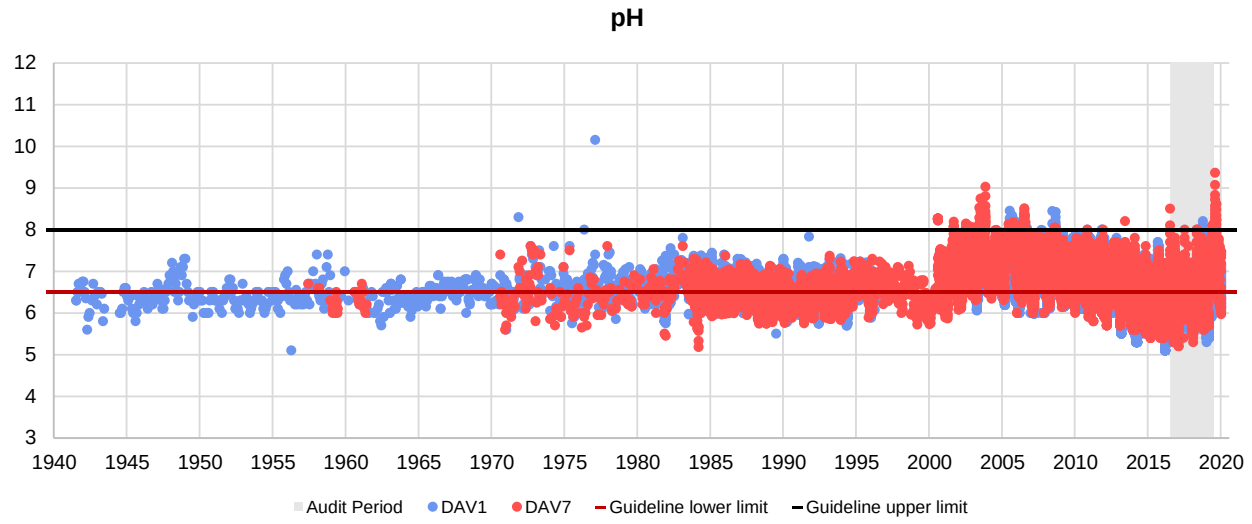

Chlorophyll-a (ug/L)
100
10
1
0.1
0.01
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
Audit Period
DNE2
Guideline

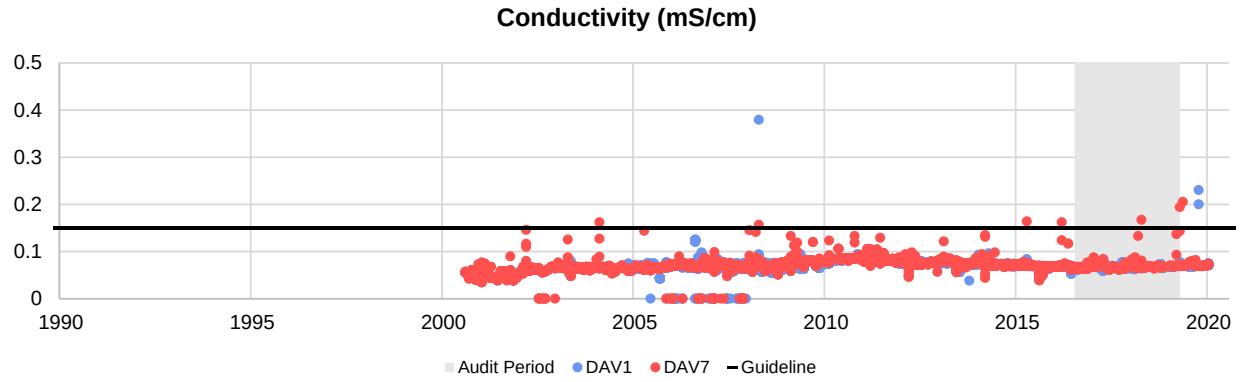

Total Phosphorus (mg/L)
10
1
0.1
0.01
0.001
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
DNE2
Guideline

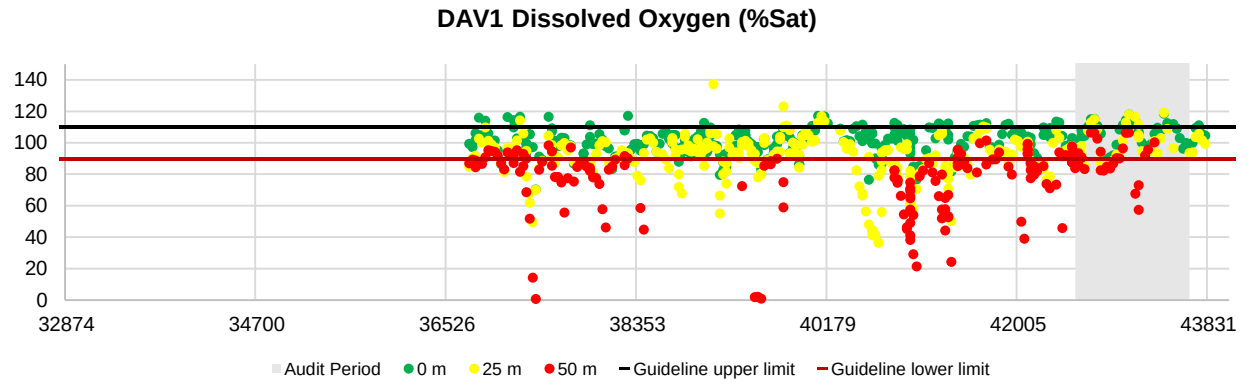

Phosphorus Soluble Reactive (mg/L)
0.04
0.03
0.02
0.01
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
DNE2
Guideline

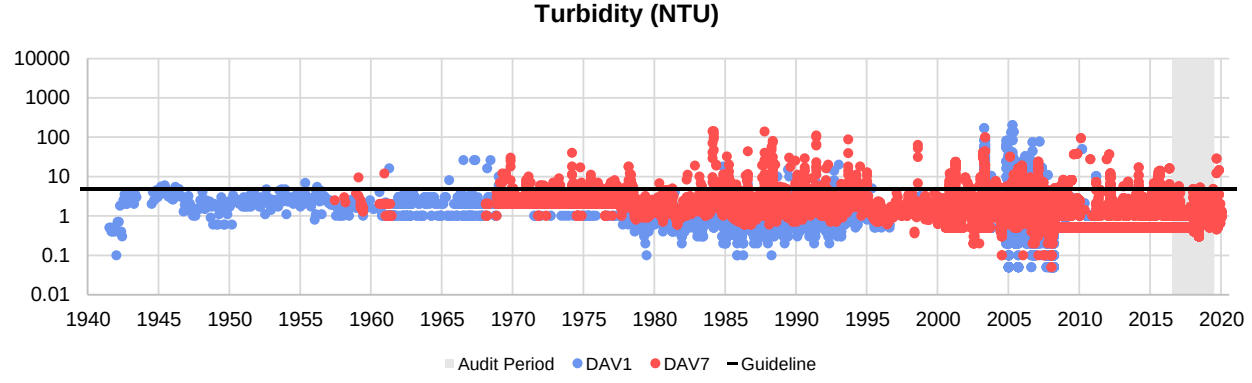

Total Aluminium (mg/L)
100
10
1
0.1
0.01
0.001
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
DNE2
Guideline

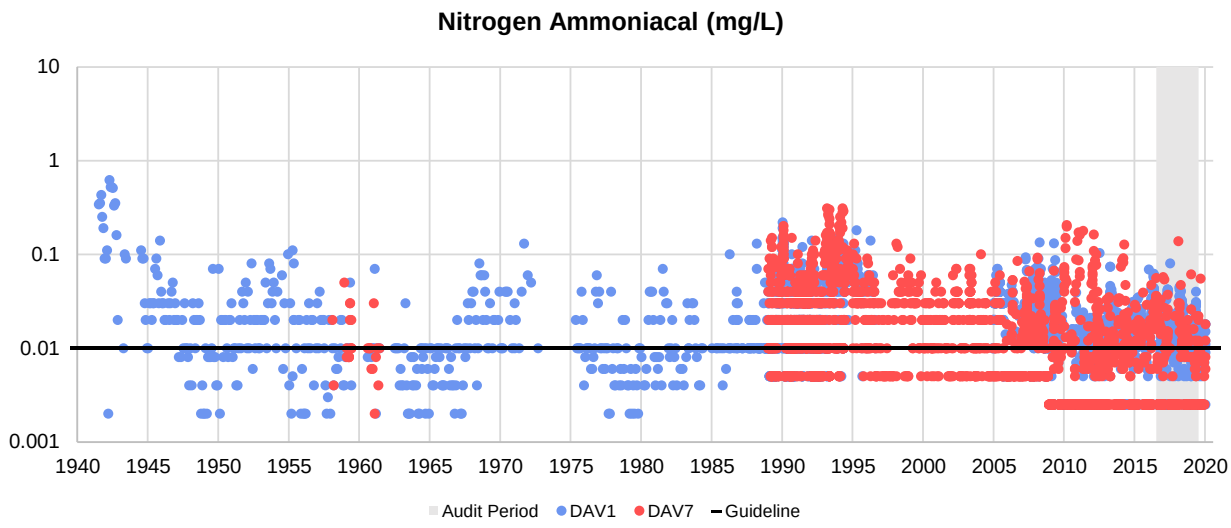

Total Iron (mg/L)
100
10
1
0.1
0.01
0.001
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
DNE2
Guideline

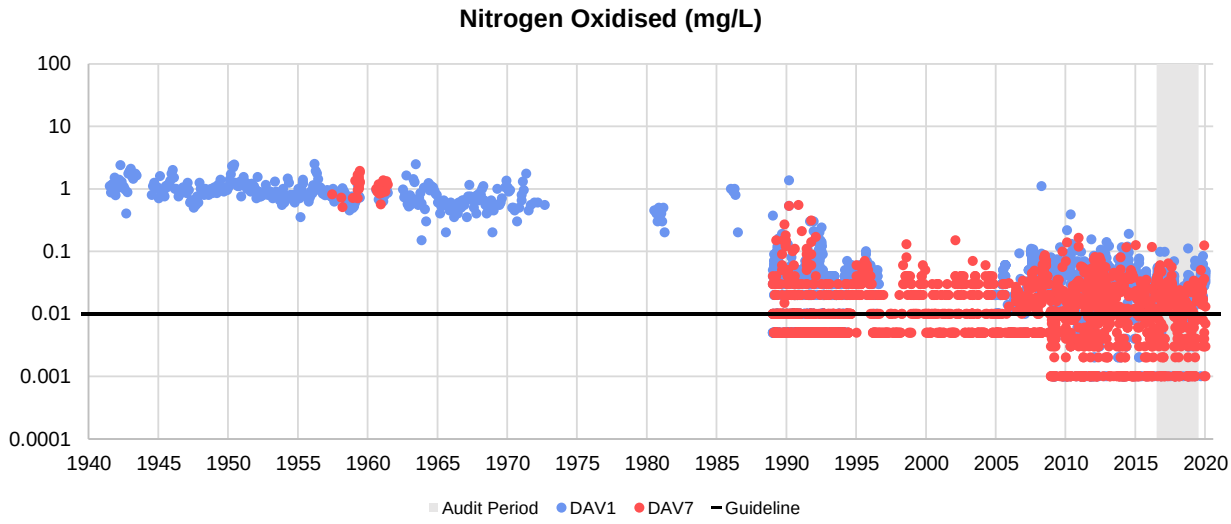

pH
12
11
10
9
8
7
6
5
4
3
1940
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
DAV1
DAV7
Guideline lower limit
Guideline upper limit

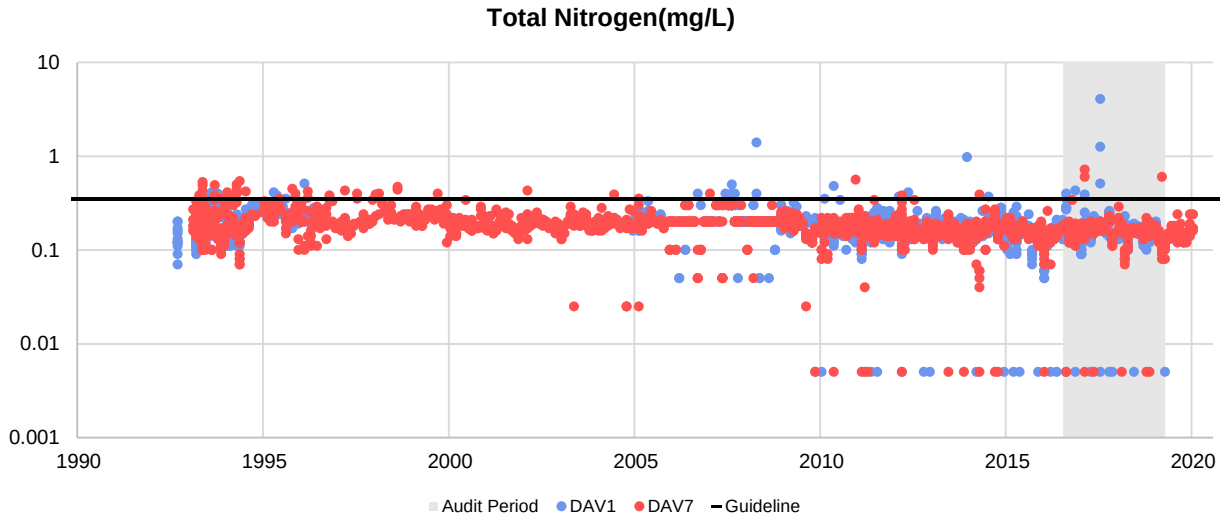

Conductivity (mS/cm)
0.5
0.4
0.3
0.2
0.1
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
DAV1
DAV7
Guideline

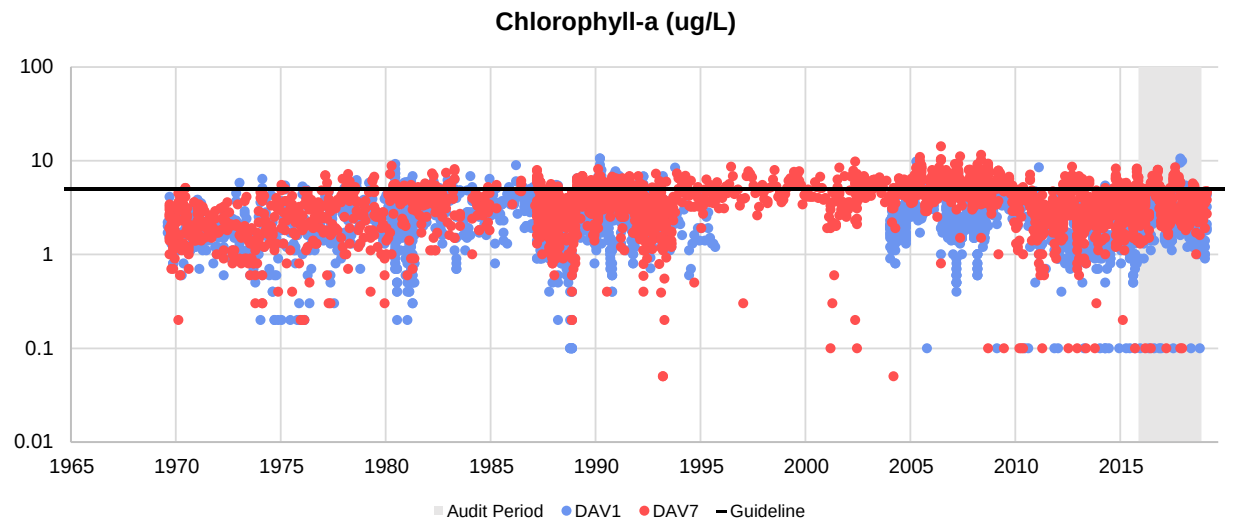

DAV1 Dissolved Oxygen (%Sat)
140
120
100
80
60
40
20
0
32874
34700
36526
38353
40179
42005
43831
Audit Period
0 m
25 m
50 m
Guideline upper limit
Guideline lower limit

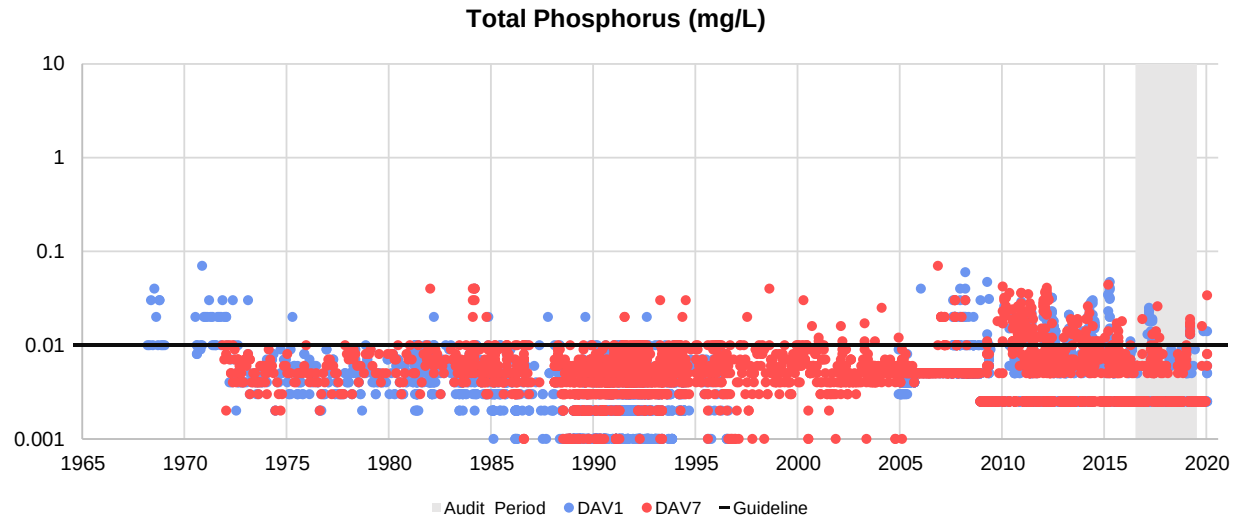

Turbidity (NTU)
10000
1000
100
10
1
0.1
0.01
1940
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
DAV1
DAV7
Guideline

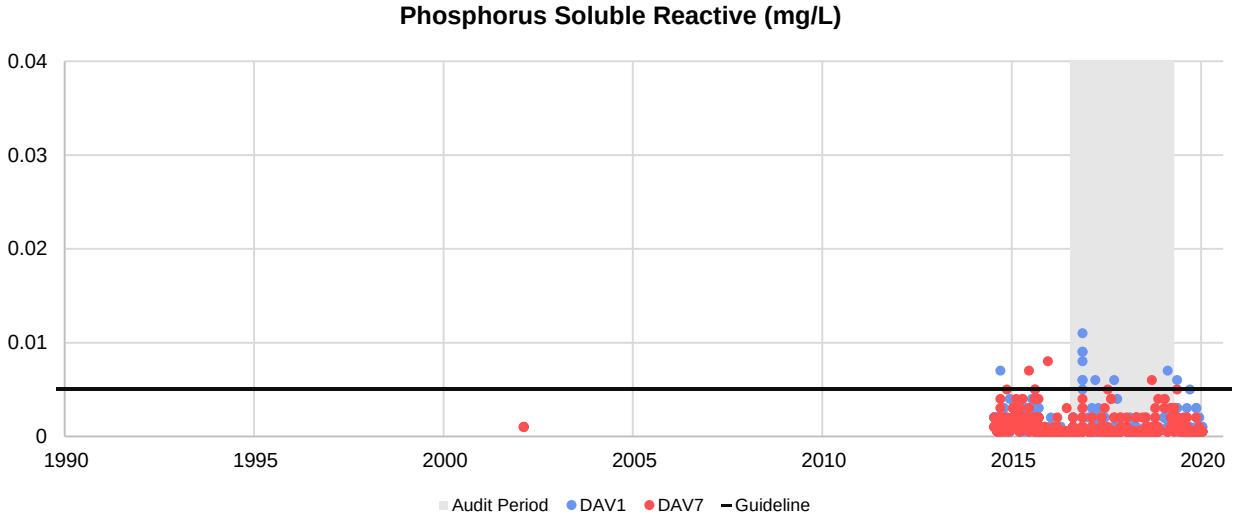

Nitrogen Ammoniacal (mg/L)
10
1
0.1
0.01
0.001
1940 1945 1950 1955 1960 1965 1970 1975 1980 1985 1990 1995 2000 2005 2010 2015 2020
Audit Period
DAV1
DAV7
Guideline

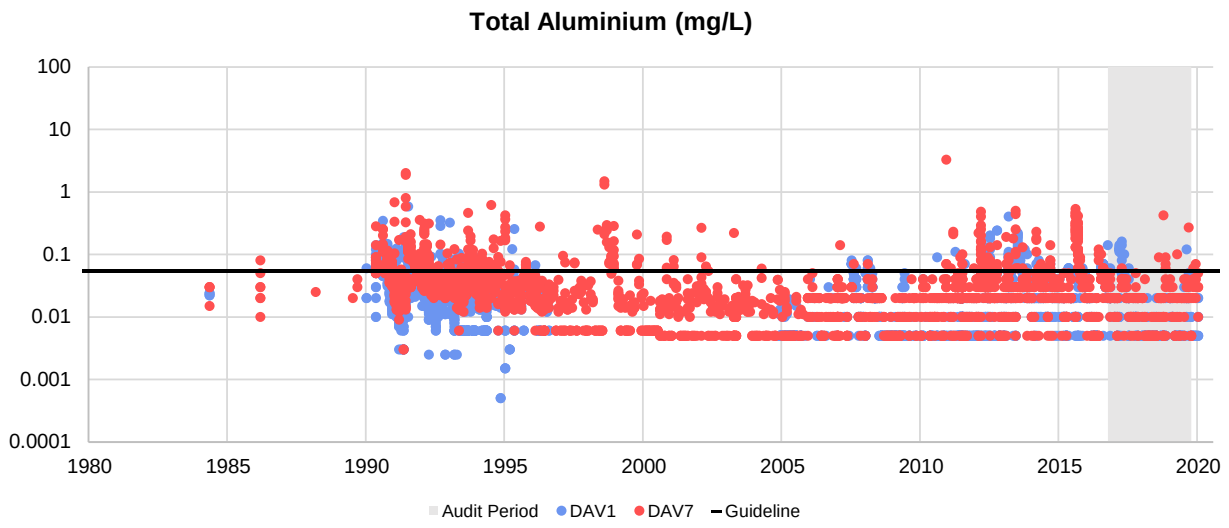

Nitrogen Oxidised (mg/L)
100
10
1
0.1
0.01
0.001
0.0001
1940 1945 1950 1955 1960 1965 1970 1975 1980 1985 1990 1995 2000 2005 2010 2015 2020
Audit Period
DAV1
DAV7
Guideline

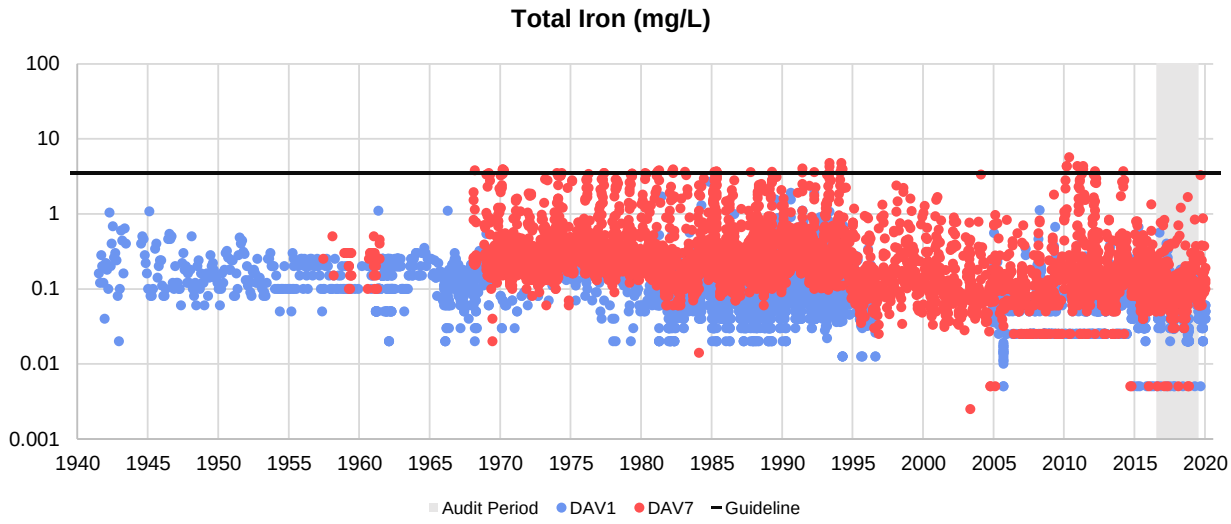

Total Nitrogen(mg/L)
10
1
0.1
0.01
0.001
1990 1995 2000 2005 2010 2015 2020
Audit Period
DAV1
DAV7
Guideline

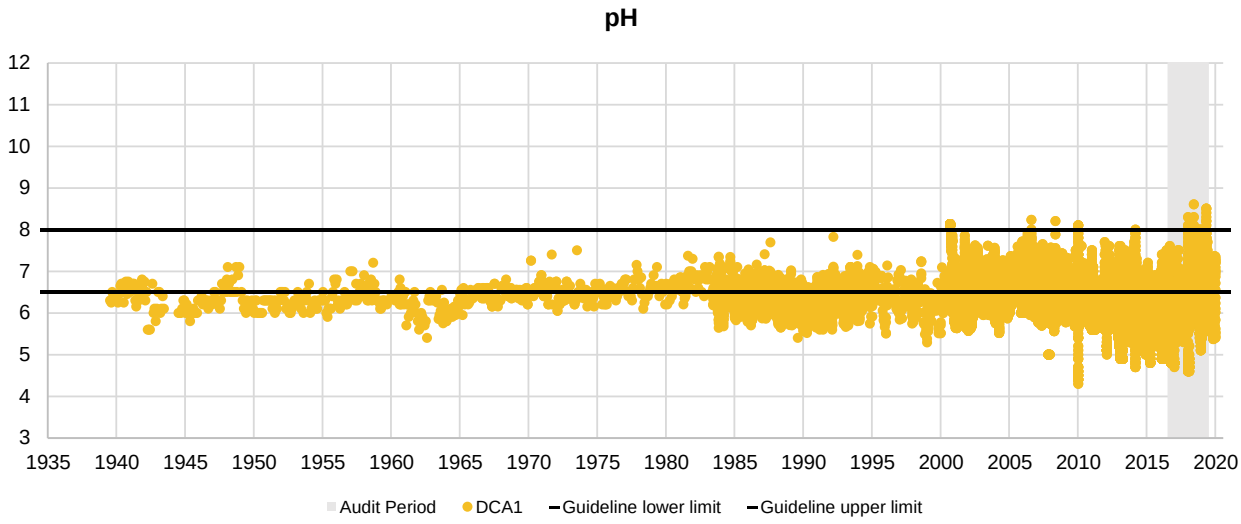

Chlorophyll-a (ug/L)
100
10
1
0.1
0.01
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
Audit Period
DAV1
DAV7
Guideline

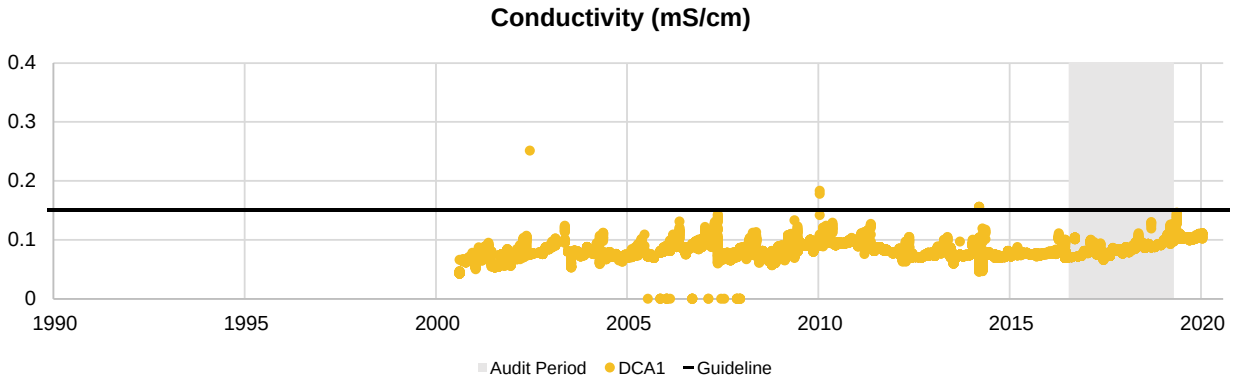

Total Phosphorus (mg/L)
10
1
0.1
0.01
0.001
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
DAV1
DAV7
Guideline

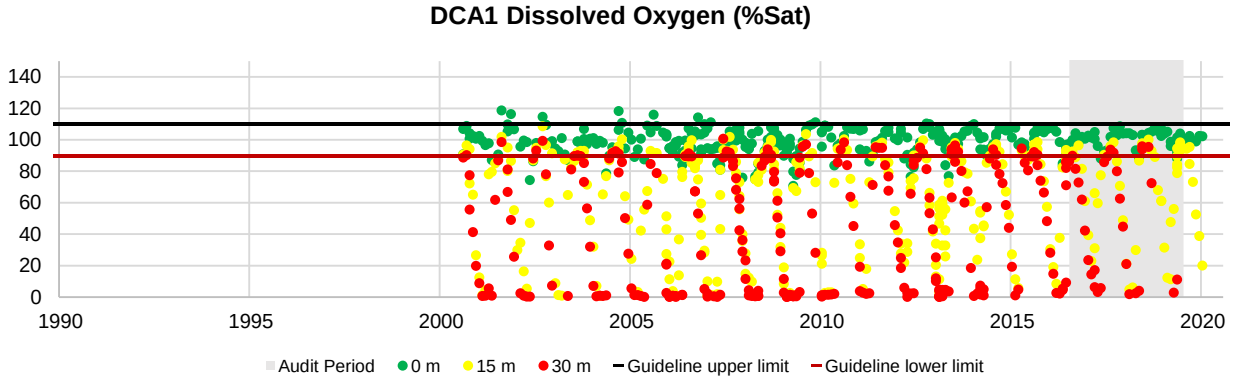

Phosphorus Soluble Reactive (mg/L)
0.04
0.03
0.02
0.01
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
DAV1
DAV7
Guideline

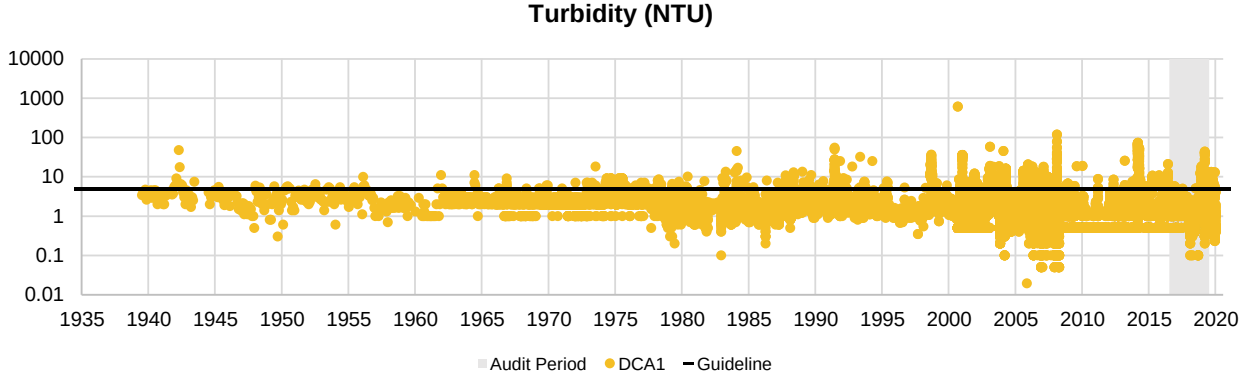

Total Aluminium (mg/L)
100
10
1
0.1
0.01
0.001
0.0001
1980
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
DAV1
DAV7
Guideline

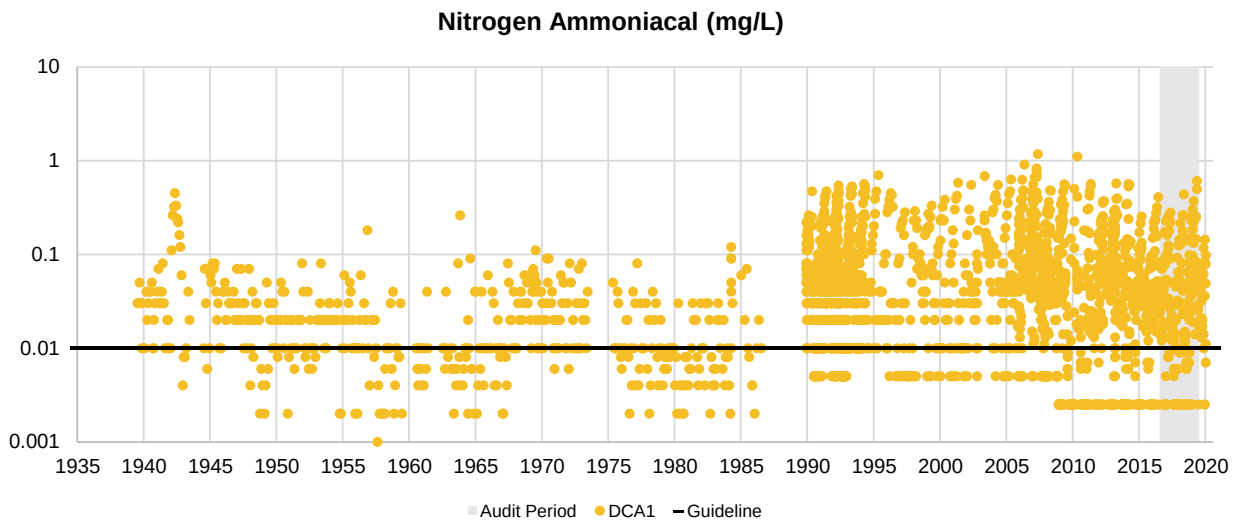

Total Iron (mg/L)
100
10
1
0.1
0.01
0.001
1940
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
DAV1
DAV7
Guideline

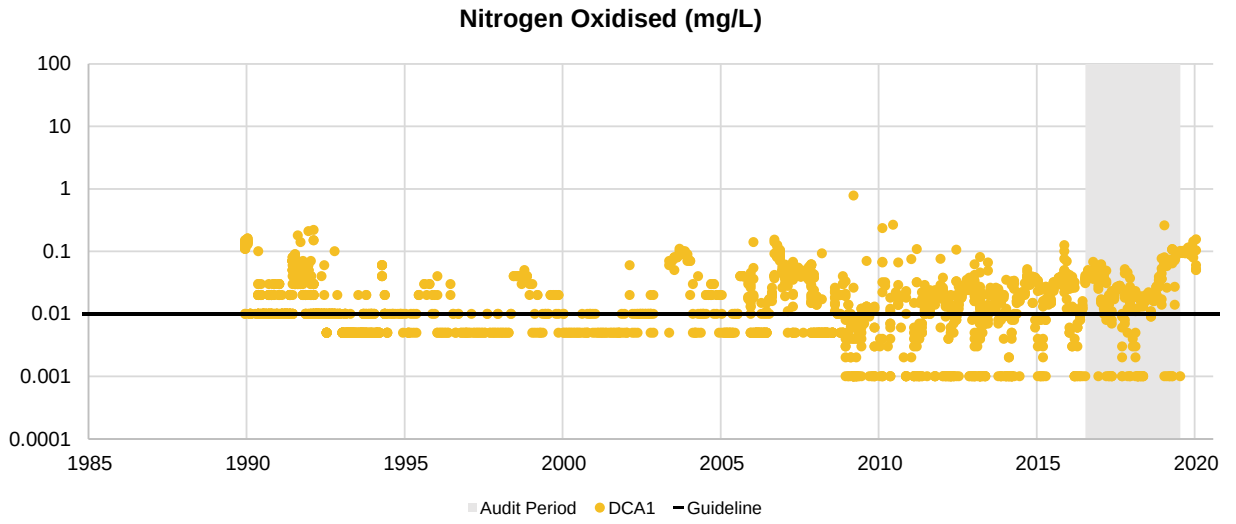

pH
12
11
10
9
8
7
6
5
4
3
1935 1940 1945 1950 1955 1960 1965 1970 1975 1980 1985 1990 1995 2000 2005 2010 2015 2020
Audit Period
DCA1
Guideline lower limit
Guideline upper limit

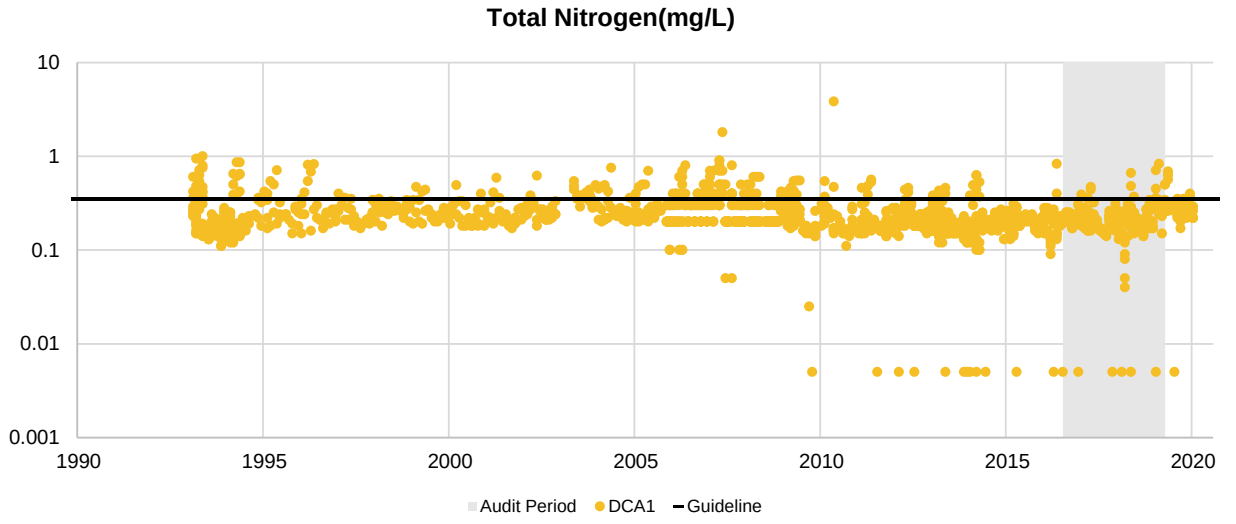

Conductivity (mS/cm)
0.4
0.3
0.2
0.1
0
1990 1995 2000 2005 2010 2015 2020
Audit Period
DCA1
Guideline

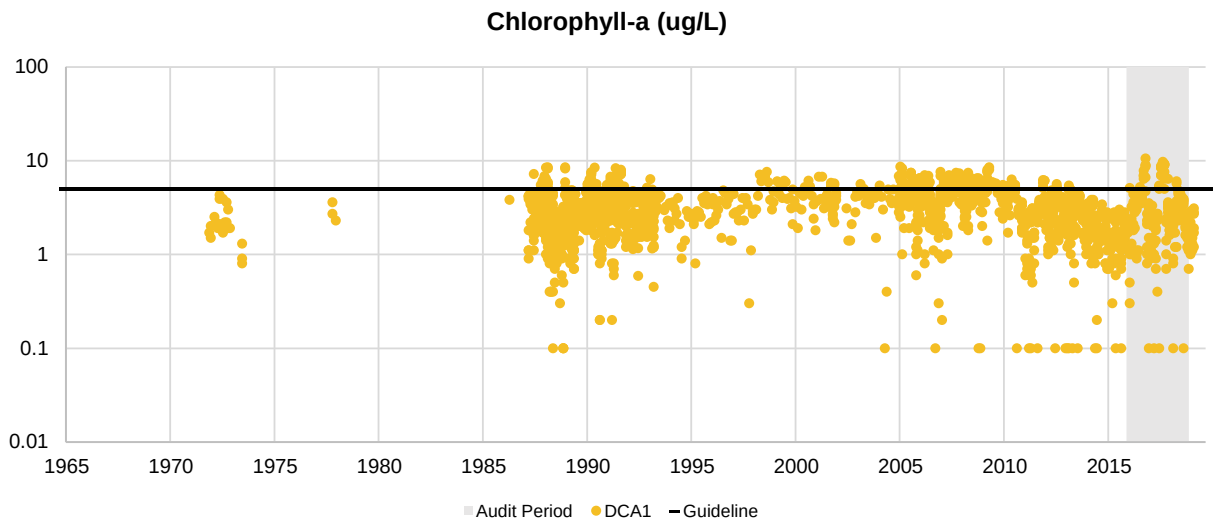

DCA1 Dissolved Oxygen (%Sat)
140
120
100
80
60
40
20
0
1990 1995 2000 2005 2010 2015 2020
Audit Period
0 m
15 m
30 m
Guideline upper limit
Guideline lower limit

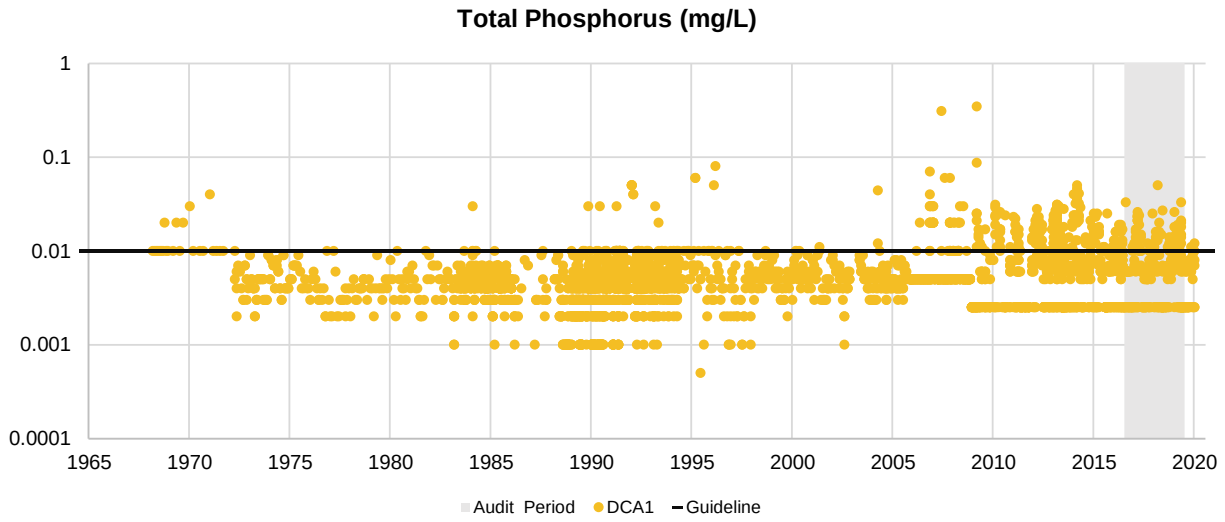

Turbidity (NTU)
10000
1000
100
10
1
0.1
0.01
1935 1940 1945 1950 1955 1960 1965 1970 1975 1980 1985 1990 1995 2000 2005 2010 2015 2020
Audit Period
DCA1
Guideline

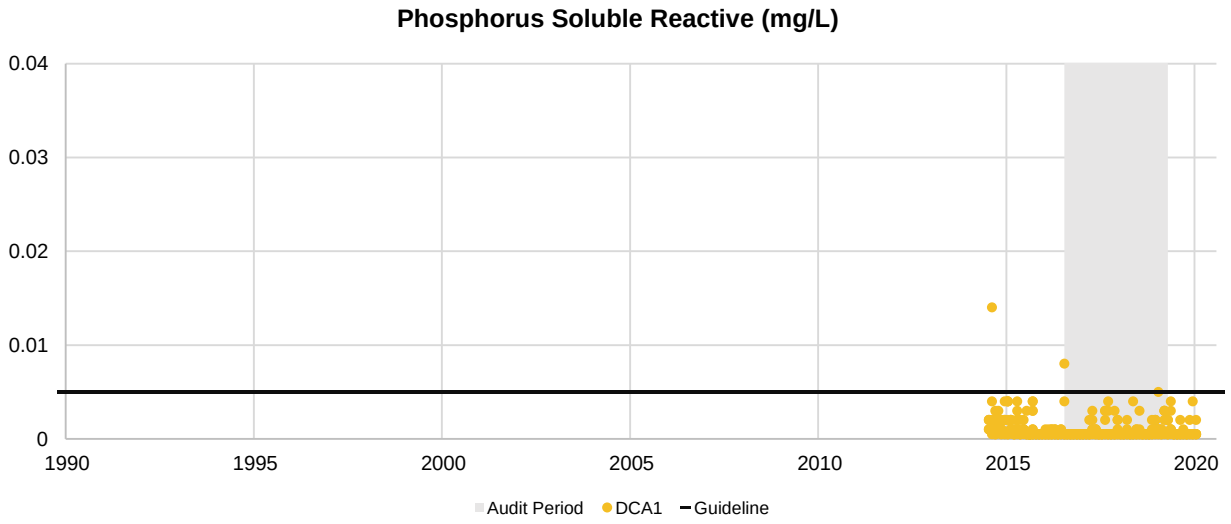

Nitrogen Ammoniacal (mg/L)
10
1
0.1
0.01
0.001
1935 1940 1945 1950 1955 1960 1965 1970 1975 1980 1985 1990 1995 2000 2005 2010 2015 2020
Audit Period
DCA1
Guideline

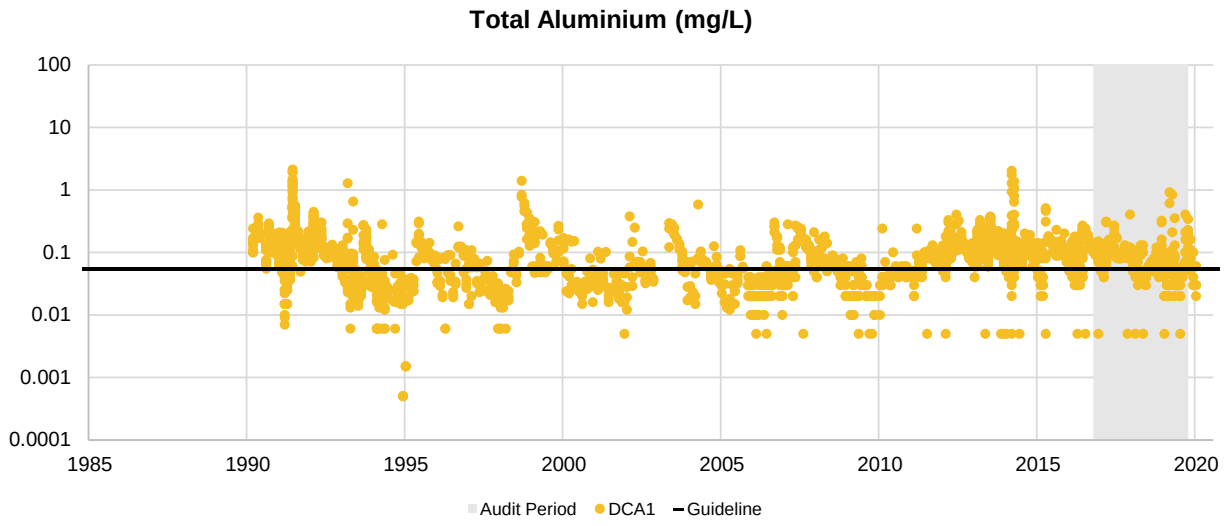

Nitrogen Oxidised (mg/L)
100
10
1
0.1
0.01
0.001
0.0001
1985 1990 1995 2000 2005 2010 2015 2020
Audit Period
DCA1
Guideline

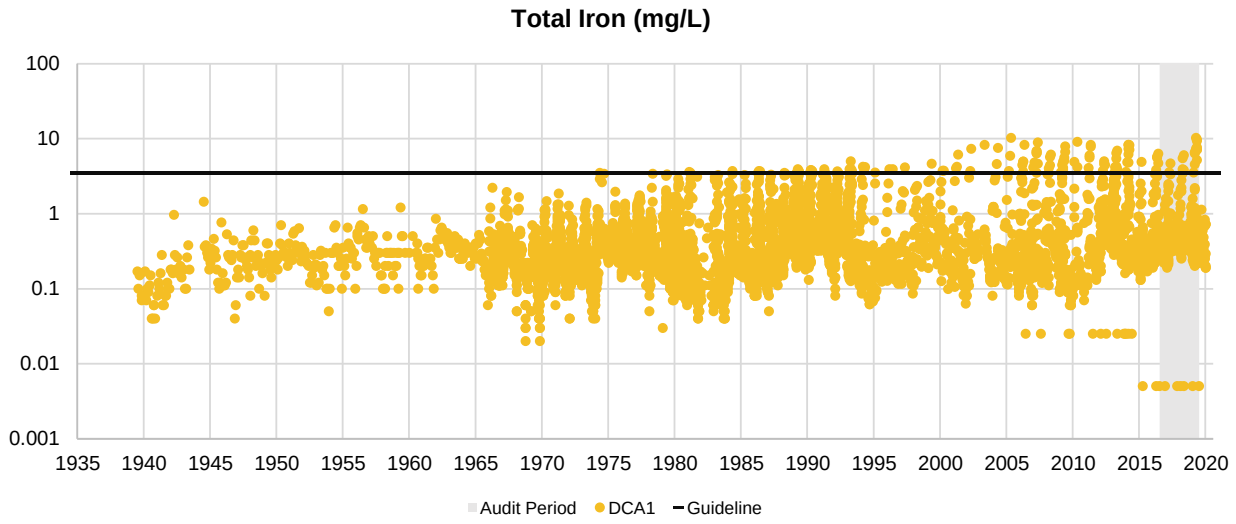

Total Nitrogen(mg/L)
10
1
0.1
0.01
0.001
1990 1995 2000 2005 2010 2015 2020
Audit Period
DCA1
Guideline

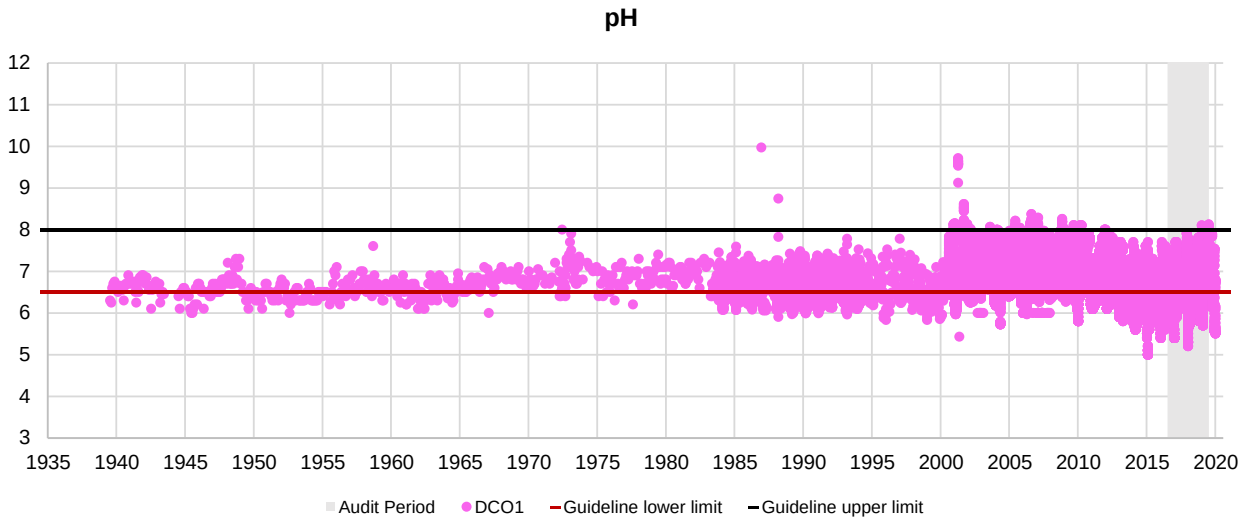

Chlorophyll-a (ug/L)
100
10
1
0.1
0.01
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
Audit Period
DCA1
Guideline

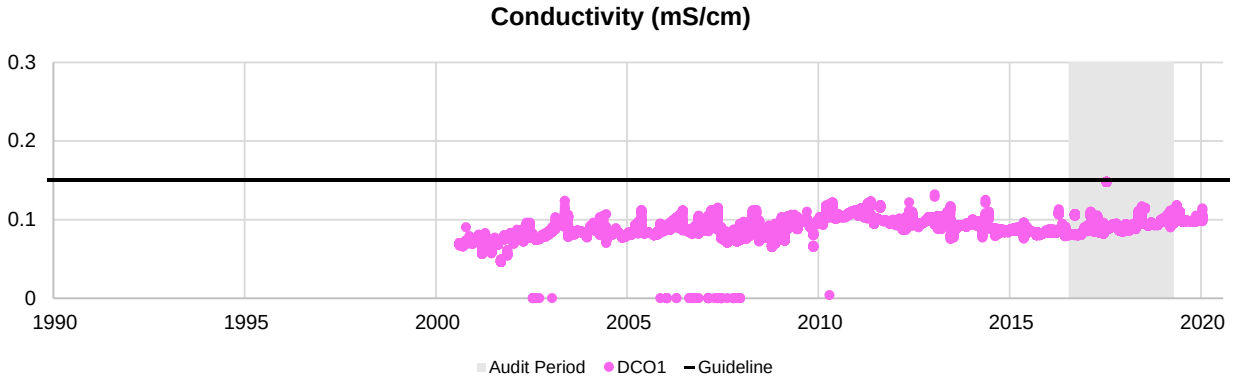

Total Phosphorus (mg/L)
1
0.1
0.01
0.001
0.0001
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
DCA1
Guideline

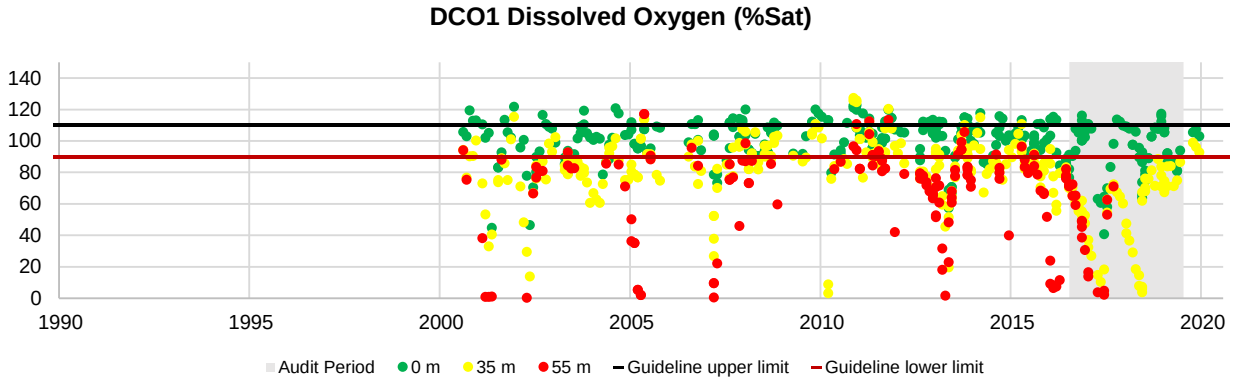

Phosphorus Soluble Reactive (mg/L)
0.04
0.03
0.02
0.01
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
DCA1
Guideline

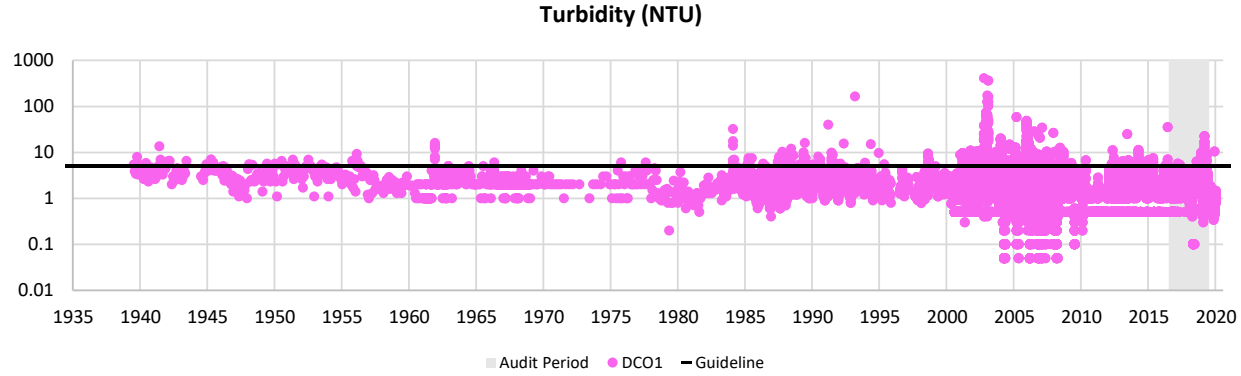

Total Aluminium (mg/L)
100
10
1
0.1
0.01
0.001
0.0001
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
DCA1
Guideline


Total Iron (mg/L)
100
10
1
0.1
0.01
0.001
1935
1940
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
DCA1
Guideline

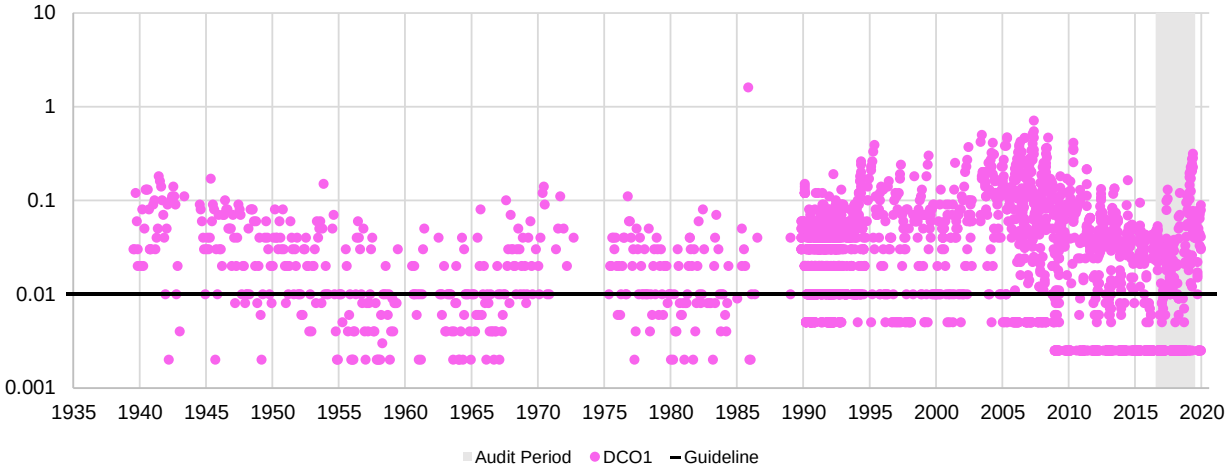

pH
12
11
10
9
8
7
6
5
4
3
1935 1940 1945 1950 1955 1960 1965 1970 1975 1980 1985 1990 1995 2000 2005 2010 2015 2020
Audit Period
DCO1
Guideline lower limit
Guideline upper limit


Conductivity (mS/cm)
0.3
0.2
0.1
0
1990 1995 2000 2005 2010 2015 2020
Audit Period
DCO1
Guideline

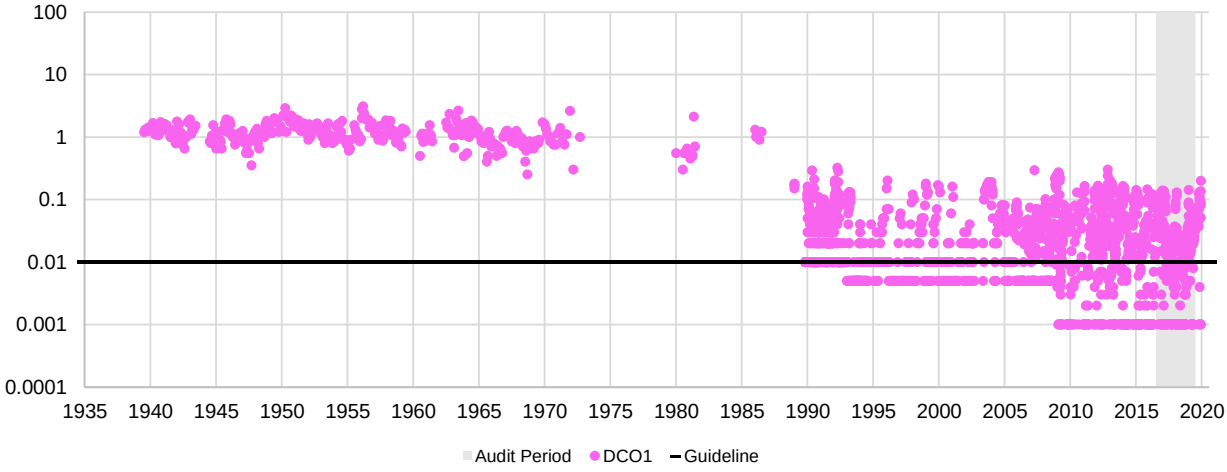

DCO1 Dissolved Oxygen (%Sat)
140
120
100
80
60
40
20
0
1990 1995 2000 2005 2010 2015 2020
Audit Period
0 m
35 m
55 m
Guideline upper limit
Guideline lower limit


Turbidity (NTU)
1000
100
10
1
0.1
0.01
1935 1940 1945 1950 1955 1960 1965 1970 1975 1980 1985 1990 1995 2000 2005 2010 2015 2020
Audit Period
DCO1
Guideline

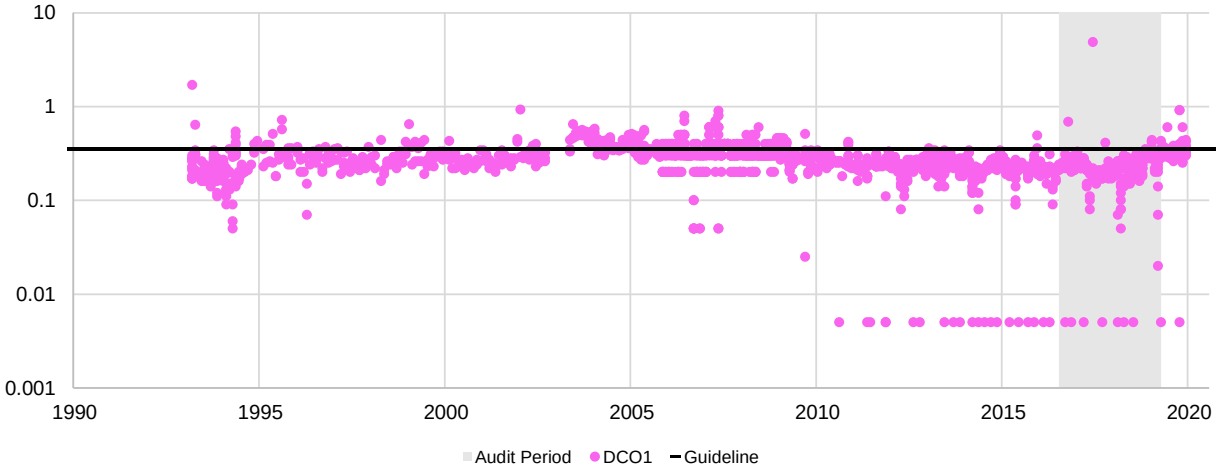
Nitrogen Ammoniacal (mg/L)

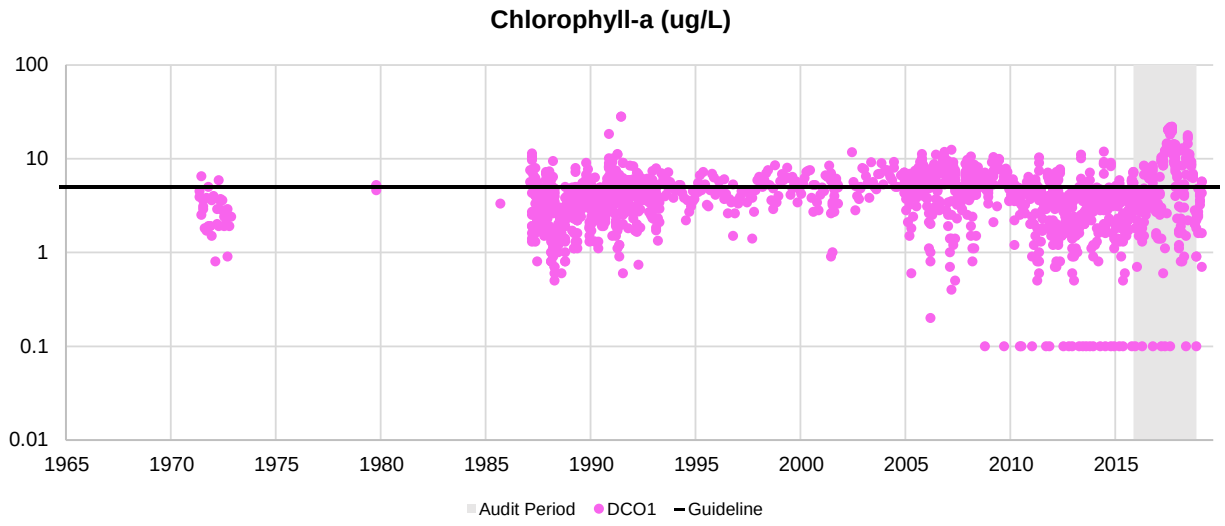


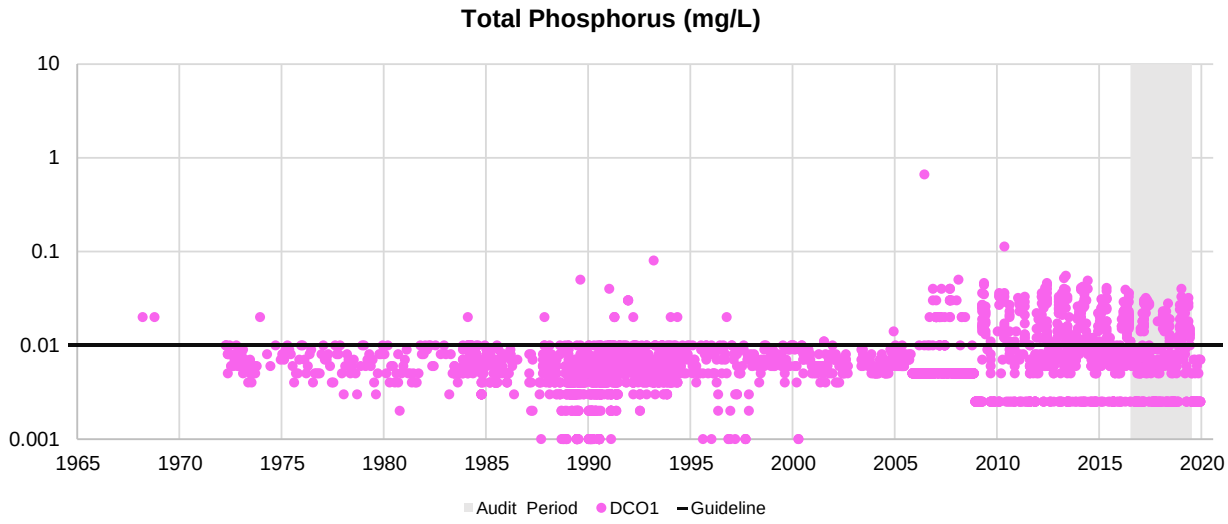
Nitrogen Oxidised (mg/L)

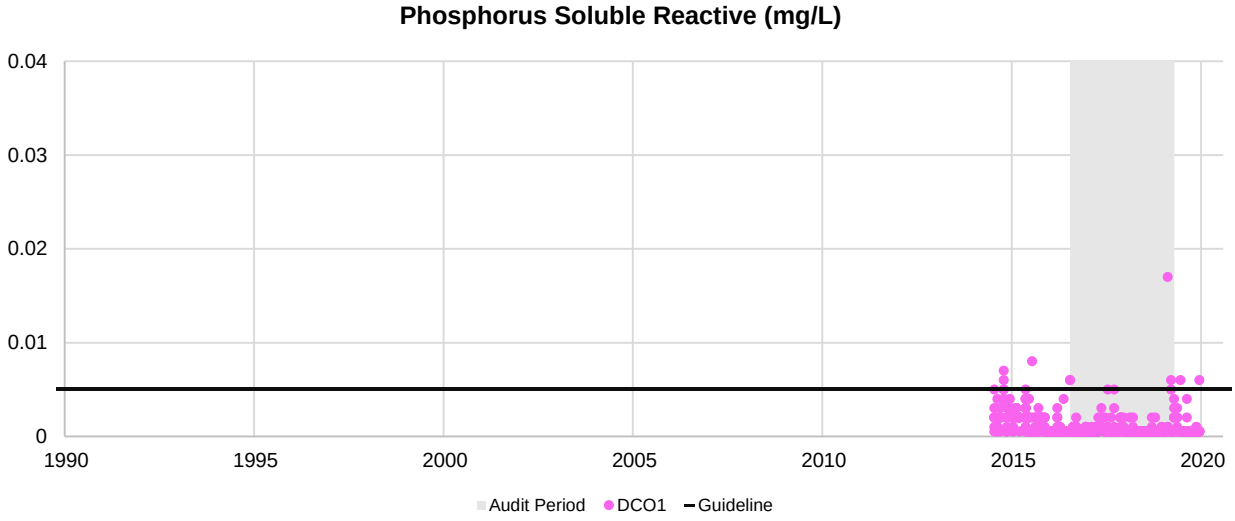


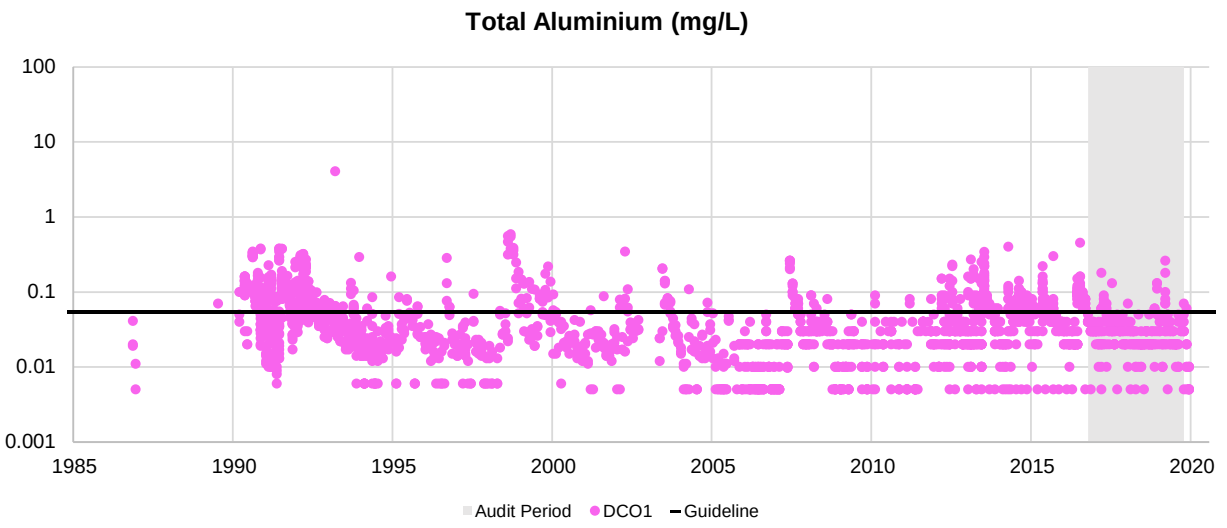
Total Nitrogen(mg/L)

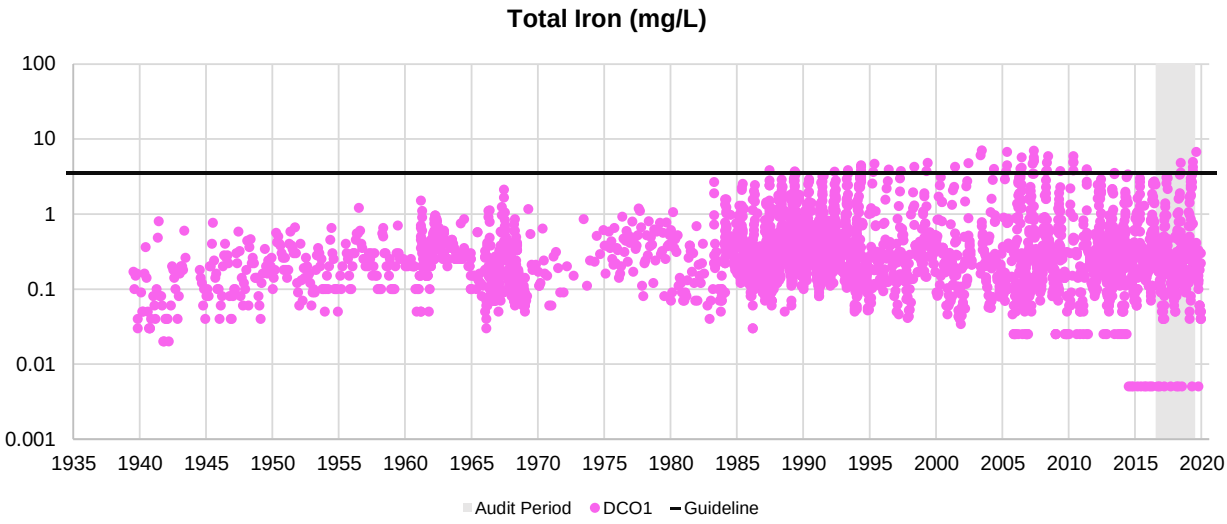



Chlorophyll-a (ug/L)
100
10
1
0.1
0.01
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
Audit Period
DCO1
Guideline


Total Phosphorus (mg/L)
10
1
0.1
0.01
0.001
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
DCO1
Guideline

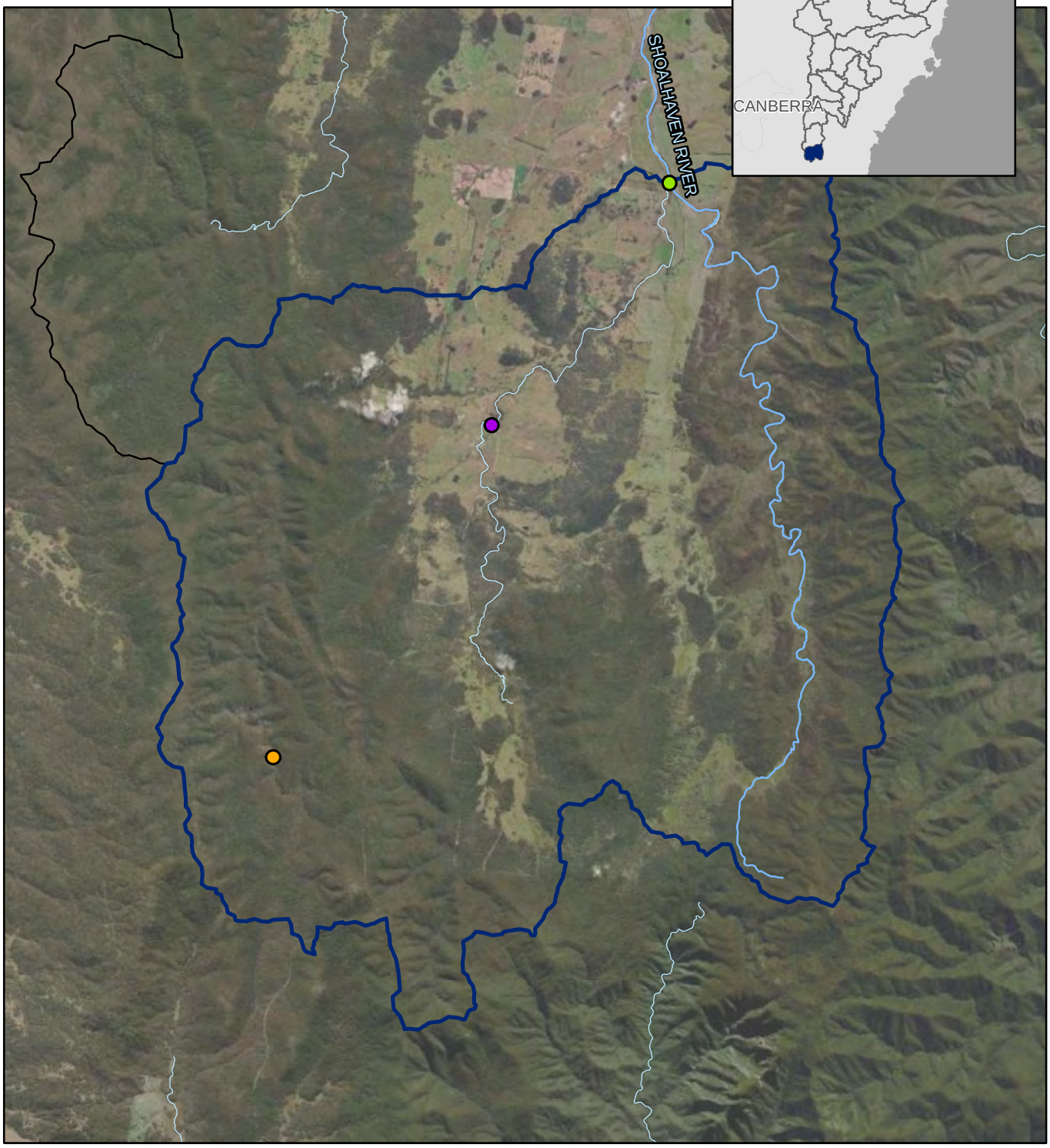

Phosphorus Soluble Reactive (mg/L)
0.04
0.03
0.02
0.01
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
DCO1
Guideline


Total Aluminium (mg/L)
100
10
1
0.1
0.01
0.001
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
DCO1
Guideline


Total Iron (mg/L)
100
10
1
0.1
0.01
0.001
1935
1940
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
DCO1
Guideline

UPPER SHOALHAVEN

CATCHMENT



Legend

- Sub Catchment Boundary
- Major Roads

Water Quality Monitoring Stations

- MMP06
- MMP269
- R8

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

0 2,100 4,200

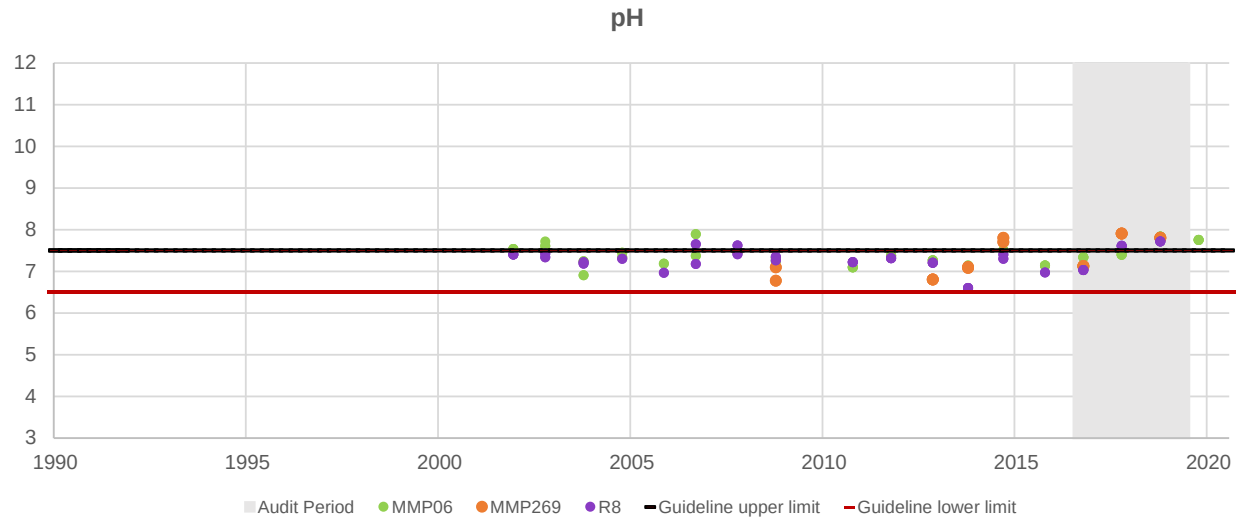
Metres

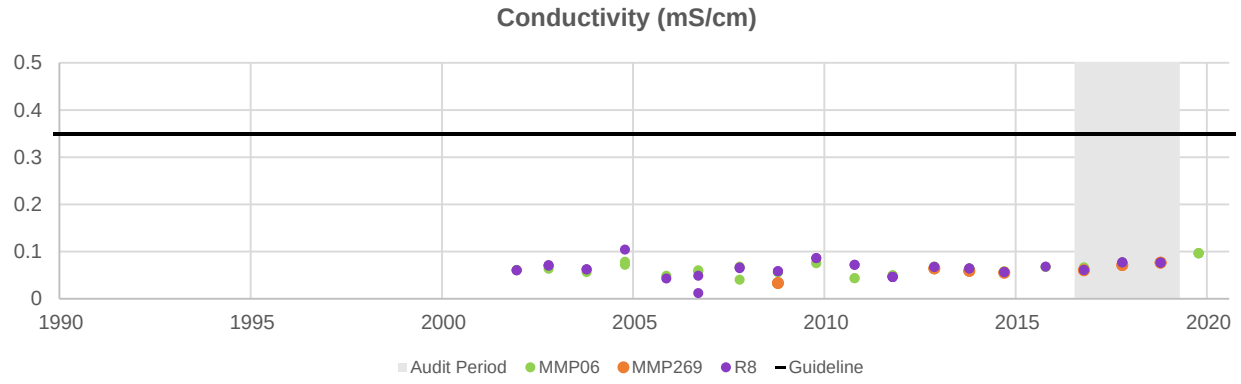
Datum/Projection:
GDA 1994 MGA Zone 56

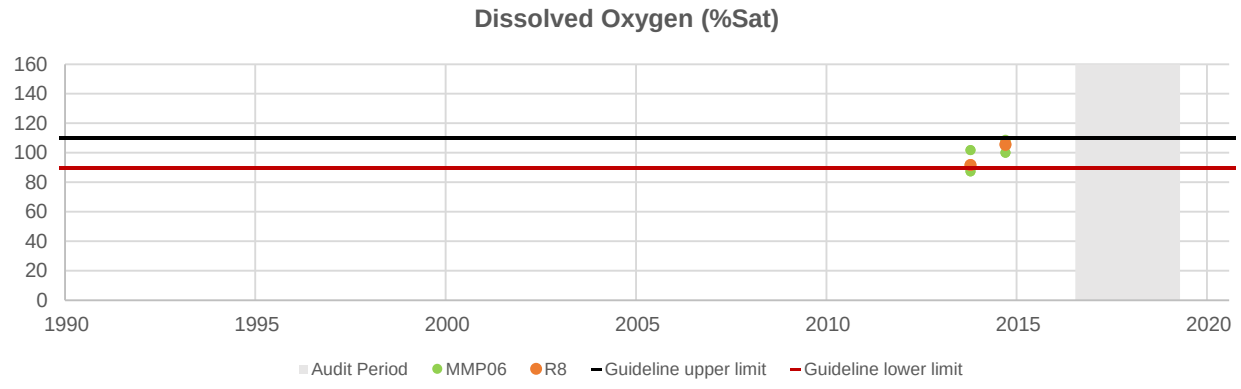
N

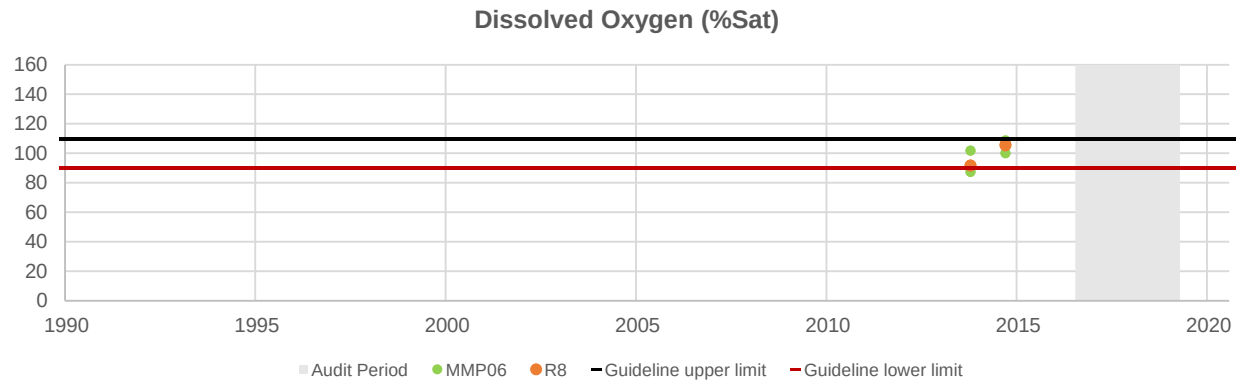
eco logical AUSTRALIA
A TETRA TECH COMPANY

Prepared by: SC Date: 18/03/2020


pH
12
11
10
9
8
7
6
5
4
3
1990
1995
2000
2005
2010
2015
2020
Audit Period
MMP06
MMP269
R8
Guideline upper limit
Guideline lower limit

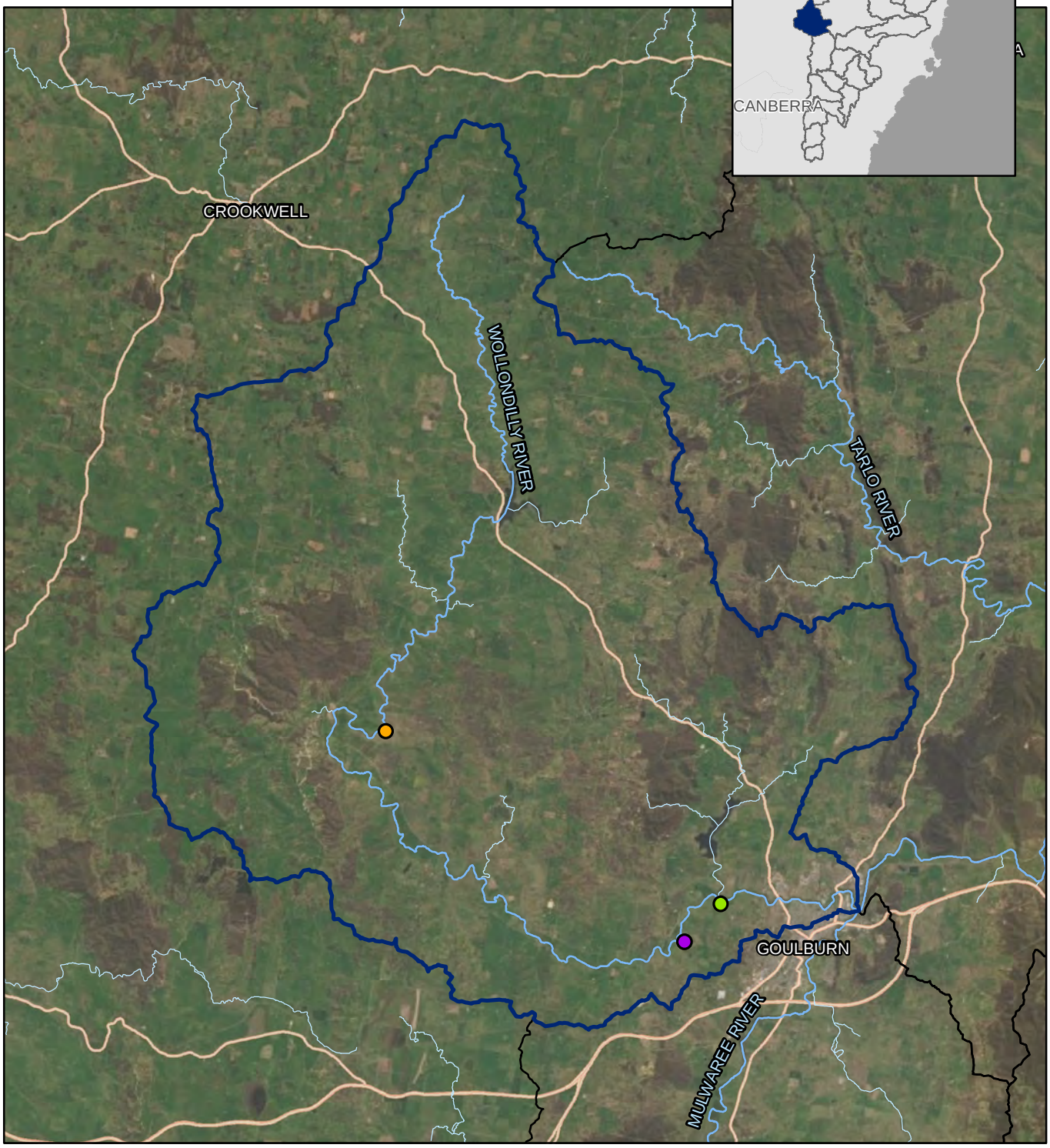

Conductivity (mS/cm)
0.5
0.4
0.3
0.2
0.1
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
MMP06
MMP269
R8
Guideline


Dissolved Oxygen (%Sat)
160
140
120
100
80
60
40
20
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
MMP06
R8
Guideline upper limit
Guideline lower limit


Dissolved Oxygen (%Sat)
160
140
120
100
80
60
40
20
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
MMP06
R8
Guideline upper limit
Guideline lower limit

UPPER WOLLONDILLY RIVER

CATCHMENT



Legend

- Sub Catchment Boundary
- Major Roads

Water Quality Monitoring Stations

- E490
- MMP27
- Uwol1

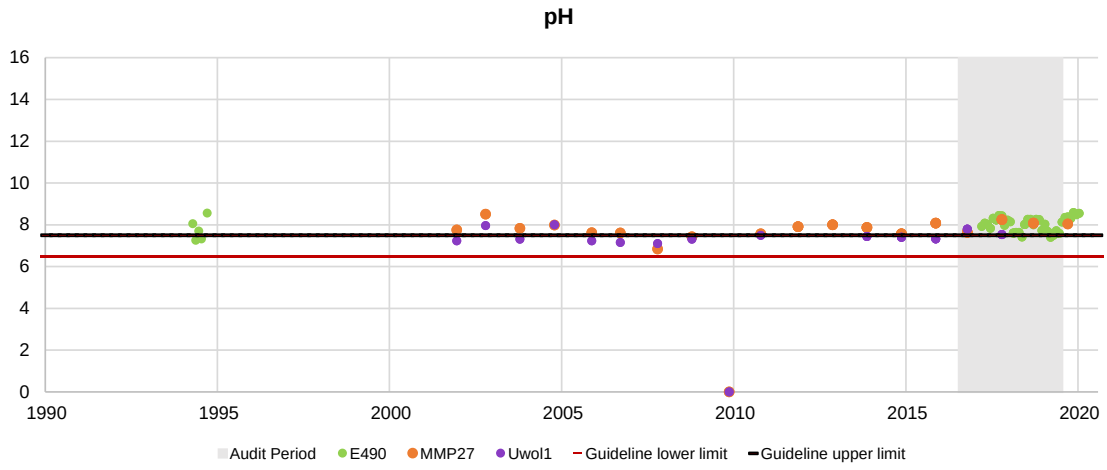
0 4,150 8,300

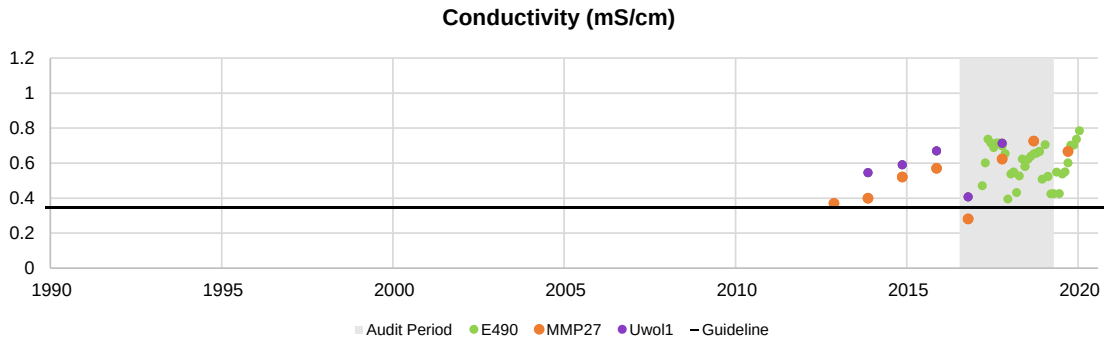
Metres

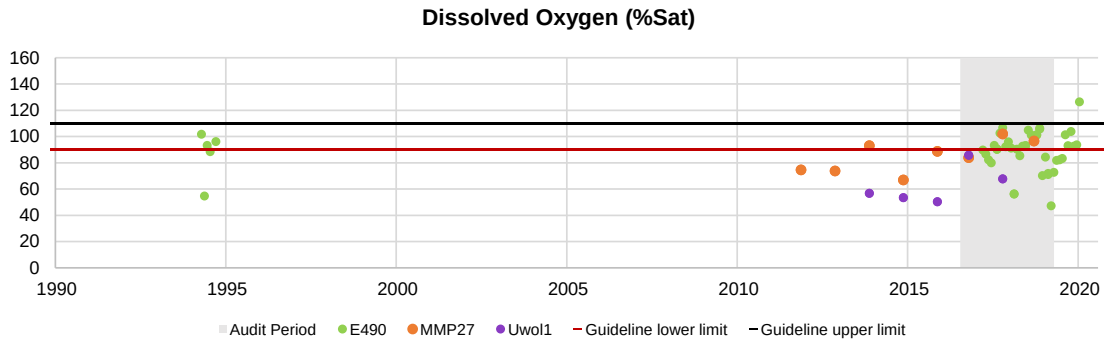
Datum/Projection:
GDA 1994 MGA Zone 56

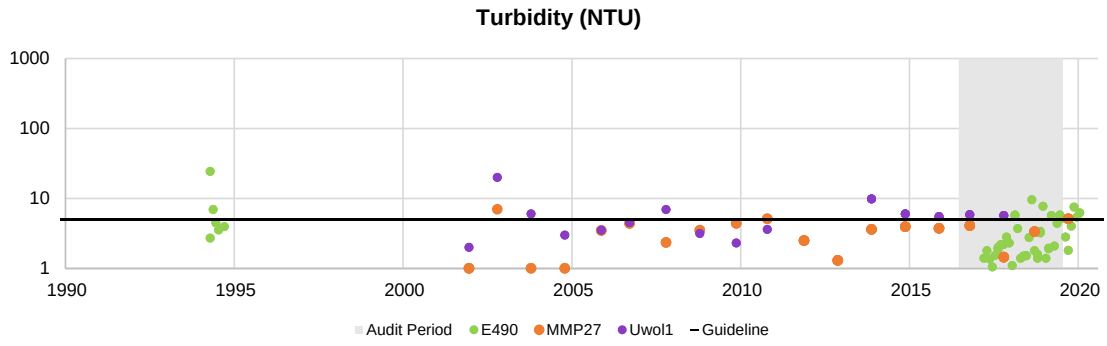
N

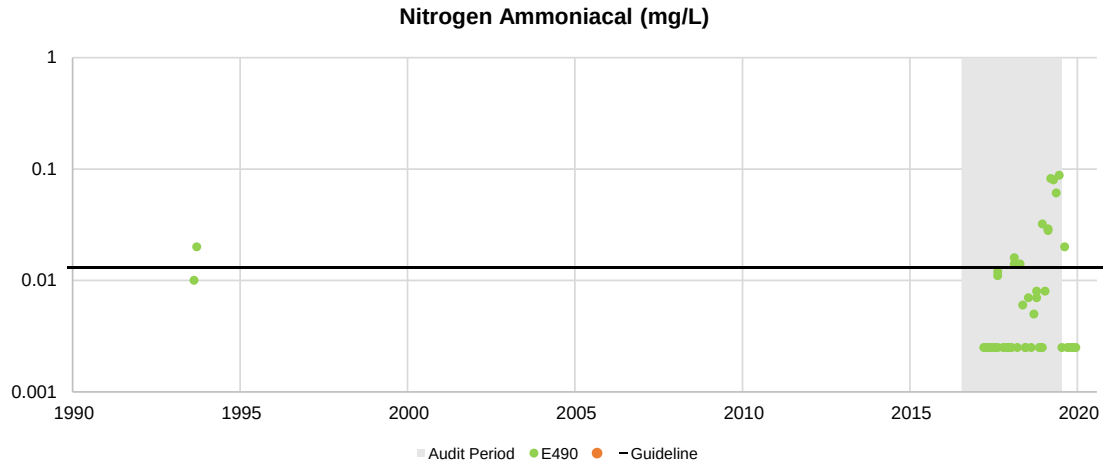
Prepared by: SC Date: 18/03/2020

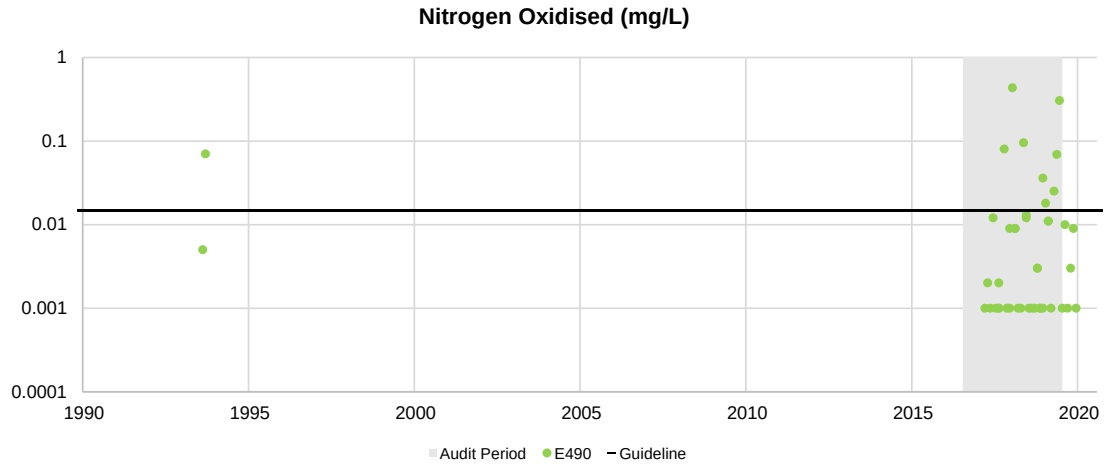

pH
16
14
12
10
8
6
4
2
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
E490
MMP27
Uwol1
Guideline lower limit
Guideline upper limit

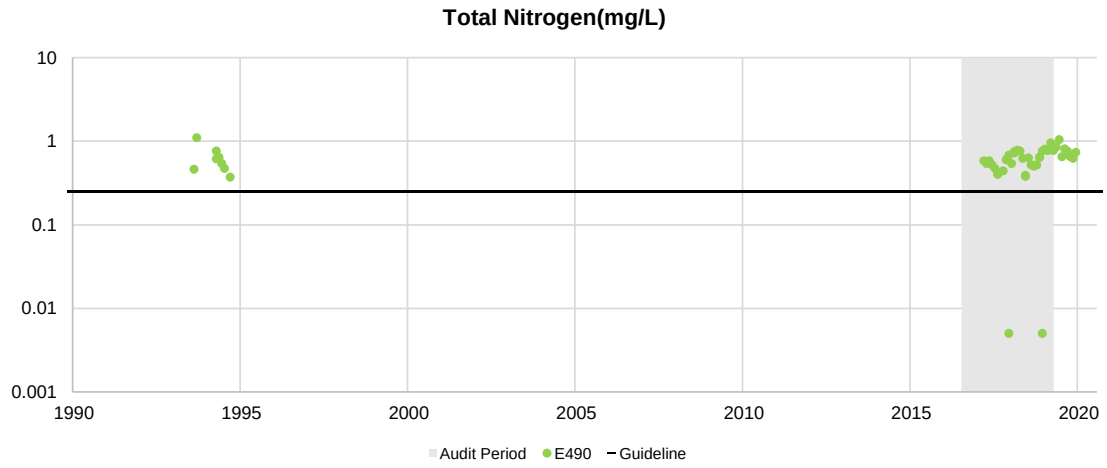

Conductivity (mS/cm)
1.2
1
0.8
0.6
0.4
0.2
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
E490
MMP27
Uwol1
Guideline

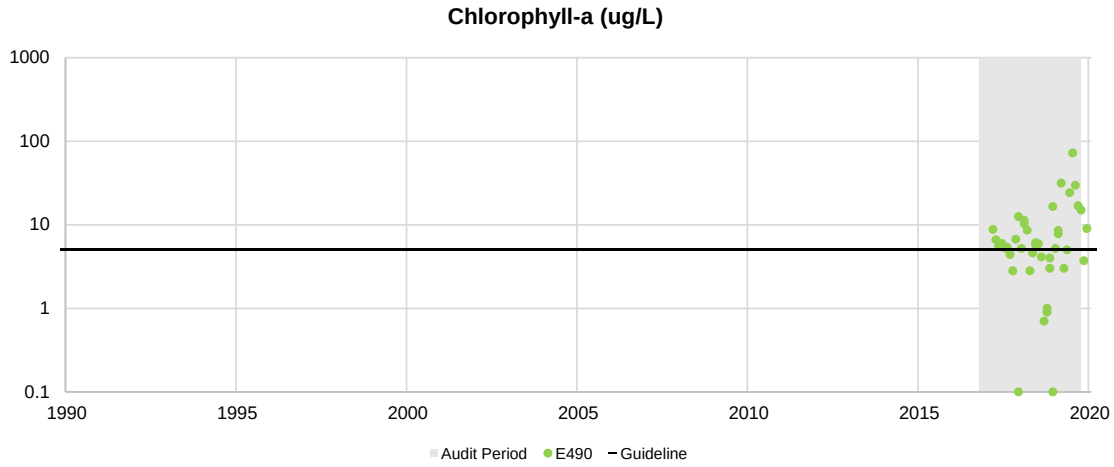

Dissolved Oxygen (%Sat)
160
140
120
100
80
60
40
20
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
E490
MMP27
Uwol1
Guideline lower limit
Guideline upper limit

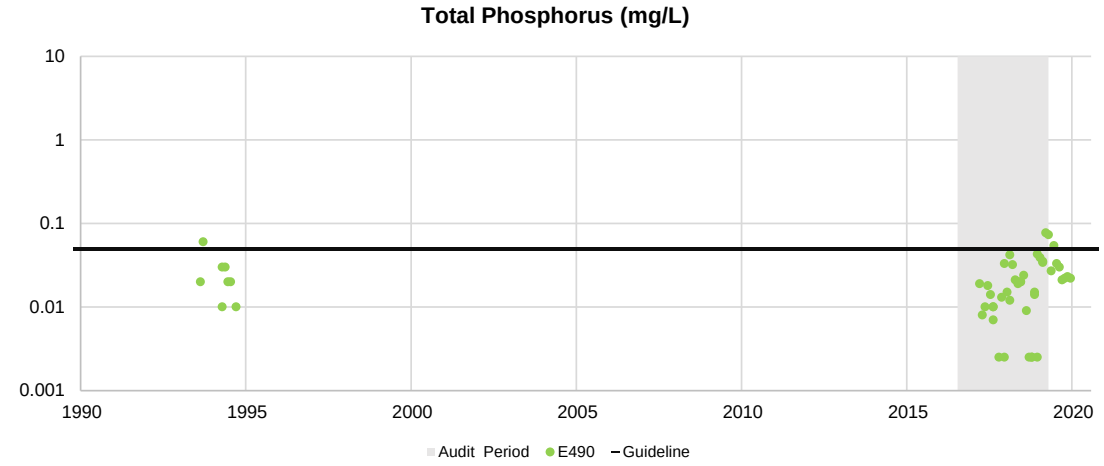

Turbidity (NTU)
1000
100
10
1
1990
1995
2000
2005
2010
2015
2020
Audit Period
E490
MMP27
Uwol1
Guideline

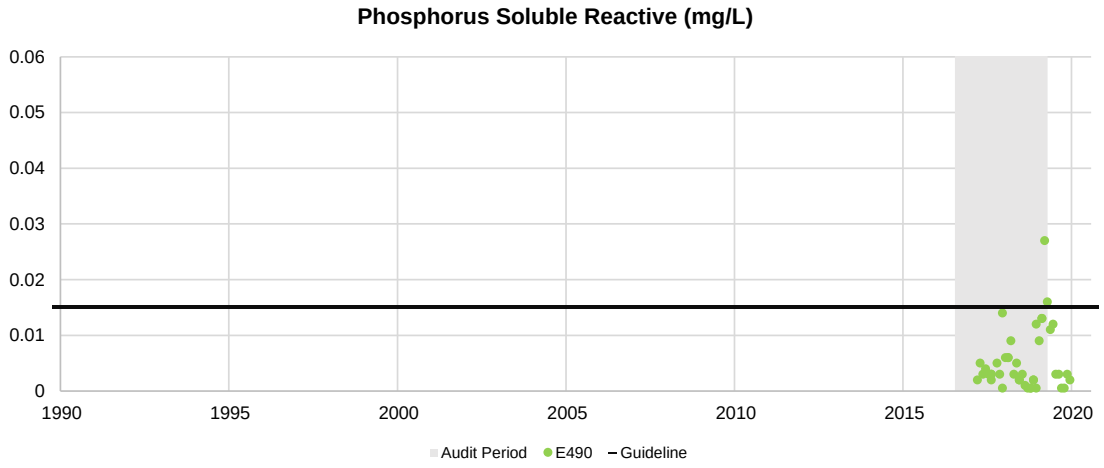

Nitrogen Ammoniacal (mg/L)
1
0.1
0.01
0.001
1990
1995
2000
2005
2010
2015
2020
Audit Period
E490
Guideline

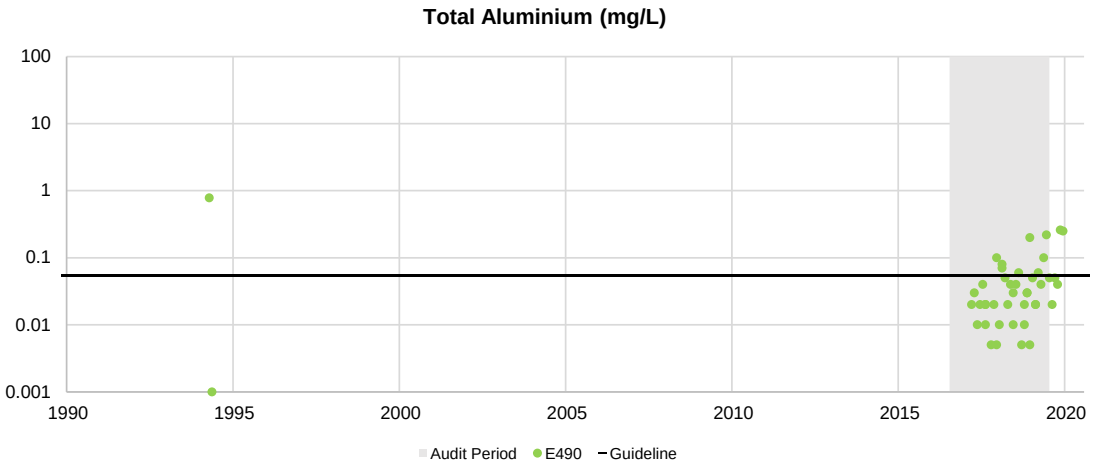

Nitrogen Oxidised (mg/L)
1
0.1
0.01
0.001
0.0001
1990
1995
2000
2005
2010
2015
2020
Audit Period
E490
Guideline

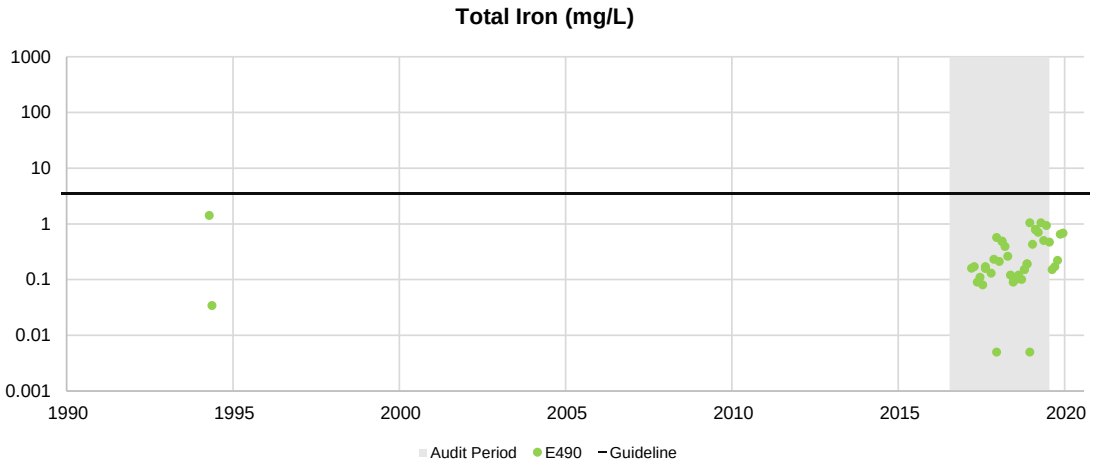

Total Nitrogen(mg/L)
10
1
0.1
0.01
0.001
1990
1995
2000
2005
2010
2015
2020
Audit Period
E490
Guideline


Chlorophyll-a (ug/L)
1000
100
10
1
0.1
1990
1995
2000
2005
2010
2015
2020
Audit Period
E490
Guideline


Total Phosphorus (mg/L)
10
1
0.1
0.01
0.001
1990
1995
2000
2005
2010
2015
2020
Audit Period
E490
Guideline

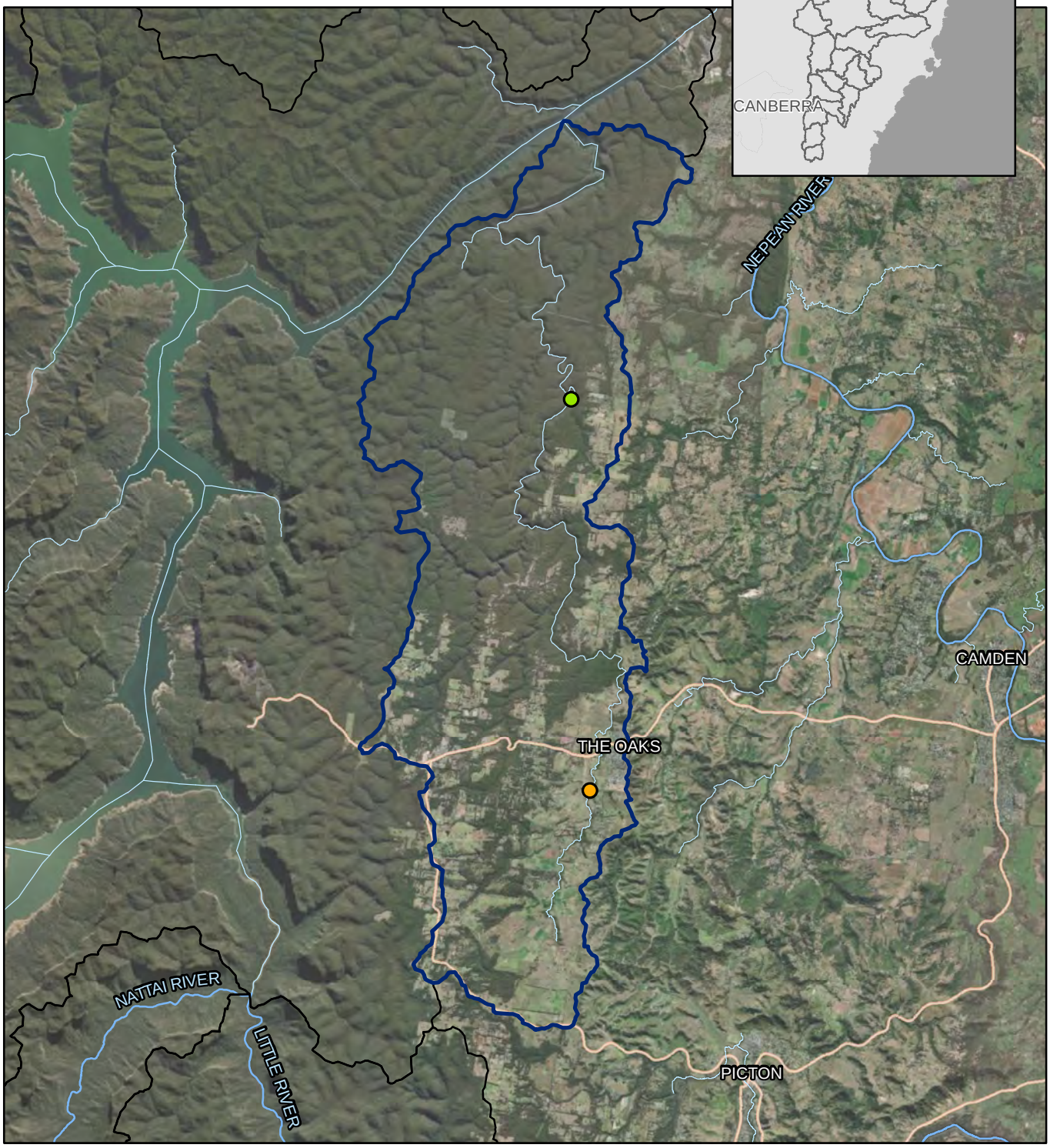

Phosphorus Soluble Reactive (mg/L)
0.06
0.05
0.04
0.03
0.02
0.01
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
E490
Guideline


Total Aluminium (mg/L)
100
10
1
0.1
0.01
0.001
1990
1995
2000
2005
2010
2015
2020
Audit Period
E490
Guideline


Total Iron (mg/L)
1000
100
10
1
0.1
0.01
0.001
1990
1995
2000
2005
2010
2015
2020
Audit Period
E490
Guideline

WERRI BERRI CREEK

CATCHMENT



Legend

- Sub Catchment Boundary
- Major Roads

Water Quality Monitoring Stations

- E531
- MMP57

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

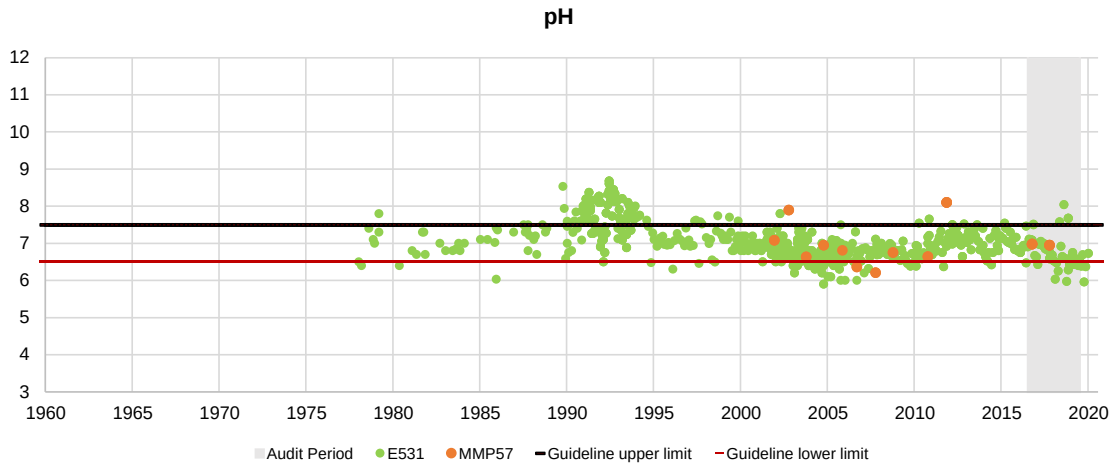
0 2,900 5,800

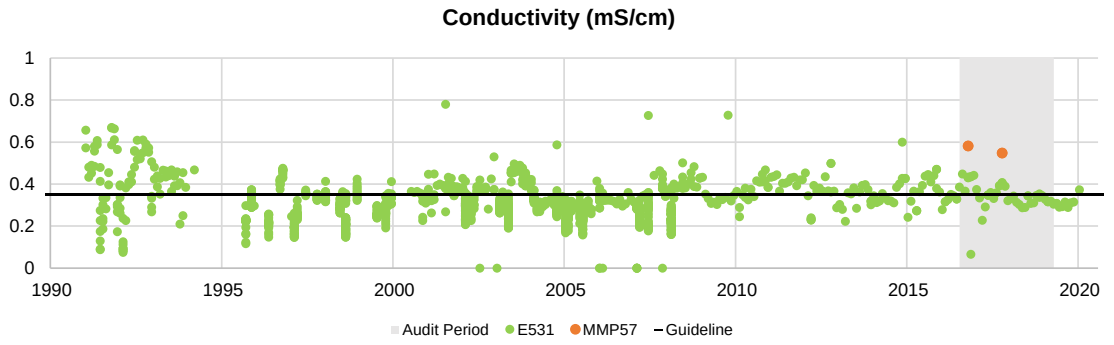
Metres

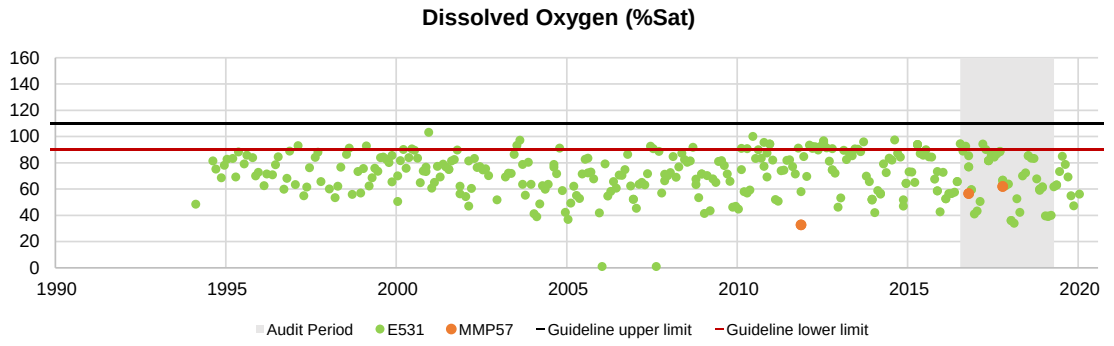
Datum/Projection:
GDA 1994 MGA Zone 56

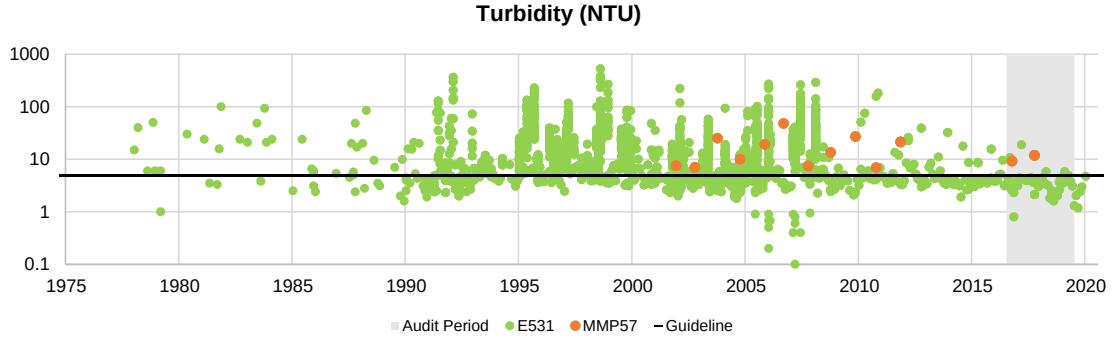
N

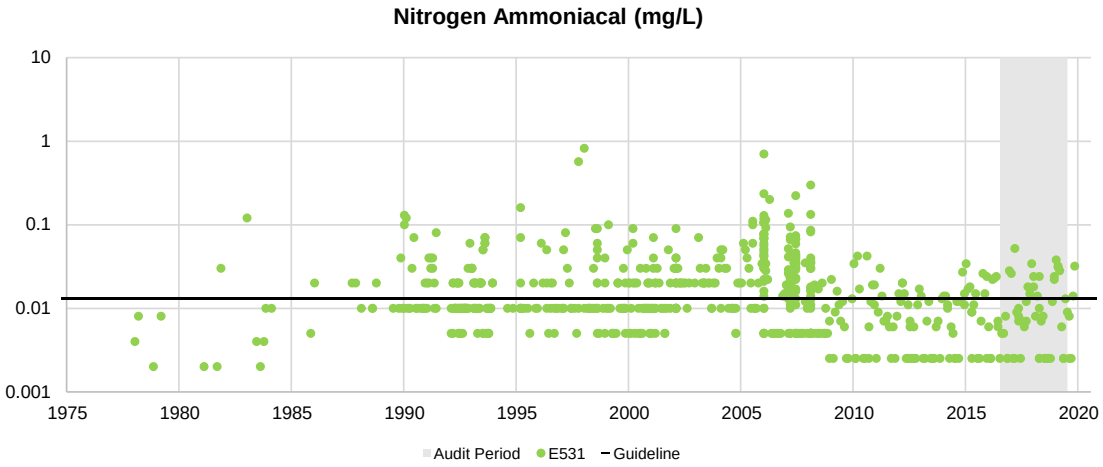
Prepared by: SC Date: 18/03/2020

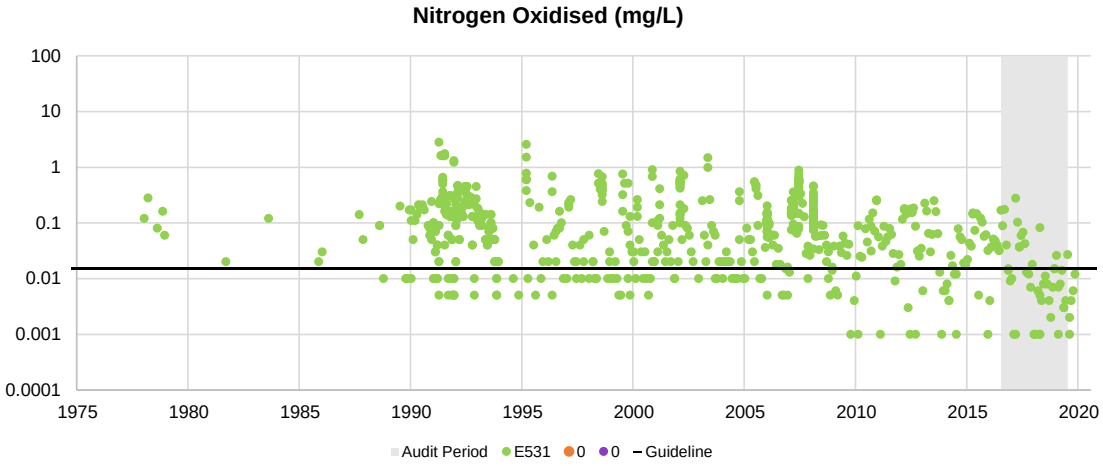

pH
12
11
10
9
8
7
6
5
4
3
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
E531
MMP57
Guideline upper limit
Guideline lower limit

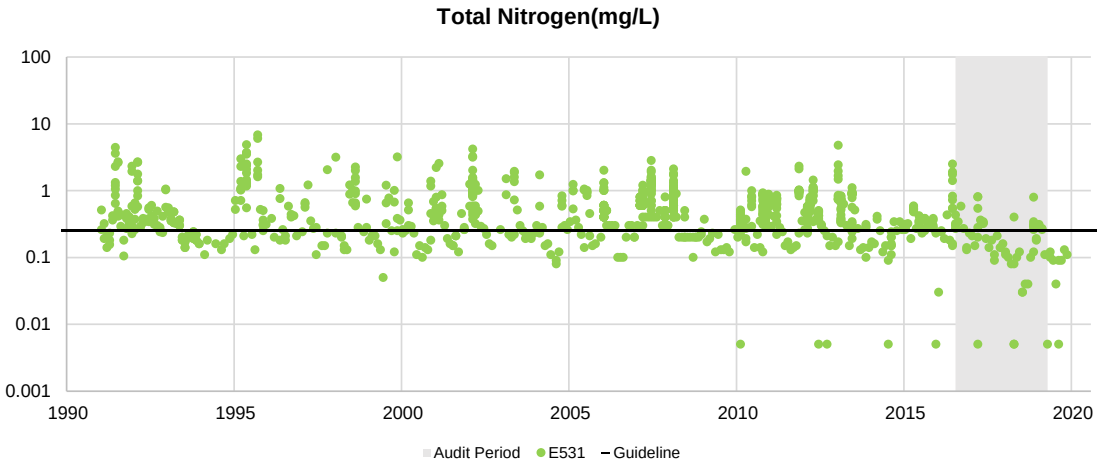

Conductivity (mS/cm)
1
0.8
0.6
0.4
0.2
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
E531
MMP57
Guideline

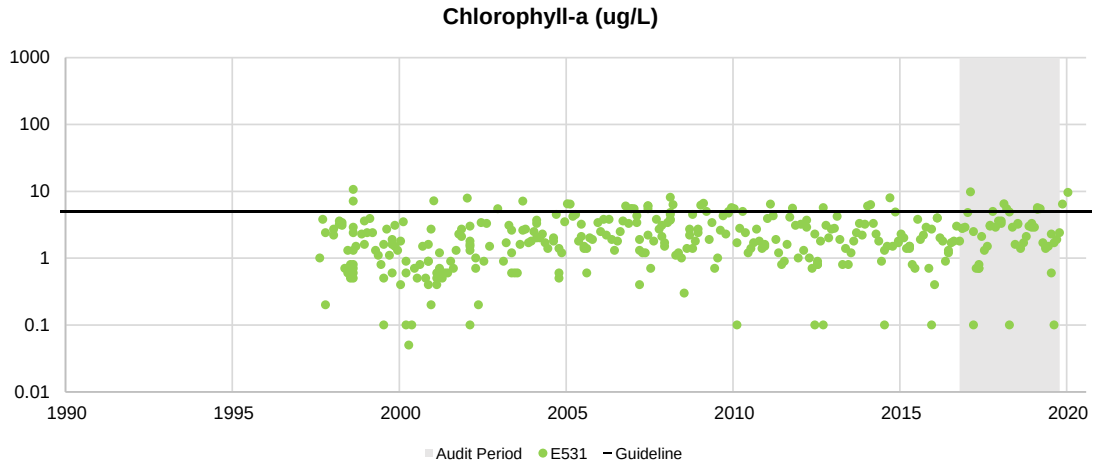

Dissolved Oxygen (%Sat)
160
140
120
100
80
60
40
20
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
E531
MMP57
Guideline upper limit
Guideline lower limit

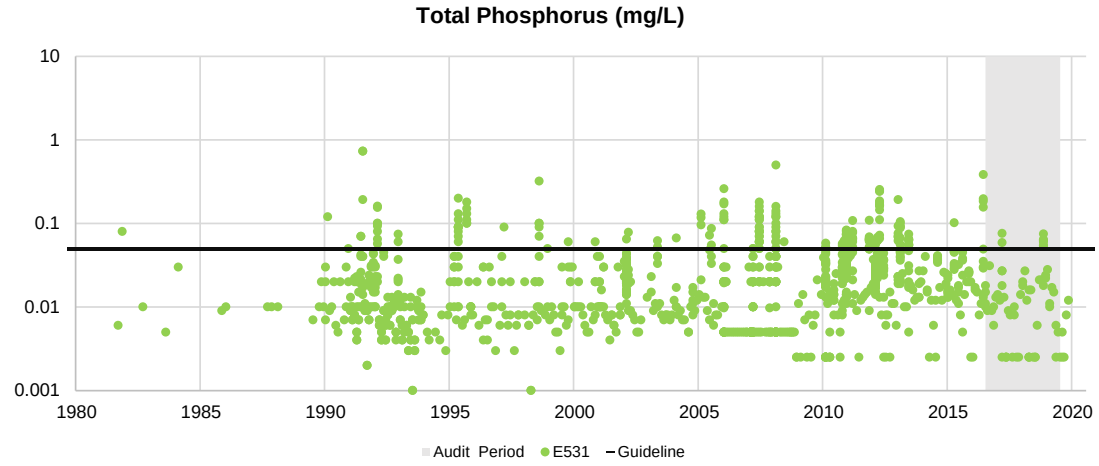

Turbidity (NTU)
1000
100
10
1
0.1
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
E531
MMP57
Guideline

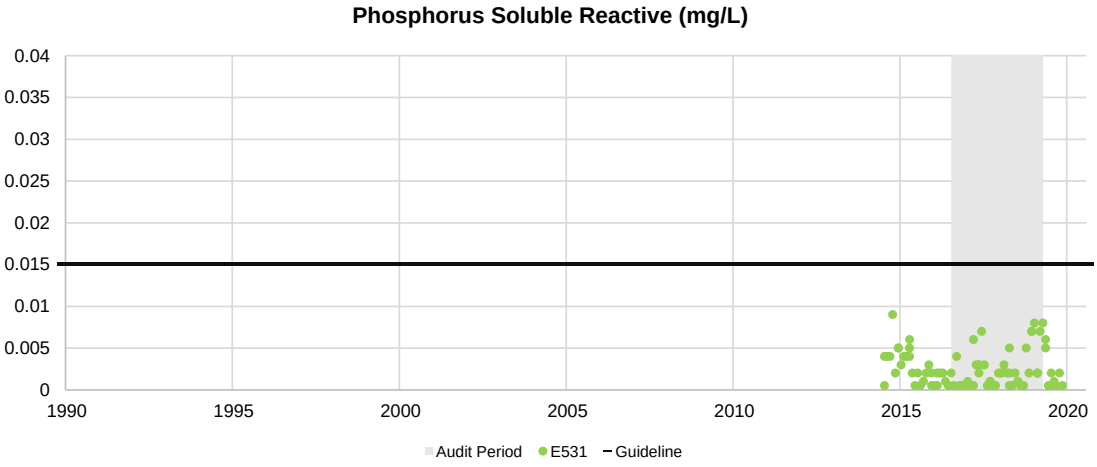

Nitrogen Ammoniacal (mg/L)
10
1
0.1
0.01
0.001
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
E531
Guideline

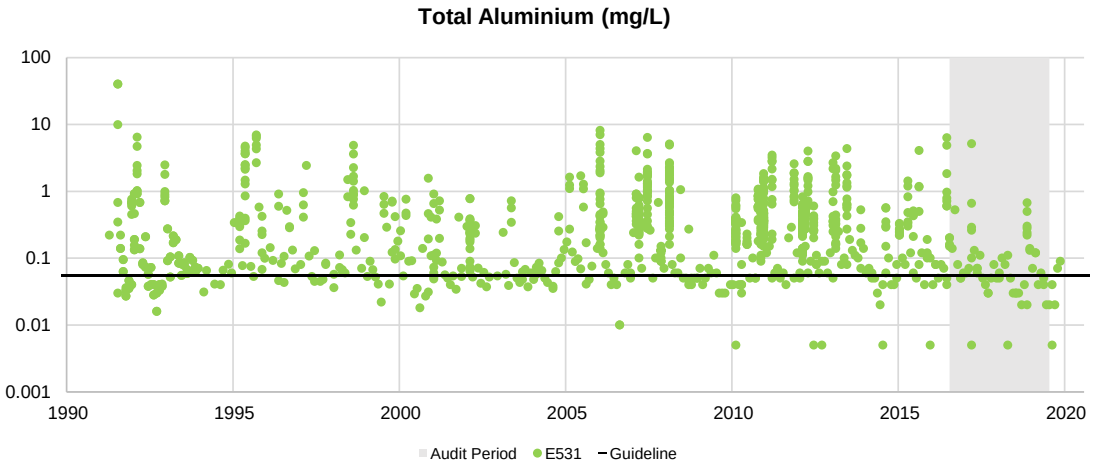

Nitrogen Oxidised (mg/L)
100
10
1
0.1
0.01
0.001
0.0001
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
E531
0
0
Guideline

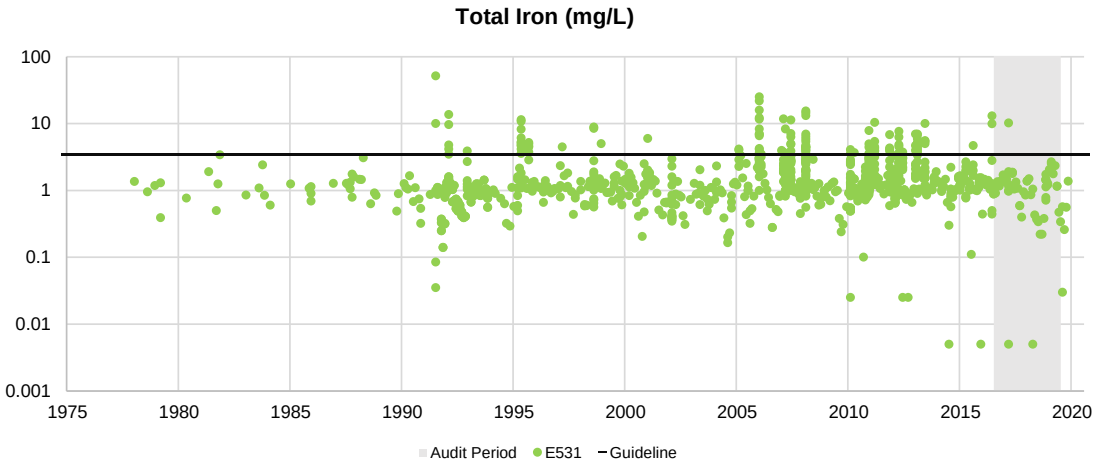

Total Nitrogen(mg/L)
100
10
1
0.1
0.01
0.001
1990
1995
2000
2005
2010
2015
2020
Audit Period
E531
Guideline


Chlorophyll-a (ug/L)
1000
100
10
1
0.1
0.01
1990
1995
2000
2005
2010
2015
2020
Audit Period
E531
Guideline


Total Phosphorus (mg/L)
10
1
0.1
0.01
0.001
1980
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
E531
Guideline

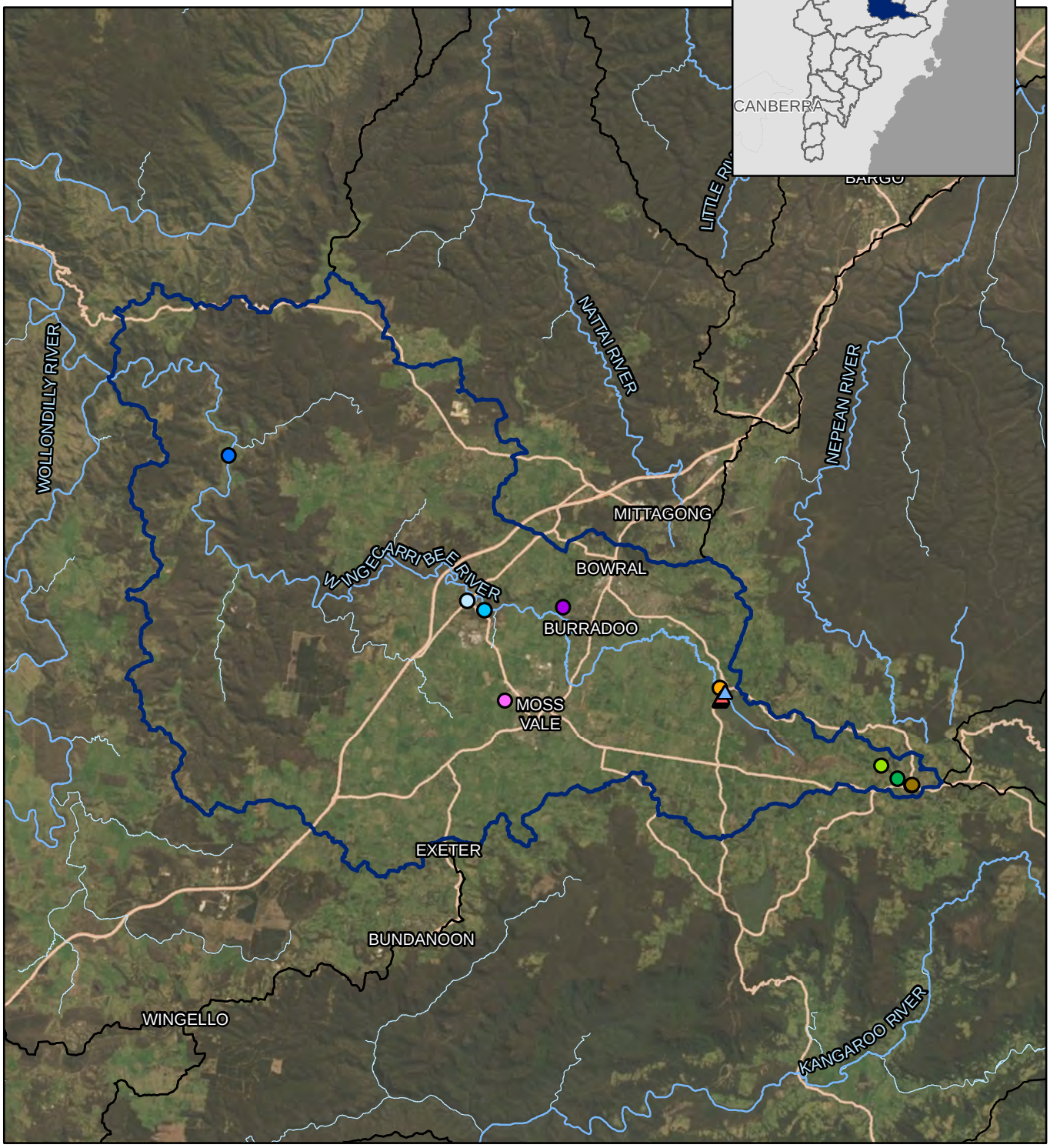

Phosphorus Soluble Reactive (mg/L)
0.04
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
E531
Guideline


Total Aluminium (mg/L)
100
10
1
0.1
0.01
0.001
1990
1995
2000
2005
2010
2015
2020
Audit Period
E531
Guideline


Total Iron (mg/L)
100
10
1
0.1
0.01
0.001
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
E531
Guideline

WINGECARRIBEE RIVER

CATCHMENT



Legend

- Sub Catchment Boundary
- Major Roads

Water Quality Monitoring Stations

- E301
- E303
- E306
- E3151
- E332
- SCI108
- SCI109
- SCI110
- U10
- Winge2

Water Quality Monitoring Stations (Storage)

- DWI1
- Other Stations: DSWI6, DSWI9, DSWI8, DSWI5A, DSWI4A, DSWI3, DSWI6B, DSWI5, DSWI8A, DSWI6A, DSWI4, DSWI7

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

0 5,000 10,000

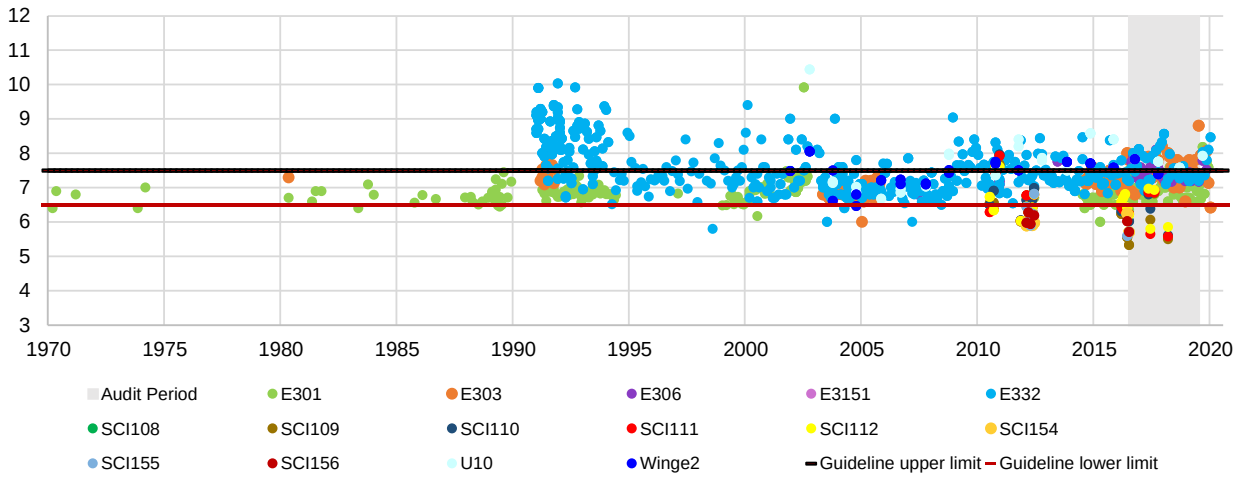
Metres

Datum/Projection: GDA 1994 MGA Zone 56

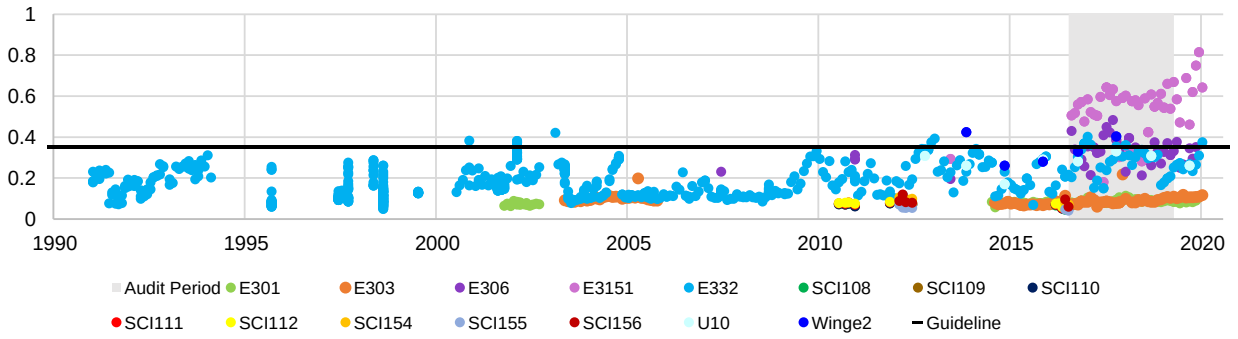
N

Prepared by: SC Date: 18/03/2020

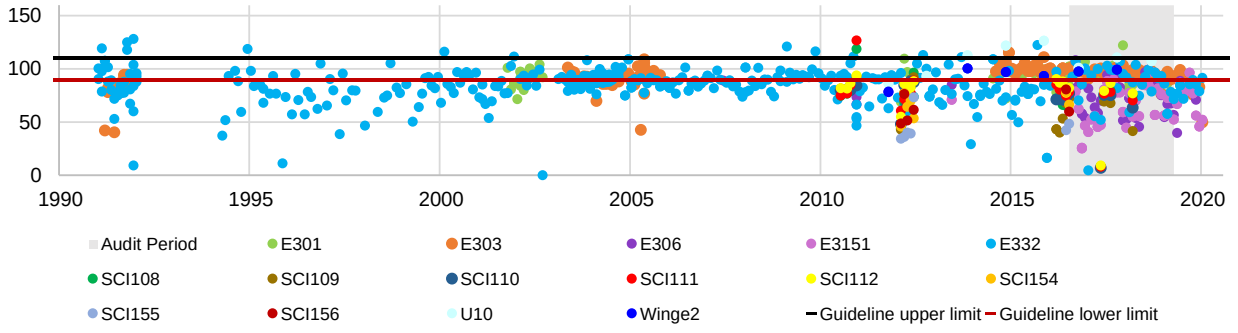
pH



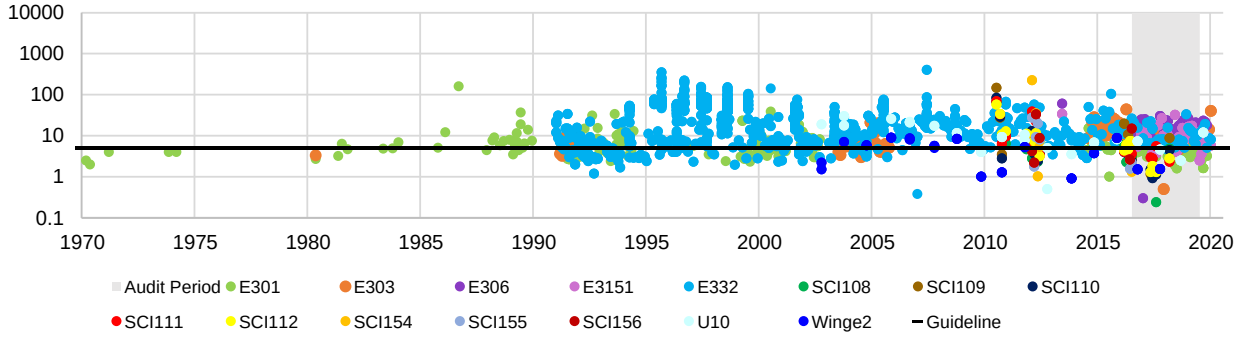
Conductivity (mS/cm)



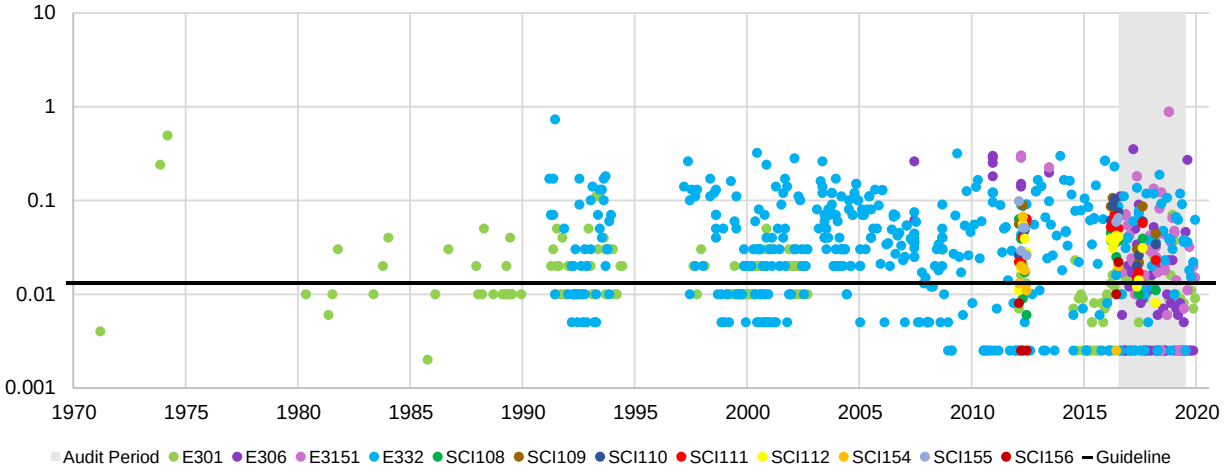
Dissolved Oxygen (%Sat)



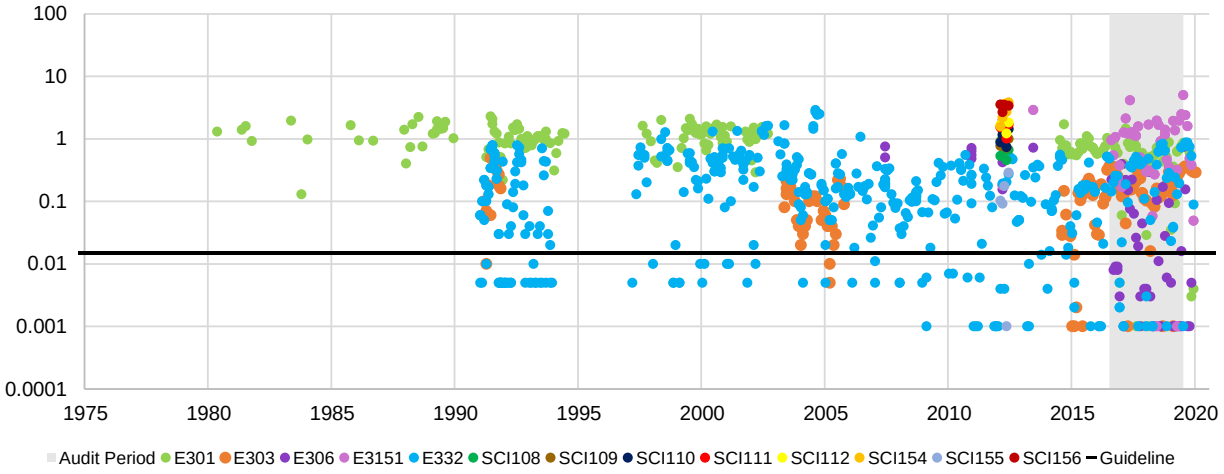
Turbidity (NTU)



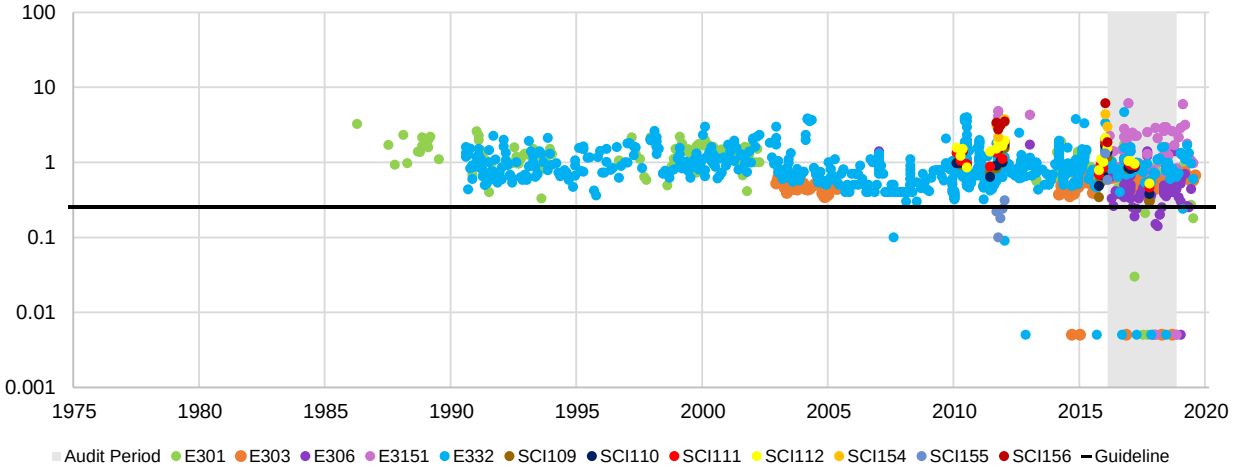
Nitrogen Ammoniacal (mg/L)

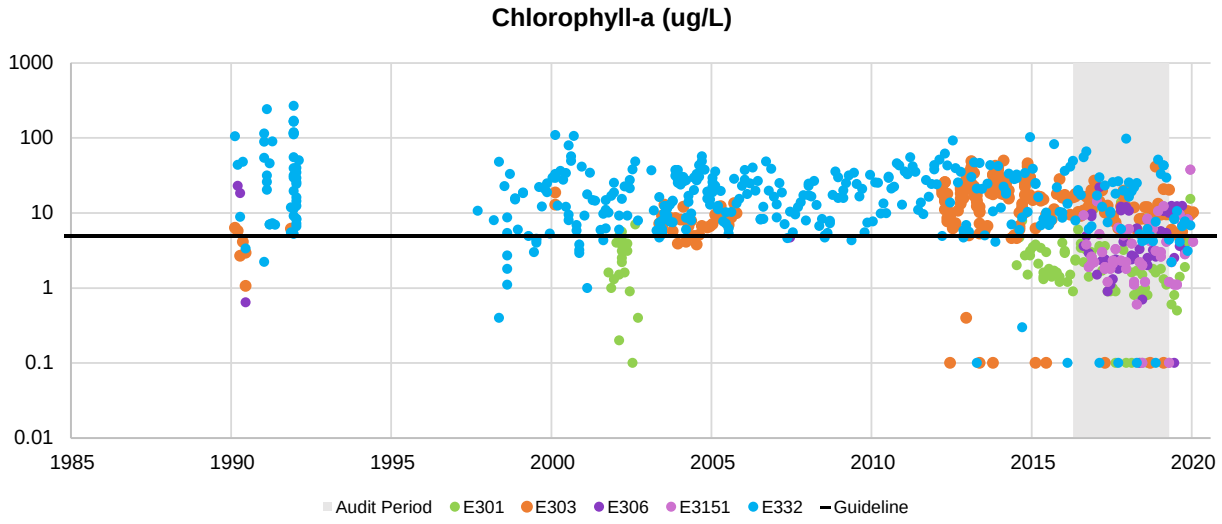


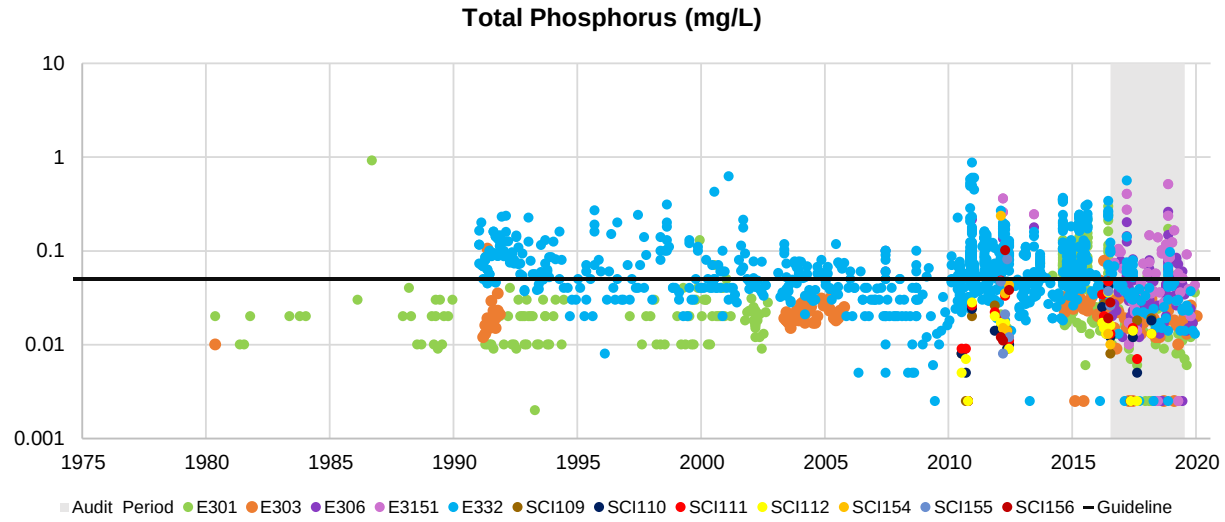
Nitrogen Oxidised (mg/L)

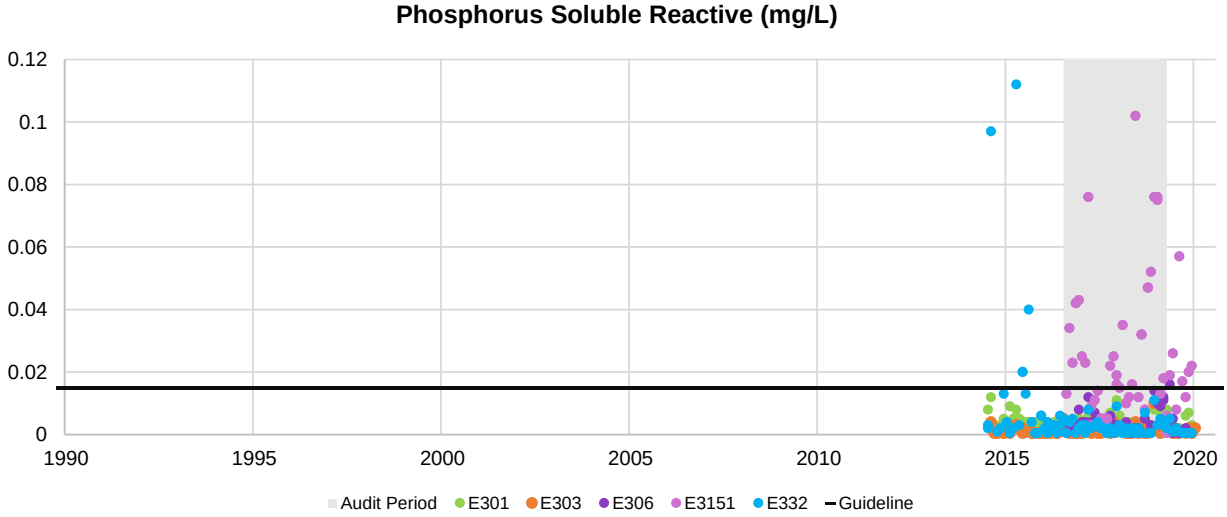


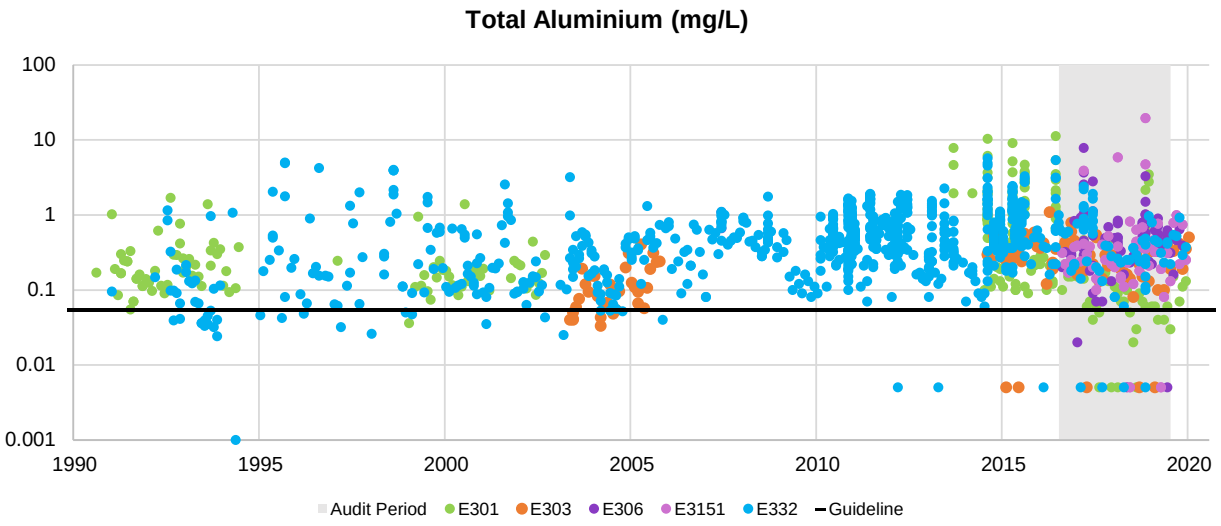
Total Nitrogen(mg/L)

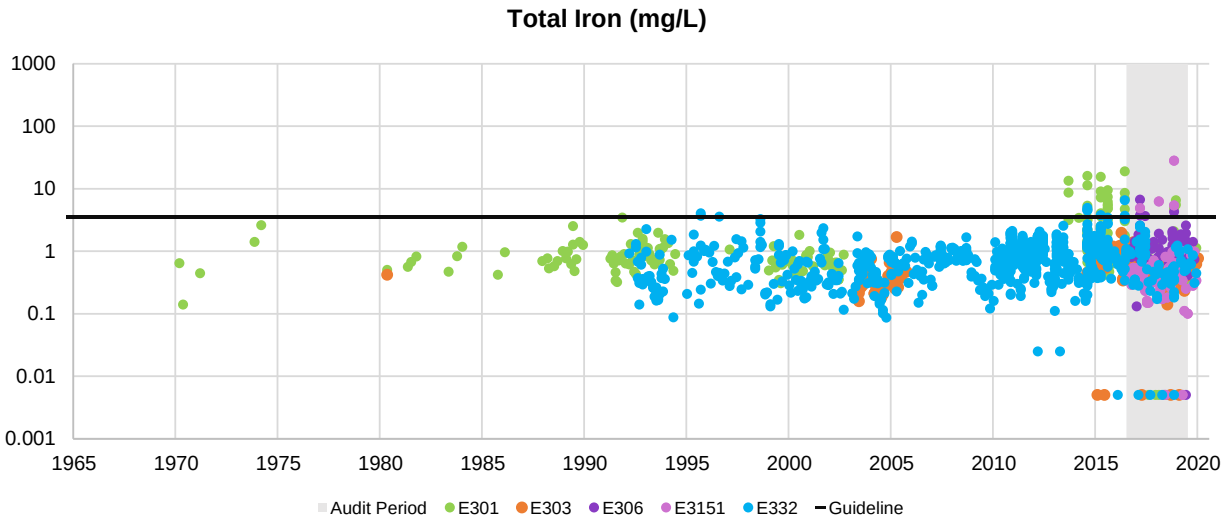


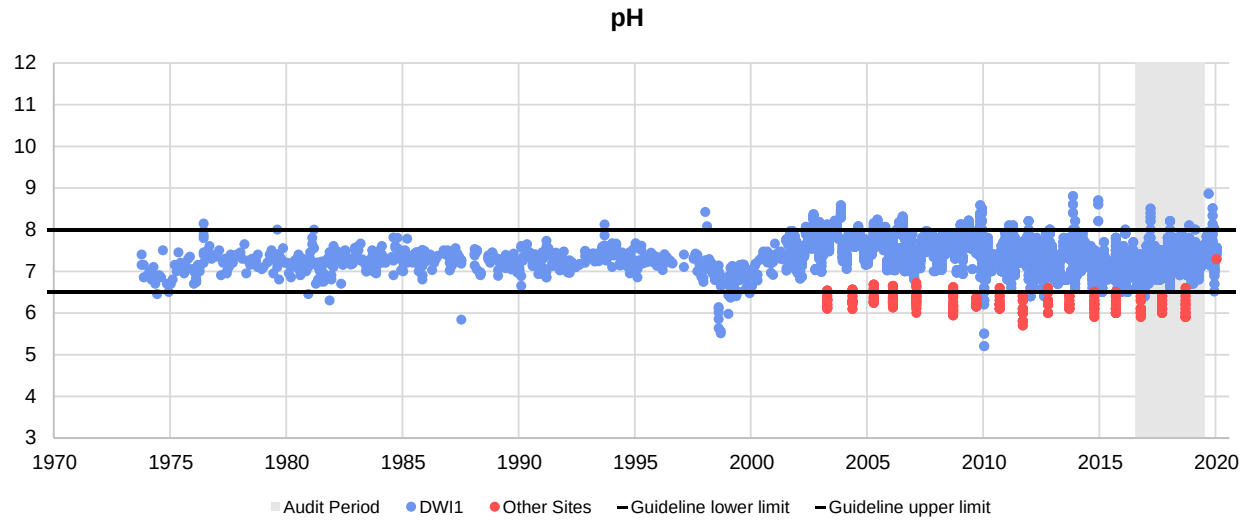

Chlorophyll-a (ug/L)
1000
100
10
1
0.1
0.01
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
E301
E303
E306
E3151
E332
Guideline

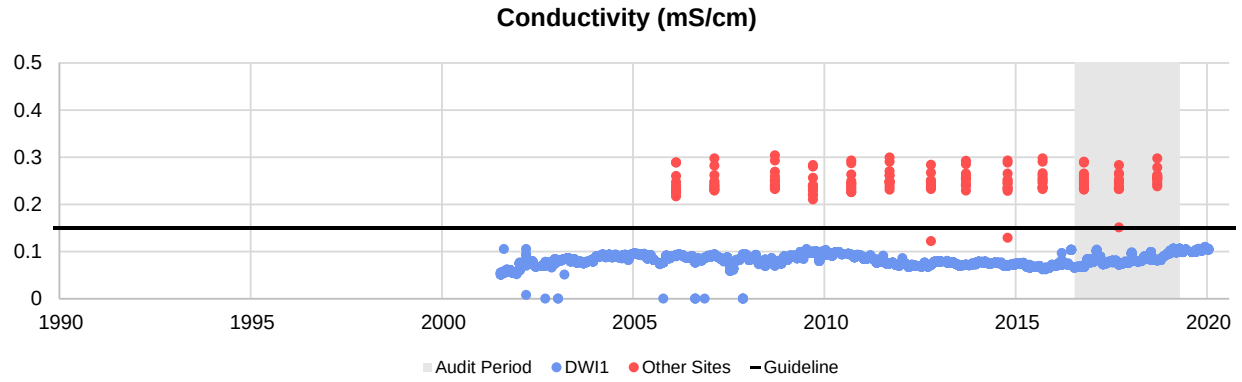

Total Phosphorus (mg/L)
10
1
0.1
0.01
0.001
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
E301
E303
E306
E3151
E332
SCI109
SCI110
SCI111
SCI112
SCI154
SCI155
SCI156
Guideline

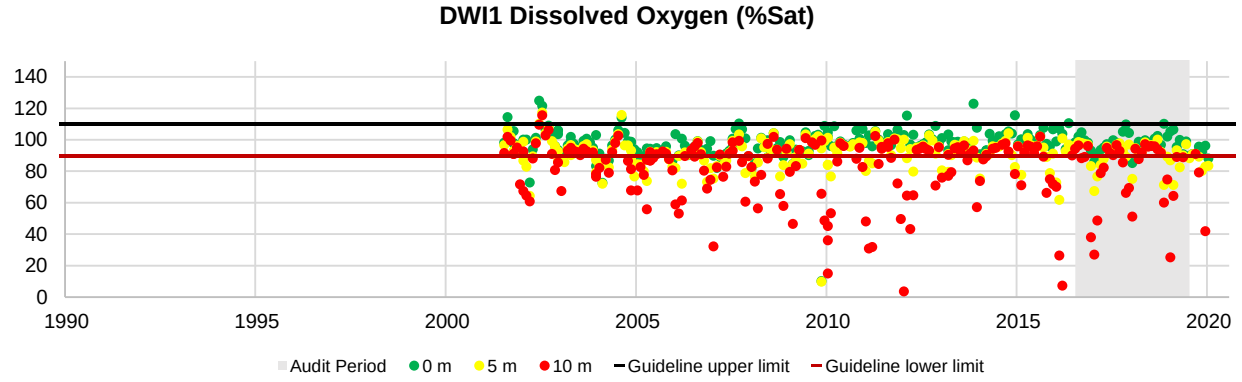

Phosphorus Soluble Reactive (mg/L)
0.12
0.1
0.08
0.06
0.04
0.02
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
E301
E303
E306
E3151
E332
Guideline

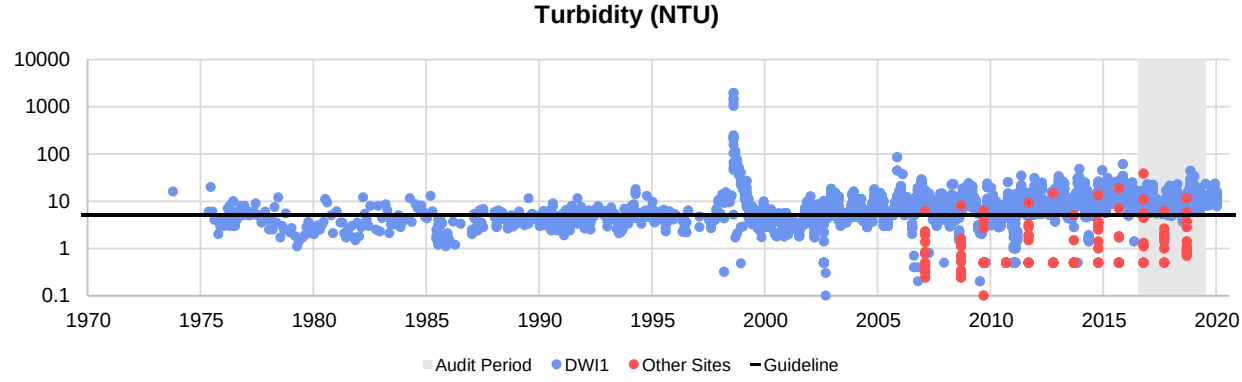

Total Aluminium (mg/L)
100
10
1
0.1
0.01
0.001
1990
1995
2000
2005
2010
2015
2020
Audit Period
E301
E303
E306
E3151
E332
Guideline

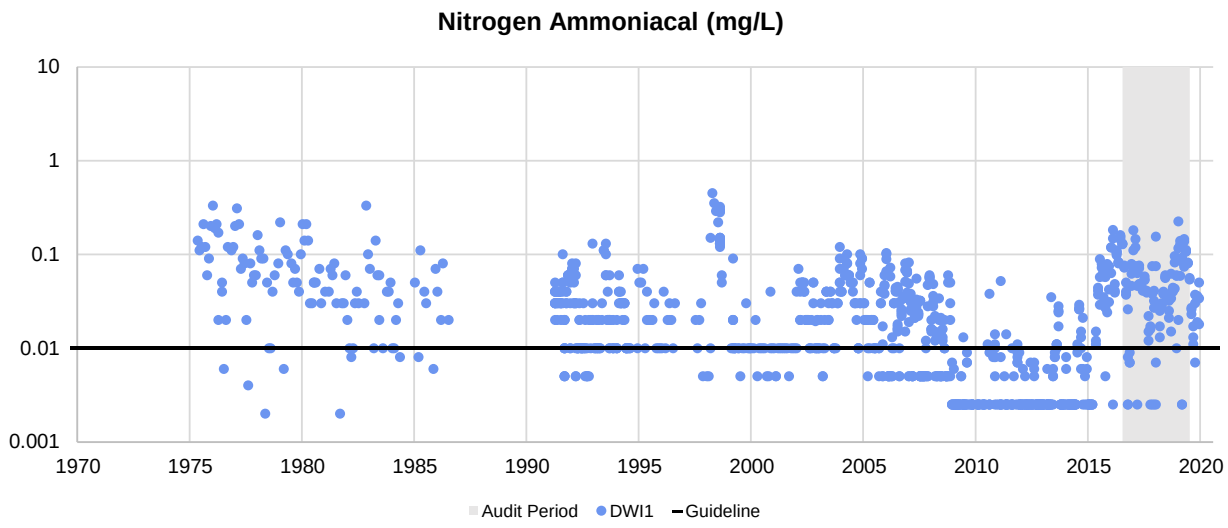

Total Iron (mg/L)
1000
100
10
1
0.1
0.01
0.001
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
E301
E303
E306
E3151
E332
Guideline

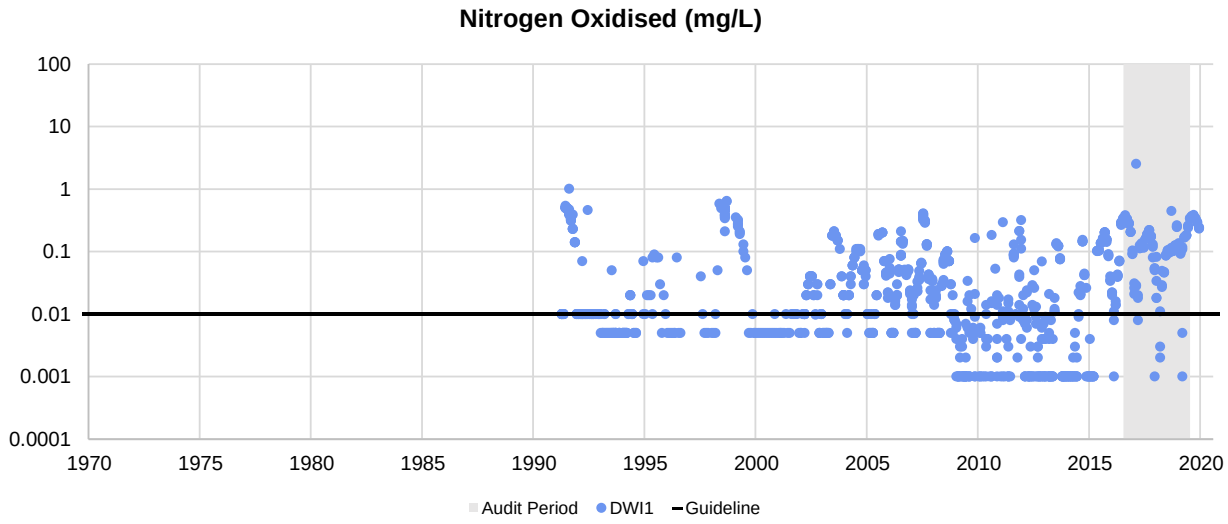

pH
12
11
10
9
8
7
6
5
4
3
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
DWI1
Other Sites
Guideline lower limit
Guideline upper limit

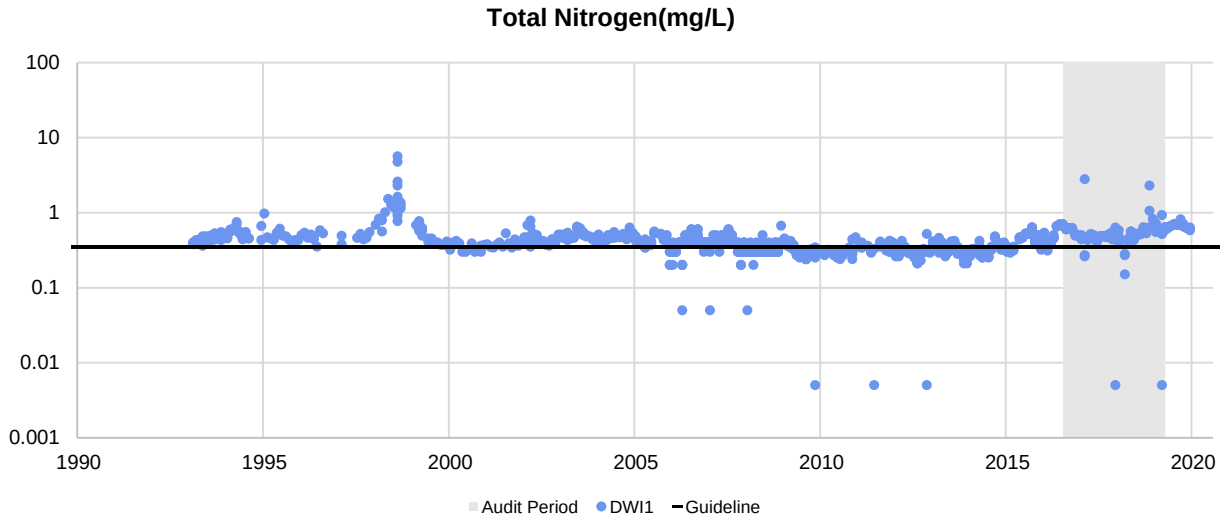

Conductivity (mS/cm)
0.5
0.4
0.3
0.2
0.1
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
DWI1
Other Sites
Guideline

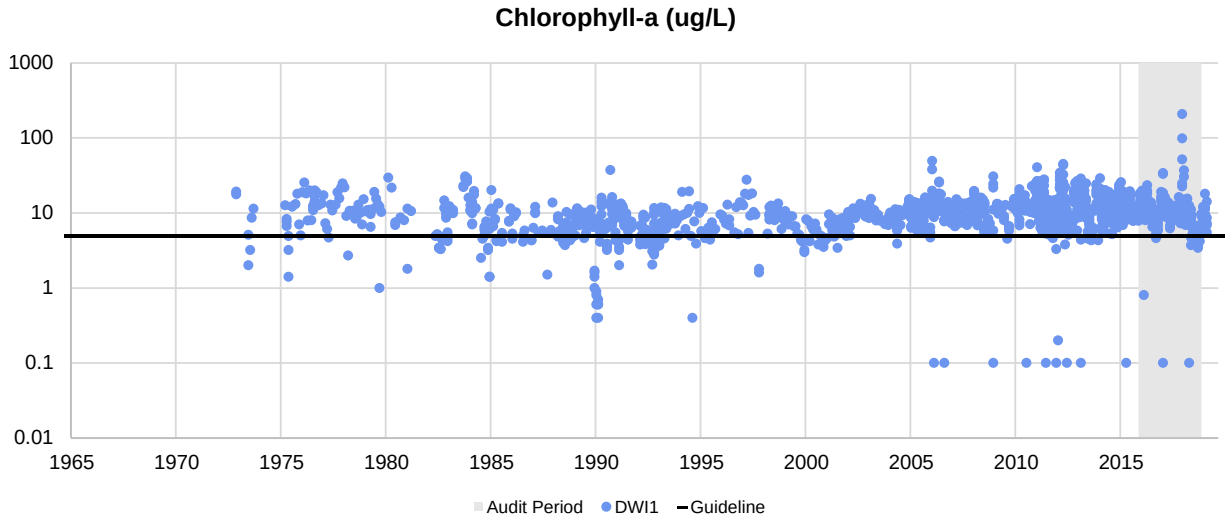

DWI1 Dissolved Oxygen (%Sat)
140
120
100
80
60
40
20
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
0 m
5 m
10 m
Guideline upper limit
Guideline lower limit

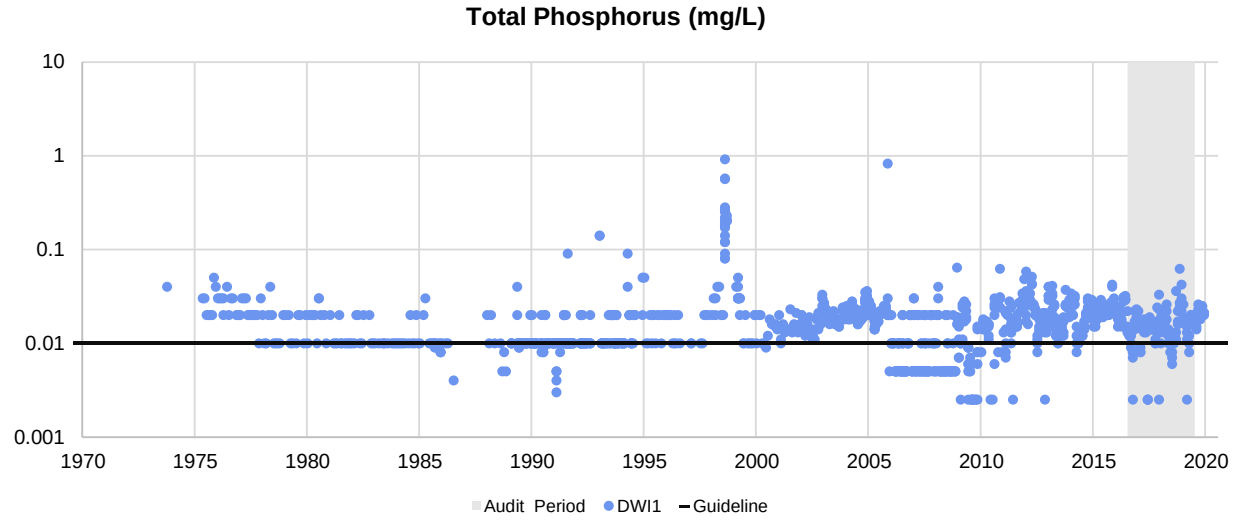

Turbidity (NTU)
10000
1000
100
10
1
0.1
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
DWI1
Other Sites
Guideline

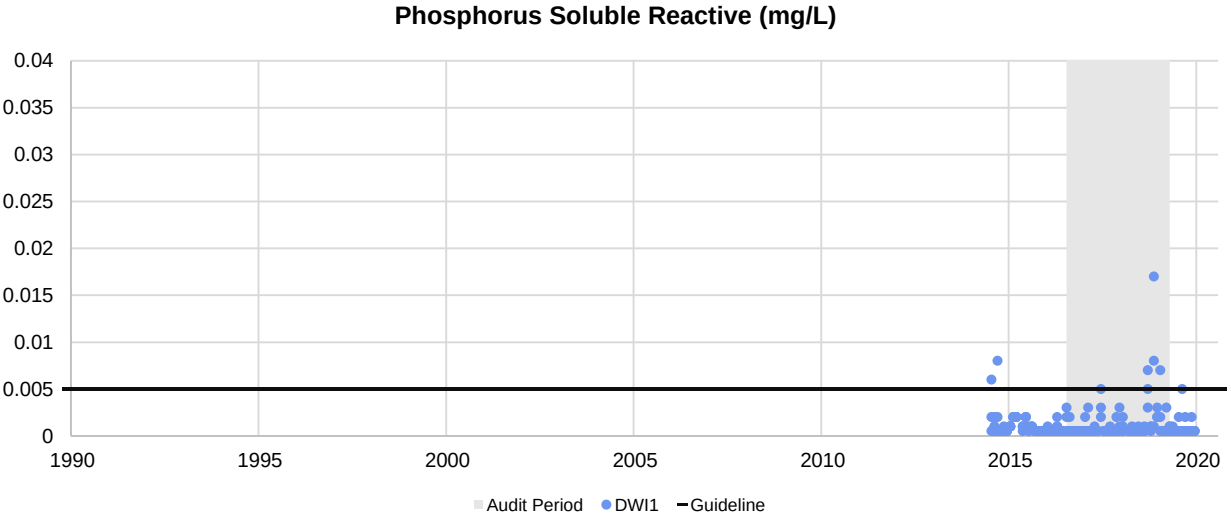

Nitrogen Ammoniacal (mg/L)
10
1
0.1
0.01
0.001
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
DWI1
Guideline

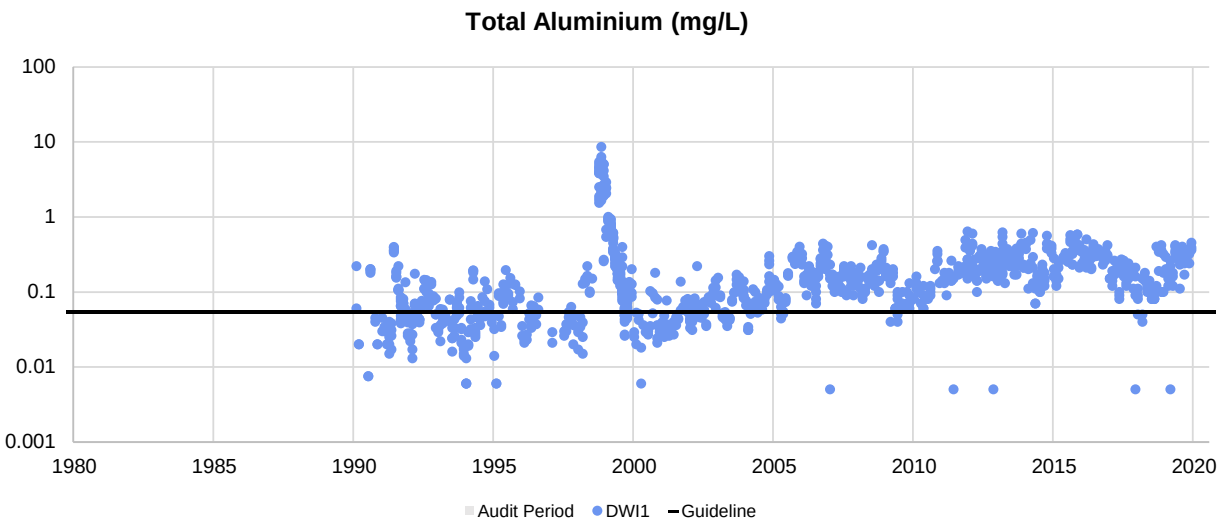

Nitrogen Oxidised (mg/L)
100
10
1
0.1
0.01
0.001
0.0001
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
DWI1
Guideline

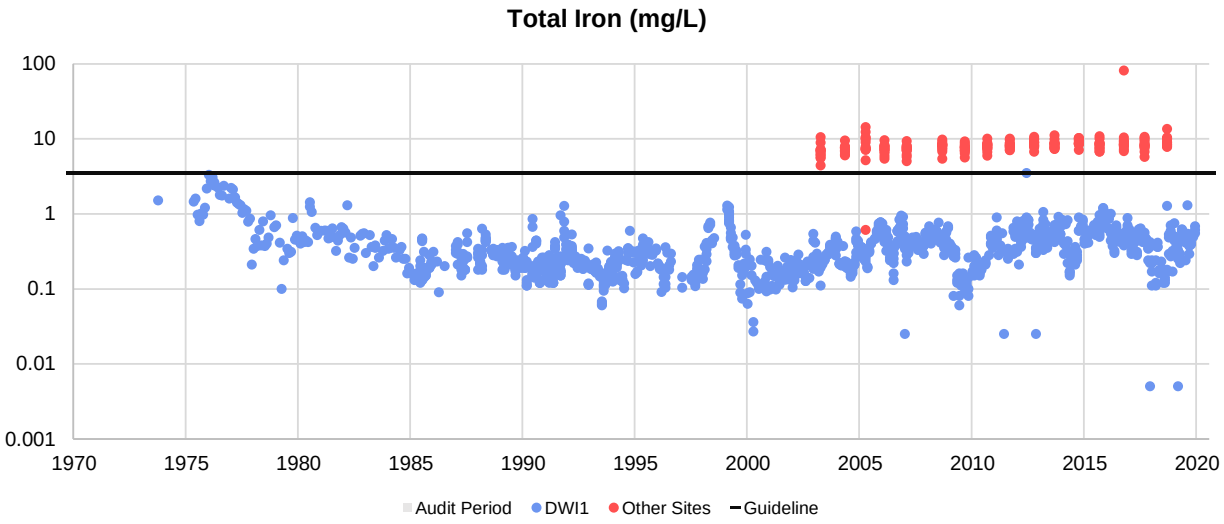

Total Nitrogen(mg/L)
100
10
1
0.1
0.01
0.001
1990
1995
2000
2005
2010
2015
2020
Audit Period
DWI1
Guideline


Chlorophyll-a (ug/L)
1000
100
10
1
0.1
0.01
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
Audit Period
DWI1
Guideline


Total Phosphorus (mg/L)
10
1
0.1
0.01
0.001
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
DWI1
Guideline

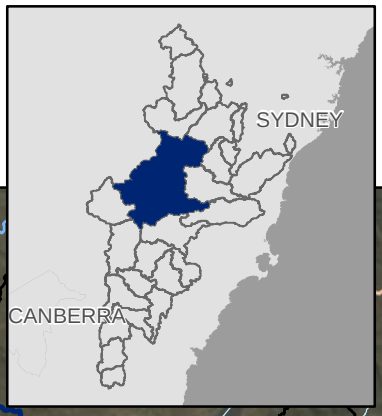

Phosphorus Soluble Reactive (mg/L)
0.04
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
DWI1
Guideline

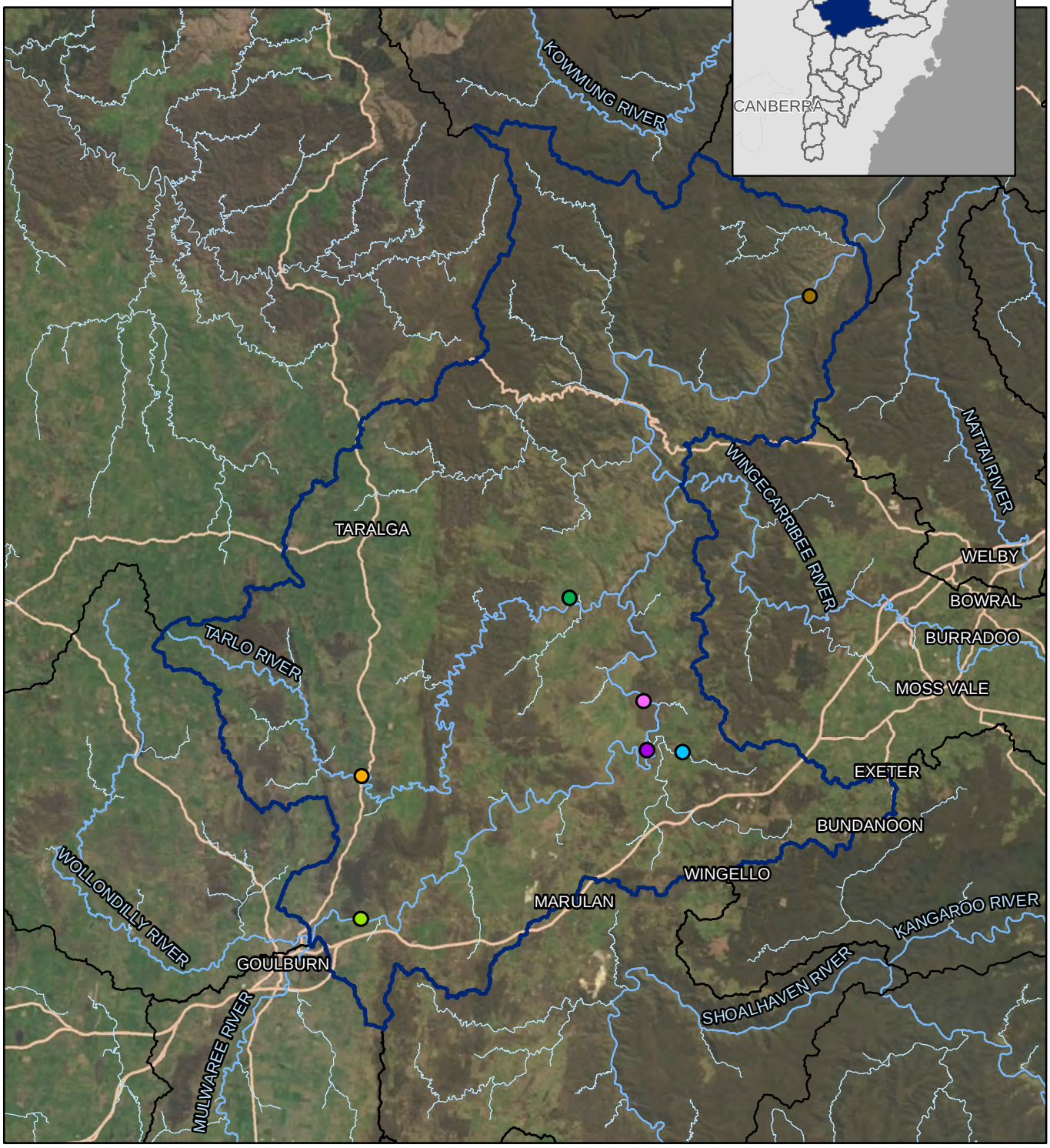

Total Aluminium (mg/L)
100
10
1
0.1
0.01
0.001
1980
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
DWI1
Guideline


Total Iron (mg/L)
100
10
1
0.1
0.01
0.001
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
DWI1
Other Sites
Guideline

WOLLONDILLY RIVER

CATCHMENT





Legend

- Sub Catchment Boundary
- Major Roads

Water Quality Monitoring Stations

- A6
- E409
- E433
- E450
- E488
- MMP130
- MMP226

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

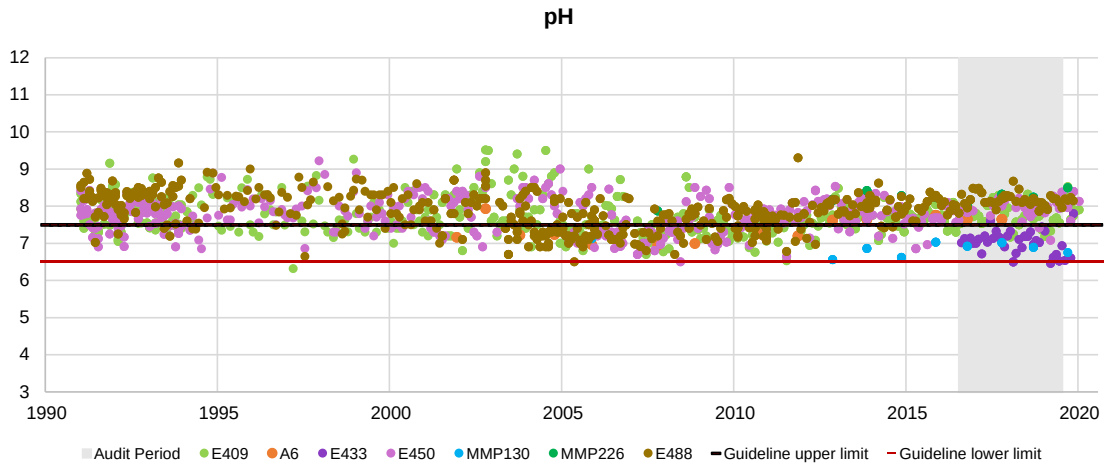
0 8,000 16,000

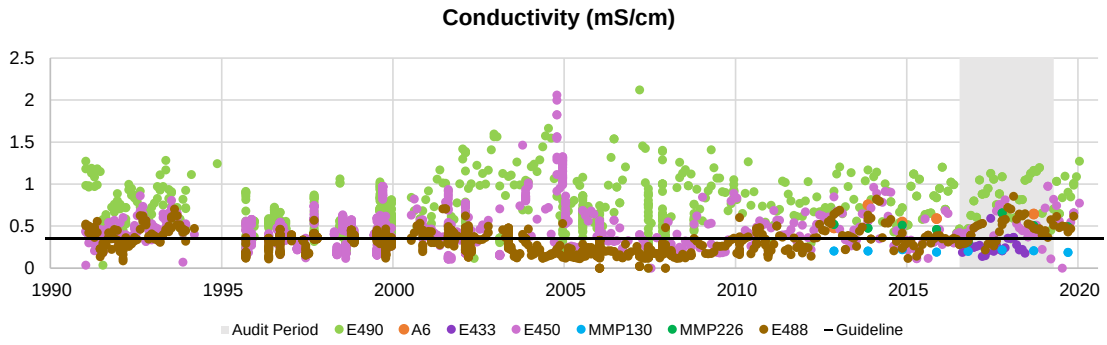
Metres

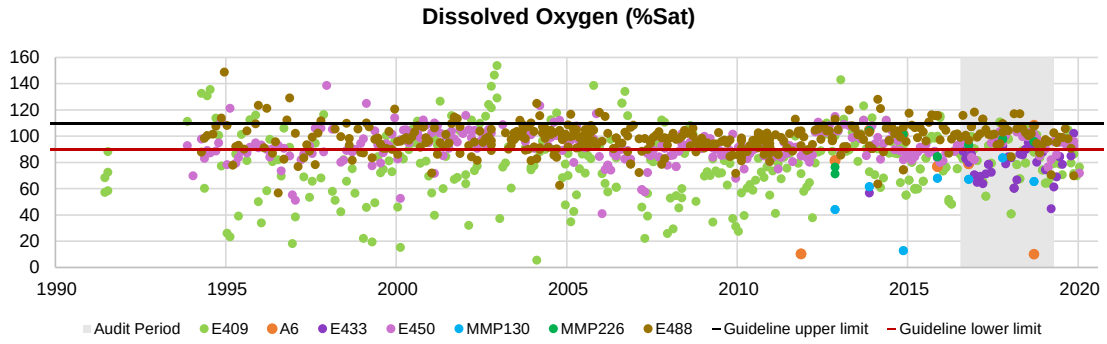
Datum/Projection:
GDA 1994 MGA Zone 56

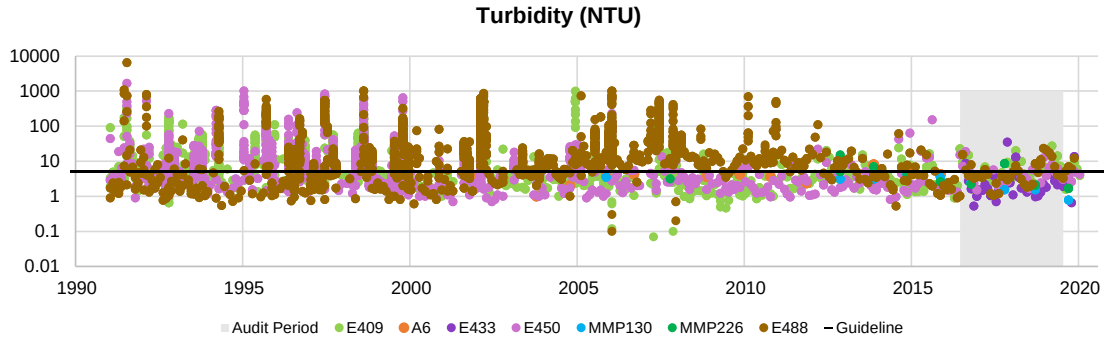
N

Prepared by: SC Date: 18/03/2020

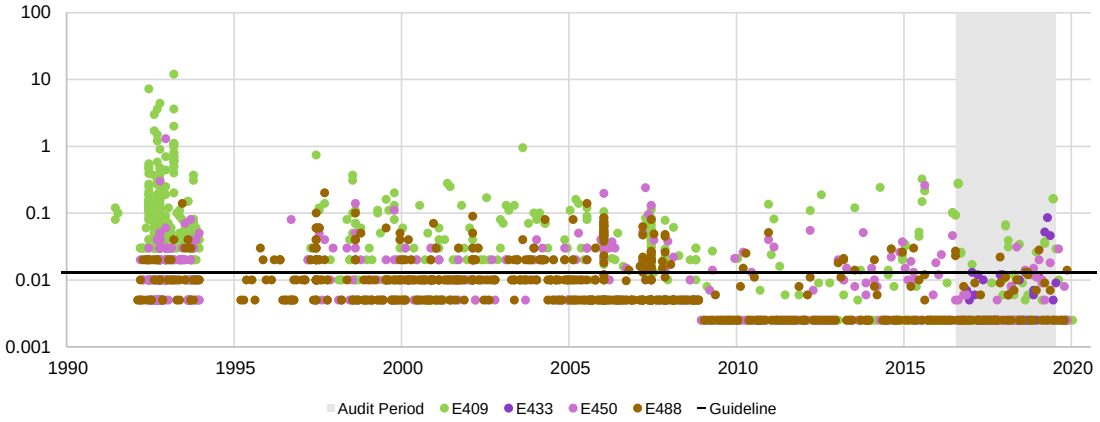

pH
12
11
10
9
8
7
6
5
4
3
1990
1995
2000
2005
2010
2015
2020
Audit Period
E409
A6
E433
E450
MMP130
MMP226
E488
Guideline upper limit
Guideline lower limit


Conductivity (mS/cm)
2.5
2
1.5
1
0.5
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
E490
A6
E433
E450
MMP130
MMP226
E488
Guideline

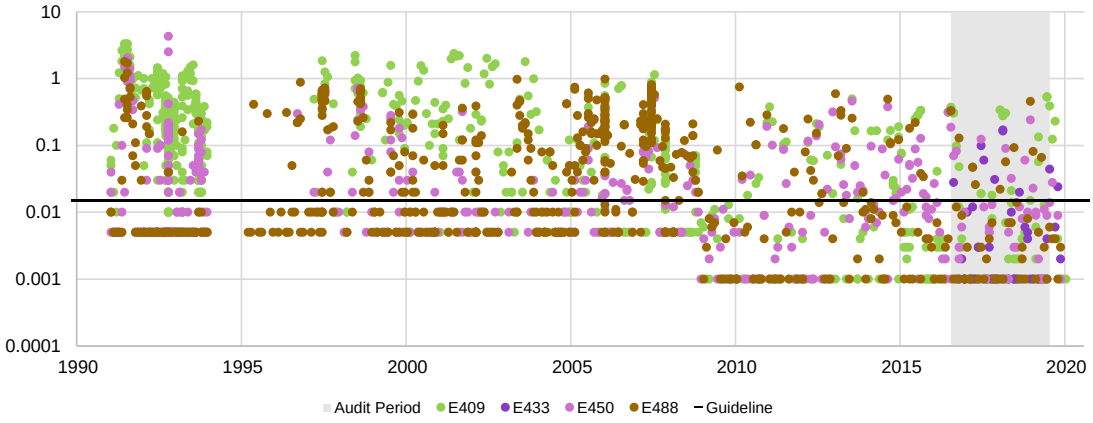

Dissolved Oxygen (%Sat)
160
140
120
100
80
60
40
20
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
E409
A6
E433
E450
MMP130
MMP226
E488
Guideline upper limit
Guideline lower limit


Turbidity (NTU)
10000
1000
100
10
1
0.1
0.01
1990
1995
2000
2005
2010
2015
2020
Audit Period
E409
A6
E433
E450
MMP130
MMP226
E488
Guideline

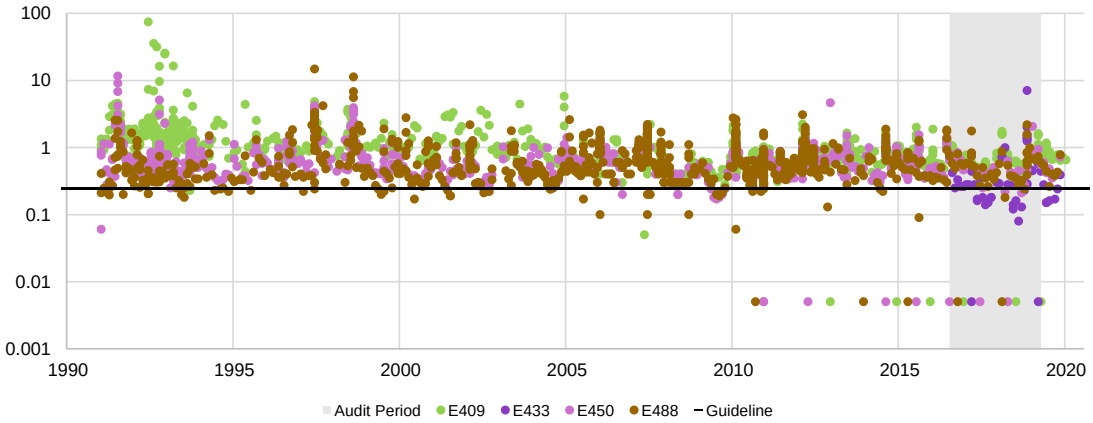
Nitrogen Ammoniacal (mg/L)

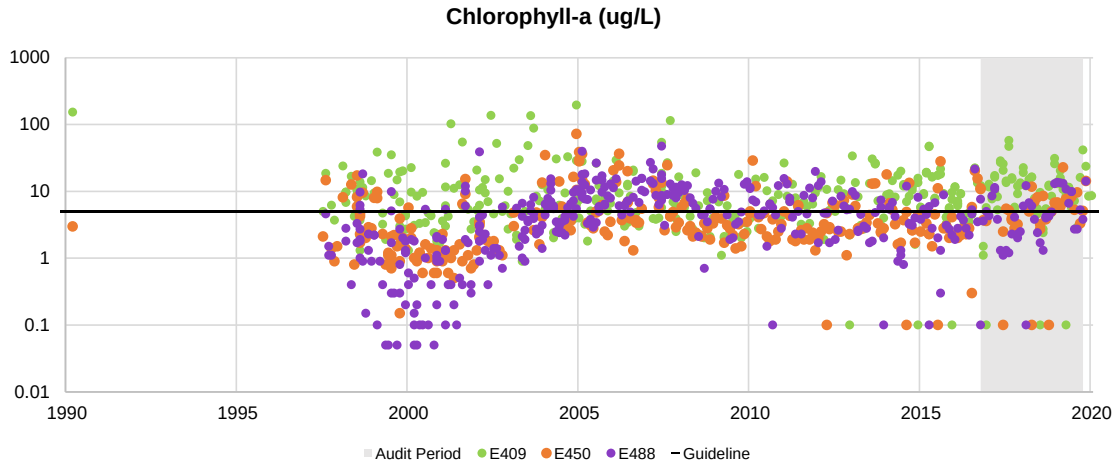


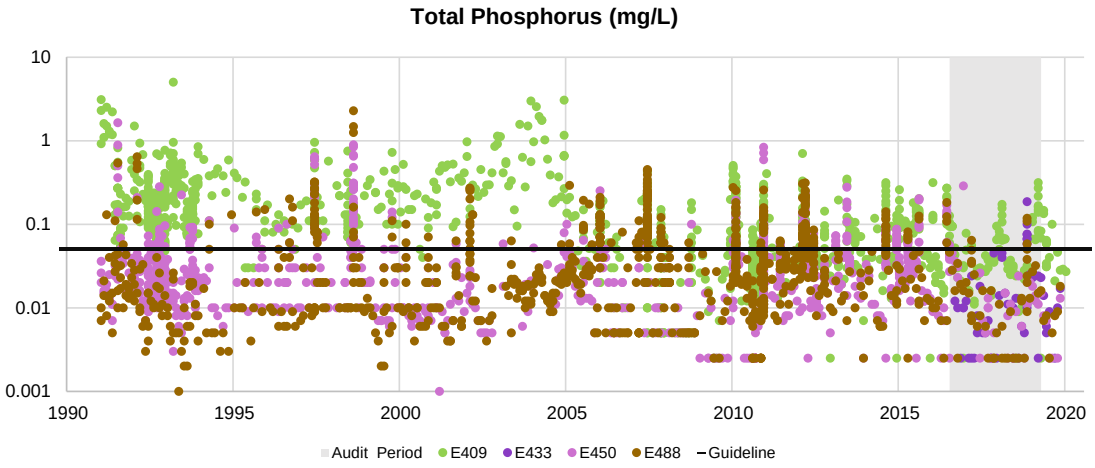
Nitrogen Oxidised (mg/L)

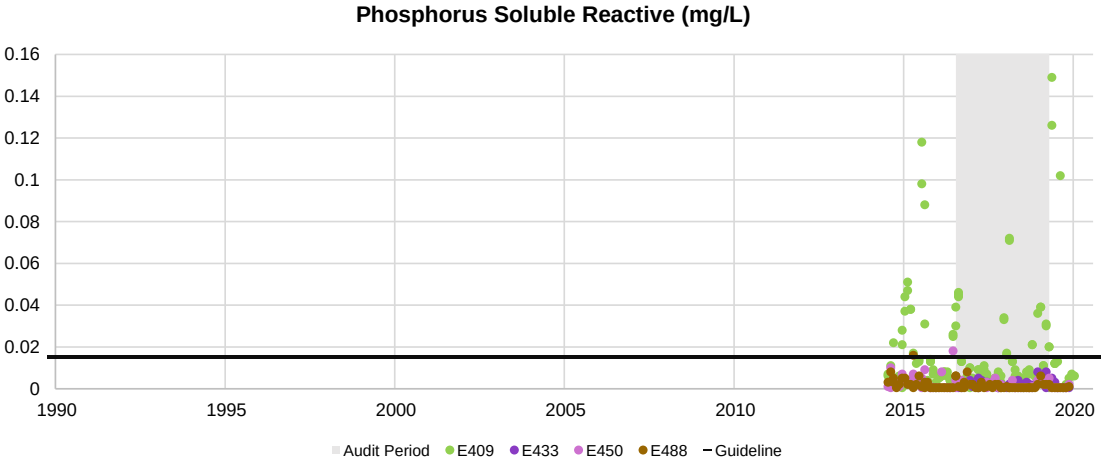


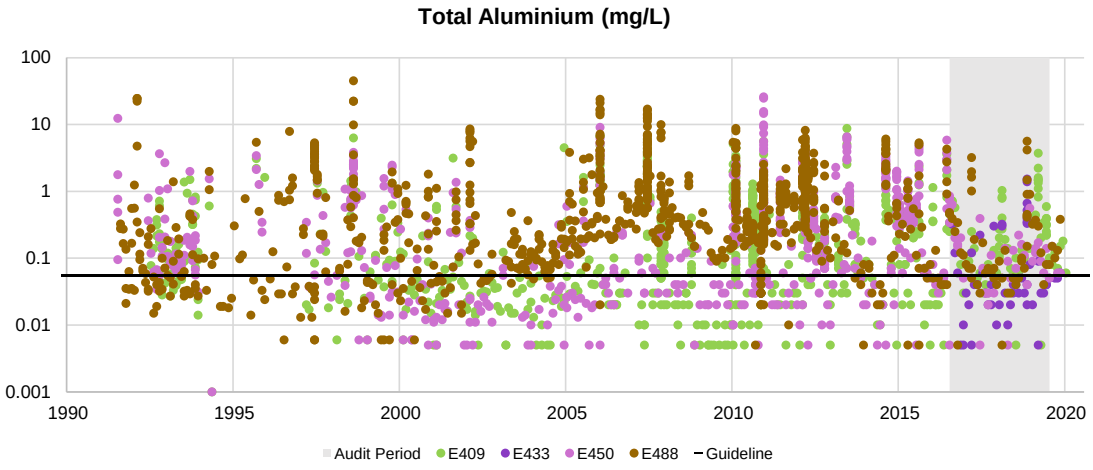
Total Nitrogen(mg/L)

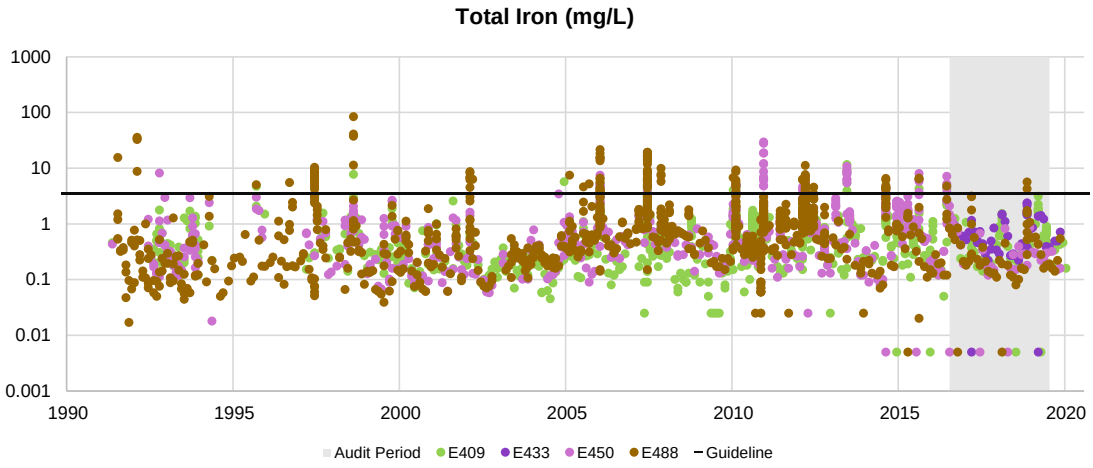



Chlorophyll-a (ug/L)
1000
100
10
1
0.1
0.01
1990
1995
2000
2005
2010
2015
2020
Audit Period
E409
E450
E488
Guideline


Total Phosphorus (mg/L)
10
1
0.1
0.01
0.001
1990
1995
2000
2005
2010
2015
2020
Audit Period
E409
E433
E450
E488
Guideline

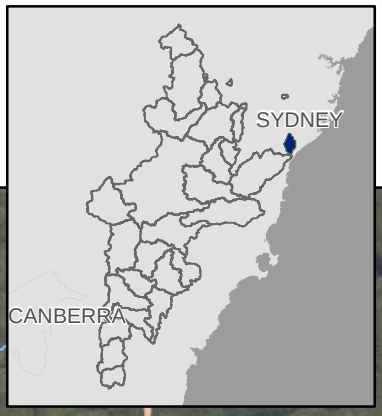

Phosphorus Soluble Reactive (mg/L)
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
E409
E433
E450
E488
Guideline

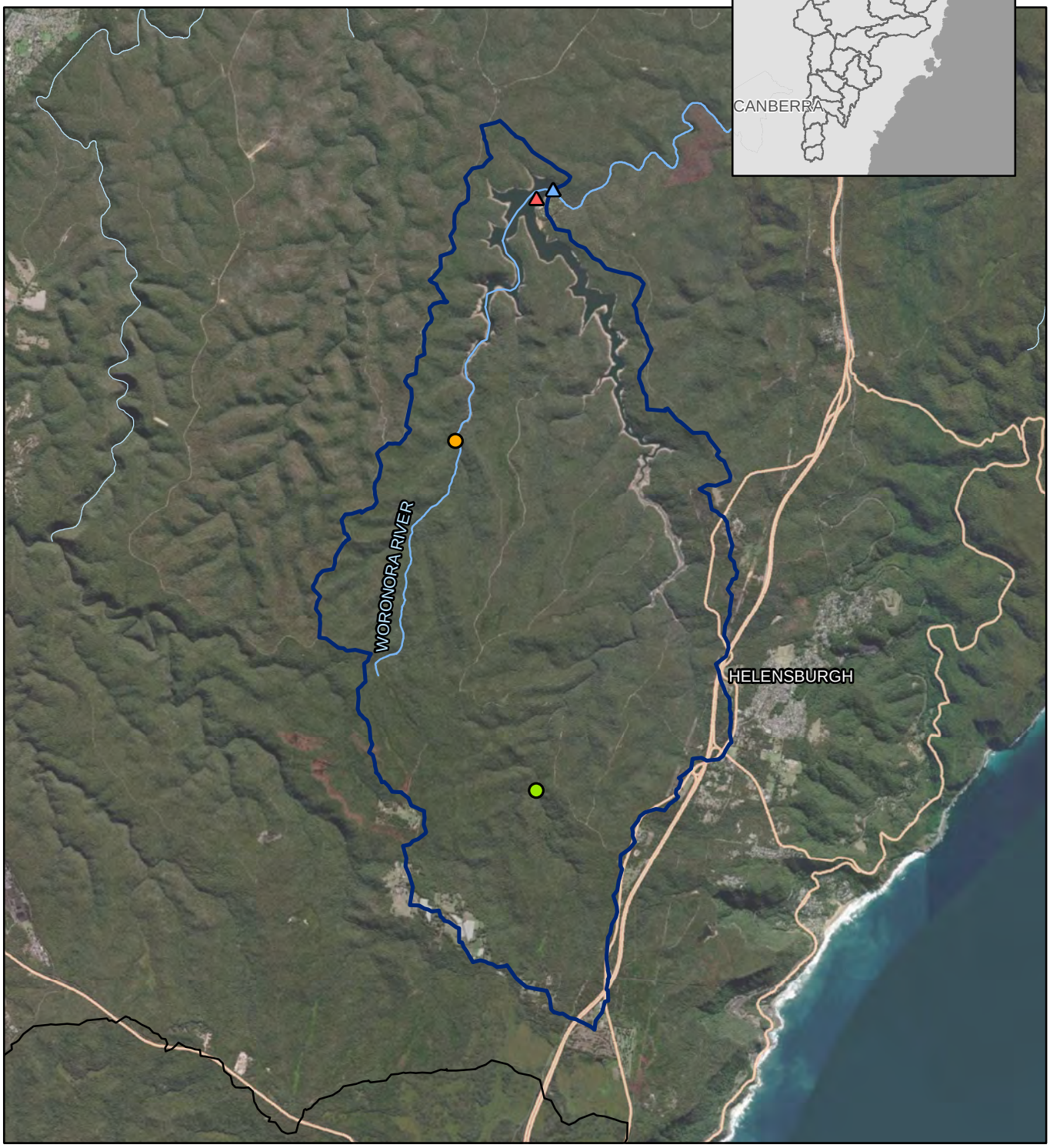

Total Aluminium (mg/L)
100
10
1
0.1
0.01
0.001
1990
1995
2000
2005
2010
2015
2020
Audit Period
E409
E433
E450
E488
Guideline


Total Iron (mg/L)
1000
100
10
1
0.1
0.01
0.001
1990
1995
2000
2005
2010
2015
2020
Audit Period
E409
E433
E450
E488
Guideline

WORONORA RIVER

CATCHMENT





Legend

- Sub Catchment Boundary
- Major Roads

Water Quality Monitoring Stations

- E6131
- E677

Water Quality Monitoring Stations (Storage)

- DWO1
- DWO_THMD

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

0 1,750 3,500

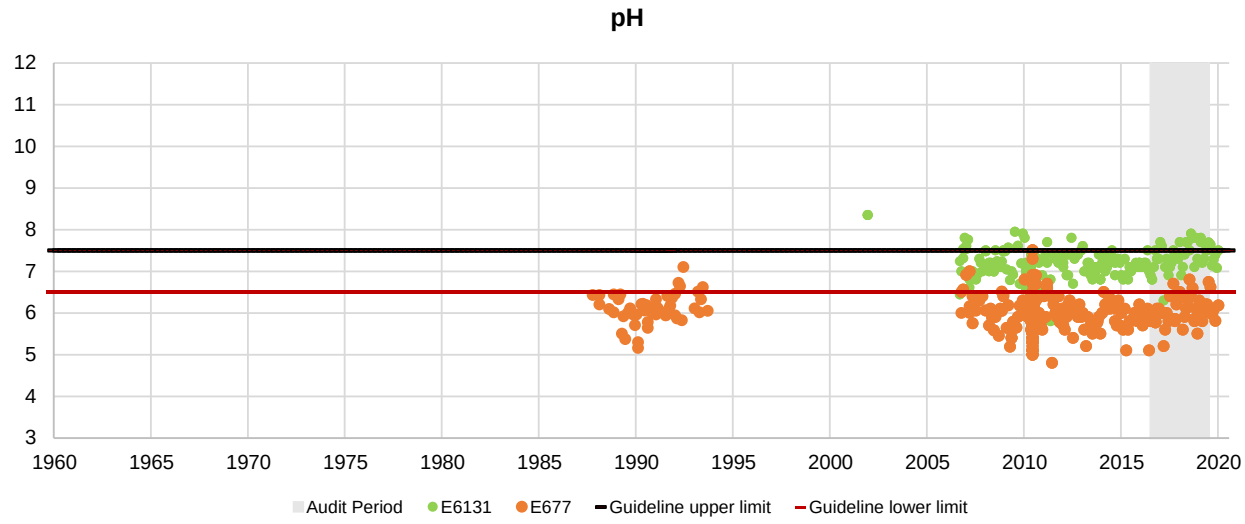
Metres

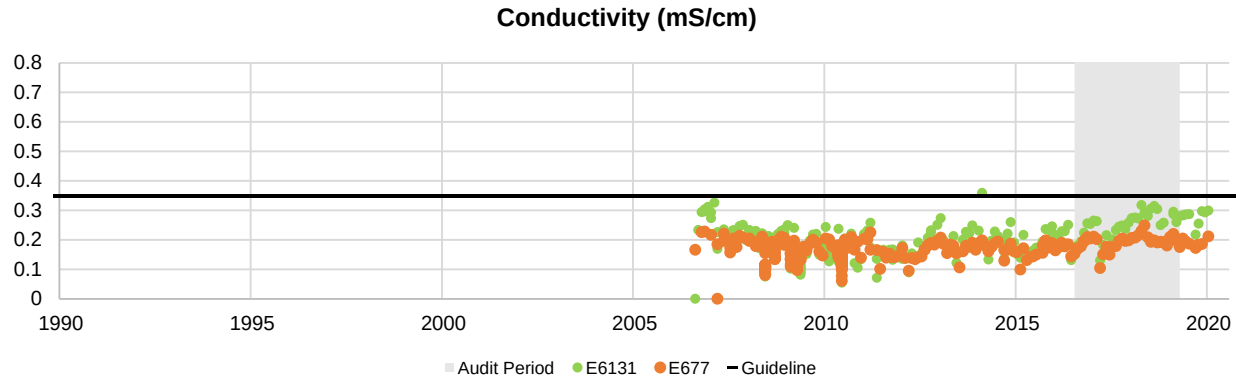
Datum/Projection:
GDA 1994 MGA Zone 56

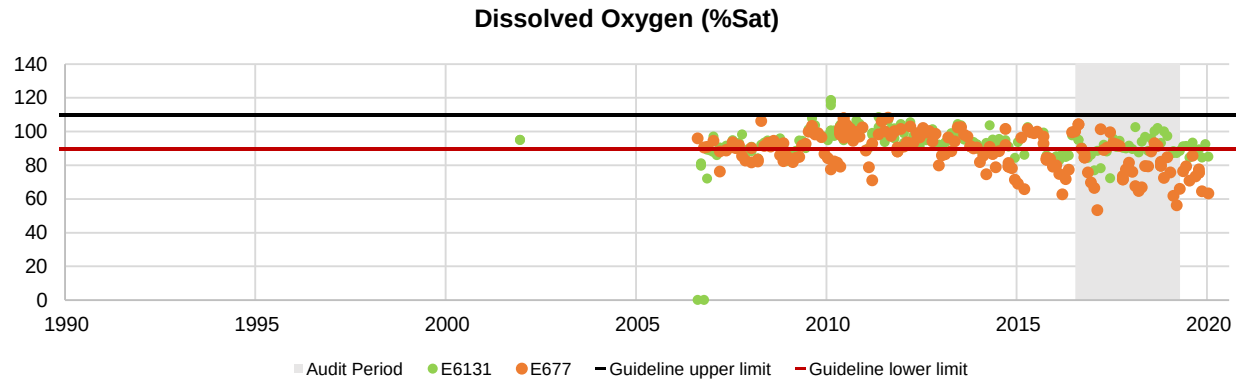
N

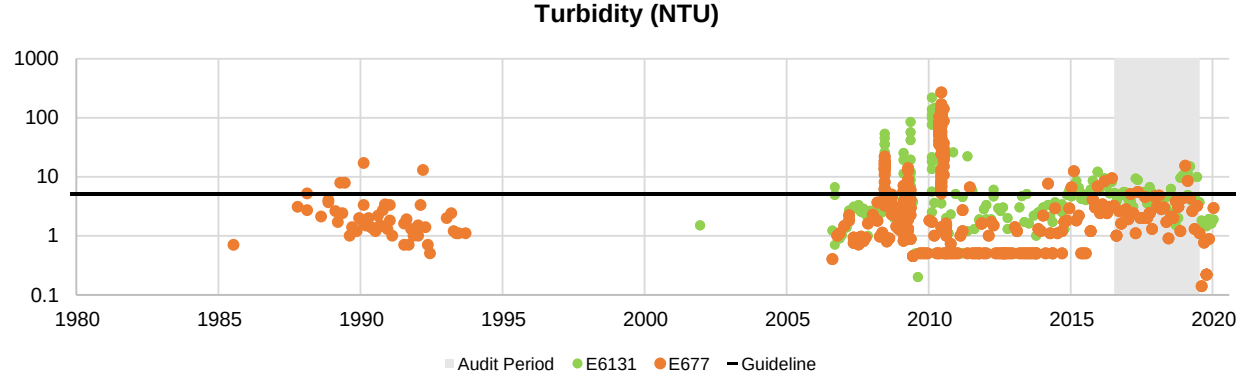
eco logical AUSTRALIA
A TETRA TECH COMPANY

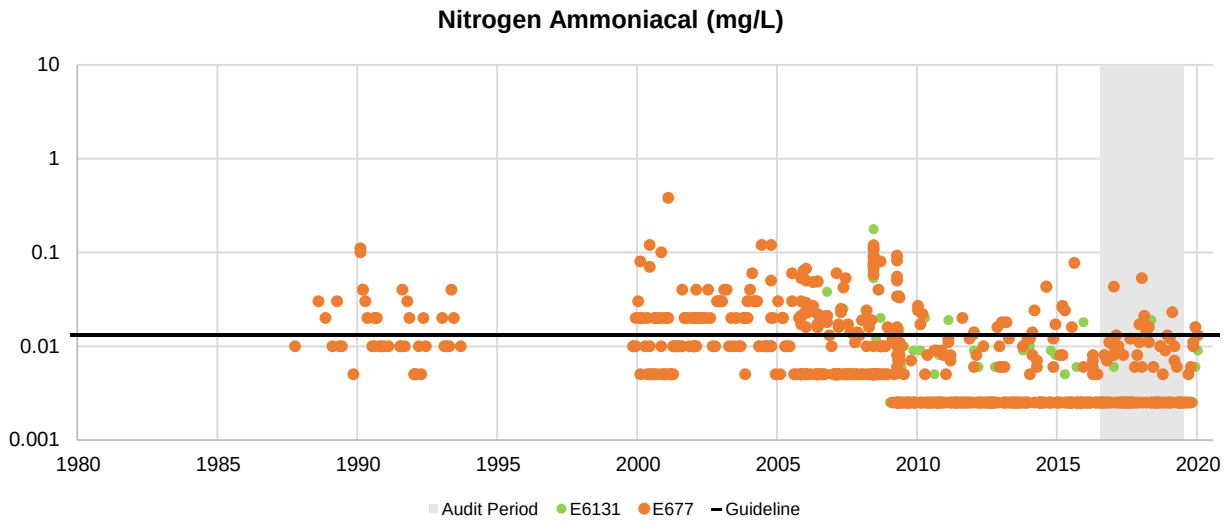
Prepared by: SC Date: 18/03/2020

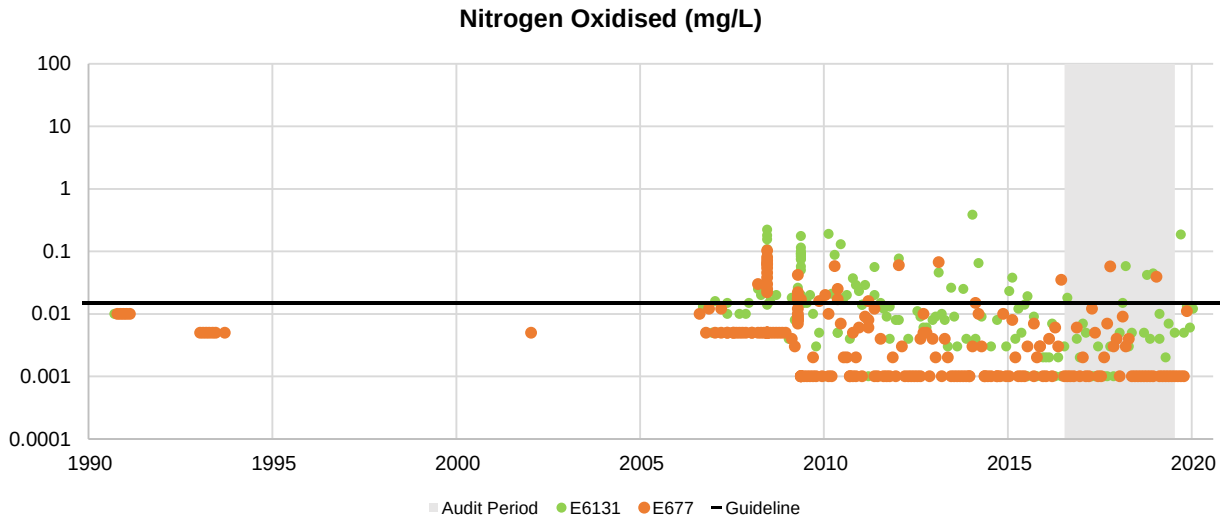

pH
12
11
10
9
8
7
6
5
4
3
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
E6131
E677
Guideline upper limit
Guideline lower limit

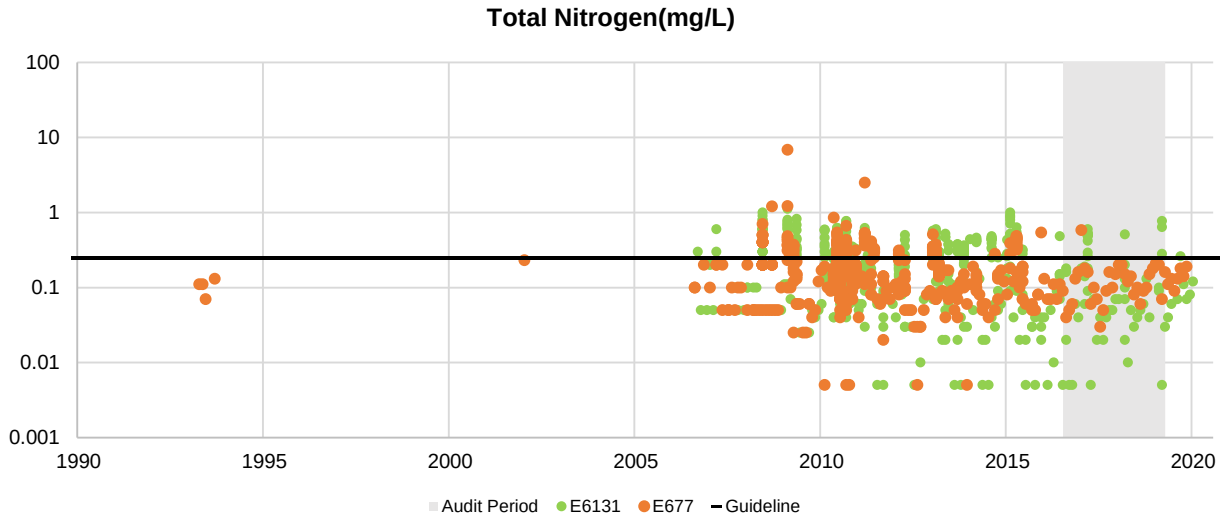

Conductivity (mS/cm)
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
E6131
E677
Guideline

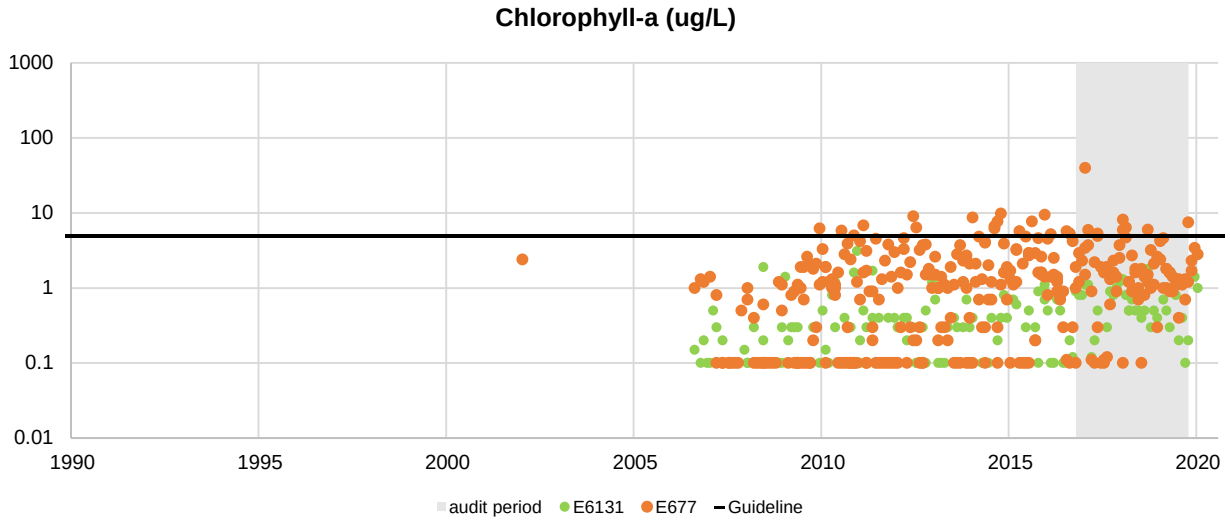

Dissolved Oxygen (%Sat)
140
120
100
80
60
40
20
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
E6131
E677
Guideline upper limit
Guideline lower limit

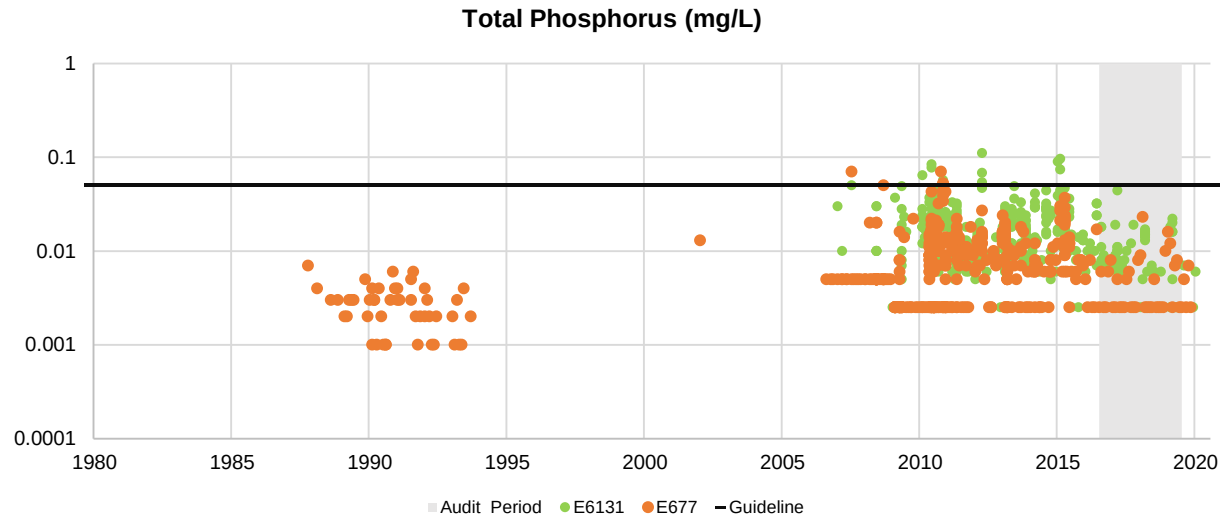

Turbidity (NTU)
1000
100
10
1
0.1
1980
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
E6131
E677
Guideline

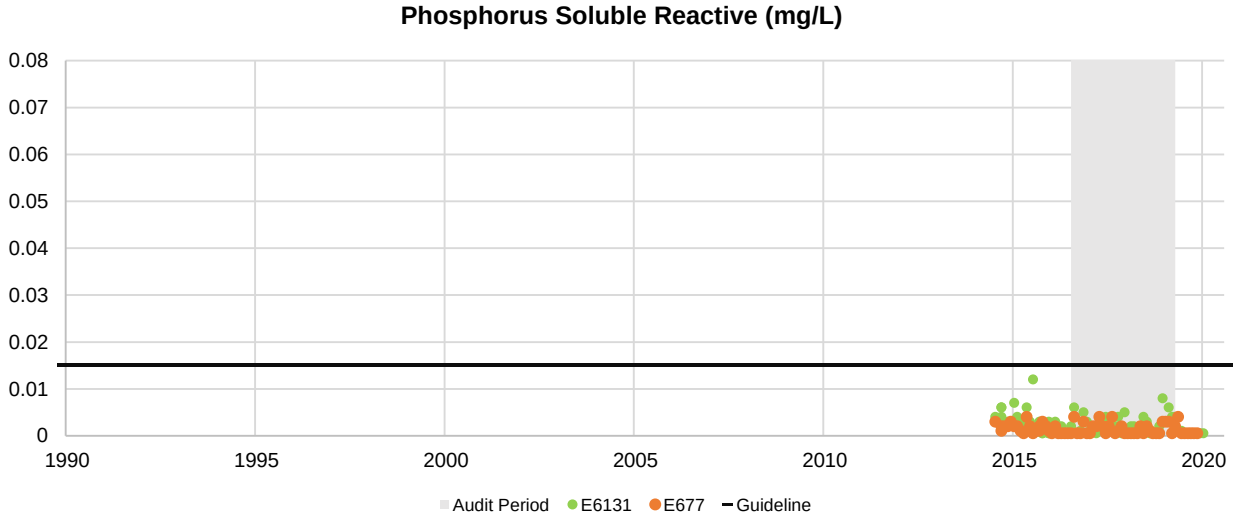

Nitrogen Ammoniacal (mg/L)
10
1
0.1
0.01
0.001
1980
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
E6131
E677
Guideline

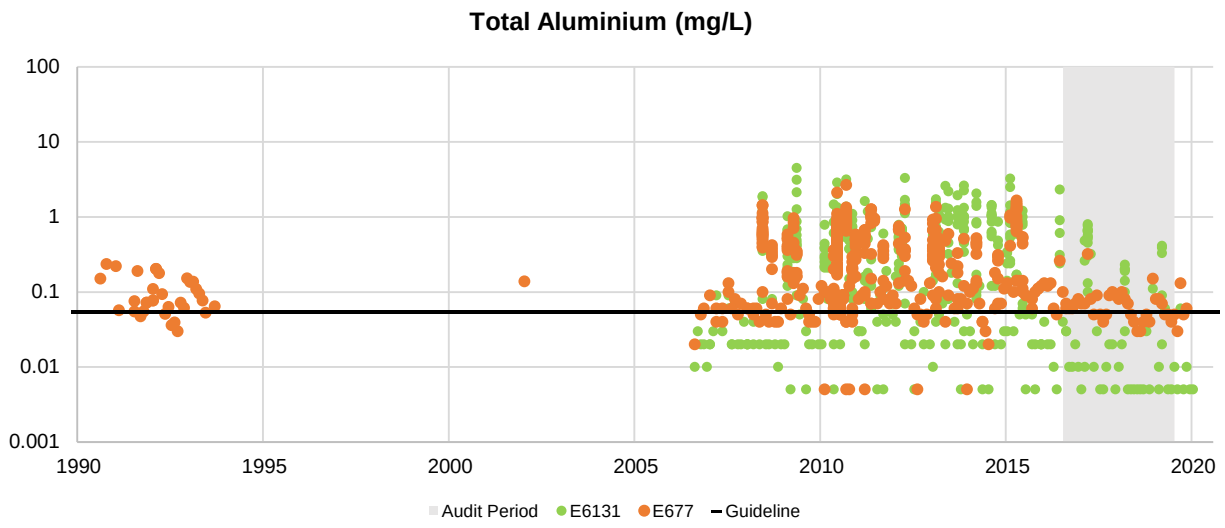

Nitrogen Oxidised (mg/L)
100
10
1
0.1
0.01
0.001
0.0001
1990
1995
2000
2005
2010
2015
2020
Audit Period
E6131
E677
Guideline

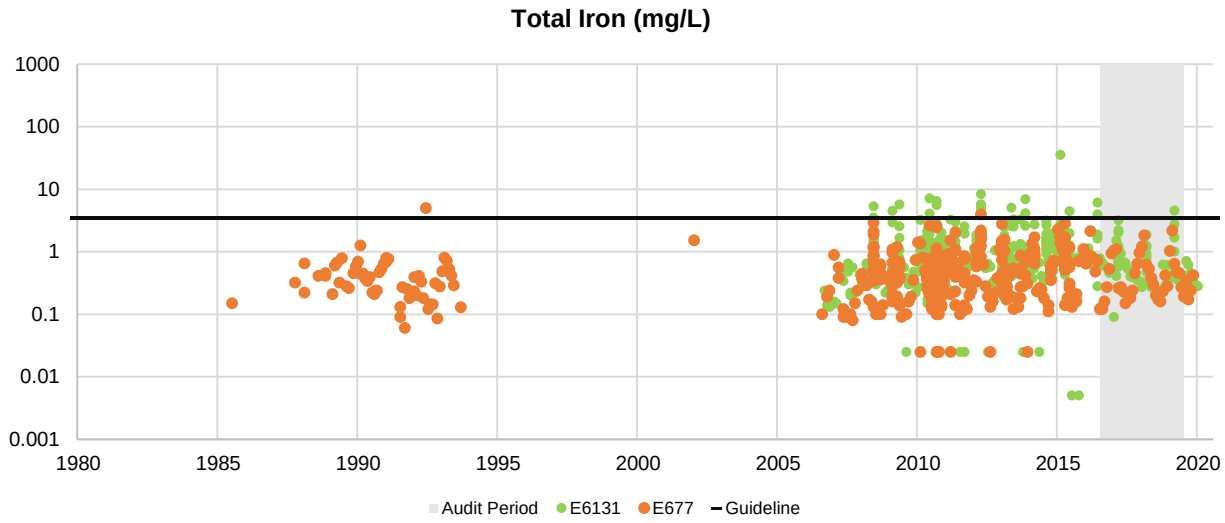

Total Nitrogen(mg/L)
100
10
1
0.1
0.01
0.001
1990
1995
2000
2005
2010
2015
2020
Audit Period
E6131
E677
Guideline

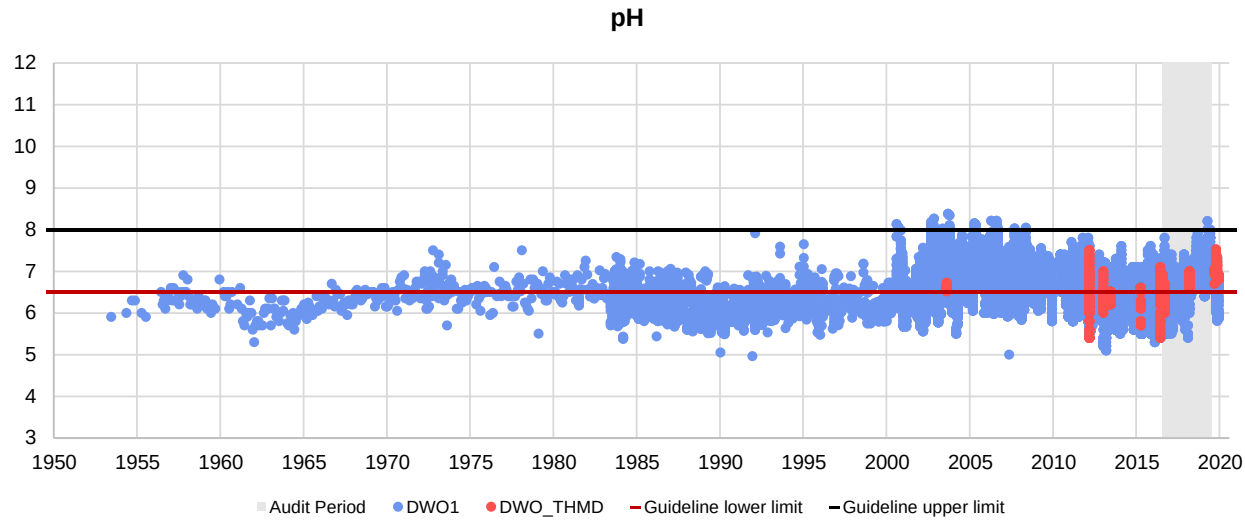

Chlorophyll-a (ug/L)
1000
100
10
1
0.1
0.01
1990
1995
2000
2005
2010
2015
2020
audit period
E6131
E677
Guideline

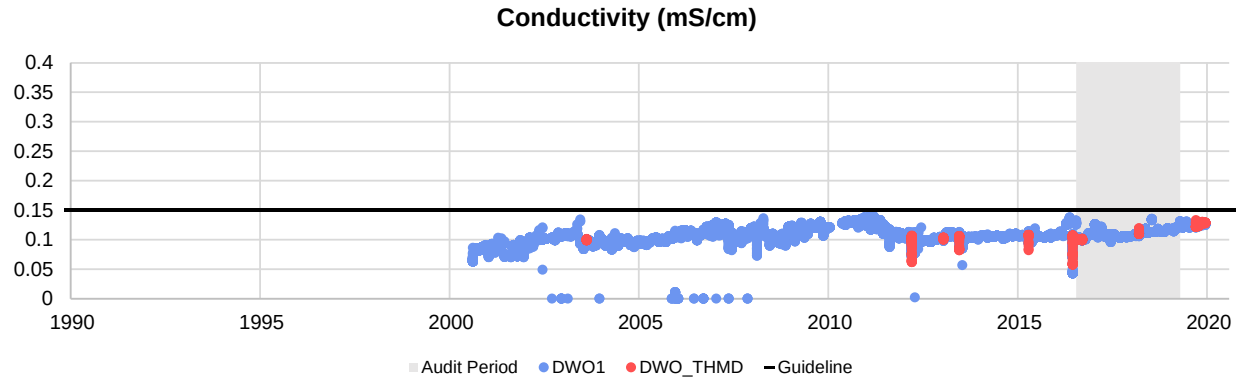

Total Phosphorus (mg/L)
1
0.1
0.01
0.001
0.0001
1980
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
E6131
E677
Guideline

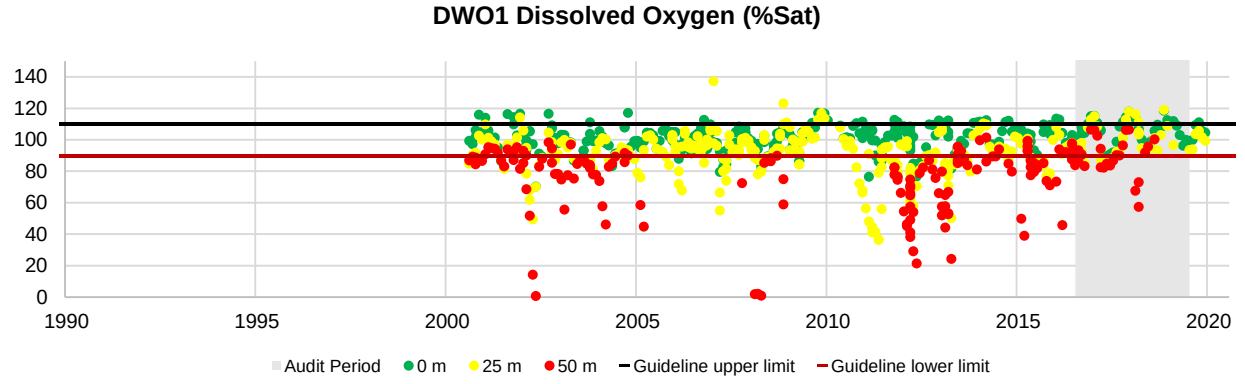

Phosphorus Soluble Reactive (mg/L)
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
E6131
E677
Guideline

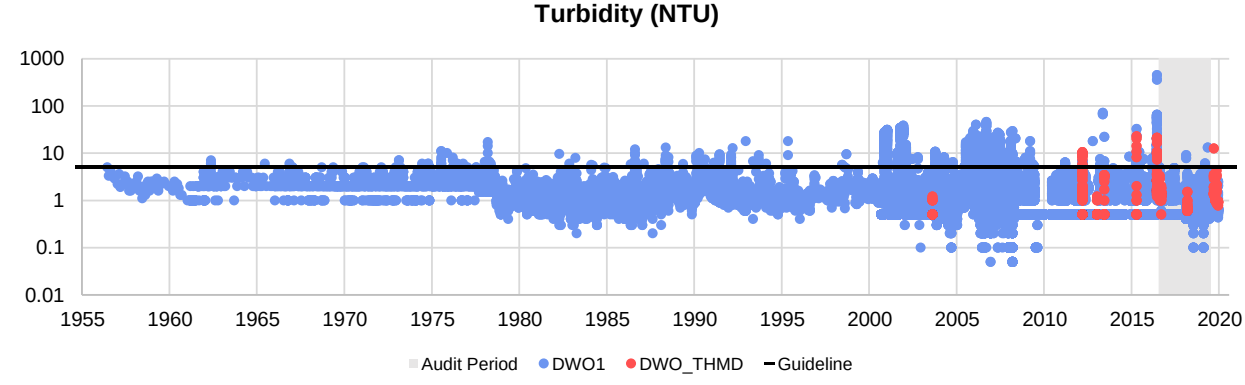

Total Aluminium (mg/L)
100
10
1
0.1
0.01
0.001
1990
1995
2000
2005
2010
2015
2020
Audit Period
E6131
E677
Guideline

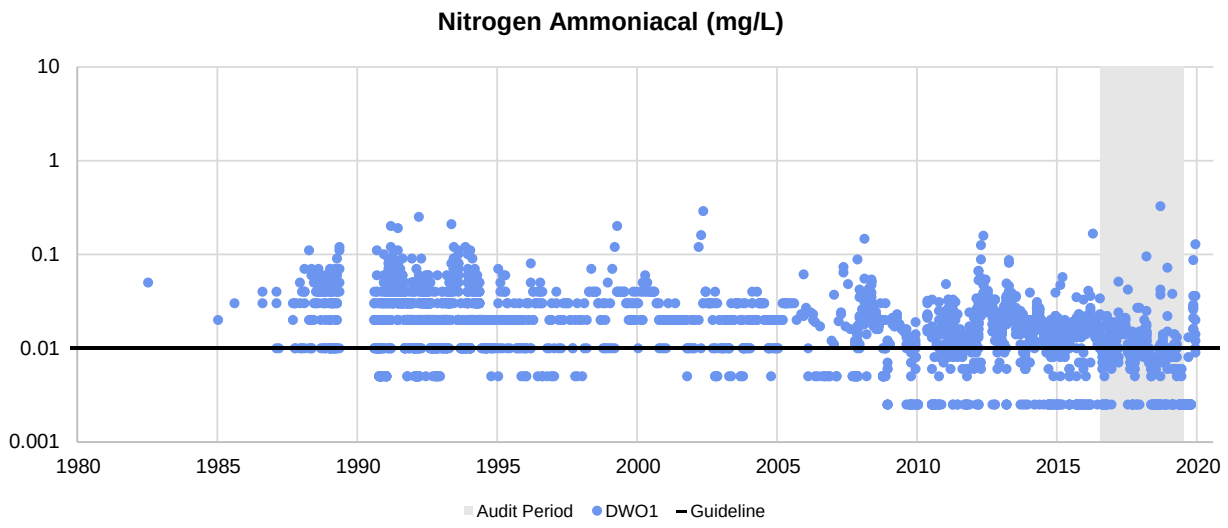

Total Iron (mg/L)
1000
100
10
1
0.1
0.01
0.001
1980
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
E6131
E677
Guideline

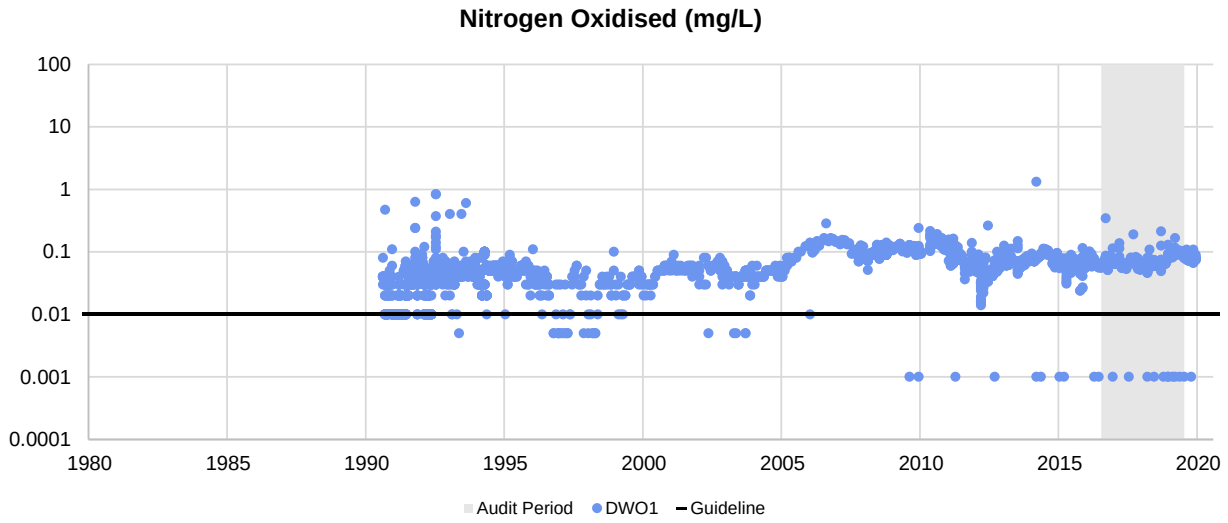

pH
12
11
10
9
8
7
6
5
4
3
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
DWO1
DWO_THMD
Guideline lower limit
Guideline upper limit

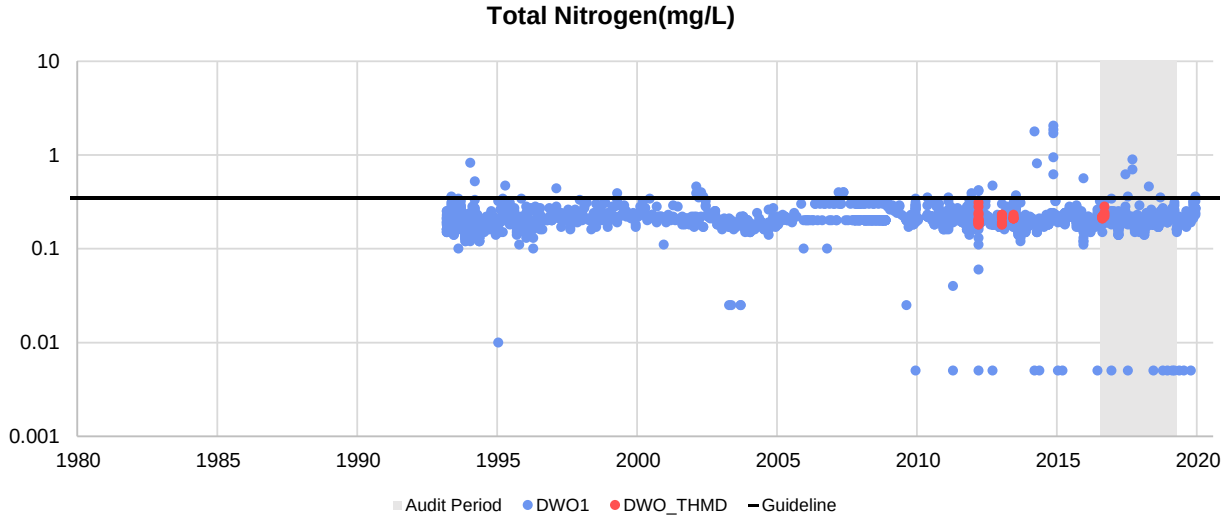

Conductivity (mS/cm)
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
DWO1
DWO_THMD
Guideline

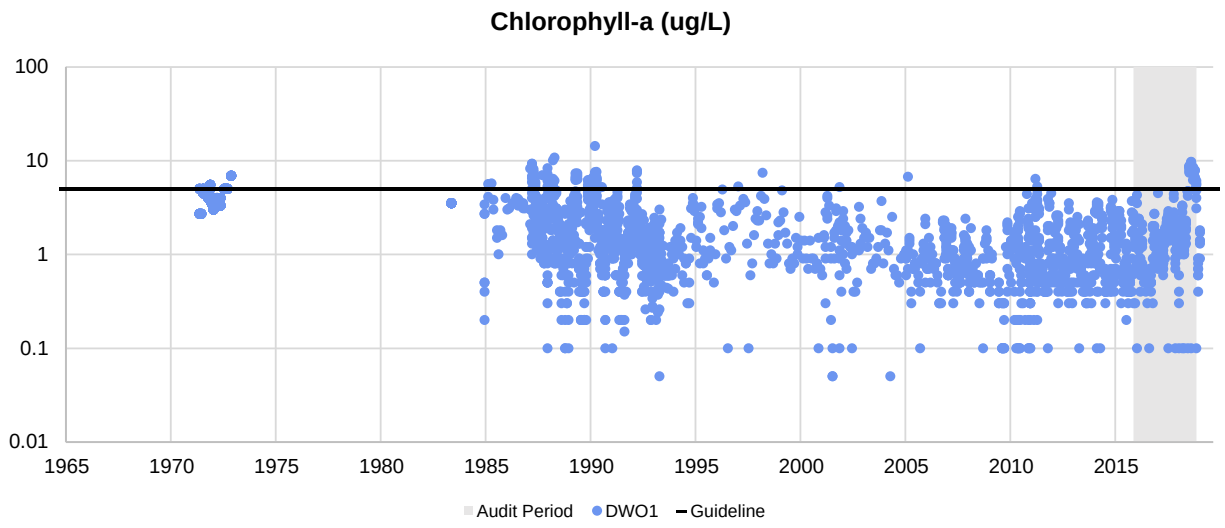

DWO1 Dissolved Oxygen (%Sat)
140
120
100
80
60
40
20
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
0 m
25 m
50 m
Guideline upper limit
Guideline lower limit

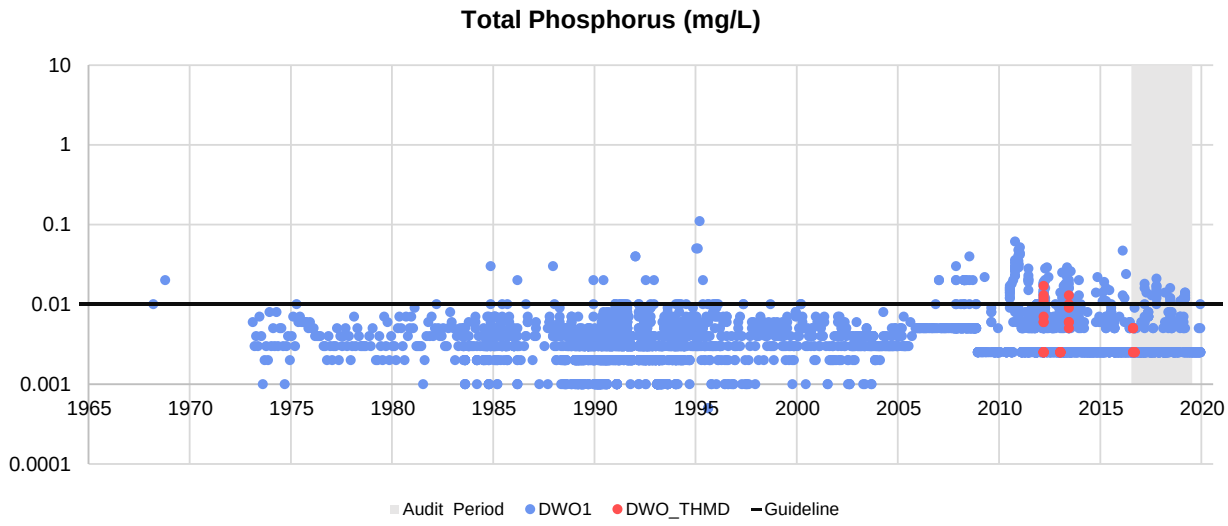

Turbidity (NTU)
1000
100
10
1
0.1
0.01
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
DWO1
DWO_THMD
Guideline

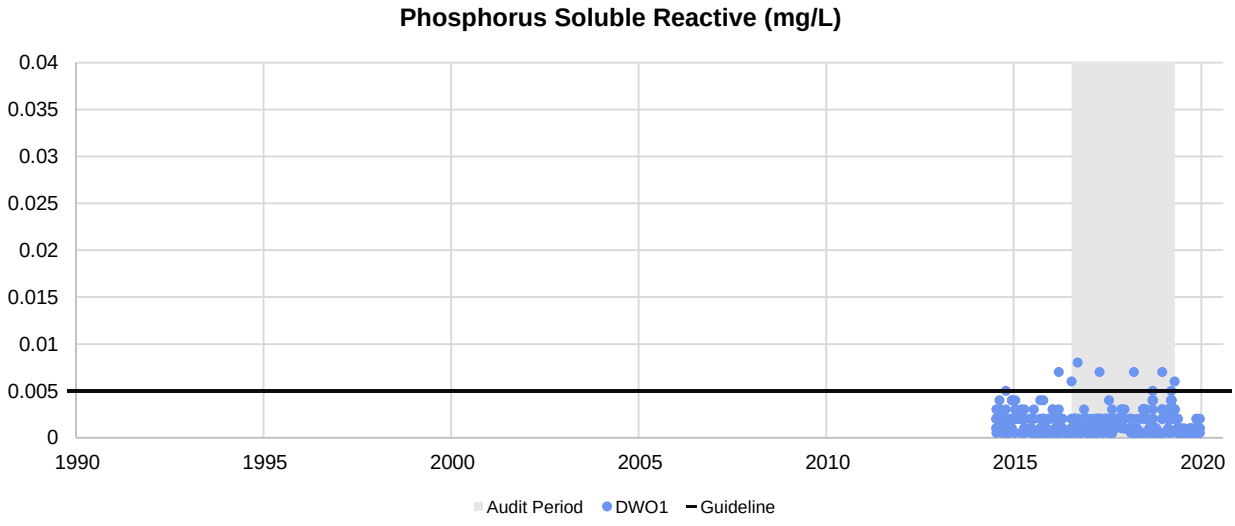

Nitrogen Ammoniacal (mg/L)
10
1
0.1
0.01
0.001
1980
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
DWO1
Guideline

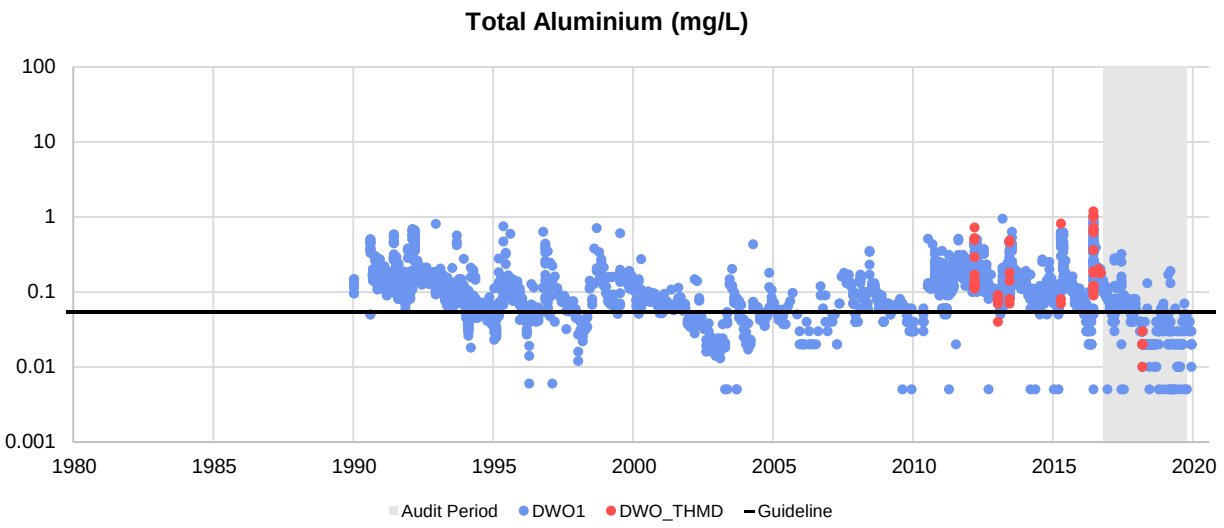

Nitrogen Oxidised (mg/L)
100
10
1
0.1
0.01
0.001
0.0001
1980
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
DWO1
Guideline

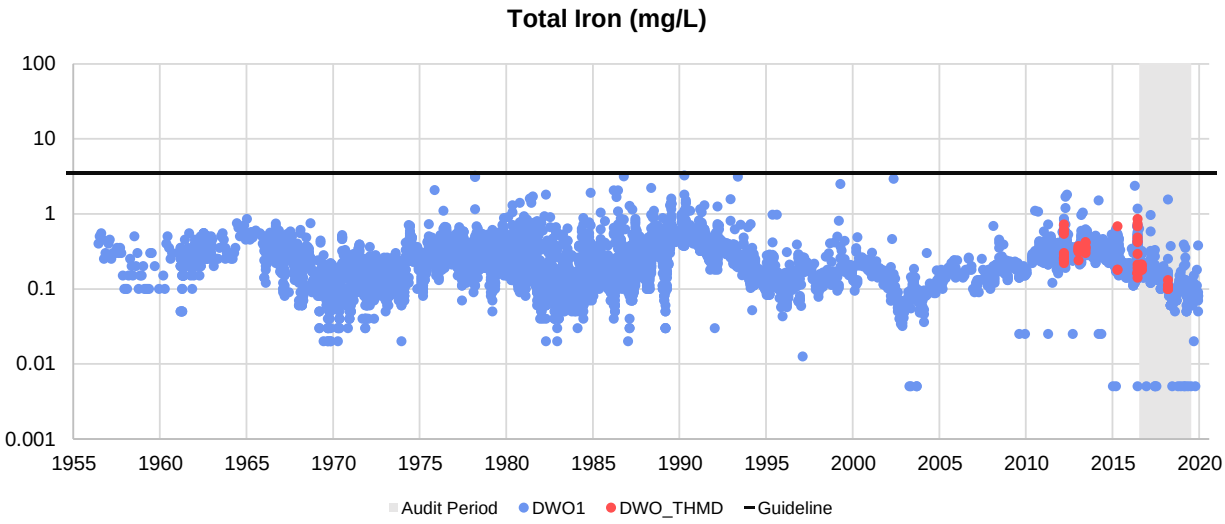

Total Nitrogen(mg/L)
10
1
0.1
0.01
0.001
1980
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
DWO1
DWO_THMD
Guideline


Chlorophyll-a (ug/L)
100
10
1
0.1
0.01
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
Audit Period
DWO1
Guideline


Total Phosphorus (mg/L)
10
1
0.1
0.01
0.001
0.0001
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
DWO1
DWO_THMD
Guideline


Phosphorus Soluble Reactive (mg/L)
0.04
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
1990
1995
2000
2005
2010
2015
2020
Audit Period
DWO1
Guideline


Total Aluminium (mg/L)
100
10
1
0.1
0.01
0.001
1980
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
DWO1
DWO_THMD
Guideline


Total Iron (mg/L)
100
10
1
0.1
0.01
0.001
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
Audit Period
DWO1
DWO_THMD
Guideline

Appendix D Cyanobacteria

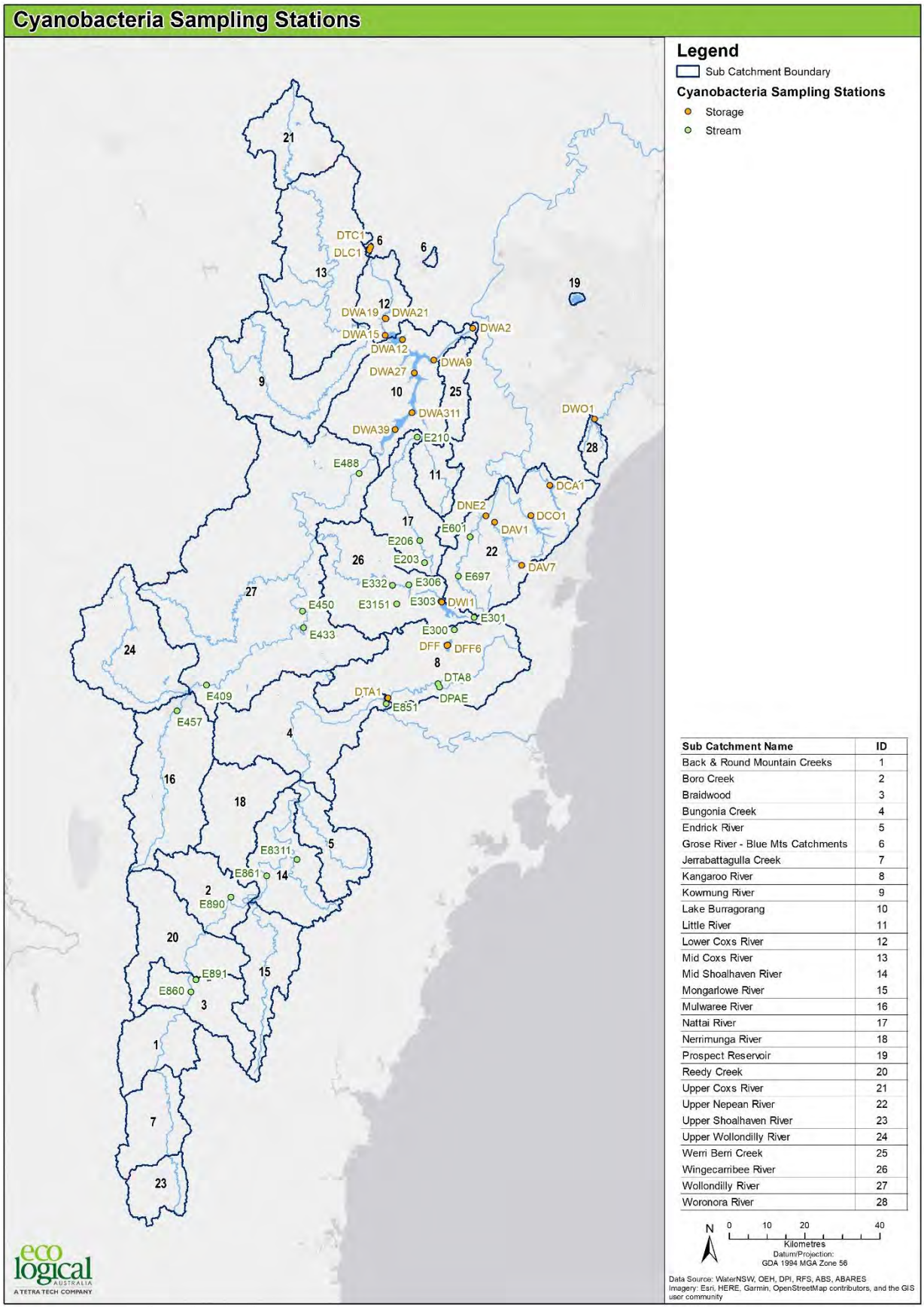
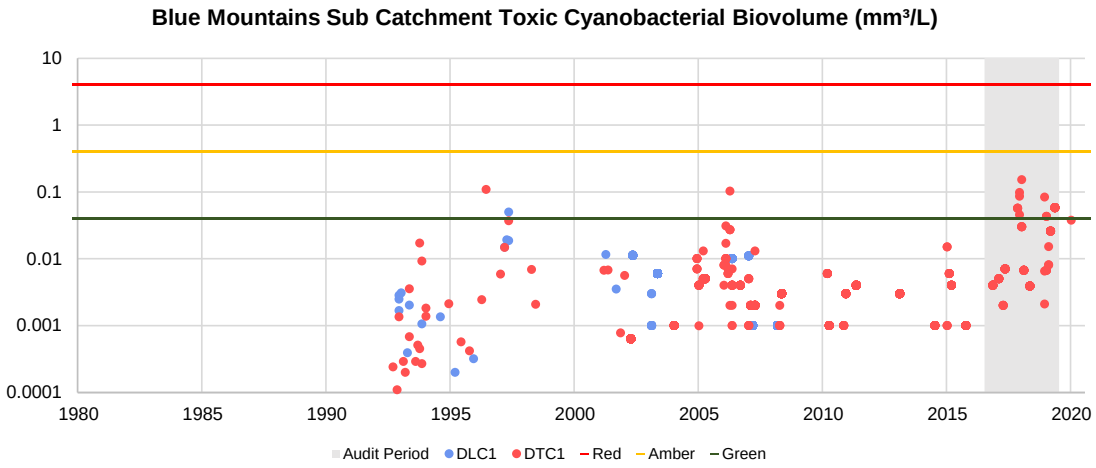
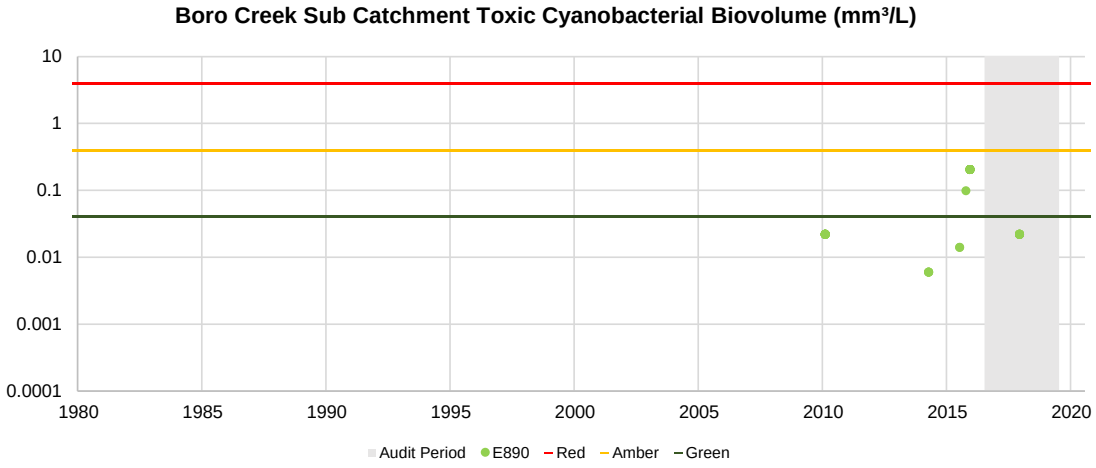
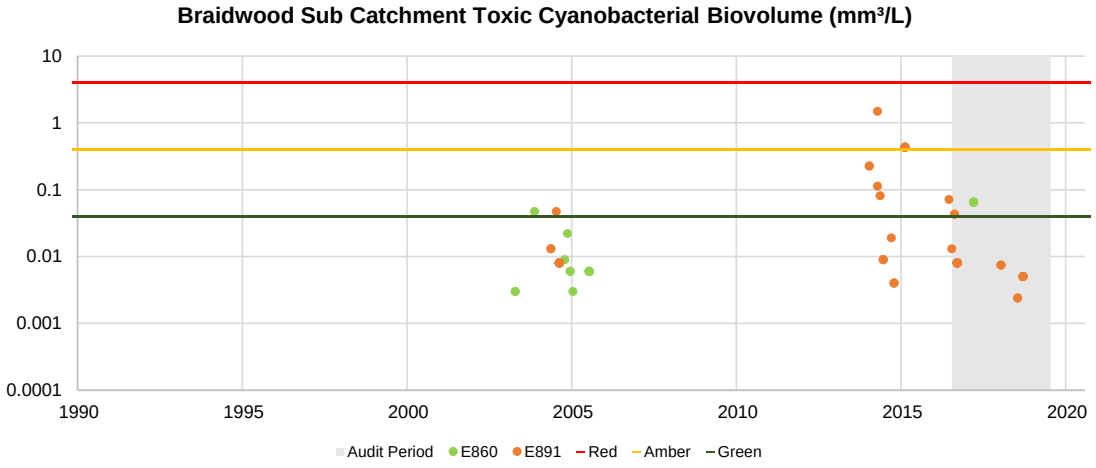


Figure 6: Cyanobacteria sampling stations

SUB CATCHMENT CYANOBACTERIA MONITORING RESULTS

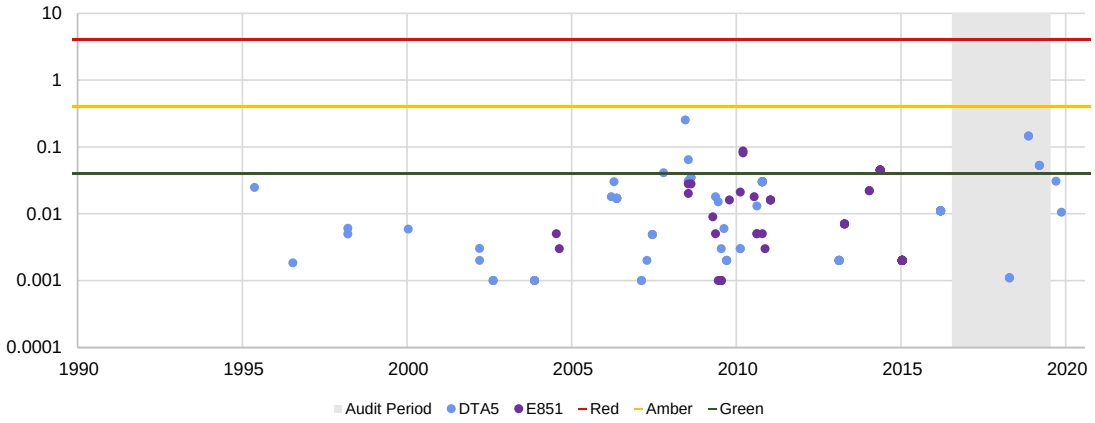




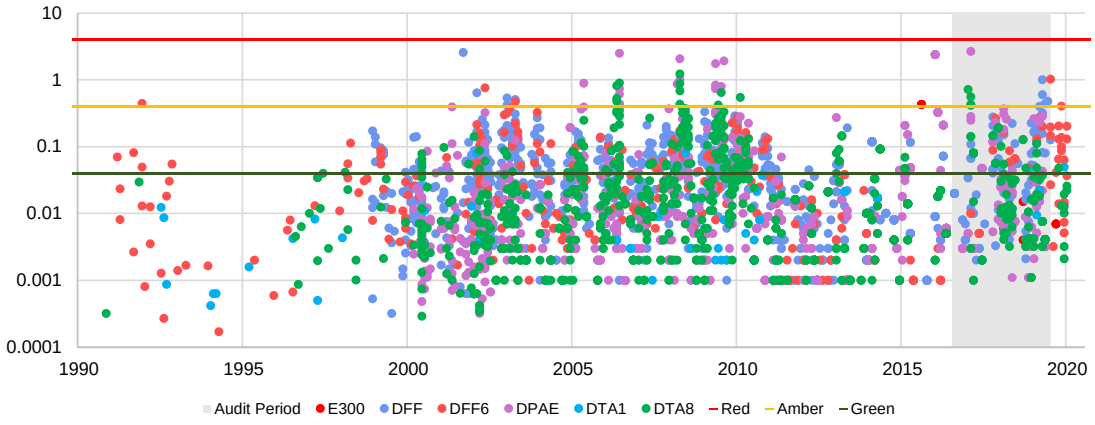


SUB CATCHMENT CYANOBACTERIA MONITORING RESULTS

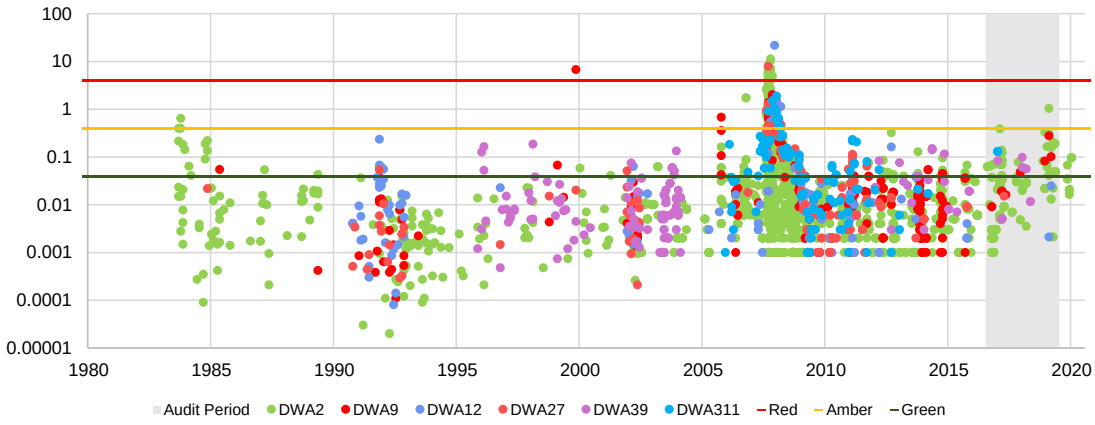
Bungonia Creek Sub Catchment Toxic Cyanobacterial Biovolume (mm³/L)



Kangaroo River Sub Catchment Toxic Cyanobacterial Biovolume (mm³/L)

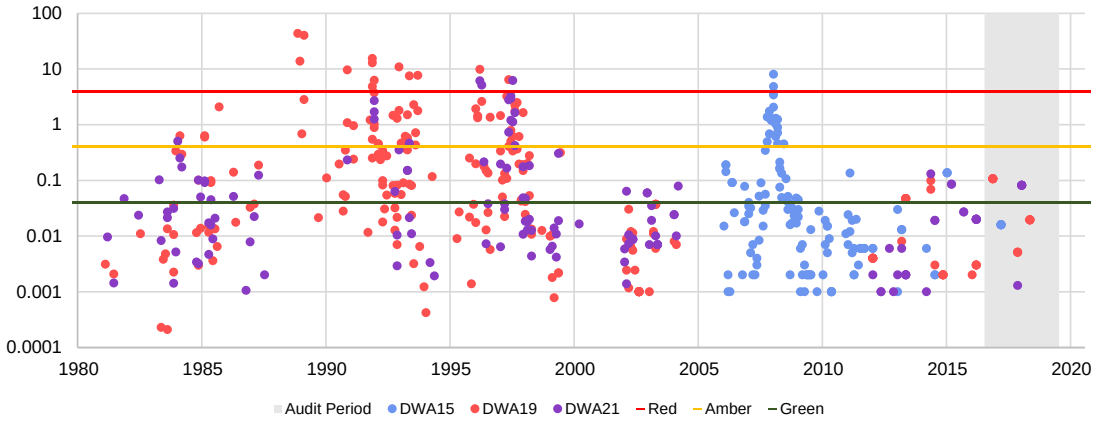


Lake Burragorang Sub Catchment Toxic Cyanobacterial Biovolume (mm³/L)

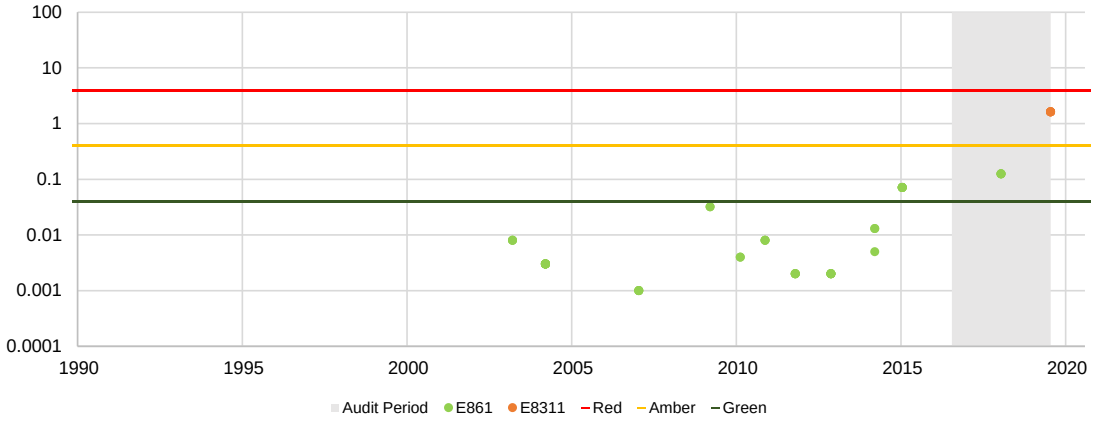


SUB CATCHMENT CYANOBACTERIA
MONITORING RESULTS

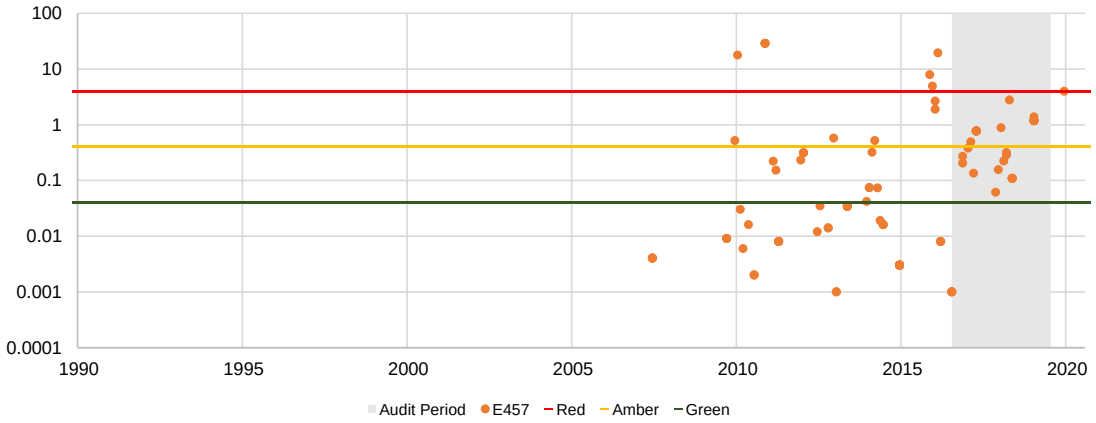
Lower Coxs Sub Catchment Toxic Cyanobacterial Biovolume (mm³/L)



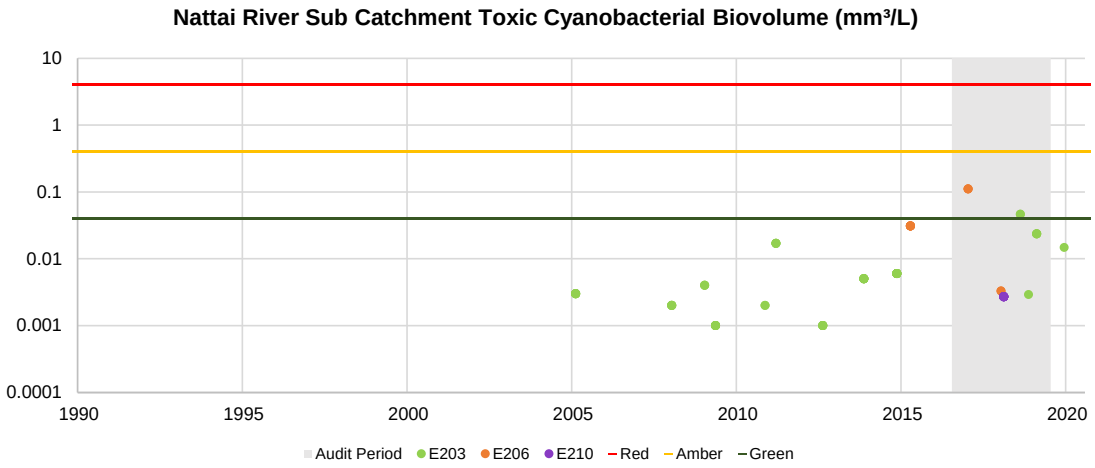
Mid Shoalhaven Sub Catchment Toxic Cyanobacterial Biovolume (mm³/L)

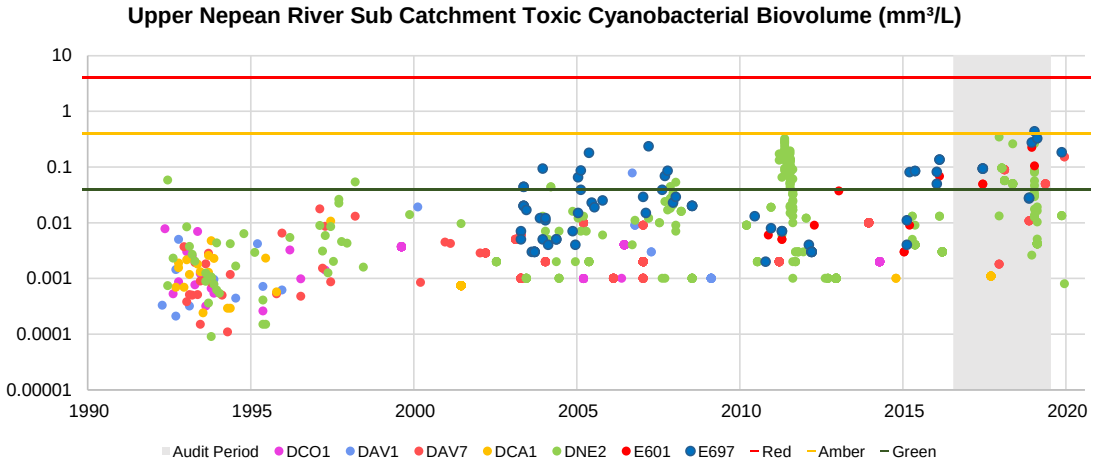


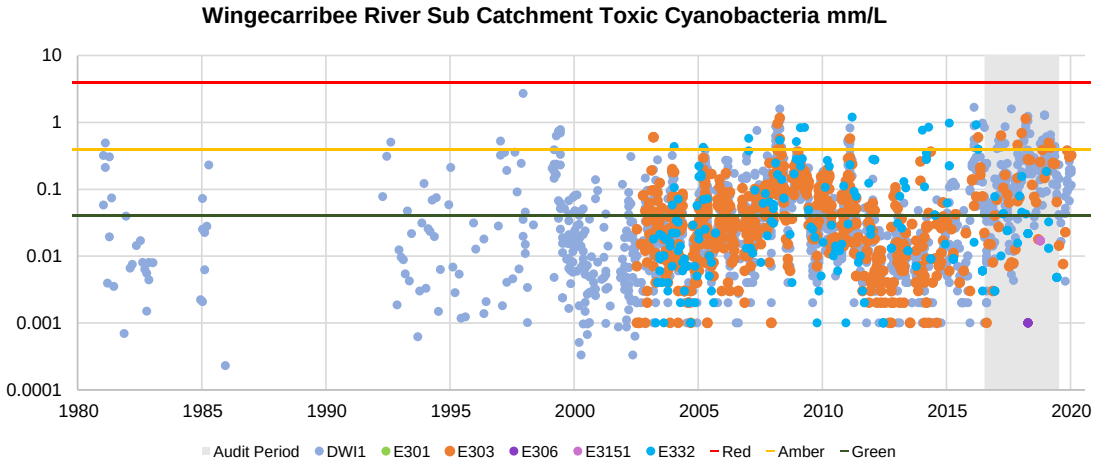
Mulwaree Sub Catchment Toxic Cyanobacterial Biovolume (mm³/L)



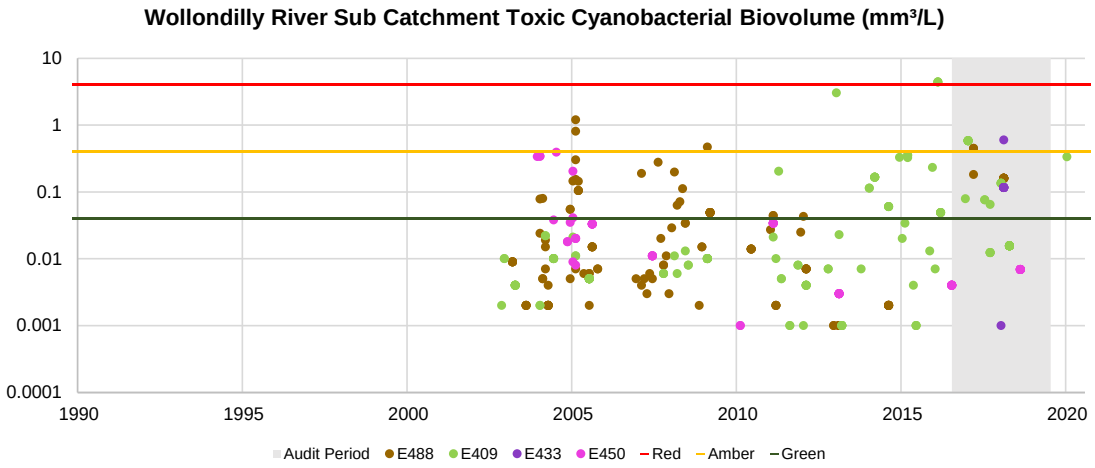
SUB CATCHMENT CYANOBACTERIA
MONITORING RESULTS

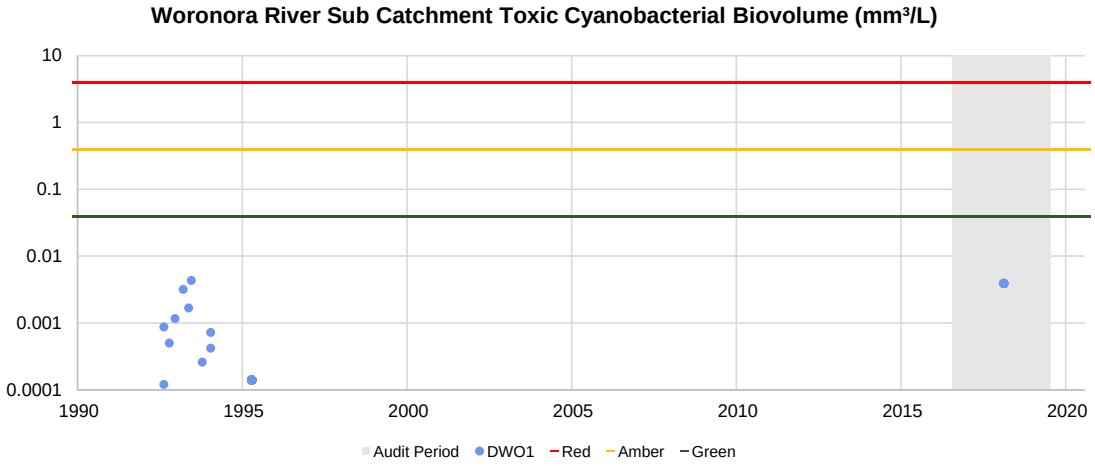




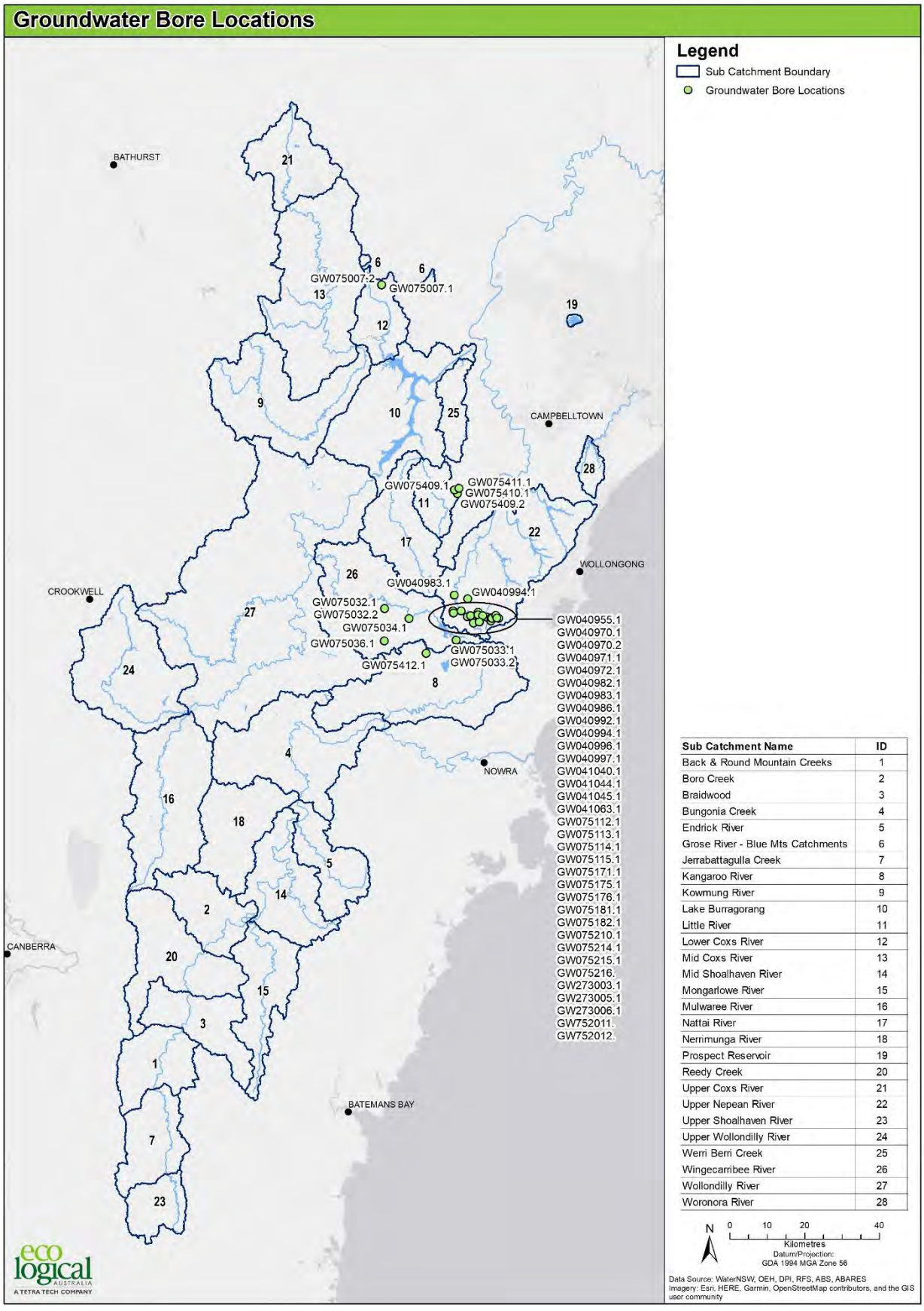


SUB CATCHMENT CYANOBACTERIA
MONITORING RESULTS





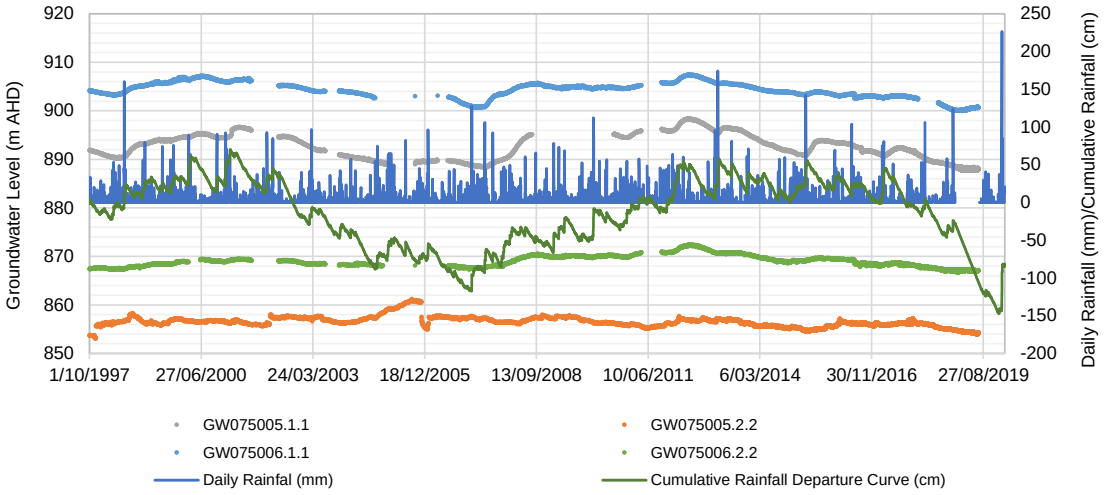
Appendix E Groundwater bore hydrographs

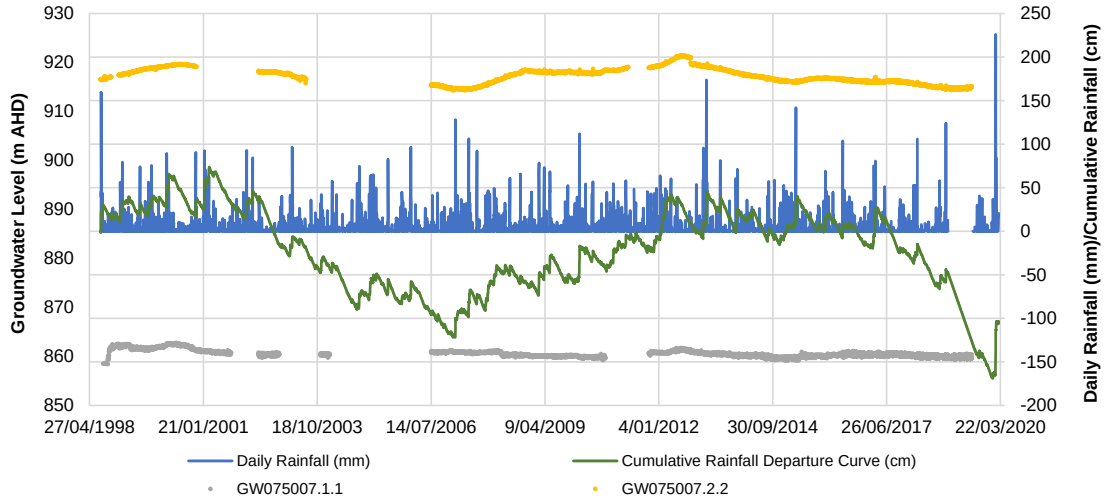


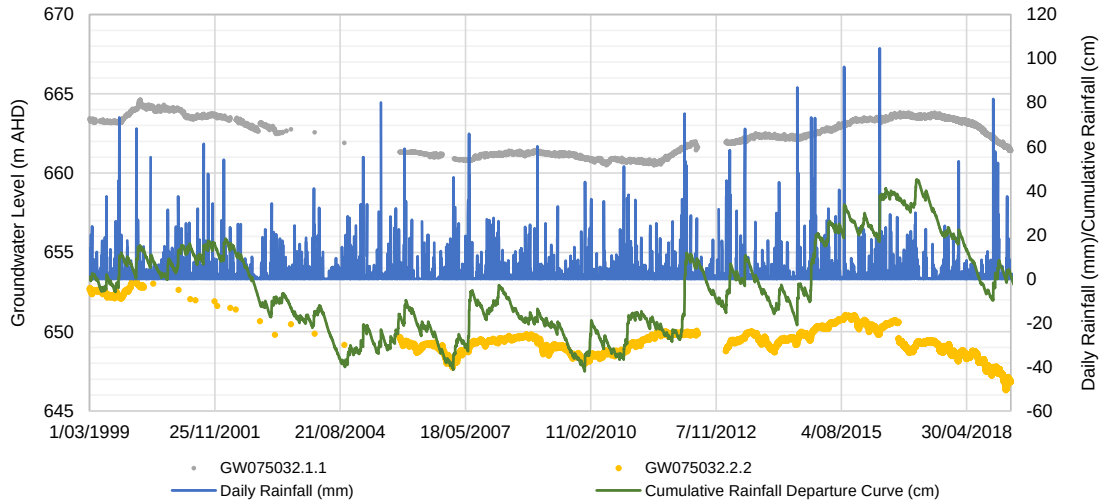
Sub Catchment Name	ID
Back & Round Mountain Creeks	1
Boro Creek	2
Braidwood	3
Bungonia Creek	4
Endrick River	5
Grose River - Blue Mts Catchments	6
Jerrabattagulla Creek	7
Kangaroo River	8
Kowmung River	9
Lake Burragorang	10
Little River	11
Lower Coxs River	12
Mid Coxs River	13
Mid Shoalhaven River	14
Mongarlowe River	15
Mulwaree River	16
Nattai River	17
Nerrimunga River	18
Prospect Reservoir	19
Reedy Creek	20
Upper Coxs River	21
Upper Nepean River	22
Upper Shoalhaven River	23
Upper Wollondilly River	24
Werri Berri Creek	25
Wingecarribee River	26
Wollondilly River	27
Woronora River	28

Figure 7: Groundwater bore locations

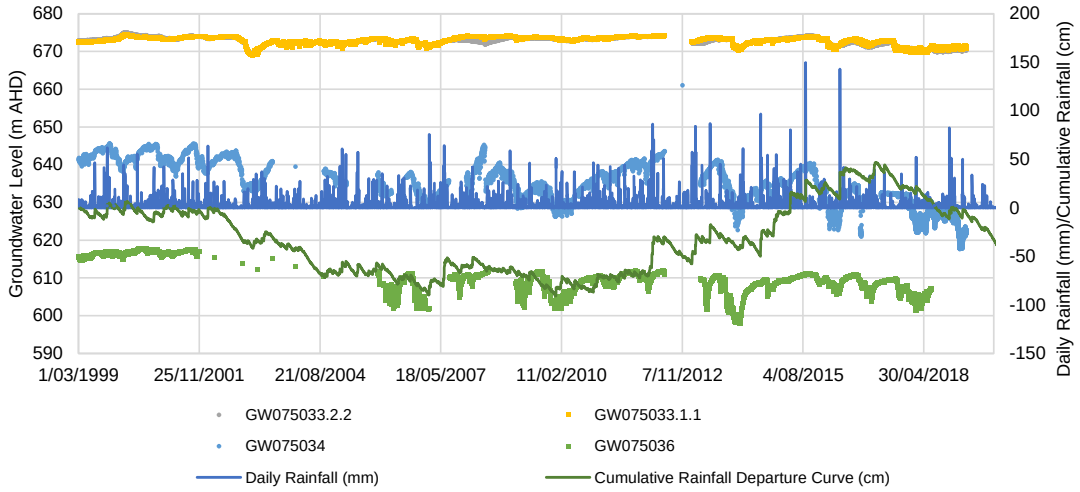
GROUNDWATER
MONITORING RESULTS

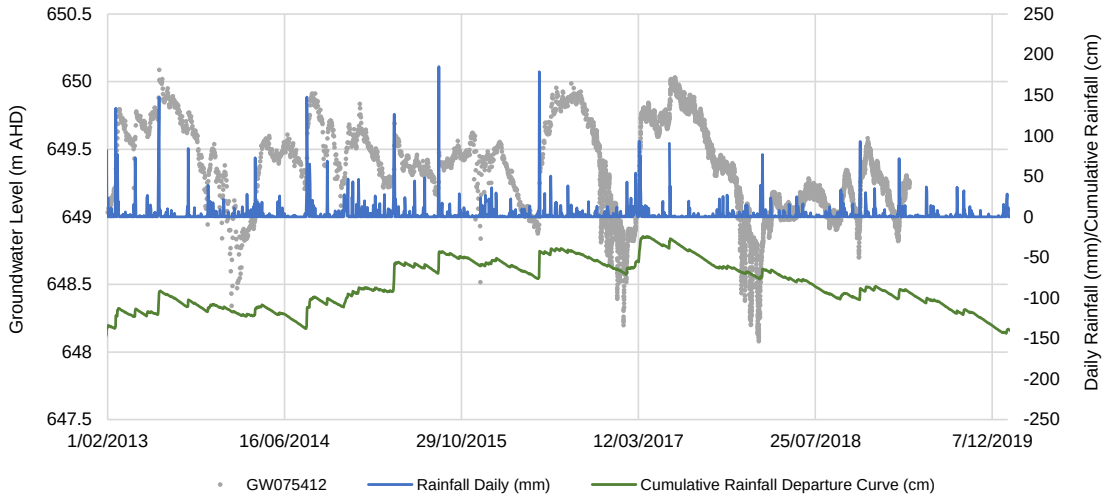


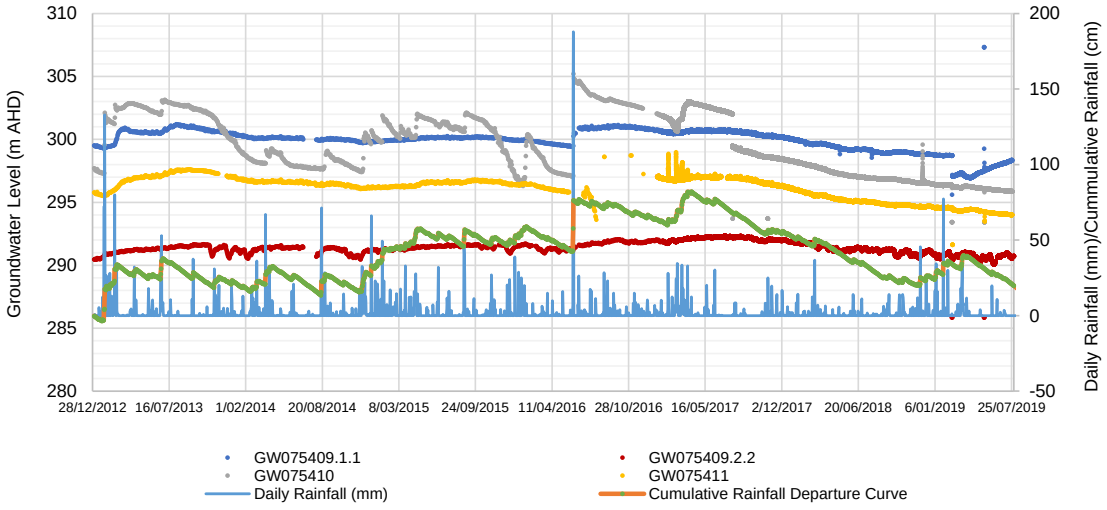




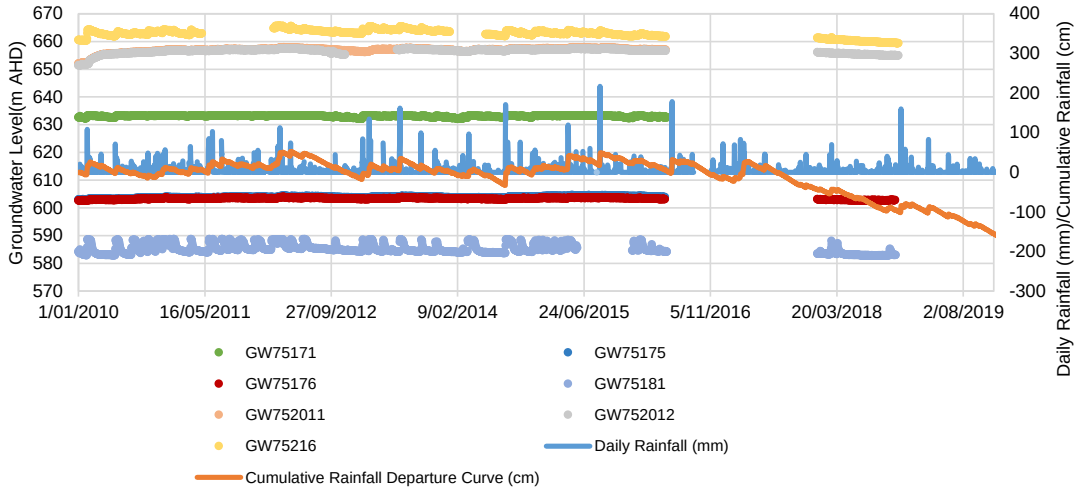
GROUNDWATER
MONITORING RESULTS

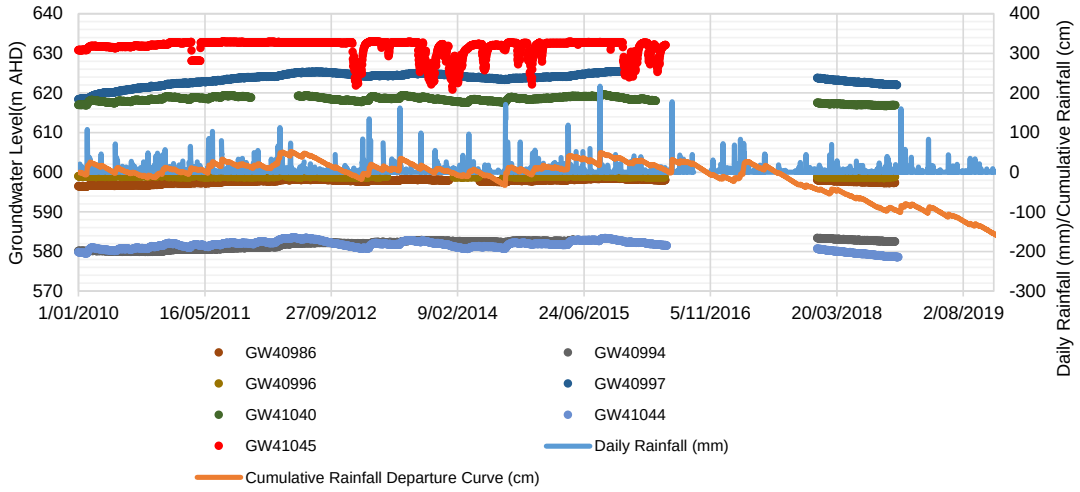


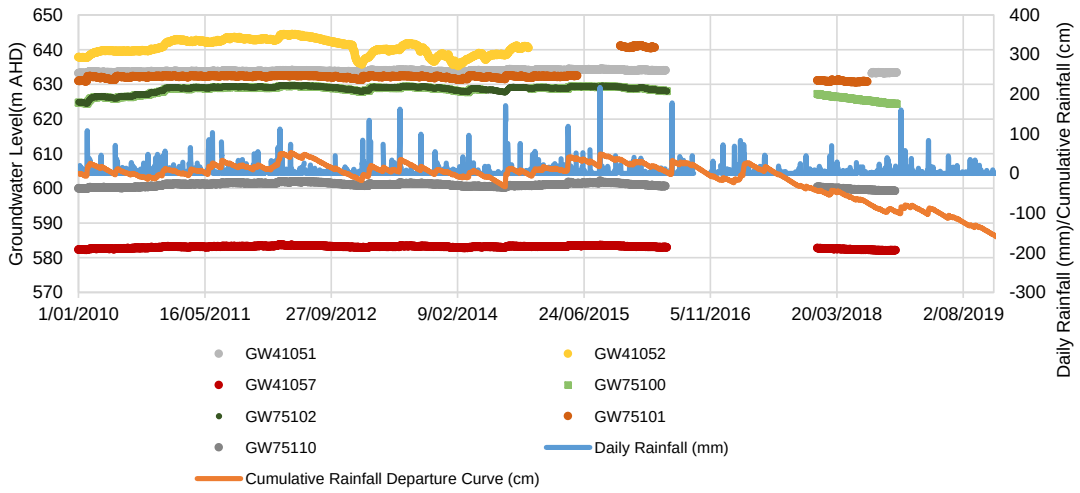




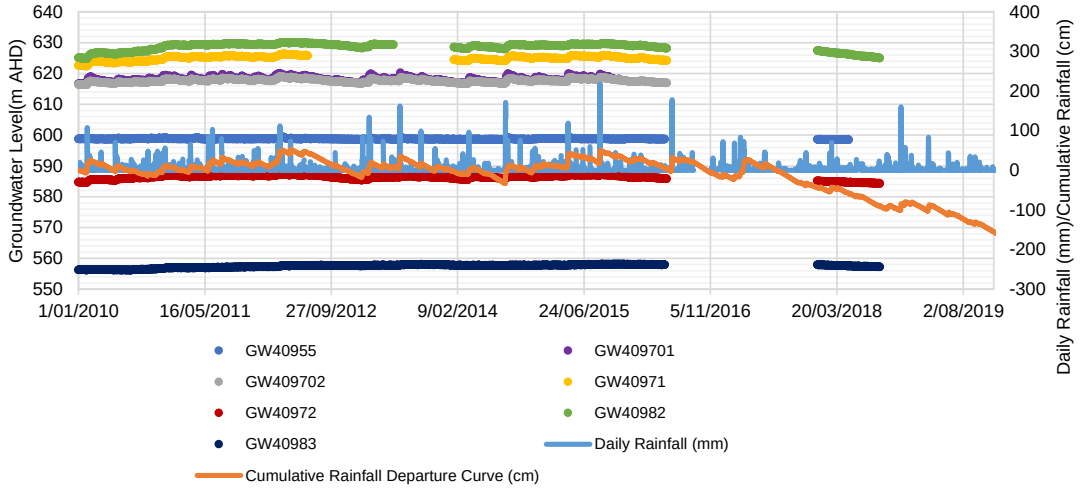
GROUNDWATER
MONITORING RESULTS

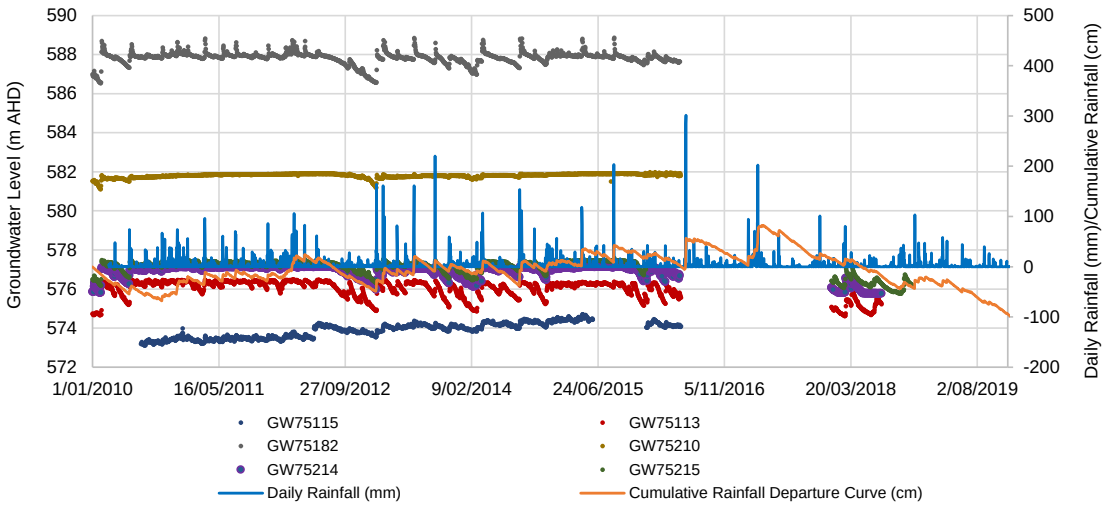


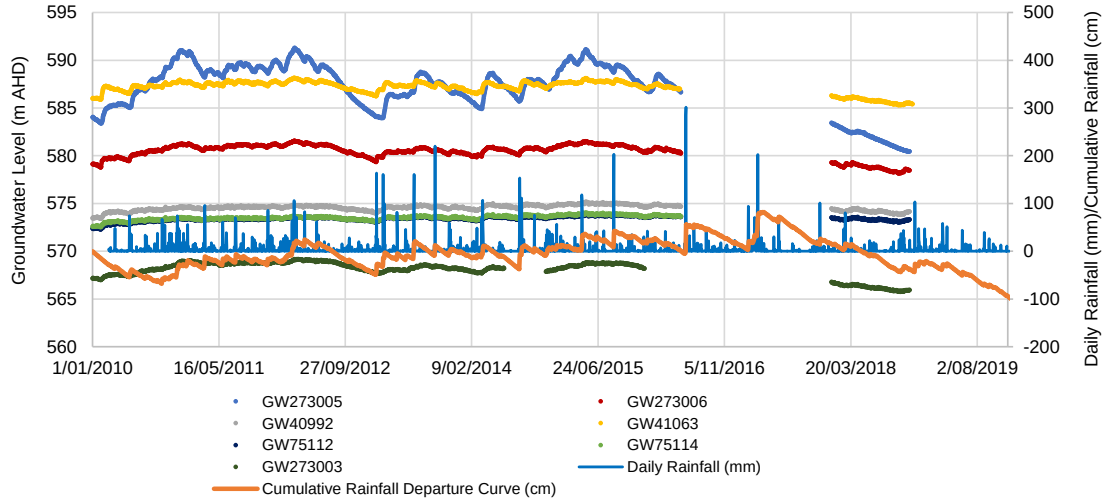




GROUNDWATER
MONITORING RESULTS







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