Waratah Coal

China First - Surface Water Assessment

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Executive Summary

E3 Consulting Pty Ltd (E3) was commissioned by Waratah Coal Pty Ltd (Waratah Coal) to undertake the assessment of surface waters for the Galilee Coal Project – Northern Export Facility project (China First Project). This technical report assesses the existing surface water quality and identifies any potential impacts resulting from the China First Project for this issue.

The project includes a:

- Coal mine located near Alpha in the Galilee Basin, Central Queensland;
- Rail alignment between the mine and a coal terminal located at the Abbot Point State Development Area (APSDA); and
- Coal terminal incorporated within both the APSDA and the Port of Abbot Point.

The study area has been broken down into four "catchments" based on the major rivers and there tributaries. The catchments are the Don, Bowen/Bogie, Suttor and Belyando. The whole study area falls within the Burdekin Catchment.

Physical sampling identified that streams in the region were generally in good health. Nutrient and metal levels were elevated at a number of sites during both dry and wet season sampling. This effect was more pronounced in the upland catchments (Belyando and Suttor) than the lowland catchments (Bowen/Bogie and Don). The lower levels of nutrients and metals identified in the lowland catchments compared to the upland catchments are likely due to the more stable nature of the streams and sandy sediments. A number of the streams sampled were perennial while waters in the Belyando Catchment are ephemeral (except for the Belyando itself) and would likely only contain water for short periods during and after the summer storm season. This results in a "first flush" event.

Construction works that have the most potential to impact on surface waters include:

- The clearing of vegetation and topsoils from work sites and stockpiling of overburden on site resulting in sediment movement though overland flow;
- Impacts on vegetation and banks during bridge construction through their removal, causing sediment movement;
- The storage of chemicals on site (e.g. hydrocarbons, detergents, degreasers, etc) during construction and operations and the movement of these to streams;
- The storage, seepage and overtopping of potentially contaminated water such as tailings water or pit process water in dams and basins at the mine site;
- The construction and operation of underground mines which may result in subsidence impacting drainage in the immediate area;
- The piling works associated with construction of the coal conveyor through the Caley Valley wetlands and stream crossings for the railway; and
- The construction of two diversions to divert Tallarenha Creek from the open cut mine areas.

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Management measures including the development of an Erosion and Sediment Control Plan have been identified to reduce potential impacts resulting from the works. If properly managed the impacts to surface water resulting from the works are expected to be minimal.

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1 Introduction

1.1 Project Overview

Waratah Coal Pty Ltd (Waratah Coal) proposes to establish a coal mine, railway and coal terminal to export high volatile, low sulphur, steaming coal to international markets. The Co-ordinator General declared the Galilee Coal Project – Northern Export Facility (the China First Project) to be a significant project requiring the preparation of an Environmental Impact Statement (EIS).

The project includes the following components:

- A mine located near Alpha in the Galilee Basin, Central Queensland;
- A rail network between the mine and Abbot Point State Development Area (APSDA) and Port of Abbot Point; and
- A coal terminal that is incorporated within both the APSDA and Port of Abbot Point.

The project study area is shown in Figure 1-1 and a full description of the project is provided in the Project Description section of the EIS.

1.2 Terms of Reference and Scope of Study

This technical report addresses Section 3.4 (Surface Water) *of* the Terms of References (ToR) for the Galilee Coal Project (Northern Export Facility). The report has been structured to address the three major structural components of the project separately; mine site, rail corridor and onshore coal infrastructure at Abbot Point. The study area has been broken down into four "catchments" based on the major rivers and their tributaries. The catchments are the Don, Bowen/Bogie, Suttor and Belyando. The whole study area falls within the Burdekin Catchment.

The technical report identified the existing environmental values of surface waters within the project area, assesses potential impacts resulting from the China First Project and suggests management measures to mitigate potential impacts. The section of the ToR pertaining to Surface Water requirements are listed in Table 1-1. For ease of reference, the respective sections of this report that address the ToR requirements are also provided.

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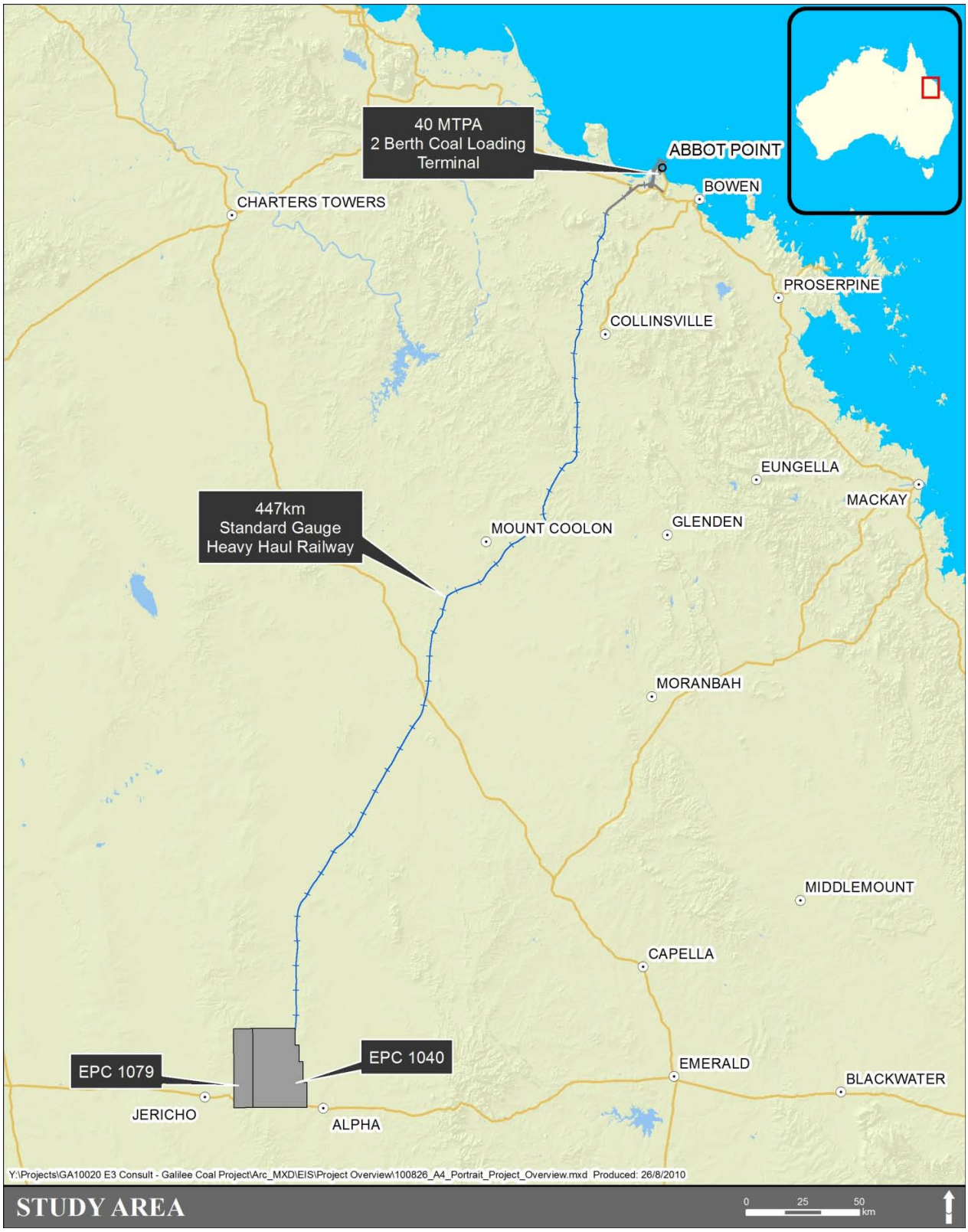

Figure 1-1: Study Area

Table 1-1: Terms of Reference - Cross reference table

Terms of Reference	Section in report
A description should be given of the surface watercourses and their quality and quantity in the area affected by the project with an outline of the significance of these waters to the river catchment system in which they occur. Details provided should include a description of existing surface drainage patterns and existing and historical flow regimes in major streams and wetlands. Details should also be provided of the likelihood of flooding, history of flooding including extent, levels and frequency, and a description of present and potential water uses downstream of the areas affected by the project.	Sections 3, 4 and 5
Flood studies should include a range of annual exceedance probabilities for affected waterways, based on observed data if available or use appropriate modelling techniques and conservative assumptions if there are no suitable observations. The flood modelling should include local flooding due to short duration events from contributing catchments on site, as well as larger scale regional flooding including waterways downstream.	Sections 3.2.5, 4.2.5, 5.2.5 and the Flood Modelling Technical Report
The EIS should provide a description, with photographic evidence of the geomorphic condition of any watercourses likely to be affected by disturbance or stream diversion. The results of this description should form the basis for the planning and subsequent monitoring of rehabilitation of the watercourses during or after the operation of the proposal.	Sections 3.2.3, 4.2.3, 5.2.3 and Appendix B
An assessment is required of existing water quality in surface waters and wetlands likely to be affected by the proposal. The basis for this assessment should be a monitoring program, with sampling stations located upstream and downstream of the proposal. Complementary stream-flow data should also be obtained from historical records (if available) to aid in interpretation. Where no background receiving water quality data is available for this purpose, the proponent should collect samples as soon as possible in accordance with the appropriate guidelines and manuals.	Sections 3.3, 4.3, 4.4 and 3.5
The water quality should be described, including seasonal variations or variations with flow where applicable. A relevant range of physical, chemical and biological parameters should be measured to benchmark the extent of any potential future environmental harm on any affected waterway or wetland system. All sampling should be performed in accordance with the *Water Quality Sampling Manual (EPA, 1999)* or the most current edition.	Sections 3, 4 and 5
The EIS should describe the environmental values of the surface waterways of the affected area in terms of: ▪ values identified in the EPP (Water) ▪ sustainability, including both quality and quantity ▪ physical integrity, fluvial processes and morphology of watercourses, including riparian zone vegetation and form ▪ downstream water uses, including their significance to the local community and/or environment ▪ any water resource plans, land and water management plans, declared or nominated wild river areas relevant to the affected catchment, particularly the *Water Resource (Burdekin Basin) Plan 2007* and the *Water Resource (Great Artesian Basin) Plan 2006* listed under the *Water Act 2000* ▪ *Australian and New Zealand Water Quality Guidelines for Fresh and Marine Waters (ANZECC, 2000).*	Section 2.2

Terms of Reference	Section in report
The water management systems for all project elements should be described, addressing surface water quality, quantity, drainage patterns and sediment movements. The beneficial (environmental, production and recreational) use of nearby surface water should be discussed, along with any proposal for the diversion or crossing of affected waterways during mining, and the stabilisation, restoration and integration of drainage of those works with surrounding and downstream drainage features.	Section 6
Where it is proposed to divert waterways during construction or operations, provision should be made for either the reinstatement of the waterways or decommissioning and rehabilitation such that the long term risk of environmental harm due to regional and local flooding is no greater than that prior to mining. Fish passage and access to fish habitats need to be addressed where waterways are to be diverted.	Section 6
Analysis of potential impacts of the diversion of affected waterways on existing and proposed relocated roads should also be carried out. This analysis should identify any likely inundation and duration, as this may affect emergency vehicle access.	Section 6
Monitoring programs should be described which will assess the effectiveness of management strategies for protecting water quality during the construction, operation and decommissioning of the project. Monitoring programs should also be designed to evaluate changes in the physical integrity and geomorphic processes associated with waterway diversions.	Section 7
If on-site storage of water sourced from waste water treatment plants is proposed, the EIS should detail how this water would be managed to ensure environmental harm is avoided. The EIS should also describe the design features of any such storages to effectively contain saline water and other harmful constituents.	Waste Technical Report
Key water management strategy objectives include: • maintenance of sufficient quantity and quality of surface waters to protect existing beneficial downstream uses and environmental values of those waters (including maintenance of aquatic ecosystems) in accordance with EPP (Water) • protection of the integrity of the marine environment • maintenance or replication of the existing geomorphic conditions of local watercourses • minimisation of impacts on flooding levels and frequencies both upstream and downstream of the project.	Section 7
The EIS should include a risk assessment for uncontrolled emissions to water due to system or catastrophic failure, implications of such emissions for human health and natural ecosystems, and strategies to prevent, minimise and contain impacts.	Section 6 and 7
The potential environmental harm to the flow and the quality of surface waters from all phases of the proposal should be discussed, with particular reference to their suitability for the current and potential downstream uses, including the requirements of any affected riparian area, wetland, estuary, littoral zone, and any marine and in-stream biological uses. The impacts of surface water flow on existing infrastructure should be considered with reference to the EPP (Water) and *Water Act 2000*	Section 6
The EIS should describe the proposed mine stormwater drainage system and the proposed disposal arrangements, including any off-site services and downstream impacts. Options for storage and/or disposal of surplus groundwater (if applicable) should be discussed, including the beneficial and adverse impacts of each option. Licensing requirements for each option should be identified.	Section 6

Terms of Reference	Section in report
Where dams, weirs, voids or ponds are proposed, the EIS should investigate the effects of predictable climatic extremes (droughts, floods) upon the structural integrity of the containing walls, and the quality of water contained, and flows and quality of water discharged.	Waste Technical Report
A dam failure impact assessment should be carried out for any proposed dams that, due to their size, trigger the need for such an assessment under the *Water Act 2000*. Any dams that are likely to be referrable under the *Water Act 2000* should be noted and emergency response procedures incorporated into the project's EMP.	Section 7
The need, or otherwise, for licensing of any dams (including referable dams) or waterway diversions, under the *Water Act 2000* and the *Fisheries Act 1994*, should be discussed. The process for water allocation and water discharge should be established in consultation with the DERM. Consideration should also be given to any water allocation and management plans.	Section 7
Hydrologic/hydraulic studies should be undertaken to estimate the impacts on operational water storages, drainage and containment systems from local and regional storm events of relevant annual exceedance probability in accordance with DERM guidelines, commensurate with hazards associated with failure scenarios.	Waste Technical Report
Consideration should be given to the potential impacts of the project on floodplain hydrology (including changes to flooding characteristics), existing land use and infrastructure and the integrity of any watercourses. Minimising risk to life and property and the protection of water (flood harvesting) entitlements are also issues that should be addressed. Potential impacts to the natural environment from stream diversions should also be discussed.	Section 6
The environmental values of the surface waters potentially affected by the project should be identified in accordance with the EPP (Water). Surface water quality objectives should be determined after consideration of the *Queensland Water Quality Guidelines* (EPA, 2007) and the *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC & ARMCANZ, 2000).	Section 2.2
Risks to farmland from potentially contaminated surface water flow, particularly during flood events and/or failure of levee banks, should be assessed.	Section 6
Options for flood mitigation and the effectiveness of mitigation measures should be discussed with particular reference to sediment, salinity and other emissions of a hazardous or toxic nature to human health, flora or fauna. Proposals for maintenance of flood levees post-mining should be discussed.	Flood Modelling Technical Report

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2 Method of Assessment

2.1 Desktop Review

The desktop component of this technical report included a literature review and search of relevant Commonwealth, Queensland and Local databases. Specific information sources utilised included:

- Online searches of the Bureau of Meteorology for climate and flooding data for the study area;
- Historical water quality data sourced from the Department of Environment and Resource Management (DERM) monitoring programs such as the watershed database; and
- Review of relevant Commonwealth, Queensland, and Local Guidelines and Standards including the *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC 2000) and *Queensland Water Quality Guidelines* (DERM 2009); and
- Published and grey literature including publications sourced from Community NRM organisations.

The objective of the desktop review was to obtain a overview of surface water quality in the China First Project study area and identify data gaps so that field surveys could be targeted to obtain the relevant information.

2.2 Legislation and Planning Framework

The legislative and planning framework put in place to protect ambient water quality throughout Queensland provides an outline for developing and implementing site specific water quality monitoring programs. This framework is outlined below.

2.2.1 *Environmental Protection Act 1994*

The object of the *Environmental Protection Act 1994* (Qld) (EP Act) is the protection of the environment within the context of ecological sustainable development. To achieve this outcome, the EP Act provides a range of tools including Environmental Protection Policies (EPPs). The purpose of the *Environmental Protection Policy Water* 2009 (EPP (Water)) is to achieve one of the objectives of the EP Act, which is the protection of Queensland water while allowing for ecologically sustainable development. The EPP (Water) outlines the process for setting environmental values (EVs) and Water Quality Objectives (WQO's) for waters within Queensland. No specific EVs or WQOs have been established for the study area.

2.2.2 Queensland Water Quality Guidelines 2009

In Queensland waters, DERM's *Queensland Water Quality Guidelines* (2009) (QWQG) are given precedence over other recognised guidelines such as ANZECC 2000 as they are more localised giving them a higher weighting under the EPP (Water). The QWQG have been created to provide monitoring criteria tailored to Queensland regions and water types as well as a process/framework for deriving local or site specific guidelines for waters in Queensland.

There are three levels of aquatic ecosystems listed in the guidelines, *High Ecological/Conservation Values* (HEV), *slightly to moderately disturbed* systems and *highly disturbed* systems. The three levels are afforded varying degrees of protection with *high ecological value* systems allowed "*no change from ambient conditions, unless it can be demonstrated that such change will not compromise the maintenance of biological diversity in the system*" while slightly to moderately and highly disturbed systems are allowed "*some change depending on the level of disturbance present in the system*".

The project encompasses a broad cross section of land uses and water types. Most of the area has been disturbed to some degree, with the mine and rail alignment occurring on land cleared for grazing or other purposes and the coal terminal located within the boundaries of the existing Port of Abbot Point and APSDA. Therefore, it is considered that the project area is overall slightly to moderately disturbed ecosystem as per the QWQG.

Section 4 of the QWQG provides a procedure for deriving water quality guidelines for aquatic ecosystem protection (Figure 2-1). This procedure has been used as a guide to developing compliance criteria for each of the catchments in the study area (Don, Bowen/Bogie, Suttor and Belyando).

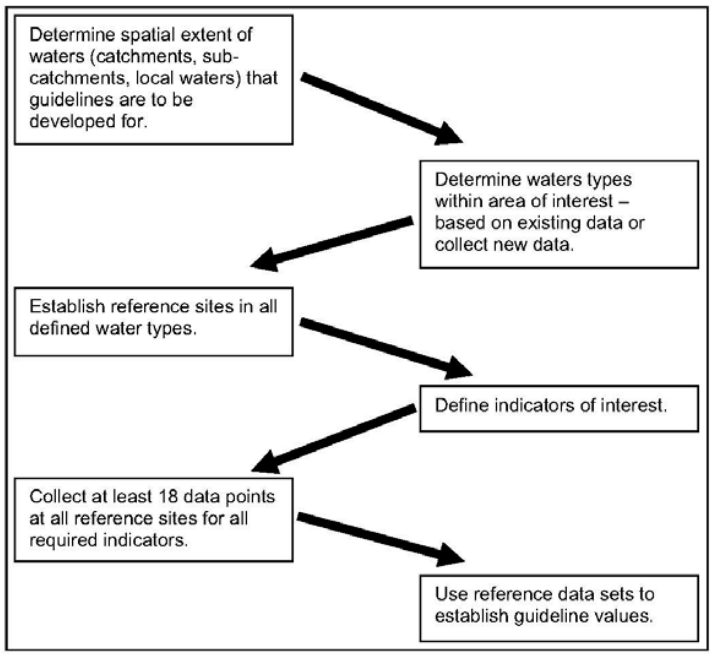

Figure 2-1: QWQG process for determining Water Quality Guidelines

2.3 Field Surveys

Field studies were carried out to determine water types and involved the collection of physical and biological data from streams within the study area. Dry (October 2009) and wet (March/April 2010) season sampling comprised field testing of physical water quality parameters and the collection of samples for laboratory analysis. Frequency and timing of surface water sampling was dependent upon seasonal

variation of rainfall and access to site locations. Observations of stream channel morphology and riparian vegetation were made using *Australian River Assessment Scheme 1997* (AusRivas) methodology.

2.3.1 Sample Locations

Field studies were undertaken over two temporal events (dry and wet) to account for seasonal variation in water quality. A total of 54 sites were sampled over the two temporal events. Site locations were selected from the results of the desktop assessment and were based on location of the infrastructure, likelihood of flowing water being present over both seasons, access and catchment size. Two sample sites (WQQ1 and WQQ2) were positioned in a quarry located within the APSDA as rock and water may be sourced from the quarry for construction. The location of the sites and catchments are shown in Figure 2-2 and Figure 2-3. The Cooper Creek Catchment intersects the Mining Lease Boundary (MLB) and footprint of underground mining area in the south west corner of the site. This catchment is not hydraulically linked to the areas where works will take place for the China First Project and therefore was not been included in the sampling program.

During field sampling, several of the sites did not contain flowing water therefore could not be sampled. This was most apparent during dry season when only 27 of the 54 sites contained sufficient water to carry out sampling. Wet season sampling was carried out within weeks of Cyclone Ului crossing the Whitsunday coastline, resulting in a number of the streams overflowing and thus restricting access to the banks for sampling. Where this occurred, sampling was carried out as near to the dry season sample location as possible. Generally samples were taken within 200m of the dry season site. Table 2-1 summarises the number of samples taken in each catchment.

Table 2-1: Summary of Water Quality Sampling

Catchment	No. of Sites	Dry Season Samples	Wet Season Samples	Total Samples
Don	9	9	9	18
Bowen/Bogie	9	8	9	17
Suttor	10	5	10	15
Belyando	24	3	22	25

The QWQG recommended a minimum of 18 data points to establish guideline values within a catchment. Due to numerous samples sites having no flow during wet season sampling, both the Bowen/Bogie (17 data points) and the Suttor (15 data points) catchments did not comply with the QWQG. However, the limited difference between the requirements under the QWQG and that sampled here would arguably still provide sufficient data points to confidently set water quality guidelines for these catchments. The Belyando catchment contained the most sampling sites as it was the largest catchment of the study area and contains the mine site, where a more intense sampling density was employed compared to the rail alignment.

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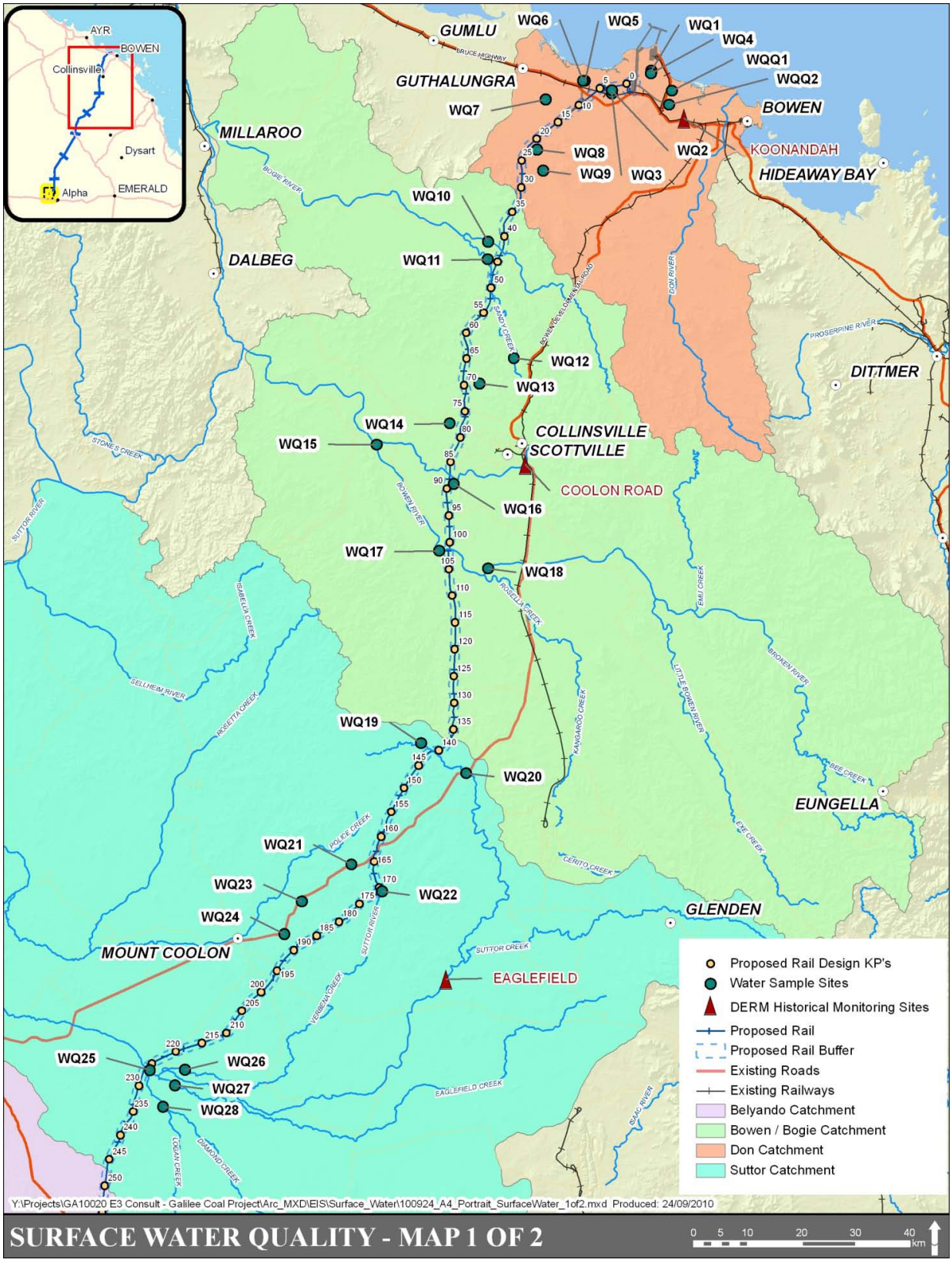

Figure 2-2: Water Quality Sampling Sites – Northern Section

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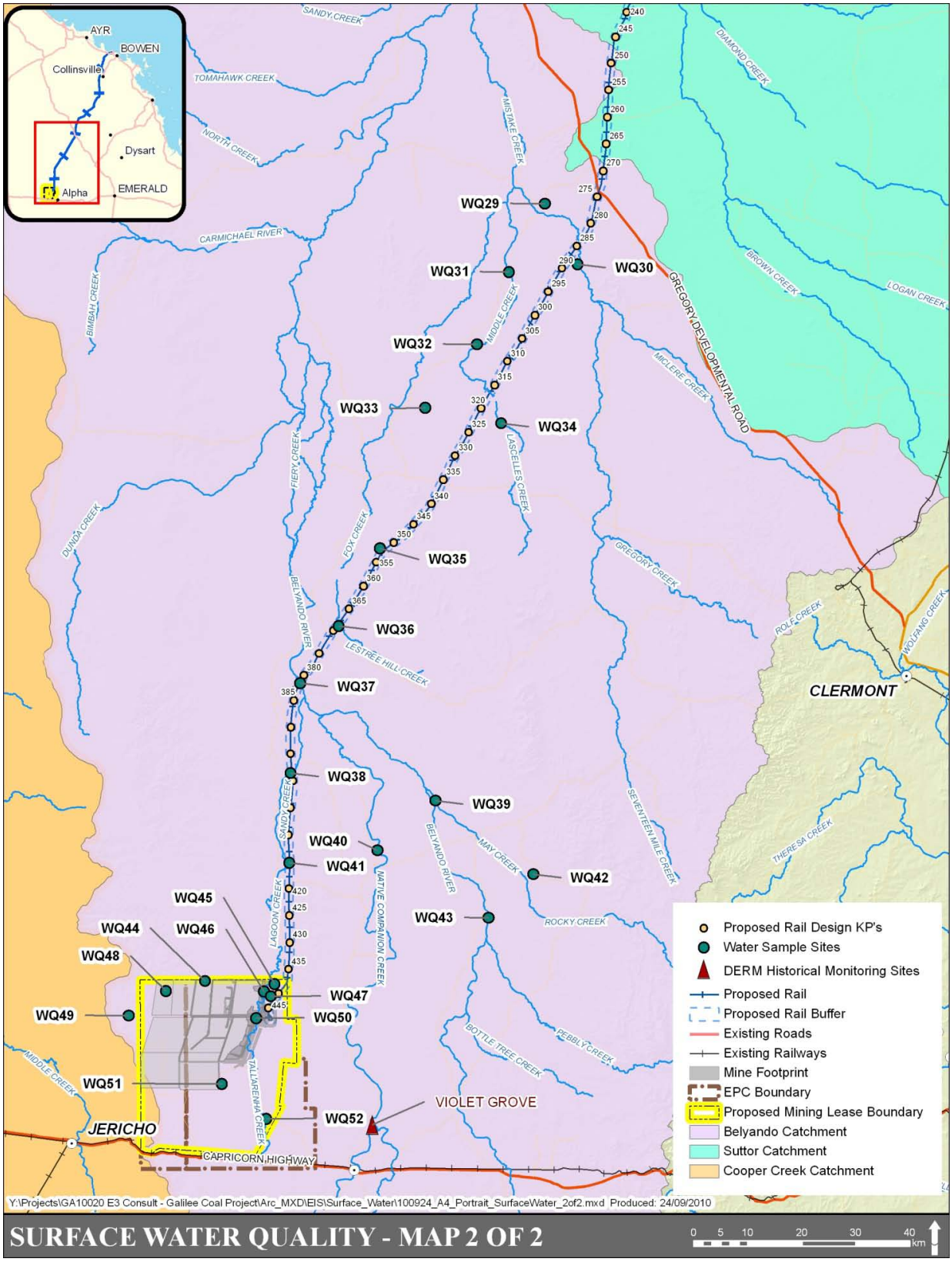

Figure 2-3: Water Quality Sampling Sites – Southern Section

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2.3.2 Sampling Methods

Surface water samples were collected in accordance with *ANZECC 2000, Environmental Planning Policy (EPP) (Water) Monitoring and Sampling Manual (2009)* and *Australian/New Zealand Standard: Water Quality-Sampling Part 6: Guidance on Sampling of Rivers and Streams (AS/NZS 5667.6: 1998) Guidelines*.

Physical samples were taken where the velocity of the stream was highest using a multi-parameter meter. Samples taken for laboratory analysis were collected mid stream at least 50mm below the water surface. The collection bottle was washed out with stream water at each site prior to collecting samples for lab analysis to reduce sample contamination.

2.3.3 Sample Parameters

Physical parameters analysed in the field included temperature (°C), pH, dissolved oxygen (DO%), turbidity (NTU) and Conductivity (mS/cm).

Collected samples were sent to a National Association of Testing Authorities (NATA) certified laboratory for analysis. Laboratory analysis included total metals, anions and cations, nutrients, chlorophyll A, Total Petroleum Hydrocarbon (TPH), Polycyclic Aromatic Hydrocarbons (PAHs) and Polychlorinated Biphenyls (PCBs). These parameters were selected as they have the highest potential to cause contamination during construction and operation. A list of methods used for the analysis and the Limits of Reporting (LoR) for all parameters are provided in Appendix A.

2.3.4 Quality Assurance/Quality Control

The measures employed during desktop studies and field sampling were conducted in accordance with *Environmental Planning Policy (Water) Monitoring and Sampling Manual (2009)* and *AS/NZS 5667.6 (1998)*. The multi-parameter meter used to record physical parameter readings was calibrated on a daily basis. Decon 90 solution was also used in decontaminating the multi-parameter instrument and sampling pole after each site to prevent any cross contamination.

Laboratory results were checked for any discrepancies using DERM database data, samples taken from the same catchment or site during baseline investigations and experience from sampling in similar regions.

2.4 Data comparison

Results from baseline sampling were compared to the most relevant surface water quality guidelines available to provide an indication of existing water quality in the assessed catchments. The QWQG provides guidelines for the Queensland Central Coast running north from the Burnett River Basin to the Black River Basin, which coincides with the Brigalow Belt and New England Tableland Bioregions (DERM 2009) and encompasses the majority of the study area. Guideline values for the Central Coast Queensland Region are provided in Table 2-2. The values listed are for *slightly to moderately disturbed* lowland and upland streams. The Don and Bowen/Bogie catchments are considered lowland streams while the Suttor and Belyando Catchments are considered upland.

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Table 2-2: QWQG 2009 Central Coast Regional Guidelines *(slightly to moderately* disturbed waters)

water type	Physio-chemical indicators and guideline values (slightly to moderately disturbed systems)										
	Ammonia as N	Total N (µg/L)	Total P (µg/L)	Chl-a (µg/L)	DO% Low - Up		Turbidity (NTU)	SS (mg/L)	pH Low - Up		Cond mS/cm
Lowland streams	20	500	50	5	85	110	50	10	6.5	8.0	0.31 – 0.81
Upland streams	10	250	30	NA	90	110	25	-	6.5	7.5	0.18

The QWQG does not include values for metals and metalloids therefore ANZECC guideline values for 95% species protection in freshwater have been used for comparison and are listed in Table 2-3.

Table 2-3: ANZECC Guidelines for 95% Species Protection in Freshwater (Metals and Metalloids)

Metal/Metalloid	Trigger values (µg/L) for 95% protection
Arsenic	24
Cadmium	370
Chromium	-
Copper	1.4
Nickel	11
Lead	3.4
Zinc	8
Iron	-

2.5 Description of Results

Results have been broken into the three distinct component of the project, mine, rail and coal terminal. These areas have been further broken down into sub catchments with the mine site including the Belyando catchment, rail encompassing the Don, Bowen/Bogie, Suttor and parts of the Belyando while the coal terminal sits within the Don catchment. For each of these catchments the following information has been provided:

- Catchment description: information on climate, dominant land uses and historical water quality within the catchment. This provides a context for the results of the baseline monitoring program;
- Baseline investigations: includes results of baseline monitoring of streams within the catchment including physical and chemical water quality results and a description of riparian characteristics for the stream; and
- A discussion is provided for each catchment comparing baseline results to relevant guideline values and relating them to the catchment characteristics.

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3 Mine Site

The mine site and rail alignment up to KP270 are located within the Belyando catchment, a sub-catchment of the Burdekin. The Belyando catchment encompasses an area of approximately 73,000km^2 and is the largest sub-catchment of the Burdekin River Basin, comprising almost 60% of the total area. Some of the major tributaries of the Belyando River include Mistake, Sandy and Native Companion Creeks.

3.1 Catchment description

3.1.1 Topography

The Belyando catchment is predominately low relief floodplain with wide braided channels and alluvial plains (Rogers *et al*., 1999). The Belyando River flows in a northerly direction and joins the Suttor River in its lower reaches. It is bounded by the Great Dividing Range in the west of Denham and Drummond Ranges to the east. General topography within the Belyando catchment differs from other sub-catchments in the Burdekin Basin, lacking high mountain conditions with a drier, typically semi-arid landscape (ANRA 2002).

The section of the catchment covering the mine is predominantly gently undulating plains with strongly undulating to hilly land in the north-east corner of the Exploration Permit Coal 1040 (EPC). Surface geology at the mine is dominated by unconsolidated Cainozoic sediments including sands, silts and clay, with thickness of up to 90m in the eastern and central sections. Soils at the mine are structureless and are mostly well drained permeable soils. Soils have low fertility and land use is limited to grazing and native pastures. Grazing lands are susceptible to surface soil degradation such as hard setting and crusting even when grazing intensity is low (see generally Geology, Soils, and Landforms Technical Report).

3.1.2 Land use

The Belyando catchment is predominantly agricultural land with cattle grazing on natural vegetation. Cropping and/or horticulture are not undertaken within the EPC. The vegetation within the mine open cut footprint is generally characterised as being in a degraded condition having been cleared and blade ploughed for grazing land.

3.1.3 Riparian Condition

Riparian areas in the catchment generally consisted of layer of mature Eucalypts including ironbark and other eucalypts species, one or two trees thick directly on the banks of the streams. These are surrounded by a layer of saplings and shrubs before the landscape opens up into grazing paddocks. Soils were mostly clays and fine sediment.

Riparian vegetation density was varied across the sites. Site WQ45 had significant larger tree species (35-65% >10m tall) while the majority had <10% large trees. The majority of sites had highly disturbed vegetation and accordingly, trees less that 10m and grass were the dominant vegetation. All sites except for WQ34 had extensive coverage of trees <10m, shrubs and grasses. Most sites had limited to slight shading although site WQ40 had substantial shading.

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Plate 3-1: Typical Stream Profile in the Belyando Catchment

The streams are generally small with widths of less than 5m except at major river systems such as Mistake Creek, the Belyando River and Sandy Creek (WQ30, WQ37 and WQ38 respectively) which are up to 20m across in some sections. These larger streams also have larger riparian areas which were up to 20m wide and sparsely populated with mature eucalypts. The riparian areas at all sites sampled were in good condition with few obvious signs of anthropogenic impact outside of clearing for agriculture. A number of the streams had broken their banks (WQ32, WQ36 and WQ45 - Middle, Lestree Hill and Malcolm Creeks respectively) at the time when wet weather sampling was carried out while others showed evidence of recent flooding such as scour and scattered debris. Photographic monitoring of every site sampled is provided in Appendix B.

Plate 3-2: Sandy Creek (WQ38)

3.1.4 Morphology

Upper Belyando

The streams in the upper reaches of the Belyando catchment (WQ52 to WQ45) were predominantly remnant channels that were either flat or shallow banked streams. The streams ranged in width from 3m to 19m wide although most streams had an observed flood plain that extended up to 50m either side of the centre of the stream. Most streams sampled had pooled water although two streams (WQ44 and WQ48) had flowing water (runs) that equated to between 10-35% of the reach. The majority of the streams had limited aquatic plant growth except for sites WQ46 and WQ47 that had significant submerged aquatic plants. Site WQ45 was located within a permanent lagoon that is restricted by a small ford and had the least disturbed vegetation.

Sand was the dominant particle observed at all sites although in some locations, this overlaid a silty clay substrate. Only site WQ44 had a bedrock base (65-90% of its banks). Erosion varied across the streams located on the mine. The streams ranged from having severe erosion to server deposition with this was related dominated by particle type. The majority of streams were partly or moderately restricted to base flow with this either being a non-vegetated bar. All but site WQ47 had some form of barrier to water flow such as a sand bank.

Lower Belyando

The streams in the lower reaches of the Belyando catchment (WQ41 to WQ29) were predominantly remnant channels that were flat, low or moderate banked streams. At a number of locations it was not possible to observe the main channel due to the high quantity of water within the stream. In these locations flood channels were observed. The streams ranged from 3m to 60m (WQ32) wide although most streams had an observed flood plain that extended up to 25m either side of the centre of the stream. Site WQ32 had a flood plain of over 2km wide. Most streams sampled had flowing and pooled water although two streams (WQ35 and WQ38) had significant flowing water (glides >65%) and over half the streams had extensive runs. All streams except for those with high flows also had large pools that covered extensive areas. The majority of the streams had no in stream aquatic plant growth except for site WQ31 that had significant emergent aquatic plants.

Silt was the dominant particle observed at the majority of sites. All the streams had limited bedrock. Erosion varied across the streams with the vast majority having moderate to severe erosion. The majority of streams had partly or very restricted flows due to non-vegetated mid channel bars. Only WQ34 had unobstructed base flows.

3.1.5 Climate

North and Central Queensland has highly variable seasonal and annual rainfall linked to tropical lows/cyclones and monsoonal activity (Lough, 2001). The climate within the Burdekin catchment ranges from tropical sub-humid on the coastal plains and adjacent ranges to a semi-arid environment in the central to western areas (Roth *et al*, 2002). The climate is generally warm with hot wet summers and dry warm winters with temperatures varying little across the catchment. The mean annual rainfall for Alpha is approximately 564mm with the highest rainfall recorded between December and April. The vast majority of the streams within the mine area are ephemeral streams with almost no flow for some of the year and the summer months bringing flood and high rainfall events.

3.1.6 Flooding

The Belyando catchment has variable rainfall and relatively flat topography which can result in localised flooding occurring in sub-catchments during events of 200mm over a 48hr period. Flooding generally occurs during summer months as a result of heavy rainfalls caused by tropical lows and rain depressions generated from cyclones crossing the Queensland coast.

The Australian Bureau of Meteorology (BoM) reports no major flooding events for the region; however discussions with locals and review of archived news stories indicate the towns of Alpha and Jericho underwent severe flooding in 1990. Flooding also occurred in the Fitzroy catchment in and around Emerald, approximately 150 km east of the EPC in January 2008. This area is not hydraulically linked to the mine, therefore will have no impact on flooding in this area. Heavy rainfall in the first quarter of 2010 resulted in minor, localised flooding of many of the streams in and around the mine.

Plate 3-3: Flooding at Mistake Creek (March 2010)

3.2 Water Quality

3.2.1 Historical Water Quality

A review of the DERM historical water quality data indicates that the Native Companion Creek site at Violet Grove is the closest site to the mine area (approximately 20km to the east – refer to Figure 2-3) where sampling is undertaken regularly. Water quality sampling was carried out at the site between 1991 and 2005. A summary of the water quality data obtained from this site is provided in Table 3-1.

Table 3-1: DERM Historical Water Quality - Violet Grove Summary

Parameter	N	minimum	10th Percentile	Median	90th Percentile	Maximum
EC (µS/cm)	34	82	93	147.5	349.8	1589
Turbidity (NTU)	24	9	38.4	360.5	904	1944
pH	30	5.80	6.70	7.35	8.32	8.62
DO (ppm)	24	2.12	4.56	5.75	8.21	9.00
TSS (mg/L)	52	5	19	110	781	1500
TN (µg/L)	9	855	-	-	-	1530
TP (µg/L)	27	27	32	206	409	540

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3.2.2 Baseline Water Quality Monitoring

Table 3-2 provides a summary of results from the Belyando Catchment (Figure 3-1). Results for each site in the catchment are provided in Appendix B with results graphs of results for each catchment provided in Appendix C.

Table 3-2: Summary Baseline Water Quality Results - Belyando Catchment

Water Quality Parameters	Units	Minimum	20th Percentile	Median	80th Percentile	Maximum
Field/Physical Parameters						
Temperature	°C	20.8	21.84	24	25.7	28.9
pH	Ph Unit	5.90	6.40	6.70	6.80	7.68
EC	mS/cm	0.093	0.153	0.215	0.346	0.524
Dissolved Oxygen	%	23	40	48	72	107
Turbidity	NTU	1.7	73.2	114	265	3,185
Laboratory Parameters						
Total Alkalinity as $CaCO^3$	mg/L	15	83.6	79	184	218
Sulfate as $SO4^{2-}$	mg/L	<1	2	2	2	5
Chloride	µg/L	4,000	8,000	11,000	19,400	39,000
Calcium	mg/L	2	7	12	18	39
Magnesium	mg/L	2	3	5	7	13
Sodium	mg/L	5	8	11	18	38
Potassium	mg/L	4	6	8	10	31
Arsenic	µg/L	<1	1.8	2	3.2	15
Cadmium	µg/L	<0.1	0.12	0.15	0.18	0.2
Chromium	µg/L	<1	1.6	3	5.4	28
Copper	µg/L	<1	2	3	5	25
Nickel	µg/L	<1	2	3	5.4	64
Lead	µg/L	<1	2	3	4	17
Zinc	µg/L	<5	7	8	14	40
Iron	µg/L	<50	1,578	2,820	5,572	13,000
Ammonia as N	µg/L	<10	14	28	40	850
Nitrite as N	µg/L	<10	10	10	10	10
Nitrate as N	µg/L	<10	20	20	40	130
Total Kjeldahl Nitrogen as N (TKN)	µg/L	<10	360	600	1,120	2,800
Total Nitrogen as N	µg/L	<10	360	600	1,120	2,800
Total Phosphorus as P	µg/L	<10	50	140	306	650
Total Anions	mEq/L	0.72	1.43	1.82	2.72	4.93
Total Cations	mEq/L	0.79	1.24	1.77	2.60	5.11
Chlorophyll a	mg/m^3	<1	2	3	7.2	47
PCB	µg/L	<1	<1	<1	<1	<1
PAH	µg/L	<1	<1	<1	<1	<1
TPH C_{10}-C_{36} Fraction (sum)	µg/L	<50	100	375	350	690

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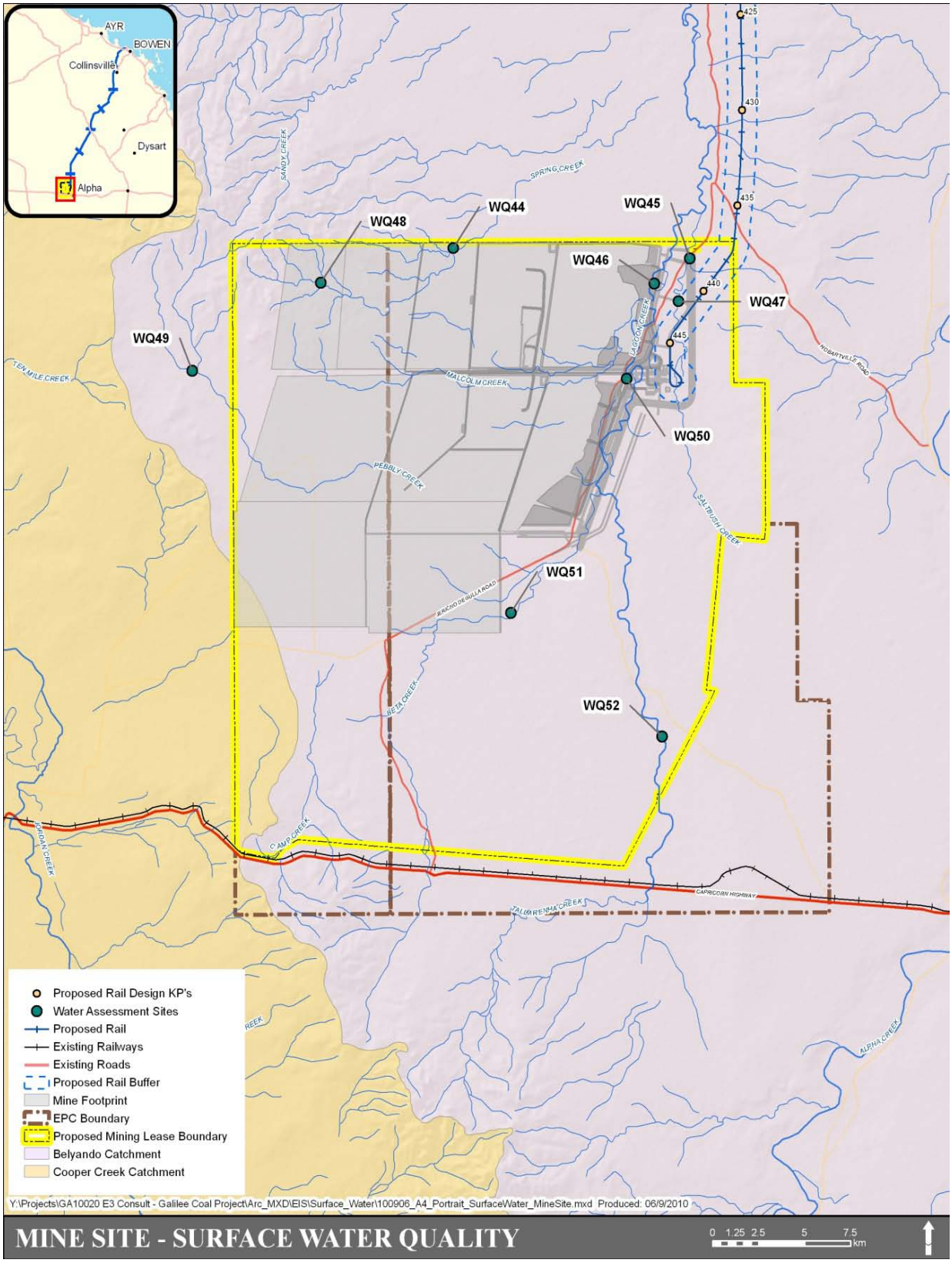

Figure 3-1: Water Quality Sampling Sites – Upper Belyando - Mine

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3.2.3 Discussion

Baseline results from the Belyando catchment show that the streams are generally of reasonable quality with readings outside of expected ranges explainable by the surrounding land uses and ephemeral nature. The physio chemical properties are comparable to the guidelines for *slightly to moderately* disturbed upland streams in the central coast region (Table 3-1) and historical results from the Violet Grove monitoring station (Table 3-2).

Physical Parameters

EC and pH show similar patterns with the median, 20th and 80th percentile either falling within or only marginally exceeding the QWQG upland streams compliance levels. The minimum for pH and maximums for pH and EC exceed the guideline limits. This is similar to the results recorded at Violet Grove and is likely due to natural fluctuations in the streams.

DO is well below the lower QWQG limits with only three out of the 25 samples having a reading of 80% saturation or above. This is likely to be as result of the ephemeral nature of the streams with pools not generating any oxygen during the dry season and high flows during wet season not allowing oxygen uptake. Turbidity also exceeded the QWQG criteria at most sites, which again is likely to be as a result of the ephemeral low/high flow nature of the streams. This is confirmed by the DO and turbidity levels measured at Violet Creek, which are similar to those measured during the baseline study.

Chemical Parameters

Total zinc, lead and nickel levels occasionally exceeded the ANZECC guideline limits of 8, 3.4 and 11 µg/L respectively. These exceedances were generally spread across various sites during both the dry and wet season sampling events and were likely the result of runoff from roads and homesteads upstream. During dry season sampling two sites (WQ39 and WQ45) had multiple exceedances of the guideline values. At the time the samples were taken, both of these sites did not contain any flowing water therefore the samples were collected from pools, which likely contributed to the elevated levels (Plate 3-4).

Plate 3-4: May Creek (WQ39) – October 2009

Copper consistently exceeded the ANZECC limit of 1.4µg/L at most of the sites during both seasonal sampling. While the exceedances were consistent, they were generally marginal with a median level of 3µg/L and an 80th percentile of 4µg/L. Given their moderately elevated levels at all sites, it is possible that the higher copper levels result from geological characteristics in the catchment. This is confirmed by sampling carried out for the Geology, Soils and Landforms Technical Report which returned results of up to 42ppm of copper from sites within the mine and Belyando catchment areas.

Nutrients (nitrogen and phosphorus) were both relatively high with the 20th percentiles of Total Nitrogen (TN) and Total Phosphorus (TP) above the QWQG upland streams trigger value. The high N levels are generally a result of kjeldahl (organic) nitrogen. During both dry and wet season sampling, most sites contained a high level of plant matter. This is a result of the ephemeral nature of the streams which result in flushes of water through the stream during and immediately after summer storm events. During storm events, the creeks and rivers tend to undergo local flooding which picks up plant material from the banks and riparian zone. This material then decomposes resulting in the elevated nutrient levels. This would also explain the several exceedances of the QWQG criteria for Chlorophyll a. TP and TN levels identified through baseline monitoring are generally consistent with the historical data from Violet Grove.

PAHs and PCBs were all below the limit of reporting. Traces of TPHs were detected at several of the sites during wet season sampling. This may be a result of runoff from the recent rain events collecting petrol and oil spills from nearby roads and homesteads. An alternate source of TPHs could be tannins, which are produced from decaying organic matter. Decaying matter from the *Eucalyptus sp.* in the riparian areas may be being washed into the waterways by overland flow during large rain events causing spikes in TPH levels.

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Anions and Cations

Waterways in the Belyando catchment generally showed similar anion and cation characteristics and were dominated by carbonates and bicarbonates (Figure 3-2). These occur naturally in rainwater which would be the source of most if not all of the water sampled from this catchment. A number of the sites (WQ49, WQ52, WQ48 and WQ47 during dry season sampling) were more saline than the other sites. All of the sites had little to no water flow when sampled and the higher levels of salts are likely a result of concentrations becoming higher as water evaporates.

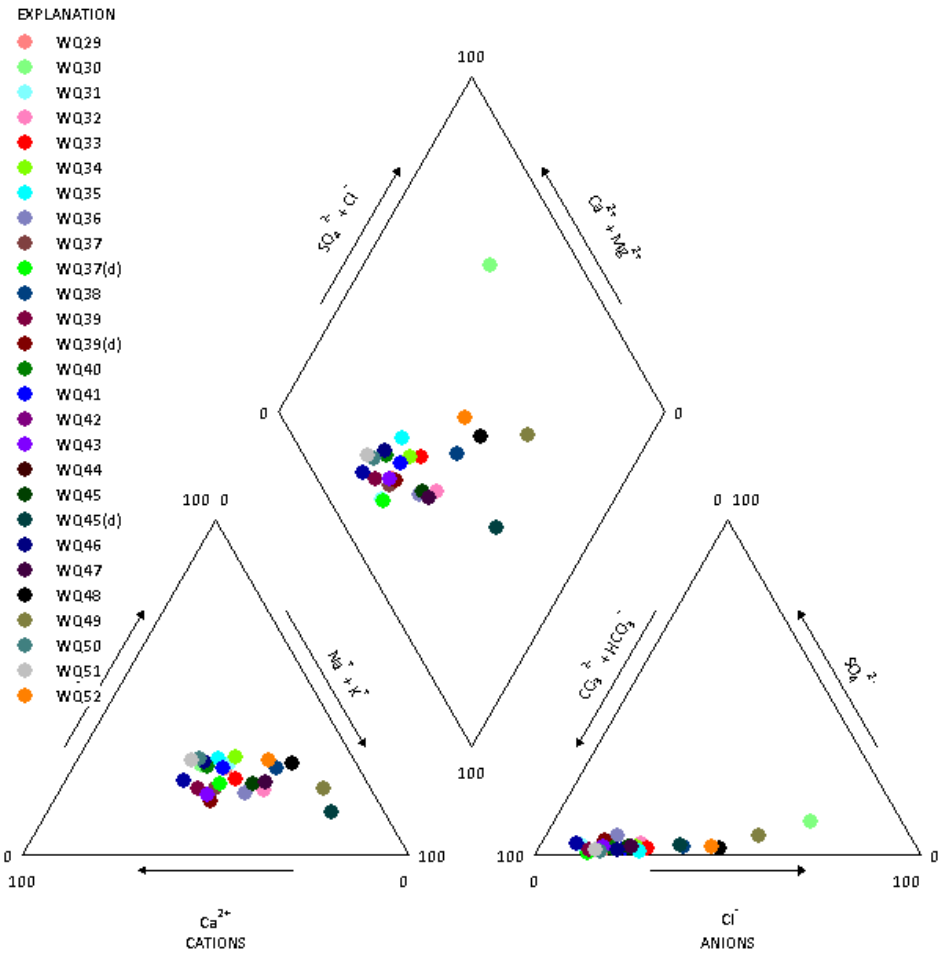

Figure 3-2: Piper Diagram - Belyando Catchment

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4 Rail Alignment

This section provides an overview of surface waters within the Suttor and Bowen/Bogie catchments which are traversed by the rail alignment. Water quality for the Belyando and Don catchments is described in other sections of this report (Belyando – Section 3; Don – Section 5). In addition to the mine, the Belyando Catchment includes from KP270 to KP447 of the rail alignment, while the Don Catchment includes the section KP00 to KP30 of the rail alignment and the coal terminal.

4.1 Catchments

The rail alignment traverses four different catchments, the Belyando, Suttor, Bowen/Bogie and Don. This section describes the Bowen/Bogie Catchment, which encompasses KP30 to KP140, and the Suttor Catchment, which encompasses approximately KP140 to KP270. Both of these are sub-catchments of the Burdekin with the Suttor forming part of the Upper Burdekin and Bowen/Bogie the Lower Burdekin River. Catchment characteristics for the Bowen/Bogie and Suttor Catchments have been described together as topography; land uses and climate do not vary significantly over the two catchments.

4.2 Catchment Characteristics

4.2.1 Topography

Topography varies over the two catchments with the areas south of Collinsville characterised by low relief floodplains with minor undulating slopes across the Suttor River floodplain. North of Collinsville the terrain becomes steeper across the Leichardt and Clarke Ranges before traversing low lying coastal areas as the alignment approaches Abbot Point.

The Bowen River is cut into the Lizzie Creek Volcanics including basalts, andesites, tuffs and minor acid volcanics and further to the south the Blackwater and Back Creeks Group comprising sedimentary rocks including sandstones, siltstones, shales and coal. Dominant soils in the river valley include dark clays at depth with sandy loam overlying these clays. In the Suttor catchment, the alignment crosses sedimentary rocks of the Suttor Formation and alluvium of the Suttor River derived from these rock types. Dominant soils on the hilly land are shallow, gritty leached sands or sandy loams. The soils of the sloping plains consist of loamy duplex soils to loamy yellow, red and grey earths and cracking clays on the lower areas.

4.2.2 Land use

The dominant land use within both catchments is agriculture (grazing) in relatively natural environments such as semi cleared paddocks. In the Bowen/Bogie catchment, an operating coal mine is located adjacent to the rail alignment (near Collinsville). A detailed description of land uses in the region can be found in the Land Use and Planning Technical Chapter.

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4.2.3 Riparian Condition

Suttor Catchment

Riparian vegetation density varied across the sites. Most sites had larger tree species (10-35% >10m tall) although two sites (WQ19 and WQ28) had extensive large trees. Four sites had <10% large trees. The majority of sites had some undisturbed vegetation with trees with fairly regular vegetation along both banks; however sites WQ21, WQ22, WQ26 and WQ28 had highly disturbed riparian vegetation communities. The only site with regular riparian vegetation was site WQ27. All sites except for WQ22 had extensive coverage of trees <10m, shrubs and grasses. Site W22 was heavily cleared with grasses the only dominant vegetation. Most sites had limited to slight shading.

Plate 4-1: Riparian Vegetation at Deception Creek (WQ21)

All streams sampled contained flowing water during the wet season with WQ25, WQ26 and WQ28 (Suttor River, Verbena and Logan Creeks respectively) all flooding at the time of sampling. Streams that hadn't broken their banks were relatively narrow (< 10m wide).

Bowen/Bogie Catchment

Riparian vegetation density was varied across the sites. Most sites had larger tree species (10-35% >10m tall) although two sites (WQ13, WQ14 and WQ18) had very limited large trees. WQ18 also had several trees within the stream itself. The majority of sites had undisturbed vegetation with trees regular vegetation along both banks. Site WQ10 had undisturbed riparian vegetation communities. All sites except for WQ14

had extensive coverage of trees <10m, shrubs and grasses. Site WQ14 was heavily cleared with grasses the only dominant vegetation. Most sites had limited to moderate shading depending on stream width.

No sites had banks that were overtopped; however many showed signs of recent flooding such as scattered debris and flattened vegetation. This may have been a result of Cyclone Ului. Soils in the catchment were course compared to the upland catchments (predominantly sands and pebbles).

Plate 4-2: Riparian Vegetation Two Mile Creek (WQ18) – March 2010

4.2.4 Morphology

Suttor Catchment

The streams on the Suttor catchment were predominantly remnant channels that were flat or two staged (stepped) banked streams. Like the lower reaches of the Belyando, at a number of locations, due to the high quantity of water within the stream, it was not possible to observe the main channel, and in these locations, flood channels were observed. The streams ranged from 3m to 2km (WQ25) wide although most streams had an observed flood plain that extended from 40m to 400m either side of the centre of the stream. Site WQ25 had a flood plain of over 6km wide. Most streams sampled had flowing and pooled water although two streams (WQ23 and WQ24) had significant flowing water (rapids and riffles >65%) and all the streams had extensive runs. Most streams except for site WQ23 had almost no pools. The majority of the streams had no in stream aquatic plant growth except for site WQ22 that had some submerged aquatic plants.

Silt was the dominant particle in the southern area of the catchment while sand was the dominant sediment in the upper reaches of the catchment. All the sites except WQ24 had limited bedrock. Erosion varied across the streams with the majority having either a stable substrate and/or moderate deposition. Only site WQ24 had observed erosion. The majority of streams were partly to very restricted at base flow with this either being a non-vegetated side channel bars in the upper reaches and vegetated mid channel bars in the lower reaches.

Bowen/Bogie Catchment

The streams on the Bowen/Bogie catchments were highly varied in stream shape. Sites WQ14, WQ15 and WQ16 were high and steeped banked streams while the remainder were remnant channels that were broad banked. The streams ranged from 2m to 80m (WQ10) wide. Most streams sampled had flowing and pooled water although two streams (WQ10 and WQ12) had significant flowing water (including rapids and riffles) and sites WQ11, WQ12 and WQ16 had extensive runs. The majority of the streams had no in stream aquatic plant growth except for site WQ16 that had moderate aquatic plants.

Sand was the dominant particle in the catchment. All the sites except for site WQ14 had limited bedrock. Erosion varied across the streams with the majority having either a stable substrate and/or moderate/severe deposition. Only site WQ12 had observed erosion. The majority of streams were moderately restricted at base flow with by either non-vegetated side channel bars or vegetated mid channel bars.

4.2.5 Climate

The climate is typical of tropical areas with hot wet summers and dry warm winters and temperatures varying little across the catchments. The mean annual rainfall for Collinsville is approximately 710mm with the highest rainfall recorded between December and April.

4.2.6 Flooding

The variable rainfall and relatively flat topography over most of the alignment can result in localised flooding occurring in floodplains throughout the length of the catchments during events of more than 200mm over a 48hr period. Flooding generally occurs during summer months as a result of heavy rainfalls caused by tropical lows and rain depressions generated from cyclones crossing the north eastern Queensland coastline.

In January and February 2008, a monsoonal low originating in the Gulf of Carpentaria caused significant rainfalls throughout the region. These falls resulted in a number of the rivers and creeks in the region overtopping their banks, including the Bogie Rivers. Flooding occurred at a number of isolated sites along Bogie Rivers between Charters Towers and Clermont, which includes areas in the vicinity of the proposed railway. This type of event is characteristic of the region where intense rainfall can result in localised flooding of a number of the river and creek systems. Similar conditions were observed in March 2010 following Cyclone Ului that traversed directly over Collinsville as a Category One system.

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4.3 Suttor Catchment Water Quality

4.3.1 Historical water quality

A review of the DERM historical water quality data indicates that the Suttor River site at Eaglefield is the only site within the Suttor catchment and is approximately 20km to the south east of KP180 (refer to Figure 2-2). Water quality sampling was carried out at the site from 1969 to 2004. Samples were taken intermittently over this period with many of the parameters having less than six replicates. A summary of the water quality data obtained from this site is provided in Table 4-1.

Table 4-1: DERM Historical Water Quality - Eaglefield Summary

Parameter	N	minimum	10th Percentile	Median	90th Percentile	Maximum
EC (µS/cm)	22	30	73	215	379	570
Turbidity (NTU)	5	17	-	-	-	295
pH	6	7.1	-	-	-	8.3
DO (ppm)	5	5.1	-	-	-	11.1
TSS (mg/L)	22	10	20.5	40.5	361.3	910
TN (µg/L)	1	740	-	-	-	-
TP (µg/L)	5	28	-	-	-	160

4.3.2 Baseline Water Quality Monitoring

Table 4-2 provides a summary of results from the sampling in the Suttor Catchment. Results for each site in the catchment are provided in Appendix B with results graphs of results for each catchment provided in Appendix C.

Table 4-2: Summary Baseline Water Quality Results - Suttor Catchment

Water Quality Parameters	Units	Minimum	20th Percentile	Median	80th Percentile	Maximum
Field/Physical Parameters						
Temperature	°C	19.8	22.72	26.6	30.74	32.7
pH	Ph Unit	5.3	6.3	6.8	7.6	8.06
EC	mS/cm	0.092	0.127	0.207	0.363	0.485
Dissolved Oxygen	%	49	50	63	76	101
Turbidity	NTU	1.3	18	172	417	588
Laboratory Parameters						
Total Alkalinity as $CaCO^{3}$	mg/L	3	40	50.5	167.6	173
Sulfate as $SO4^{2-}$	mg/L	1	1	2	6	16
Chloride	µg/L	11,000	13,200	21,000	41,800	122,000
Calcium	mg/L	3	4	6.5	17.6	30
Magnesium	mg/L	2	2.2	5.5	9.6	17
Sodium	mg/L	9	16.2	28.5	48	60
Potassium	mg/L	1	2	3	8	13
Arsenic	µg/L	<1	1	2	2.4	4
Cadmium	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Chromium	µg/L	<1	2.2	3	4.2	6
Copper	µg/L	<1	2	2.5	4	5
Nickel	µg/L	<1	2	2.5	3.4	4
Lead	µg/L	<1	3	4.5	5	8
Zinc	µg/L	<5	8	8	8	8
Iron	µg/L	160	170	730	1,950	8,980

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Water Quality Parameters	Units	Minimum	20th Percentile	Median	80th Percentile	Maximum
Ammonia as N	µg/L	<10	20	20	50	280
Nitrite as N	µg/L	<10	10	10	10	10
Nitrate as N	µg/L	<10	20	35	40	80
Total Kjeldahl Nitrogen as N (TKN)	µg/L	<10	340	500	860	1,100
Total Nitrogen as N	µg/L	<10	340	500	920	1,200
Total Phosphorus as P	µg/L	<10	74	100	106	150
Total Anions	mEq/L	1.21	1.44	2.05	3.89	5.06
Total Cations	mEq/L	<1	1	3.5	5	48
Chlorophyll a	mg/m³	<1	<1	<1	<1	<1
PCB	µg/L	<1	<1	<1	<1	<1
PAH	µg/L	<50	292	295	298	300
TPH C_{10}-C_{36} Fraction (sum)	µg/L	3	40	50.5	167.6	173

4.3.3 Discussion

Baseline results from the Suttor catchment show that water quality varies significantly within the catchment. Generally it is of reasonable quality with the physio chemical properties comparable to the guidelines for *slightly to moderately* disturbed upland streams in the central coast region (Table 2-2) and historical results from the Eaglefield monitoring station.

Physical Parameters

Medians for EC and pH fall within QWQG criteria levels. Only the 80th percentile and above for DO are within the guideline range (85% to 110%). All turbidity readings taken in the catchment were below the guideline criteria of 50 NTU. Given the lack of historical data, it is difficult to compare these readings to other areas of the catchment; however comparison with the QWQG indicates that the streams are generally characteristic of upland streams.

Chemical Parameters

Metals were generally low with median levels within or marginally exceeding relevant guideline limits. Copper marginally exceeded guideline limits at several sites (WQ20, 25, 26, 27 and 28) which is likely a result of elevated copper levels in the surrounding geology (see generally the discussion of water quality in Section 3.2).

Nutrients levels were elevated with the medians of TN and TP above QWQG criteria. This is the result of large amounts of organic matter being present in the streams due to flushing during and after storm events.

PAHs and TPHs were detected at two sites (WQ20 and 25) during dry season monitoring and is likely a result of spills that have occurred in the surrounding area or decomposing plant matter in the riparian areas flushing into the stream after a large storm event.

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Plate 4-3: WQ20 (Suttor River) – October 2009

Plate 4-4: WQ20 (Suttor River) - March 2010

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Anions and Cations

Waterways in the Suttor catchment are similar to those in the Belyando catchment with carbonates and bicarbonates dominating (Figure 4-1). There was a high proportion of Chlorides at WQ19 compared to other sites in the catchment. This site contained high chloride levels compared to the rest of the catchment during both wet and dry season sampling. There is no apparent cause for the elevated levels and they are most likely related to land uses immediately surrounding the site.

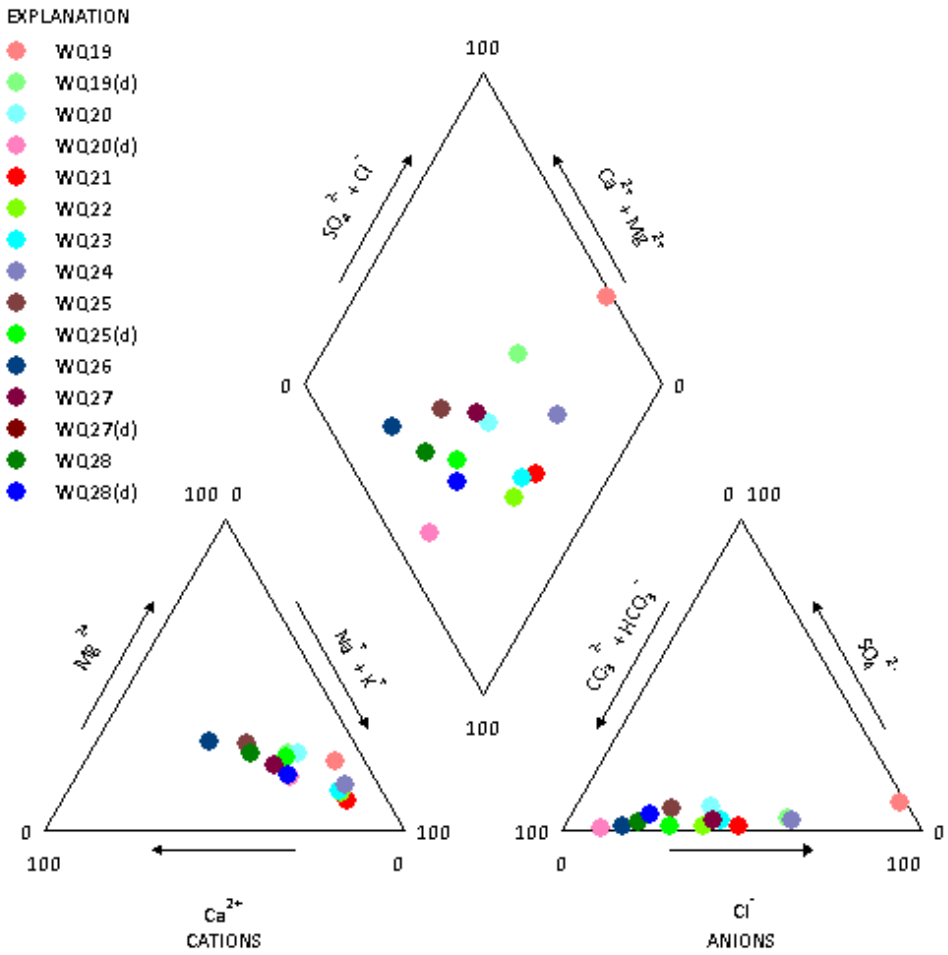

Figure 4-1: Piper Diagram - Suttor Catchment

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4.4 Bowen/Bogie Catchment Water Quality

Historical water quality

A review of the DERM historical water quality data indicated that the Pelican Creek site at Coolon Road is the only site within the Bowen/Bogie catchments to have historical data (approximately 15km south of KP85 – refer to Figure 2-2). Water quality sampling was only carried out at the site for a year from 2003 to 2004. During this period, parameters were only tested on two or three occasions. A summary of the water quality data obtained from this site is provided in Table 4-3.

Table 4-3: DERM Historical Water Quality – Coolon Road

Parameter	N	minimum	10th Percentile	Median	90th Percentile	Maximum
EC (mS/cm)	2	0.162	-	-	-	0.185
Turbidity (NTU)	3	1	-	-	-	10
pH	2	7.2	-	-	-	7.4
DO (ppm)	3	4.9	-	-	-	7.2
TSS (mg/L)	2	7	-	-	-	8
TN (µg/L)	3	150	-	-	-	360
TP (µg/L)	3	70	-	-	-	100

4.4.1 Baseline Water Quality Monitoring

Table 4-4 provides a summary of results from the sampling in the Bowen/Bogie Catchment. Results for each site in the catchment are provided in Appendix B with results graphs of results for each catchment provided in Appendix C.

Table 4-4: Summary Baseline Water Quality Results – Bowen/Bogie Catchment

Water Quality Parameters	Units	Minimum	20th Percentile	Median	80th Percentile	Maximum
Temperature	°C	23.1	26.3	29.4	30.7	32.7
pH	Ph Unit	6.4	7.1	7.6	8.0	8.4
EC	mS/cm	0.002	0.342	0.81	1.17	7.8
Dissolved Oxygen	%	55	59	76	81	107
Turbidity	NTU	1.9	3.9	5.9	26	48
Laboratory Parameters						
Total Alkalinity as $CaCO^{3}$	mg/L	77	108	151.5	216	242
Sulfate as $SO4^{2-}$	mg/L	3	6	23	136	3080
Chloride	µg/L	20,000	27,400	40,500	260,400	1,040,000
Calcium	mg/L	13	22.4	29	51.8	346
Magnesium	mg/L	9	9.2	16	47.8	428
Sodium	mg/L	23	25.4	42.5	170.2	1,080
Potassium	mg/L	1	1.4	3	6.8	18
Arsenic	µg/L	<1	1	2	8	2
Cadmium	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Chromium	µg/L	<1	1.4	2	4.4	6
Copper	µg/L	<1	1	2	3	5
Nickel	µg/L	<1	4.6	5.5	6.4	7
Lead	µg/L	<1	1.6	2.5	4.2	6
Zinc	µg/L	<5	10	10	10	10
Iron	µg/L	90	162	385	3,360	6,980

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Water Quality Parameters	Units	Minimum	20th Percentile	Median	80th Percentile	Maximum
Ammonia as N	µg/L	<10	20	30	30	40
Nitrite as N	µg/L	<10	<10	<10	<10	<10
Nitrate as N	µg/L	<10	30	40	50	120
Total Kjeldahl Nitrogen as N (TKN)	µg/L	<100	200	300	380	400
Total Nitrogen as N	µg/L	<100	220	400	400	400
Total Phosphorus as P	µg/L	<10	70	110	150	170
Total Anions	mEq/L	2.68	2.95	4.65	14.5	98.2
Total Cations	mEq/L	2.85	2.98	4.79	14	99.8
Chlorophyll a	mg/m³	<1	3.6	6	9.6	12
PCB	µg/L	<1	<1	<1	<1	<1
PAH	µg/L	<1	<1	<1	<1	<1
TPH C_{10}-C_{36} Fraction (sum)	µg/L	<50	<50	<50	<50	<50

4.4.2 Discussion

Baseline results from the Bowen/Bogie Catchment show that the streams are generally in good condition with the physio-chemical properties comparable to the QWQG for *slightly to moderately* disturbed lowland streams in the central coast region (Table 2-2) and the limited historical results from the Coolon Road monitoring station.

Physical Parameters

Medians for EC and pH fall within QWQG criteria levels. The 80th percentile and above for DO were the only ones within the QWQG range (85% to 110%). All turbidity readings taken in the catchment were below the guideline criteria of 50 NTU. Given the lack of historical data, it is difficult to compare these readings to other areas of the catchment; however comparison with QWQG indicates that the streams are generally characteristic of lowland streams.

Chemical Parameters

Metals levels in this catchment are generally low with minor and isolated exceedances of ANZECC guideline limits. Copper marginally exceeded guideline limits at several of the sites (WQ12, 14, 15 and 16) which is likely a result of elevated copper levels in the surrounding geology (see generally the discussion of water quality in Section 3.2).

Nutrient levels in Bowen/Bogie Catchment are also generally low with all TN results below the lowland streams criteria of 500µg/L. TP exceeds the guideline limits from the 20th percentile onwards; however levels are relatively low compared to the Belyando catchment. PCBs, PAHs and TPHs were below the limit of reporting at all sites in this catchment.

The lower levels of nutrients, metals and contaminants identified in this catchment compared to the Belyando and Suttor Catchments are likely to be as a result of the more stable nature of the streams and sandy sediments. A number of the streams sampled were perennial and contain flowing water year round while waters in the Belyando Catchment are ephemeral and would likely only contain water for short periods during and after the summer storm season.

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Plate 4-5: Bowen River (WQ18) - October 2009

Anions and Cations

Similar to the other catchments waterways in the Bowen/Bogie generally showed similar anion and cation characteristics and were dominated by carbonates and bicarbonates (Figure 4-2). Most of the sites sampled also contained elevated levels of sodium which likely leached from the surrounding highly sodic soils (refer to the Geology, Soils and Landforms Technical Report). Sites WQ13 and WQ14 contain higher levels of Sulphur compared to the other sites in the catchment which may indicate the presence of Acid Sulphate Soils (ASS) in the area.

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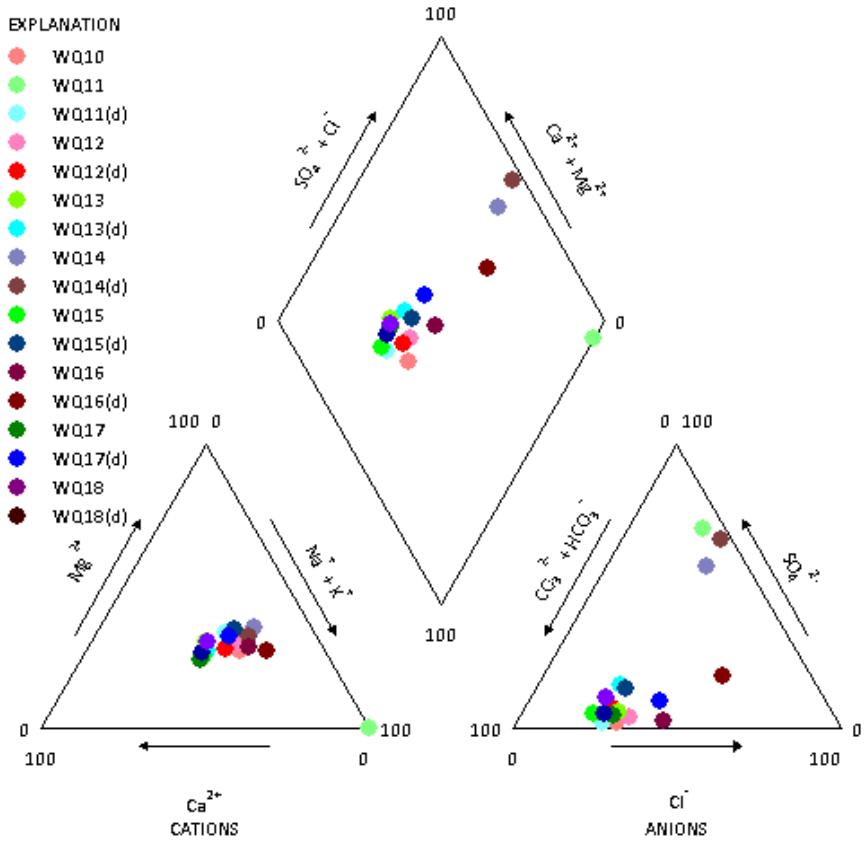

Figure 4-2: Piper Diagram - Bowen/Bogie Catchment

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5 Coal Terminal

This section provides an overview of surface waters within the Don catchment in proximity to the coal terminal.

5.1 Don Catchment

The coal terminal is located adjacent to existing infrastructure at the Port of Abbot Point, approximately 20km north-west of Bowen. This area is characterised by low lying coastal floodplains and wetlands with some elevated areas including Mt Luce.

Abbot Point falls within the Don River catchment; however the dominant hydrological feature of the port area is the Abbot Point - Caley Valley Wetlands, which are situated to the south west of the existing coal terminal at Abbot Point. The wetland is currently bunded off from tidal exchange and is fed by a series of small creeks, including Armstrong and Sandy Creek. The total catchment draining into the wetland is approximately 400km^2. The wetland retreats on a seasonal basis to a small lake (Lake Caley) and can become completely dry during drought; however when inundated, it can cover an area of 5,000 ha.

5.2 Catchment Characteristics

5.2.1 Topography and Soils

The topography of Abbot Point consists of coastal mud flats lying at elevations below 5m Australian Height Datum (AHD) and abrupt granitic hills such as Mount Luce located to the west of the coal terminal and Mount Roundback located to the south east rising to 728m AHD.

Geology in the area comprises primarily of Quaternary coastal dunes and sand plains formed by sands sourced from wind (Aeolian) and Cainozoic alluvial and deltaic deposits of silt, sand and clay. The area is dominated by Sodosol soils in which a major part of the B horizon is sodic (contains sodium) and not strongly subplastic. Sodosol soils will hard set when dry and are prone to dispersion and instability.

5.2.2 Land use

Land use in the Don catchment is primarily low intensity agriculture and cropping. The Caley Valley Wetland represents one of the largest intact wetland systems between Townsville and Bowen. There is an operating coal terminal adjacent to the study area comprising a rail in-loading facility, stock yards, conveyor and berths at Abbot Point. The North Queensland Bulk Ports Corporation has plans to expand the capacity of this terminal by more than double in the near future.

5.2.3 Riparian Condition

Sites WQ1, 4, 5 and 6 were within wetlands associated with the Caley Valley system at Abbot Point. The vegetation in these riparian areas varies between brackish wetland in the wet season and samphire dominated forbland in the dry season. During wet season riparian vegetation is dominated by emergent

and floating macrophyte species such as *Spirodela punctata* (thin duckweed), *Cyperus diformis*, *Eleocharis plana* (flat sedge) and *Marselia hirsute* (nadoo). Dry season vegetation is dominated by *Halosarcia pergranulata*, *H. Indica* (glasswort) and *Portulaca bicolor* (pigweed).

Plate 5-1: Riparian Vegetation in Caley Valley Wetlands

The other sites in the catchment were generally small, shallow streams (<10m in width) with sandy soils and sediments and sparse riparian areas dominated by wetland species such as *Melaleucas*. No sites were flooded during the sampling events; however all showed signs of recent flooding.

5.2.4 Morphology

The shape of the waterways in the Don catchment varied significantly. Sites WQ1, WQ4, WQ5, WQ6, and WQ7 were wetland habitats with flat flood plains and no distinct channels. In contrast the remaining sites were shallow and/or steeped banked streams with remnant channels. The streams ranged from 2m to 12m wide while the wetlands covered extensive areas in the wet season and retreated to smaller “lakes” in the dry seasaon. Most streams sampled outside of the wetlands had flowing and pooled water although four streams (WQ2, WQ3, WQ8 and WQ10) had significant flowing water (including rapids and riffles) and sites WQ2, WQ3 and WQ10 had extensive runs. Sites WQ1, WQ4, WQ5, WQ6, and WQ7 had extensive pools and/or backwaters. WQ1 and WQ4 are part of the Caley Valley Wetlands. Those areas with extensive pools and/or backwater had high abundances of in stream aquatic plant growth, both floating and submerged. Sites WQ2, WQ3, WQ8 and WQ9 had no aquatic plants.

Sand was the dominant particle in the flowing steams of the catchment while silt was observed in the wetland environments. No streams sites had bedrock. Erosion was not observed with the majority of flowing streams having moderate/severe deposition. The majority of flowing streams were moderately restricted at base flow with mid channel non-vegetated bars. There was limited and/or no flow in the wetland environments.

5.2.5 Climate

Northern Queensland has highly variable seasonal and annual rainfall linked to tropical lows/cyclones and monsoonal activity (Lough, 2001), is like most on the east coast south of the Wet Tropics, being within the sub-tropical to tropical climate zone with cyclonic monsoonal conditions during the summer months and a relatively dry winter. The area is subject to high frequency cyclonic activity, between 10 and 15 cyclones/decade, flooding and prolonged drought (Bruinsma *et al*, 1999).

5.2.6 Flooding

Information from the BoM weather station at Bowen (approximately 20km south east of Abbot Point) indicates that the annual average rainfall in the region is approximately 788mm. The wettest periods are the summer months from December to February when approximately 62% of the annual rainfall occurs. Less than 9% of the annual rainfall occurs between June and August.

Twelve tropical cyclones have crossed the coast within 200km of Abbot Point since 1980, an average of one every 2.5 years. The most recent was Cyclone Ului in March 2010.

The Bureau of Meteorology indicates that the most recent major flooding in the region was in February 2008 when a monsoonal low originating in the Gulf of Carpentaria caused significant rainfalls in the region of up to 300mm in a 24 hour period. This resulted in widespread flooding across the coastal basins of the Haughton, Burdekin, and Don Rivers, which traverse the coastal regions surrounding Abbot Point.

The Haughton River also underwent major flooding in January 2010 as a result of a monsoonal low caused by ex tropical cyclone Helga. The rainfall produced by Helga also resulted in minor flooding in areas of the Don catchment. None of these catchments are hydraulically connected to Abbot Point and the existing port infrastructure was not significantly impacted by the flooding.

5.3 Water quality

5.3.1 Historical Water Quality

A review of the DERM historical water quality data indicated that the Euri Creek site at Koonandah is the closest site to the coal terminal (approximately 11km south east – refer to Figure 2-2). Water quality sampling was carried out at the site between 1999 and 2006. A summary of the water quality data obtained from this site is provided in Table 5-1.

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Table 5-1: DERM Historical Water Quality - Koonandah Summary

Parameter	N	minimum	10th Percentile	Median	90th Percentile	Maximum
EC (µS/cm)	14	121	213	711	1148	1220
Turbidity (NTU)	15	2	4.2	7.0	59	99
pH	15	7.1	7.2	7.7	8.36	9.4
DO (ppm)	13	1.8	4.2	7.7	9.9	19.1
TN (µg/L)	15	178	262	584	1,421	3,319
TP (µg/L)	15	20	22	105	254	541

5.3.2 Baseline Water Quality Monitoring

Table 5-2 provides a summary of results from the sampling in the Don Catchment (Figure 5-1**Figure 5-2**). Results for each site in the catchment are provided in Appendices B and C. Results for each site in the catchment are provided in Appendix B with results graphs of results for each catchment provided in Appendix C.

Table 5-2: Summary Baseline Water Quality Results - Don Catchment

Water Quality Parameters	Units	Minimum	20th Percentile	Median	80th Percentile	Maximum
Temperature	°C	21.9	23.24	25.05	28.24	29.5
pH	Ph Unit	6.2	7.3	7.7	7.9	8.3
EC	mS/cm	0.003	0.684	1.53	59.9	156.9
Dissolved Oxygen	%	40	50	74	85	113
Turbidity	NTU	0.1	0.88	4.85	14	377
Laboratory Parameters						
Total Alkalinity as $CaCO^{3}$	mg/L	56	146.8	276	408.4	847
Sulfate as $SO4^{2-}$	mg/L	3	13.2	25.5	4180	11400
Chloride	µg/L	249	5,1440	119,000	449,000	49,000,000
Calcium	mg/L	13	87.6	109.5	1094	1000
Magnesium	mg/L	10	35	91.5	4599.2	6210
Sodium	mg/L	27	108.4	207.5	16292	45800
Potassium	mg/L	1	1.4	4.5	557.4	3600
Arsenic	µg/L	1	2	8	80.4	93
Cadmium	µg/L	0.2	0.56	1.1	1.64	2
Chromium	µg/L	1	2	22	56.4	61
Copper	µg/L	1	1.8	5.5	37.6	42
Nickel	µg/L	2	2.6	5	12.2	20
Lead	µg/L	2	3	23	25	42
Zinc	µg/L	5	5.8	9	38	64
Iron	µg/L	6.98	140	540	3,200	4,980
Ammonia as N	µg/L	10	24	40	582	960
Nitrite as N	µg/L	10	10	10	10	10
Nitrate as N	µg/L	30	34	70	128	610
Total Kjeldahl Nitrogen as N (TKN)	µg/L	20	300	700	3,640	11,900
Total Nitrogen as N	µg/L	100	332	500	1,040	13,100
Total Phosphorus as P	µg/L	30	40	135	240	2,220
Total Anions	mEq/L	2.68	11.42	21.2	501.1595	2,800
Total Cations	mEq/L	2.86	10.92	20.05	10.92	2,640
Chlorophyll a	mg/m^3	<1	1.6	2	2.4	5
PCB	µg/L	<1	<1	<1	<1	<1
PAH	µg/L	<1	12.77	12.77	12.77	12.77
TPH C_{10}-C_{36} Fraction (sum)	µg/L	<50	388	450	2,290	2,450

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5.3.3 Discussion

Baseline Water Quality results from the Don Catchment show that the streams are generally of decent quality with the medians for most of the parameters within relevant guideline limits and comparable to the historical results from the Koonandah monitoring station. TPHs and PAHs were identified at several of the sites during dry and wet season sampling and are likely the result of petrol or chemical spills somewhere near the site.

Physical Parameters

Turbidity and pH fall within relevant guideline limits up to the 80th percentile. EC exceeds guideline values from the 20th percentile onwards, which may be due to saltwater intrusion in the wetland areas (WQ1, WQ4, WQ5 and WQ6). EC levels were generally higher during dry season sampling at these sites when the wetlands had retreated and no freshwater was flowing in from the catchment. EC reading during wet season monitoring were much lower and were more characteristic of freshwater systems (<1mS/cm). The slightly higher pH levels compared to some of the other catchments is characteristic of coastal streams as pH tends to increase with salinity.

DO was below the lower guideline limits up to the 80th percentile with only four out of the 18 samples taken giving a reading of 85% saturation or over. The lowest values were generally recorded during dry season when the wetlands areas were retreating and there was very little to no freshwater influx from the catchment.

Chemical Parameters

Exceedances of guideline criteria for metals generally only occurred during the dry season sampling events at sites WQ1, WQ4, WQ5 and WQ6. The exceedances were pronounced at a number of sites with arsenic, copper, lead and zinc all more than five times the QWQG values at some sites. Copper, nickel and zinc also exceeded guideline limits at WQ5 during wet season sampling. Elevated metal levels in the water column generally result from the weathering of rock and leaching of soils, and have the potential to be particularly high in catchments with significant metal and/or ore deposits. It is likely that the metals are being transported into the wetlands areas during wet season rain events and the concentrations increasing as the wetlands recede during the dry season. Most metals bind readily to fine particles and organics and are released into the water column through desorption from the suspended particulates and bottom sediments. It is therefore likely that the sediments in the wetland areas will also contain metals.

Nutrients levels were elevated with the medians of TN and TP above QWQG criteria. This is the result of large amounts of organic matter being present in streams and wetlands due to flushing during and after storm events.

PCBs were all below the limit of reporting. PAHs were identified at one site (WQ7) during dry season sampling. Sources of PAHs include sewage and industrial effluents, waste incineration, oil spills, asphalt production and combustion of fossil fuels although some PAHs can be derived from the environment (Kennish, 1996). The isolated occurrence of PAH suggests a spill of some kind occurred upstream of the

sample site. PAHs rapidly bind with particulate matter and settle out of the water column so it is likely sediments at the site still contain contaminants. TPHs were detected at sites WQ1, 5 and 6 over both dry and wet season sampling and may be a result of petrol spills have occurring within the catchment or decomposing plant matter in the making its way into the waterway.

Anions and Cations

Waterways in the Don Catchment generally had higher levels of salts compared to the other catchments in the study area (Figure 5-1) which is expected from brackish water and coastal wetlands. The samples taken from streams further inland, in particular WQ7, had lower salinity levels than the other sites and high levels of carbonates and bicarbonates which suggests it was flushed by fresh water resulting from recent rainfalls.

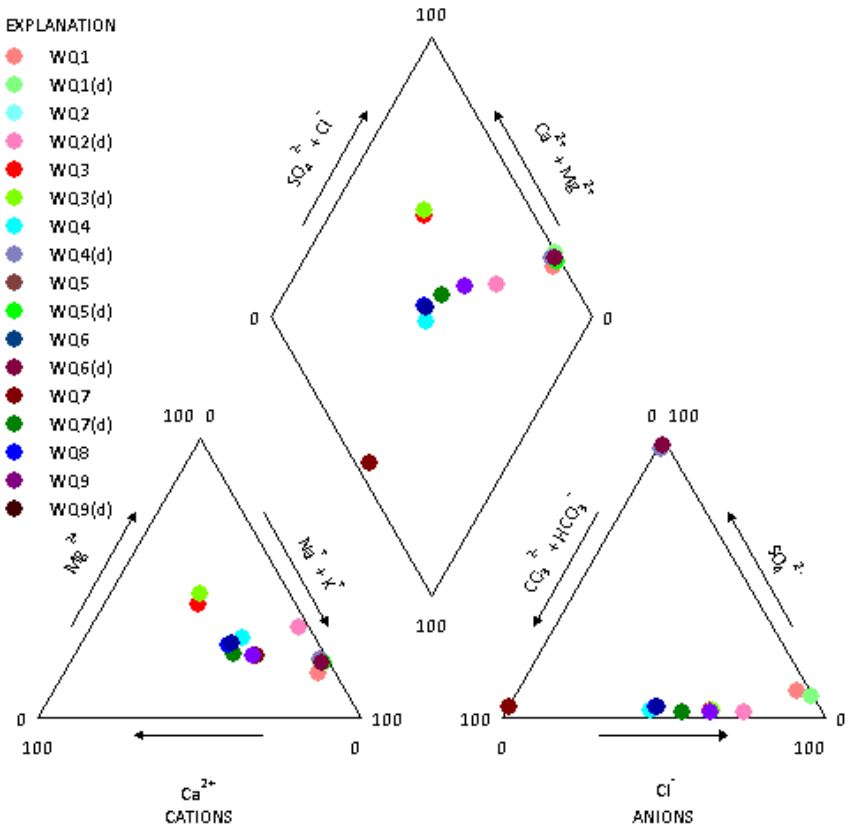

Figure 5-1: Piper Diagram - Don Catchment

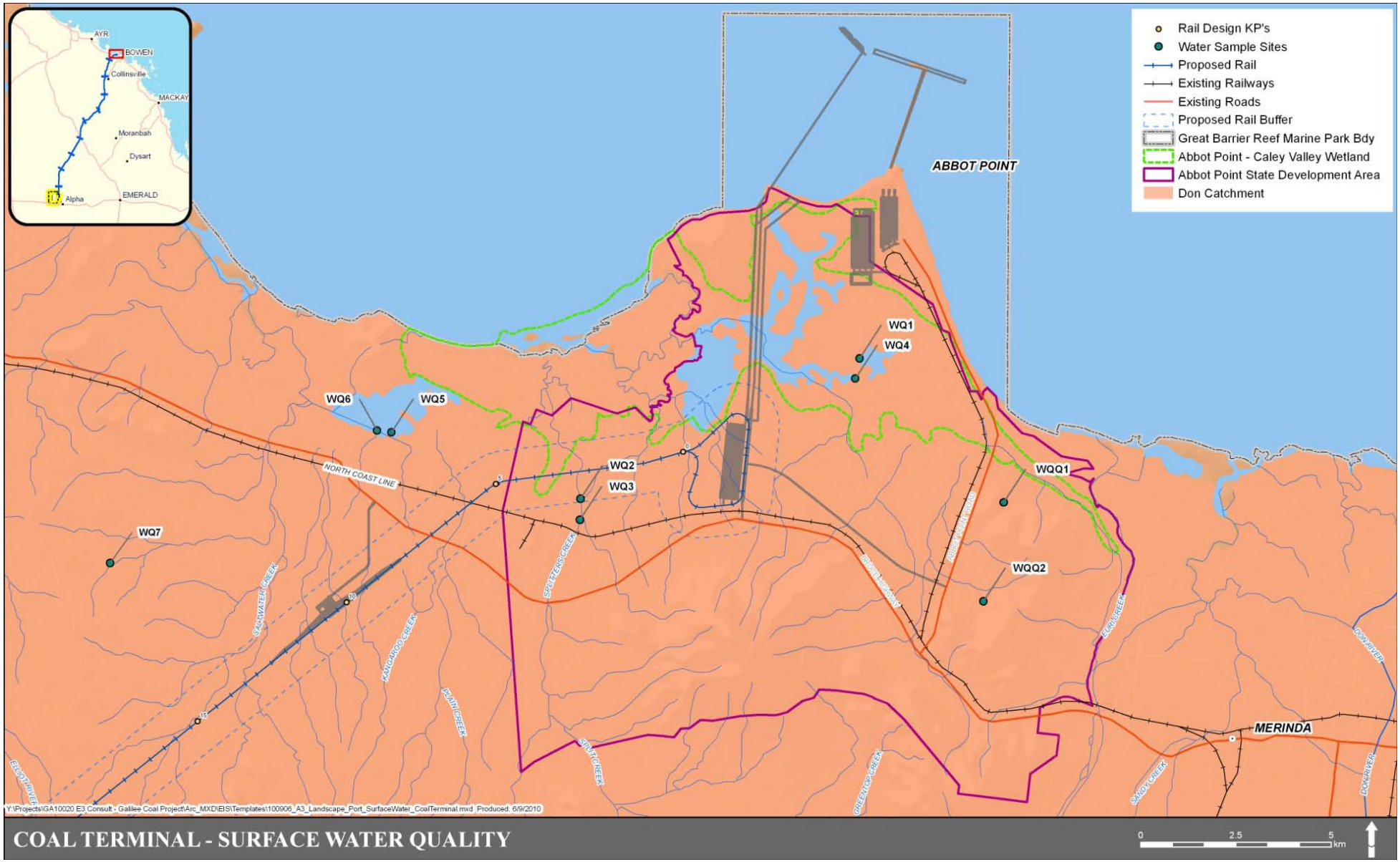

Figure 5-2: Water Quality Sampling Site - Abbot Point

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6 Potential Impacts

Potential impacts addressed in the report include those that will have direct impacts to the physical and chemical water quality. For a detailed assessment of impacts to biota refer to the aquatic ecology technical report.

6.1 Mine Site

Construction and ongoing operation of the mine has the potential to significant impact on streams in the region. The activities with the highest risk of causing impacts include:

- The clearing of vegetation and topsoils from work sites and stockpiling of overburden on site resulting in sediment movement though overland flow;
- Impacts on vegetation and banks during bridge construction through their removal, causing sediment movement;
- The storage of chemicals on site (e.g. hydrocarbons, detergents, degreasers, etc) during construction and operations and the movement of these to streams;
- The storage, seepage and overtopping of potentially contaminated water such as tailings water or pit process water in dams and basins at the mine site;
- The construction and operation of underground mines which may result in subsidence impacting drainage in the immediate area; and
- The construction of two diversions to divert Tallarenha Creek from the open cut mine areas.

6.1.1 Clearing and stockpiles

The clearing of vegetation and construction of mine infrastructure (open cut areas, dams, supporting infrastructure, etc) has the potential to increase sediment deposition in streams offsite. Overburden dumps have the highest potential to impact surrounding streams in the event of large storm events prior to full rehabilitation. Potential impacts include:

- Siltation of watercourses and aquatic habitat;
- Irregular and unstable land forms due to gully, channel and bank erosion;
- Adverse ecological effects from de-silting streams;
- Reduced ecology and aesthetic value of streams and riparian vegetation;
- Increased turbidity in the streams;
- Clogged drainage infrastructure and increased localised flooding;
- Silting and bank damage to trench works and drainage structures; and
- Increased downtime during construction after storm events while these areas are rehabilitated.

6.1.2 Chemical and water storage

Inappropriately stored and handled chemicals and other hazardous substances have the potential to impact surface waters in and around the mine site during construction and operations. Chemical spills or low-level

exposure of the aquatic environment to chemicals (e.g. run-off from machinery, including potential vehicle accidents) would most likely involve hydrocarbon products such as fuels and lubricants. Fuels and chemicals will be stored, transported, handled and used in accordance with relevant legislation, regulations, standards and guidelines. As such, the risk of spillage would be low.

Impacts to aquatic environments during mining operations could also result from seepage or discharge of water containing salts, metals and other potential pollutants from dams and sediment basins located on site. Discharge could occur through failure of dam walls or overflow of weirs into surrounding drainage areas which then make their way into adjacent streams or seepage through the walls and base of the dams either into unconfined aquifers which transport the contaminants to surface waters.

6.1.3 Underground mines

The construction and ongoing operations of the underground mines have the potential to cause subsidence directly above the mining areas. Potential impacts would include changed drainage due to ground depressions which may have an effect on the existing hydraulics of surface waters near the mine. The surface water located over the underground mines includes unnamed tributaries of Tallarenha Creek.

6.1.4 Diversions

The diversion of Tallarenha Creek would impact on drainage in the region with higher flows caused by the diversion potentially impacting on hydrology and increasing flooding risk of the creeks downstream of the diversions. Potential impacts to hydrology are addressed in the flooding technical report however increased flows have the potential to have a number of downstream impacts including:

- Erosion and sedimentation within the diverted creeks if opened before vegetation is established and stabilised;
- Increase in water velocity in diverted creeks, with the potential for scour erosion if not managed correctly; and
- Increased upstream and downstream flood levels due to increased flow rates. Existing and planned infrastructure such as roads and rail will need to undergo design reviews to ensure they will not be affected by flooding.

6.2 Rail Corridor

During construction and operation of the rail corridor there are a number of mechanisms that have the potential to impact on surface water quality including:

- Impacts on vegetation and banks during bridge construction through their removal, causing sediment movement;
- Disturbance and stockpiling of soils causing increased turbidity or suspended solids within the water column;
- Piling and culvert works for streamy crossings;

- use of potentially contaminated / low quality water for dust suppression and other site activities; and
- storage of oil, fuel and chemicals on site.

6.2.1 Clearing and disturbance of soils

Construction activities are expected to be relatively invasive, involving extensive excavations including removal of large areas of vegetation in order to create works areas near streams to construct culverts and bridges for crossings. This has the potential to increase sediment loads within the stream as well as nutrients and toxicants associated with the suspended sediment. The stockpiling of topsoils near streams also has the potential to increase sediment loads in streams if not managed properly.

Excavation activities may also result in the disturbance and exposure of Acid Sulfate Soils (ASS) in the Don Catchment which can then impact on water quality; however further testing needs to be undertaken to determine their presence and extent. Potential impacts from ASS disturbance include:

- Damage or death of aquatic fauna and flora;
- The release of iron, aluminium and heavy metals into surface water, which reduces water quality;
- Damage to infrastructure which is subject to corrosion from acidic water; and
- Slumping of structures built on material containing ASS, as this soil type generally has a low-bearing capacity.

6.2.2 Piling

Construction will involve the driving of concrete piles and placement of culverts within the riparian zone and potentially the watercourse itself. These works will result in direct disturbance to the streams, especially for crossings requiring piling or the placement of structures in the stream itself. Potential impacts include the re-suspension of bottom sediments into the water column increasing turbidity and any toxicants present in the sediment. Toxicants in the sediment may include pesticides such as Dichloro-Diphenyl-Trichloroethane (DDT) and its analogues. These have been banned in Australia since 1987 however the compounds are often found in accumulated in sediments downstream of agricultural lands due to historical use.

6.2.3 Release of potentially contaminated water

Construction of the railway will require substantial quantities of water for dust suppression (not quantifiable at present), landscaping, and surface stabilisation or compaction purposes. Due to the remoteness of large section of the rail alignment, town water supplies may not be available or practical for use. Supply for construction purposes is likely to be sought from non-potable sources such as existing streams, private dams or quarry sites (i.e. the quarry at Abbot Point). Water from non-potable sources may have poor water quality, and if run-off from the construction site occurs at a high velocity, it may contribute to lowering water quality in the catchment.

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6.2.4 Spills

Chemical spills or low-level exposure of the aquatic environment to chemicals (e.g. run-off from machinery, including potential vehicle accidents) would most likely involve hydrocarbon products such as fuels and lubricants. Fuels and chemicals will be stored, transported, handled and used in accordance with relevant legislation, regulations, standards and guidelines. As such, the risk of spillage would be low.

6.2.5 Operational phase impacts

There is little available information about the effect of rail infrastructure on water quality. It is likely that a number of potential contaminants could be released from trains, including oils and lubricants, which could disperse into downstream environments. Such releases could either occur as a result of a single major incident or multiple small releases from the day to day operations of rail infrastructure.

It can be expected that major incidents releasing contaminants into streams will affect aquatic fauna, in particular the sensitive taxa. However, the effects of multiple small releases over extended periods are difficult to quantify and will be highly dependent on the nature of the chemical released.

6.3 Coal Terminal

The components of the coal terminal with the most potential to impact on surface water include construction of the coal stockyards and conveyor transporting the coal to the wharf and ongoing operation of the stockyards and conveyor. The activities with the most potential to impact streams include:

- Piling works associated with the conveyor through the Caley Valley wetlands;
- Clearing of vegetation, excavations and stockpiling of materials, including potential ASS, associated with construction of the coal stockyards;
- Use of potentially contaminated/low quality water for dust suppression and other site activities; and
- Storage of oil, fuel and chemicals on site.

6.3.1 Piling

Construction of the supporting structures for the coal conveyor will likely require piling within the Caley Valley Wetland. Impacts to water quality resulting from these works would be dependent on the methodology employed (i.e. vibrocoring would result in reduced impacts compared to a hammer piling) but will likely include:

- Disturbance of ASS which may result in the impacts if not managed appropriately;
- Re-suspension of sediment from the wetland into the water column. These sediments have the potential to contain high levels of metals such as arsenic; and
- Impacts resulting from leaching of any materials used in the construction of the supporting structures.

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Potential impacts resulting from the storage clearing, the use of potentially contaminated water on site and storage of chemicals on site are similar to those described for the mine and rail components.

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7 Management Measures

Management measures are described in Table 7-1.

Table 7-1: Surface Water Management Measures

Management requirement	Management measure	Component	Timing	Responsibility
Erosion and sediment control	Develop Erosion and Sediment Control Plans (ESCPs) for the mine, rail and coal terminal works detailing control measures to be implemented, construction details, dimensions, materials used, expected outcomes and staging of erosion and sediment control once construction is complete. The ESCP will be signed off by the appropriate authority prior to the commencement of works.	Mine, rail and coal terminal	Pre Construction	Construction Contractor
	Sediment control structures will be regularly checked, repaired, replaced or cleaned out. They shall be maintained so that they will always have 70% of their capacity available.	Mine, rail and coal terminal	Pre Construction	Construction Contractor
	Ensure all sediment from work sites remains outside of drainage lines, streams and existing stormwater treatment devices. No material should be stockpiled within known drainage lines. Any material transported from work areas into these places should be cleaned as soon as practicable.	Mine, rail and coal terminal	Construction	Construction contractor
	All stockpiled material is to be kept inside bunded/sediment fenced areas with delineated access points.	Mine, rail and coal terminal	Construction	Construction contractor
	Temporary sediment control fences will be installed around any stockpiles in place for more than one week.	Mine, rail and coal terminal	Construction	Construction contractor
Material transport	Limit vehicle access during construction to access tracks and designated construction areas.	Mine, rail and coal terminal	Construction	Construction contractor
	Sediment on vehicle should be prevented from being carried out from the site onto local roads. A vehicle shakedown area at the entrance to work sites will ensure sediment is removed before accessing off-site road networks.	Mine, rail and coal terminal	Construction	Construction contractor
	Any material spilled from trucks must be recovered from road surfaces and placed in designated fill areas, stockpiles or disposal areas.	Mine, rail and coal terminal	Construction	Construction contractor
	Wash down of plant and equipment shall be undertaken only where there are appropriate handling facilities. If on-site wash down is unavoidable, a bunded, impervious receptacle will be used.	Mine, rail and coal terminal	Construction	Construction contractor

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Management requirement	Management measure	Component	Timing	Responsibility
Safe and effective fuel, oil and chemical storage and handling	Ensure safe and effective fuel, oil and chemical storage and handling on site.	Mine, rail and coal terminal	Construction and operation	Construction contractor
	Ensure all oils, fuels and chemicals for use at the site are located within roofed, bunded areas with a storage capacity exceeding the capacity of the storage vessel by 100%.	Mine, rail and coal terminal	Construction	Construction contractor
	All refuelling facilities and the storage and handling of oil and chemicals will comply with the relevant Australian Standards.	Mine, rail and coal terminal	Construction and operation	Construction contractor
	Machinery is not to be left unattended while it is being refuelled.	Mine, rail and coal terminal	Construction and operation	Construction contractor
	Fuel facilities should have back pressure automatic shut-off nozzles.	Mine, rail and coal terminal	Construction and operation	Construction contractor
Spill control	Appropriate spill control materials including booms and absorbent materials will be maintained on site and at refuelling facilities for use in the event that a substance is spilled into the surrounding waters. In the event of a spill to the environment, the following actions will be undertaken: • Fuel/oil clean up kits including absorbent materials are to be kept on site at all times; • Any spills to be contained, and cleaned up immediately; and • No flushing of spills into streams or drainage channels.	Mine, rail and coal terminal	Construction and operation	Construction contractor
Acid Sulphate Soils (ASS)	An ASS Management Plan will be developed prior to the commencement of construction which will include the results of detailed site investigations and put in place management measures to reduce the potential for ASS to impacts on surface waters.	Coal terminal and rail line up to KP30	Pre construction	Waratah Coal
Waste management	The site is to be left in a clean and tidy state at the end of each day.	Mine, rail and coal terminal	Construction	Construction contractor
	Any rubbish or site debris that enters a stream or drainage line must be immediately recovered.	Mine, rail and coal terminal	Construction	Construction contractor
Dams	A dam failure impact assessment should be carried out for any proposed dams. Any dams that are likely to be referrable under the *Water Act 2000* should be noted and emergency response procedures developed.	Mine	Pre Construction	Waratah Coal
Stormwater	Develop storm water management plans for each component of the construction. These should consider the use of storm water tanks and re-use of grey water.	Mine, rail and coal terminal	Pre Construction	Waratah Coal
Construction Timing	Where possible stream crossing works for the rail alignment will be carried out during the dry	Rail	Construction	Construction contractor

Management requirement	Management measure	Component	Timing	Responsibility
	season (April – October) when many of the streams are unlikely to contain flowing water and there is less risk from tropical storms.			
Works within streams	Where works are to be carried out within the streams themselves (i.e. piling for creek crossings and the coal conveyor) sediment sampling will be carried out to identify potential contaminants.	Rail and coal terminal	Pre Construction	Waratah Coal
	Where possible vibrocorers will be used in preference to hammer pile drivers to reduce re-suspension of bottom sediments.	Rail and coal terminal	Construction	Construction contractor

7.1 Monitoring program

A water quality monitoring program will be put in place for construction works through the Construction Environmental Management Plans (EMP). The monitoring program will incorporate the following:

- Impact monitoring criteria will be included in the EMP. Criteria will be developed for each of the catchments addressed in this report (Don, Bowen/Bogie, Suttor and Belyando) with trigger values set at the 80th and 20th percentiles identified through baseline investigations;
- Monitoring will include visual inspections of construction areas and surrounding waters for evidence of spills;
- Physical and chemical water quality monitoring will be carried out up and down stream of work sites for the mine, railway and port;
- In the event of an exceedance of any of the trigger values a response mechanism will be put in place which will include a similar structure to the one outlined below:
    - In the event of an exceedance compare down current results to up current. If the two are similar exceedance is unlikely to be a result of the works;
    - If down current results are noticeably higher than up current carry out a visual inspection of the works site to identify potential sources of contaminants; and
    - If no sources can be identified review construction methods to identify ways of improving works.

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8 Conclusions

Baseline monitoring was carried out at 52 sites encompassing four catchments; the Belyando, Suttor, Bowen/Bogie and Don with field studies being undertaken over two temporal events encompassing dry and wet seasons to account for seasonal variation in water quality. Wet season sampling was carried out within a week of significant rainfalls in the region resulting from cyclone Ului.

Results from the field sampling identified that streams in the study area were generally in good health. Nutrient and metal levels were elevated at some sites during both dry and wet season sampling. This effect was more pronounced in the upland catchments (Belyando and Suttor) then the lowland catchments (Bowen/Bogie and Don). The lower levels of nutrients and metals identified in the lowland catchments compared to the upland catchments are likely due to the more stable nature of the streams and sandy sediments. A number of the streams sampled were perennial while waters in the Belyando Catchment are ephemeral and would likely only contain water for short periods during and after the summer storm season. This results in a “first flush” event, when contaminants that have build up in pools and adjacent land during the dry season are “flushed” through the system after the first summer rain events.

Construction works that have the most potential to impact on surface waters include:

- Clearing of vegetation and topsoils from work sites and stockpiling of overburden on site;
- Impacts on vegetation and banks during bridge construction through their removal, causing sediment movement;
- Storage of chemicals on site (e.g. hydrocarbons, detergents, degreasers, etc) during construction and operations;
- Storage of potentially contaminated water such as tailings water or pit process water in dams and basins at the mine site;
- Construction and operation of underground mines which may result in subsidence impacting drainage in the immediate area;
- Piling works associated with construction of the coal conveyor through the Caley Valley wetlands and stream crossings for the railway; and
- The construction of two diversions to divert Tallarenha Creek from the open cut mine areas.

Management measures have been identified to reduce potential impacts resulting from the works. If properly managed the impacts to surface water resulting from the works are expected to be minimal.

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9 Recommendations

From the surface water investigations carried out we recommend the following actions are carried out:

- Develop ASS management plans and ESCPs prior to the commencement of construction;
- Develop storm water management plans for each component of the construction. These will consider the use of storm water tanks and re-use of grey water;
- Carry out sediment sampling where works are to be carried out within the streams themselves (i.e. piling for creek crossings and the coal conveyor) to identify potential contaminants including pesticides and herbicides; and
- Develop a construction EMP incorporating monitoring requirements for surface waters.

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Glossary

Abbreviations

Abbreviation	Meaning
^{o}C	degrees Celsius
µg	microgram
µg/m^3	micrograms per cubic metre
AHD	Australian Height Datum
ANZECC	Australian and New Zealand Environment and Conservation Council
ARMCANZ	Agriculture and Resource Management Council of Australia and New Zealand
AS	Australian Standard
AS/NZS	Australian Standard / New Zealand Standard
ASS	acid sulfate soil
AusRivas	Australian River Assessment System
BoM	Bureau of Meteorology
cm	centimetre
DERM	Department of Environment and Resource Management (Qld)
NRW	former Department of Natural Resources and Water (Qld)
DO	dissolved oxygen
EC	electrical conductivity
EIS	environmental impact statement
EP Act	*Environmental Protection Act 1994*
EPC	Exploration permit coal (as defined in the Land use and planning chapters)
EPP	Environmental Protection Policy
EPP (Water)	Environmental Protection (Water) Policy 1997
g	grams
km	kilometre
m	metre
m^3	cubic metres
mg	milligram
mg/L	milligram per Litre
mg/m^3	milligrams per cubic metre
MGA	Map Grid Australia
MGA94	Map Grid of Australia 1994
mm	millimetre
NTU	nephelometric turbidity units
OCPs	organochlorine pesticides
PAH	polycyclic aromatic hydrocarbons
PCB	polychlorinated biphenyls
QA	quality assurance
QC	quality control
Qld	Queensland
QWQG	Queensland water quality guidelines
TKN	total Kjeldahl nitrogen
TN	total nitrogen
TOR	terms of reference
TP	total phosphorus
TPH	total petroleum hydrocarbons
TSS	total suspended solids

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Glossary of Terms

Abbreviation	Meaning
Acid sulfate soils	Naturally occurring soils, sediments or organic substrates (e.g. peat) that are formed under waterlogged conditions. These soils contain iron sulfide minerals (predominantly as the mineral pyrite) or their oxidation products. In an undisturbed state below the water table, acid sulphate soils are benign. However if the soils are drained, excavated or exposed to air by a lowering of the water table, the sulfides will react with oxygen to form sulfuric acid.
Analyte	Substance or chemical constituent that is determined in an analytical procedure.
Aquifer	A water-saturated geologic unit that is capable of transmitting significant or usable quantities of groundwater under ordinary hydraulic gradients.
Basin	A topographic depression containing, or capable of containing, sediment.
Bathymetry	Underwater topography (soundings).
Bedrock	The solid rock that underlies unconsolidated surficial sediments.
Biota	All the plant and animal life of a particular region.
Brackish water	Water that contains relatively low concentrations of soluble salts. Brackish water is saltier than fresh water, but not as salty as salt water.
Buffer	Area of vegetation providing protection from disturbance.
Catchment	The term used to describe the area which is drained by a river. It is sometimes called the river basin or watershed. The catchment is the most significant factor determining the amount or likelihood of flooding.
Channel	An eroded depression in the soil or bedrock surface within which alluvial deposits accumulate (i.e. gravel, sands, silt, clay).
Chlorophyll *a*	The principal photosynthetic pigment possessed by phytoplankton and is used to measure phytoplankton concentrations.
Conductivity	A measure of waters' ability to conduct electricity.
Contaminant	A substance that is present in an environmental medium in excess of natural baseline concentration.
Dam	A land-based structure or void that will contain, divert or control flowable substances. For the purposes of this study, a pond is also referred to as a dam.
Discharge	An outflow of water from a stream, pipe, groundwater aquifer, or watershed; the opposite of recharge.
Dissolved solids	Minerals and organic matter dissolved in water.
Dominant	One or more species, by means of their number, coverage, or size that exerts considerable influence upon or control of the conditions of existence of associated species.
Electrical conductivity	Measure of a material to conduct electricity. Electrical conductivity of water is a measure of the impurity (dissolved ions) in water - usually measured in siemens per unit length (e.g. millisiemens per centimetre).
Ecology	The scientific study of the distribution and abundance of life and the interactions between organisms and their environment. The environment of an organism includes physical properties, which can be described as the sum of local abiotic factors such as insolation (sunlight), climate, and geology and biotic factors, which are other organisms that share its habitat.
Ecosystem	A natural unit consisting of all plants, animals and micro-organisms (biotic factors) in an area functioning together with all of the non-living physical (abiotic) factors of the environment.
Environmental impact assessment	The process used to assess the environmental impact of a proposed development.
Environmental impact statement (EIS)	The information document prepared by the proponent when undertaking an environmental impact assessment. It is prepared in accordance with terms of reference prepared or approved by government. EIS is the term used by the Environment Protection and Biodiversity Conservation Act 1999 and the Environmental Protection Act 1994, and it is defined in Part 4 of the State Development and Public Works Organisation Act 1971.
Environmental Management Plan	A document developed by proponents during a project's planning and design. An Environmental management plan (EMP) provides life-of-project control strategies in accordance with agreed performance criteria for specified acceptable levels of environmental harm. It may continue through the whole life of a project (e.g. preconstruction, construction, operation and decommissioning).
Environmental values	An aspect of the environment that is to be protected.
Ephemeral	A stream, creek, river or waterbody that carries or contains water only during or immediately after irregular rainfall or flow events. These waterbodies have limited baseflow component with no groundwater discharge during the no flow period.
Erosion	The process by which material, such as rock or soil, is worn away or removed by wind or water.

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Abbreviation	Meaning
Estuarine	Pertaining to aquatic habitats where freshwater from streams or rivers mixes with sea water, resulting in a gradation of brackish waters with varying degrees of salinity. The estuarine environment consists of deepwater tidal habitats and adjacent tidal wetlands that are usually semi-enclosed by land but have open, partially obstructed, or sporadic access to the open ocean, and in which ocean water is at least occasionally diluted by freshwater runoff from the land.
Floodplain	An area of land periodically inundated by floodwater.
Flora	Plant life.
Flow rate	The time required for a volume of groundwater to move between points. Typically groundwater moves very slowly—sometimes as little as millimetres per year.
Fluvial	Material deposited by moving water (i.e. rivers and streams).
Fresh water	Water that is not salty, especially when considered as a natural resource.
Groundwater	All the water contained in the pores/voids within unconsolidated sediments or consolidated rocks (i.e. bedrock).
Landscape	Natural and manmade features of the urban, rural or natural environment, such as vegetation, topography and land use elements.
Nutrients	Any substance that promotes growth with living organisms. The term is generally applied to nitrogen and phosphorus in wastewater, but is also applied to other essential and trace elements.
Overburden	Any loose material which overlies bedrock (often used as a synonym for Quaternary sediments and/or surficial deposits) or any barren material, consolidated or loose, that overlies an ore body.
Perennial	A stream, creek, river or waterbody that carries or contains water in parts of its bed all year round during years of normal rainfall.
pH	The logarithm of the reciprocal of hydrogen-ion concentration in gram atoms per litre; provides a measure on a scale from 0 to 14 of the acidity or alkalinity of a solution (where 7 is neutral and greater than 7 is more basic and less than 7 is more acidic).
Phenols	Oxygen–substituted benzenes commonly derived from the degradation of natural organic matter, the distillation of wood and coal, and the refining of oil. This particular class of organic compounds is ubiquitous in nature, and is common in groundwater.
Pollution	An alteration in the character or quality of the environment, or any of its components, that renders it less suited for certain uses. The alteration of the physical, chemical, or biological properties of water by the introduction of any substance that renders the water harmful to use.
Polycyclic aromatic hydrocarbons	A group of over 100 different organic compounds composed of several benzene rings.
Rehabilitation	The process of environmental restoration to a former condition or status after some process (business, industry, natural disaster etc.) has damaged it.
Riparian	Any land which adjoins or directly influences or is influenced by a body of water.
Runoff	The portion of precipitation (rain and snow) that ultimately reaches streams.
Salinity	An accumulation of soluble salts in the soil root zone, at levels where plant growth or land use is adversely affected. Also used to indicate the amounts of various types of salt present in soil or water (see total dissolved solids).
Sampling sites	Specific locations within the study area where data is collected.
Seepage	1. The slow movement of water into or out of a body of surface or subsurface water. 2. The loss of water by infiltration into the soil from a canal, ditch, lateral, watercourse, reservoir, storage facility, or other body of water, or from a field.
Silt	Mud or clay or small rocks deposited by a river or lake. Fine particles in the size range 0.02 - 0.002 mm.
Subsidence	The gradual settling or sudden sinking of the land surface owing to natural or anthropogenic influences of materials in the subsurface.
Surface water	Water above the surface of the land, including lakes, rivers, streams, ponds, floodwater, and runoff.
Terms of Reference	As defined by Part 4 of the *State Development and Public Works Organisation Act 1971*.
Tide	Movement of the oceans due to astronomical influences.
Topography	A description of the surface features of a place or region.
Topsoil	A part of the soil profile, typically the A1 horizon, containing material which is usually darker, more fertile and better structured than the underlying layers.
Turbidity	The cloudiness or haziness of a fluid caused by individual particles (suspended solids) that are generally invisible to the naked eye, similar to smoke in air. The measurement of turbidity is a key test of water quality.
Unconfined Aquifer	A permeable bed only partly filled with water and overlying a layer of lower hydraulic conductivity. Its upper boundary is formed by a free water table where pore pressure is equal to atmospheric

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Abbreviation	Meaning
	pressure. Water in a well penetrating an unconfined aquifer does not, in general, rise above the water surface.
Water column	The height of water in a waterway.
Watershed	An area bounded peripherally by a divide, draining ultimately to a particular watercourse or waterbody.
Wetland	The land area alongside fresh and salt waters, that is flooded all or part of the time.

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Appendix A – Sample Methods and Limits of Reporting

Analyte grouping/Analyte	CAS Number	Analysis methods	Units	LOR
ED037P: Alkalinity by PC Titrator		USEPA 3005, 3051, 200.2 and ALS EN/EG 005 and 020		
Hydroxide Alkalinity as CaCO3	DMO-210-001		mg/L	1
Carbonate Alkalinity as CaCO3	3812-32-6		mg/L	1
Bicarbonate Alkalinity as CaCO3	71-52-3		mg/L	1
Total Alkalinity as CaCO3			mg/L	1
ED040F: Dissolved Major Anions		USEPA 3005, 3051, 200.2 and ALS EN/EG 005 and 020		
Sulfate as SO4 2-	14808-79-8		mg/L	1
ED045G: Chloride Discrete analyser		USEPA 3005, 3051, 200.2 and ALS EN/EG 005 and 020		
Chloride	16887-00-6		mg/L	1
ED093F: Dissolved Major Cations		USEPA 3005, 3051, 200.2 and ALS EN/EG 005 and 020		
Calcium	7440-70-2		mg/L	1
Magnesium	7439-95-4		mg/L	1
Sodium	7440-23-5		mg/L	1
Potassium	2023-69-5		mg/L	1
EG020T: Total Metals by ICP-MS		USEPA 3005, 3051, 200.2 and ALS EN/EG 005 and 020		
Arsenic	7440-38-2		mg/L	0.001
Cadmium	7440-43-9		mg/L	0.0001
Chromium	7440-47-3		mg/L	0.001
Copper	7440-50-8		mg/L	0.001
Lead	7439-92-1		mg/L	0.001
Nickel	7440-02-0		mg/L	0.001
Zinc	7440-66-6		mg/L	0.005
Iron	7439-89-6		mg/L	0.05
EK055G: Ammonia as N by Discrete Analyser		ALS EP 300		
Ammonia as N	7664-41-7		mg/L	0.01
EK057G: Nitrite as N by Discrete Analyser		ALS EP 300		
Nitrite as N			mg/L	0.01
EK058G: Nitrate as N by Discrete Analyser		ALS EP 300		
Nitrate as N	14797-55-8		mg/L	0.01
EK059G: NOX as N by Discrete Analyser		ALS EP 300		
Nitrite + Nitrate as N			mg/L	0.01
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser		ALS EP 300		
Total Kjeldahl Nitrogen as N			mg/L	0.1
EK062: Total Nitrogen as N (TKN + NOx)		ALS EP 300		
Total Nitrogen as N			mg/L	0.1
EK067G: Total Phosphorus as P by Discrete Analyser		ALS EP 300		
Total Phosphorus as P			mg/L	0.01
EN055: Ionic Balance		USEPA 3005, 3051, 200.2 and ALS EN/EG 005 and 020		
Total Anions			meq/L	0.01
Total Cations			meq/L	0.01
Ionic Balance			%	0.01

EP008: Chlorophyll a & Pheophytin a		ALS EP 300		
Chlorophyll a			mg/m³	1
EP066: Polychlorinated Biphenyls (PCB)		ALS EP 066 and 301		
Total Polychlorinated biphenyls			µg/L	1
EP066S: PCB Surrogate		ALS EP 066 and 301		
Decachlorobiphenyl	2051-24-3		%	1
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons		ALS EP 075		
Naphthalene	91-20-3		µg/L	1
Acenaphthylene	208-96-8		µg/L	1
Acenaphthene	83-32-9		µg/L	1
Fluorene	86-73-7		µg/L	1
Phenanthrene	85-01-8		µg/L	1
Anthracene	120-12-7		µg/L	1
Fluoranthene	206-44-0		µg/L	1
Pyrene	129-00-0		µg/L	1
Benz(a)anthracene	56-55-3		µg/L	1
Chrysene	218-01-9		µg/L	1
Benzo(b)fluoranthene	205-99-2		µg/L	1
Benzo(k)fluoranthene	207-08-9		µg/L	1
Benzo(a)pyrene	50-32-8		µg/L	0.5
Indeno(1.2.3.cd)pyrene	193-39-5		µg/L	1
Dibenz(a.h)anthracene	53-70-3		µg/L	1
Benzo(g.h.i)perylene	191-24-2		µg/L	1
EP075(SIM)S: Phenolic Compound Surrogates		ALS EP 075		
Phenol-d6	13127-88-3		%	1
2-Chlorophenol-D4	93951-73-6		%	1
2.4.6-Tribromophenol	118-79-6		%	1
EP075(SIM)T: PAH Surrogates		ALS EP 075		
2-Fluorobiphenyl	321-60-8		%	1
Anthracene-d10	1719-06-8		%	1
4-Terphenyl-d14	1718-51-0		%	1
EP080/071: Total Petroleum Hydrocarbons		ALS EP 071		
C6 - C9 Fraction			µg/L	20
C10 - C14 Fraction			µg/L	50
C15 - C28 Fraction			µg/L	100
C29 - C36 Fraction			µg/L	50
C10 - C36 Fraction (sum)			µg/L	50
EP080S: TPH(V)/BTEX Surrogates		ALS EP 071		
1.2-Dichloroethane-D4	17060-07-0		%	2
Toluene-D8	2037-26-5		%	2
4-Bromofluorobenzene	460-00-4		%	2

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Appendix B – Water Quality and Photo Monitoring

SITE WQ1

Wet Season

Upstream

Downstream

Dry Season

Upstream

Downstream

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet	Dry
Temperature	°C	NC	28.8	23.3
pH	pH Unit	6.5-8.0	6.51	8.36
Conductivity	mS/cm	0.814	0.00394	95.4
Dissolved Oxygen	%	85-110	83	75
Turbidity	NTU	50	0.1	0.8
Alkalinity				
Hydroxide Alkalinity as CaCO3	mg/L	NC	<1	<1
Carbonate Alkalinity as CaCO3	mg/L	NC	<1	<1
Bicarbonate Alkalinity as CaCO3	mg/L	NC	92	276
Total Alkalinity as CaCO3	mg/L	NC	92	276
Dissolved Major Anions				
Sulfate as $SO4^{2-}$	mg/L	NC	166	5580
Chloride				
Chloride	µg/L	NC	1100000	49000000
Dissolved Major Cations				
Calcium	mg/L	NC	41	647
Magnesium	mg/L	NC	72	3440
Sodium	mg/L	NC	666	24200
Potassium	mg/L	NC	23	821
Total Metals				
Arsenic	µg/L	24	<1	84
Cadmium	µg/L	370	<0.1	<0.5
Chromium	µg/L	NC	<1	22
Copper	µg/L	1.4	<1	19
Nickel	µg/L	11	3	<5
Lead	µg/L	3.4	<1	23
Zinc	µg/L	8	<5	46
Iron	µg/L	NC	140	2050
Ammonia as N				
Ammonia as N	µg/L	20	40	640
Nitrite as N				
Nitrite as N	µg/L	3	<10	<10
Nitrate as N				
Nitrate as N	µg/L	700	40	50
NOX as N				
Nitrite + Nitrate as N	µg/L	10	40	50
Total Kjeldahl Nitrogen (TKN)				
Total Kjeldahl Nitrogen as N	µg/L	NC	400	11900
Total Nitrogen as N (TKN + NOx)				
Total Nitrogen as N	µg/L	500	400	1200

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet	Dry
Total Phosphorus as P				
Total Phosphorus as P	µg/L	50	<10	2220
Ionic Balance				
Total Anions	meq/L	NC	36.5	1500
Total Cations	meq/L	NC	37.5	1390
Ionic Balance	%	NC	-	4.05
Chlorophyll a & Pheophytin a				
Chlorophyll a	mg/m³	5	1	5
Polychlorinated Biphenyls (PCB)				
Total Polychlorinated biphenyls	µg/L	NC	<1	<1
Polynuclear Aromatic Hydrocarbons				
Naphthalene	µg/L	16	<1	<1
Acenaphthylene	µg/L	NC	<1	<1
Acenaphthene	µg/L	NC	<1	<1
Fluorene	µg/L	NC	<1	<1
Phenanthrene	µg/L	NC	<1	<1
Anthracene	µg/L	NC	<1	<1
Fluoranthene	µg/L	NC	<1	<1
Pyrene	µg/L	NC	<1	<1
Benz(a)anthracene	µg/L	NC	<1	<1
Chrysene	µg/L	NC	<1	<1
Benzo(b)fluoranthene	µg/L	NC	<1	<1
Benzo(k)fluoranthene	µg/L	NC	<1	<1
Benzo(a)pyrene	µg/L	NC	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	µg/L	NC	<1	<1
Dibenz(a.h)anthracene	µg/L	NC	<1	<1
Benzo(g.h.i)perylene	µg/L	NC	<1	<1
Total PAH	µg/L	3	<1	<1
Total Petroleum Hydrocarbons				
C6 - C9 Fraction	µg/L	NC	<20	<20
C10 - C14 Fraction	µg/L		<50	190
C15 - C28 Fraction	µg/L		<100	1740
C29 - C36 Fraction	µg/L		<50	520
C10 - C36 Fraction (sum)	µg/L		<50	2450

SITE WQ2

Wet Season

Upstream

Downstream

Dry Season

Upstream

Downstream

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet	Dry
Temperature	°C	NC	21.9	25.4
pH	pH Unit	6.5-8.0	7.9	8.2
Conductivity	mS/cm	0.814	0.693	6.68
Dissolved Oxygen	%	85-110	82	50
Turbidity	NTU	50	2.9	8.1
Alkalinity				
Hydroxide Alkalinity as CaCO3	mg/L	NC	<1	<1
Carbonate Alkalinity as CaCO3	mg/L	NC	<1	78
Bicarbonate Alkalinity as CaCO3	mg/L	NC	391	768
Total Alkalinity as CaCO3	mg/L	NC	391	847
Dissolved Major Anions				
Sulfate as $SO4^{2-}$	mg/L	NC	23	50
Chloride				
Chloride	µg/L	NC	422000	1660000
Dissolved Major Cations				
Calcium	mg/L	NC	112	40
Magnesium	mg/L	NC	92	269
Sodium	mg/L	NC	129	1010
Potassium	mg/L	NC	1	4
Total Metals				
Arsenic	µg/L	24	<1	2
Cadmium	µg/L	370	<0.1	<0.1
Chromium	µg/L	NC	<1	1
Copper	µg/L	1.4	<1	2
Nickel	µg/L	11	<1	<1
Lead	µg/L	3.4	2	3
Zinc	µg/L	8	<5	5
Iron	µg/L	NC	100	220
Ammonia as N				
Ammonia as N	µg/L	20	20	30
Nitrite as N				
Nitrite as N	µg/L	3	<10	<10
Nitrate as N				
Nitrate as N	µg/L	700	<10	40
NOX as N				
Nitrite + Nitrate as N	µg/L	10	<10	40
Total Kjeldahl Nitrogen (TKN)				
Total Kjeldahl Nitrogen as N	µg/L	NC	<100	700
Total Nitrogen as N (TKN + NOx)				
Total Nitrogen as N	µg/L	500	<100	700

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet	Dry
Total Phosphorus as P				
Total Phosphorus as P	µg/L	50	<10	<10
Ionic Balance				
Total Anions	meq/L	NC	20.2	64.7
Total Cations	meq/L	NC	18.8	68.2
Ionic Balance	%	NC	3.43	2.58
Chlorophyll a & Pheophytin a				
Chlorophyll a	mg/m³	5	<1	2
Polychlorinated Biphenyls (PCB)				
Total Polychlorinated biphenyls	µg/L	NC	<1	<1
Polynuclear Aromatic Hydrocarbons				
Naphthalene	µg/L	16	<1	<1
Acenaphthylene	µg/L	NC	<1	<1
Acenaphthene	µg/L	NC	<1	<1
Fluorene	µg/L	NC	<1	<1
Phenanthrene	µg/L	NC	<1	<1
Anthracene	µg/L	NC	<1	<1
Fluoranthene	µg/L	NC	<1	<1
Pyrene	µg/L	NC	<1	<1
Benz(a)anthracene	µg/L	NC	<1	<1
Chrysene	µg/L	NC	<1	<1
Benzo(b)fluoranthene	µg/L	NC	<1	<1
Benzo(k)fluoranthene	µg/L	NC	<1	<1
Benzo(a)pyrene	µg/L	NC	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	µg/L	NC	<1	<1
Dibenz(a.h)anthracene	µg/L	NC	<1	<1
Benzo(g.h.i)perylene	µg/L	NC	<1	<1
Total PAH	µg/L	3	<1	<1
Total Petroleum Hydrocarbons				
C6 - C9 Fraction	µg/L	NC	<20	<20
C10 - C14 Fraction	µg/L		<50	<50
C15 - C28 Fraction	µg/L		<100	<100
C29 - C36 Fraction	µg/L		<50	<50
C10 - C36 Fraction (sum)	µg/L		<50	<50

SITE WQ3

Wet Season

Upstream

Downstream

Dry Season

Upstream

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet	Dry
Temperature	°C	NC	22	23.7
pH	pH Unit	6.5-8.0	7.9	7.8
Conductivity	mS/cm	0.814	0.678	2.396
Dissolved Oxygen	%	85-110	86	72
Turbidity	NTU	50	4.8	28
Alkalinity				
Hydroxide Alkalinity as CaCO3	mg/L	NC	<1	<1
Carbonate Alkalinity as CaCO3	mg/L	NC	<1	<1
Bicarbonate Alkalinity as CaCO3	mg/L	NC	390	420
Total Alkalinity as CaCO3	mg/L	NC	390	420
Dissolved Major Anions				
Sulfate as $SO4^{2-}$	mg/L	NC	23	28
Chloride				
Chloride	µg/L	NC	422000	467000
Dissolved Major Cations				
Calcium	mg/L	NC	112	115
Magnesium	mg/L	NC	91	112
Sodium	mg/L	NC	127	137
Potassium	mg/L	NC	1	1
Total Metals				
Arsenic	µg/L	24	<1	<1
Cadmium	µg/L	370	<0.1	<0.1
Chromium	µg/L	NC	<1	<1
Copper	µg/L	1.4	<1	1
Nickel	µg/L	11	<1	<1
Lead	µg/L	3.4	<1	<1
Zinc	µg/L	8	8	<5
Iron	µg/L	NC	90	270
Ammonia as N				
Ammonia as N	µg/L	20	30	40
Nitrite as N				
Nitrite as N	µg/L	3	<10	<10
Nitrate as N				
Nitrate as N	µg/L	700	<10	110
NOX as N				
Nitrite + Nitrate as N	µg/L	10	<10	110
Total Kjeldahl Nitrogen (TKN)				
Total Kjeldahl Nitrogen as N	µg/L	NC	<100	<100
Total Nitrogen as N (TKN + NOx)				
Total Nitrogen as N	µg/L	500	<100	100

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet	Dry
Total Phosphorus as P				
Total Phosphorus as P	µg/L	50	<10	<10
Ionic Balance				
Total Anions	meq/L	NC	20.2	22.2
Total Cations	meq/L	NC	18.7	21
Ionic Balance	%	NC	3.91	2.71
Chlorophyll a & Pheophytin a				
Chlorophyll a	mg/m³	5	<1	2
Polychlorinated Biphenyls (PCB)				
Total Polychlorinated biphenyls	µg/L	NC	<1	<1
Polynuclear Aromatic Hydrocarbons				
Naphthalene	µg/L	16	<1	<1
Acenaphthylene	µg/L	NC	<1	<1
Acenaphthene	µg/L	NC	<1	<1
Fluorene	µg/L	NC	<1	<1
Phenanthrene	µg/L	NC	<1	<1
Anthracene	µg/L	NC	<1	<1
Fluoranthene	µg/L	NC	<1	<1
Pyrene	µg/L	NC	<1	<1
Benz(a)anthracene	µg/L	NC	<1	<1
Chrysene	µg/L	NC	<1	<1
Benzo(b)fluoranthene	µg/L	NC	<1	<1
Benzo(k)fluoranthene	µg/L	NC	<1	<1
Benzo(a)pyrene	µg/L	NC	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	µg/L	NC	<1	<1
Dibenz(a.h)anthracene	µg/L	NC	<1	<1
Benzo(g.h.i)perylene	µg/L	NC	<1	<1
Total PAH	µg/L	3	<1	<1
Total Petroleum Hydrocarbons				
C6 - C9 Fraction	µg/L	NC	<20	<20
C10 - C14 Fraction	µg/L		<50	<50
C15 - C28 Fraction	µg/L		<100	<100
C29 - C36 Fraction	µg/L		<50	<50
C10 - C36 Fraction (sum)	µg/L		<50	<50

SITE WQ4

Wet Season

Upstream

Downstream

Dry Season

Upstream

Downstream

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet	Dry
Temperature	°C	NC	25.4	22.2
pH	pH Unit	6.5-8.0	6.2	8.23
Conductivity	mS/cm	0.814	2.156	129
Dissolved Oxygen	%	85-110	83	60
Turbidity	NTU	50	377	13
Alkalinity				
Hydroxide Alkalinity as CaCO3	mg/L	NC	<1	<1
Carbonate Alkalinity as CaCO3	mg/L	NC	<1	<1
Bicarbonate Alkalinity as CaCO3	mg/L	NC	77	339
Total Alkalinity as CaCO3	mg/L	NC	77	339
Dissolved Major Anions				
Sulfate as $SO4^{2-}$	mg/L	NC	3	9260
Chloride				
Chloride	µg/L	NC	39000	70100
Dissolved Major Cations				
Calcium	mg/L	NC	13	860
Magnesium	mg/L	NC	10	5120
Sodium	mg/L	NC	27	34300
Potassium	mg/L	NC	10	1320
Total Metals				
Arsenic	µg/L	24	2	78
Cadmium	µg/L	370	<0.1	<1
Chromium	µg/L	NC	6	61
Copper	µg/L	1.4	5	40
Nickel	µg/L	11	7	10
Lead	µg/L	3.4	3	42
Zinc	µg/L	8	10	64
Iron	µg/L	NC	6.98	4330
Ammonia as N				
Ammonia as N	µg/L	20	20	710
Nitrite as N				
Nitrite as N	µg/L	3	<10	<10
Nitrate as N				
Nitrate as N	µg/L	700	30	80
NOX as N				
Nitrite + Nitrate as N	µg/L	10	30	80
Total Kjeldahl Nitrogen (TKN)				
Total Kjeldahl Nitrogen as N	µg/L	NC	400	130
Total Nitrogen as N (TKN + NOx)				
Total Nitrogen as N	µg/L	500	400	13100

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet	Dry
Total Phosphorus as P				
Total Phosphorus as P	µg/L	50	170	30
Ionic Balance				
Total Anions	meq/L	NC	2.68	2180
Total Cations	meq/L	NC	2.86	1990
Ionic Balance	%	NC	-	4.52
Chlorophyll a & Pheophytin a				
Chlorophyll a	mg/m³	5	2	<1
Polychlorinated Biphenyls (PCB)				
Total Polychlorinated biphenyls	µg/L	NC	<1	<1
Polynuclear Aromatic Hydrocarbons				
Naphthalene	µg/L	16	<1	<1
Acenaphthylene	µg/L	NC	<1	<1
Acenaphthene	µg/L	NC	<1	<1
Fluorene	µg/L	NC	<1	<1
Phenanthrene	µg/L	NC	<1	<1
Anthracene	µg/L	NC	<1	<1
Fluoranthene	µg/L	NC	<1	<1
Pyrene	µg/L	NC	<1	<1
Benz(a)anthracene	µg/L	NC	<1	<1
Chrysene	µg/L	NC	<1	<1
Benzo(b)fluoranthene	µg/L	NC	<1	<1
Benzo(k)fluoranthene	µg/L	NC	<1	<1
Benzo(a)pyrene	µg/L	NC	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	µg/L	NC	<1	<1
Dibenz(a.h)anthracene	µg/L	NC	<1	<1
Benzo(g.h.i)perylene	µg/L	NC	<1	<1
Total PAH	µg/L	3	<1	<1
Total Petroleum Hydrocarbons				
C6 - C9 Fraction	µg/L	NC	<20	<20
C10 - C14 Fraction	µg/L		<50	160
C15 - C28 Fraction	µg/L		<100	1580
C29 - C36 Fraction	µg/L		<50	500
C10 - C36 Fraction (sum)	µg/L		<50	2250

SITE WQ5

Wet Season

Upstream

Downstream

Dry Season

Upstream

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet	Dry
Temperature	°C	NC	28.6	24.6
pH	pH Unit	6.5-8.0	7.22	7.91
Conductivity	mS/cm	0.814	0.02423	157
Dissolved Oxygen	%	85-110	113	45
Turbidity	NTU	50	40.1	11.6
Alkalinity				
Hydroxide Alkalinity as CaCO3	mg/L	NC	<1	<1
Carbonate Alkalinity as CaCO3	mg/L	NC	<1	<1
Bicarbonate Alkalinity as CaCO3	mg/L	NC	56	215
Total Alkalinity as CaCO3	mg/L	NC	56	215
Dissolved Major Anions				
Sulfate as $SO4^{2-}$	mg/L	NC	2,080	11400
Chloride				
Chloride	µg/L	NC	8020	90800
Dissolved Major Cations				
Calcium	mg/L	NC	397	915
Magnesium	mg/L	NC	589	6210
Sodium	mg/L	NC	4,430	45800
Potassium	mg/L	NC	162	3600
Total Metals				
Arsenic	µg/L	24	3	93
Cadmium	µg/L	370	2	<0.1
Chromium	µg/L	NC	1	57
Copper	µg/L	1.4	6	42
Nickel	µg/L	11	20	10
Lead	µg/L	3.4	<1	25
Zinc	µg/L	8	26	52
Iron	µg/L	NC	1680	4780
Ammonia as N				
Ammonia as N	µg/L	20	960	610
Nitrite as N				
Nitrite as N	µg/L	3	<10	<10
Nitrate as N				
Nitrate as N	µg/L	700	100	70
NOX as N				
Nitrite + Nitrate as N	µg/L	10	100	70
Total Kjeldahl Nitrogen (TKN)				
Total Kjeldahl Nitrogen as N	µg/L	NC	3,400	3800
Total Nitrogen as N (TKN + NOx)				
Total Nitrogen as N	µg/L	500	3,500	390

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet	Dry
Total Phosphorus as P				
Total Phosphorus as P	µg/L	50	<10	240
Ionic Balance				
Total Anions	meq/L	NC	271	2800
Total Cations	meq/L	NC	265	2640
Ionic Balance	%	NC	1.07	3.01
Chlorophyll a & Pheophytin a				
Chlorophyll a	mg/m³	5	2	1
Polychlorinated Biphenyls (PCB)				
Total Polychlorinated biphenyls	µg/L	NC	<1	<1
Polynuclear Aromatic Hydrocarbons				
Naphthalene	µg/L	16	<1	<1
Acenaphthylene	µg/L	NC	<1	<1
Acenaphthene	µg/L	NC	<1	<1
Fluorene	µg/L	NC	<1	<1
Phenanthrene	µg/L	NC	<1	<1
Anthracene	µg/L	NC	<1	<1
Fluoranthene	µg/L	NC	<1	<1
Pyrene	µg/L	NC	<1	<1
Benz(a)anthracene	µg/L	NC	<1	<1
Chrysene	µg/L	NC	<1	<1
Benzo(b)fluoranthene	µg/L	NC	<1	<1
Benzo(k)fluoranthene	µg/L	NC	<1	<1
Benzo(a)pyrene	µg/L	NC	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	µg/L	NC	<1	<1
Dibenz(a.h)anthracene	µg/L	NC	<1	<1
Benzo(g.h.i)perylene	µg/L	NC	<1	<1
Total PAH	µg/L	3	<1	<1
Total Petroleum Hydrocarbons				
C6 - C9 Fraction	µg/L	NC	<20	<20
C10 - C14 Fraction	µg/L		<50	60
C15 - C28 Fraction	µg/L		120	300
C29 - C36 Fraction	µg/L		60	90
C10 - C36 Fraction (sum)	µg/L		180	440

SITE WQ6

Wet Season

Upstream

Downstream

Dry Season

Upstream

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet	Dry
Temperature	°C	NC	24.2	25.6
pH	pH Unit	6.5-8.0	7.32	7.85
Conductivity	mS/cm	0.814	0.01624	134
Dissolved Oxygen	%	85-110	82	62
Turbidity	NTU	50	7.1	14.7
Alkalinity				
Hydroxide Alkalinity as CaCO3	mg/L	NC	<1	<1
Carbonate Alkalinity as CaCO3	mg/L	NC	<1	<1
Bicarbonate Alkalinity as CaCO3	mg/L	NC	120	196
Total Alkalinity as CaCO3	mg/L	NC	120	196
Dissolved Major Anions				
Sulfate as $SO4^{2-}$	mg/L	NC	856	10300
Chloride				
Chloride	µg/L	NC	5580	75700
Dissolved Major Cations				
Calcium	mg/L	NC	181	1000
Magnesium	mg/L	NC	366	5140
Sodium	mg/L	NC	2,900	37300
Potassium	mg/L	NC	128	2840
Total Metals				
Arsenic	µg/L	24	8	76
Cadmium	µg/L	370	<0.1	<0.1
Chromium	µg/L	NC	<1	54
Copper	µg/L	1.4	2	37
Nickel	µg/L	11	2	10
Lead	µg/L	3.4	<1	25
Zinc	µg/L	8	7	52
Iron	µg/L	NC	620	4980
Ammonia as N				
Ammonia as N	µg/L	20	50	540
Nitrite as N				
Nitrite as N	µg/L	3	<10	<10
Nitrate as N				
Nitrate as N	µg/L	700	<10	30
NOX as N				
Nitrite + Nitrate as N	µg/L	10	<10	30
Total Kjeldahl Nitrogen (TKN)				
Total Kjeldahl Nitrogen as N	µg/L	NC	1,000	3400
Total Nitrogen as N (TKN + NOx)				
Total Nitrogen as N	µg/L	500	1,000	340

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet	Dry
Total Phosphorus as P				
Total Phosphorus as P	µg/L	50	<10	<10
Ionic Balance				
Total Anions	meq/L	NC	178	2350
Total Cations	meq/L	NC	169	2170
Ionic Balance	%	NC	2.67	4.1
Chlorophyll a & Pheophytin a				
Chlorophyll a	mg/m³	5	<1	3
Polychlorinated Biphenyls (PCB)				
Total Polychlorinated biphenyls	µg/L	NC	<1	<1
Polynuclear Aromatic Hydrocarbons				
Naphthalene	µg/L	16	<1	<1
Acenaphthylene	µg/L	NC	<1	<1
Acenaphthene	µg/L	NC	<1	<1
Fluorene	µg/L	NC	<1	<1
Phenanthrene	µg/L	NC	<1	<1
Anthracene	µg/L	NC	<1	<1
Fluoranthene	µg/L	NC	<1	<1
Pyrene	µg/L	NC	<1	<1
Benz(a)anthracene	µg/L	NC	<1	<1
Chrysene	µg/L	NC	<1	<1
Benzo(b)fluoranthene	µg/L	NC	<1	<1
Benzo(k)fluoranthene	µg/L	NC	<1	<1
Benzo(a)pyrene	µg/L	NC	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	µg/L	NC	<1	<1
Dibenz(a.h)anthracene	µg/L	NC	<1	<1
Benzo(g.h.i)perylene	µg/L	NC	<1	<1
Total PAH	µg/L	3	<1	<1
Total Petroleum Hydrocarbons				
C6 - C9 Fraction	µg/L	NC	<20	<20
C10 - C14 Fraction	µg/L		<50	60
C15 - C28 Fraction	µg/L		<100	280
C29 - C36 Fraction	µg/L		<50	100
C10 - C36 Fraction (sum)	µg/L		<50	450

SITE WQ7

Wet Season

Upstream

Downstream

Dry Season

Upstream

Downstream

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet	Dry
Temperature	°C	NC	23.2	26.1
pH	pH Unit	6.5-8.0	7.4	7.4
Conductivity	mS/cm	0.814	1.549	2.122
Dissolved Oxygen	%	85-110	51	40
Turbidity	NTU	50	1	4.7
Alkalinity				
Hydroxide Alkalinity as CaCO3	mg/L	NC	<1	<1
Carbonate Alkalinity as CaCO3	mg/L	NC	16	<1
Bicarbonate Alkalinity as CaCO3	mg/L	NC	422	488
Total Alkalinity as CaCO3	mg/L	NC	438	488
Dissolved Major Anions				
Sulfate as $SO4^{2-}$	mg/L	NC	15	19
Chloride				
Chloride	µg/L	NC	249	357000
Dissolved Major Cations				
Calcium	mg/L	NC	64	107
Magnesium	mg/L	NC	41	53
Sodium	mg/L	NC	199	216
Potassium	mg/L	NC	1	2
Total Metals				
Arsenic	µg/L	24	<1	1
Cadmium	µg/L	370	<0.1	<0.1
Chromium	µg/L	NC	<1	<1
Copper	µg/L	1.4	<1	1
Nickel	µg/L	11	<1	<1
Lead	µg/L	3.4	<1	<1
Zinc	µg/L	8	<5	5
Iron	µg/L	NC	<50	3200
Ammonia as N				
Ammonia as N	µg/L	20	40	90
Nitrite as N				
Nitrite as N	µg/L	3	10	<10
Nitrate as N				
Nitrate as N	µg/L	700	610	140
NOX as N				
Nitrite + Nitrate as N	µg/L	10	620	140
Total Kjeldahl Nitrogen (TKN)				
Total Kjeldahl Nitrogen as N	µg/L	NC	<100	4000
Total Nitrogen as N (TKN + NOx)				
Total Nitrogen as N	µg/L	500	600	500

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet	Dry
Total Phosphorus as P				
Total Phosphorus as P	µg/L	50	<10	<10
Ionic Balance				
Total Anions	meq/L	NC	16.1	20.2
Total Cations	meq/L	NC	15.2	19.1
Ionic Balance	%	NC	2.7	2.72
Chlorophyll a & Pheophytin a				
Chlorophyll a	mg/m³	5	<1	<1
Polychlorinated Biphenyls (PCB)				
Total Polychlorinated biphenyls	µg/L	NC	<1	<1
Polynuclear Aromatic Hydrocarbons				
Naphthalene	µg/L	16	<1	<1
Acenaphthylene	µg/L	NC	<1	<1
Acenaphthene	µg/L	NC	<1	<1
Fluorene	µg/L	NC	<1	<1
Phenanthrene	µg/L	NC	<1	<1
Anthracene	µg/L	NC	<1	<1
Fluoranthene	µg/L	NC	<1	<1
Pyrene	µg/L	NC	<1	<1
Benz(a)anthracene	µg/L	NC	<1	<1
Chrysene	µg/L	NC	<1	1.1
Benzo(b)fluoranthene	µg/L	NC	<1	1.6
Benzo(k)fluoranthene	µg/L	NC	<1	2.5
Benzo(a)pyrene	µg/L	NC	<0.5	0.7
Indeno(1.2.3.cd)pyrene	µg/L	NC	<1	2.8
Dibenz(a.h)anthracene	µg/L	NC	<1	1.3
Benzo(g.h.i)perylene	µg/L	NC	<1	3.4
Total PAH	µg/L	3	<1	12.77
Total Petroleum Hydrocarbons				
C6 - C9 Fraction	µg/L	NC	<20	<20
C10 - C14 Fraction	µg/L		<50	<50
C15 - C28 Fraction	µg/L		<100	<100
C29 - C36 Fraction	µg/L		<50	<50
C10 - C36 Fraction (sum)	µg/L		<50	<50

SITE WQ8

Wet Season

Upstream

Downstream

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet
Temperature	°C	NC	29.5
pH	pH Unit	6.5-8.0	7.89
Conductivity	mS/cm	0.814	1.36
Dissolved Oxygen	%	85-110	88
Turbidity	NTU	50	0.5
Alkalinity			
Hydroxide Alkalinity as CaCO3	mg/L	NC	<1
Carbonate Alkalinity as CaCO3	mg/L	NC	<1
Bicarbonate Alkalinity as CaCO3	mg/L	NC	187
Total Alkalinity as CaCO3	mg/L	NC	187
Dissolved Major Anions			
Sulfate as $SO4^{2-}$	mg/L	NC	11
Chloride			
Chloride	µg/L	NC	100000
Dissolved Major Cations			
Calcium	mg/L	NC	38
Magnesium	mg/L	NC	21
Sodium	mg/L	NC	70
Potassium	mg/L	NC	2
Total Metals			
Arsenic	µg/L	24	<1
Cadmium	µg/L	370	0.2
Chromium	µg/L	NC	<1
Copper	µg/L	1.4	<1
Nickel	µg/L	11	<1
Lead	µg/L	3.4	<1
Zinc	µg/L	8	<5
Iron	µg/L	NC	<50
Ammonia as N			
Ammonia as N	µg/L	20	20
Nitrite as N			
Nitrite as N	µg/L	3	<10
Nitrate as N			
Nitrate as N	µg/L	700	<10
NOX as N			
Nitrite + Nitrate as N	µg/L	10	<10
Total Kjeldahl Nitrogen (TKN)			

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet
Total Kjeldahl Nitrogen as N	µg/L	NC	20
Total Nitrogen as N (TKN + NOx)			
Total Nitrogen as N	µg/L	500	200
Total Phosphorus as P			
Total Phosphorus as P	µg/L	50	<10
Ionic Balance			
Total Anions	meq/L	NC	6.79
Total Cations	meq/L	NC	6.75
Ionic Balance	%	NC	0.29
Chlorophyll a & Pheophytin a			
Chlorophyll a	mg/m³	5	<1
Polychlorinated Biphenyls (PCB)			
Total Polychlorinated biphenyls	µg/L	NC	<1
Polynuclear Aromatic Hydrocarbons			
Naphthalene	µg/L	16	<1
Acenaphthylene	µg/L	NC	<1
Acenaphthene	µg/L	NC	<1
Fluorene	µg/L	NC	<1
Phenanthrene	µg/L	NC	<1
Anthracene	µg/L	NC	<1
Fluoranthene	µg/L	NC	<1
Pyrene	µg/L	NC	<1
Benz(a)anthracene	µg/L	NC	<1
Chrysene	µg/L	NC	<1
Benzo(b)fluoranthene	µg/L	NC	<1
Benzo(k)fluoranthene	µg/L	NC	<1
Benzo(a)pyrene	µg/L	NC	<0.5
Indeno(1.2.3.cd)pyrene	µg/L	NC	<1
Dibenz(a.h)anthracene	µg/L	NC	<1
Benzo(g.h.i)perylene	µg/L	NC	<1
Total PAH	µg/L	3	<1
Total Petroleum Hydrocarbons			
C6 - C9 Fraction	µg/L	NC	<20
C10 - C14 Fraction	µg/L		<50
C15 - C28 Fraction	µg/L		<100
C29 - C36 Fraction	µg/L		<50
C10 - C36 Fraction (sum)	µg/L		<50

SITE WQ9

Wet Season

Upstream

Downstream

Dry Season

Upstream

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet	Dry
Temperature	°C	NC	29.2	27.7
pH	pH Unit	6.5-8.0	7.55	7.33
Conductivity	mS/cm	0.814	1.0007	1.523
Dissolved Oxygen	%	85-110	93	70
Turbidity	NTU	50	0.7	4.9
Alkalinity				
Hydroxide Alkalinity as CaCO3	mg/L	NC	<1	<1
Carbonate Alkalinity as CaCO3	mg/L	NC	<1	<1
Bicarbonate Alkalinity as CaCO3	mg/L	NC	254	254
Total Alkalinity as CaCO3	mg/L	NC	254	254
Dissolved Major Anions				
Sulfate as $SO4^{2-}$	mg/L	NC	15	12
Chloride				
Chloride	µg/L	NC	138000	275000
Dissolved Major Cations				
Calcium	mg/L	NC	48	55
Magnesium	mg/L	NC	29	33
Sodium	mg/L	NC	96	153
Potassium	mg/L	NC	2	5
Total Metals				
Arsenic	µg/L	24	<1	<1
Cadmium	µg/L	370	<0.1	<0.1
Chromium	µg/L	NC	<1	<1
Copper	µg/L	1.4	<1	<1
Nickel	µg/L	11	<1	<1
Lead	µg/L	3.4	<1	<1
Zinc	µg/L	8	<5	<5
Iron	µg/L	NC	1100	460
Ammonia as N				
Ammonia as N	µg/L	20	10	110
Nitrite as N				
Nitrite as N	µg/L	3	<10	<10
Nitrate as N				
Nitrate as N	µg/L	700	<10	180
NOX as N				
Nitrite + Nitrate as N	µg/L	10	<10	180
Total Kjeldahl Nitrogen (TKN)				
Total Kjeldahl Nitrogen as N	µg/L	NC	<10	300
Total Nitrogen as N (TKN + NOx)				
Total Nitrogen as N	µg/L	500	<100	500

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet	Dry
Total Phosphorus as P				
Total Phosphorus as P	µg/L	50	<10	40
Ionic Balance				
Total Anions	meq/L	NC	9.26	13.1
Total Cations	meq/L	NC	9.02	12.3
Ionic Balance	%	NC	1.35	3.16
Chlorophyll a & Pheophytin a				
Chlorophyll a	mg/m³	5	<1	2
Polychlorinated Biphenyls (PCB)				
Total Polychlorinated biphenyls	µg/L	NC	<1	<1
Polynuclear Aromatic Hydrocarbons				
Naphthalene	µg/L	16	<1	<1
Acenaphthylene	µg/L	NC	<1	<1
Acenaphthene	µg/L	NC	<1	<1
Fluorene	µg/L	NC	<1	<1
Phenanthrene	µg/L	NC	<1	<1
Anthracene	µg/L	NC	<1	<1
Fluoranthene	µg/L	NC	<1	<1
Pyrene	µg/L	NC	<1	<1
Benz(a)anthracene	µg/L	NC	<1	<1
Chrysene	µg/L	NC	<1	<1
Benzo(b)fluoranthene	µg/L	NC	<1	<1
Benzo(k)fluoranthene	µg/L	NC	<1	<1
Benzo(a)pyrene	µg/L	NC	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	µg/L	NC	<1	<1
Dibenz(a.h)anthracene	µg/L	NC	<1	<1
Benzo(g.h.i)perylene	µg/L	NC	<1	<1
Total PAH	µg/L	3	<1	<1
Total Petroleum Hydrocarbons				
C6 - C9 Fraction	µg/L	NC	<20	<20
C10 - C14 Fraction	µg/L		<50	<50
C15 - C28 Fraction	µg/L		<100	<100
C29 - C36 Fraction	µg/L		<50	<50
C10 - C36 Fraction (sum)	µg/L		<50	<50

SITE WQ10

Wet Season

Upstream

Downstream

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet
Temperature	°C	NC	23
pH	pH Unit	6.5-8.0	7.8
Conductivity	mS/cm	0.814	0.905
Dissolved Oxygen	%	85-110	91
Turbidity	NTU	50	8.1
Non Marine - Estimated TDS Salinity			
Total Dissolved Solids (est.)	mg/L	NC	0.383
Suspended Solids			
Suspended Solids (SS)	mg/L	10	249
Alkalinity			
Hydroxide Alkalinity as CaCO3	mg/L	NC	<1
Carbonate Alkalinity as CaCO3	mg/L	NC	11
Bicarbonate Alkalinity as CaCO3	mg/L	NC	295
Total Alkalinity as CaCO3	mg/L	NC	306
Dissolved Major Anions			
Sulfate as $SO4^{2-}$	mg/L	NC	6
Chloride			
Chloride	µg/L	NC	84000
Dissolved Major Cations			
Calcium	mg/L	NC	44
Magnesium	mg/L	NC	28
Sodium	mg/L	NC	91
Potassium	mg/L	NC	3
Total Metals			
Arsenic	µg/L	24	<1
Cadmium	µg/L	370	<0.1
Chromium	µg/L	NC	<1
Copper	µg/L	1.4	<1
Nickel	µg/L	11	<1
Lead	µg/L	3.4	<1
Zinc	µg/L	8	<5
Iron	µg/L	NC	<50
Ammonia as N			
Ammonia as N	µg/L	20	30
Nitrite as N			
Nitrite as N	µg/L	3	<10
Nitrate as N			
Nitrate as N	µg/L	700	10
NOX as N			
Nitrite + Nitrate as N	µg/L	10	10

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet
Total Kjeldahl Nitrogen (TKN)			
Total Kjeldahl Nitrogen as N	µg/L	NC	20
Total Nitrogen as N (TKN + NOx)			
Total Nitrogen as N	µg/L	500	200
Total Phosphorus as P			
Total Phosphorus as P	µg/L	50	160
Ionic Balance			
Total Anions	meq/L	NC	8.59
Total Cations	meq/L	NC	8.58
Ionic Balance	%	NC	0.07
Chlorophyll a & Pheophytin a			
Chlorophyll a	mg/m³	5	<1
Polychlorinated Biphenyls (PCB)			
Total Polychlorinated biphenyls	µg/L	NC	<1
Polynuclear Aromatic Hydrocarbons			
Naphthalene	µg/L	16	<1
Acenaphthylene	µg/L	NC	<1
Acenaphthene	µg/L	NC	<1
Fluorene	µg/L	NC	<1
Phenanthrene	µg/L	NC	<1
Anthracene	µg/L	NC	<1
Fluoranthene	µg/L	NC	<1
Pyrene	µg/L	NC	<1
Benz(a)anthracene	µg/L	NC	<1
Chrysene	µg/L	NC	<1
Benzo(b)fluoranthene	µg/L	NC	<1
Benzo(k)fluoranthene	µg/L	NC	<1
Benzo(a)pyrene	µg/L	NC	<0.5
Indeno(1.2.3.cd)pyrene	µg/L	NC	<1
Dibenz(a.h)anthracene	µg/L	NC	<1
Benzo(g.h.i)perylene	µg/L	NC	<1
Total PAH	µg/L	3	<1
Total Petroleum Hydrocarbons			
C6 - C9 Fraction	µg/L	NC	<20
C10 - C14 Fraction	µg/L		<50
C15 - C28 Fraction	µg/L		<100
C29 - C36 Fraction	µg/L		<50
C10 - C36 Fraction (sum)	µg/L		<50

SITE WQ11

Wet Season

Upstream

Downstream

Dry Season

Upstream

Downstream

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet	Dry
Temperature	°C	NC	22.9	29.8
pH	pH Unit	6.5-8.0	7.7	7.3
Conductivity	mS/cm	0.814	0.81	1.689
Dissolved Oxygen	%	85-110	76	48
Turbidity	NTU	50	1.4	5.9
Non Marine - Estimated TDS Salinity				
Total Dissolved Solids (est.)	mg/L	NC	0.493	
Suspended Solids				-
Suspended Solids (SS)	mg/L	10	320	
Alkalinity				-
Hydroxide Alkalinity as CaCO3	mg/L	NC	<1	<1
Carbonate Alkalinity as CaCO3	mg/L	NC	<1	<1
Bicarbonate Alkalinity as CaCO3	mg/L	NC	189	609
Total Alkalinity as CaCO3	mg/L	NC	189	609
Dissolved Major Anions				
Sulfate as $SO4^{2-}$	mg/L	NC	1560	12
Chloride				
Chloride	µg/L	NC	380000	132000
Dissolved Major Cations				
Calcium	mg/L	NC	181	84
Magnesium	mg/L	NC	366	64
Sodium	mg/L	NC	254	139
Potassium	mg/L	NC	1	2
Total Metals				
Arsenic	µg/L	24	<1	<1
Cadmium	µg/L	370	<0.1	<0.1
Chromium	µg/L	NC	<1	<1
Copper	µg/L	1.4	1	<1
Nickel	µg/L	11	<1	<1
Lead	µg/L	3.4	<1	<1
Zinc	µg/L	8	13	<5
Iron	µg/L	NC	500	670
Ammonia as N				
Ammonia as N	µg/L	20	30	30
Nitrite as N				
Nitrite as N	µg/L	3	50	<10
Nitrate as N				
Nitrate as N	µg/L	700	200	50
NOX as N				
Nitrite + Nitrate as N	µg/L	10	200	50

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet	Dry
Total Kjeldahl Nitrogen (TKN)				
Total Kjeldahl Nitrogen as N	µg/L	NC	100	200
Total Nitrogen as N (TKN + NOx)				
Total Nitrogen as N	µg/L	500	200	300
Total Phosphorus as P				
Total Phosphorus as P	µg/L	50	100	270
Ionic Balance				
Total Anions	meq/L	NC	178	16.1
Total Cations	meq/L	NC	169	15.6
Ionic Balance	%	NC	2.67	1.84
Chlorophyll a & Pheophytin a				
Chlorophyll a	mg/m³	5	<1	2
Polychlorinated Biphenyls (PCB)				
Total Polychlorinated biphenyls	µg/L	NC	<1	<1
Polynuclear Aromatic Hydrocarbons				
Naphthalene	µg/L	16	<1	<1
Acenaphthylene	µg/L	NC	<1	<1
Acenaphthene	µg/L	NC	<1	<1
Fluorene	µg/L	NC	<1	<1
Phenanthrene	µg/L	NC	<1	<1
Anthracene	µg/L	NC	<1	<1
Fluoranthene	µg/L	NC	<1	<1
Pyrene	µg/L	NC	<1	<1
Benz(a)anthracene	µg/L	NC	<1	<1
Chrysene	µg/L	NC	<1	<1
Benzo(b)fluoranthene	µg/L	NC	<1	<1
Benzo(k)fluoranthene	µg/L	NC	<1	<1
Benzo(a)pyrene	µg/L	NC	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	µg/L	NC	<1	<1
Dibenz(a.h)anthracene	µg/L	NC	<1	<1
Benzo(g.h.i)perylene	µg/L	NC	<1	<1
Total PAH	µg/L	3	<1	<1
Total Petroleum Hydrocarbons				
C6 - C9 Fraction	µg/L	NC	<20	<20
C10 - C14 Fraction	µg/L		<50	<50
C15 - C28 Fraction	µg/L		<100	<100
C29 - C36 Fraction	µg/L		<50	<50
C10 - C36 Fraction (sum)	µg/L		<50	<50

SITE WQ12

Wet Season

Upstream

Downstream

Dry Season

Upstream

Downstream

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet	Dry
Temperature	°C	NC	29.8	25
pH	pH Unit	6.5-8.0	7.6	7.8
Conductivity	mS/cm	0.814	1.149	0.545
Dissolved Oxygen	%	85-110	128	76
Turbidity	NTU	50	11.2	27.9
Non Marine - Estimated TDS Salinity				
Total Dissolved Solids (est.)	mg/L	NC	-	-
Suspended Solids				
Suspended Solids (SS)	mg/L	10	-	-
Alkalinity				
Hydroxide Alkalinity as CaCO3	mg/L	NC	<1	<1
Carbonate Alkalinity as CaCO3	mg/L	NC	<1	<1
Bicarbonate Alkalinity as CaCO3	mg/L	NC	375	173
Total Alkalinity as CaCO3	mg/L	NC	375	173
Dissolved Major Anions				
Sulfate as $SO4^{2-}$	mg/L	NC	17	15
Chloride				
Chloride	µg/L	NC	117000	42000
Dissolved Major Cations				
Calcium	mg/L	NC	59	30
Magnesium	mg/L	NC	41	17
Sodium	mg/L	NC	112	48
Potassium	mg/L	NC	3	3
Total Metals				
Arsenic	µg/L	24	<1	1
Cadmium	µg/L	370	<0.1	<0.1
Chromium	µg/L	NC	2	1
Copper	µg/L	1.4	4	<1
Nickel	µg/L	11	2	<1
Lead	µg/L	3.4	<1	<1
Zinc	µg/L	8	<5	<5
Iron	µg/L	NC	2400	170
Ammonia as N				
Ammonia as N	µg/L	20	50	30
Nitrite as N				
Nitrite as N	µg/L	3	<10	<10
Nitrate as N				
Nitrate as N	µg/L	700	<10	30
NOX as N				
Nitrite + Nitrate as N	µg/L	10	<10	30

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet	Dry
Total Kjeldahl Nitrogen (TKN)				
Total Kjeldahl Nitrogen as N	µg/L	NC	200	<100
Total Nitrogen as N (TKN + NOx)				
Total Nitrogen as N	µg/L	500	200	<100
Total Phosphorus as P				
Total Phosphorus as P	µg/L	50	140	100
Ionic Balance				
Total Anions	meq/L	NC	11.2	4.95
Total Cations	meq/L	NC	11.3	5.06
Ionic Balance	%	NC	0.48	1.13
Chlorophyll a & Pheophytin a				
Chlorophyll a	mg/m³	5	3	<1
Polychlorinated Biphenyls (PCB)				
Total Polychlorinated biphenyls	µg/L	NC	<1	<1
Polynuclear Aromatic Hydrocarbons				
Naphthalene	µg/L	16	<1	<1
Acenaphthylene	µg/L	NC	<1	<1
Acenaphthene	µg/L	NC	<1	<1
Fluorene	µg/L	NC	<1	<1
Phenanthrene	µg/L	NC	<1	<1
Anthracene	µg/L	NC	<1	<1
Fluoranthene	µg/L	NC	<1	<1
Pyrene	µg/L	NC	<1	<1
Benz(a)anthracene	µg/L	NC	<1	<1
Chrysene	µg/L	NC	<1	<1
Benzo(b)fluoranthene	µg/L	NC	<1	<1
Benzo(k)fluoranthene	µg/L	NC	<1	<1
Benzo(a)pyrene	µg/L	NC	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	µg/L	NC	<1	<1
Dibenz(a.h)anthracene	µg/L	NC	<1	<1
Benzo(g.h.i)perylene	µg/L	NC	<1	<1
Total PAH	µg/L	3	<1	<1
Total Petroleum Hydrocarbons				
C6 - C9 Fraction	µg/L	NC	<20	<20
C10 - C14 Fraction	µg/L		<50	<50
C15 - C28 Fraction	µg/L		<100	<100
C29 - C36 Fraction	µg/L		<50	<50
C10 - C36 Fraction (sum)	µg/L		<50	<50

SITE WQ13

Wet Season

Upstream

Downstream

Dry Season

Upstream

Downstream

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet	Dry
Temperature	°C	NC	29.8	25.9
pH	pH Unit	6.5-8.0	7.6	7.71
Conductivity	mS/cm	0.814	1.289	0.502
Dissolved Oxygen	%	85-110	59	107
Turbidity	NTU	50	11.2	1.9
Non Marine - Estimated TDS Salinity				
Total Dissolved Solids (est.)	mg/L	NC	-	-
Suspended Solids				
Suspended Solids (SS)	mg/L	10	-	-
Alkalinity				
Hydroxide Alkalinity as CaCO3	mg/L	NC	<1	<1
Carbonate Alkalinity as CaCO3	mg/L	NC	<1	<1
Bicarbonate Alkalinity as CaCO3	mg/L	NC	450	139
Total Alkalinity as CaCO3	mg/L	NC	450	139
Dissolved Major Anions				
Sulfate as $SO4^{2-}$	mg/L	NC	30	28
Chloride				
Chloride	µg/L	NC	119000	35000
Dissolved Major Cations				
Calcium	mg/L	NC	91	32
Magnesium	mg/L	NC	48	15
Sodium	mg/L	NC	101	37
Potassium	mg/L	NC	4	3
Total Metals				
Arsenic	µg/L	24	<1	2
Cadmium	µg/L	370	<0.1	<0.1
Chromium	µg/L	NC	<1	<1
Copper	µg/L	1.4	<1	<1
Nickel	µg/L	11	<1	<1
Lead	µg/L	3.4	<1	<1
Zinc	µg/L	8	<5	<5
Iron	µg/L	NC	<50	160
Ammonia as N				
Ammonia as N	µg/L	20	40	20
Nitrite as N				
Nitrite as N	µg/L	3	<10	<10
Nitrate as N				
Nitrate as N	µg/L	700	<10	50
NOX as N				
Nitrite + Nitrate as N	µg/L	10	<10	50

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet	Dry
Total Kjeldahl Nitrogen (TKN)				
Total Kjeldahl Nitrogen as N	µg/L	NC	100	200
Total Nitrogen as N (TKN + NOx)				
Total Nitrogen as N	µg/L	500	100	300
Total Phosphorus as P				
Total Phosphorus as P	µg/L	50	130	<10
Ionic Balance				
Total Anions	meq/L	NC	13	4.35
Total Cations	meq/L	NC	13	4.52
Ionic Balance	%	NC	0.05	1.91
Chlorophyll a & Pheophytin a				
Chlorophyll a	mg/m³	5	<1	<1
Polychlorinated Biphenyls (PCB)				
Total Polychlorinated biphenyls	µg/L	NC	<1	<1
Polynuclear Aromatic Hydrocarbons				
Naphthalene	µg/L	16	<1	<1
Acenaphthylene	µg/L	NC	<1	<1
Acenaphthene	µg/L	NC	<1	<1
Fluorene	µg/L	NC	<1	<1
Phenanthrene	µg/L	NC	<1	<1
Anthracene	µg/L	NC	<1	<1
Fluoranthene	µg/L	NC	<1	<1
Pyrene	µg/L	NC	<1	<1
Benz(a)anthracene	µg/L	NC	<1	<1
Chrysene	µg/L	NC	<1	<1
Benzo(b)fluoranthene	µg/L	NC	<1	<1
Benzo(k)fluoranthene	µg/L	NC	<1	<1
Benzo(a)pyrene	µg/L	NC	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	µg/L	NC	<1	<1
Dibenz(a.h)anthracene	µg/L	NC	<1	<1
Benzo(g.h.i)perylene	µg/L	NC	<1	<1
Total PAH	µg/L	3	<1	<1
Total Petroleum Hydrocarbons				
C6 - C9 Fraction	µg/L	NC	<20	<20
C10 - C14 Fraction	µg/L		<50	<50
C15 - C28 Fraction	µg/L		<100	<100
C29 - C36 Fraction	µg/L		<50	<50
C10 - C36 Fraction (sum)	µg/L		<50	<50

SITE WQ14

Wet Season

Upstream

Downstream

Dry Season

Upstream

Downstream

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet	Dry
Temperature	°C	NC	29.8	28.6
pH	pH Unit	6.5-8.0	7.28	8.36
Conductivity	mS/cm	0.814	0.00278	7.8
Dissolved Oxygen	%	85-110	90	55
Turbidity	NTU	50	11.2	19.5
Non Marine - Estimated TDS Salinity				
Total Dissolved Solids (est.)	mg/L	NC	-	-
Suspended Solids				
Suspended Solids (SS)	mg/L	10	-	-
Alkalinity				
Hydroxide Alkalinity as CaCO3	mg/L	NC	<1	<1
Carbonate Alkalinity as CaCO3	mg/L	NC	<1	<1
Bicarbonate Alkalinity as CaCO3	mg/L	NC	234	208
Total Alkalinity as CaCO3	mg/L	NC	234	208
Dissolved Major Anions				
Sulfate as $SO4^{2-}$	mg/L	NC	831	3080
Chloride				
Chloride	µg/L	NC	324000	1040000
Dissolved Major Cations				
Calcium	mg/L	NC	346	126
Magnesium	mg/L	NC	428	121
Sodium	mg/L	NC	1080	333
Potassium	mg/L	NC	18	6
Total Metals				
Arsenic	µg/L	24	1	<1
Cadmium	µg/L	370	<0.1	<0.1
Chromium	µg/L	NC	2	<1
Copper	µg/L	1.4	3	1
Nickel	µg/L	11	<1	4
Lead	µg/L	3.4	6	<1
Zinc	µg/L	8	<5	<5
Iron	µg/L	NC	440	780
Ammonia as N				
Ammonia as N	µg/L	20	30	10
Nitrite as N				
Nitrite as N	µg/L	3	<10	10
Nitrate as N				
Nitrate as N	µg/L	700	40	20
NOX as N				
Nitrite + Nitrate as N	µg/L	10	40	30

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet	Dry
Total Kjeldahl Nitrogen (TKN)				
Total Kjeldahl Nitrogen as N	µg/L	NC	<100	<100
Total Nitrogen as N (TKN + NOx)				
Total Nitrogen as N	µg/L	500	<100	<100
Total Phosphorus as P				
Total Phosphorus as P	µg/L	50	<10	<10
Ionic Balance				
Total Anions	meq/L	NC	98.2	30.6
Total Cations	meq/L	NC	99.8	30.9
Ionic Balance	%	NC	0.78	0.51
Chlorophyll a & Pheophytin a				
Chlorophyll a	mg/m³	5	<1	<1
Polychlorinated Biphenyls (PCB)				
Total Polychlorinated biphenyls	µg/L	NC	<1	<1
Polynuclear Aromatic Hydrocarbons				
Naphthalene	µg/L	16	<1	<1
Acenaphthylene	µg/L	NC	<1	<1
Acenaphthene	µg/L	NC	<1	<1
Fluorene	µg/L	NC	<1	<1
Phenanthrene	µg/L	NC	<1	<1
Anthracene	µg/L	NC	<1	<1
Fluoranthene	µg/L	NC	<1	<1
Pyrene	µg/L	NC	<1	<1
Benz(a)anthracene	µg/L	NC	<1	<1
Chrysene	µg/L	NC	<1	<1
Benzo(b)fluoranthene	µg/L	NC	<1	<1
Benzo(k)fluoranthene	µg/L	NC	<1	<1
Benzo(a)pyrene	µg/L	NC	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	µg/L	NC	<1	<1
Dibenz(a.h)anthracene	µg/L	NC	<1	<1
Benzo(g.h.i)perylene	µg/L	NC	<1	<1
Total PAH	µg/L	3	<1	<1
Total Petroleum Hydrocarbons				
C6 - C9 Fraction	µg/L	NC	<20	<20
C10 - C14 Fraction	µg/L		<50	<50
C15 - C28 Fraction	µg/L		<100	<100
C29 - C36 Fraction	µg/L		<50	<50
C10 - C36 Fraction (sum)	µg/L		<50	<50

SITE WQ15

Wet Season

Upstream

Downstream

Dry Season

Upstream

Downstream

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet	Dry
Temperature	°C	NC	31.7	29.4
pH	pH Unit	6.5-8.0	7.37	8.33
Conductivity	mS/cm	0.814	0.00317	0.695
Dissolved Oxygen	%	85-110	80	81
Turbidity	NTU	50	4.5	4.7
Non Marine - Estimated TDS Salinity				
Total Dissolved Solids (est.)	mg/L	NC	-	-
Suspended Solids				
Suspended Solids (SS)	mg/L	10	-	-
Alkalinity				
Hydroxide Alkalinity as CaCO3	mg/L	NC	<1	<1
Carbonate Alkalinity as CaCO3	mg/L	NC	<1	22
Bicarbonate Alkalinity as CaCO3	mg/L	NC	112	141
Total Alkalinity as CaCO3	mg/L	NC	112	163
Dissolved Major Anions				
Sulfate as $SO4^{2-}$	mg/L	NC	6	34
Chloride				
Chloride	µg/L	NC	20000	51000
Dissolved Major Cations				
Calcium	mg/L	NC	22	26
Magnesium	mg/L	NC	9	23
Sodium	mg/L	NC	24	50
Potassium	mg/L	NC	1	3
Total Metals				
Arsenic	µg/L	24	<1	1
Cadmium	µg/L	370	<0.1	<0.1
Chromium	µg/L	NC	<1	<1
Copper	µg/L	1.4	<1	2
Nickel	µg/L	11	<1	<1
Lead	µg/L	3.4	<1	<1
Zinc	µg/L	8	<5	<5
Iron	µg/L	NC	2400	100
Ammonia as N				
Ammonia as N	µg/L	20	<10	40
Nitrite as N				
Nitrite as N	µg/L	3	<10	<10
Nitrate as N				
Nitrate as N	µg/L	700	30	120
NOX as N				
Nitrite + Nitrate as N	µg/L	10	30	120

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet	Dry
Total Kjeldahl Nitrogen (TKN)				
Total Kjeldahl Nitrogen as N	µg/L	NC	<100	300
Total Nitrogen as N (TKN + NOx)				
Total Nitrogen as N	µg/L	500	<100	400
Total Phosphorus as P				
Total Phosphorus as P	µg/L	50	<10	120
Ionic Balance				
Total Anions	meq/L	NC	2.94	5.42
Total Cations	meq/L	NC	2.96	5.42
Ionic Balance	%	NC	-	0.06
Chlorophyll a & Pheophytin a				
Chlorophyll a	mg/m³	5	<1	<1
Polychlorinated Biphenyls (PCB)				
Total Polychlorinated biphenyls	µg/L	NC	<1	<1
Polynuclear Aromatic Hydrocarbons				
Naphthalene	µg/L	16	<1	<1
Acenaphthylene	µg/L	NC	<1	<1
Acenaphthene	µg/L	NC	<1	<1
Fluorene	µg/L	NC	<1	<1
Phenanthrene	µg/L	NC	<1	<1
Anthracene	µg/L	NC	<1	<1
Fluoranthene	µg/L	NC	<1	<1
Pyrene	µg/L	NC	<1	<1
Benz(a)anthracene	µg/L	NC	<1	<1
Chrysene	µg/L	NC	<1	<1
Benzo(b)fluoranthene	µg/L	NC	<1	<1
Benzo(k)fluoranthene	µg/L	NC	<1	<1
Benzo(a)pyrene	µg/L	NC	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	µg/L	NC	<1	<1
Dibenz(a.h)anthracene	µg/L	NC	<1	<1
Benzo(g.h.i)perylene	µg/L	NC	<1	<1
Total PAH	µg/L	3	<1	<1
Total Petroleum Hydrocarbons				
C6 - C9 Fraction	µg/L	NC	<20	<20
C10 - C14 Fraction	µg/L		<50	<50
C15 - C28 Fraction	µg/L		<100	<100
C29 - C36 Fraction	µg/L		<50	<50
C10 - C36 Fraction (sum)	µg/L		<50	<50

SITE WQ16

Wet Season

Upstream

Downstream

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet	Dry
Temperature	°C	NC	32.7	23.1
pH	pH Unit	6.5-8.0	7.48	7.1
Conductivity	mS/cm	0.814	1.222	1.822
Dissolved Oxygen	%	85-110	80	75
Turbidity	NTU	50	4.3	47.9
Non Marine - Estimated TDS Salinity				
Total Dissolved Solids (est.)	mg/L	NC	-	-
Suspended Solids				
Suspended Solids (SS)	mg/L	10	-	-
Alkalinity				
Hydroxide Alkalinity as CaCO3	mg/L	NC	<1	<1
Carbonate Alkalinity as CaCO3	mg/L	NC	<1	9
Bicarbonate Alkalinity as CaCO3	mg/L	NC	77	233
Total Alkalinity as CaCO3	mg/L	NC	77	242
Dissolved Major Anions				
Sulfate as $SO4^{2-}$	mg/L	NC	3	136
Chloride				
Chloride	µg/L	NC	39000	299000
Dissolved Major Cations				
Calcium	mg/L	NC	13	54
Magnesium	mg/L	NC	10	52
Sodium	mg/L	NC	27	195
Potassium	mg/L	NC	10	4
Total Metals				
Arsenic	µg/L	24	2	2
Cadmium	µg/L	370	<0.1	<0.1
Chromium	µg/L	NC	6	<1
Copper	µg/L	1.4	5	1
Nickel	µg/L	11	7	<1
Lead	µg/L	3.4	3	1
Zinc	µg/L	8	10	<5
Iron	µg/L	NC	6980	180
Ammonia as N				
Ammonia as N	µg/L	20	20	30
Nitrite as N				
Nitrite as N	µg/L	3	<10	<10
Nitrate as N				
Nitrate as N	µg/L	700	30	30
NOX as N				
Nitrite + Nitrate as N	µg/L	10	30	30

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet	Dry
Total Kjeldahl Nitrogen (TKN)				
Total Kjeldahl Nitrogen as N	µg/L	NC	400	200
Total Nitrogen as N (TKN + NOx)				
Total Nitrogen as N	µg/L	500	400	200
Total Phosphorus as P				
Total Phosphorus as P	µg/L	50	170	<10
Ionic Balance				
Total Anions	meq/L	NC	2.68	16.1
Total Cations	meq/L	NC	2.86	15.5
Ionic Balance	%	NC	-	1.89
Chlorophyll a & Pheophytin a				
Chlorophyll a	mg/m³	5	2	<1
Polychlorinated Biphenyls (PCB)				
Total Polychlorinated biphenyls	µg/L	NC	<1	<1
Polynuclear Aromatic Hydrocarbons				
Naphthalene	µg/L	16	<1	<1
Acenaphthylene	µg/L	NC	<1	<1
Acenaphthene	µg/L	NC	<1	<1
Fluorene	µg/L	NC	<1	<1
Phenanthrene	µg/L	NC	<1	<1
Anthracene	µg/L	NC	<1	<1
Fluoranthene	µg/L	NC	<1	<1
Pyrene	µg/L	NC	<1	<1
Benz(a)anthracene	µg/L	NC	<1	<1
Chrysene	µg/L	NC	<1	<1
Benzo(b)fluoranthene	µg/L	NC	<1	<1
Benzo(k)fluoranthene	µg/L	NC	<1	<1
Benzo(a)pyrene	µg/L	NC	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	µg/L	NC	<1	<1
Dibenz(a.h)anthracene	µg/L	NC	<1	<1
Benzo(g.h.i)perylene	µg/L	NC	<1	<1
Total PAH	µg/L	3	<1	<1
Total Petroleum Hydrocarbons				
C6 - C9 Fraction	µg/L	NC	<20	<20
C10 - C14 Fraction	µg/L		<50	<50
C15 - C28 Fraction	µg/L		<100	<100
C29 - C36 Fraction	µg/L		<50	<50
C10 - C36 Fraction (sum)	µg/L		<50	<50

SITE WQ17

Wet Season

Upstream

Downstream

Dry Season

Upstream

Downstream

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet	Dry
Temperature	°C	NC	30.8	28.9
pH	pH Unit	6.5-8.0	6.99	8.06
Conductivity	mS/cm	0.814	0.508	0.947
Dissolved Oxygen	%	85-110	58	55
Turbidity	NTU	50	5.68	43.2
Non Marine - Estimated TDS Salinity				
Total Dissolved Solids (est.)	mg/L	NC	-	-
Suspended Solids				
Suspended Solids (SS)	mg/L	10	-	-
Alkalinity				
Hydroxide Alkalinity as CaCO3	mg/L	NC	<1	<1
Carbonate Alkalinity as CaCO3	mg/L	NC	<1	10
Bicarbonate Alkalinity as CaCO3	mg/L	NC	107	208
Total Alkalinity as CaCO3	mg/L	NC	107	218
Dissolved Major Anions				
Sulfate as $SO4^{2-}$	mg/L	NC	6	33
Chloride				
Chloride	µg/L	NC	27000	106000
Dissolved Major Cations				
Calcium	mg/L	NC	24	43
Magnesium	mg/L	NC	9	31
Sodium	mg/L	NC	25	71
Potassium	mg/L	NC	1	7
Total Metals				
Arsenic	µg/L	24	<1	2
Cadmium	µg/L	370	<0.1	<0.1
Chromium	µg/L	NC	<1	<1
Copper	µg/L	1.4	<1	2
Nickel	µg/L	11	<1	<1
Lead	µg/L	3.4	<1	2
Zinc	µg/L	8	<5	<5
Iron	µg/L	NC	3600	330
Ammonia as N				
Ammonia as N	µg/L	20	20	30
Nitrite as N				
Nitrite as N	µg/L	3	<10	<10
Nitrate as N				
Nitrate as N	µg/L	700	<10	40
NOX as N				

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet	Dry
Nitrite + Nitrate as N	µg/L	10	<10	40
Total Kjeldahl Nitrogen (TKN)				
Total Kjeldahl Nitrogen as N	µg/L	NC	<100	400
Total Nitrogen as N (TKN + NOx)				
Total Nitrogen as N	µg/L	500	<100	400
Total Phosphorus as P				
Total Phosphorus as P	µg/L	50	<10	70
Ionic Balance				
Total Anions	meq/L	NC	3.03	8.03
Total Cations	meq/L	NC	3.07	7.99
Ionic Balance	%	NC	0.7	0.24
Chlorophyll a & Pheophytin a				
Chlorophyll a	mg/m³	5	<1	12
Polychlorinated Biphenyls (PCB)				
Total Polychlorinated biphenyls	µg/L	NC	<1	<1
Polynuclear Aromatic Hydrocarbons				
Naphthalene	µg/L	16	<1	<1
Acenaphthylene	µg/L	NC	<1	<1
Acenaphthene	µg/L	NC	<1	<1
Fluorene	µg/L	NC	<1	<1
Phenanthrene	µg/L	NC	<1	<1
Anthracene	µg/L	NC	<1	<1
Fluoranthene	µg/L	NC	<1	<1
Pyrene	µg/L	NC	<1	<1
Benz(a)anthracene	µg/L	NC	<1	<1
Chrysene	µg/L	NC	<1	<1
Benzo(b)fluoranthene	µg/L	NC	<1	<1
Benzo(k)fluoranthene	µg/L	NC	<1	<1
Benzo(a)pyrene	µg/L	NC	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	µg/L	NC	<1	<1
Dibenz(a.h)anthracene	µg/L	NC	<1	<1
Benzo(g.h.i)perylene	µg/L	NC	<1	<1
Total PAH	µg/L	3	<1	<1
Total Petroleum Hydrocarbons				
C6 - C9 Fraction	µg/L	NC	<20	<20
C10 - C14 Fraction	µg/L		<50	<50
C15 - C28 Fraction	µg/L		<100	<100
C29 - C36 Fraction	µg/L		<50	<50
C10 - C36 Fraction (sum)	µg/L		<50	<50

SITE WQ18

Wet Season

Upstream

Downstream

Dry Season

Upstream

Downstream

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet	Dry
Temperature	°C	NC	30.6	28.1
pH	pH Unit	6.5-8.0	6.38	7.79
Conductivity	mS/cm	0.814	0.302	0.515
Dissolved Oxygen	%	85-110	62	75
Turbidity	NTU	50	3.8	3.2
Non Marine - Estimated TDS Salinity				
Total Dissolved Solids (est.)	mg/L	NC	-	-
Suspended Solids				
Suspended Solids (SS)	mg/L	10	-	-
Alkalinity				
Hydroxide Alkalinity as CaCO3	mg/L	NC	<1	<1
Carbonate Alkalinity as CaCO3	mg/L	NC	<1	<1
Bicarbonate Alkalinity as CaCO3	mg/L	NC	101	140
Total Alkalinity as CaCO3	mg/L	NC	101	140
Dissolved Major Anions				
Sulfate as $SO4^{2-}$	mg/L	NC	6	18
Chloride				
Chloride	µg/L	NC	22000	29000
Dissolved Major Cations				
Calcium	mg/L	NC	21	28
Magnesium	mg/L	NC	9	15
Sodium	mg/L	NC	23	32
Potassium	mg/L	NC	1	3
Total Metals				
Arsenic	µg/L	24	<1	2
Cadmium	µg/L	370	<0.1	<0.1
Chromium	µg/L	NC	<1	<1
Copper	µg/L	1.4	<1	<1
Nickel	µg/L	11	<1	<1
Lead	µg/L	3.4	<1	<1
Zinc	µg/L	8	<5	<5
Iron	µg/L	NC	3900	90
Ammonia as N				
Ammonia as N	µg/L	20	<10	30
Nitrite as N				
Nitrite as N	µg/L	3	<10	<10
Nitrate as N				
Nitrate as N	µg/L	700	40	50
NOX as N				
Nitrite + Nitrate as N	µg/L	10	40	50

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet	Dry
Total Kjeldahl Nitrogen (TKN)				
Total Kjeldahl Nitrogen as N	µg/L	NC	200	300
Total Nitrogen as N (TKN + NOx)				
Total Nitrogen as N	µg/L	500	200	400
Total Phosphorus as P				
Total Phosphorus as P	µg/L	50	20	150
Ionic Balance				
Total Anions	meq/L	NC	2.75	4
Total Cations	meq/L	NC	2.85	4.13
Ionic Balance	%	NC	-	1.6
Chlorophyll a & Pheophytin a				
Chlorophyll a	mg/m³	5	<1	6
Polychlorinated Biphenyls (PCB)				
Total Polychlorinated biphenyls	µg/L	NC	<1	<1
Polynuclear Aromatic Hydrocarbons				
Naphthalene	µg/L	16	<1	<1
Acenaphthylene	µg/L	NC	<1	<1
Acenaphthene	µg/L	NC	<1	<1
Fluorene	µg/L	NC	<1	<1
Phenanthrene	µg/L	NC	<1	<1
Anthracene	µg/L	NC	<1	<1
Fluoranthene	µg/L	NC	<1	<1
Pyrene	µg/L	NC	<1	<1
Benz(a)anthracene	µg/L	NC	<1	<1
Chrysene	µg/L	NC	<1	<1
Benzo(b)fluoranthene	µg/L	NC	<1	<1
Benzo(k)fluoranthene	µg/L	NC	<1	<1
Benzo(a)pyrene	µg/L	NC	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	µg/L	NC	<1	<1
Dibenz(a.h)anthracene	µg/L	NC	<1	<1
Benzo(g.h.i)perylene	µg/L	NC	<1	<1
Total PAH	µg/L	3	<1	<1
Total Petroleum Hydrocarbons				
C6 - C9 Fraction	µg/L	NC	<20	<20
C10 - C14 Fraction	µg/L		<50	<50
C15 - C28 Fraction	µg/L		<100	<100
C29 - C36 Fraction	µg/L		<50	<50
C10 - C36 Fraction (sum)	µg/L		<50	<50

SITE WQ19

Wet Season

Upstream

Downstream

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet	Dry
Temperature	°C	NC	30.8	19
pH	pH Unit	6.5-7.5	5.33	7.4
Conductivity	mS/cm	0.18	0.473	0.442
Dissolved Oxygen	%	90-110	50	43
Turbidity	NTU	25	10	262
Alkalinity				
Hydroxide Alkalinity as CaCO3	mg/L	NC	<1	<1
Carbonate Alkalinity as CaCO3	mg/L	NC	<1	<1
Bicarbonate Alkalinity as CaCO3	mg/L	NC	3	75
Total Alkalinity as CaCO3	mg/L	NC	3	75
Dissolved Major Anions				
Sulfate as $SO4^{2-}$	mg/L	NC	16	6
Chloride				
Chloride	µg/L	NC	122000	77000
Dissolved Major Cations				
Calcium	mg/L	NC	6	15
Magnesium	mg/L	NC	10	11
Sodium	mg/L	NC	60	42
Potassium	mg/L	NC	1	9
Total Metals				
Arsenic	µg/L	24	<1	<1
Cadmium	µg/L	370	<0.1	<0.1
Chromium	µg/L	NC	<1	2
Copper	µg/L	1.4	<1	4
Nickel	µg/L	11	2	4
Lead	µg/L	3.4	<1	4
Zinc	µg/L	8	<5	<5
Iron	µg/L	NC	160	2930
Ammonia as N				
Ammonia as N	µg/L	20	10	270
Nitrite as N				
Nitrite as N	µg/L	3	<10	10
Nitrate as N				
Nitrate as N	µg/L	700	40	20
NOX as N				
Nitrite + Nitrate as N	µg/L	10	40	40
Total Kjeldahl Nitrogen (TKN)				
Total Kjeldahl Nitrogen as N	µg/L	NC	<10	900
Total Nitrogen as N (TKN + NOx)				
Total Nitrogen as N	µg/L	250	<10	1000

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet	Dry
Total Phosphorus as P				
Total Phosphorus as P	µg/L	30	<10	40
Ionic Balance				
Total Anions	meq/L	NC	3.82	3.79
Total Cations	meq/L	NC	3.77	3.72
Ionic Balance	%	NC	0.63	0.96
Chlorophyll a & Pheophytin a				
Chlorophyll a	mg/m³	5	<1	<1
Polychlorinated Biphenyls (PCB)				
Total Polychlorinated biphenyls	µg/L	NC	<1	<1
Polynuclear Aromatic Hydrocarbons				
Naphthalene	µg/L	16	<1	<1
Acenaphthylene	µg/L	NC	<1	<1
Acenaphthene	µg/L	NC	<1	<1
Fluorene	µg/L	NC	<1	<1
Phenanthrene	µg/L	NC	<1	<1
Anthracene	µg/L	NC	<1	<1
Fluoranthene	µg/L	NC	<1	<1
Pyrene	µg/L	NC	<1	<1
Benz(a)anthracene	µg/L	NC	<1	<1
Chrysene	µg/L	NC	<1	<1
Benzo(b)fluoranthene	µg/L	NC	<1	<1
Benzo(k)fluoranthene	µg/L	NC	<1	<1
Benzo(a)pyrene	µg/L	NC	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	µg/L	NC	<1	<1
Dibenz(a.h)anthracene	µg/L	NC	<1	<1
Benzo(g.h.i)perylene	µg/L	NC	<1	<1
Total PAH	µg/L	3	<1	<1
Total Petroleum Hydrocarbons				
C6 - C9 Fraction	µg/L	NC	<20	<20
C10 - C14 Fraction	µg/L		<50	<50
C15 - C28 Fraction	µg/L		<100	190
C29 - C36 Fraction	µg/L		<50	60
C10 - C36 Fraction (sum)	µg/L		<50	260

SITE WQ20

Wet Season

Upstream

Downstream

Dry Season

Upstream

Downstream

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet	Dry
Temperature	°C	NC	29.9	23
pH	pH Unit	6.5-7.5	6.8	6.3
Conductivity	mS/cm	0.18	0.2133	0.2133
Dissolved Oxygen	%	90-110	74	72
Turbidity	NTU	25	302	351
Alkalinity				
Hydroxide Alkalinity as CaCO3	mg/L	NC	<1	<1
Carbonate Alkalinity as CaCO3	mg/L	NC	<1	<1
Bicarbonate Alkalinity as CaCO3	mg/L	NC	55	170
Total Alkalinity as CaCO3	mg/L	NC	55	170
Dissolved Major Anions				
Sulfate as $SO4^{2-}$	mg/L	NC	6	1
Chloride				
Chloride	µg/L	NC	23000	12000
Dissolved Major Cations				
Calcium	mg/L	NC	7	18
Magnesium	mg/L	NC	6	8
Sodium	mg/L	NC	26	48
Potassium	mg/L	NC	2	9
Total Metals				
Arsenic	µg/L	24	<1	<1
Cadmium	µg/L	370	<0.1	<0.1
Chromium	µg/L	NC	3	<1
Copper	µg/L	1.4	2	2
Nickel	µg/L	11	4	<1
Lead	µg/L	3.4	3	5
Zinc	µg/L	8	8	<5
Iron	µg/L	NC	8980	160
Ammonia as N				
Ammonia as N	µg/L	20	20	280
Nitrite as N				
Nitrite as N	µg/L	3	<10	<10
Nitrate as N				
Nitrate as N	µg/L	700	80	40
NOX as N				
Nitrite + Nitrate as N	µg/L	10	80	40
Total Kjeldahl Nitrogen (TKN)				
Total Kjeldahl Nitrogen as N	µg/L	NC	<10	1100
Total Nitrogen as N (TKN + NOx)				
Total Nitrogen as N	µg/L	250	<10	1200

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet	Dry
Total Phosphorus as P				
Total Phosphorus as P	µg/L	30	<10	100
Ionic Balance				
Total Anions	meq/L	NC	1.88	3.78
Total Cations	meq/L	NC	2.07	3.92
Ionic Balance	%	NC	-	1.84
Chlorophyll a & Pheophytin a				
Chlorophyll a	mg/m³	5	<1	5
Polychlorinated Biphenyls (PCB)				
Total Polychlorinated biphenyls	µg/L	NC	<1	<1
Polynuclear Aromatic Hydrocarbons				
Naphthalene	µg/L	16	<1	<1
Acenaphthylene	µg/L	NC	<1	<1
Acenaphthene	µg/L	NC	<1	<1
Fluorene	µg/L	NC	<1	<1
Phenanthrene	µg/L	NC	<1	<1
Anthracene	µg/L	NC	<1	<1
Fluoranthene	µg/L	NC	<1	<1
Pyrene	µg/L	NC	<1	<1
Benz(a)anthracene	µg/L	NC	<1	<1
Chrysene	µg/L	NC	<1	<1
Benzo(b)fluoranthene	µg/L	NC	<1	<1
Benzo(k)fluoranthene	µg/L	NC	<1	<1
Benzo(a)pyrene	µg/L	NC	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	µg/L	NC	<1	<1
Dibenz(a.h)anthracene	µg/L	NC	<1	<1
Benzo(g.h.i)perylene	µg/L	NC	<1	<1
Total PAH	µg/L	3	<1	<1
Total Petroleum Hydrocarbons				
C6 - C9 Fraction	µg/L	NC	<20	<20
C10 - C14 Fraction	µg/L		<50	<50
C15 - C28 Fraction	µg/L		<100	210
C29 - C36 Fraction	µg/L		<50	80
C10 - C36 Fraction (sum)	µg/L		<50	290

SITE WQ21

Wet Season

Upstream

Downstream

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet
Temperature	°C	NC	30.7
pH	pH Unit	6.5-7.5	7.7
Conductivity	mS/cm	0.18	0.29
Dissolved Oxygen	%	90-110	80
Turbidity	NTU	25	88.4
Alkalinity			
Hydroxide Alkalinity as CaCO3	mg/L	NC	<1
Carbonate Alkalinity as CaCO3	mg/L	NC	<1
Bicarbonate Alkalinity as CaCO3	mg/L	NC	46
Total Alkalinity as CaCO3	mg/L	NC	46
Dissolved Major Anions			
Sulfate as $SO4^{2-}$	mg/L	NC	1
Chloride			
Chloride	µg/L	NC	27000
Dissolved Major Cations			
Calcium	mg/L	NC	4
Magnesium	mg/L	NC	2
Sodium	mg/L	NC	31
Potassium	mg/L	NC	2
Total Metals			
Arsenic	µg/L	24	<1
Cadmium	µg/L	370	<0.1
Chromium	µg/L	NC	<1
Copper	µg/L	1.4	<1
Nickel	µg/L	11	<1
Lead	µg/L	3.4	1
Zinc	µg/L	8	<5
Iron	µg/L	NC	1950
Ammonia as N			
Ammonia as N	µg/L	20	20
Nitrite as N			
Nitrite as N	µg/L	3	<10
Nitrate as N			
Nitrate as N	µg/L	700	40
NOX as N			
Nitrite + Nitrate as N	µg/L	10	40
Total Kjeldahl Nitrogen (TKN)			
Total Kjeldahl Nitrogen as N	µg/L	NC	300
Total Nitrogen as N (TKN + NOx)			
Total Nitrogen as N	µg/L	250	300

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet
Total Phosphorus as P			
Total Phosphorus as P	µg/L	30	<10
Ionic Balance			
Total Anions	meq/L	NC	1.7
Total Cations	meq/L	NC	1.79
Ionic Balance	%	NC	-
Chlorophyll a & Pheophytin a			
Chlorophyll a	mg/m³	5	<1
Polychlorinated Biphenyls (PCB)			
Total Polychlorinated biphenyls	µg/L	NC	<1
Polynuclear Aromatic Hydrocarbons			
Naphthalene	µg/L	16	<1
Acenaphthylene	µg/L	NC	<1
Acenaphthene	µg/L	NC	<1
Fluorene	µg/L	NC	<1
Phenanthrene	µg/L	NC	<1
Anthracene	µg/L	NC	<1
Fluoranthene	µg/L	NC	<1
Pyrene	µg/L	NC	<1
Benz(a)anthracene	µg/L	NC	<1
Chrysene	µg/L	NC	<1
Benzo(b)fluoranthene	µg/L	NC	<1
Benzo(k)fluoranthene	µg/L	NC	<1
Benzo(a)pyrene	µg/L	NC	<0.5
Indeno(1.2.3.cd)pyrene	µg/L	NC	<1
Dibenz(a.h)anthracene	µg/L	NC	<1
Benzo(g.h.i)perylene	µg/L	NC	<1
Total PAH	µg/L	3	<1
Total Petroleum Hydrocarbons			
C6 - C9 Fraction	µg/L	NC	<20
C10 - C14 Fraction	µg/L		<50
C15 - C28 Fraction	µg/L		<100
C29 - C36 Fraction	µg/L		<50
C10 - C36 Fraction (sum)	µg/L		<50

SITE WQ22

Wet Season

Upstream

Downstream

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet
Temperature	°C	NC	32.7
pH	pH Unit	6.5-7.5	8.06
Conductivity	mS/cm	0.18	0.1468
Dissolved Oxygen	%	90-110	101
Turbidity	NTU	25	1.3
Alkalinity			
Hydroxide Alkalinity as CaCO3	mg/L	NC	<1
Carbonate Alkalinity as CaCO3	mg/L	NC	5
Bicarbonate Alkalinity as CaCO3	mg/L	NC	38
Total Alkalinity as CaCO3	mg/L	NC	43
Dissolved Major Anions			
Sulfate as $SO4^{2-}$	mg/L	NC	<1
Chloride			
Chloride	µg/L	NC	18000
Dissolved Major Cations			
Calcium	mg/L	NC	3
Magnesium	mg/L	NC	2
Sodium	mg/L	NC	23
Potassium	mg/L	NC	2
Total Metals			
Arsenic	µg/L	24	4
Cadmium	µg/L	370	<0.1
Chromium	µg/L	NC	<1
Copper	µg/L	1.4	<1
Nickel	µg/L	11	<1
Lead	µg/L	3.4	<1
Zinc	µg/L	8	<5
Iron	µg/L	NC	<50
Ammonia as N			
Ammonia as N	µg/L	20	10
Nitrite as N			
Nitrite as N	µg/L	3	<10
Nitrate as N			
Nitrate as N	µg/L	700	20
NOX as N			
Nitrite + Nitrate as N	µg/L	10	20
Total Kjeldahl Nitrogen (TKN)			
Total Kjeldahl Nitrogen as N	µg/L	NC	<100
Total Nitrogen as N (TKN + NOx)			
Total Nitrogen as N	µg/L	250	<100

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet
Total Phosphorus as P			
Total Phosphorus as P	µg/L	30	<10
Ionic Balance			
Total Anions	meq/L	NC	1.38
Total Cations	meq/L	NC	1.4
Ionic Balance	%	NC	-
Chlorophyll a & Pheophytin a			
Chlorophyll a	mg/m³	5	1
Polychlorinated Biphenyls (PCB)			
Total Polychlorinated biphenyls	µg/L	NC	<1
Polynuclear Aromatic Hydrocarbons			
Naphthalene	µg/L	16	<1
Acenaphthylene	µg/L	NC	<1
Acenaphthene	µg/L	NC	<1
Fluorene	µg/L	NC	<1
Phenanthrene	µg/L	NC	<1
Anthracene	µg/L	NC	<1
Fluoranthene	µg/L	NC	<1
Pyrene	µg/L	NC	<1
Benz(a)anthracene	µg/L	NC	<1
Chrysene	µg/L	NC	<1
Benzo(b)fluoranthene	µg/L	NC	<1
Benzo(k)fluoranthene	µg/L	NC	<1
Benzo(a)pyrene	µg/L	NC	<0.5
Indeno(1.2.3.cd)pyrene	µg/L	NC	<1
Dibenz(a.h)anthracene	µg/L	NC	<1
Benzo(g.h.i)perylene	µg/L	NC	<1
Total PAH	µg/L	3	<1
Total Petroleum Hydrocarbons			
C6 - C9 Fraction	µg/L	NC	<20
C10 - C14 Fraction	µg/L		<50
C15 - C28 Fraction	µg/L		<100
C29 - C36 Fraction	µg/L		<50
C10 - C36 Fraction (sum)	µg/L		<50

SITE WQ23

Wet Season

Upstream

Downstream

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet
Temperature	°C	NC	29.7
pH	pH Unit	6.5-7.5	7.27
Conductivity	mS/cm	0.18	0.1343
Dissolved Oxygen	%	90-110	63
Turbidity	NTU	25	23.7
Alkalinity			
Hydroxide Alkalinity as CaCO3	mg/L	NC	<1
Carbonate Alkalinity as CaCO3	mg/L	NC	<1
Bicarbonate Alkalinity as CaCO3	mg/L	NC	40
Total Alkalinity as CaCO3	mg/L	NC	40
Dissolved Major Anions			
Sulfate as $SO4^{2-}$	mg/L	NC	2
Chloride			
Chloride	µg/L	NC	19000
Dissolved Major Cations			
Calcium	mg/L	NC	3
Magnesium	mg/L	NC	2
Sodium	mg/L	NC	21
Potassium	mg/L	NC	3
Total Metals			
Arsenic	µg/L	24	<1
Cadmium	µg/L	370	<0.1
Chromium	µg/L	NC	<1
Copper	µg/L	1.4	<1
Nickel	µg/L	11	<1
Lead	µg/L	3.4	<1
Zinc	µg/L	8	<5
Iron	µg/L	NC	730
Ammonia as N			
Ammonia as N	µg/L	20	20
Nitrite as N			
Nitrite as N	µg/L	3	<10
Nitrate as N			
Nitrate as N	µg/L	700	<10
NOX as N			
Nitrite + Nitrate as N	µg/L	10	<10
Total Kjeldahl Nitrogen (TKN)			
Total Kjeldahl Nitrogen as N	µg/L	NC	400
Total Nitrogen as N (TKN + NOx)			
Total Nitrogen as N	µg/L	250	400

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet
Total Phosphorus as P			
Total Phosphorus as P	µg/L	30	<10
Ionic Balance			
Total Anions	meq/L	NC	1.37
Total Cations	meq/L	NC	1.35
Ionic Balance	%	NC	-
Chlorophyll a & Pheophytin a			
Chlorophyll a	mg/m³	5	3
Polychlorinated Biphenyls (PCB)			
Total Polychlorinated biphenyls	µg/L	NC	<1
Polynuclear Aromatic Hydrocarbons			
Naphthalene	µg/L	16	<1
Acenaphthylene	µg/L	NC	<1
Acenaphthene	µg/L	NC	<1
Fluorene	µg/L	NC	<1
Phenanthrene	µg/L	NC	<1
Anthracene	µg/L	NC	<1
Fluoranthene	µg/L	NC	<1
Pyrene	µg/L	NC	<1
Benz(a)anthracene	µg/L	NC	<1
Chrysene	µg/L	NC	<1
Benzo(b)fluoranthene	µg/L	NC	<1
Benzo(k)fluoranthene	µg/L	NC	<1
Benzo(a)pyrene	µg/L	NC	<0.5
Indeno(1.2.3.cd)pyrene	µg/L	NC	<1
Dibenz(a.h)anthracene	µg/L	NC	<1
Benzo(g.h.i)perylene	µg/L	NC	<1
Total PAH	µg/L	3	<1
Total Petroleum Hydrocarbons			
C6 - C9 Fraction	µg/L	NC	<20
C10 - C14 Fraction	µg/L		<50
C15 - C28 Fraction	µg/L		<100
C29 - C36 Fraction	µg/L		<50
C10 - C36 Fraction (sum)	µg/L		<50

SITE WQ24

Wet Season

Upstream

Downstream

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet
Temperature	°C	NC	29.6
pH	pH Unit	6.5-7.5	7.51
Conductivity	mS/cm	0.18	0.265
Dissolved Oxygen	%	90-110	63
Turbidity	NTU	25	24.6
Alkalinity			
Hydroxide Alkalinity as CaCO3	mg/L	NC	<1
Carbonate Alkalinity as CaCO3	mg/L	NC	<1
Bicarbonate Alkalinity as CaCO3	mg/L	NC	40
Total Alkalinity as CaCO3	mg/L	NC	40
Dissolved Major Anions			
Sulfate as $SO4^{2-}$	mg/L	NC	3
Chloride			
Chloride	µg/L	NC	45000
Dissolved Major Cations			
Calcium	mg/L	NC	4
Magnesium	mg/L	NC	4
Sodium	mg/L	NC	37
Potassium	mg/L	NC	3
Total Metals			
Arsenic	µg/L	24	<1
Cadmium	µg/L	370	<0.1
Chromium	µg/L	NC	<1
Copper	µg/L	1.4	<1
Nickel	µg/L	11	<1
Lead	µg/L	3.4	<1
Zinc	µg/L	8	<5
Iron	µg/L	NC	590
Ammonia as N			
Ammonia as N	µg/L	20	60
Nitrite as N			
Nitrite as N	µg/L	3	<10
Nitrate as N			
Nitrate as N	µg/L	700	<10
NOX as N			
Nitrite + Nitrate as N	µg/L	10	<10
Total Kjeldahl Nitrogen (TKN)			
Total Kjeldahl Nitrogen as N	µg/L	NC	30
Total Nitrogen as N (TKN + NOx)			
Total Nitrogen as N	µg/L	250	30

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet
Total Phosphorus as P			
Total Phosphorus as P	µg/L	30	130
Ionic Balance			
Total Anions	meq/L	NC	2.14
Total Cations	meq/L	NC	2.17
Ionic Balance	%	NC	-
Chlorophyll a & Pheophytin a			
Chlorophyll a	mg/m³	5	<1
Polychlorinated Biphenyls (PCB)			
Total Polychlorinated biphenyls	µg/L	NC	<1
Polynuclear Aromatic Hydrocarbons			
Naphthalene	µg/L	16	<1
Acenaphthylene	µg/L	NC	<1
Acenaphthene	µg/L	NC	<1
Fluorene	µg/L	NC	<1
Phenanthrene	µg/L	NC	<1
Anthracene	µg/L	NC	<1
Fluoranthene	µg/L	NC	<1
Pyrene	µg/L	NC	<1
Benz(a)anthracene	µg/L	NC	<1
Chrysene	µg/L	NC	<1
Benzo(b)fluoranthene	µg/L	NC	<1
Benzo(k)fluoranthene	µg/L	NC	<1
Benzo(a)pyrene	µg/L	NC	<0.5
Indeno(1.2.3.cd)pyrene	µg/L	NC	<1
Dibenz(a.h)anthracene	µg/L	NC	<1
Benzo(g.h.i)perylene	µg/L	NC	<1
Total PAH	µg/L	3	<1
Total Petroleum Hydrocarbons			
C6 - C9 Fraction	µg/L	NC	<20
C10 - C14 Fraction	µg/L		<50
C15 - C28 Fraction	µg/L		<100
C29 - C36 Fraction	µg/L		<50
C10 - C36 Fraction (sum)	µg/L		<50

SITE WQ25

Wet Season

Upstream

Downstream

Dry Season

Upstream

Downstream

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet	Dry
Temperature	°C	NC	23.6	19.8
pH	pH Unit	6.5-7.5	6.8	6.82
Conductivity	mS/cm	0.18	0.19	0.485
Dissolved Oxygen	%	90-110	50	49
Turbidity	NTU	25	380	94.6
Alkalinity				
Hydroxide Alkalinity as CaCO3	mg/L	NC	<1	<1
Carbonate Alkalinity as CaCO3	mg/L	NC	<1	<1
Bicarbonate Alkalinity as CaCO3	mg/L	NC	173	166
Total Alkalinity as CaCO3	mg/L	NC	173	166
Dissolved Major Anions				
Sulfate as $SO4^{2-}$	mg/L	NC	15	2
Chloride				
Chloride	µg/L	NC	42000	41000
Dissolved Major Cations				
Calcium	mg/L	NC	30	19
Magnesium	mg/L	NC	17	13
Sodium	mg/L	NC	48	50
Potassium	mg/L	NC	3	13
Total Metals				
Arsenic	µg/L	24	1	2
Cadmium	µg/L	370	<0.1	<0.1
Chromium	µg/L	NC	1	<1
Copper	µg/L	1.4	<1	4
Nickel	µg/L	11	<1	<1
Lead	µg/L	3.4	<1	4
Zinc	µg/L	8	<5	<5
Iron	µg/L	NC	170	470
Ammonia as N				
Ammonia as N	µg/L	20	30	20
Nitrite as N				
Nitrite as N	µg/L	3	<10	<10
Nitrate as N				
Nitrate as N	µg/L	700	30	20
NOX as N				
Nitrite + Nitrate as N	µg/L	10	30	20
Total Kjeldahl Nitrogen (TKN)				
Total Kjeldahl Nitrogen as N	µg/L	NC	<10	900
Total Nitrogen as N (TKN + NOx)				
Total Nitrogen as N	µg/L	250	<10	1000

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet	Dry
Total Phosphorus as P				
Total Phosphorus as P	µg/L	30	100	80
Ionic Balance				
Total Anions	meq/L	NC	4.95	4.52
Total Cations	meq/L	NC	5.06	4.52
Ionic Balance	%	NC	1.13	0.04
Chlorophyll a & Pheophytin a				
Chlorophyll a	mg/m³	5	<1	<1
Polychlorinated Biphenyls (PCB)				
Total Polychlorinated biphenyls	µg/L	NC	<1	<1
Polynuclear Aromatic Hydrocarbons				
Naphthalene	µg/L	16	<1	<1
Acenaphthylene	µg/L	NC	<1	<1
Acenaphthene	µg/L	NC	<1	<1
Fluorene	µg/L	NC	<1	<1
Phenanthrene	µg/L	NC	<1	<1
Anthracene	µg/L	NC	<1	<1
Fluoranthene	µg/L	NC	<1	<1
Pyrene	µg/L	NC	<1	<1
Benz(a)anthracene	µg/L	NC	<1	<1
Chrysene	µg/L	NC	<1	<1
Benzo(b)fluoranthene	µg/L	NC	<1	<1
Benzo(k)fluoranthene	µg/L	NC	<1	<1
Benzo(a)pyrene	µg/L	NC	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	µg/L	NC	<1	<1
Dibenz(a.h)anthracene	µg/L	NC	<1	<1
Benzo(g.h.i)perylene	µg/L	NC	<1	<1
Total PAH	µg/L	3	<1	<1
Total Petroleum Hydrocarbons				
C6 - C9 Fraction	µg/L	NC	<20	<20
C10 - C14 Fraction	µg/L		<50	<50
C15 - C28 Fraction	µg/L		<100	200
C29 - C36 Fraction	µg/L		<50	100
C10 - C36 Fraction (sum)	µg/L		<50	300

SITE WQ26

Wet Season

Upstream

Downstream

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet
Temperature	°C	NC	23.3
pH	pH Unit	6.5-7.5	6.4
Conductivity	mS/cm	0.18	0.118
Dissolved Oxygen	%	90-110	50
Turbidity	NTU	25	250
Alkalinity			
Hydroxide Alkalinity as CaCO3	mg/L	NC	<1
Carbonate Alkalinity as CaCO3	mg/L	NC	<1
Bicarbonate Alkalinity as CaCO3	mg/L	NC	92
Total Alkalinity as CaCO3	mg/L	NC	92
Dissolved Major Anions			
Sulfate as $SO4^{2-}$	mg/L	NC	1
Chloride			
Chloride	µg/L	NC	11000
Dissolved Major Cations			
Calcium	mg/L	NC	16
Magnesium	mg/L	NC	7
Sodium	mg/L	NC	9
Potassium	mg/L	NC	10
Total Metals			
Arsenic	µg/L	24	1
Cadmium	µg/L	370	<0.1
Chromium	µg/L	NC	<1
Copper	µg/L	1.4	2
Nickel	µg/L	11	2
Lead	µg/L	3.4	<1
Zinc	µg/L	8	<5
Iron	µg/L	NC	1890
Ammonia as N			
Ammonia as N	µg/L	20	<10
Nitrite as N			
Nitrite as N	µg/L	3	<10
Nitrate as N			
Nitrate as N	µg/L	700	20
NOX as N			
Nitrite + Nitrate as N	µg/L	10	20
Total Kjeldahl Nitrogen (TKN)			
Total Kjeldahl Nitrogen as N	µg/L	NC	800
Total Nitrogen as N (TKN + NOx)			
Total Nitrogen as N	µg/L	250	800

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet
Total Phosphorus as P			
Total Phosphorus as P	µg/L	30	50
Ionic Balance			
Total Anions	meq/L	NC	2.18
Total Cations	meq/L	NC	2.03
Ionic Balance	%	NC	-
Chlorophyll a & Pheophytin a			
Chlorophyll a	mg/m³	5	4
Polychlorinated Biphenyls (PCB)			
Total Polychlorinated biphenyls	µg/L	NC	<1
Polynuclear Aromatic Hydrocarbons			
Naphthalene	µg/L	16	<1
Acenaphthylene	µg/L	NC	<1
Acenaphthene	µg/L	NC	<1
Fluorene	µg/L	NC	<1
Phenanthrene	µg/L	NC	<1
Anthracene	µg/L	NC	<1
Fluoranthene	µg/L	NC	<1
Pyrene	µg/L	NC	<1
Benz(a)anthracene	µg/L	NC	<1
Chrysene	µg/L	NC	<1
Benzo(b)fluoranthene	µg/L	NC	<1
Benzo(k)fluoranthene	µg/L	NC	<1
Benzo(a)pyrene	µg/L	NC	<0.5
Indeno(1.2.3.cd)pyrene	µg/L	NC	<1
Dibenz(a.h)anthracene	µg/L	NC	<1
Benzo(g.h.i)perylene	µg/L	NC	<1
Total PAH	µg/L	3	<1
Total Petroleum Hydrocarbons			
C6 - C9 Fraction	µg/L	NC	<20
C10 - C14 Fraction	µg/L		<50
C15 - C28 Fraction	µg/L		<100
C29 - C36 Fraction	µg/L		<50
C10 - C36 Fraction (sum)	µg/L		<50

SITE WQ27

Wet Season

Upstream

Downstream

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet	Dry
Temperature	°C	NC	22.3	30.2
pH	pH Unit	6.5-7.5	6.3	6.6
Conductivity	mS/cm	0.18	0.092	0.1281
Dissolved Oxygen	%	90-110	63	80
Turbidity	NTU	25	473	440
Alkalinity				
Hydroxide Alkalinity as CaCO3	mg/L	NC	<1	<1
Carbonate Alkalinity as CaCO3	mg/L	NC	<1	<1
Bicarbonate Alkalinity as CaCO3	mg/L	NC	42	67
Total Alkalinity as CaCO3	mg/L	NC	42	67
Dissolved Major Anions				
Sulfate as $SO4^{2-}$	mg/L	NC	2	4
Chloride				
Chloride	µg/L	NC	18000	12000
Dissolved Major Cations				
Calcium	mg/L	NC	6	9
Magnesium	mg/L	NC	3	4
Sodium	mg/L	NC	12	22
Potassium	mg/L	NC	4	6
Total Metals				
Arsenic	µg/L	24	2	2
Cadmium	µg/L	370	<0.1	<0.1
Chromium	µg/L	NC	6	40
Copper	µg/L	1.4	5	14
Nickel	µg/L	11	3	3
Lead	µg/L	3.4	8	22
Zinc	µg/L	8	8	<5
Iron	µg/L	NC	5020	1940
Ammonia as N				
Ammonia as N	µg/L	20	50	60
Nitrite as N				
Nitrite as N	µg/L	3	10	<10
Nitrate as N				
Nitrate as N	µg/L	700	<10	100
NOX as N				
Nitrite + Nitrate as N	µg/L	10	<10	100
Total Kjeldahl Nitrogen (TKN)				
Total Kjeldahl Nitrogen as N	µg/L	NC	600	1000
Total Nitrogen as N (TKN + NOx)				
Total Nitrogen as N	µg/L	250	600	1100

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet	Dry
Total Phosphorus as P				
Total Phosphorus as P	µg/L	30	<10	150
Ionic Balance				
Total Anions	meq/L	NC	1.4	1.76
Total Cations	meq/L	NC	1.21	1.89
Ionic Balance	%	NC	-	-
Chlorophyll a & Pheophytin a				
Chlorophyll a	mg/m³	5	6	48
Polychlorinated Biphenyls (PCB)				
Total Polychlorinated biphenyls	µg/L	NC	<1	<1
Polynuclear Aromatic Hydrocarbons				
Naphthalene	µg/L	16	<1	<1
Acenaphthylene	µg/L	NC	<1	<1
Acenaphthene	µg/L	NC	<1	<1
Fluorene	µg/L	NC	<1	<1
Phenanthrene	µg/L	NC	<1	<1
Anthracene	µg/L	NC	<1	<1
Fluoranthene	µg/L	NC	<1	<1
Pyrene	µg/L	NC	<1	<1
Benz(a)anthracene	µg/L	NC	<1	<1
Chrysene	µg/L	NC	<1	<1
Benzo(b)fluoranthene	µg/L	NC	<1	<1
Benzo(k)fluoranthene	µg/L	NC	<1	<1
Benzo(a)pyrene	µg/L	NC	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	µg/L	NC	<1	<1
Dibenz(a.h)anthracene	µg/L	NC	<1	<1
Benzo(g.h.i)perylene	µg/L	NC	<1	<1
Total PAH	µg/L	3	<1	<1
Total Petroleum Hydrocarbons				
C6 - C9 Fraction	µg/L	NC	<20	<20
C10 - C14 Fraction	µg/L		<50	<50
C15 - C28 Fraction	µg/L		<100	100
C29 - C36 Fraction	µg/L		<50	50
C10 - C36 Fraction (sum)	µg/L		<50	150

SITE WQ28

Wet Season

Upstream

Downstream

Dry Season

Upstream

Downstream

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet	Dry
Temperature	°C	NC	23	27.4
pH	pH Unit	6.5-7.5	6.3	7.94
Conductivity	mS/cm	0.18	0.202	0.397
Dissolved Oxygen	%	90-110	53	79
Turbidity	NTU	25	588	56.3
Alkalinity				
Hydroxide Alkalinity as CaCO3	mg/L	NC	<1	<1
Carbonate Alkalinity as CaCO3	mg/L	NC	<1	<1
Bicarbonate Alkalinity as CaCO3	mg/L	NC	71	67
Total Alkalinity as CaCO3	mg/L	NC	71	67
Dissolved Major Anions				
Sulfate as $SO4^{2-}$	mg/L	NC	2	4
Chloride				
Chloride	µg/L	NC	11000	12000
Dissolved Major Cations				
Calcium	mg/L	NC	10	9
Magnesium	mg/L	NC	5	4
Sodium	mg/L	NC	15	22
Potassium	mg/L	NC	4	6
Total Metals				
Arsenic	µg/L	24	<1	2
Cadmium	µg/L	370	<0.1	<0.1
Chromium	µg/L	NC	3	40
Copper	µg/L	1.4	3	14
Nickel	µg/L	11	<1	3
Lead	µg/L	3.4	5	22
Zinc	µg/L	8	<5	20
Iron	µg/L	NC	1780	1940
Ammonia as N				
Ammonia as N	µg/L	20	30	60
Nitrite as N				
Nitrite as N	µg/L	3	<10	<10
Nitrate as N				
Nitrate as N	µg/L	700	<10	100
NOX as N				
Nitrite + Nitrate as N	µg/L	10	<10	100
Total Kjeldahl Nitrogen (TKN)				
Total Kjeldahl Nitrogen as N	µg/L	NC	400	1000
Total Nitrogen as N (TKN + NOx)				
Total Nitrogen as N	µg/L	250	400	1100

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet	Dry
Total Phosphorus as P				
Total Phosphorus as P	µg/L	30	<10	150
Ionic Balance				
Total Anions	meq/L	NC	1.77	1.76
Total Cations	meq/L	NC	1.61	1.89
Ionic Balance	%	NC	-	-
Chlorophyll a & Pheophytin a				
Chlorophyll a	mg/m³	5	1	48
Polychlorinated Biphenyls (PCB)				
Total Polychlorinated biphenyls	µg/L	NC	<1	<1
Polynuclear Aromatic Hydrocarbons				
Naphthalene	µg/L	16	<1	<1
Acenaphthylene	µg/L	NC	<1	<1
Acenaphthene	µg/L	NC	<1	<1
Fluorene	µg/L	NC	<1	<1
Phenanthrene	µg/L	NC	<1	<1
Anthracene	µg/L	NC	<1	<1
Fluoranthene	µg/L	NC	<1	<1
Pyrene	µg/L	NC	<1	<1
Benz(a)anthracene	µg/L	NC	<1	<1
Chrysene	µg/L	NC	<1	<1
Benzo(b)fluoranthene	µg/L	NC	<1	<1
Benzo(k)fluoranthene	µg/L	NC	<1	<1
Benzo(a)pyrene	µg/L	NC	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	µg/L	NC	<1	<1
Dibenz(a.h)anthracene	µg/L	NC	<1	<1
Benzo(g.h.i)perylene	µg/L	NC	<1	<1
Total PAH	µg/L	3	<1	<1
Total Petroleum Hydrocarbons				
C6 - C9 Fraction	µg/L	NC	<20	<20
C10 - C14 Fraction	µg/L		<50	<50
C15 - C28 Fraction	µg/L		<100	100
C29 - C36 Fraction	µg/L		<50	50
C10 - C36 Fraction (sum)	µg/L		<50	150

SITE WQ29

Wet Season

Upstream

Downstream

Dry Season

Upstream

Downstream

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet
Temperature	°C	NC	21
pH	pH Unit	6.5-7.5	6.9
Conductivity	mS/cm	0.18	0.21
Dissolved oxygen (% saturation)	%	90-110	41
Turbidity	NTU	25	103
Non Marine - Estimated TDS Salinity			
Total Dissolved Solids (est.)	mg/L	NC	-
Suspended Solids			
Suspended Solids (SS)	mg/L	10	-
Alkalinity			
Hydroxide Alkalinity as CaCO3	mg/L	NC	<1
Carbonate Alkalinity as CaCO3	mg/L	NC	<1
Bicarbonate Alkalinity as CaCO3	mg/L	NC	60
Total Alkalinity as CaCO3	mg/L	NC	60
Dissolved Major Anions			
Sulfate as $SO4^{2-}$	mg/L	NC	1
Chloride			
Chloride	µg/L	NC	8000
Dissolved Major Cations			
Calcium	mg/L	NC	11
Magnesium	mg/L	NC	5
Sodium	mg/L	NC	11
Potassium	mg/L	NC	6
Total Metals			
Arsenic	µg/L	24	3
Cadmium	µg/L	370	<0.1
Chromium (Total)	µg/L	NC	<1
Copper	µg/L	1.4	1
Nickel	µg/L	11	<1
Lead	µg/L	3.4	3
Zinc	µg/L	8	<5
Iron	µg/L	NC	840
Ammonia as N			
Ammonia as N	µg/L	20	40
Nitrite as N	µg/L	3	<10
Nitrate as N	µg/L	700	40

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet
Nitrite + Nitrate as N	µg/L	10	40
Total Kjeldahl Nitrogen as N	µg/L	NC	500
Total Nitrogen as N	µg/L	250	500
Total Phosphorus as P			
Total Phosphorus as P	µg/L	30	<10
Ionic Balance			
Total Anions	meq/L	NC	1.46
Total Cations	meq/L	NC	1.56
Ionic Balance	%	NC	-
Chlorophyll a & Pheophytin a			
Chlorophyll a	mg/m³	5	<1
Polychlorinated Biphenyls (PCB)			
Total Polychlorinated biphenyls	µg/L	NC	<1
Polynuclear Aromatic Hydrocarbons			
Naphthalene	µg/L	16	<1
Acenaphthylene	µg/L	NC	<1
Acenaphthene	µg/L	NC	<1
Fluorene	µg/L	NC	<1
Phenanthrene	µg/L	NC	<1
Anthracene	µg/L	NC	<1
Fluoranthene	µg/L	NC	<1
Pyrene	µg/L	NC	<1
Benz(a)anthracene	µg/L	NC	<1
Chrysene	µg/L	NC	<1
Benzo(b)fluoranthene	µg/L	NC	<1
Benzo(k)fluoranthene	µg/L	NC	<1
Benzo(a)pyrene	µg/L	NC	<0.5
Indeno(1.2.3.cd)pyrene	µg/L	NC	<1
Dibenz(a.h)anthracene	µg/L	NC	<1
Benzo(g.h.i)perylene	µg/L	NC	<1
Total PAH	µg/L	3	<1
Total Petroleum Hydrocarbons			
C6 - C9 Fraction	µg/L	NC	<20
C10 - C14 Fraction	µg/L		<50
C15 - C28 Fraction	µg/L		<100
C29 - C36 Fraction	µg/L		50
C10 - C36 Fraction (sum)	µg/L		50

SITE WQ30

Wet Season

Upstream

Downstream

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	WQ30
Temperature	°C	NC	24.1
pH	pH Unit	6.5-7.5	6.8
Conductivity	mS/cm	0.18	0.125
Dissolved oxygen (% saturation)	%	90-110	42
Turbidity	NTU	25	85
Non Marine - Estimated TDS Salinity			
Total Dissolved Solids (est.)	mg/L	NC	-
Suspended Solids			
Suspended Solids (SS)	mg/L	10	-
Alkalinity			-
Hydroxide Alkalinity as CaCO3	mg/L	NC	<1
Carbonate Alkalinity as CaCO3	mg/L	NC	<1
Bicarbonate Alkalinity as CaCO3	mg/L	NC	<1
Total Alkalinity as CaCO3	mg/L	NC	<1
Dissolved Major Anions			
Sulfate as $SO4^{2-}$	mg/L	NC	<1
Chloride			
Chloride	µg/L	NC	5000
Dissolved Major Cations			
Calcium	mg/L	NC	10
Magnesium	mg/L	NC	4
Sodium	mg/L	NC	7
Potassium	mg/L	NC	4
Total Metals			
Arsenic	µg/L	24	2
Cadmium	µg/L	370	<0.1
Chromium (Total)	µg/L	NC	<1
Copper	µg/L	1.4	1
Nickel	µg/L	11	<1
Lead	µg/L	3.4	3
Zinc	µg/L	8	<5
Iron	µg/L	NC	500
Ammonia as N			
Ammonia as N	µg/L	20	20
Nitrite as N			
Nitrite as N	µg/L	3	<10
Nitrate as N			
Nitrate as N	µg/L	700	<10
NOX as N			

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	WQ30
Nitrite + Nitrate as N	µg/L	10	<10
Total Kjeldahl Nitrogen (TKN)			
Total Kjeldahl Nitrogen as N	µg/L	NC	400
Total Nitrogen as N (TKN + NOx)			
Total Nitrogen as N	µg/L	250	400
Total Phosphorus as P			
Total Phosphorus as P	µg/L	30	<10
Ionic Balance			
Total Anions	meq/L	NC	1.44
Total Cations	meq/L	NC	1.26
Ionic Balance	%	NC	-
Chlorophyll a & Pheophytin a			
Chlorophyll a	mg/m³	5	<1
Polychlorinated Biphenyls (PCB)			
Total Polychlorinated biphenyls	µg/L	NC	<1
Polynuclear Aromatic Hydrocarbons			
Naphthalene	µg/L	16	<1
Acenaphthylene	µg/L	NC	<1
Acenaphthene	µg/L	NC	<1
Fluorene	µg/L	NC	<1
Phenanthrene	µg/L	NC	<1
Anthracene	µg/L	NC	<1
Fluoranthene	µg/L	NC	<1
Pyrene	µg/L	NC	<1
Benz(a)anthracene	µg/L	NC	<1
Chrysene	µg/L	NC	<1
Benzo(b)fluoranthene	µg/L	NC	<1
Benzo(k)fluoranthene	µg/L	NC	<1
Benzo(a)pyrene	µg/L	NC	<0.5
Indeno(1.2.3.cd)pyrene	µg/L	NC	<1
Dibenz(a.h)anthracene	µg/L	NC	<1
Benzo(g.h.i)perylene	µg/L	NC	<1
Total PAH	µg/L	3	<1
Total Petroleum Hydrocarbons			
C6 - C9 Fraction	µg/L	NC	<20
C10 - C14 Fraction	µg/L		<50
C15 - C28 Fraction	µg/L		<100
C29 - C36 Fraction	µg/L		<50
C10 - C36 Fraction (sum)	µg/L		<50

SITE WQ31

Wet Season

Upstream

Downstream

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet
Temperature	°C	NC	21
pH	pH Unit	6.5-7.5	6.4
Conductivity	mS/cm	0.18	0.189
Dissolved oxygen (% saturation)	%	90-110	41
Turbidity	NTU	25	114
Non Marine - Estimated TDS Salinity			
Total Dissolved Solids (est.)	mg/L	NC	-
Suspended Solids			
Suspended Solids (SS)	mg/L	10	-
Alkalinity			
Hydroxide Alkalinity as CaCO3	mg/L	NC	<1
Carbonate Alkalinity as CaCO3	mg/L	NC	<1
Bicarbonate Alkalinity as CaCO3	mg/L	NC	80
Total Alkalinity as CaCO3	mg/L	NC	80
Dissolved Major Anions			
Sulfate as $SO4^{2-}$	mg/L	NC	2
Chloride			
Chloride	µg/L	NC	6000
Dissolved Major Cations			
Calcium	mg/L	NC	12
Magnesium	mg/L	NC	6
Sodium	mg/L	NC	12
Potassium	mg/L	NC	8
Total Metals			
Arsenic	µg/L	24	2
Cadmium	µg/L	370	<0.1
Chromium (Total)	µg/L	NC	3
Copper	µg/L	1.4	4
Nickel	µg/L	11	2
Lead	µg/L	3.4	6
Zinc	µg/L	8	<5
Iron	µg/L	NC	2620
Ammonia as N			
Ammonia as N	µg/L	20	40
Nitrite as N			
Nitrite as N	µg/L	3	<10
Nitrate as N			
Nitrate as N	µg/L	700	<10
NOX as N			

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet
Nitrite + Nitrate as N	µg/L	10	<10
Total Kjeldahl Nitrogen (TKN)			
Total Kjeldahl Nitrogen as N	µg/L	NC	600
Total Nitrogen as N (TKN + NOx)			
Total Nitrogen as N	µg/L	250	600
Total Phosphorus as P			
Total Phosphorus as P	µg/L	30	<10
Ionic Balance			
Total Anions	meq/L	NC	1.82
Total Cations	meq/L	NC	1.77
Ionic Balance	%	NC	-
Chlorophyll a & Pheophytin a			
Chlorophyll a	mg/m³	5	2
Polychlorinated Biphenyls (PCB)			
Total Polychlorinated biphenyls	µg/L	NC	<1
Polynuclear Aromatic Hydrocarbons			
Naphthalene	µg/L	16	<1
Acenaphthylene	µg/L	NC	<1
Acenaphthene	µg/L	NC	<1
Fluorene	µg/L	NC	<1
Phenanthrene	µg/L	NC	<1
Anthracene	µg/L	NC	<1
Fluoranthene	µg/L	NC	<1
Pyrene	µg/L	NC	<1
Benz(a)anthracene	µg/L	NC	<1
Chrysene	µg/L	NC	<1
Benzo(b)fluoranthene	µg/L	NC	<1
Benzo(k)fluoranthene	µg/L	NC	<1
Benzo(a)pyrene	µg/L	NC	<0.5
Indeno(1.2.3.cd)pyrene	µg/L	NC	<1
Dibenz(a.h)anthracene	µg/L	NC	<1
Benzo(g.h.i)perylene	µg/L	NC	<1
Total PAH	µg/L	3	<1
Total Petroleum Hydrocarbons			
C6 - C9 Fraction	µg/L	NC	<20
C10 - C14 Fraction	µg/L		<50
C15 - C28 Fraction	µg/L		<100
C29 - C36 Fraction	µg/L		<50
C10 - C36 Fraction (sum)	µg/L		<50

SITE WQ32

Wet Season

Upstream

Downstream

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet
Temperature	°C	NC	22.7
pH	pH Unit	6.5-7.5	6.9
Conductivity	mS/cm	0.18	0.0932
Dissolved oxygen (% saturation)	%	90-110	40
Turbidity	NTU	25	103
Non Marine - Estimated TDS Salinity			
Total Dissolved Solids (est.)	mg/L	NC	-
Suspended Solids			
Suspended Solids (SS)	mg/L	10	-
Alkalinity			
Hydroxide Alkalinity as CaCO3	mg/L	NC	<1
Carbonate Alkalinity as CaCO3	mg/L	NC	<1
Bicarbonate Alkalinity as CaCO3	mg/L	NC	50
Total Alkalinity as CaCO3	mg/L	NC	50
Dissolved Major Anions			
Sulfate as $SO4^{2-}$	mg/L	NC	2
Chloride			
Chloride	µg/L	NC	11000
Dissolved Major Cations			
Calcium	mg/L	NC	7
Magnesium	mg/L	NC	3
Sodium	mg/L	NC	12
Potassium	mg/L	NC	6
Total Metals			
Arsenic	µg/L	24	1
Cadmium	µg/L	370	<0.1
Chromium (Total)	µg/L	NC	3
Copper	µg/L	1.4	4
Nickel	µg/L	11	2
Lead	µg/L	3.4	4
Zinc	µg/L	8	7
Iron	µg/L	NC	3970
Ammonia as N			
Ammonia as N	µg/L	20	40
Nitrite as N			
Nitrite as N	µg/L	3	<10
Nitrate as N			
Nitrate as N	µg/L	700	120
NOX as N			

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet
Nitrite + Nitrate as N	µg/L	10	120
Total Kjeldahl Nitrogen (TKN)			
Total Kjeldahl Nitrogen as N	µg/L	NC	600
Total Nitrogen as N (TKN + NOx)			
Total Nitrogen as N	µg/L	250	700
Total Phosphorus as P			
Total Phosphorus as P	µg/L	30	<10
Ionic Balance			
Total Anions	meq/L	NC	1.35
Total Cations	meq/L	NC	1.29
Ionic Balance	%	NC	-
Chlorophyll a & Pheophytin a			
Chlorophyll a	mg/m³	5	1
Polychlorinated Biphenyls (PCB)			
Total Polychlorinated biphenyls	µg/L	NC	<1
Polynuclear Aromatic Hydrocarbons			
Naphthalene	µg/L	16	<1
Acenaphthylene	µg/L	NC	<1
Acenaphthene	µg/L	NC	<1
Fluorene	µg/L	NC	<1
Phenanthrene	µg/L	NC	<1
Anthracene	µg/L	NC	<1
Fluoranthene	µg/L	NC	<1
Pyrene	µg/L	NC	<1
Benz(a)anthracene	µg/L	NC	<1
Chrysene	µg/L	NC	<1
Benzo(b)fluoranthene	µg/L	NC	<1
Benzo(k)fluoranthene	µg/L	NC	<1
Benzo(a)pyrene	µg/L	NC	<0.5
Indeno(1.2.3.cd)pyrene	µg/L	NC	<1
Dibenz(a.h)anthracene	µg/L	NC	<1
Benzo(g.h.i)perylene	µg/L	NC	<1
Total PAH	µg/L	3	<1
Total Petroleum Hydrocarbons			
C6 - C9 Fraction	µg/L	NC	<20
C10 - C14 Fraction	µg/L		<50
C15 - C28 Fraction	µg/L		<100
C29 - C36 Fraction	µg/L		<50
C10 - C36 Fraction (sum)	µg/L		<50

SITE WQ33

Wet Season

Upstream

Downstream

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet
Temperature	°C	NC	22.7
pH	pH Unit	6.5-7.5	6.6
Conductivity	mS/cm	0.18	0.159
Dissolved oxygen (% saturation)	%	90-110	74
Turbidity	NTU	25	114
Non Marine - Estimated TDS Salinity			
Total Dissolved Solids (est.)	mg/L	NC	-
Suspended Solids			
Suspended Solids (SS)	mg/L	10	-
Alkalinity			
Hydroxide Alkalinity as CaCO3	mg/L	NC	<1
Carbonate Alkalinity as CaCO3	mg/L	NC	<1
Bicarbonate Alkalinity as CaCO3	mg/L	NC	103
Total Alkalinity as CaCO3	mg/L	NC	103
Dissolved Major Anions			
Sulfate as $SO4^{2-}$	mg/L	NC	2
Chloride			
Chloride	µg/L	NC	25000
Dissolved Major Cations			
Calcium	mg/L	NC	17
Magnesium	mg/L	NC	7
Sodium	mg/L	NC	22
Potassium	mg/L	NC	6
Total Metals			
Arsenic	µg/L	24	<1
Cadmium	µg/L	370	<0.1
Chromium (Total)	µg/L	NC	<1
Copper	µg/L	1.4	2
Nickel	µg/L	11	<1
Lead	µg/L	3.4	3
Zinc	µg/L	8	<5
Iron	µg/L	NC	6700
Ammonia as N			
Ammonia as N	µg/L	20	10
Nitrite as N			
Nitrite as N	µg/L	3	<10
Nitrate as N			
Nitrate as N	µg/L	700	10
NOX as N			

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet
Nitrite + Nitrate as N	µg/L	10	10
Total Kjeldahl Nitrogen (TKN)			
Total Kjeldahl Nitrogen as N	µg/L	NC	200
Total Nitrogen as N (TKN + NOx)			
Total Nitrogen as N	µg/L	250	200
Total Phosphorus as P			
Total Phosphorus as P	µg/L	30	<10
Ionic Balance			
Total Anions	meq/L	NC	2.8
Total Cations	meq/L	NC	2.61
Ionic Balance	%	NC	-
Chlorophyll a & Pheophytin a			
Chlorophyll a	mg/m³	5	<1
Polychlorinated Biphenyls (PCB)			
Total Polychlorinated biphenyls	µg/L	NC	<1
Polynuclear Aromatic Hydrocarbons			
Naphthalene	µg/L	16	<1
Acenaphthylene	µg/L	NC	<1
Acenaphthene	µg/L	NC	<1
Fluorene	µg/L	NC	<1
Phenanthrene	µg/L	NC	<1
Anthracene	µg/L	NC	<1
Fluoranthene	µg/L	NC	<1
Pyrene	µg/L	NC	<1
Benz(a)anthracene	µg/L	NC	<1
Chrysene	µg/L	NC	<1
Benzo(b)fluoranthene	µg/L	NC	<1
Benzo(k)fluoranthene	µg/L	NC	<1
Benzo(a)pyrene	µg/L	NC	<0.5
Indeno(1.2.3.cd)pyrene	µg/L	NC	<1
Dibenz(a.h)anthracene	µg/L	NC	<1
Benzo(g.h.i)perylene	µg/L	NC	<1
Total PAH	µg/L	3	<1
Total Petroleum Hydrocarbons			
C6 - C9 Fraction	µg/L	NC	<20
C10 - C14 Fraction	µg/L		<50
C15 - C28 Fraction	µg/L		100
C29 - C36 Fraction	µg/L		<50
C10 - C36 Fraction (sum)	µg/L		100

SITE WQ34

Wet Season

Upstream

Downstream

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet
Temperature	°C	NC	22
pH	pH Unit	6.5-7.5	6.6
Conductivity	mS/cm	0.18	0.126
Dissolved oxygen (% saturation)	%	90-110	51
Turbidity	NTU	25	144
Non Marine - Estimated TDS Salinity			
Total Dissolved Solids (est.)	mg/L	NC	-
Suspended Solids			
Suspended Solids (SS)	mg/L	10	-
Alkalinity			
Hydroxide Alkalinity as CaCO3	mg/L	NC	<1
Carbonate Alkalinity as CaCO3	mg/L	NC	<1
Bicarbonate Alkalinity as CaCO3	mg/L	NC	82
Total Alkalinity as CaCO3	mg/L	NC	82
Dissolved Major Anions			
Sulfate as $SO4^{2-}$	mg/L	NC	2
Chloride			
Chloride	µg/L	NC	17000
Dissolved Major Cations			
Calcium	mg/L	NC	12
Magnesium	mg/L	NC	7
Sodium	mg/L	NC	14
Potassium	mg/L	NC	8
Total Metals			
Arsenic	µg/L	24	1
Cadmium	µg/L	370	<0.1
Chromium (Total)	µg/L	NC	2
Copper	µg/L	1.4	3
Nickel	µg/L	11	3
Lead	µg/L	3.4	4
Zinc	µg/L	8	<5
Iron	µg/L	NC	3240
Ammonia as N			
Ammonia as N	µg/L	20	60
Nitrite as N			
Nitrite as N	µg/L	3	<10
Nitrate as N			
Nitrate as N	µg/L	700	10
NOX as N			

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet
Nitrite + Nitrate as N	µg/L	10	10
Total Kjeldahl Nitrogen (TKN)			
Total Kjeldahl Nitrogen as N	µg/L	NC	200
Total Nitrogen as N (TKN + NOx)			
Total Nitrogen as N	µg/L	250	200
Total Phosphorus as P			
Total Phosphorus as P	µg/L	30	<10
Ionic Balance			
Total Anions	meq/L	NC	2.16
Total Cations	meq/L	NC	1.98
Ionic Balance	%	NC	-
Chlorophyll a & Pheophytin a			
Chlorophyll a	mg/m³	5	12
Polychlorinated Biphenyls (PCB)			
Total Polychlorinated biphenyls	µg/L	NC	<1
Polynuclear Aromatic Hydrocarbons			
Naphthalene	µg/L	16	<1
Acenaphthylene	µg/L	NC	<1
Acenaphthene	µg/L	NC	<1
Fluorene	µg/L	NC	<1
Phenanthrene	µg/L	NC	<1
Anthracene	µg/L	NC	<1
Fluoranthene	µg/L	NC	<1
Pyrene	µg/L	NC	<1
Benz(a)anthracene	µg/L	NC	<1
Chrysene	µg/L	NC	<1
Benzo(b)fluoranthene	µg/L	NC	<1
Benzo(k)fluoranthene	µg/L	NC	<1
Benzo(a)pyrene	µg/L	NC	<0.5
Indeno(1.2.3.cd)pyrene	µg/L	NC	<1
Dibenz(a.h)anthracene	µg/L	NC	<1
Benzo(g.h.i)perylene	µg/L	NC	<1
Total PAH	µg/L	3	<1
Total Petroleum Hydrocarbons			
C6 - C9 Fraction	µg/L	NC	<20
C10 - C14 Fraction	µg/L		<50
C15 - C28 Fraction	µg/L		<100
C29 - C36 Fraction	µg/L		<50
C10 - C36 Fraction (sum)	µg/L		<50

SITE WQ35

Wet Season

Upstream

Downstream

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet
Temperature	°C	NC	21.2
pH	pH Unit	6.5-7.5	6.6
Conductivity	mS/cm	0.18	0.175
Dissolved oxygen (% saturation)	%	90-110	80
Turbidity	NTU	25	96
Non Marine - Estimated TDS Salinity			
Total Dissolved Solids (est.)	mg/L	NC	-
Suspended Solids			
Suspended Solids (SS)	mg/L	10	-
Alkalinity			
Hydroxide Alkalinity as CaCO3	mg/L	NC	<1
Carbonate Alkalinity as CaCO3	mg/L	NC	<1
Bicarbonate Alkalinity as CaCO3	mg/L	NC	103
Total Alkalinity as CaCO3	mg/L	NC	103
Dissolved Major Anions			
Sulfate as $SO4^{2-}$	mg/L	NC	1
Chloride			
Chloride	µg/L	NC	23000
Dissolved Major Cations			
Calcium	mg/L	NC	18
Magnesium	mg/L	NC	9
Sodium	mg/L	NC	18
Potassium	mg/L	NC	6
Total Metals			
Arsenic	µg/L	24	2
Cadmium	µg/L	370	<0.1
Chromium (Total)	µg/L	NC	<1
Copper	µg/L	1.4	<1
Nickel	µg/L	11	<1
Lead	µg/L	3.4	4
Zinc	µg/L	8	<5
Iron	µg/L	NC	1650
Ammonia as N			
Ammonia as N	µg/L	20	20
Nitrite as N			
Nitrite as N	µg/L	3	<10
Nitrate as N			
Nitrate as N	µg/L	700	<10
NOX as N			

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet
Nitrite + Nitrate as N	µg/L	10	<10
Total Kjeldahl Nitrogen (TKN)			
Total Kjeldahl Nitrogen as N	µg/L	NC	<100
Total Nitrogen as N (TKN + NOx)			
Total Nitrogen as N	µg/L	250	<100
Total Phosphorus as P			
Total Phosphorus as P	µg/L	30	<10
Ionic Balance			
Total Anions	meq/L	NC	2.73
Total Cations	meq/L	NC	2.56
Ionic Balance	%	NC	-
Chlorophyll a & Pheophytin a			
Chlorophyll a	mg/m³	5	<1
Polychlorinated Biphenyls (PCB)			
Total Polychlorinated biphenyls	µg/L	NC	<1
Polynuclear Aromatic Hydrocarbons			
Naphthalene	µg/L	16	<1
Acenaphthylene	µg/L	NC	<1
Acenaphthene	µg/L	NC	<1
Fluorene	µg/L	NC	<1
Phenanthrene	µg/L	NC	<1
Anthracene	µg/L	NC	<1
Fluoranthene	µg/L	NC	<1
Pyrene	µg/L	NC	<1
Benz(a)anthracene	µg/L	NC	<1
Chrysene	µg/L	NC	<1
Benzo(b)fluoranthene	µg/L	NC	<1
Benzo(k)fluoranthene	µg/L	NC	<1
Benzo(a)pyrene	µg/L	NC	<0.5
Indeno(1.2.3.cd)pyrene	µg/L	NC	<1
Dibenz(a.h)anthracene	µg/L	NC	<1
Benzo(g.h.i)perylene	µg/L	NC	<1
Total PAH	µg/L	3	<1
Total Petroleum Hydrocarbons			
C6 - C9 Fraction	µg/L	NC	<20
C10 - C14 Fraction	µg/L		<50
C15 - C28 Fraction	µg/L		100
C29 - C36 Fraction	µg/L		50
C10 - C36 Fraction (sum)	µg/L		150

SITE WQ36

Wet Season

Upstream

Downstream

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet
Temperature	°C	NC	24.4
pH	pH Unit	6.5-7.5	6.8
Conductivity	mS/cm	0.18	0.121
Dissolved oxygen (% saturation)	%	90-110	40
Turbidity	NTU	25	121
Non Marine - Estimated TDS Salinity			
Total Dissolved Solids (est.)	mg/L	NC	-
Suspended Solids			
Suspended Solids (SS)	mg/L	10	-
Alkalinity			
Hydroxide Alkalinity as CaCO3	mg/L	NC	<1
Carbonate Alkalinity as CaCO3	mg/L	NC	<1
Bicarbonate Alkalinity as CaCO3	mg/L	NC	33
Total Alkalinity as CaCO3	mg/L	NC	33
Dissolved Major Anions			
Sulfate as $SO4^{2-}$	mg/L	NC	2
Chloride			
Chloride	µg/L	NC	5000
Dissolved Major Cations			
Calcium	mg/L	NC	6
Magnesium	mg/L	NC	2
Sodium	mg/L	NC	6
Potassium	mg/L	NC	7
Total Metals			
Arsenic	µg/L	24	2
Cadmium	µg/L	370	<0.1
Chromium (Total)	µg/L	NC	3
Copper	µg/L	1.4	4
Nickel	µg/L	11	3
Lead	µg/L	3.4	2
Zinc	µg/L	8	9
Iron	µg/L	NC	3490
Ammonia as N			
Ammonia as N	µg/L	20	10
Nitrite as N			
Nitrite as N	µg/L	3	<10
Nitrate as N			
Nitrate as N	µg/L	700	30
NOX as N			

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet
Nitrite + Nitrate as N	µg/L	10	30
Total Kjeldahl Nitrogen (TKN)			
Total Kjeldahl Nitrogen as N	µg/L	NC	500
Total Nitrogen as N (TKN + NOx)			
Total Nitrogen as N	µg/L	250	500
Total Phosphorus as P			
Total Phosphorus as P	µg/L	30	330
Ionic Balance			
Total Anions	meq/L	NC	0.84
Total Cations	meq/L	NC	0.9
Ionic Balance	%	NC	-
Chlorophyll a & Pheophytin a			
Chlorophyll a	mg/m³	5	1
Polychlorinated Biphenyls (PCB)			
Total Polychlorinated biphenyls	µg/L	NC	<1
Polynuclear Aromatic Hydrocarbons			
Naphthalene	µg/L	16	<1
Acenaphthylene	µg/L	NC	<1
Acenaphthene	µg/L	NC	<1
Fluorene	µg/L	NC	<1
Phenanthrene	µg/L	NC	<1
Anthracene	µg/L	NC	<1
Fluoranthene	µg/L	NC	<1
Pyrene	µg/L	NC	<1
Benz(a)anthracene	µg/L	NC	<1
Chrysene	µg/L	NC	<1
Benzo(b)fluoranthene	µg/L	NC	<1
Benzo(k)fluoranthene	µg/L	NC	<1
Benzo(a)pyrene	µg/L	NC	<0.5
Indeno(1.2.3.cd)pyrene	µg/L	NC	<1
Dibenz(a.h)anthracene	µg/L	NC	<1
Benzo(g.h.i)perylene	µg/L	NC	<1
Total PAH	µg/L	3	<1
Total Petroleum Hydrocarbons			
C6 - C9 Fraction	µg/L	NC	<20
C10 - C14 Fraction	µg/L		<50
C15 - C28 Fraction	µg/L		100
C29 - C36 Fraction	µg/L		<50
C10 - C36 Fraction (sum)	µg/L		100

SITE WQ37

Wet Season

Upstream

Downstream

Dry Season

Upstream

Downstream

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet	Dry
Temperature	°C	NC	24.9	26.9
pH	pH Unit	6.5-7.5	6.7	7.68
Conductivity	mS/cm	0.18	0.1688	0.524
Dissolved oxygen (% saturation)	%	90-110	52	107
Turbidity	NTU	25	370	87
Non Marine - Estimated TDS Salinity				
Total Dissolved Solids (est.)	mg/L	NC	-	-
Suspended Solids				
Suspended Solids (SS)	mg/L	10	-	-
Alkalinity				
Hydroxide Alkalinity as CaCO3	mg/L	NC	<1	<1
Carbonate Alkalinity as CaCO3	mg/L	NC	<1	<1
Bicarbonate Alkalinity as CaCO3	mg/L	NC	50	218
Total Alkalinity as CaCO3	mg/L	NC	50	218
Dissolved Major Anions				
Sulfate as $SO4^{2-}$	mg/L	NC	1	<1
Chloride				
Chloride	µg/L	NC	6000	20000
Dissolved Major Cations				
Calcium	mg/L	NC	10	39
Magnesium	mg/L	NC	3	13
Sodium	mg/L	NC	8	37
Potassium	mg/L	NC	6	18
Total Metals				
Arsenic	µg/L	24	2	2
Cadmium	µg/L	370	<0.1	<0.1
Chromium (Total)	µg/L	NC	5	<1
Copper	µg/L	1.4	4	2
Nickel	µg/L	11	6	<1
Lead	µg/L	3.4	3	2
Zinc	µg/L	8	6	<5
Iron	µg/L	NC	5540	480
Ammonia as N				
Ammonia as N	µg/L	20	<10	30
Nitrite as N				
Nitrite as N	µg/L	3	<10	<10
Nitrate as N				
Nitrate as N	µg/L	700	50	40
NOX as N				

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet	Dry
Nitrite + Nitrate as N	µg/L	10	50	40
Total Kjeldahl Nitrogen (TKN)				
Total Kjeldahl Nitrogen as N	µg/L	NC	100	1500
Total Nitrogen as N (TKN + NOx)				
Total Nitrogen as N	µg/L	250	200	1600
Total Phosphorus as P				
Total Phosphorus as P	µg/L	30	380	160
Ionic Balance				
Total Anions	meq/L	NC	1.2	4.93
Total Cations	meq/L	NC	1.24	5.11
Ionic Balance	%	NC	-	1.8
Chlorophyll a & Pheophytin a				
Chlorophyll a	mg/m³	5	3	<1
Polychlorinated Biphenyls (PCB)				
Total Polychlorinated biphenyls	µg/L	NC	<1	<1
Polynuclear Aromatic Hydrocarbons				
Naphthalene	µg/L	16	<1	<1
Acenaphthylene	µg/L	NC	<1	<1
Acenaphthene	µg/L	NC	<1	<1
Fluorene	µg/L	NC	<1	<1
Phenanthrene	µg/L	NC	<1	<1
Anthracene	µg/L	NC	<1	<1
Fluoranthene	µg/L	NC	<1	<1
Pyrene	µg/L	NC	<1	<1
Benz(a)anthracene	µg/L	NC	<1	<1
Chrysene	µg/L	NC	<1	<1
Benzo(b)fluoranthene	µg/L	NC	<1	<1
Benzo(k)fluoranthene	µg/L	NC	<1	<1
Benzo(a)pyrene	µg/L	NC	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	µg/L	NC	<1	<1
Dibenz(a.h)anthracene	µg/L	NC	<1	<1
Benzo(g.h.i)perylene	µg/L	NC	<1	<1
Total PAH	µg/L	3	<1	<1
Total Petroleum Hydrocarbons				
C6 - C9 Fraction	µg/L	NC	<20	<20
C10 - C14 Fraction	µg/L		<50	<50
C15 - C28 Fraction	µg/L		110	240
C29 - C36 Fraction	µg/L		<50	110
C10 - C36 Fraction (sum)	µg/L		110	350

SITE WQ38

Wet Season

Upstream

Downstream

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet
Temperature	°C	NC	25
pH	pH Unit	6.5-7.5	6.7
Conductivity	mS/cm	0.18	0.524
Dissolved oxygen (% saturation)	%	90-110	75
Turbidity	NTU	25	220
Non Marine - Estimated TDS Salinity			
Total Dissolved Solids (est.)	mg/L	NC	-
Suspended Solids			
Suspended Solids (SS)	mg/L	10	-
Alkalinity			
Hydroxide Alkalinity as CaCO3	mg/L	NC	<1
Carbonate Alkalinity as CaCO3	mg/L	NC	<1
Bicarbonate Alkalinity as CaCO3	mg/L	NC	28
Total Alkalinity as CaCO3	mg/L	NC	28
Dissolved Major Anions			
Sulfate as $SO4^{2-}$	mg/L	NC	1
Chloride			
Chloride	µg/L	NC	11000
Dissolved Major Cations			
Calcium	mg/L	NC	4
Magnesium	mg/L	NC	3
Sodium	mg/L	NC	8
Potassium	mg/L	NC	6
Total Metals			
Arsenic	µg/L	24	1
Cadmium	µg/L	370	<0.1
Chromium (Total)	µg/L	NC	5
Copper	µg/L	1.4	6
Nickel	µg/L	11	5
Lead	µg/L	3.4	3
Zinc	µg/L	8	8
Iron	µg/L	NC	5580
Ammonia as N			
Ammonia as N	µg/L	20	90
Nitrite as N			
Nitrite as N	µg/L	3	<10
Nitrate as N			
Nitrate as N	µg/L	700	30
NOX as N			

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet
Nitrite + Nitrate as N	µg/L	10	30
Total Kjeldahl Nitrogen (TKN)			
Total Kjeldahl Nitrogen as N	µg/L	NC	200
Total Nitrogen as N (TKN + NOx)			
Total Nitrogen as N	µg/L	250	200
Total Phosphorus as P			
Total Phosphorus as P	µg/L	30	210
Ionic Balance			
Total Anions	meq/L	NC	0.89
Total Cations	meq/L	NC	0.93
Ionic Balance	%	NC	-
Chlorophyll a & Pheophytin a			
Chlorophyll a	mg/m³	5	<1
Polychlorinated Biphenyls (PCB)			
Total Polychlorinated biphenyls	µg/L	NC	<1
Polynuclear Aromatic Hydrocarbons			
Naphthalene	µg/L	16	<1
Acenaphthylene	µg/L	NC	<1
Acenaphthene	µg/L	NC	<1
Fluorene	µg/L	NC	<1
Phenanthrene	µg/L	NC	<1
Anthracene	µg/L	NC	<1
Fluoranthene	µg/L	NC	<1
Pyrene	µg/L	NC	<1
Benz(a)anthracene	µg/L	NC	<1
Chrysene	µg/L	NC	<1
Benzo(b)fluoranthene	µg/L	NC	<1
Benzo(k)fluoranthene	µg/L	NC	<1
Benzo(a)pyrene	µg/L	NC	<0.5
Indeno(1.2.3.cd)pyrene	µg/L	NC	<1
Dibenz(a.h)anthracene	µg/L	NC	<1
Benzo(g.h.i)perylene	µg/L	NC	<1
Total PAH	µg/L	3	<1
Total Petroleum Hydrocarbons			
C6 - C9 Fraction	µg/L	NC	<20
C10 - C14 Fraction	µg/L		<50
C15 - C28 Fraction	µg/L		140
C29 - C36 Fraction	µg/L		<50
C10 - C36 Fraction (sum)	µg/L		140

SITE WQ39

Wet Season

Upstream

Downstream

Dry Season

Upstream

Downstream

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet	Dry
Temperature	°C	NC	23.6	23.6
pH	pH Unit	6.5-7.5	6.8	7.27
Conductivity	mS/cm	0.18	0.36	0.325
Dissolved oxygen (% saturation)	%	90-110	39	39
Turbidity	NTU	25	115	1159
Non Marine - Estimated TDS Salinity				
Total Dissolved Solids (est.)	mg/L	NC	130	-
Suspended Solids				
Suspended Solids (SS)	mg/L	10	19	-
Alkalinity				
Hydroxide Alkalinity as CaCO3	mg/L	NC	<1	<1
Carbonate Alkalinity as CaCO3	mg/L	NC	<1	<1
Bicarbonate Alkalinity as CaCO3	mg/L	NC	84	124
Total Alkalinity as CaCO3	mg/L	NC	84	124
Dissolved Major Anions				
Sulfate as $SO4^{2-}$	mg/L	NC	1	5
Chloride				
Chloride	µg/L	NC	8000	15000
Dissolved Major Cations				
Calcium	mg/L	NC	19	27
Magnesium	mg/L	NC	5	6
Sodium	mg/L	NC	13	22
Potassium	mg/L	NC	7	12
Total Metals				
Arsenic	µg/L	24	5	13
Cadmium	µg/L	370	<0.1	0.1
Chromium (Total)	µg/L	NC	1	9
Copper	µg/L	1.4	3	11
Nickel	µg/L	11	3	21
Lead	µg/L	3.4	2	12
Zinc	µg/L	8	7	34
Iron	µg/L	NC	2820	1560
Ammonia as N				
Ammonia as N	µg/L	20	10	26
Nitrite as N				
Nitrite as N	µg/L	3	<10	<10
Nitrate as N				
Nitrate as N	µg/L	700	20	70
NOX as N				

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet	Dry
Nitrite + Nitrate as N	µg/L	10	20	70
Total Kjeldahl Nitrogen (TKN)				
Total Kjeldahl Nitrogen as N	µg/L	NC	200	2200
Total Nitrogen as N (TKN + NOx)				
Total Nitrogen as N	µg/L	250	200	2200
Total Phosphorus as P				
Total Phosphorus as P	µg/L	30	90	650
Ionic Balance				
Total Anions	meq/L	NC	1.93	3.02
Total Cations	meq/L	NC	2.09	3.1
Ionic Balance	%	NC	-	1.43
Chlorophyll a & Pheophytin a				
Chlorophyll a	mg/m³	5	3	47
Polychlorinated Biphenyls (PCB)				
Total Polychlorinated biphenyls	µg/L	NC	<1	<1
Polynuclear Aromatic Hydrocarbons				
Naphthalene	µg/L	16	<1	<1
Acenaphthylene	µg/L	NC	<1	<1
Acenaphthene	µg/L	NC	<1	<1
Fluorene	µg/L	NC	<1	<1
Phenanthrene	µg/L	NC	<1	<1
Anthracene	µg/L	NC	<1	<1
Fluoranthene	µg/L	NC	<1	<1
Pyrene	µg/L	NC	<1	<1
Benz(a)anthracene	µg/L	NC	<1	<1
Chrysene	µg/L	NC	<1	<1
Benzo(b)fluoranthene	µg/L	NC	<1	<1
Benzo(k)fluoranthene	µg/L	NC	<1	<1
Benzo(a)pyrene	µg/L	NC	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	µg/L	NC	<1	<1
Dibenz(a.h)anthracene	µg/L	NC	<1	<1
Benzo(g.h.i)perylene	µg/L	NC	<1	<1
Total PAH	µg/L	3	<1	<1
Total Petroleum Hydrocarbons				
C6 - C9 Fraction	µg/L	NC	<20	<20
C10 - C14 Fraction	µg/L		<50	<50
C15 - C28 Fraction	µg/L		<100	<100
C29 - C36 Fraction	µg/L		<50	<50
C10 - C36 Fraction (sum)	µg/L		<50	<50

SITE WQ40

Wet Season

Upstream

Downstream

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet
Temperature	°C	NC	20.8
pH	pH Unit	6.5-7.5	6.8
Conductivity	mS/cm	0.18	0.334
Dissolved oxygen (% saturation)	%	90-110	80
Turbidity	NTU	25	75
Non Marine - Estimated TDS Salinity			
Total Dissolved Solids (est.)	mg/L	NC	-
Suspended Solids			
Suspended Solids (SS)	mg/L	10	-
Alkalinity			
Hydroxide Alkalinity as CaCO3	mg/L	NC	<1
Carbonate Alkalinity as CaCO3	mg/L	NC	<1
Bicarbonate Alkalinity as CaCO3	mg/L	NC	115
Total Alkalinity as CaCO3	mg/L	NC	115
Dissolved Major Anions			
Sulfate as $SO4^{2-}$	mg/L	NC	2
Chloride			
Chloride	µg/L	NC	17000
Dissolved Major Cations			
Calcium	mg/L	NC	22
Magnesium	mg/L	NC	9
Sodium	mg/L	NC	18
Potassium	mg/L	NC	8
Total Metals			
Arsenic	µg/L	24	2
Cadmium	µg/L	370	<0.1
Chromium (Total)	µg/L	NC	<1
Copper	µg/L	1.4	2
Nickel	µg/L	11	<1
Lead	µg/L	3.4	3
Zinc	µg/L	8	<5
Iron	µg/L	NC	1260
Ammonia as N			
Ammonia as N	µg/L	20	20
Nitrite as N			
Nitrite as N	µg/L	3	<10
Nitrate as N			
Nitrate as N	µg/L	700	<10
NOX as N			

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet
Nitrite + Nitrate as N	µg/L	10	<10
Total Kjeldahl Nitrogen (TKN)			
Total Kjeldahl Nitrogen as N	µg/L	NC	<10
Total Nitrogen as N (TKN + NOx)			
Total Nitrogen as N	µg/L	250	<10
Total Phosphorus as P			
Total Phosphorus as P	µg/L	30	<10
Ionic Balance			
Total Anions	meq/L	NC	2.83
Total Cations	meq/L	NC	2.82
Ionic Balance	%	NC	-
Chlorophyll a & Pheophytin a			
Chlorophyll a	mg/m³	5	8
Polychlorinated Biphenyls (PCB)			
Total Polychlorinated biphenyls	µg/L	NC	<1
Polynuclear Aromatic Hydrocarbons			
Naphthalene	µg/L	16	<1
Acenaphthylene	µg/L	NC	<1
Acenaphthene	µg/L	NC	<1
Fluorene	µg/L	NC	<1
Phenanthrene	µg/L	NC	<1
Anthracene	µg/L	NC	<1
Fluoranthene	µg/L	NC	<1
Pyrene	µg/L	NC	<1
Benz(a)anthracene	µg/L	NC	<1
Chrysene	µg/L	NC	<1
Benzo(b)fluoranthene	µg/L	NC	<1
Benzo(k)fluoranthene	µg/L	NC	<1
Benzo(a)pyrene	µg/L	NC	<0.5
Indeno(1.2.3.cd)pyrene	µg/L	NC	<1
Dibenz(a.h)anthracene	µg/L	NC	<1
Benzo(g.h.i)perylene	µg/L	NC	<1
Total PAH	µg/L	3	<1
Total Petroleum Hydrocarbons			
C6 - C9 Fraction	µg/L	NC	<20
C10 - C14 Fraction	µg/L		<50
C15 - C28 Fraction	µg/L		<100
C29 - C36 Fraction	µg/L		<50
C10 - C36 Fraction (sum)	µg/L		<50

SITE WQ41

Wet Season

Upstream

Downstream

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet
Temperature	°C	NC	23.2
pH	pH Unit	6.5-7.5	6.8
Conductivity	mS/cm	0.18	0.215
Dissolved oxygen (% saturation)	%	90-110	48
Turbidity	NTU	25	83
Non Marine - Estimated TDS Salinity			
Total Dissolved Solids (est.)	mg/L	NC	-
Suspended Solids			
Suspended Solids (SS)	mg/L	10	-
Alkalinity			
Hydroxide Alkalinity as CaCO3	mg/L	NC	<1
Carbonate Alkalinity as CaCO3	mg/L	NC	<1
Bicarbonate Alkalinity as CaCO3	mg/L	NC	56
Total Alkalinity as CaCO3	mg/L	NC	56
Dissolved Major Anions			
Sulfate as $SO4^{2-}$	mg/L	NC	<1
Chloride			
Chloride	µg/L	NC	10000
Dissolved Major Cations			
Calcium	mg/L	NC	11
Magnesium	mg/L	NC	5
Sodium	mg/L	NC	9
Potassium	mg/L	NC	9
Total Metals			
Arsenic	µg/L	24	2
Cadmium	µg/L	370	<0.1
Chromium (Total)	µg/L	NC	1
Copper	µg/L	1.4	6
Nickel	µg/L	11	2
Lead	µg/L	3.4	1
Zinc	µg/L	8	<5
Iron	µg/L	NC	2380
Ammonia as N			
Ammonia as N	µg/L	20	40
Nitrite as N			
Nitrite as N	µg/L	3	<10
Nitrate as N			
Nitrate as N	µg/L	700	30
NOX as N			

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet
Nitrite + Nitrate as N	µg/L	10	30
Total Kjeldahl Nitrogen (TKN)			
Total Kjeldahl Nitrogen as N	µg/L	NC	500
Total Nitrogen as N (TKN + NOx)			
Total Nitrogen as N	µg/L	250	500
Total Phosphorus as P			
Total Phosphorus as P	µg/L	30	140
Ionic Balance			
Total Anions	meq/L	NC	1.4
Total Cations	meq/L	NC	1.57
Ionic Balance	%	NC	-
Chlorophyll a & Pheophytin a			
Chlorophyll a	mg/m³	5	3
Polychlorinated Biphenyls (PCB)			
Total Polychlorinated biphenyls	µg/L	NC	<1
Polynuclear Aromatic Hydrocarbons			
Naphthalene	µg/L	16	<1
Acenaphthylene	µg/L	NC	<1
Acenaphthene	µg/L	NC	<1
Fluorene	µg/L	NC	<1
Phenanthrene	µg/L	NC	<1
Anthracene	µg/L	NC	<1
Fluoranthene	µg/L	NC	<1
Pyrene	µg/L	NC	<1
Benz(a)anthracene	µg/L	NC	<1
Chrysene	µg/L	NC	<1
Benzo(b)fluoranthene	µg/L	NC	<1
Benzo(k)fluoranthene	µg/L	NC	<1
Benzo(a)pyrene	µg/L	NC	<0.5
Indeno(1.2.3.cd)pyrene	µg/L	NC	<1
Dibenz(a.h)anthracene	µg/L	NC	<1
Benzo(g.h.i)perylene	µg/L	NC	<1
Total PAH	µg/L	3	<1
Total Petroleum Hydrocarbons			
C6 - C9 Fraction	µg/L	NC	<20
C10 - C14 Fraction	µg/L		<50
C15 - C28 Fraction	µg/L		210
C29 - C36 Fraction	µg/L		70
C10 - C36 Fraction (sum)	µg/L		280

SITE WQ42

Wet Season

Upstream

Downstream

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet
Temperature	°C	NC	22.8
pH	pH Unit	6.5-7.5	6.7
Conductivity	mS/cm	0.18	0.214
Dissolved oxygen (% saturation)	%	90-110	23
Turbidity	NTU	25	66
Non Marine - Estimated TDS Salinity			
Total Dissolved Solids (est.)	mg/L	NC	87
Suspended Solids			
Suspended Solids (SS)	mg/L	10	12
Alkalinity			
Hydroxide Alkalinity as CaCO3	mg/L	NC	<1
Carbonate Alkalinity as CaCO3	mg/L	NC	<1
Bicarbonate Alkalinity as CaCO3	mg/L	NC	63
Total Alkalinity as CaCO3	mg/L	NC	63
Dissolved Major Anions			
Sulfate as $SO4^{2-}$	mg/L	NC	2
Chloride			
Chloride	µg/L	NC	4000
Dissolved Major Cations			
Calcium	mg/L	NC	14
Magnesium	mg/L	NC	4
Sodium	mg/L	NC	7
Potassium	mg/L	NC	6
Total Metals			
Arsenic	µg/L	24	5
Cadmium	µg/L	370	<0.1
Chromium (Total)	µg/L	NC	1
Copper	µg/L	1.4	2
Nickel	µg/L	11	3
Lead	µg/L	3.4	2
Zinc	µg/L	8	<5
Iron	µg/L	NC	2030
Ammonia as N			
Ammonia as N	µg/L	20	<10
Nitrite as N			
Nitrite as N	µg/L	3	<10
Nitrate as N			
Nitrate as N	µg/L	700	20
NOX as N			

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet
Nitrite + Nitrate as N	µg/L	10	20
Total Kjeldahl Nitrogen (TKN)			
Total Kjeldahl Nitrogen as N	µg/L	NC	800
Total Nitrogen as N (TKN + NOx)			
Total Nitrogen as N	µg/L	250	800
Total Phosphorus as P			
Total Phosphorus as P	µg/L	30	20
Ionic Balance			
Total Anions	meq/L	NC	1.42
Total Cations	meq/L	NC	1.45
Ionic Balance	%	NC	-
Chlorophyll a & Pheophytin a			
Chlorophyll a	mg/m³	5	2
Polychlorinated Biphenyls (PCB)			
Total Polychlorinated biphenyls	µg/L	NC	<1
Polynuclear Aromatic Hydrocarbons			
Naphthalene	µg/L	16	<1
Acenaphthylene	µg/L	NC	<1
Acenaphthene	µg/L	NC	<1
Fluorene	µg/L	NC	<1
Phenanthrene	µg/L	NC	<1
Anthracene	µg/L	NC	<1
Fluoranthene	µg/L	NC	<1
Pyrene	µg/L	NC	<1
Benz(a)anthracene	µg/L	NC	<1
Chrysene	µg/L	NC	<1
Benzo(b)fluoranthene	µg/L	NC	<1
Benzo(k)fluoranthene	µg/L	NC	<1
Benzo(a)pyrene	µg/L	NC	<0.5
Indeno(1.2.3.cd)pyrene	µg/L	NC	<1
Dibenz(a.h)anthracene	µg/L	NC	<1
Benzo(g.h.i)perylene	µg/L	NC	<1
Total PAH	µg/L	3	<1
Total Petroleum Hydrocarbons			
C6 - C9 Fraction	µg/L	NC	<20
C10 - C14 Fraction	µg/L		<50
C15 - C28 Fraction	µg/L		<100
C29 - C36 Fraction	µg/L		<50
C10 - C36 Fraction (sum)	µg/L		<50

SITE WQ43

Wet Season

Upstream

Downstream

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet
Temperature	°C	NC	24
pH	pH Unit	6.5-7.5	6.8
Conductivity	mS/cm	0.18	0.36
Dissolved oxygen (% saturation)	%	90-110	50
Turbidity	NTU	25	300
Non Marine - Estimated TDS Salinity			
Total Dissolved Solids (est.)	mg/L	NC	144
Suspended Solids			
Suspended Solids (SS)	mg/L	10	54
Alkalinity			
Hydroxide Alkalinity as CaCO3	mg/L	NC	<1
Carbonate Alkalinity as CaCO3	mg/L	NC	<1
Bicarbonate Alkalinity as CaCO3	mg/L	NC	90
Total Alkalinity as CaCO3	mg/L	NC	90
Dissolved Major Anions			
Sulfate as $SO4^{2-}$	mg/L	NC	2
Chloride			
Chloride	µg/L	NC	11000
Dissolved Major Cations			
Calcium	mg/L	NC	20
Magnesium	mg/L	NC	5
Sodium	mg/L	NC	17
Potassium	mg/L	NC	6
Total Metals			
Arsenic	µg/L	24	4
Cadmium	µg/L	370	<0.1
Chromium (Total)	µg/L	NC	3
Copper	µg/L	1.4	5
Nickel	µg/L	11	5
Lead	µg/L	3.4	4
Zinc	µg/L	8	14
Iron	µg/L	NC	5650
Ammonia as N			
Ammonia as N	µg/L	20	<10
Nitrite as N			
Nitrite as N	µg/L	3	<10
Nitrate as N			
Nitrate as N	µg/L	700	130
NOX as N			

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet
Nitrite + Nitrate as N	µg/L	10	130
Total Kjeldahl Nitrogen (TKN)			
Total Kjeldahl Nitrogen as N	µg/L	NC	800
Total Nitrogen as N (TKN + NOx)			
Total Nitrogen as N	µg/L	250	900
Total Phosphorus as P			
Total Phosphorus as P	µg/L	30	<10
Ionic Balance			
Total Anions	meq/L	NC	2.15
Total Cations	meq/L	NC	2.27
Ionic Balance	%	NC	-
Chlorophyll a & Pheophytin a			
Chlorophyll a	mg/m³	5	1
Polychlorinated Biphenyls (PCB)			
Total Polychlorinated biphenyls	µg/L	NC	<1
Polynuclear Aromatic Hydrocarbons			
Naphthalene	µg/L	16	<1
Acenaphthylene	µg/L	NC	<1
Acenaphthene	µg/L	NC	<1
Fluorene	µg/L	NC	<1
Phenanthrene	µg/L	NC	<1
Anthracene	µg/L	NC	<1
Fluoranthene	µg/L	NC	<1
Pyrene	µg/L	NC	<1
Benz(a)anthracene	µg/L	NC	<1
Chrysene	µg/L	NC	<1
Benzo(b)fluoranthene	µg/L	NC	<1
Benzo(k)fluoranthene	µg/L	NC	<1
Benzo(a)pyrene	µg/L	NC	<0.5
Indeno(1.2.3.cd)pyrene	µg/L	NC	<1
Dibenz(a.h)anthracene	µg/L	NC	<1
Benzo(g.h.i)perylene	µg/L	NC	<1
Total PAH	µg/L	3	<1
Total Petroleum Hydrocarbons			
C6 - C9 Fraction	µg/L	NC	<20
C10 - C14 Fraction	µg/L		<50
C15 - C28 Fraction	µg/L		<100
C29 - C36 Fraction	µg/L		<50
C10 - C36 Fraction (sum)	µg/L		<50

SITE WQ44

Wet Season

Upstream

Downstream

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet
Temperature	°C	NC	28.4
pH	pH Unit	6.5-7.5	6.7
Conductivity	mS/cm	0.18	0.247
Dissolved oxygen (% saturation)	%	90-110	76
Turbidity	NTU	25	110
Non Marine - Estimated TDS Salinity			
Total Dissolved Solids (est.)	mg/L	NC	125
Suspended Solids			
Suspended Solids (SS)	mg/L	10	24
Alkalinity			
Hydroxide Alkalinity as CaCO3	mg/L	NC	<1
Carbonate Alkalinity as CaCO3	mg/L	NC	<1
Bicarbonate Alkalinity as CaCO3	mg/L	NC	92
Total Alkalinity as CaCO3	mg/L	NC	92
Dissolved Major Anions			
Sulfate as $SO4^{2-}$	mg/L	NC	1
Chloride			
Chloride	µg/L	NC	11000
Dissolved Major Cations			
Calcium	mg/L	NC	16
Magnesium	mg/L	NC	7
Sodium	mg/L	NC	9
Potassium	mg/L	NC	10
Total Metals			
Arsenic	µg/L	24	1
Cadmium	µg/L	370	<0.1
Chromium (Total)	µg/L	NC	<1
Copper	µg/L	1.4	2
Nickel	µg/L	11	2
Lead	µg/L	3.4	<1
Zinc	µg/L	8	<5
Iron	µg/L	NC	1890
Ammonia as N			
Ammonia as N	µg/L	20	<10
Nitrite as N			
Nitrite as N	µg/L	3	<10
Nitrate as N			
Nitrate as N	µg/L	700	20
NOX as N			

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet
Nitrite + Nitrate as N	µg/L	10	20
Total Kjeldahl Nitrogen (TKN)			
Total Kjeldahl Nitrogen as N	µg/L	NC	800
Total Nitrogen as N (TKN + NOx)			
Total Nitrogen as N	µg/L	250	800
Total Phosphorus as P			
Total Phosphorus as P	µg/L	30	50
Ionic Balance			
Total Anions	meq/L	NC	2.18
Total Cations	meq/L	NC	2.03
Ionic Balance	%	NC	-
Chlorophyll a & Pheophytin a			
Chlorophyll a	mg/m³	5	4
Polychlorinated Biphenyls (PCB)			
Total Polychlorinated biphenyls	µg/L	NC	<1
Polynuclear Aromatic Hydrocarbons			
Naphthalene	µg/L	16	<1
Acenaphthylene	µg/L	NC	<1
Acenaphthene	µg/L	NC	<1
Fluorene	µg/L	NC	<1
Phenanthrene	µg/L	NC	<1
Anthracene	µg/L	NC	<1
Fluoranthene	µg/L	NC	<1
Pyrene	µg/L	NC	<1
Benz(a)anthracene	µg/L	NC	<1
Chrysene	µg/L	NC	<1
Benzo(b)fluoranthene	µg/L	NC	<1
Benzo(k)fluoranthene	µg/L	NC	<1
Benzo(a)pyrene	µg/L	NC	<0.5
Indeno(1.2.3.cd)pyrene	µg/L	NC	<1
Dibenz(a.h)anthracene	µg/L	NC	<1
Benzo(g.h.i)perylene	µg/L	NC	<1
Total PAH	µg/L	3	<1
Total Petroleum Hydrocarbons			
C6 - C9 Fraction	µg/L	NC	<20
C10 - C14 Fraction	µg/L		<50
C15 - C28 Fraction	µg/L		<100
C29 - C36 Fraction	µg/L		<50
C10 - C36 Fraction (sum)	µg/L		<50

SITE WQ45

Wet Season

Upstream

Downstream

Dry Season

Upstream

Downstream

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet	Dry
Temperature	°C	NC	27.7	21
pH	pH Unit	6.5-7.5	5.9	6.31
Conductivity	mS/cm	0.18	0.162	0.349
Dissolved oxygen (% saturation)	%	90-110	42	25
Turbidity	NTU	25	25	3185
Non Marine - Estimated TDS Salinity				
Total Dissolved Solids (est.)	mg/L	NC	77	-
Suspended Solids				
Suspended Solids (SS)	mg/L	10	38	-
Alkalinity				
Hydroxide Alkalinity as CaCO3	mg/L	NC	<1	<1
Carbonate Alkalinity as CaCO3	mg/L	NC	<1	<1
Bicarbonate Alkalinity as CaCO3	mg/L	NC	42	104
Total Alkalinity as CaCO3	mg/L	NC	42	104
Dissolved Major Anions				
Sulfate as $SO4^{2-}$	mg/L	NC	<1	4
Chloride				
Chloride	µg/L	NC	8000	37000
Dissolved Major Cations				
Calcium	mg/L	NC	7	9
Magnesium	mg/L	NC	3	5
Sodium	mg/L	NC	8	38
Potassium	mg/L	NC	9	31
Total Metals				
Arsenic	µg/L	24	2	15
Cadmium	µg/L	370	<0.1	<0.1
Chromium (Total)	µg/L	NC	<1	28
Copper	µg/L	1.4	2	25
Nickel	µg/L	11	<1	64
Lead	µg/L	3.4	<1	17
Zinc	µg/L	8	<5	40
Iron	µg/L	NC	2620	5470
Ammonia as N				
Ammonia as N	µg/L	20	30	850
Nitrite as N				
Nitrite as N	µg/L	3	<10	10
Nitrate as N				
Nitrate as N	µg/L	700	20	<10
NOX as N				

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet	Dry
Nitrite + Nitrate as N	µg/L	10	20	20
Total Kjeldahl Nitrogen (TKN)				
Total Kjeldahl Nitrogen as N	µg/L	NC	1,600	2800
Total Nitrogen as N (TKN + NOx)				
Total Nitrogen as N	µg/L	250	1,600	2800
Total Phosphorus as P				
Total Phosphorus as P	µg/L	30	190	560
Ionic Balance				
Total Anions	meq/L	NC	1.06	3.22
Total Cations	meq/L	NC	1.14	3.3
Ionic Balance	%	NC	-	1.32
Chlorophyll a & Pheophytin a				
Chlorophyll a	mg/m³	5	10	<1
Polychlorinated Biphenyls (PCB)				
Total Polychlorinated biphenyls	µg/L	NC	<1	<1
Polynuclear Aromatic Hydrocarbons				
Naphthalene	µg/L	16	<1	<1
Acenaphthylene	µg/L	NC	<1	<1
Acenaphthene	µg/L	NC	<1	<1
Fluorene	µg/L	NC	<1	<1
Phenanthrene	µg/L	NC	<1	<1
Anthracene	µg/L	NC	<1	<1
Fluoranthene	µg/L	NC	<1	<1
Pyrene	µg/L	NC	<1	<1
Benz(a)anthracene	µg/L	NC	<1	<1
Chrysene	µg/L	NC	<1	<1
Benzo(b)fluoranthene	µg/L	NC	<1	<1
Benzo(k)fluoranthene	µg/L	NC	<1	<1
Benzo(a)pyrene	µg/L	NC	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	µg/L	NC	<1	<1
Dibenz(a.h)anthracene	µg/L	NC	<1	<1
Benzo(g.h.i)perylene	µg/L	NC	<1	<1
Total PAH	µg/L	3	<1	<1
Total Petroleum Hydrocarbons				
C6 - C9 Fraction	µg/L	NC	<20	<20
C10 - C14 Fraction	µg/L		<50	<50
C15 - C28 Fraction	µg/L		390	490
C29 - C36 Fraction	µg/L		90	200
C10 - C36 Fraction (sum)	µg/L		480	690

SITE WQ46

Wet Season

Upstream

Downstream

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet
Temperature	°C	NC	25.2
pH	pH Unit	6.5-7.5	6.2
Conductivity	mS/cm	0.18	0.228
Dissolved oxygen (% saturation)	%	90-110	45
Turbidity	NTU	25	162
Non Marine - Estimated TDS Salinity			
Total Dissolved Solids (est.)	mg/L	NC	112
Suspended Solids			
Suspended Solids (SS)	mg/L	10	14
Alkalinity			
Hydroxide Alkalinity as CaCO3	mg/L	NC	<1
Carbonate Alkalinity as CaCO3	mg/L	NC	<1
Bicarbonate Alkalinity as CaCO3	mg/L	NC	69
Total Alkalinity as CaCO3	mg/L	NC	69
Dissolved Major Anions			
Sulfate as $SO4^{2-}$	mg/L	NC	<1
Chloride			
Chloride	µg/L	NC	11000
Dissolved Major Cations			
Calcium	mg/L	NC	14
Magnesium	mg/L	NC	6
Sodium	mg/L	NC	8
Potassium	mg/L	NC	10
Total Metals			
Arsenic	µg/L	24	2
Cadmium	µg/L	370	<0.1
Chromium (Total)	µg/L	NC	<1
Copper	µg/L	1.4	1
Nickel	µg/L	11	3
Lead	µg/L	3.4	<1
Zinc	µg/L	8	7
Iron	µg/L	NC	4500
Ammonia as N			
Ammonia as N	µg/L	20	<10
Nitrite as N			
Nitrite as N	µg/L	3	<10
Nitrate as N			
Nitrate as N	µg/L	700	20
NOX as N			

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet
Nitrite + Nitrate as N	µg/L	10	20
Total Kjeldahl Nitrogen (TKN)			
Total Kjeldahl Nitrogen as N	µg/L	NC	800
Total Nitrogen as N (TKN + NOx)			
Total Nitrogen as N	µg/L	250	800
Total Phosphorus as P			
Total Phosphorus as P	µg/L	30	120
Ionic Balance			
Total Anions	meq/L	NC	1.69
Total Cations	meq/L	NC	1.82
Ionic Balance	%	NC	-

SITE WQ47

Wet Season

Upstream

Downstream

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet
Temperature	°C	NC	25
pH	pH Unit	6.5-7.5	6.3
Conductivity	mS/cm	0.18	0.152
Dissolved oxygen (% saturation)	%	90-110	35
Turbidity	NTU	25	1.7
Non Marine - Estimated TDS Salinity			
Total Dissolved Solids (est.)	mg/L	NC	71
Suspended Solids			
Suspended Solids (SS)	mg/L	10	7
Alkalinity			
Hydroxide Alkalinity as CaCO3	mg/L	NC	<1
Carbonate Alkalinity as CaCO3	mg/L	NC	<1
Bicarbonate Alkalinity as CaCO3	mg/L	NC	40
Total Alkalinity as CaCO3	mg/L	NC	40
Dissolved Major Anions			
Sulfate as $SO4^{2-}$	mg/L	NC	<1
Chloride			
Chloride	µg/L	NC	8000
Dissolved Major Cations			
Calcium	mg/L	NC	6
Magnesium	mg/L	NC	3
Sodium	mg/L	NC	9
Potassium	mg/L	NC	8
Total Metals			
Arsenic	µg/L	24	2
Cadmium	µg/L	370	<0.1
Chromium (Total)	µg/L	NC	<1
Copper	µg/L	1.4	<1
Nickel	µg/L	11	<1
Lead	µg/L	3.4	<1
Zinc	µg/L	8	<5
Iron	µg/L	NC	830
Ammonia as N			
Ammonia as N	µg/L	20	<10
Nitrite as N			
Nitrite as N	µg/L	3	<10
Nitrate as N			
Nitrate as N	µg/L	700	20
NOX as N			

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet
Nitrite + Nitrate as N	µg/L	10	20
Total Kjeldahl Nitrogen (TKN)			
Total Kjeldahl Nitrogen as N	µg/L	NC	1200
Total Nitrogen as N (TKN + NOx)			
Total Nitrogen as N	µg/L	250	1200
Total Phosphorus as P			
Total Phosphorus as P	µg/L	30	30
Ionic Balance			
Total Anions	meq/L	NC	1.02
Total Cations	meq/L	NC	1.13
Ionic Balance	%	NC	-
Chlorophyll a & Pheophytin a			
Chlorophyll a	mg/m³	5	<1
Polychlorinated Biphenyls (PCB)			
Total Polychlorinated biphenyls	µg/L	NC	<1
Polynuclear Aromatic Hydrocarbons			
Naphthalene	µg/L	16	<1
Acenaphthylene	µg/L	NC	<1
Acenaphthene	µg/L	NC	<1
Fluorene	µg/L	NC	<1
Phenanthrene	µg/L	NC	<1
Anthracene	µg/L	NC	<1
Fluoranthene	µg/L	NC	<1
Pyrene	µg/L	NC	<1
Benz(a)anthracene	µg/L	NC	<1
Chrysene	µg/L	NC	<1
Benzo(b)fluoranthene	µg/L	NC	<1
Benzo(k)fluoranthene	µg/L	NC	<1
Benzo(a)pyrene	µg/L	NC	<0.5
Indeno(1.2.3.cd)pyrene	µg/L	NC	<1
Dibenz(a.h)anthracene	µg/L	NC	<1
Benzo(g.h.i)perylene	µg/L	NC	<1
Total PAH	µg/L	3	<1
Total Petroleum Hydrocarbons			
C6 - C9 Fraction	µg/L	NC	<20
C10 - C14 Fraction	µg/L		<50
C15 - C28 Fraction	µg/L		130
C29 - C36 Fraction	µg/L		<50
C10 - C36 Fraction (sum)	µg/L		130

SITE WQ48

Wet Season

Upstream

Downstream

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet
Temperature	°C	NC	28.9
pH	pH Unit	6.5-7.5	6.8
Conductivity	mS/cm	0.18	0.212
Dissolved oxygen (% saturation)	%	90-110	55
Turbidity	NTU	25	16
Non Marine - Estimated TDS Salinity			
Total Dissolved Solids (est.)	mg/L	NC	99
Suspended Solids			
Suspended Solids (SS)	mg/L	10	7
Alkalinity			
Hydroxide Alkalinity as CaCO3	mg/L	NC	<1
Carbonate Alkalinity as CaCO3	mg/L	NC	<1
Bicarbonate Alkalinity as CaCO3	mg/L	NC	37
Total Alkalinity as CaCO3	mg/L	NC	37
Dissolved Major Anions			
Sulfate as $SO4^{2-}$	mg/L	NC	1
Chloride			
Chloride	µg/L	NC	21000
Dissolved Major Cations			
Calcium	mg/L	NC	5
Magnesium	mg/L	NC	5
Sodium	mg/L	NC	15
Potassium	mg/L	NC	8
Total Metals			
Arsenic	µg/L	24	2
Cadmium	µg/L	370	0.2
Chromium (Total)	µg/L	NC	<1
Copper	µg/L	1.4	2
Nickel	µg/L	11	3
Lead	µg/L	3.4	<1
Zinc	µg/L	8	<5
Iron	µg/L	NC	13000
Ammonia as N			
Ammonia as N	µg/L	20	<10
Nitrite as N			
Nitrite as N	µg/L	3	<10
Nitrate as N			
Nitrate as N	µg/L	700	10
NOX as N			

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet
Nitrite + Nitrate as N	µg/L	10	10
Total Kjeldahl Nitrogen (TKN)			
Total Kjeldahl Nitrogen as N	µg/L	NC	600
Total Nitrogen as N (TKN + NOx)			
Total Nitrogen as N	µg/L	250	600
Total Phosphorus as P			
Total Phosphorus as P	µg/L	30	<10
Ionic Balance			
Total Anions	meq/L	NC	1.35
Total Cations	meq/L	NC	1.52
Ionic Balance	%	NC	-
Chlorophyll a & Pheophytin a			
Chlorophyll a	mg/m³	5	<1
Polychlorinated Biphenyls (PCB)			
Total Polychlorinated biphenyls	µg/L	NC	<1
Polynuclear Aromatic Hydrocarbons			
Naphthalene	µg/L	16	<1
Acenaphthylene	µg/L	NC	<1
Acenaphthene	µg/L	NC	<1
Fluorene	µg/L	NC	<1
Phenanthrene	µg/L	NC	<1
Anthracene	µg/L	NC	<1
Fluoranthene	µg/L	NC	<1
Pyrene	µg/L	NC	<1
Benz(a)anthracene	µg/L	NC	<1
Chrysene	µg/L	NC	<1
Benzo(b)fluoranthene	µg/L	NC	<1
Benzo(k)fluoranthene	µg/L	NC	<1
Benzo(a)pyrene	µg/L	NC	<0.5
Indeno(1.2.3.cd)pyrene	µg/L	NC	<1
Dibenz(a.h)anthracene	µg/L	NC	<1
Benzo(g.h.i)perylene	µg/L	NC	<1
Total PAH	µg/L	3	<1
Total Petroleum Hydrocarbons			
C6 - C9 Fraction	µg/L	NC	<20
C10 - C14 Fraction	µg/L		<50
C15 - C28 Fraction	µg/L		<100
C29 - C36 Fraction	µg/L		<50
C10 - C36 Fraction (sum)	µg/L		<50

SITE WQ49

Wet Season

Upstream

Downstream

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet
Temperature	°C	NC	25.2
pH	pH Unit	6.5-7.5	6.4
Conductivity	mS/cm	0.18	0.1316
Dissolved oxygen (% saturation)	%	90-110	43
Turbidity	NTU	25	270
Non Marine - Estimated TDS Salinity			
Total Dissolved Solids (est.)	mg/L	NC	53
Suspended Solids			
Suspended Solids (SS)	mg/L	10	48
Alkalinity			
Hydroxide Alkalinity as CaCO3	mg/L	NC	<1
Carbonate Alkalinity as CaCO3	mg/L	NC	<1
Bicarbonate Alkalinity as CaCO3	mg/L	NC	15
Total Alkalinity as CaCO3	mg/L	NC	15
Dissolved Major Anions			
Sulfate as $SO4^{2-}$	mg/L	NC	2
Chloride			
Chloride	µg/L	NC	14000
Dissolved Major Cations			
Calcium	mg/L	NC	2
Magnesium	mg/L	NC	2
Sodium	mg/L	NC	10
Potassium	mg/L	NC	5
Total Metals			
Arsenic	µg/L	24	2
Cadmium	µg/L	370	<0.1
Chromium (Total)	µg/L	NC	3
Copper	µg/L	1.4	6
Nickel	µg/L	11	3
Lead	µg/L	3.4	3
Zinc	µg/L	8	<5
Iron	µg/L	NC	4320
Ammonia as N			
Ammonia as N	µg/L	20	10
Nitrite as N			
Nitrite as N	µg/L	3	<10
Nitrate as N			
Nitrate as N	µg/L	700	20
NOX as N			

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet
Nitrite + Nitrate as N	µg/L	10	20
Total Kjeldahl Nitrogen (TKN)			
Total Kjeldahl Nitrogen as N	µg/L	NC	400
Total Nitrogen as N (TKN + NOx)			
Total Nitrogen as N	µg/L	250	400
Total Phosphorus as P			
Total Phosphorus as P	µg/L	30	20
Ionic Balance			
Total Anions	meq/L	NC	0.72
Total Cations	meq/L	NC	0.79
Ionic Balance	%	NC	-
Chlorophyll a & Pheophytin a			
Chlorophyll a	mg/m³	5	<1
Polychlorinated Biphenyls (PCB)			
Total Polychlorinated biphenyls	µg/L	NC	<1
Polynuclear Aromatic Hydrocarbons			
Naphthalene	µg/L	16	<1
Acenaphthylene	µg/L	NC	<1
Acenaphthene	µg/L	NC	<1
Fluorene	µg/L	NC	<1
Phenanthrene	µg/L	NC	<1
Anthracene	µg/L	NC	<1
Fluoranthene	µg/L	NC	<1
Pyrene	µg/L	NC	<1
Benz(a)anthracene	µg/L	NC	<1
Chrysene	µg/L	NC	<1
Benzo(b)fluoranthene	µg/L	NC	<1
Benzo(k)fluoranthene	µg/L	NC	<1
Benzo(a)pyrene	µg/L	NC	<0.5
Indeno(1.2.3.cd)pyrene	µg/L	NC	<1
Dibenz(a.h)anthracene	µg/L	NC	<1
Benzo(g.h.i)perylene	µg/L	NC	<1
Total PAH	µg/L	3	<1
Total Petroleum Hydrocarbons			
C6 - C9 Fraction	µg/L	NC	<20
C10 - C14 Fraction	µg/L		<50
C15 - C28 Fraction	µg/L		<100
C29 - C36 Fraction	µg/L		<50
C10 - C36 Fraction (sum)	µg/L		<50

SITE WQ50

Wet Season

Upstream

Downstream

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet
Temperature	°C	NC	24.4
pH	pH Unit	6.5-7.5	6.6
Conductivity	mS/cm	0.18	0.289
Dissolved oxygen (% saturation)	%	90-110	57
Turbidity	NTU	25	19
Non Marine - Estimated TDS Salinity			
Total Dissolved Solids (est.)	mg/L	NC	125
Suspended Solids			
Suspended Solids (SS)	mg/L	10	24
Alkalinity			
Hydroxide Alkalinity as CaCO3	mg/L	NC	<1
Carbonate Alkalinity as CaCO3	mg/L	NC	<1
Bicarbonate Alkalinity as CaCO3	mg/L	NC	92
Total Alkalinity as CaCO3	mg/L	NC	92
Dissolved Major Anions			
Sulfate as $SO4^{2-}$	mg/L	NC	1
Chloride			
Chloride	µg/L	NC	11000
Dissolved Major Cations			
Calcium	mg/L	NC	16
Magnesium	mg/L	NC	7
Sodium	mg/L	NC	9
Potassium	mg/L	NC	10
Total Metals			
Arsenic	µg/L	24	1
Cadmium	µg/L	370	<0.1
Chromium (Total)	µg/L	NC	<1
Copper	µg/L	1.4	2
Nickel	µg/L	11	2
Lead	µg/L	3.4	<1
Zinc	µg/L	8	<5
Iron	µg/L	NC	1890
Ammonia as N			
Ammonia as N	µg/L	20	<10
Nitrite as N			
Nitrite as N	µg/L	3	<10
Nitrate as N			
Nitrate as N	µg/L	700	20
NOX as N			

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet
Nitrite + Nitrate as N	µg/L	10	20
Total Kjeldahl Nitrogen (TKN)			
Total Kjeldahl Nitrogen as N	µg/L	NC	800
Total Nitrogen as N (TKN + NOx)			
Total Nitrogen as N	µg/L	250	800
Total Phosphorus as P			
Total Phosphorus as P	µg/L	30	50
Ionic Balance			
Total Anions	meq/L	NC	2.18
Total Cations	meq/L	NC	2.03
Ionic Balance	%	NC	-
Chlorophyll a & Pheophytin a			
Chlorophyll a	mg/m³	5	4
Polychlorinated Biphenyls (PCB)			
Total Polychlorinated biphenyls	µg/L	NC	<1
Polynuclear Aromatic Hydrocarbons			
Naphthalene	µg/L	16	<1
Acenaphthylene	µg/L	NC	<1
Acenaphthene	µg/L	NC	<1
Fluorene	µg/L	NC	<1
Phenanthrene	µg/L	NC	<1
Anthracene	µg/L	NC	<1
Fluoranthene	µg/L	NC	<1
Pyrene	µg/L	NC	<1
Benz(a)anthracene	µg/L	NC	<1
Chrysene	µg/L	NC	<1
Benzo(b)fluoranthene	µg/L	NC	<1
Benzo(k)fluoranthene	µg/L	NC	<1
Benzo(a)pyrene	µg/L	NC	<0.5
Indeno(1.2.3.cd)pyrene	µg/L	NC	<1
Dibenz(a.h)anthracene	µg/L	NC	<1
Benzo(g.h.i)perylene	µg/L	NC	<1
Total PAH	µg/L	3	<1
Total Petroleum Hydrocarbons			
C6 - C9 Fraction	µg/L	NC	<20
C10 - C14 Fraction	µg/L		<50
C15 - C28 Fraction	µg/L		<100
C29 - C36 Fraction	µg/L		<50
C10 - C36 Fraction (sum)	µg/L		<50

SITE WQ51

Wet Season

Upstream

Downstream

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet
Temperature	°C	NC	25.2
pH	pH Unit	6.5-7.5	7.2
Conductivity	mS/cm	0.18	0.247
Dissolved oxygen (% saturation)	%	90-110	65
Turbidity	NTU	25	247
Non Marine - Estimated TDS Salinity			
Total Dissolved Solids (est.)	mg/L	NC	113
Suspended Solids			
Suspended Solids (SS)	mg/L	10	28
Alkalinity			
Hydroxide Alkalinity as CaCO3	mg/L	NC	<1
Carbonate Alkalinity as CaCO3	mg/L	NC	<1
Bicarbonate Alkalinity as CaCO3	mg/L	NC	84
Total Alkalinity as CaCO3	mg/L	NC	84
Dissolved Major Anions			
Sulfate as $SO4^{2-}$	mg/L	NC	<1
Chloride			
Chloride	µg/L	NC	9000
Dissolved Major Cations			
Calcium	mg/L	NC	15
Magnesium	mg/L	NC	6
Sodium	mg/L	NC	5
Potassium	mg/L	NC	12
Total Metals			
Arsenic	µg/L	24	<1
Cadmium	µg/L	370	<0.1
Chromium (Total)	µg/L	NC	<1
Copper	µg/L	1.4	2
Nickel	µg/L	11	2
Lead	µg/L	3.4	<1
Zinc	µg/L	8	8
Iron	µg/L	NC	6300
Ammonia as N			
Ammonia as N	µg/L	20	<10
Nitrite as N			
Nitrite as N	µg/L	3	<10
Nitrate as N			
Nitrate as N	µg/L	700	10
NOX as N			

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet
Nitrite + Nitrate as N	µg/L	10	10
Total Kjeldahl Nitrogen (TKN)			
Total Kjeldahl Nitrogen as N	µg/L	NC	1100
Total Nitrogen as N (TKN + NOx)			
Total Nitrogen as N	µg/L	250	1100
Total Phosphorus as P			
Total Phosphorus as P	µg/L	30	70
Ionic Balance			
Total Anions	meq/L	NC	1.92
Total Cations	meq/L	NC	1.75
Ionic Balance	%	NC	-
Chlorophyll a & Pheophytin a			
Chlorophyll a	mg/m³	5	4
Polychlorinated Biphenyls (PCB)			
Total Polychlorinated biphenyls	µg/L	NC	<1
Polynuclear Aromatic Hydrocarbons			
Naphthalene	µg/L	16	<1
Acenaphthylene	µg/L	NC	<1
Acenaphthene	µg/L	NC	<1
Fluorene	µg/L	NC	<1
Phenanthrene	µg/L	NC	<1
Anthracene	µg/L	NC	<1
Fluoranthene	µg/L	NC	<1
Pyrene	µg/L	NC	<1
Benz(a)anthracene	µg/L	NC	<1
Chrysene	µg/L	NC	<1
Benzo(b)fluoranthene	µg/L	NC	<1
Benzo(k)fluoranthene	µg/L	NC	<1
Benzo(a)pyrene	µg/L	NC	<0.5
Indeno(1.2.3.cd)pyrene	µg/L	NC	<1
Dibenz(a.h)anthracene	µg/L	NC	<1
Benzo(g.h.i)perylene	µg/L	NC	<1
Total PAH	µg/L	3	<1
Total Petroleum Hydrocarbons			
C6 - C9 Fraction	µg/L	NC	<20
C10 - C14 Fraction	µg/L		<50
C15 - C28 Fraction	µg/L		<100
C29 - C36 Fraction	µg/L		<50
C10 - C36 Fraction (sum)	µg/L		<50

SITE WQ52

Wet Season

Upstream

Downstream

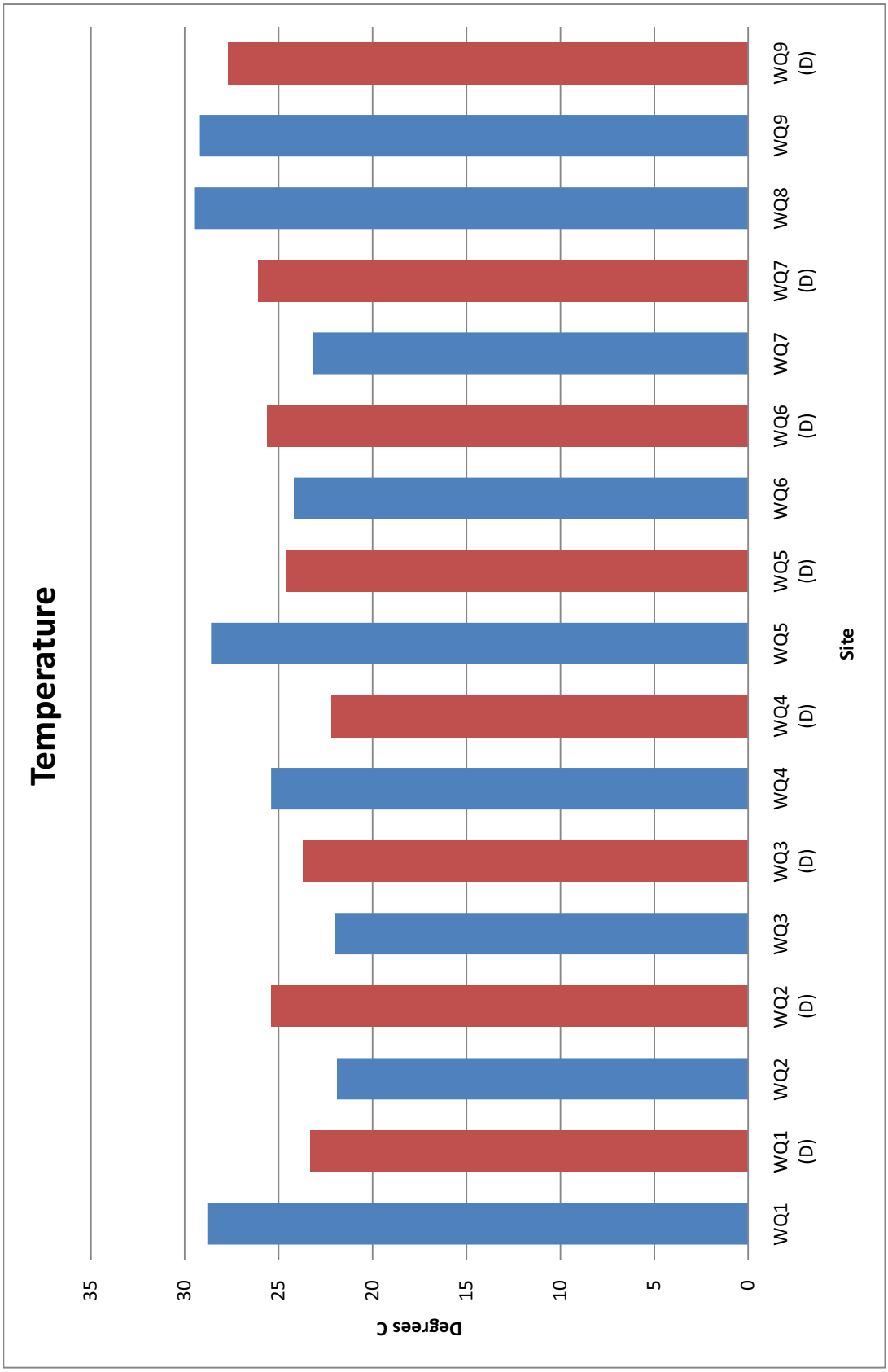
Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet
Temperature	°C	NC	25.4
pH	pH Unit	6.5-7.5	6.2
Conductivity	mS/cm	0.18	0.482
Dissolved oxygen (% saturation)	%	90-110	60
Turbidity	NTU	25	377
Non Marine - Estimated TDS Salinity			
Total Dissolved Solids (est.)	mg/L	NC	197
Suspended Solids			
Suspended Solids (SS)	mg/L	10	117
Alkalinity			
Hydroxide Alkalinity as CaCO3	mg/L	NC	<1
Carbonate Alkalinity as CaCO3	mg/L	NC	<1
Bicarbonate Alkalinity as CaCO3	mg/L	NC	77
Total Alkalinity as CaCO3	mg/L	NC	77
Dissolved Major Anions			
Sulfate as $SO4^{2-}$	mg/L	NC	3
Chloride			
Chloride	µg/L	NC	39000
Dissolved Major Cations			
Calcium	mg/L	NC	13
Magnesium	mg/L	NC	10
Sodium	mg/L	NC	27
Potassium	mg/L	NC	10
Total Metals			
Arsenic	µg/L	24	2
Cadmium	µg/L	370	<0.1
Chromium (Total)	µg/L	NC	6
Copper	µg/L	1.4	5
Nickel	µg/L	11	7
Lead	µg/L	3.4	3
Zinc	µg/L	8	10
Iron	µg/L	NC	6980
Ammonia as N			
Ammonia as N	µg/L	20	20
Nitrite as N			
Nitrite as N	µg/L	3	<10
Nitrate as N			
Nitrate as N	µg/L	700	30
NOX as N			

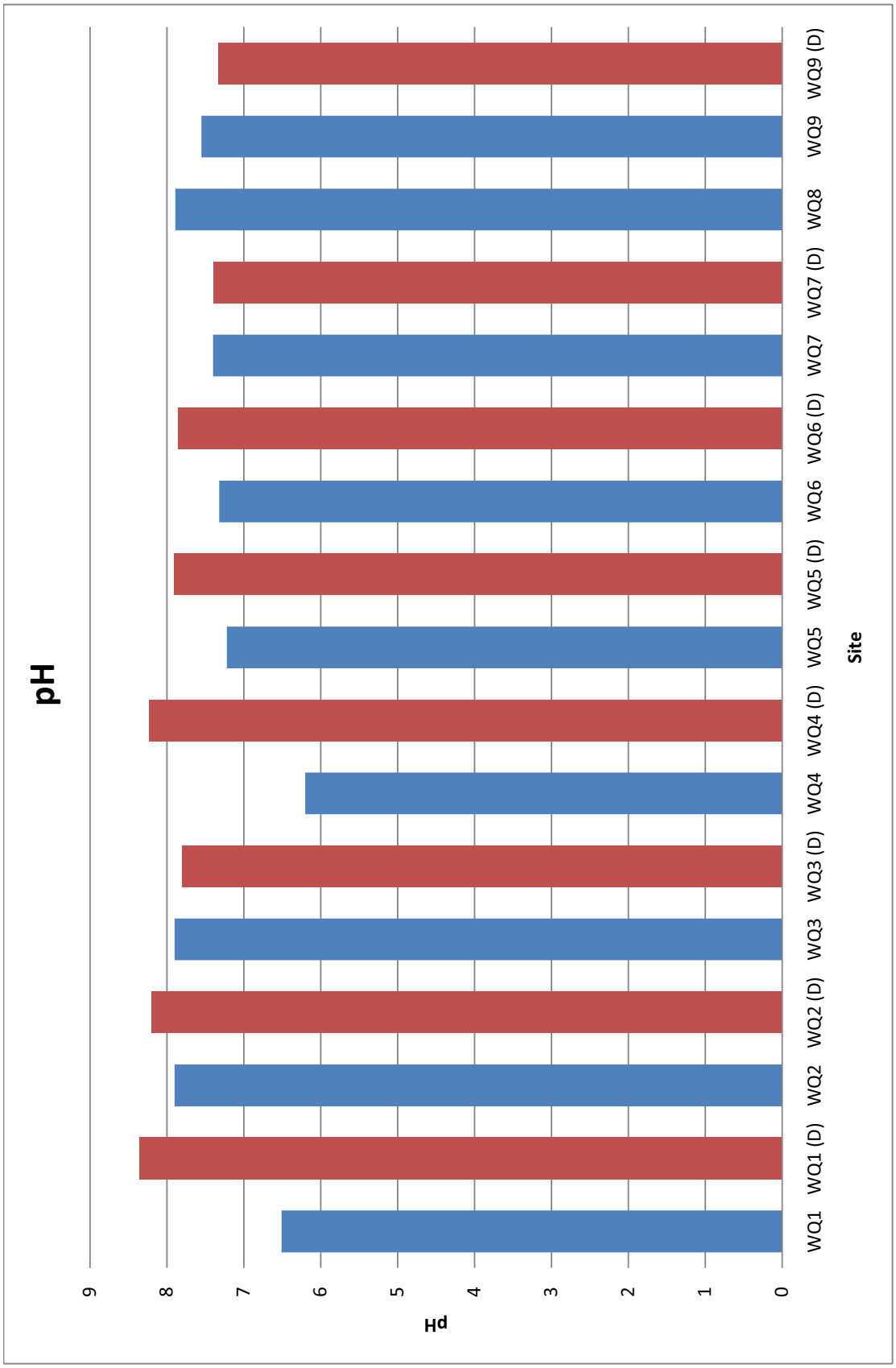
Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Wet
Nitrite + Nitrate as N	µg/L	10	30
Total Kjeldahl Nitrogen (TKN)			
Total Kjeldahl Nitrogen as N	µg/L	NC	400
Total Nitrogen as N (TKN + NOx)			
Total Nitrogen as N	µg/L	250	400
Total Phosphorus as P			
Total Phosphorus as P	µg/L	30	170
Ionic Balance			
Total Anions	meq/L	NC	2.68
Total Cations	meq/L	NC	2.86
Ionic Balance	%	NC	-
Chlorophyll a & Pheophytin a			
Chlorophyll a	mg/m³	5	2
Polychlorinated Biphenyls (PCB)			
Total Polychlorinated biphenyls	µg/L	NC	<1
Polynuclear Aromatic Hydrocarbons			
Naphthalene	µg/L	16	<1
Acenaphthylene	µg/L	NC	<1
Acenaphthene	µg/L	NC	<1
Fluorene	µg/L	NC	<1
Phenanthrene	µg/L	NC	<1
Anthracene	µg/L	NC	<1
Fluoranthene	µg/L	NC	<1
Pyrene	µg/L	NC	<1
Benz(a)anthracene	µg/L	NC	<1
Chrysene	µg/L	NC	<1
Benzo(b)fluoranthene	µg/L	NC	<1
Benzo(k)fluoranthene	µg/L	NC	<1
Benzo(a)pyrene	µg/L	NC	<0.5
Indeno(1.2.3.cd)pyrene	µg/L	NC	<1
Dibenz(a.h)anthracene	µg/L	NC	<1
Benzo(g.h.i)perylene	µg/L	NC	<1
Total PAH	µg/L	3	<1
Total Petroleum Hydrocarbons			
C6 - C9 Fraction	µg/L	NC	<20
C10 - C14 Fraction	µg/L		<50
C15 - C28 Fraction	µg/L		<100
C29 - C36 Fraction	µg/L		<50
C10 - C36 Fraction (sum)	µg/L		<50

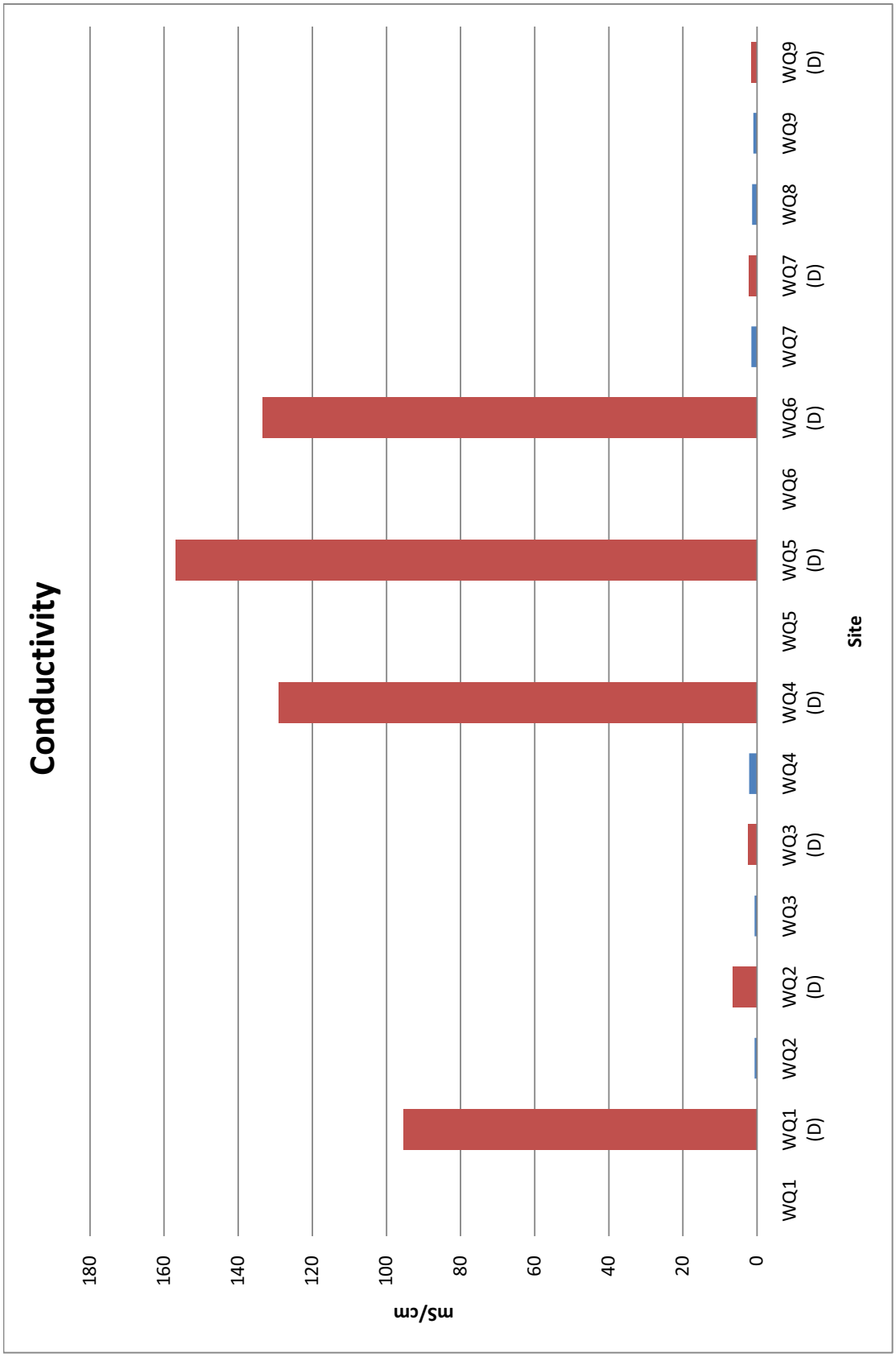
Waratah Coal

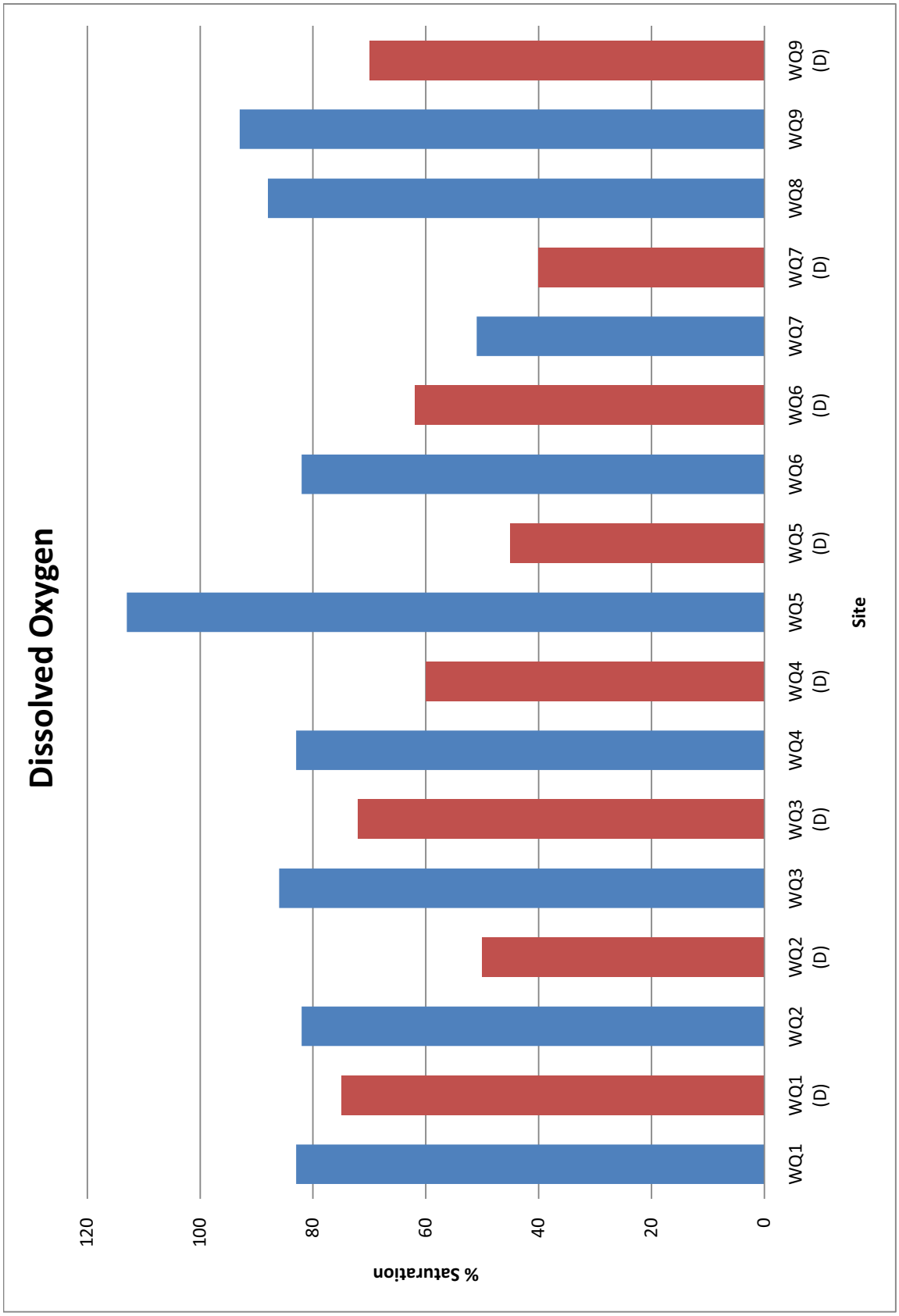
Appendix C – Graphed Water Quality Results

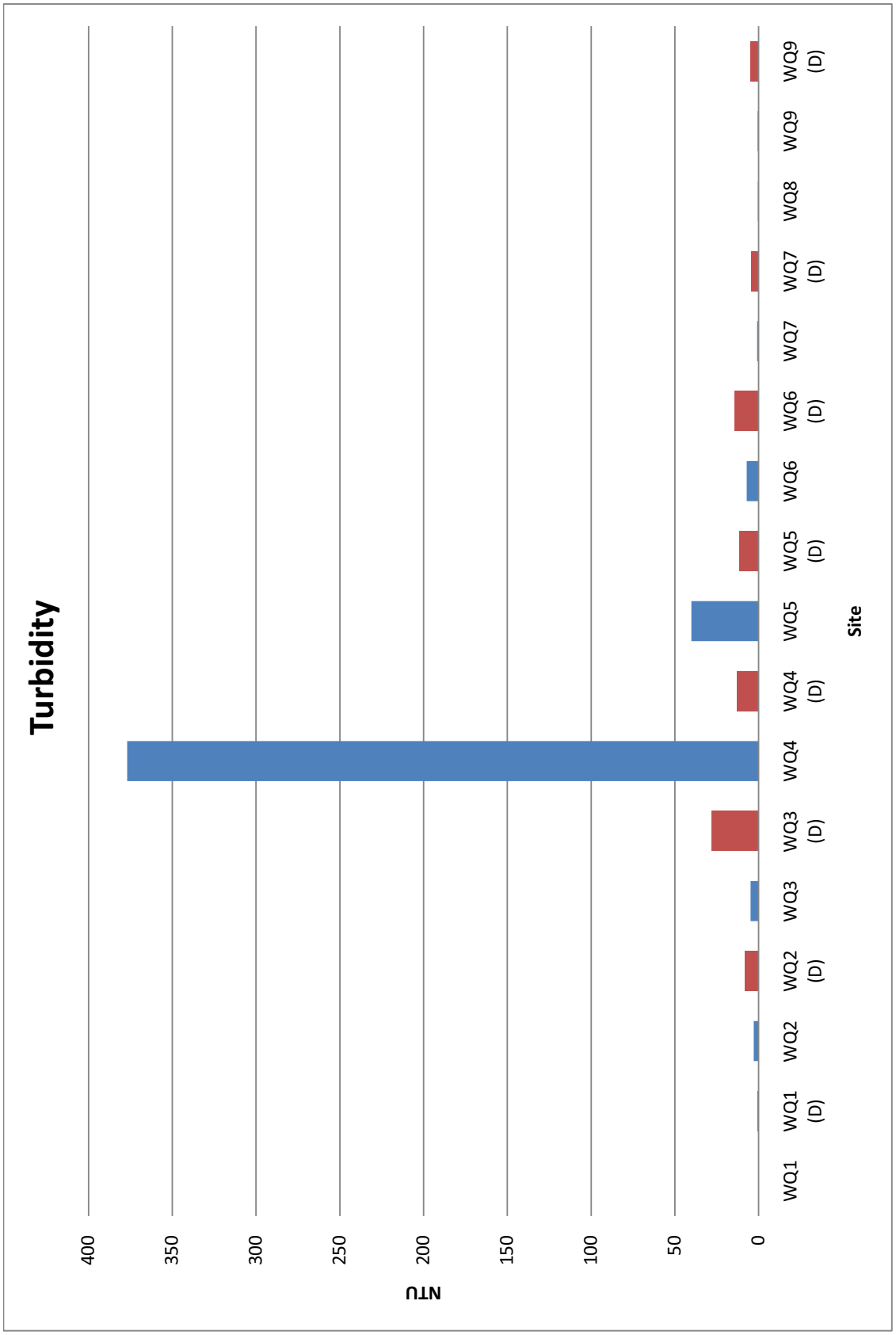
DON CATCHMENT

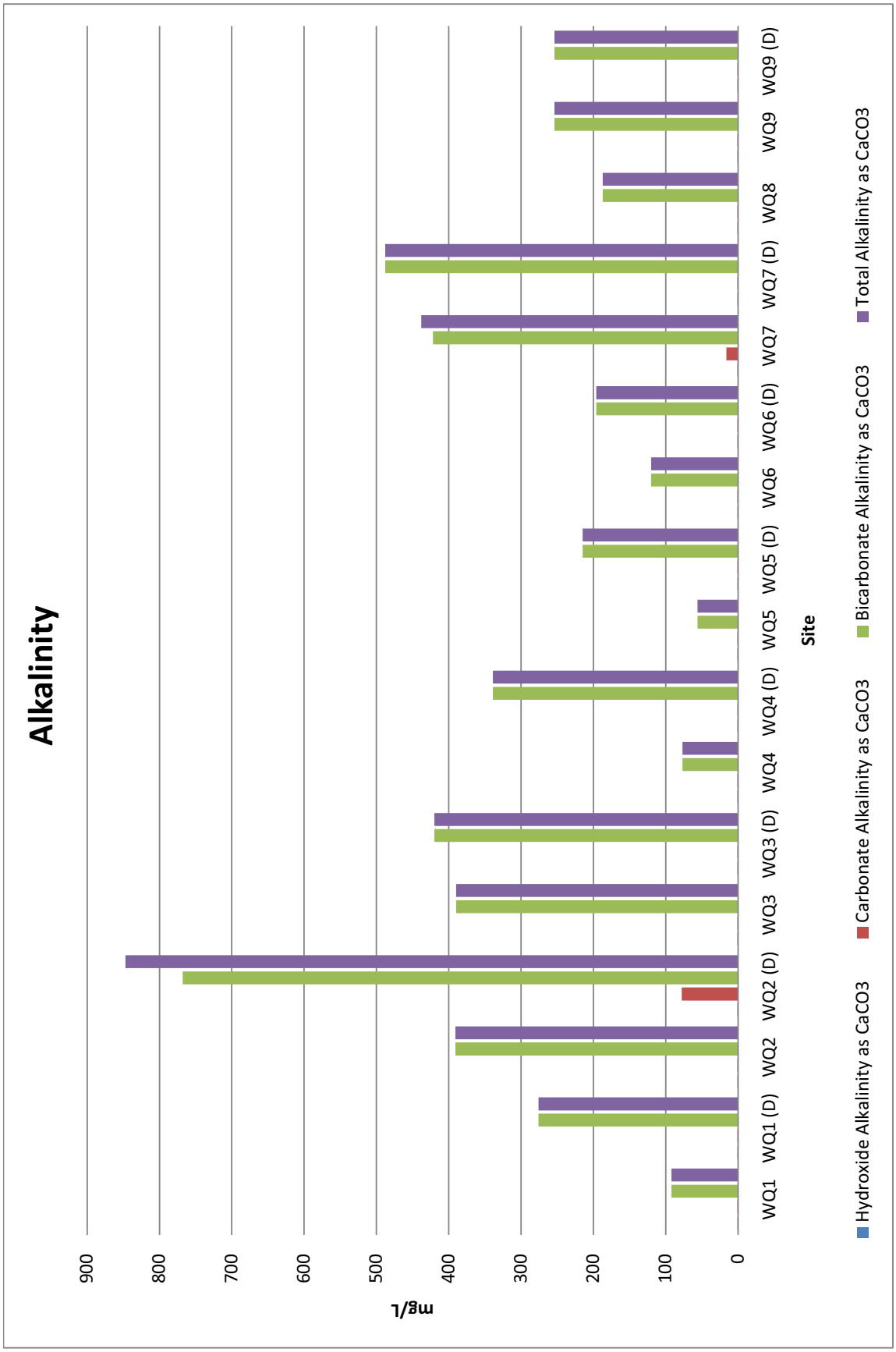



pH
pH
0
1
2
3
4
5
6
7
8
9
Site
WQ1
WQ1 (D)
WQ2
WQ2 (D)
WQ3
WQ3 (D)
WQ4
WQ4 (D)
WQ5
WQ5 (D)
WQ6
WQ6 (D)
WQ7
WQ7 (D)
WQ8
WQ9
WQ9 (D)


Conductivity
mS/cm
0
20
40
60
80
100
120
140
160
180
Site
WQ1
WQ1 (D)
WQ2
WQ2 (D)
WQ3
WQ3 (D)
WQ4
WQ4 (D)
WQ5
WQ5 (D)
WQ6
WQ6 (D)
WQ7
WQ7 (D)
WQ8
WQ9
WQ9 (D)


Dissolved Oxygen
% Saturation
0
20
40
60
80
100
120
Site
WQ1
WQ1 (D)
WQ2
WQ2 (D)
WQ3
WQ3 (D)
WQ4
WQ4 (D)
WQ5
WQ5 (D)
WQ6
WQ6 (D)
WQ7
WQ7 (D)
WQ8
WQ9
WQ9 (D)


Turbidity
NTU
400
350
300
250
200
150
100
50
0
Site
WQ1
WQ1 (D)
WQ2
WQ2 (D)
WQ3
WQ3 (D)
WQ4
WQ4 (D)
WQ5
WQ5 (D)
WQ6
WQ6 (D)
WQ7
WQ7 (D)
WQ8
WQ9
WQ9 (D)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mg/L
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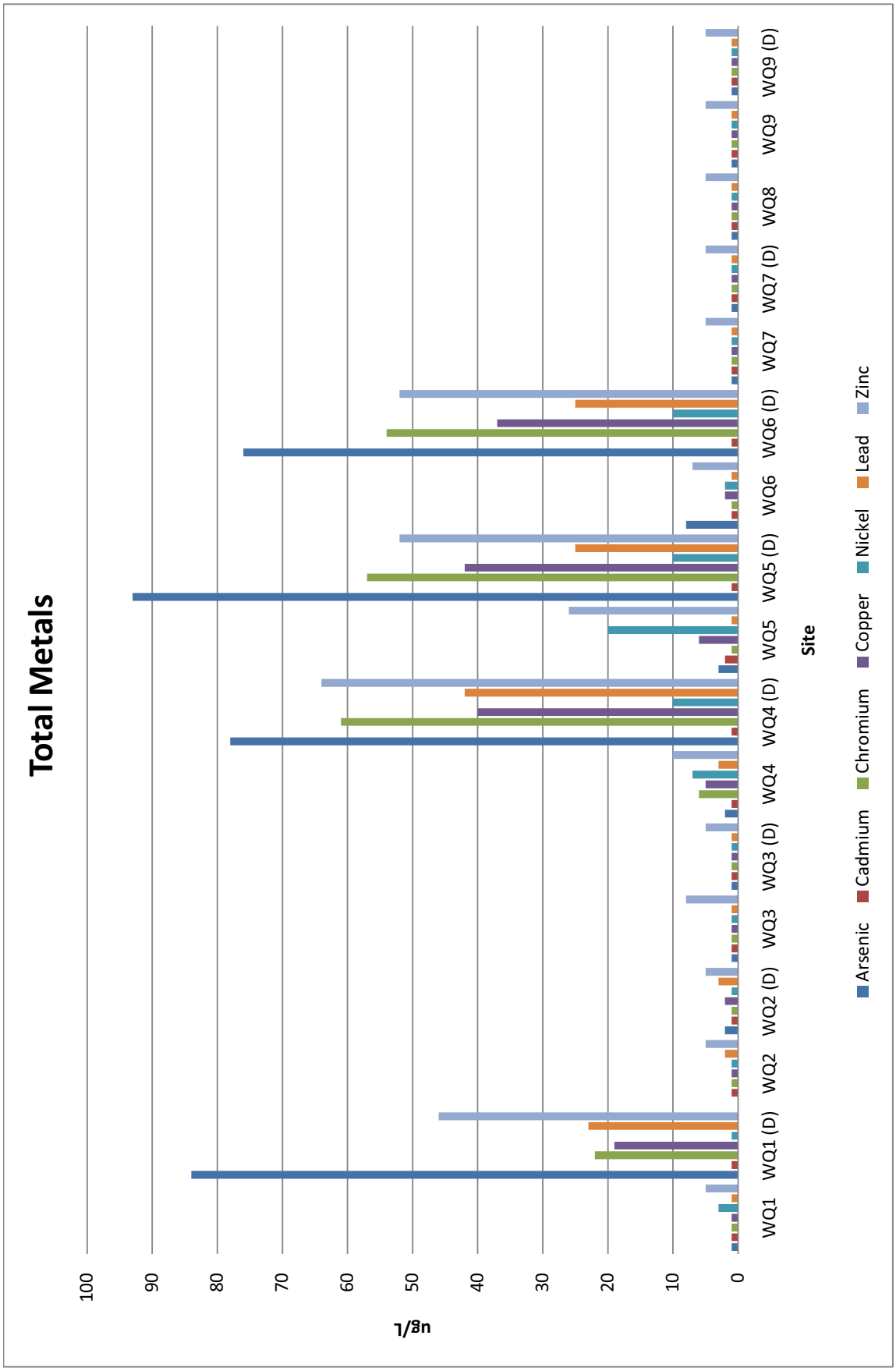
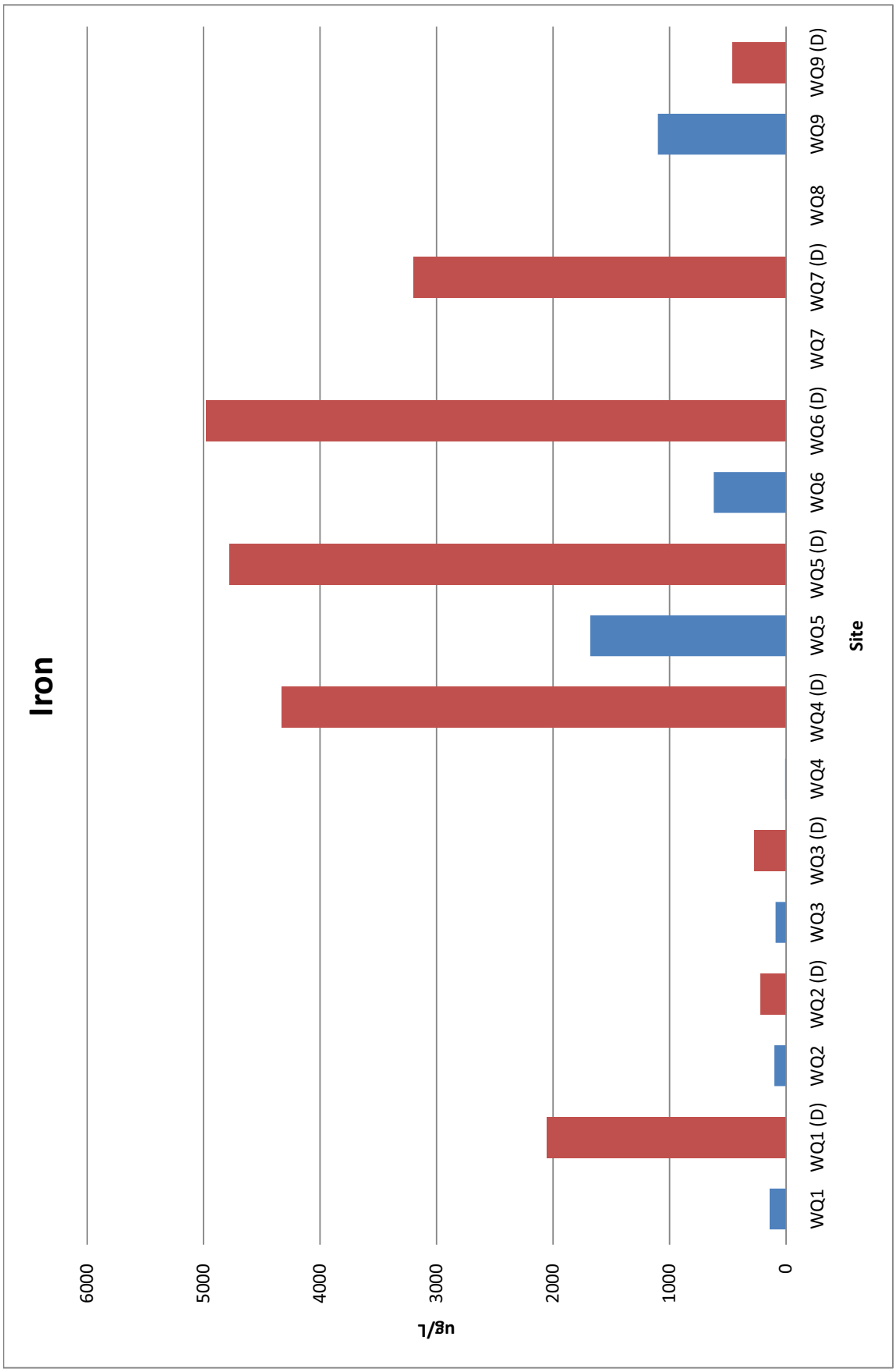
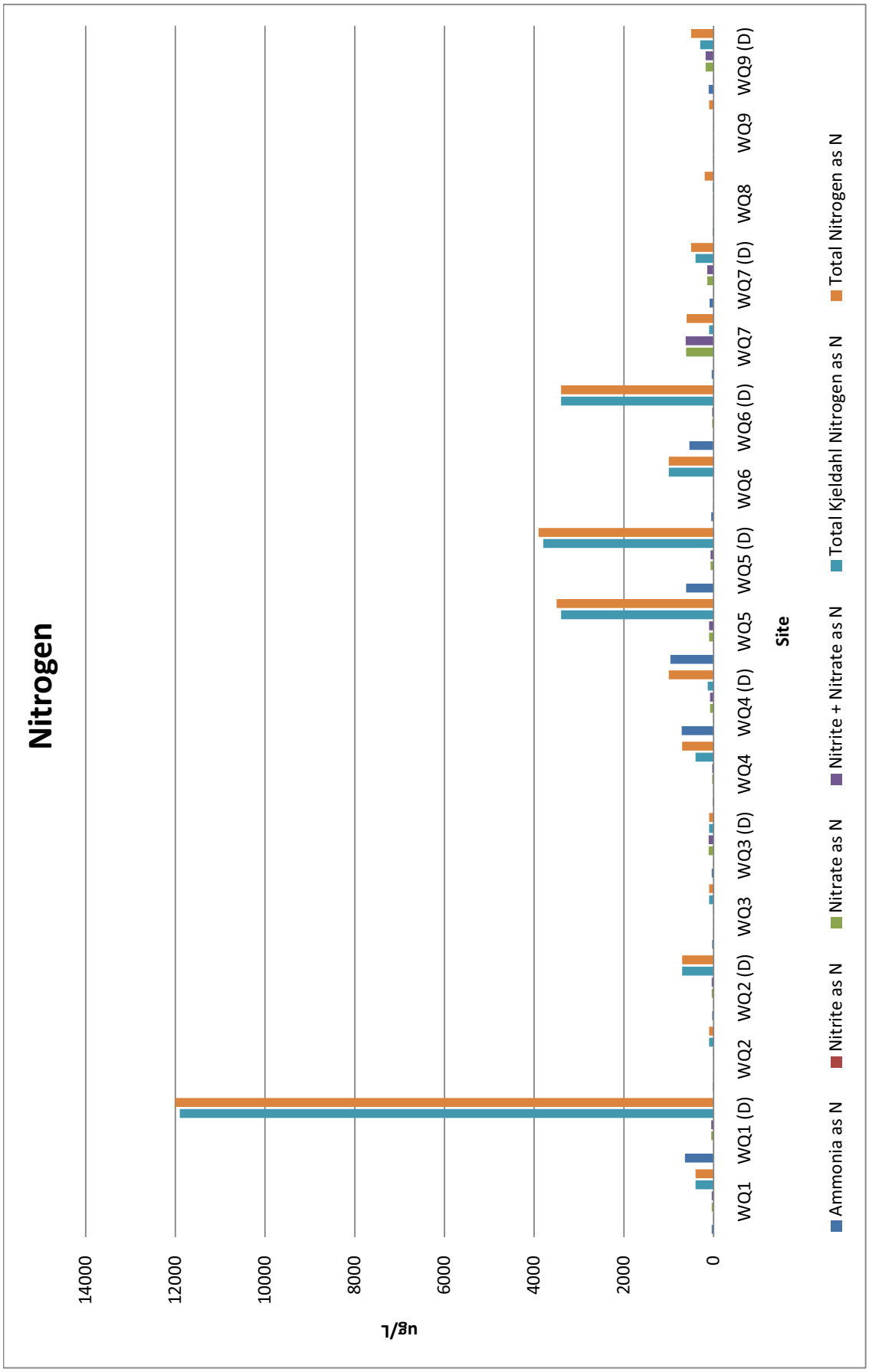
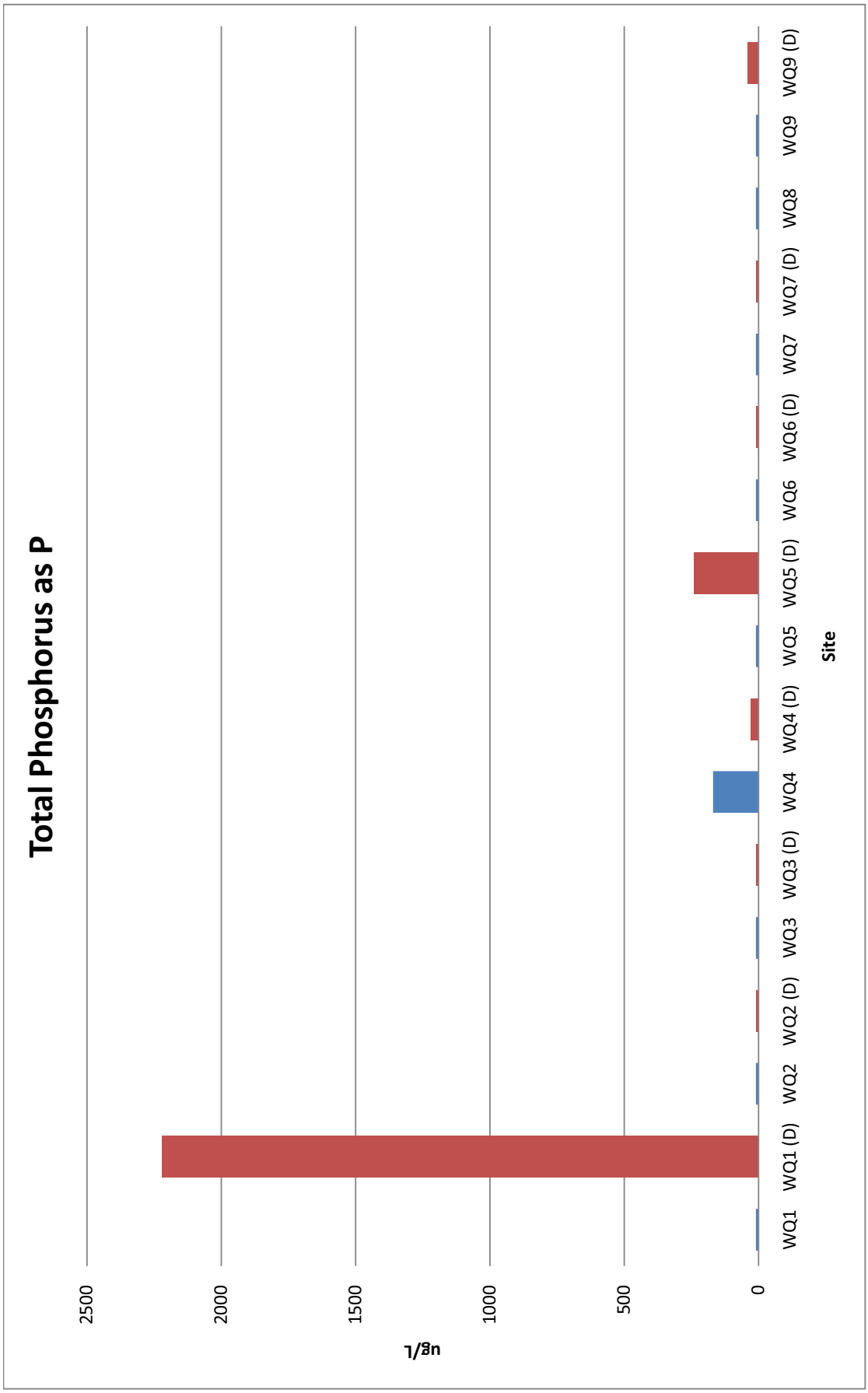
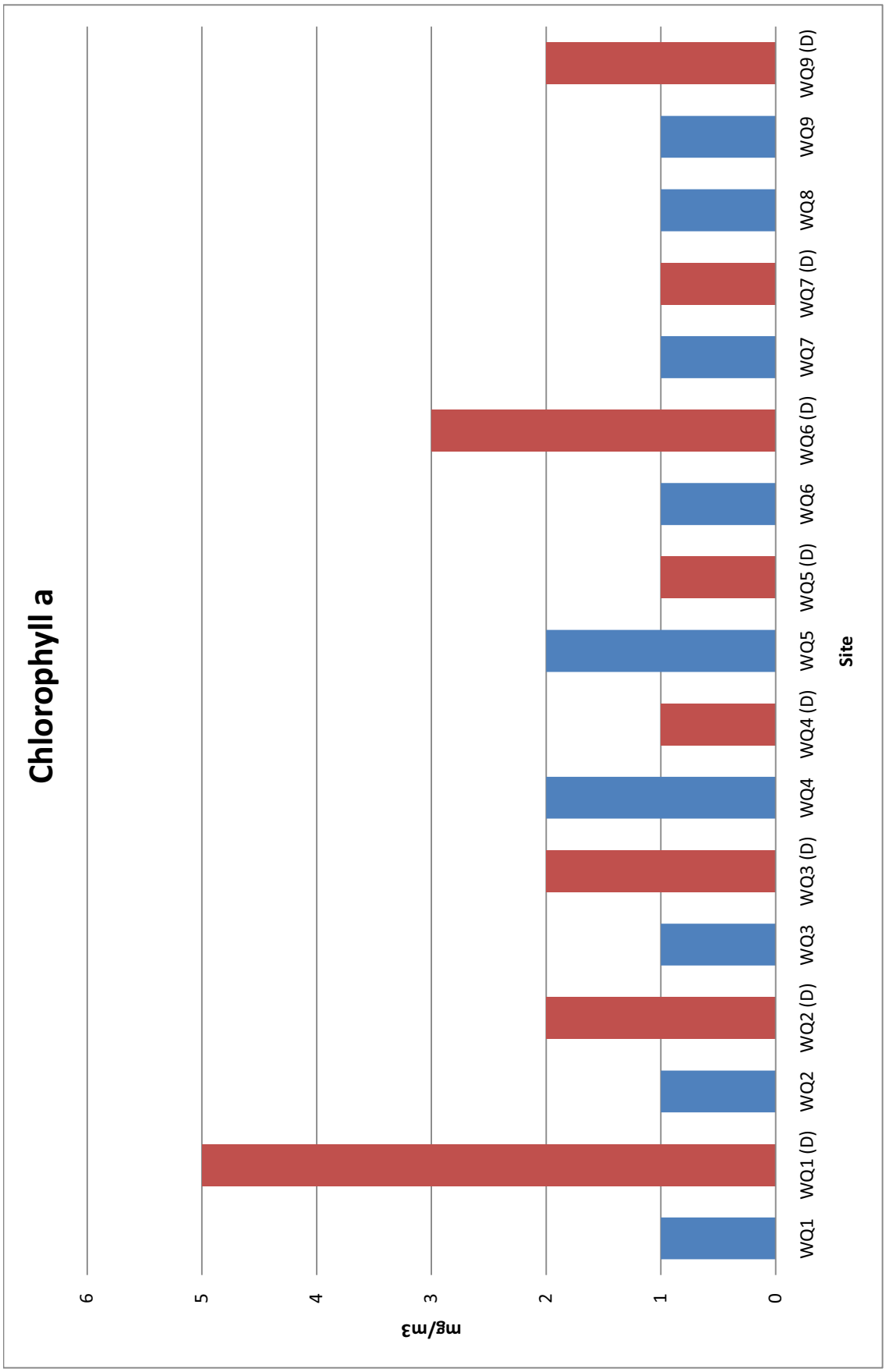
800
700
600
500
400
300
200
100
0
WQ1
WQ1 (D)
WQ2
WQ2 (D)
WQ3
WQ3 (D)
WQ4
WQ4 (D)
WQ5
WQ5 (D)
WQ6
WQ6 (D)
WQ7
WQ7 (D)
WQ8
WQ9
WQ9 (D)
Site
Hydroxide Alkalinity as CaCO3
Carbonate Alkalinity as CaCO3
Bicarbonate Alkalinity as CaCO3
Total Alkalinity as CaCO3


Total Metals
µg/L
100
90
80
70
60
50
40
30
20
10
0
WQ1
WQ1 (D)
WQ2
WQ2 (D)
WQ3
WQ3 (D)
WQ4
WQ4 (D)
WQ5
WQ5 (D)
WQ6
WQ6 (D)
WQ7
WQ7 (D)
WQ8
WQ9
WQ9 (D)
Site
Arsenic
Cadmium
Chromium
Copper
Nickel
Lead
Zinc

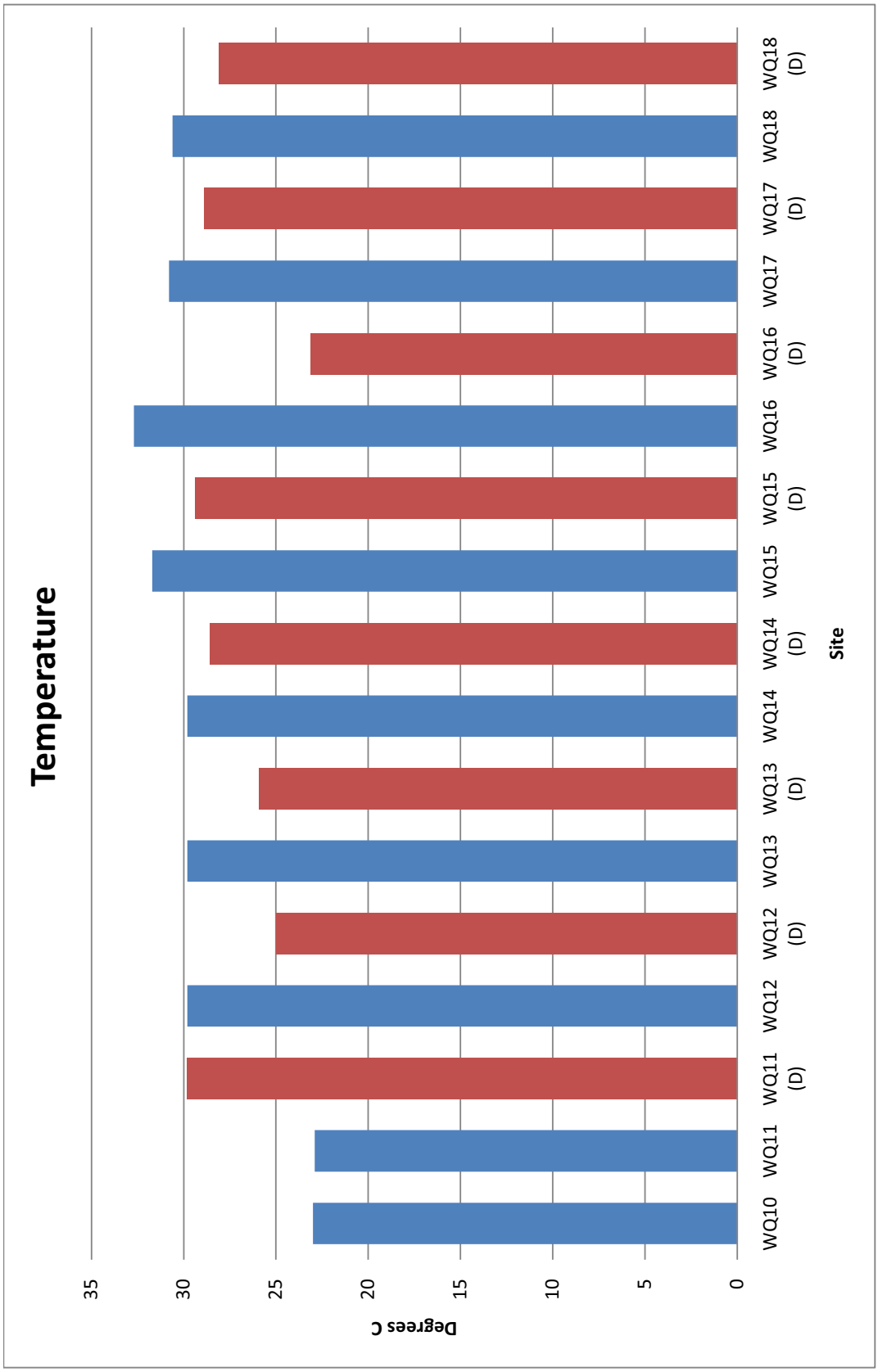

Iron
µg/L
6000
5000
4000
3000
2000
1000
0
WQ1
WQ1 (D)
WQ2
WQ2 (D)
WQ3
WQ3 (D)
WQ4
WQ4 (D)
WQ5
WQ5 (D)
WQ6
WQ6 (D)
WQ7
WQ7 (D)
WQ8
WQ9
WQ9 (D)
Site

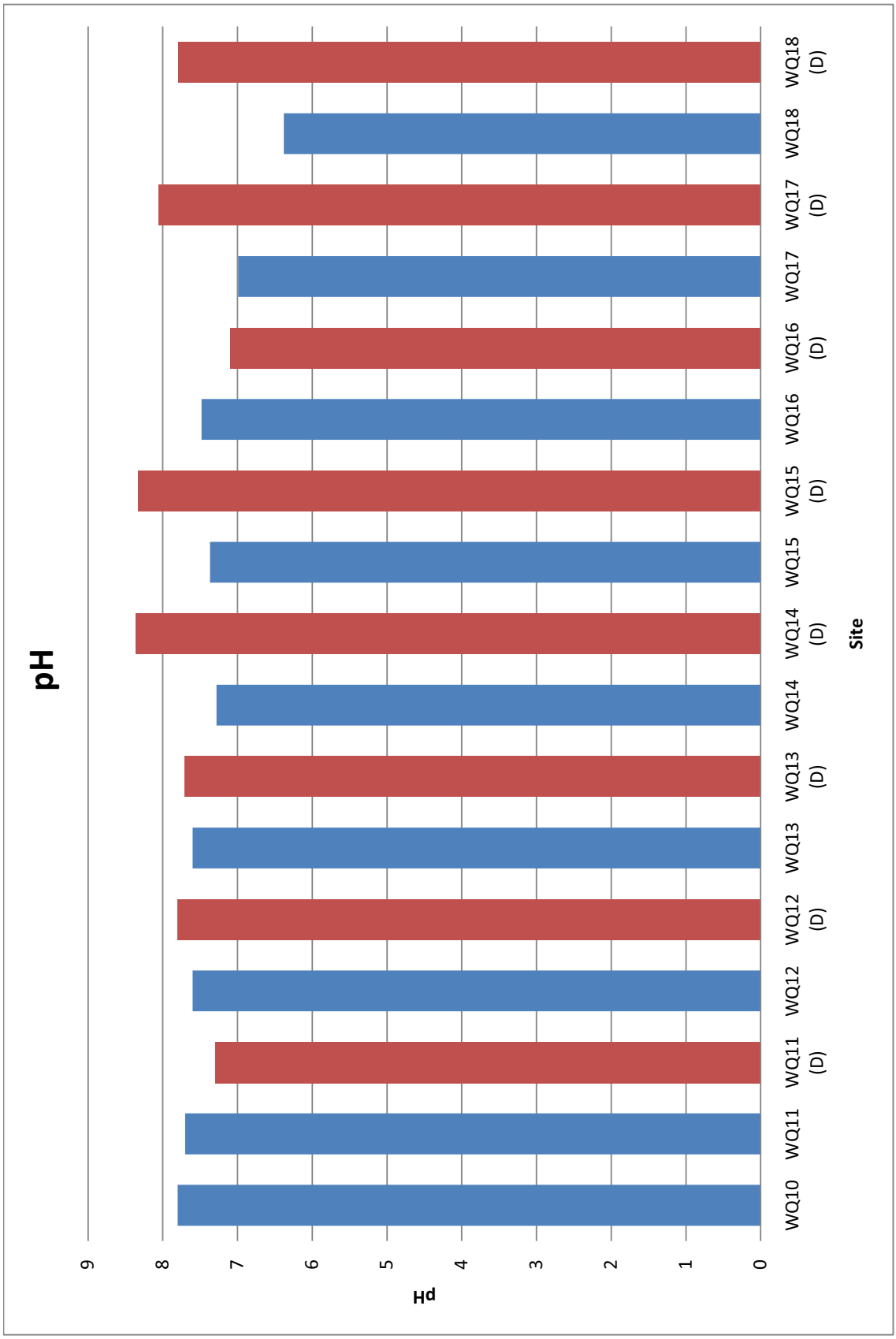

Nitrogen
µg/L
14000
12000
10000
8000
6000
4000
2000
0
WQ1
WQ1 (D)
WQ2
WQ2 (D)
WQ3
WQ3 (D)
WQ4
WQ4 (D)
WQ5
WQ5 (D)
WQ6
WQ6 (D)
WQ7
WQ7 (D)
WQ8
WQ9
WQ9 (D)
Site
Ammonia as N
Nitrite as N
Nitrate as N
Nitrite + Nitrate as N
Total Kjeldahl Nitrogen as N
Total Nitrogen as N

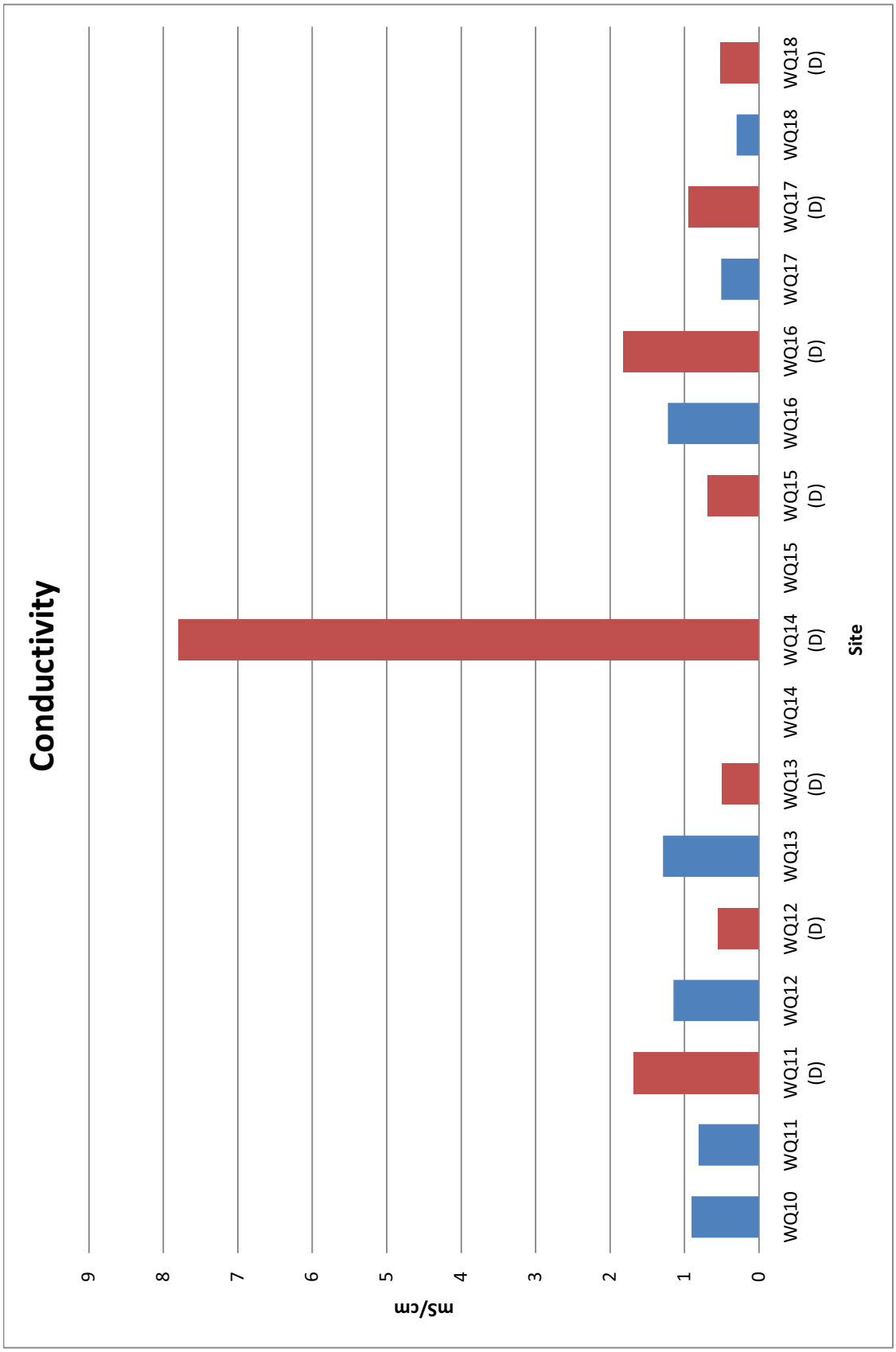

Total Phosphorus as P
µg/L
2500
2000
1500
1000
500
0
WQ1
WQ1 (D)
WQ2
WQ2 (D)
WQ3
WQ3 (D)
WQ4
WQ4 (D)
WQ5
WQ5 (D)
WQ6
WQ6 (D)
WQ7
WQ7 (D)
WQ8
WQ9
WQ9 (D)
Site

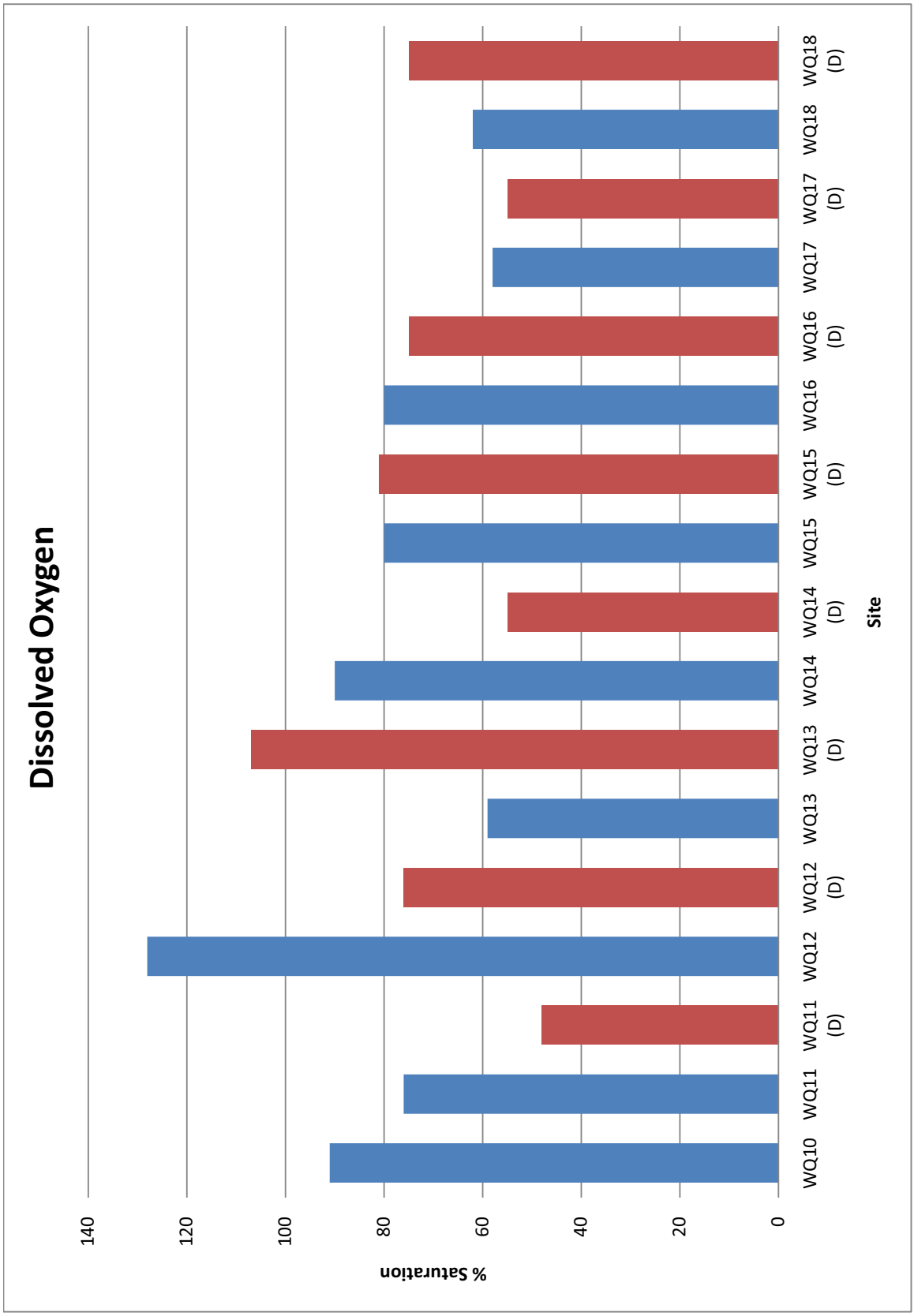

Chlorophyll a
mg/m3
0
1
2
3
4
5
6
Site
WQ1
WQ1 (D)
WQ2
WQ2 (D)
WQ3
WQ3 (D)
WQ4
WQ4 (D)
WQ5
WQ5 (D)
WQ6
WQ6 (D)
WQ7
WQ7 (D)
WQ8
WQ9
WQ9 (D)

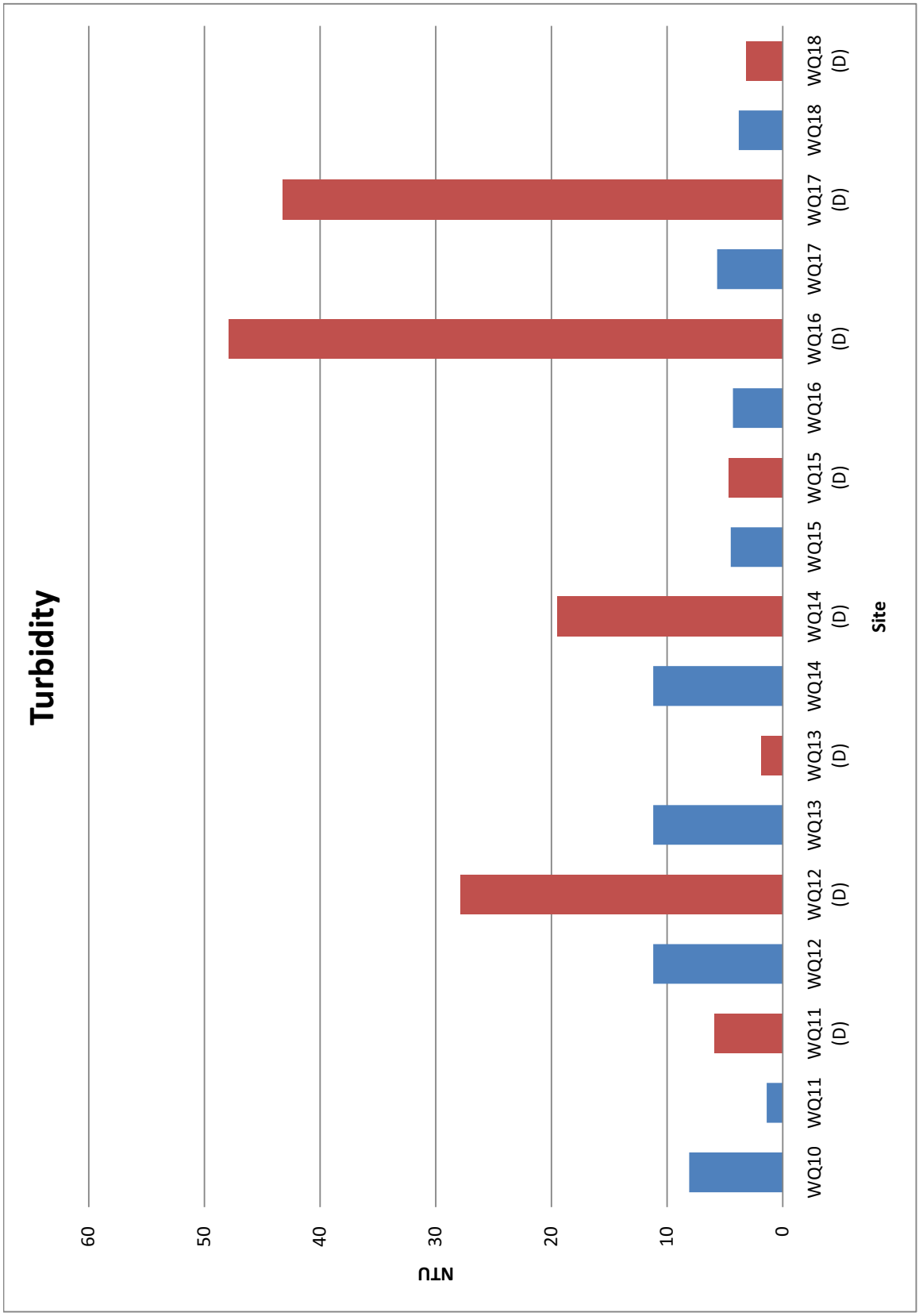
BOWEN/BOGIE CATCHMENT

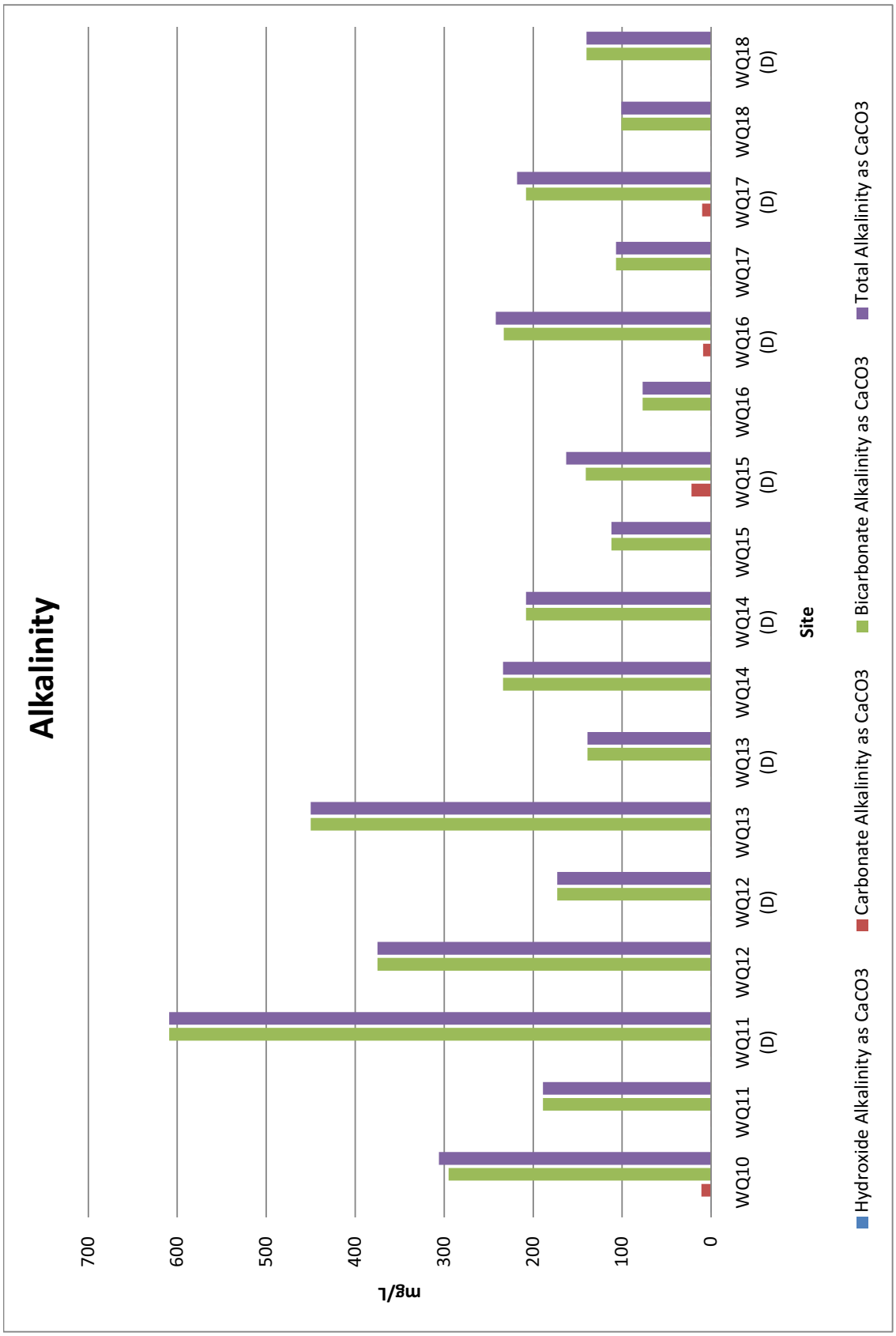


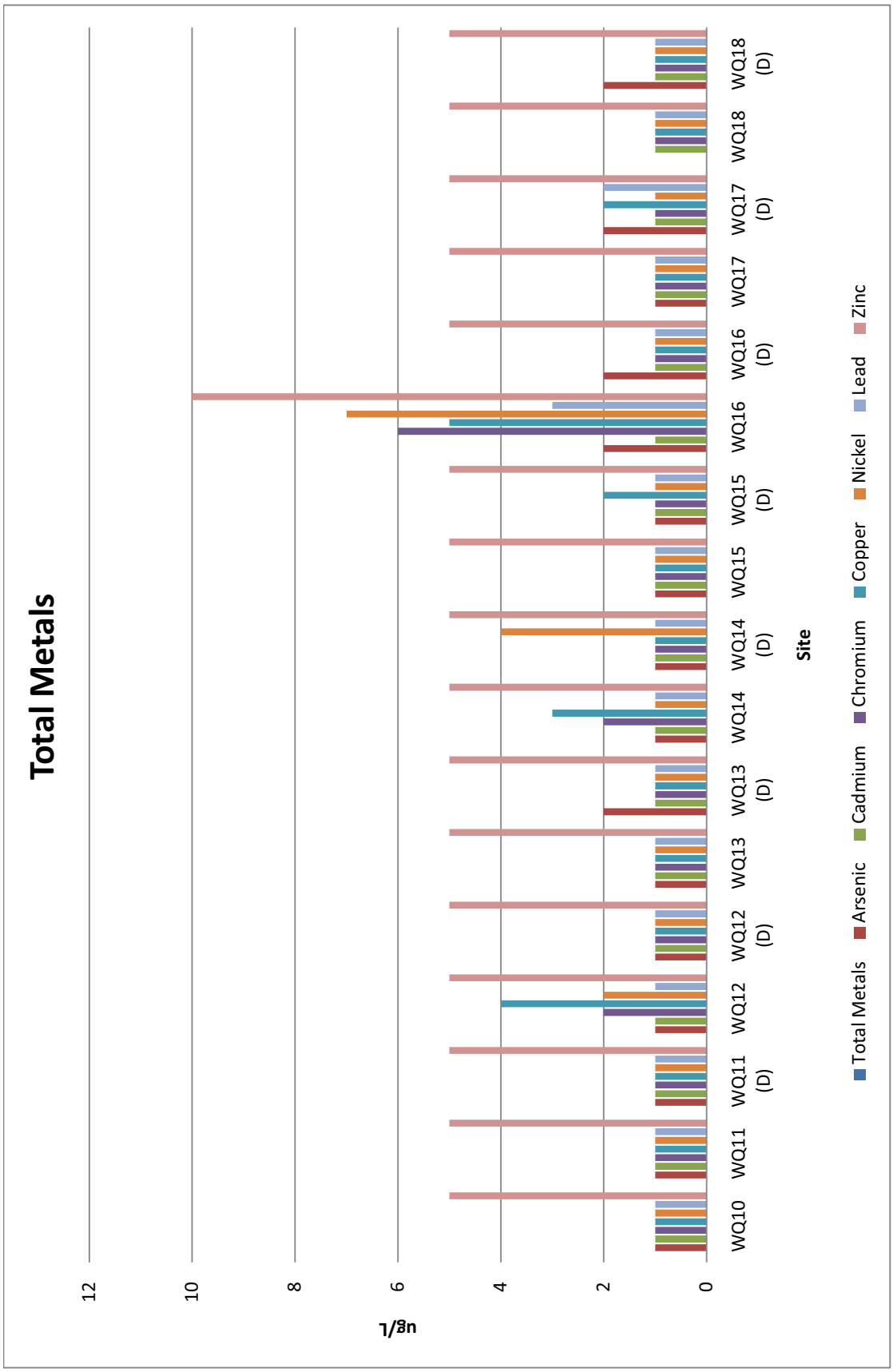

pH
pH
0
1
2
3
4
5
6
7
8
9
Site
WQ10
WQ11
WQ11 (D)
WQ12
WQ12 (D)
WQ13
WQ13 (D)
WQ14
WQ14 (D)
WQ15
WQ15 (D)
WQ16
WQ16 (D)
WQ17
WQ17 (D)
WQ18
WQ18 (D)

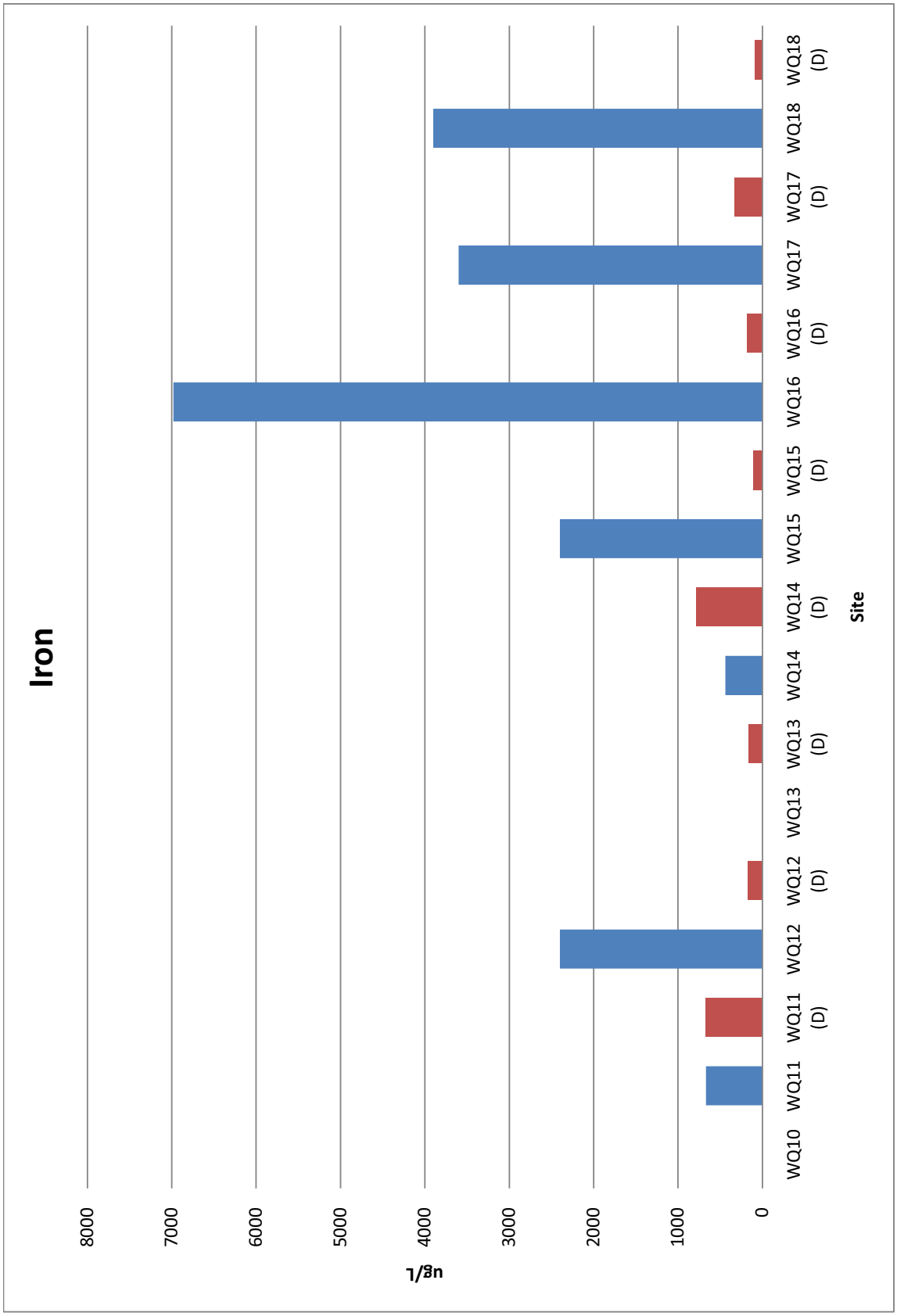

Conductivity
mS/cm
0
1
2
3
4
5
6
7
8
9
WQ10
WQ11
WQ11 (D)
WQ12
WQ12 (D)
WQ13
WQ13 (D)
WQ14
WQ14 (D)
WQ15
WQ15 (D)
WQ16
WQ16 (D)
WQ17
WQ17 (D)
WQ18
WQ18 (D)
Site

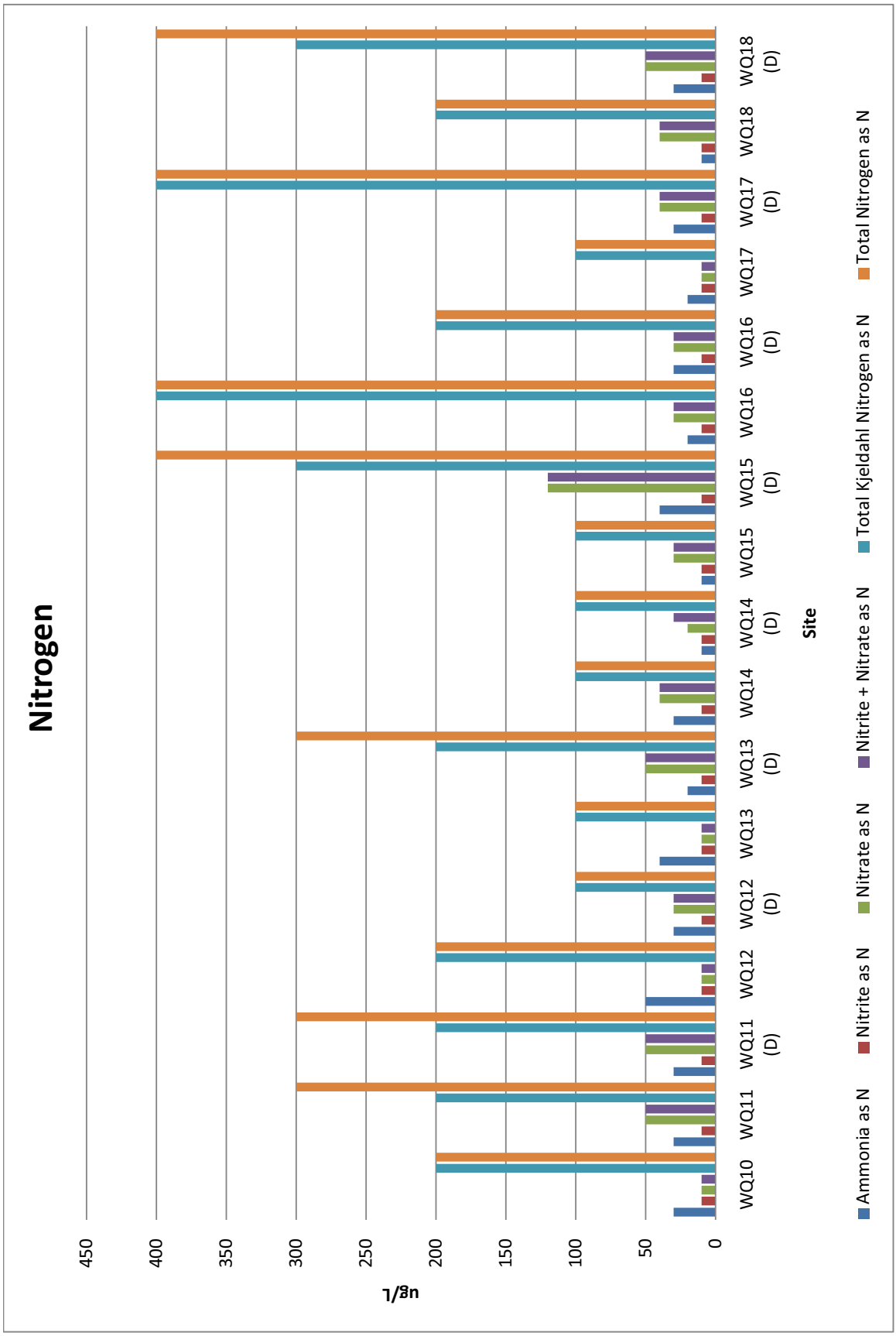

Dissolved Oxygen
% Saturation
0
20
40
60
80
100
120
140
Site
WQ10
WQ11
WQ11 (D)
WQ12
WQ12 (D)
WQ13
WQ13 (D)
WQ14
WQ14 (D)
WQ15
WQ15 (D)
WQ16
WQ16 (D)
WQ17
WQ17 (D)
WQ18
WQ18 (D)

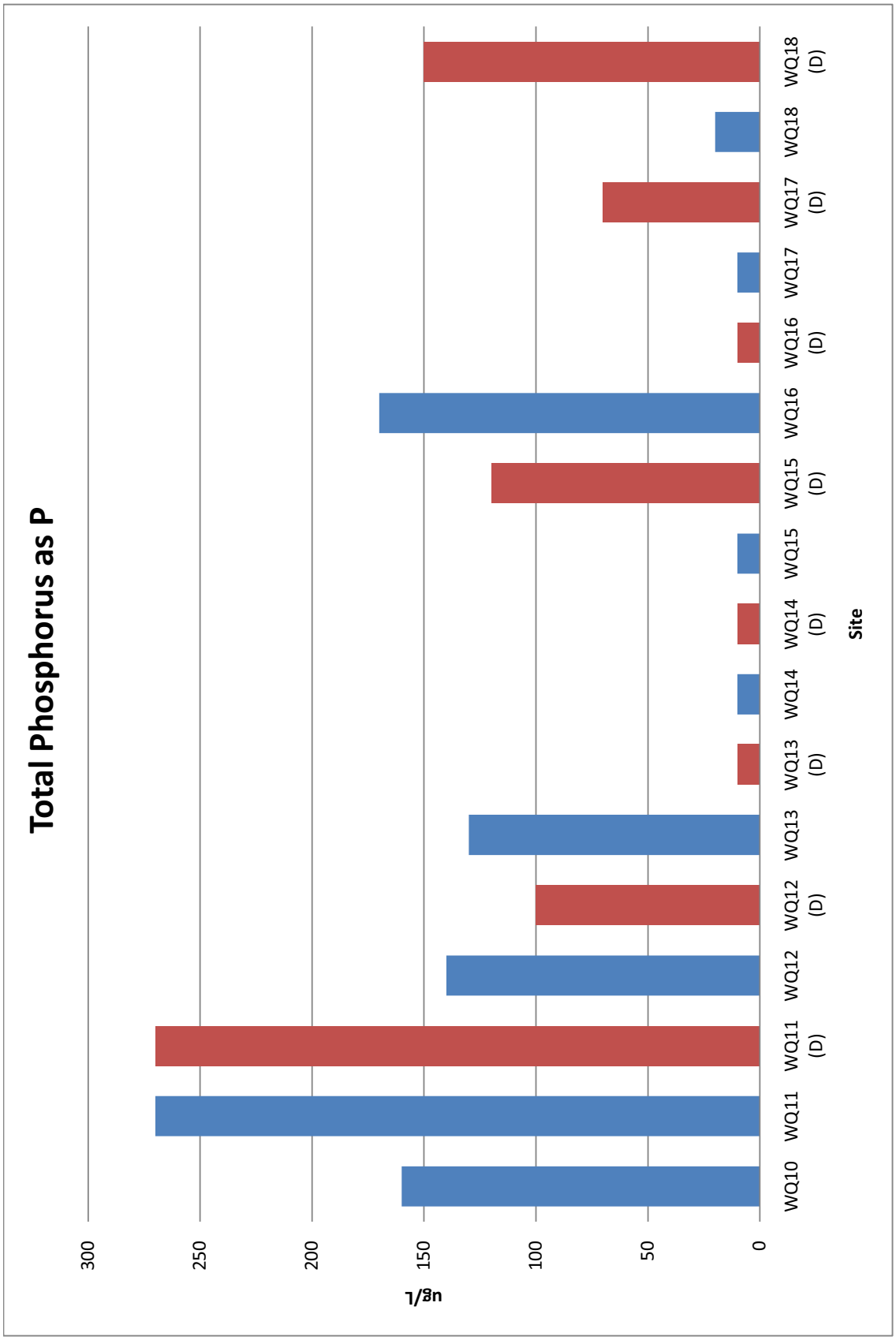

Turbidity
NTU
60
50
40
30
20
10
0
WQ10
WQ11
WQ11 (D)
WQ12
WQ12 (D)
WQ13
WQ13 (D)
WQ14
WQ14 (D)
WQ15
WQ15 (D)
WQ16
WQ16 (D)
WQ17
WQ17 (D)
WQ18
WQ18 (D)
Site

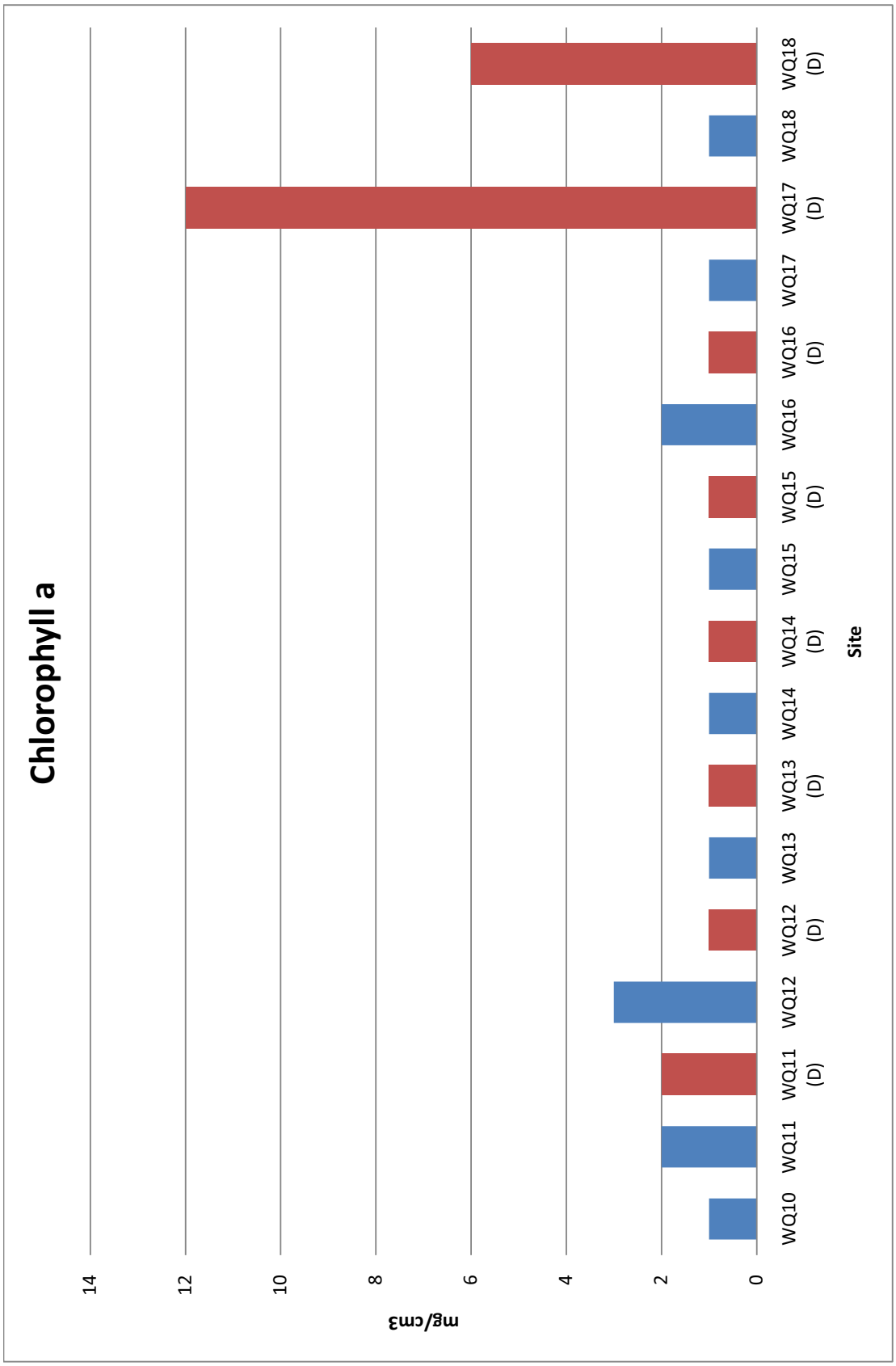

Alkalinity
mg/L
700
600
500
400
300
200
100
0
WQ10
WQ11
WQ11 (D)
WQ12
WQ12 (D)
WQ13
WQ13 (D)
WQ14
WQ14 (D)
WQ15
WQ15 (D)
WQ16
WQ16 (D)
WQ17
WQ17 (D)
WQ18
WQ18 (D)
Site
Hydroxide Alkalinity as CaCO3
Carbonate Alkalinity as CaCO3
Bicarbonate Alkalinity as CaCO3
Total Alkalinity as CaCO3

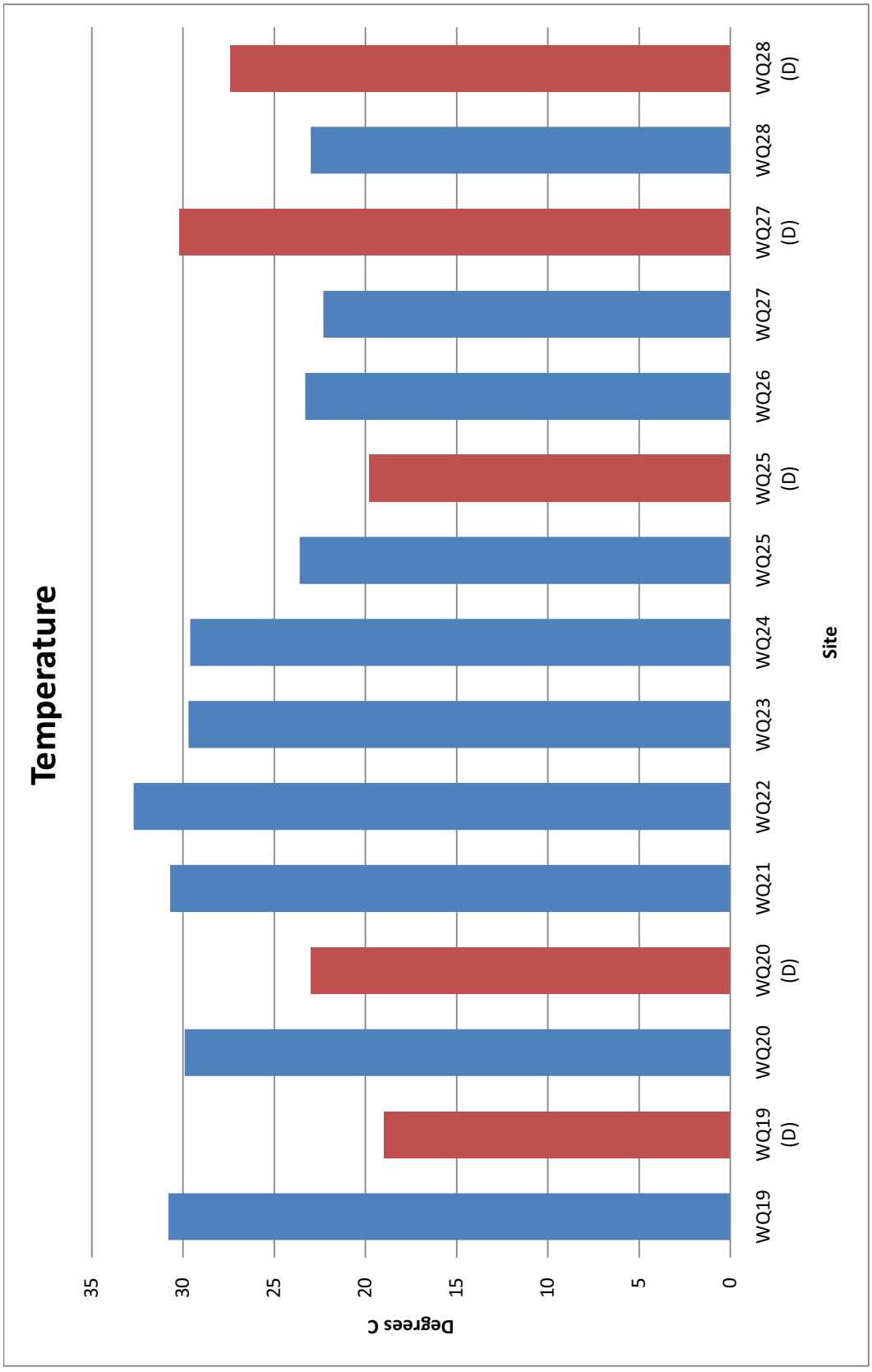

Total Metals
µg/L
0
2
4
6
8
10
12
WQ10
WQ11
WQ11 (D)
WQ12
WQ12 (D)
WQ13
WQ13 (D)
WQ14
WQ14 (D)
WQ15
WQ15 (D)
WQ16
WQ16 (D)
WQ17
WQ17 (D)
WQ18
WQ18 (D)
Site
Total Metals
Arsenic
Cadmium
Chromium
Copper
Nickel
Lead
Zinc


Iron
ug/L
8000
7000
6000
5000
4000
3000
2000
1000
0
WQ10
WQ11
WQ11 (D)
WQ12
WQ12 (D)
WQ13
WQ13 (D)
WQ14
WQ14 (D)
WQ15
WQ15 (D)
WQ16
WQ16 (D)
WQ17
WQ17 (D)
WQ18
WQ18 (D)
Site

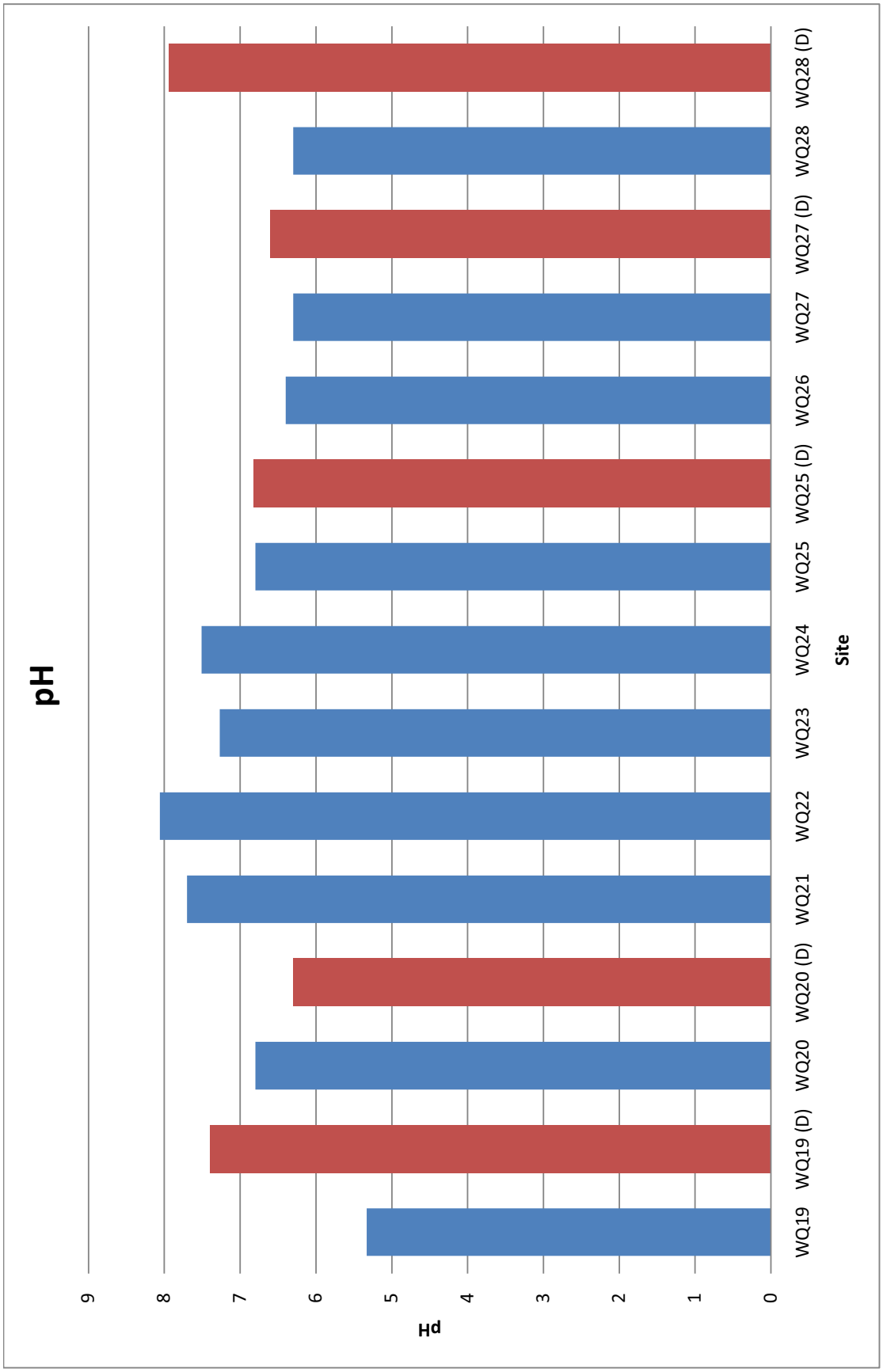

Nitrogen
µg/L
450
400
350
300
250
200
150
100
50
0
WQ10
WQ11
WQ11 (D)
WQ12
WQ12 (D)
WQ13
WQ13 (D)
WQ14
WQ14 (D)
WQ15
WQ15 (D)
WQ16
WQ16 (D)
WQ17
WQ17 (D)
WQ18
WQ18 (D)
Site
Ammonia as N
Nitrite as N
Nitrate as N
Nitrite + Nitrate as N
Total Kjeldahl Nitrogen as N
Total Nitrogen as N

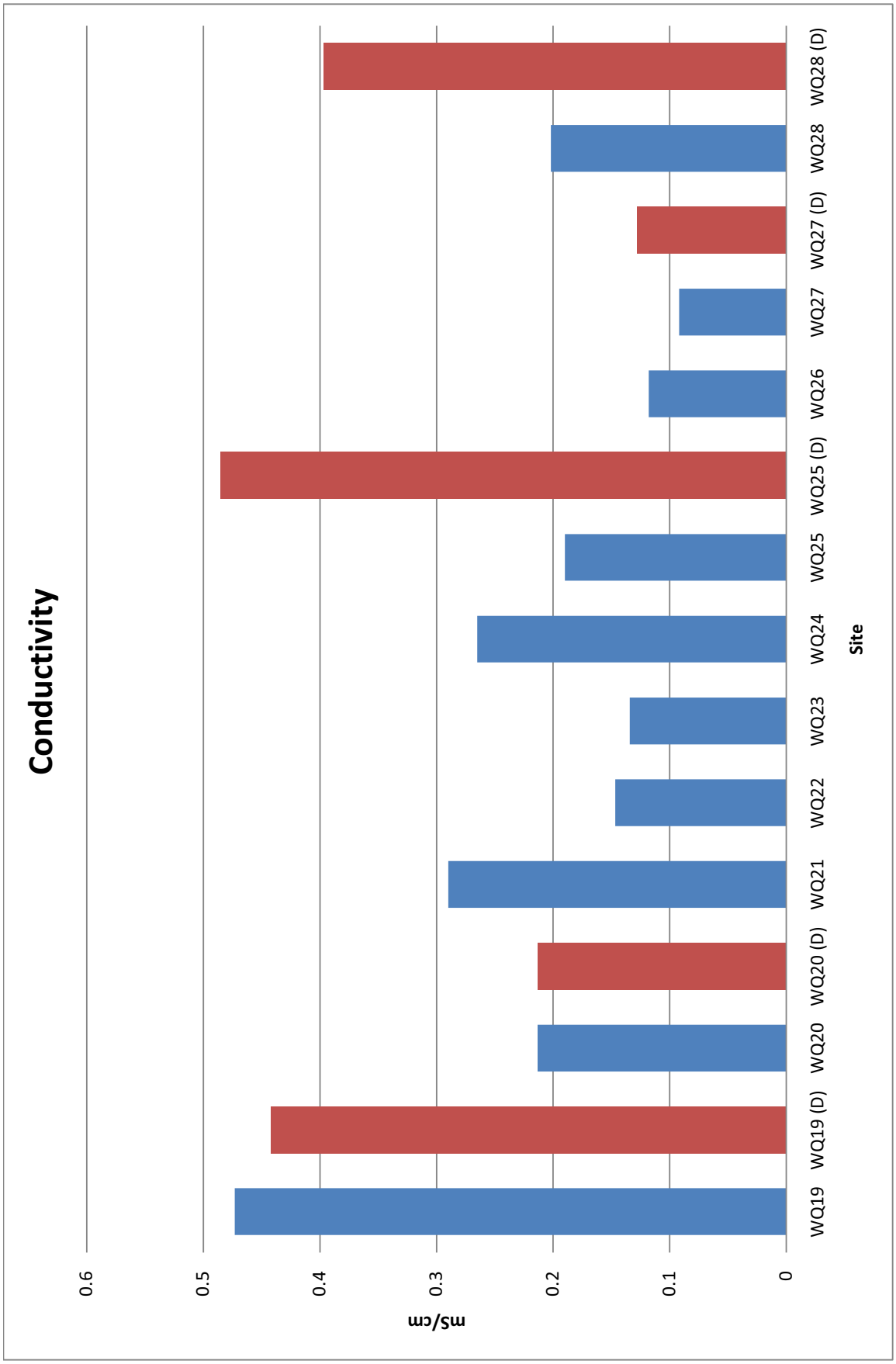

Total Phosphorus as P
µg/L
300
250
200
150
100
50
0
WQ10
WQ11
WQ11 (D)
WQ12
WQ12 (D)
WQ13
WQ13 (D)
WQ14
WQ14 (D)
WQ15
WQ15 (D)
WQ16
WQ16 (D)
WQ17
WQ17 (D)
WQ18
WQ18 (D)
Site

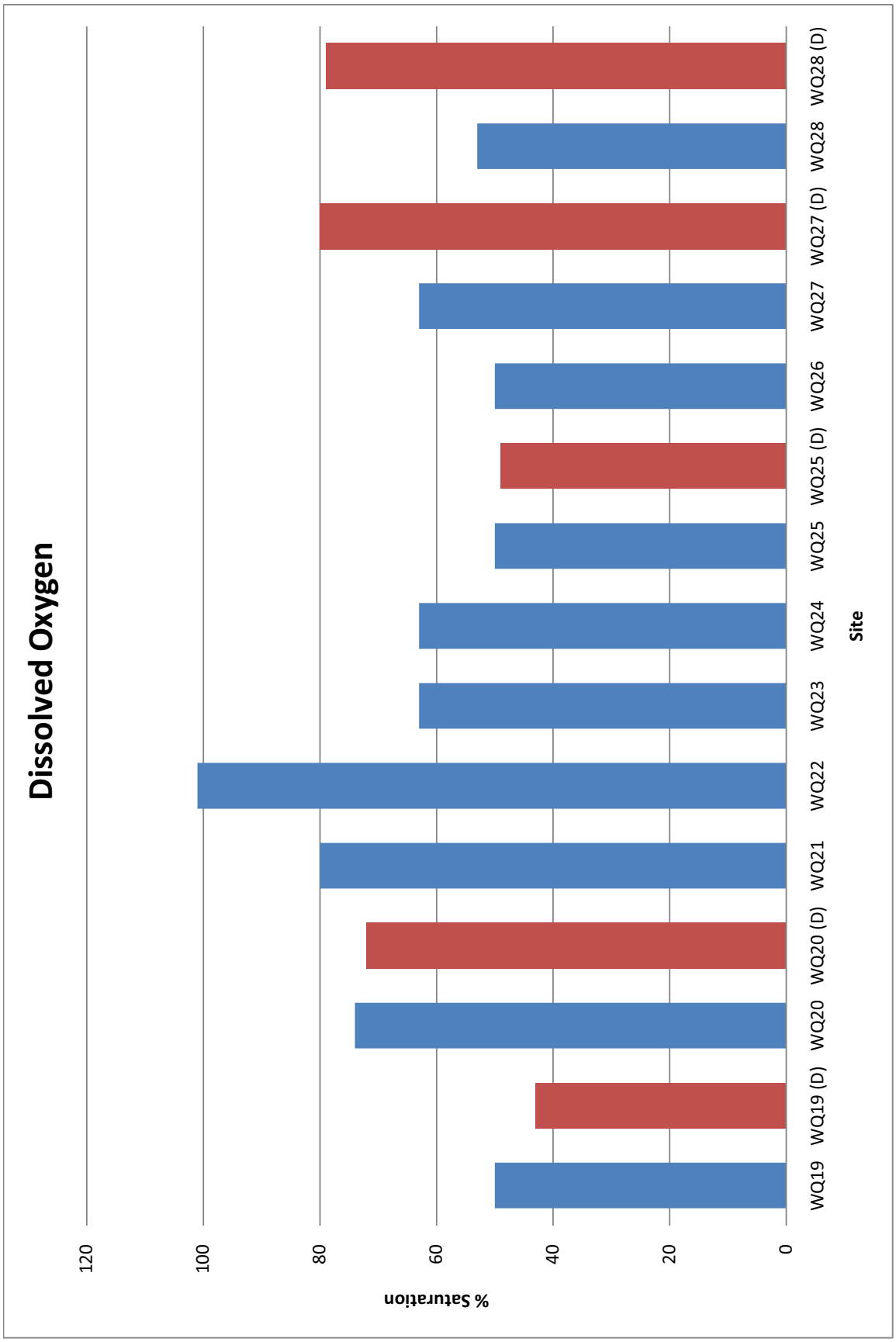

Chlorophyll a
mg/cm3
0
2
4
6
8
10
12
14
WQ10
WQ11
WQ11 (D)
WQ12
WQ12 (D)
WQ13
WQ13 (D)
WQ14
WQ14 (D)
WQ15
WQ15 (D)
WQ16
WQ16 (D)
WQ17
WQ17 (D)
WQ18
WQ18 (D)
Site

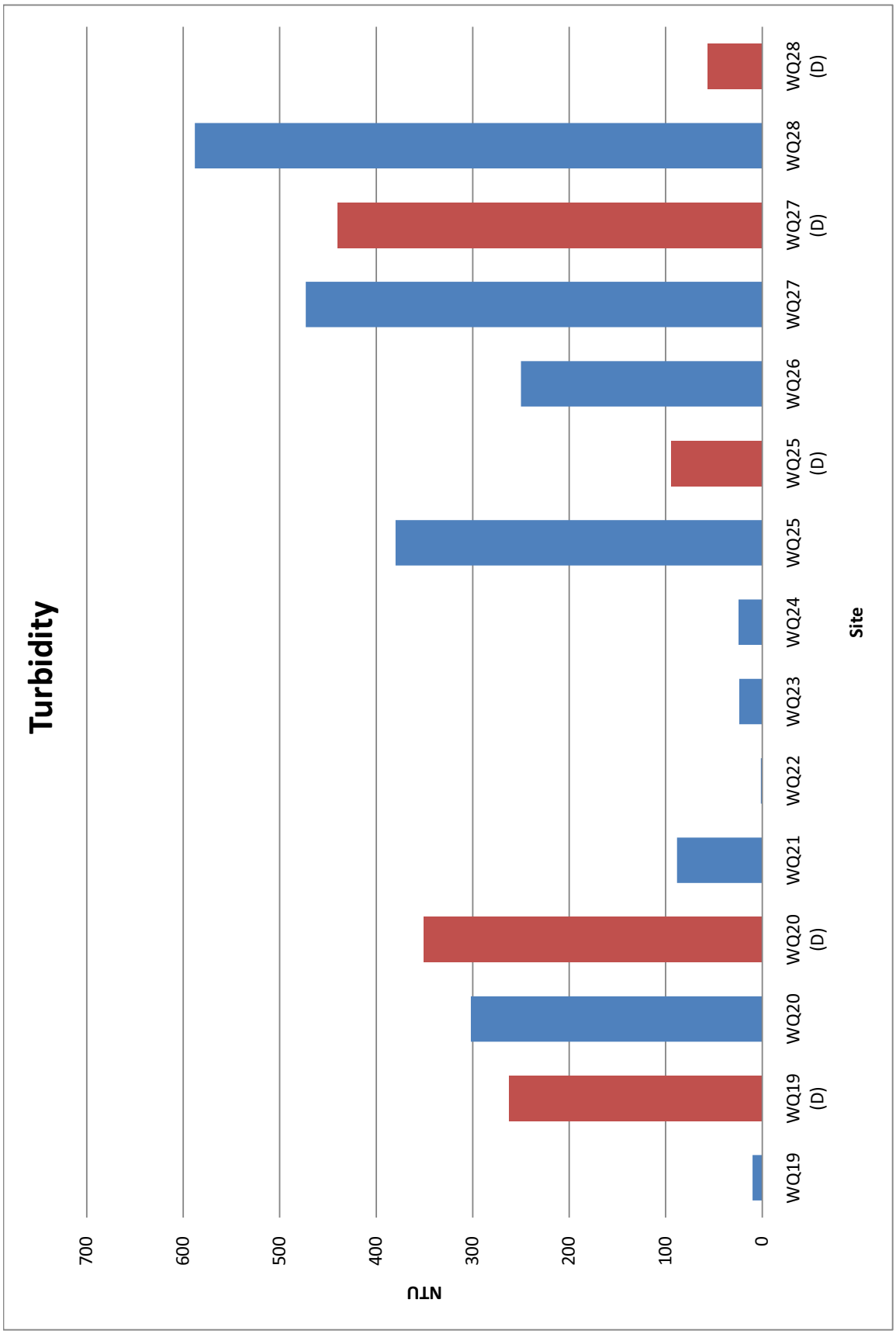


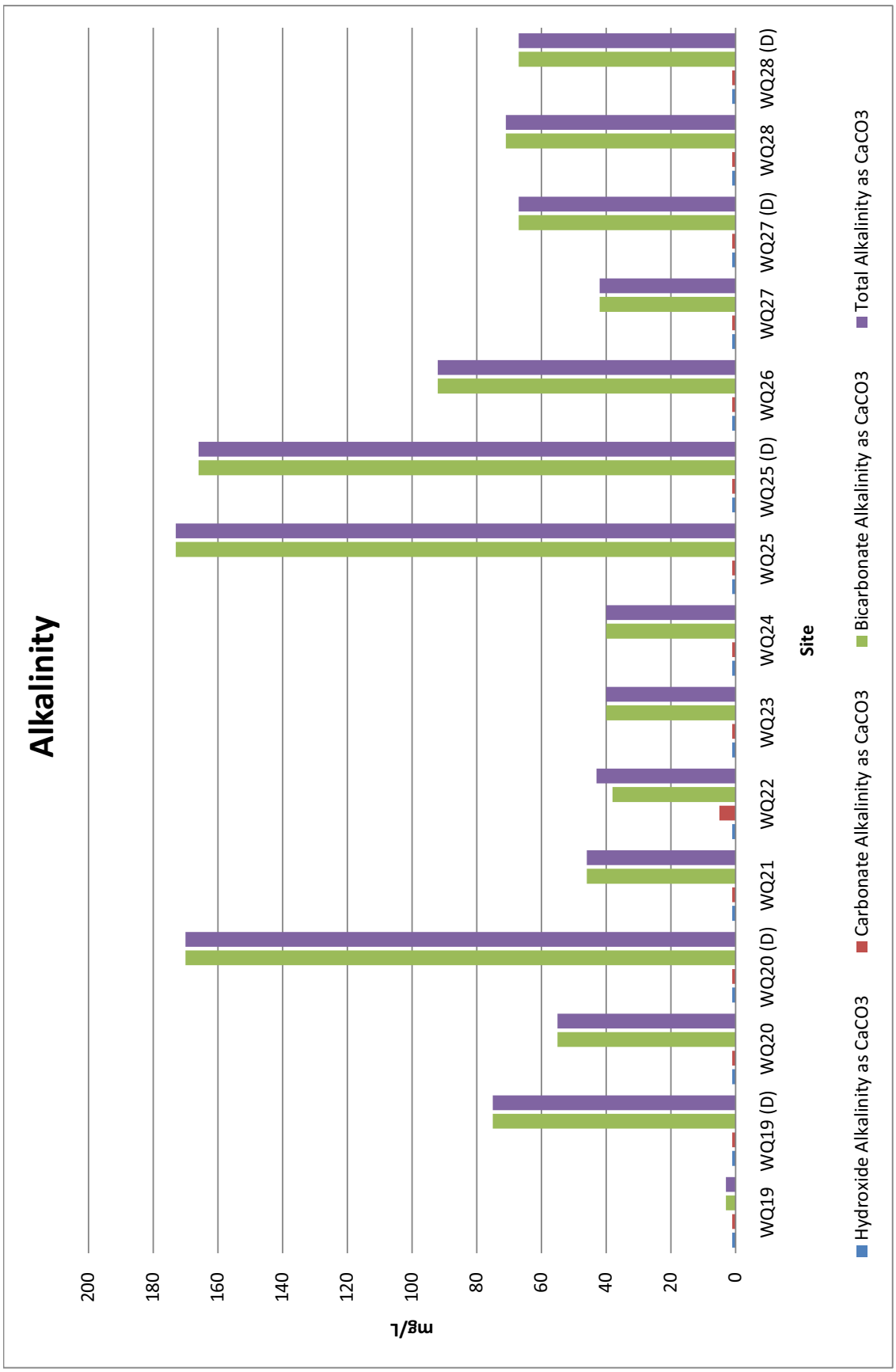
SUTTOR CATCHMENT

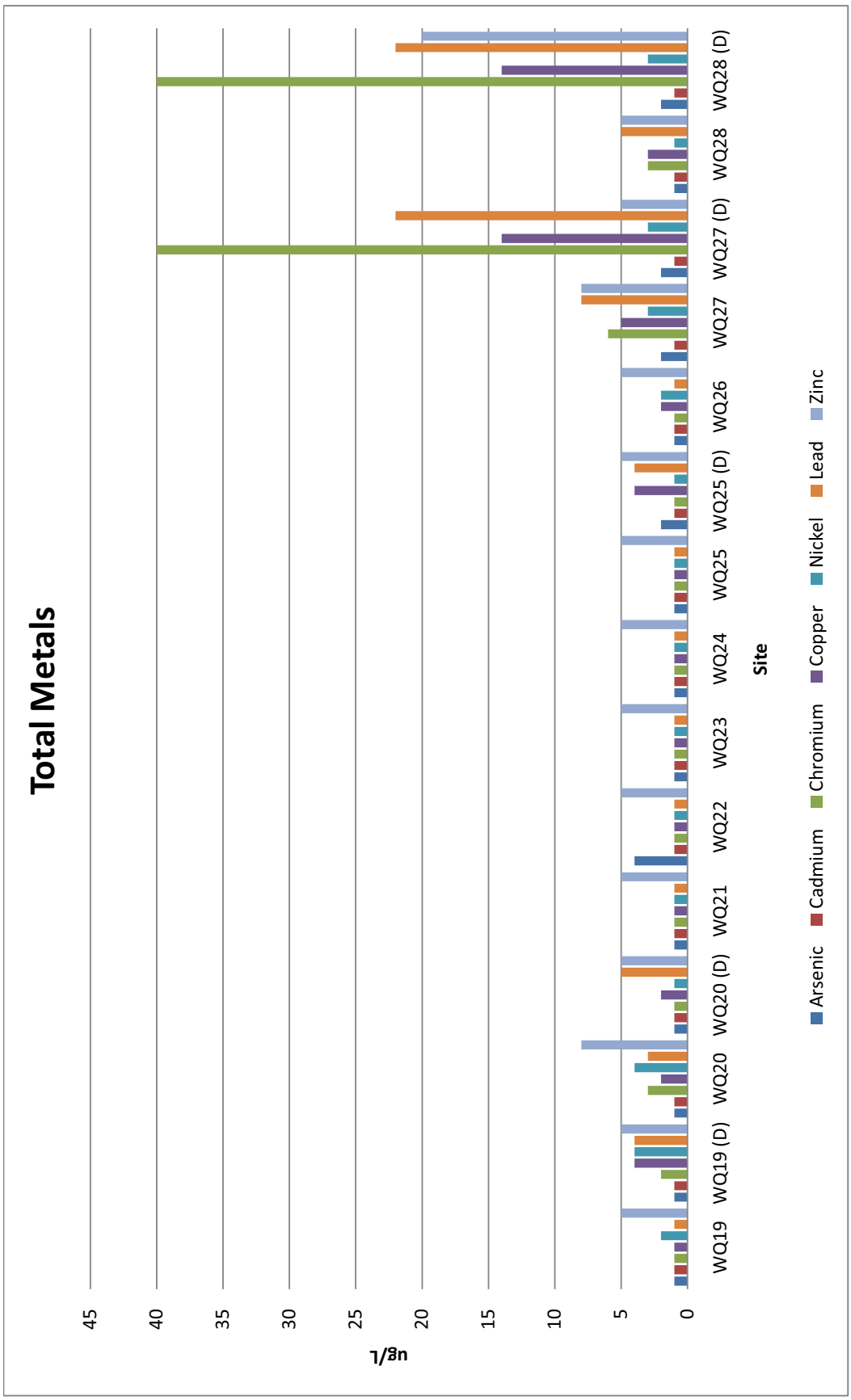

pH
pH
9
8
7
6
5
4
3
2
1
0
Site
WQ19
WQ19 (D)
WQ20
WQ20 (D)
WQ21
WQ22
WQ23
WQ24
WQ25
WQ25 (D)
WQ26
WQ27
WQ27 (D)
WQ28
WQ28 (D)

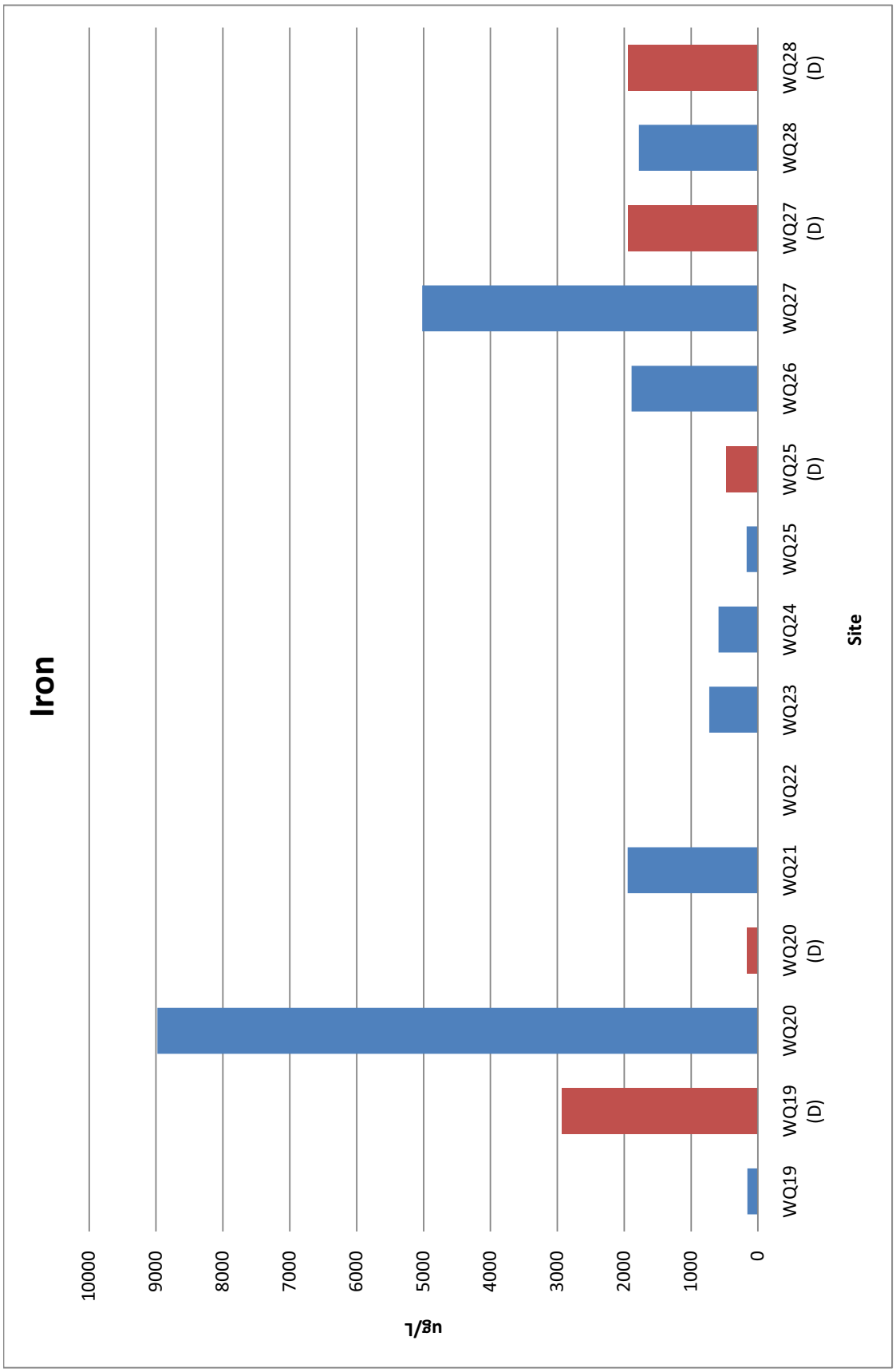

Conductivity
mS/cm
0.6
0.5
0.4
0.3
0.2
0.1
0
Site
WQ19
WQ19 (D)
WQ20
WQ20 (D)
WQ21
WQ22
WQ23
WQ24
WQ25
WQ25 (D)
WQ26
WQ27
WQ27 (D)
WQ28
WQ28 (D)

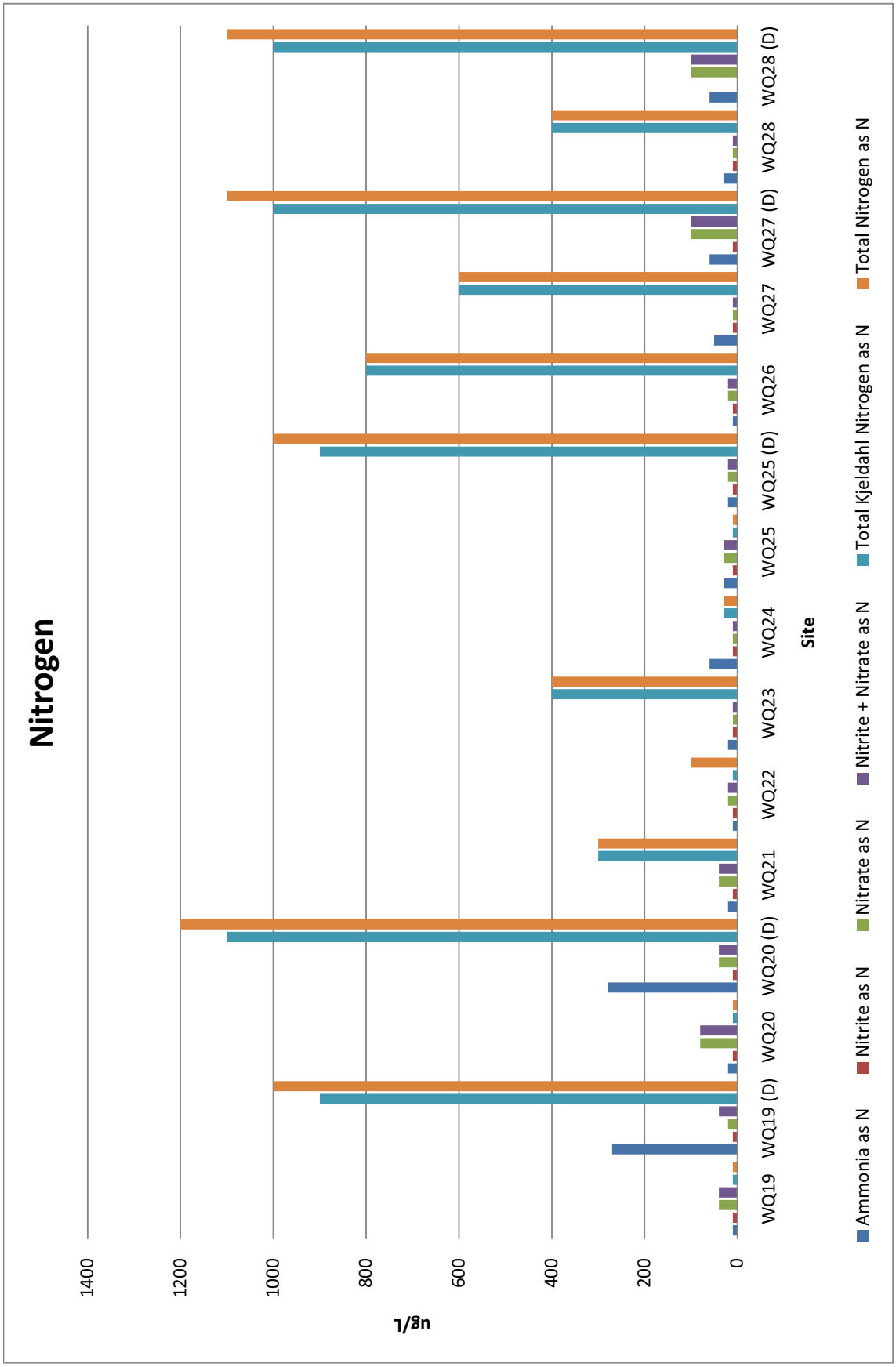

Dissolved Oxygen
% Saturation
0
20
40
60
80
100
120
Site
WQ19
WQ19 (D)
WQ20
WQ20 (D)
WQ21
WQ22
WQ23
WQ24
WQ25
WQ25 (D)
WQ26
WQ27
WQ27 (D)
WQ28
WQ28 (D)

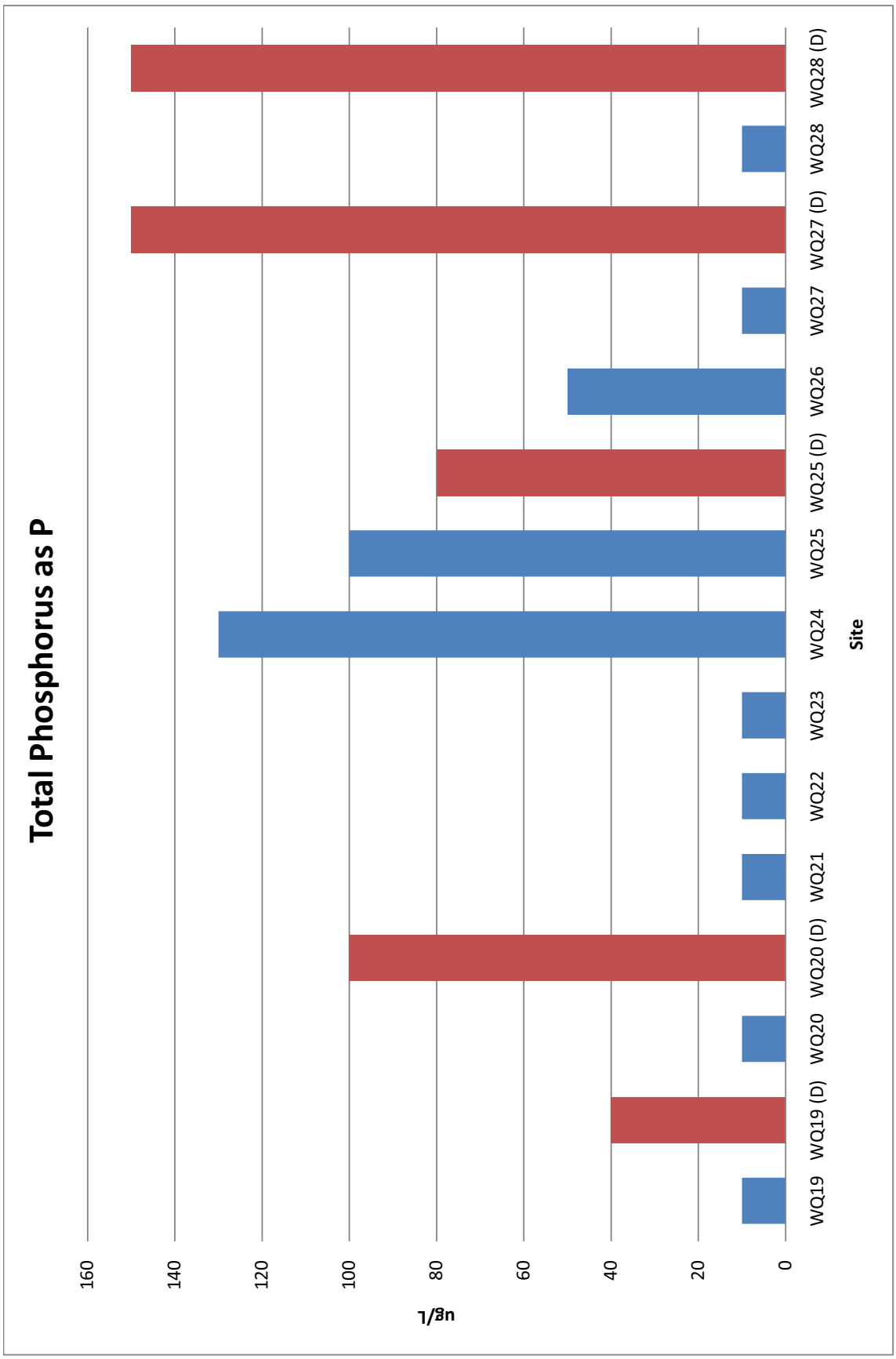

Turbidity
NTU
0
100
200
300
400
500
600
700
Site
WQ19
WQ19 (D)
WQ20
WQ20 (D)
WQ21
WQ22
WQ23
WQ24
WQ25
WQ25 (D)
WQ26
WQ27
WQ27 (D)
WQ28
WQ28 (D)

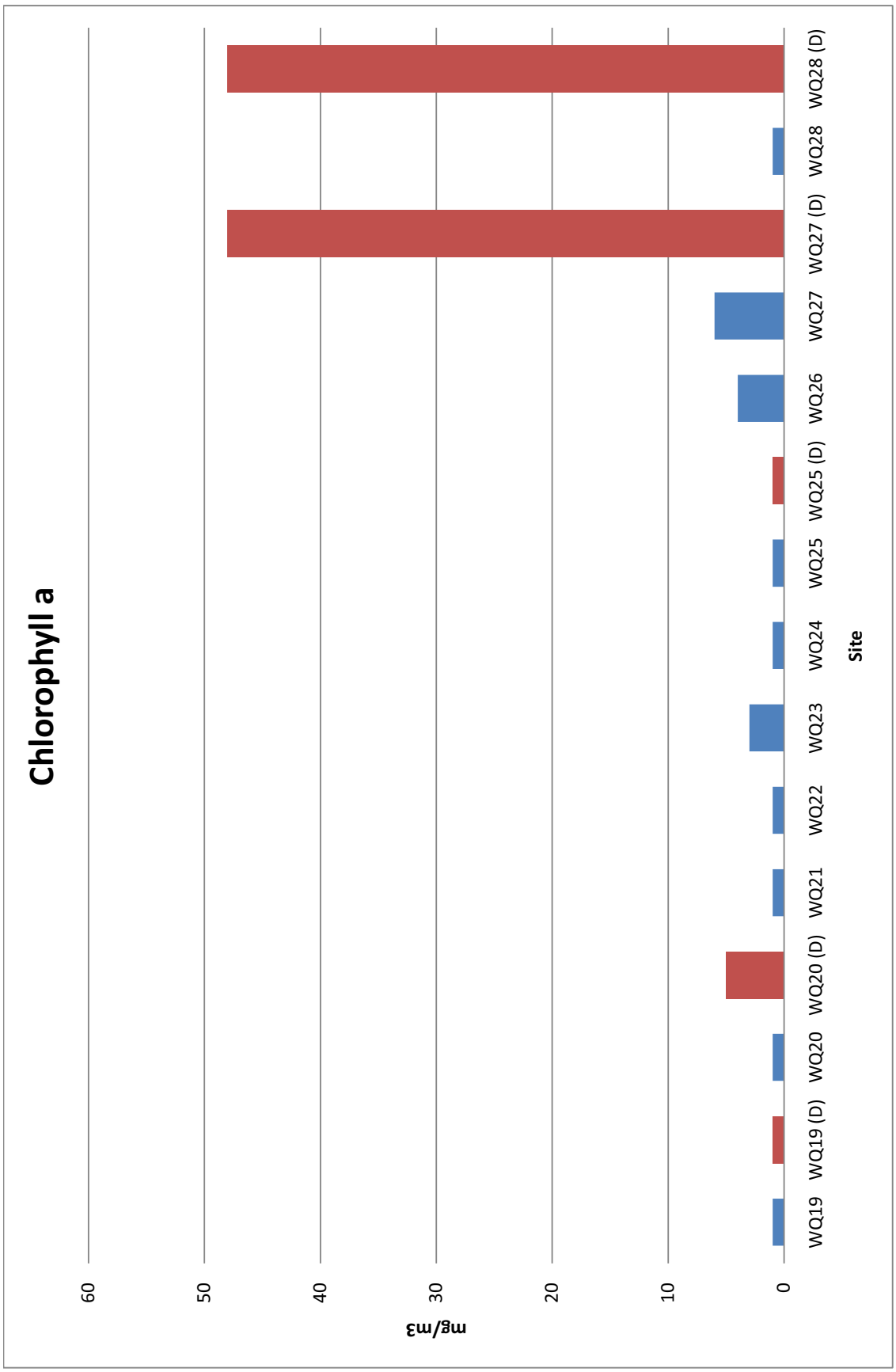

Alkalinity
mg/L
0
20
40
60
80
100
120
140
160
180
200
WQ19
WQ19 (D)
WQ20
WQ20 (D)
WQ21
WQ22
WQ23
WQ24
WQ25
WQ25 (D)
WQ26
WQ27
WQ27 (D)
WQ28
WQ28 (D)
Site
Hydroxide Alkalinity as CaCO3
Carbonate Alkalinity as CaCO3
Bicarbonate Alkalinity as CaCO3
Total Alkalinity as CaCO3


Total Metals
µg/L
45
40
35
30
25
20
15
10
5
0
WQ19
WQ19 (D)
WQ20
WQ20 (D)
WQ21
WQ22
WQ23
WQ24
WQ25
WQ25 (D)
WQ26
WQ27
WQ27 (D)
WQ28
WQ28 (D)
Site
Arsenic
Cadmium
Chromium
Copper
Nickel
Lead
Zinc

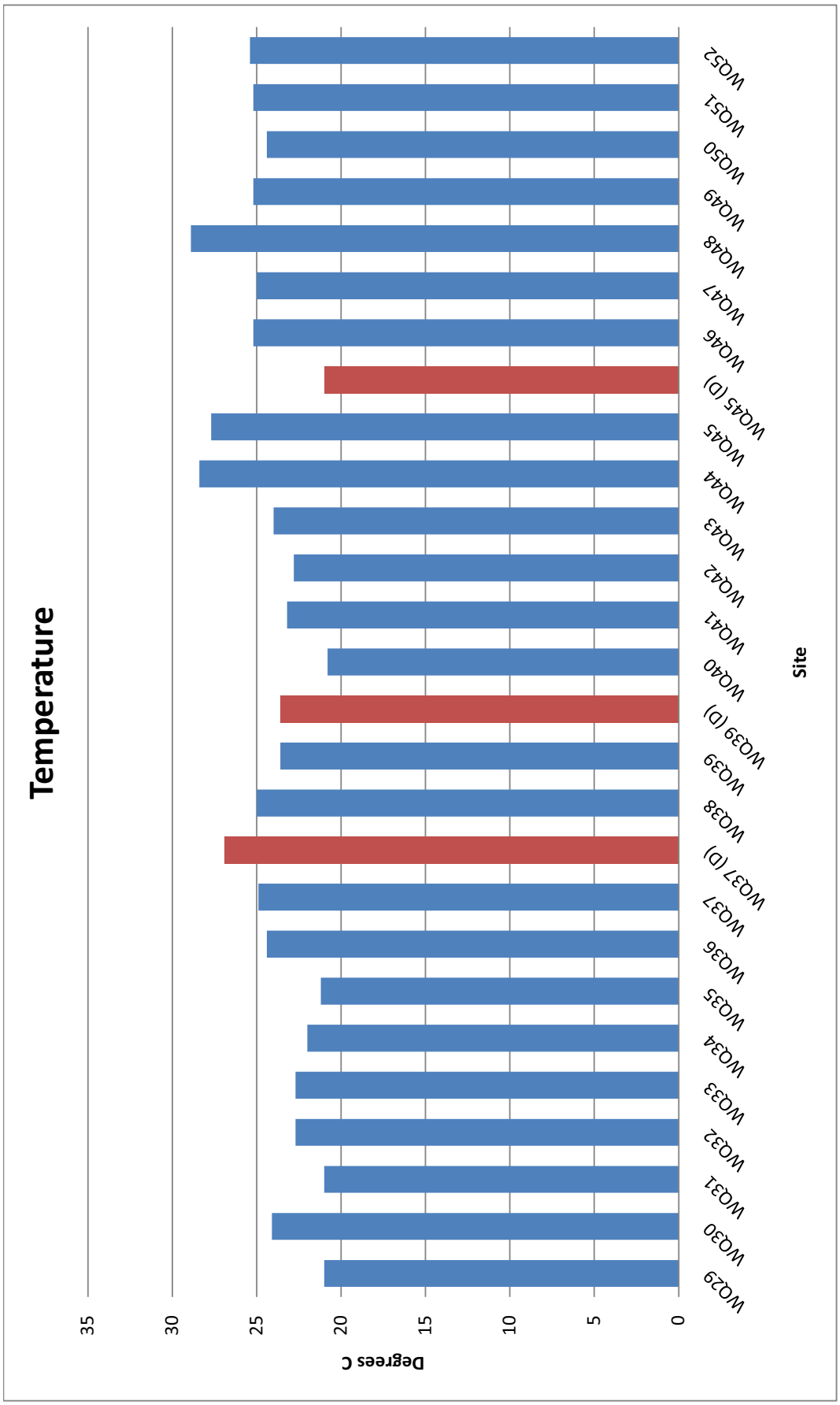

Iron
µg/L
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
WQ19
WQ19 (D)
WQ20
WQ20 (D)
WQ21
WQ22
WQ23
WQ24
WQ25
WQ25 (D)
WQ26
WQ27
WQ27 (D)
WQ28
WQ28 (D)
Site

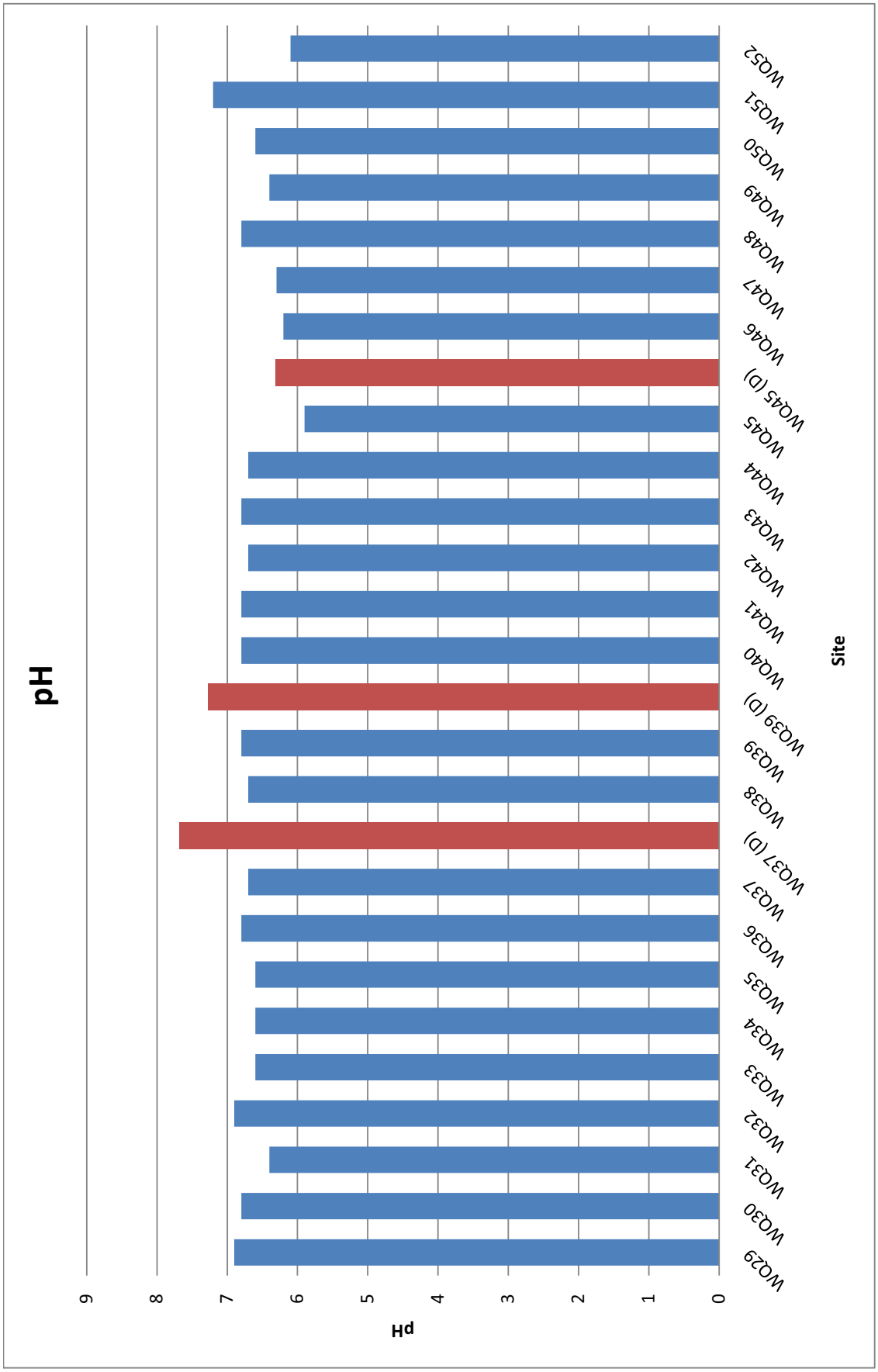

Nitrogen
µg/L
1400
1200
1000
800
600
400
200
0
WQ19
WQ19 (D)
WQ20
WQ20 (D)
WQ21
WQ22
WQ23
WQ24
WQ25
WQ25 (D)
WQ26
WQ27
WQ27 (D)
WQ28
WQ28 (D)
Site
Ammonia as N
Nitrite as N
Nitrate as N
Nitrite + Nitrate as N
Total Kjeldahl Nitrogen as N
Total Nitrogen as N

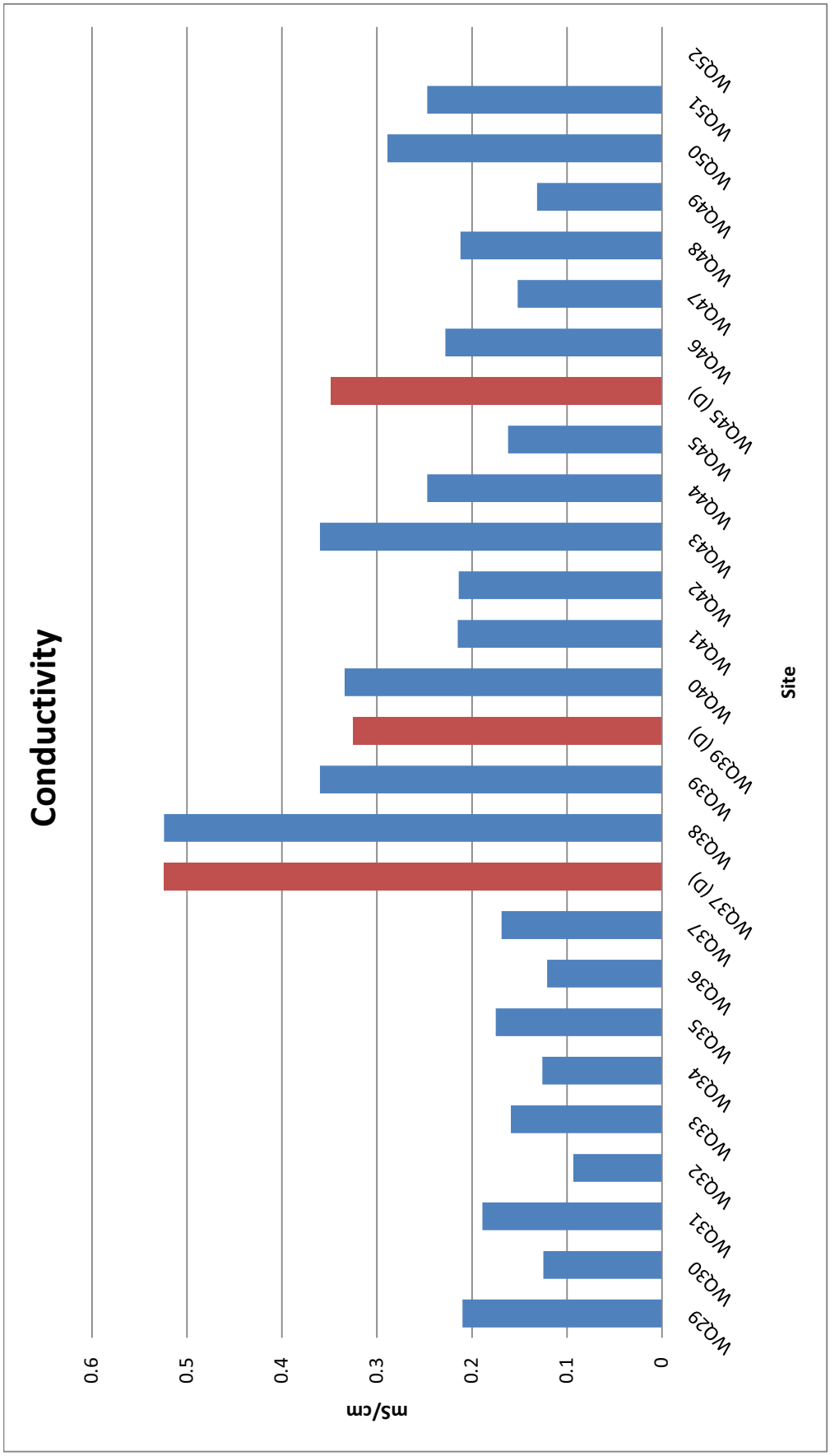

Total Phosphorus as P
µg/L
0
20
40
60
80
100
120
140
160
Site
WQ19
WQ19 (D)
WQ20
WQ20 (D)
WQ21
WQ22
WQ23
WQ24
WQ25
WQ25 (D)
WQ26
WQ27
WQ27 (D)
WQ28
WQ28 (D)

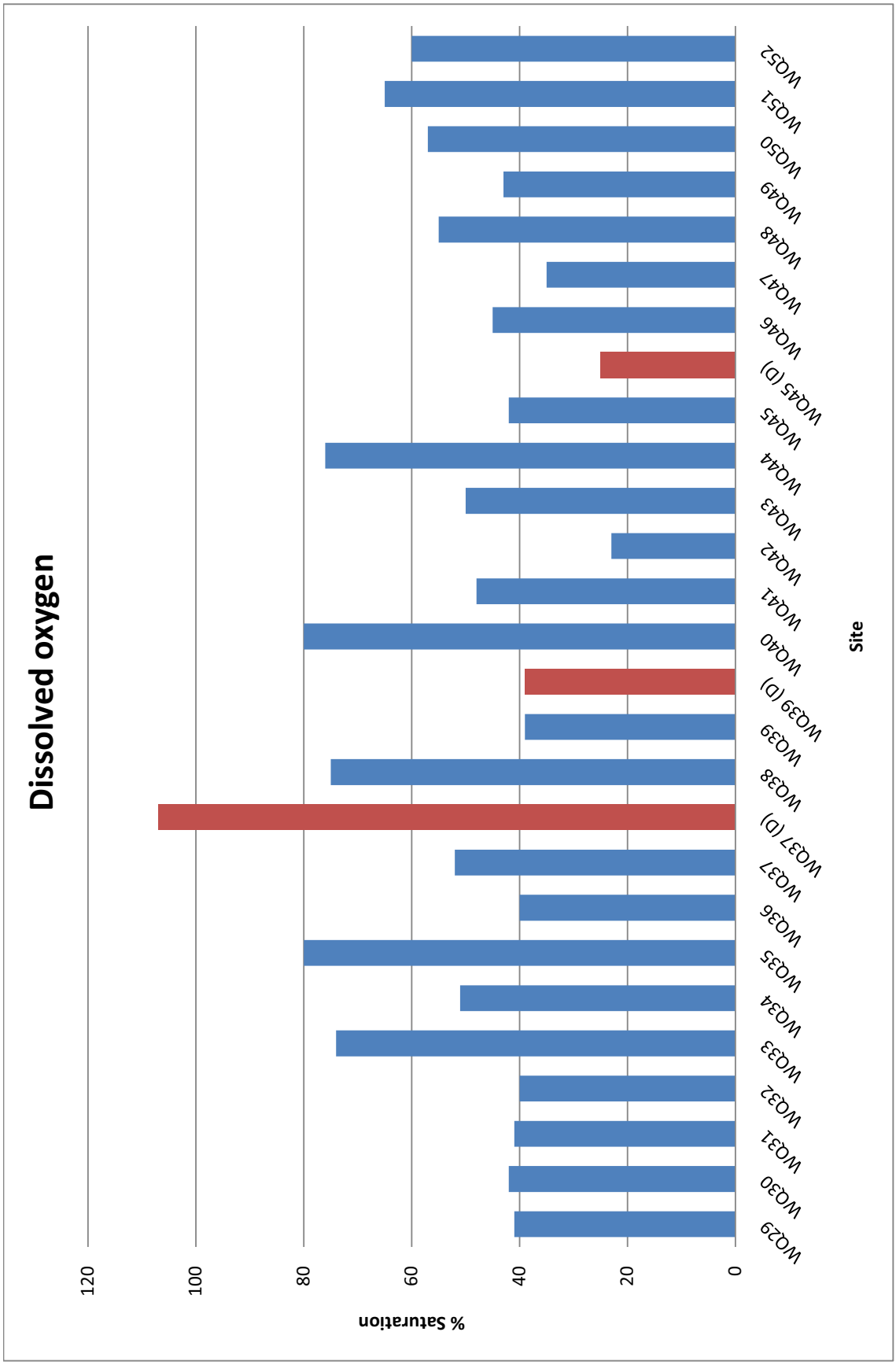

Chlorophyll a
mg/m3
60
50
40
30
20
10
0
Site
WQ19
WQ19 (D)
WQ20
WQ20 (D)
WQ21
WQ22
WQ23
WQ24
WQ25
WQ25 (D)
WQ26
WQ27
WQ27 (D)
WQ28
WQ28 (D)

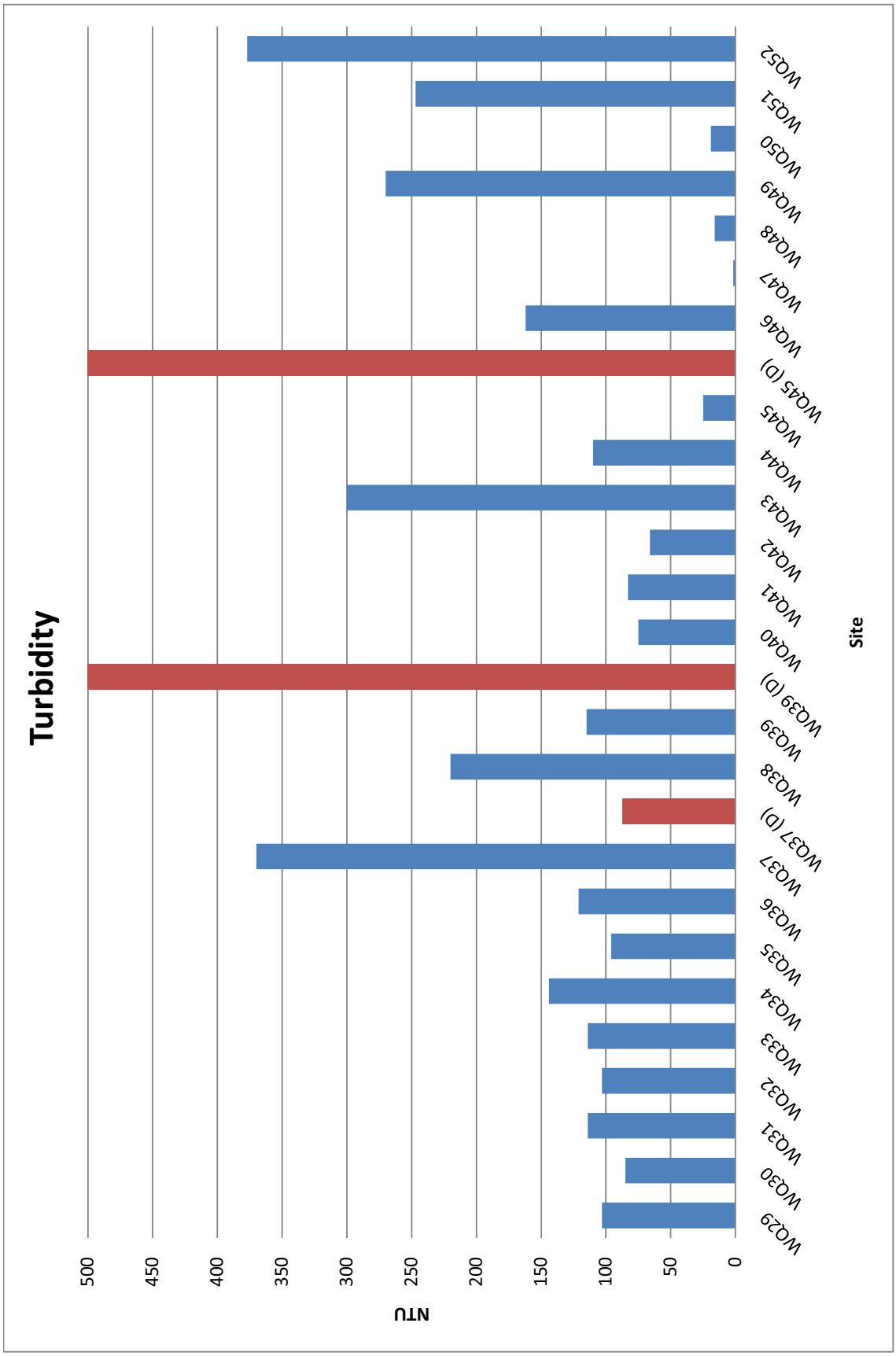
BELYANDO CATCHMENT

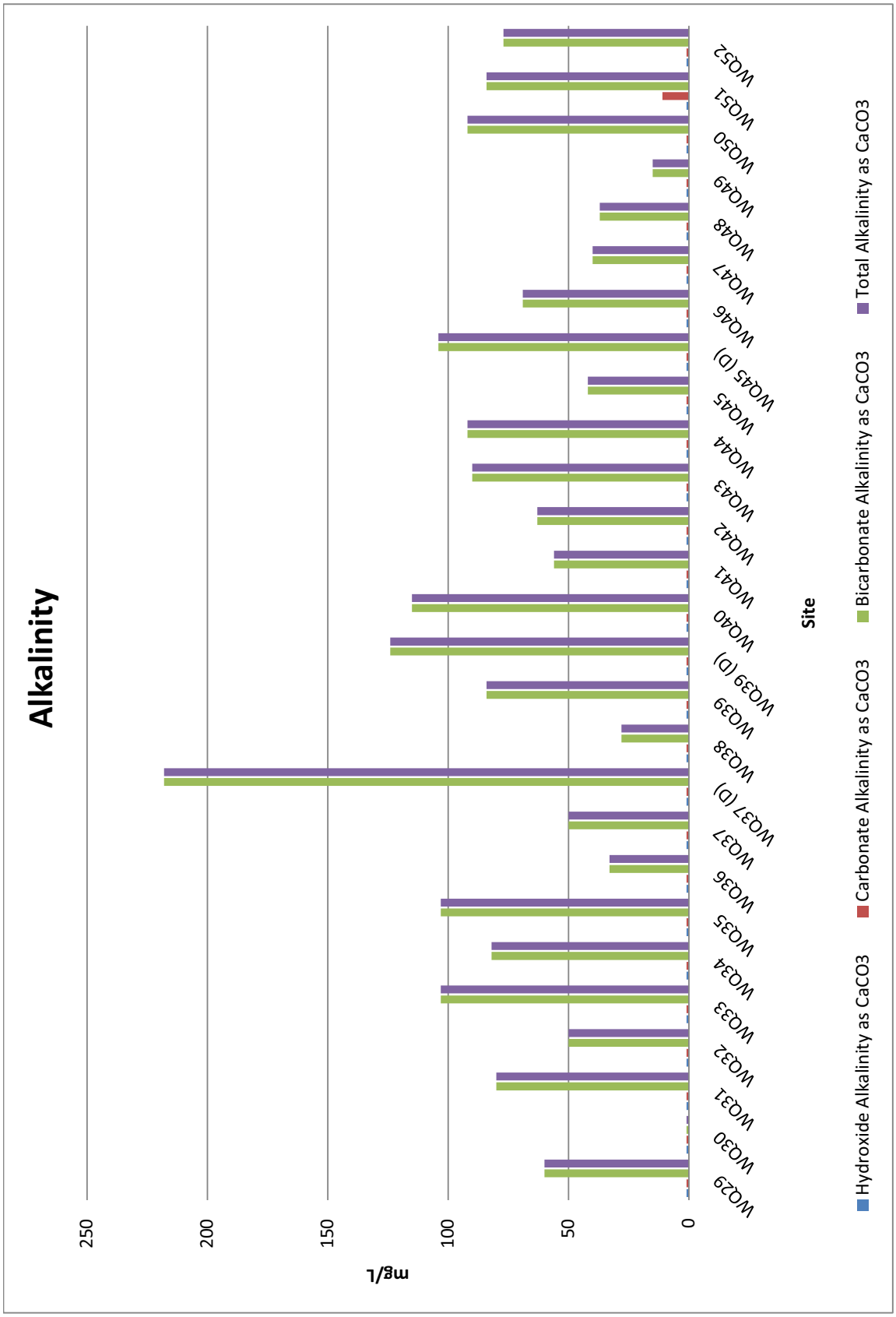


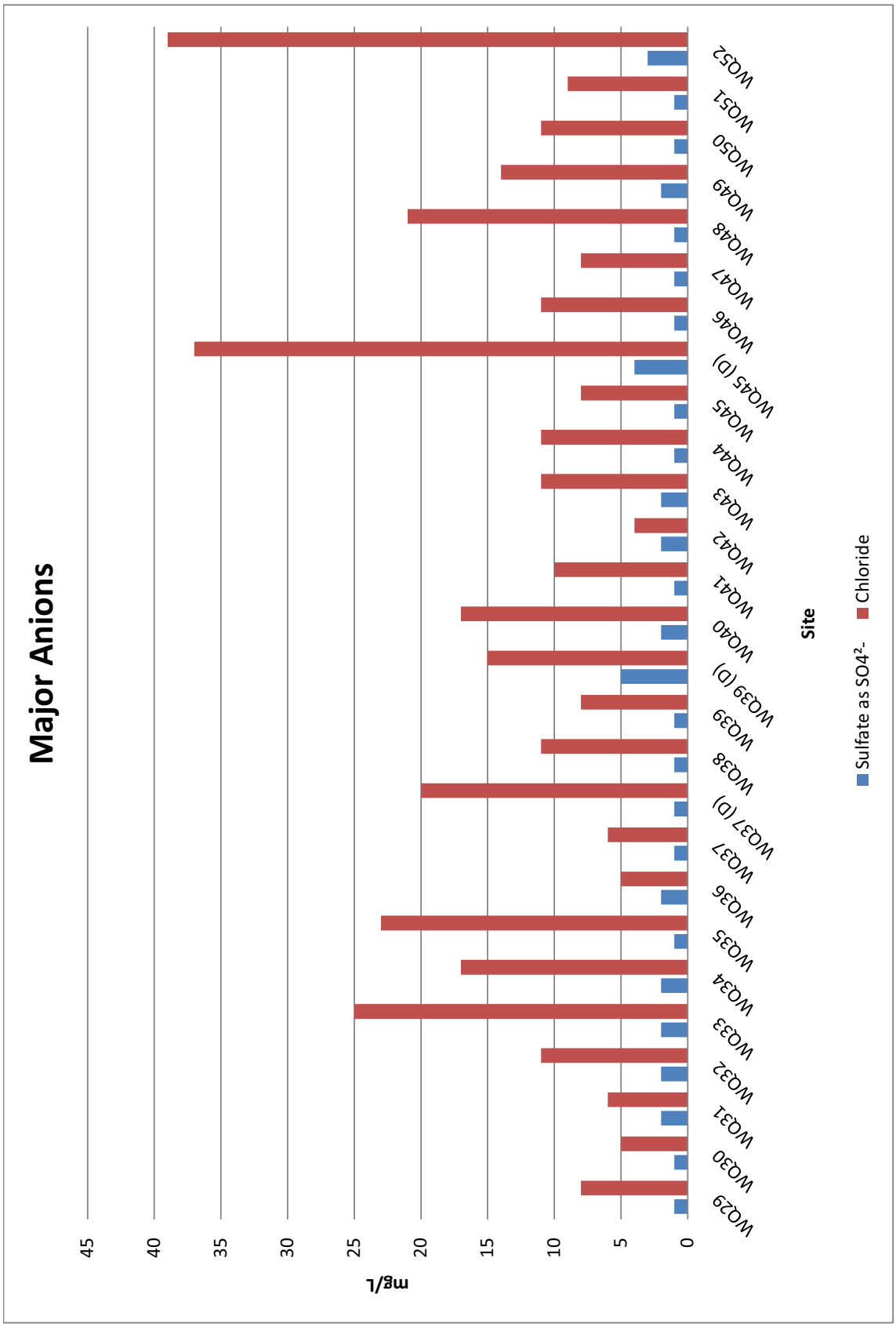

pH
pH
0
1
2
3
4
5
6
7
8
9
Site
WQ29
WQ30
WQ31
WQ32
WQ33
WQ34
WQ35
WQ36
WQ37
WQ37 (D)
WQ38
WQ39
WQ39 (D)
WQ40
WQ41
WQ42
WQ43
WQ44
WQ45
WQ45 (D)
WQ46
WQ47
WQ48
WQ49
WQ50
WQ51
WQ52

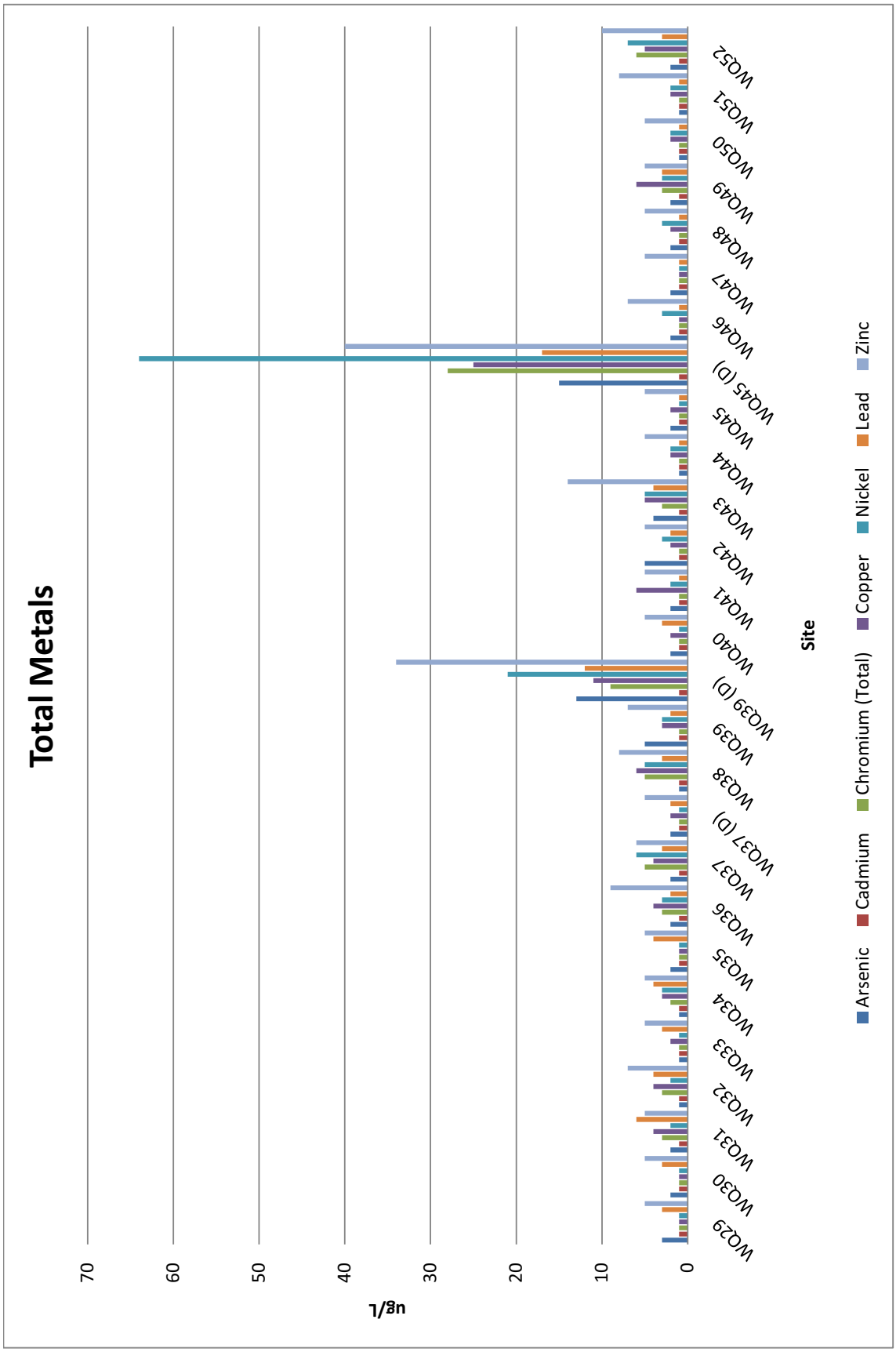

Conductivity
mS/cm
0
0.1
0.2
0.3
0.4
0.5
0.6
Site
WQ29
WQ30
WQ31
WQ32
WQ33
WQ34
WQ35
WQ36
WQ37
WQ37 (D)
WQ38
WQ39
WQ39 (D)
WQ40
WQ41
WQ42
WQ43
WQ44
WQ45
WQ45 (D)
WQ46
WQ47
WQ48
WQ49
WQ50
WQ51
WQ52

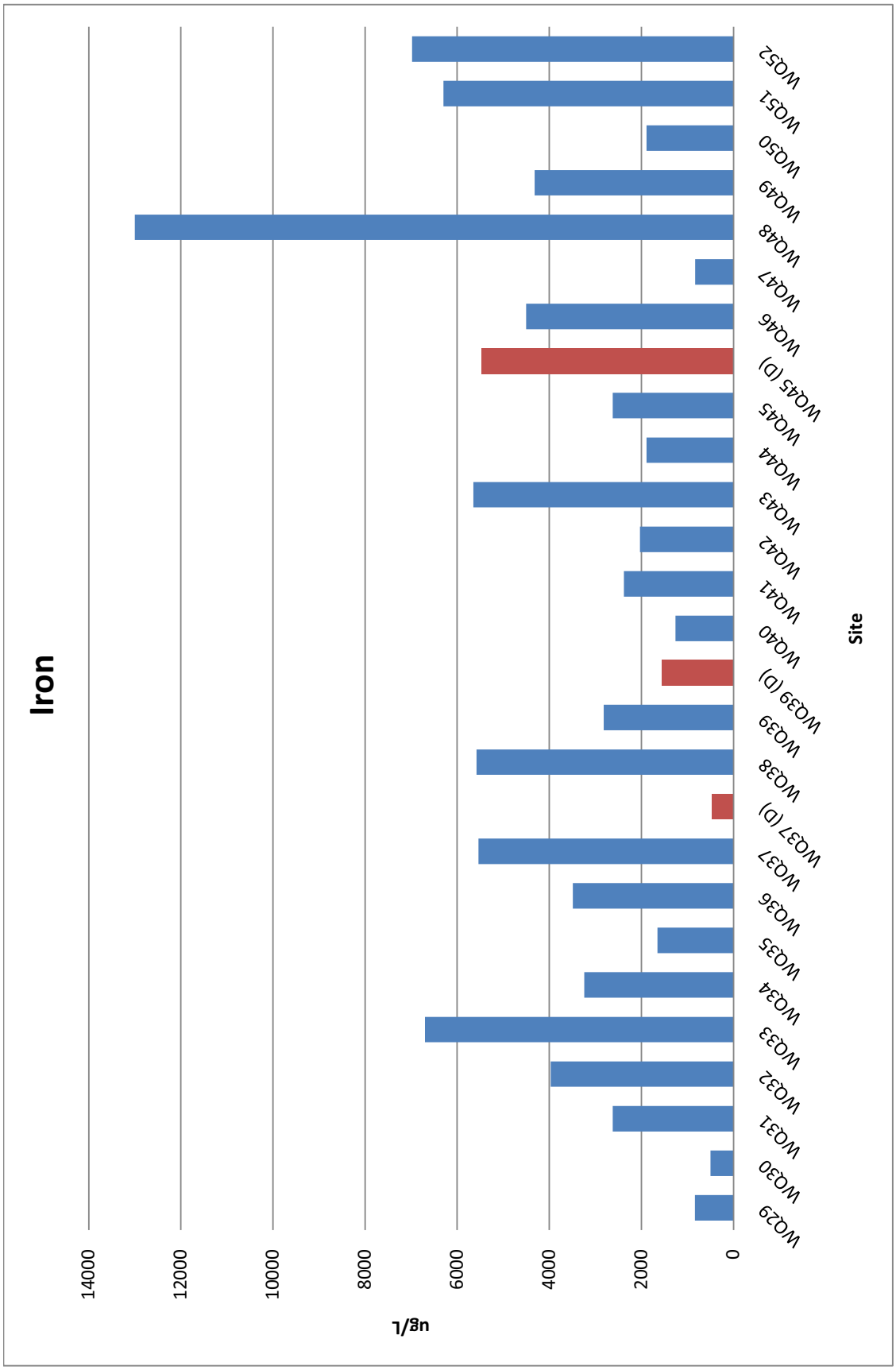

Dissolved oxygen
% Saturation
0
20
40
60
80
100
120
Site
WQ29
WQ30
WQ31
WQ32
WQ33
WQ34
WQ35
WQ36
WQ37
WQ37 (D)
WQ38
WQ39
WQ39 (D)
WQ40
WQ41
WQ42
WQ43
WQ44
WQ45
WQ45 (D)
WQ46
WQ47
WQ48
WQ49
WQ50
WQ51
WQ52

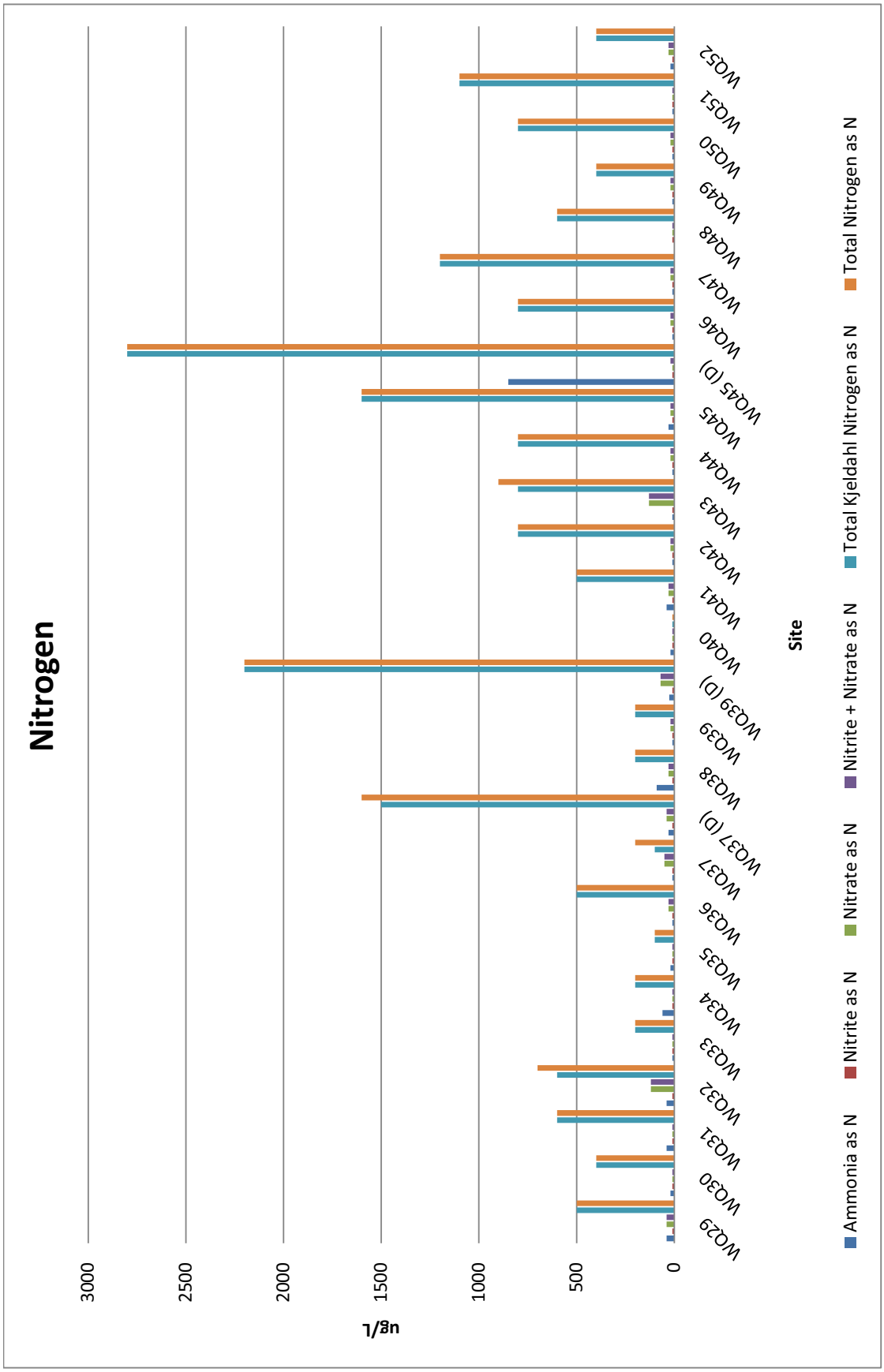

Turbidity
NTU
0
50
100
150
200
250
300
350
400
450
500
Site
WQ29
WQ30
WQ31
WQ32
WQ33
WQ34
WQ35
WQ36
WQ37
WQ37 (D)
WQ38
WQ39
WQ39 (D)
WQ40
WQ41
WQ42
WQ43
WQ44
WQ45
WQ45 (D)
WQ46
WQ47
WQ48
WQ49
WQ50
WQ51
WQ52

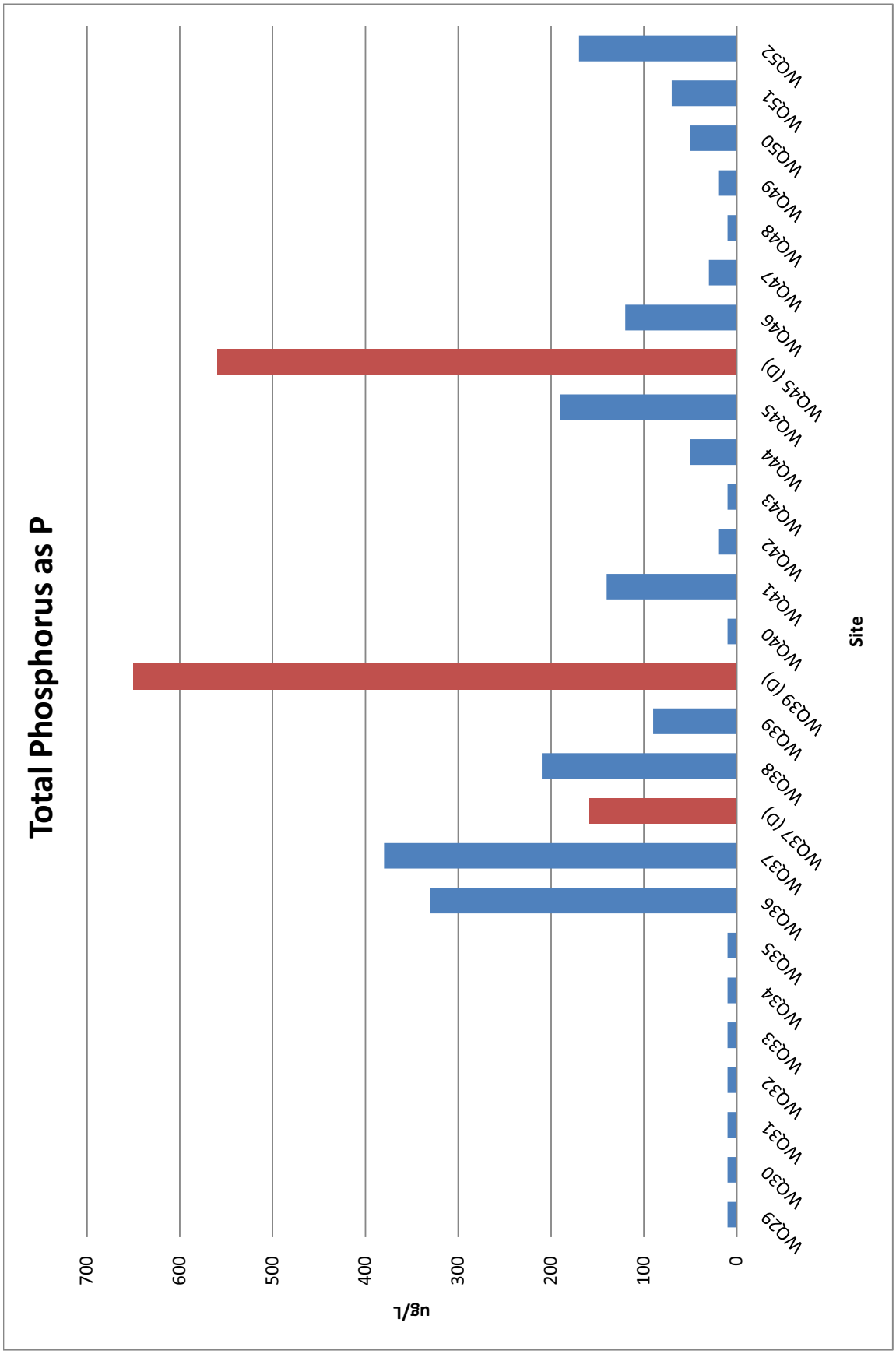

Alkalinity
mg/L
250
200
150
100
50
0
Site
WQ29
WQ30
WQ31
WQ32
WQ33
WQ34
WQ35
WQ36
WQ37
WQ37 (D)
WQ38
WQ39
WQ39 (D)
WQ40
WQ41
WQ42
WQ43
WQ44
WQ45
WQ45 (D)
WQ46
WQ47
WQ48
WQ49
WQ50
WQ51
WQ52
Hydroxide Alkalinity as CaCO3
Carbonate Alkalinity as CaCO3
Bicarbonate Alkalinity as CaCO3
Total Alkalinity as CaCO3

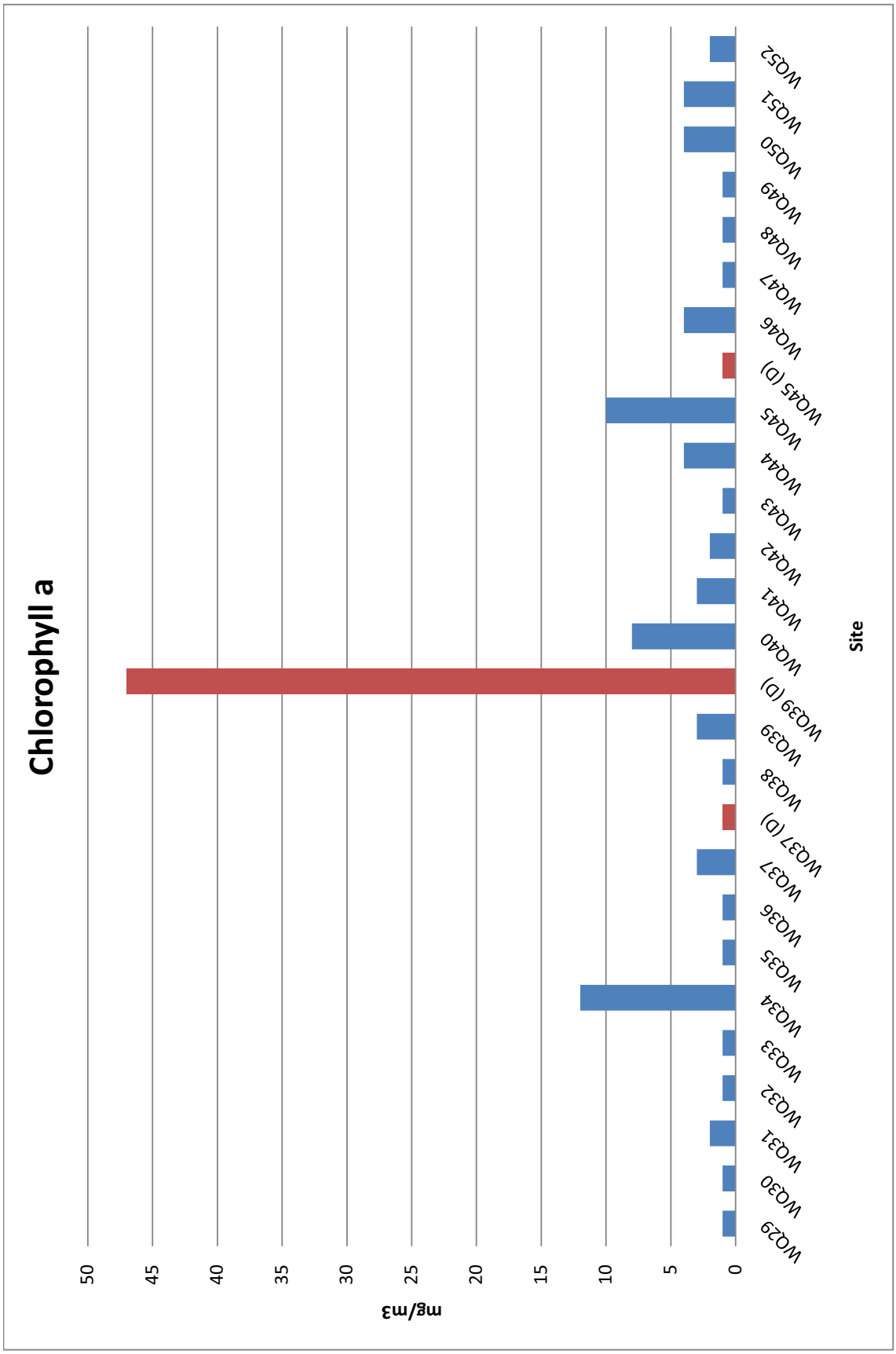

Major Anions
mg/L
0
5
10
15
20
25
30
35
40
45
WQ29
WQ30
WQ31
WQ32
WQ33
WQ34
WQ35
WQ36
WQ37
WQ37 (D)
WQ38
WQ39
WQ39 (D)
WQ40
WQ41
WQ42
WQ43
WQ44
WQ45
WQ45 (D)
WQ46
WQ47
WQ48
WQ49
WQ50
WQ51
WQ52
Site
Chloride
Sulfate as SO4²-


Total Metals
µg/L
0
10
20
30
40
50
60
70
WQ29
WQ30
WQ31
WQ32
WQ33
WQ34
WQ35
WQ36
WQ37
WQ37 (D)
WQ38
WQ39
WQ39 (D)
WQ40
WQ41
WQ42
WQ43
WQ44
WQ45
WQ45 (D)
WQ46
WQ47
WQ48
WQ49
WQ50
WQ51
WQ52
Site
Arsenic
Cadmium
Chromium (Total)
Copper
Nickel
Lead
Zinc


Iron
µg/L
0
2000
4000
6000
8000
10000
12000
14000
Site
WQ29
WQ30
WQ31
WQ32
WQ33
WQ34
WQ35
WQ36
WQ37
WQ37 (D)
WQ38
WQ39
WQ39 (D)
WQ40
WQ41
WQ42
WQ43
WQ44
WQ45
WQ45 (D)
WQ46
WQ47
WQ48
WQ49
WQ50
WQ51
WQ52


Nitrogen
µg/L
3000
2500
2000
1500
1000
500
0
WQ29
WQ30
WQ31
WQ32
WQ33
WQ34
WQ35
WQ36
WQ37
WQ37 (D)
WQ38
WQ39
WQ39 (D)
WQ40
WQ41
WQ42
WQ43
WQ44
WQ45
WQ45 (D)
WQ46
WQ47
WQ48
WQ49
WQ50
WQ51
WQ52
Site
Ammonia as N
Nitrite as N
Nitrate as N
Nitrite + Nitrate as N
Total Kjeldahl Nitrogen as N
Total Nitrogen as N


Total Phosphorus as P
µg/L
0
100
200
300
400
500
600
700
Site
WQ29
WQ30
WQ31
WQ32
WQ33
WQ34
WQ35
WQ36
WQ37
WQ37 (D)
WQ38
WQ39
WQ39 (D)
WQ40
WQ41
WQ42
WQ43
WQ44
WQ45
WQ45 (D)
WQ46
WQ47
WQ48
WQ49
WQ50
WQ51
WQ52


Chlorophyll a
mg/m3
0
5
10
15
20
25
30
35
40
45
50
Site
WQ29
WQ30
WQ31
WQ32
WQ33
WQ34
WQ35
WQ36
WQ37
WQ37 (D)
WQ38
WQ39
WQ39 (D)
WQ40
WQ41
WQ42
WQ43
WQ44
WQ45
WQ45 (D)
WQ46
WQ47
WQ48
WQ49
WQ50
WQ51
WQ52

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Don Catchment																					
			wet	Dry	wet	Dry	wet	Dry	wet	dry	wet	dry	wet	dry	wet	dry	wet	wet	dry					
			WQ1	WQ1	WQ2	WQ2	WQ3	WQ3	WQ4	WQ4	WQ5	WQ5	WQ6	WQ6	WQ7	WQ7	WQ8	WQ9	WQ9	Minimum	Maximum	Median	20th Percentile	80th Percentile	110th Percentile
Temperature	°C	NC	28.8	23.3	21.9	25.4	22	23.7	25.4	22.2	28.6	24.6	24.2	25.6	23.2	26.1	29.5	29.2	27.7	22.2	29.5	25.6	24.2	28.6	52.7
pH	pH Unit	6.5-8.0	6.51	8.36	7.9	8.2	7.9	7.8	6.2	8.23	7.22	7.91	7.32	7.85	7.4	7.4	7.89	7.55	7.33	6.2	8.23	7.4	7.32	7.89	15.45
Conductivity	mS/cm	0.814	0.00394	95.4	0.693	6.68	0.678	2.396	2.156	129	0.02423	157	0.01624	134	1.549	2.122	1.36	1.0007	1.523	0.01624	156.9	1.549	1.0007	129	156.92423
Dissolved Oxygen	%	85-110	83	75	82	50	86	72	83	60	113	45	82	62	51	40	88	93	70	40	113	70	51	88	158
Turbidity	NTU	50	0.1	0.8	2.9	8.1	4.8	28	377	13	40.1	11.6	7.1	14.7	1	4.7	0.5	0.7	4.9	0.5	377	7.1	1	14.7	377.7
Non Marine - Estimated TDS Salinity																									
Total Dissolved Solids (est.)	mg/L	NC	-	-	-	-	-	-	197	-	-	-	-	-	-	-	-	-	-		197	197	197	197	197
Suspended Solids																									
Suspended Solids (SS)	mg/L	10	-	-	-	-	-	-	117	-	-	-		-	-	-	-	-	-		117	117	117	117	117
Alkalinity																									
Hydroxide Alkalinity as CaCO3	mg/L	NC	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	mg/L	NC	<1	<1	<1	78	<1	<1	<1	<1	<1	<1	<1	<1	16	<1	<1	<1	<1	<1	16	16	16	16	32
Bicarbonate Alkalinity as CaCO3	mg/L	NC	92	276	391	769	390	420	77	339	56	215	120	196	422	488	187	254	254	56	488	215	120	339	565
Total Alkalinity as CaCO3	mg/L	NC	92	276	391	847	390	420	77	339	56	215	120	196	438	488	187	254	254	56	488	234.5	120	339	565
Dissolved Major Anions																									
Sulfate as $SO4^{2-}$	mg/L	NC	166	5580	23	50	23	28	3	9260	2,080	11400	856	10300	15	19	11	15	12	3	11400	19	12	9260	11411
Chloride																									
Chloride	µg/L	NC	1100000	49000000	422000	1660000	422000	467000	39000	70100	8020	90800	5580	75700	249	357000	100000	138000	275000	249	357000	75700	8020	138000	362580
Dissolved Major Cations																									
Calcium	mg/L	NC	41	647	112	40	112	115	13	860	397	915	181	1000	64	107	38	48	55	13	1000	107	96	1720	1038
Magnesium	mg/L	NC	72	3440	92	269	91	112	10	5120	589	6210	366	5140	41	53	21	29	33	10	6210	53	29	10240	6231
Sodium	mg/L	NC	686	24200	129	1010	127	137	27	34300	4,430	45800	2,900	37300	199	216	70	98	153	27	45800	216	96	34300	49870
Potassium	mg/L	NC	23	821	1	4	1	1	10	1320	162	3600	128	2840	1	2	2	2	5	1	3600	10	2	1320	3602
Total Metals																									
Arsenic	µg/L	24	<1	84	<1	2	<1	<1	2	78	3	93	8	76	<1	1	<1	<1	<1	1	93	8	2.2	77.6	94.6
Cadmium	µg/L	370	<0.1	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<1	2	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	0.2	2	1.1	0.56	1.64	4
Chromium	µg/L	NC	<1	22	<1	1	<1	<1	6	61	1	57	<1	54	<1	<1	<1	<1	<1	1	61	54	5	57.8	64
Copper	µg/L	1.4	<1	19	<1	2	<1	1	5	40	6	42	2	37	<1	1	<1	<1	<1	<1	42	6	2.6	39.4	43.6
Nickel	µg/L	11	3	<5	<1	<1	<1	<1	7	10	20	10	2	10	<1	<1	<1	<1	<1	2	20	10	7	10	24.5
Lead	µg/L	3.4	<1	23	2	3	<1	<1	3	42	<1	25	<1	25	<1	<1	<1	<1	<1	3	42	25	16.2	31.8	51.6
Zinc	µg/L	8	<5	46	<5	5	8	<5	10	64	26	52	7	52	<5	5	<5	<5	<5	5	64	26	7.6	52	70.2
Iron	µg/L	NC	140	2050	100	220	90	270	6.98	4330	1680	4780	620	4980	<50	3200	<50	1100	460	6.98	4980	1,680	556	4510	5349.396
Ammonia as N																									
Ammonia as N	µg/L	20	40	640	20	30	30	40	20	710	960	610	50	540	40	90	20	10	110	10	960	90	20	610	980
Nitrite as N																									
Nitrite as N	µg/L	3	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	10	<10	<10	<10	<10	10	10	10	10	10	20
Nitrate as N																									
Nitrate as N	µg/L	700	40	50	<10	40	<10	110	30	80	100	70	<10	30	610	140	<10	<10	180	30	610	90	46	164	640
NOX as N																									
Nitrite + Nitrate as N	µg/L	10	40	50	<10	40	<10	110	30	80	100	70	<10	30	620	140	<10	<10	180	30	620	90	46	164	650
Total Kjeldahl Nitrogen (TKN)																									
Total Kjeldahl Nitrogen as N	µg/L	NC	400	11900	<100	700	<100	<100	400	130	3,400	3800	1,000	3400	<100	400	20	<10	300	20	3800	400	232	3400	3908
Total Nitrogen as N (TKN + NOx)																									
Total Nitrogen as N	µg/L	500	400	1200	<100	700	<100	100	400	1000	3,500	3900	1,000	340	600	500	200	<100	500	200	3900	550	388	1500	4226
Total Phosphorus as P																									
Total Phosphorus as P	µg/L	50	<10	2220	<10	<10	<10	<10	170	30	<10	240	<10	<10	<10	<10	<10	<10	40	30	240	105	36	198	273
Ionic Balance																									
Total Anions	meq/L	NC	36.5	1500	20.2	64.7	20.2	22.2	2.68	2180	271	2800	178	2350	16.1	20.2	6.79	9.26	13.1	2.68	2800	20.2	9.26	653.9941667	2806.79
Total Cations	meq/L	NC	37.5	1390	18.8	68.2	18.7	21	2.86	1990	265	2640	169	2170	15.2	19.1	6.75	9.02	12.3	2.86	2640	19.1	9.02	9.02	2646.75
Ionic Balance	%	NC	-	4.05	3.43	2.58	3.91	2.71	-	4.52	1.07	3.01	2.67	4.1	2.7	2.72	0.29	1.35	3.16	0.29	4.52	2.71	1.294	3.348	5.512
Chlorophyll a & Pheophytin a																									
Chlorophyll a	mg/m³	5	1	5	<1	2	<1	2	2	<1	2	1	<1	3	<1	<1	<1	<1	2	<1	3	2	1.8	2.2	4.4
Polychlorinated Biphenyls (PCB)																									
Total Polychlorinated biphenyls	µg/L	NC	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Polynuclear Aromatic Hydrocarbons																									
Naphthalene	µg/L	16	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Acenaphthylene	µg/L	NC	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Acenaphthene	µg/L	NC	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Fluorene	µg/L	NC	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Phenanthrene	µg/L	NC	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Anthracene	µg/L	NC	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Fluoranthene	µg/L	NC	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Pyrene	µg/L	NC	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Benz(a)anthracene	µg/L	NC	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Chrysene	µg/L	NC	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	1.1	<1	<1	<1	<1	1.1	1.1	1.1	1.1	2.2
Benzo(b)fluoranthene	µg/L	NC	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	1.6	<1	<1	<1	<1	1.6	1.6	1.6	1.6	3.2
Benzo(k)fluoranthene	µg/L	NC	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	2.5	<1	<1	<1	<1	2.5	2.5	2.5	2.5	5
Benzo(a)pyrene	µg/L	NC	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.7	<0.5	<0.5	<0.5	<1	0.7	0.7	0.7	0.7	1.4
Indeno(1,2,3.cd)pyrene	µg/L	NC	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	2.8	<1	<1	<1	<1	2.8	2.8	2.8	2.8	5.6
Dibenz(a.h)anthracene	µg/L	NC	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	1.3	<1	<1	<1	<1	1.3	1.3	1.3	1.3	2.6
Benzo(g.h.i)perylene	µg/L	NC	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	3.4	<1	<1	<1	<1	3.4	3.4	3.4	3.4	6.8
Total PAH	µg/L	3	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	12.77	<1	<1	<1	<1	12.77	12.77	12.77	12.77	25.54
Total Petroleum Hydrocarbons																									
C6 - C9 Fraction	µg/L		<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
C10 - C14 Fraction	µg/L		<50	190	<50	<50	<50	<50	<50	160	<50	60	<50	60	<50	<50	<50	<50	<50	<50	160	60	120	120	220
C15 - C28 Fraction	µg/L	NC	<100	1740	<100	<100	<100	<100	<100	1580	120	300	<100	280	<100	<100	<100	<100	<100	<100	1580	290	216	490	1748
C29 - C36 Fraction	µg/L		<50	520	<50	<50	<50	<50	<50	500	60	90	<50	100	<50	<50	<50	<50	<50	<50	500	95	78	260	569
C10 - C36 Fraction (sum)	µg/L		<50	2450	<50	<50	<50	<50	<50	2250	180	440	<50	450	<50	<50	<50	<50	<50	<50	2250	445	336	1170	2508

Notes:
Where no Queensland Water Quality Guidelines criteria are available, ANZECC 2000 guidelines for 95% freshwater species protection have been used.

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Bowen/Bogie Catchment																						
			wet	wet	Dry	wet	Dry	wet	Dry	wet	Dry	wet	dry	wet	dry	wet	Dry	wet	dry						
			WQ10	WQ11	WQ11	WQ12	WQ12	WQ13	WQ13	WQ14	WQ14	WQ15	WQ15	WQ16	WQ16	WQ17	WQ17	WQ18	WQ18	Minimum	Maximum	Median	20th Percentile	80th Percentile	110th Percentile
Temperature	°C	NC	23	22.9	29.8	29.8	25	29.8	25.9	29.8	28.6	31.7	29.4	32.7	23.1	30.8	28.9	30.6	28.1	22.9	32.7	29.4	25.18	30.44	55.7
pH	pH Unit	6.5-8.0	7.8	7.7	7.3	7.6	7.8	7.6	7.71	7.28	8.36	7.37	8.33	7.48	7.1	6.99	8.06	6.38	7.79	6.38	8.36	7.6	7.284	7.8	15.35
Conductivity	mS/cm	0.814	0.905	0.81	1.689	1.149	0.545	1.289	0.502	0.00278	7.8	0.00317	0.695	1.222	1.822	0.508	0.947	0.302	0.515	0.00278	7.8	0.812	0.5032	1.2756	7.80317
Dissloved Oxygen	%	85-110	91	76	48	128	76	59	107	90	55	80	81	80	75	58	55	62	75	48	128	76	58.2	88.2	183
Turbidity	NTU	50	8.1	1.4	5.9	11.2	27.9	11.2	1.9	11.2	19.5	4.5	4.7	4.3	47.9	5.68	43.2	3.8	3.2	1.4	50	7	3.9	17.84	51.9
Non Marine - Estimated TDS Salinity																									
Total Dissolved Solids (est.)	mg/L	NC	0.383	0.493	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Suspended Solids																									
Suspended Solids (SS)	mg/L	10	249	320	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Alkalinity																									
Hydroxide Alkalinity as CaCO3	mg/L	NC	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	mg/L	NC	11	<1	<1	<1	<1	<1	<1	<1	<1	<1	22	<1	9	<1	10	<1	<1	<1	22	10.5	9.6	15.4	31.36
Bicarbonate Alkalinity as CaCO3	mg/L	NC	295	189	609	375	173	450	139	234	208	112	141	77	233	107	208	101	140	77	609	189	77	282.8	686
Total Alkalinity as CaCO3	mg/L	NC	306	189	609	375	173	450	139	234	208	112	163	77	242	107	218	101	140	77	609	189	117.4	293.2	710
Dissolved Major Anions																									
Sulfate as SO_4^{2-}	mg/L	NC	6	1560	12	17	15	30	28	831	3080	6	34	3	136	6	33	6	18	3	3080	18	6	115.6	3086
Chloride																									
Chloride	µg/L	NC	84000	380000	132000	117000	42000	119000	35000	324000	1040000	20000	51000	39000	299000	27000	106000	22000	29000	20000	1040000	84000	30200	265600	1062000
Dissolved Major Cations																									
Calcium	mg/L	NC	44	84	84	59	30	91	32	346	126	22	26	13	54	24	43	21	28	13	346	43	24.4	84	367
Magnesium	mg/L	NC	28	64	64	41	17	48	15	428	121	9	23	10	52	9	31	9	15	9	428	28	11	61.6	437
Sodium	mg/L	NC	91	139	139	112	48	101	37	1080	333	24	50	27	195	25	71	23	32	23	1080	71	28	139	1104
Potassium	mg/L	NC	3	2	2	3	3	4	3	18	6	1	3	10	4	1	7	1	3	1	18	3	2	5.6	19
Total Metals																									
Arsenic	µg/L	24	<1	<1	<1	<1	1	<1	2	1	<1	<1	1	2	2	<1	2	<1	2	<1	24	2	1	8	25
Cadmium	µg/L	370	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chromium	µg/L	NC	<1	<1	<1	2	1	<1	<1	2	<1	<1	<1	6	<1	<1	<1	<1	<1	<1	6	2	1.6	3.6	7.36
Copper	µg/L	1.4	<1	<1	<1	4	<1	<1	<1	3	1	<1	2	5	1	<1	2	<1	<1	<1	5	2	1.2	3.8	6
Nickel	µg/L	11	<1	<1	<1	2	<1	<1	<1	<1	4	<1	7	<1	<1	<1	<1	<1	<1	<1	11	4	2.8	5.8	13.4
Lead	µg/L	3.4	<1	<1	<1	<1	<1	<1	<1	6	<1	<1	<1	3	1	<1	2	<1	<1	<1	6	2.5	1.6	4.2	7.36
Zinc	µg/L	8	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	10	<5	<5	<5	<5	<5	<5	10	10	10	10	20
Iron	µg/L	NC	<50	670	670	2400	170	<50	160	440	780	2400	100	6980	180	3600	330	3900	90	90	6980	670	168	2640	7078
Ammonia as N																									
Ammonia as N	µg/L	20	30	30	30	50	30	40	20	30	10	<10	40	20	30	20	30	<10	30	<10	50	30	20	32	70
Nitrite as N																									
Nitrite as N	µg/L	3	<10	<10	<10	<10	<10	<10	<10	<10	10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Nitrate as N																									
Nitrate as N	µg/L	700	10	50	50	<10	30	<10	50	40	20	30	120	30	30	<10	40	40	50	<10	700	40	30	50	726
NOX as N																									
Nitrite + Nitrate as N	µg/L	10	10	50	50	<10	30	<10	50	40	30	30	120	30	30	<10	40	40	50	<10	120	40	30	50	150
Total Kjeldahl Nitrogen (TKN)																									
Total Kjeldahl Nitrogen as N	µg/L	NC	20	200	200	200	<100	100	200	<100	<100	<100	300	400	200	<100	400	200	300	<100	400	200	200	300	540
Total Nitrogen as N (TKN + NOx)																									
Total Nitrogen as N	µg/L	500	200	300	300	200	<100	100	300	<100	<100	<100	400	400	200	<100	400	200	400	<100	400	300	200	400	600
Total Phosphorus as P																									
Total Phosphorus as P	µg/L	50	160	270	270	140	100	130	<10	<10	<10	<10	120	170	<10	<10	70	20	150	<10	270	140	100	170	349
Ionic Balance																									
Total Anions	meq/L	NC	8.59	16.1	16.1	11.2	4.95	13	4.35	98.2	30.6	2.94	5.42	2.68	16.1	3.03	8.03	2.75	4	2.68	98.2	8.03	3.224	16.1	100.95
Total Cations	meq/L	NC	8.58	15.6	15.6	11.3	5.06	13	4.52	99.8	30.9	2.96	5.42	2.86	15.5	3.07	7.99	2.85	4.13	2.85	99.8	7.99	3.282	15.58	102.66
Ionic Balance	%	NC	0.07	1.84	1.84	0.48	1.13	0.05	1.91	0.78	0.51	-	0.06	-	1.89	0.7	0.24	-	1.6	0.05	1.91	0.74	0.172	1.84	1.967
Chlorophyll a & Pheophytin a																									
Chlorophyll a	mg/m³	5	<1	2	2	3	<1	<1	<1	<1	<1	<1	<1	2	<1	<1	12	<1	6	<1	12	2.5	2	6	14
Polychlorinated Biphenyls (PCB)																									
Total Polychlorinated biphenyls	µg/L	NC	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Polynuclear Aromatic Hydrocarbons																									
Naphthalene	µg/L	16	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Acenaphthylene	µg/L	NC	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Acenaphthene	µg/L	NC	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Fluorene	µg/L	NC	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Phenanthrene	µg/L	NC	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Anthracene	µg/L	NC	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Fluoranthene	µg/L	NC	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Pyrene	µg/L	NC	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Benz(a)anthracene	µg/L	NC	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Chrysene	µg/L	NC	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Benzo(b)fluoranthene	µg/L	NC	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Benzo(k)fluoranthene	µg/L	NC	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Benzo(a)pyrene	µg/L	NC	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1,2,3-cd)pyrene	µg/L	NC	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Dibenz(a,h)anthracene	µg/L	NC	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Benzo(g,h,i)perylene	µg/L	NC	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Total PAH	µg/L	3	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Total Petroleum Hydrocarbons																									
C6 - C9 Fraction	µg/L	NC	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
C10 - C14 Fraction	µg/L		<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
C15 - C28 Fraction	µg/L		<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
C29 - C36 Fraction	µg/L		<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
C10 - C36 Fraction (sum)	µg/L		<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50

Notes:
Where no Queensland Water Quality Guidelines criteria are available, ANZECC 2000 guidelines for 95% freshwater species protection have been used.

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Suttor Catchment																				
			wet	Dry	wet	dry	wet	wet	wet	wet	wet	dry	wet	wet	Dry	Wet	Dry						
			WQ19	WQ19	WQ20	WQ20	WQ21	WQ22	WQ23	WQ24	WQ25	WQ25	WQ26	WQ27	WQ27	WQ28	WQ28	Minimum	Maximum	Median	20th Percentile	80th Percentile	110th Percentile
Temperature	°C	NC	30.8	19	29.9	23	30.7	32.7	29.7	29.6	23.6	19.8	23.3	22.3	30.2	23	27.4	19	32.7	27.4	22.44	30.6	52.18
pH	pH Unit	6.5-7.5	5.33	7.4	6.8	6.3	7.7	8.06	7.27	7.51	6.8	6.82	6.4	6.3	6.6	6.3	7.94	5.33	8.06	6.8	6.3	7.662	13.972
Conductivity	mS/cm	0.18	0.473	0.442	0.2133	0.2133	0.29	0.1468	0.1343	0.265	0.19	0.485	0.118	0.092	0.1281	0.202	0.397	0.092	0.485	0.2133	0.12934	0.433	0.5926
Dissolved Oxygen	%	90-110	50	43	74	72	80	101	63	63	50	49	50	63	80	53	79	43	101	63	50	79.8	147.6
Turbidity	NTU	25	10	262	302	351	88.4	1.3	23.7	24.6	380	94.6	250	473	440	588	56.3	1.3	588	250	23.88	428	594.52
Non Marine - Estimated TDS Salinity																							
Total Dissolved Solids (est.)	mg/L	NC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Suspended Solids																							
Suspended Solids (SS)	mg/L	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Alkalinity																							
Hydroxide Alkalinity as CaCO3	mg/L	NC	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	mg/L	NC	<1	<1	<1	<1	<1	5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	mg/L	NC	3	75	55	170	46	38	40	40	173	166	92	42	67	71	67	3	173	67	40	106.8	211.8
Total Alkalinity as CaCO3	mg/L	NC	3	75	55	170	46	43	40	40	173	166	92	42	67	71	67	3	173	67	40.4	151.2	332
Dissolved Major Anions																							
Sulfate as $SO4^{2-}$	mg/L	NC	16	6	6	1	1	<1	2	3	15	2	1	2	4	2	4	1	16	2.5	1.6	6	17
Chloride																							
Chloride	µg/L	NC	122000	77000	23000	12000	27000	18000	19000	45000	42000	41000	11000	18000	12000	11000	12000	11000	122000	19000	12000	42600	133400
Dissolved Major Cations																							
Calcium	mg/L	NC	6	15	7	18	4	3	3	4	30	19	16	6	9	10	9	3	30	9	4	16.4	33.4
Magnesium	mg/L	NC	10	11	6	8	2	2	2	4	17	13	7	3	4	5	4	2	17	5	2.8	10.2	19
Sodium	mg/L	NC	60	42	26	48	31	23	21	37	48	50	9	12	22	15	22	9	60	26	19.8	48	73.2
Potassium	mg/L	NC	1	9	2	9	2	2	3	3	3	13	10	4	6	4	6	1	13	4	2	9	15
Total Metals																							
Arsenic	µg/L	24	<1	<1	<1	<1	<1	4	<1	<1	1	2	1	2	2	<1	2	<1	4	2	1.2	2	5
Cadmium	µg/L	370	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chromium	µg/L	NC	<1	2	3	<1	<1	<1	<1	<1	1	<1	<1	6	40	3	40	<1	40	3	2.2	33.2	41.6
Copper	µg/L	1.4	<1	4	2	2	<1	<1	<1	<1	<1	4	2	5	14	3	14	<1	14	4	2	8.6	16
Nickel	µg/L	11	2	4	4	<1	<1	<1	<1	<1	<1	<1	2	3	3	<1	3	<1	4	3	2.2	3.8	6
Lead	µg/L	3.4	<1	4	3	5	1	<1	<1	<1	<1	4	<1	8	22	5	22	<1	22	5	3.6	13.6	24.6
Zinc	µg/L	8	<5	<5	8	<5	<5	<5	<5	<5	<5	<5	<5	8	<5	<5	20	<5	20	8	8	15.2	28
Iron	µg/L	NC	160	2930	8980	160	1950	<50	730	590	170	470	1890	5020	1940	1780	1940	160	8980	1,835	350	2342	9143
Ammonia as N																							
Ammonia as N	µg/L	20	10	270	20	280	20	10	20	60	30	20	<10	50	60	30	60	<10	280	30	20	60	293
Nitrite as N																							
Nitrite as N	µg/L	3	<10	10	<10	<10	<10	<10	<10	<10	<10	<10	<10	10	<10	<10	<10	<10	10	10	10	10	20
Nitrate as N																							
Nitrate as N	µg/L	700	40	20	80	40	40	20	<10	<10	30	20	20	<10	100	<10	100	<10	100	40	20	80	120
NOX as N																							
Nitrite + Nitrate as N	µg/L	10	40	40	80	40	40	20	<10	<10	30	20	20	<10	100	<10	100	<10	100	40	20	80	120
Total Kjeldahl Nitrogen (TKN)																							
Total Kjeldahl Nitrogen as N	µg/L	NC	<10	900	<10	1100	300	<100	400	30	<10	900	800	600	1000	400	1000	<10	1100	800	400	1000	1400
Total Nitrogen as N (TKN + NOx)																							
Total Nitrogen as N	µg/L	250	<10	1000	<10	1200	300	<100	400	30	<10	1000	800	600	1100	400	1100	<10	1200	800	400	1100	1500
Total Phosphorus as P																							
Total Phosphorus as P	µg/L	30	<10	40	<10	100	<10	<10	<10	130	100	80	50	<10	150	<10	150	<10	150	100	62	142	197
Ionic Balance																							
Total Anions	meq/L	NC	3.82	3.79	1.88	3.78	1.7	1.38	1.37	2.14	4.95	4.52	2.18	1.4	1.76	1.77	1.76	1.37	4.95	1.88	1.64	3.796	6.338
Total Cations	meq/L	NC	3.77	3.72	2.07	3.92	1.79	1.4	1.35	2.17	5.06	4.52	2.03	1.21	1.89	1.61	1.89	1.21	5.06	2.03	1.568	3.8	6.43
Ionic Balance	%	NC	0.63	0.96	-	1.84	-	-	-	-	1.13	0.04	-	-	-	-	-	0.04	1.84	0.96	0.512	1.272	2.116
Chlorophyll a & Pheophytin a																							
Chlorophyll a	mg/m³	5	<1	<1	<1	5	<1	1	3	<1	<1	<1	4	6	48	1	48	<1	48	4.5	1.8	31.2	49
Polychlorinated Biphenyls (PCB)																							
Total Polychlorinated biphenyls	µg/L	NC	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Polynuclear Aromatic Hydrocarbons																							
Naphthalene	µg/L	16	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Acenaphthylene	µg/L	NC	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Acenaphthene	µg/L	NC	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Fluorene	µg/L	NC	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Phenanthrene	µg/L	NC	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Anthracene	µg/L	NC	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Fluoranthene	µg/L	NC	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Pyrene	µg/L	NC	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Benz(a)anthracene	µg/L	NC	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Chrysene	µg/L	NC	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Benzo(b)fluoranthene	µg/L	NC	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Benzo(k)fluoranthene	µg/L	NC	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Benzo(a)pyrene	µg/L	NC	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1,2,3-cd)pyrene	µg/L	NC	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Dibenz(a,h)anthracene	µg/L	NC	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Benzo(g,h,i)perylene	µg/L	NC	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Total PAH	µg/L	3	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Total Petroleum Hydrocarbons																							
C6 - C9 Fraction	µg/L	NC	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
C10 - C14 Fraction	µg/L		<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
C15 - C28 Fraction	µg/L		<100	190	<100	210	<100	<100	<100	<100	<100	200	<100	<100	100	<100	100	<100	200	190	100	202	310
C29 - C36 Fraction	µg/L		<50	60	<50	80	<50	<50	<50	<50	<50	100	<50	<50	50	<50	50	<50	100	60	50	84	150
C10 - C36 Fraction (sum)	µg/L		<50	260	<50	290	<50	<50	<50	<50	<50	300	<50	<50	150	<50	150	<50	300	260	150	292	450

Notes:
Where no Queensland Water Quality Guidelines criteria are available, ANZECC 2000 guidelines for 95% freshwater species protection have been used.

Water Quality Parameters	Units	Guideline Value (ANZECC and Queensland Water Quality Guidelines)	Belyando Catchment																															
			wet	wet	wet	wet	wet	wet	wet	Wet	wet	dry	wet	wet	dry	wet	wet	wet	wet	wet	wet	dry	wet	wet	wet	wet	wet	wet	wet						
			WQ29	WQ30	WQ31	WQ32	WQ33	WQ34	WQ35	WQ36	WQ37	WQ37	WQ38	WQ39	WQ39	WQ40	WQ41	WQ42	WQ43	WQ44	WQ45	WQ45	WQ46	WQ47	WQ48	WQ49	WQ50	WQ51	WQ52	Minimum	Maximum	Median	20th Percentile	80th Percentile	110th Percentile
Temperature	°C	NC	21	24.1	21	22.7	22.7	22	21.2	24.4	24.9	26.9	25	23.6	23.6	20.8	23.2	22.8	24	28.4	27.7	21	25.2	25	28.9	25.2	24.4	25.2	25.4	20.8	28.9	25	23.44	26	51.34
pH	pH Unit	6.5-7.5	6.9	6.8	6.4	6.9	6.6	6.6	6.6	6.8	6.7	7.68	6.7	6.8	7.27	6.8	6.8	6.7	6.8	6.7	5.9	6.31	6.2	6.3	6.8	6.4	6.6	7.2	6.2	5.9	7.68	6.7	6.306	6.8	13.88
Conductivity	mS/cm	0.18	0.21	0.125	0.189	0.0932	0.159	0.126	0.175	0.121	0.1688	0.524	0.524	0.36	0.325	0.334	0.215	0.214	0.36	0.247	0.162	0.349	0.228	0.152	0.212	0.1316	0.289	0.247	0.482	0.1316	0.524	0.247	0.19472	0.36	0.684
Dissolved oxygen (% saturation)	%	90-110	41	42	41	40	74	51	80	40	52	107	75	39	39	80	48	23	50	76	42	25	45	35	55	43	57	65	60	23	107	50	39	69	140
Turbidity	NTU	25	103	85	114	103	114	144	96	121	370	87	220	115	1159	75	83	66	300	110	25	3185	162	1.7	16	270	19	247	377	1.7	3185	115	49.6	328	3203.4
Non Marine - Estimated TDS Salinity																																			
Total Dissolved Solids (est.)	mg/L	NC	-	-	-	-	-	-	-	-	-	-	-	130	-	-	-	87	144	125	77	-	112	71	99	53	125	113	197	53	197	112.5	79	129	269.6
Suspended Solids																																			
Suspended Solids (SS)	mg/L	10	-	-	-	-	-	-	-	-	-	-	-	19	-	-	-	12	54	24	38	-	14	7	7	48	24	28	117	7	117	24	12.4	46	124.5
Alkalinity				-																															
Hydroxide Alkalinity as CaCO3	mg/L	NC	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	mg/L	NC	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	mg/L	NC	60	<1	80	50	103	82	103	33	50	218	28	84	124	115	56	63	90	92	42	104	69	40	37	15	92	84	77	15	218	77	41.2	96.8	253.2
Total Alkalinity as CaCO3	mg/L	NC	60	<1	80	50	103	82	103	33	50	218	28	84	124	115	56	63	90	92	42	104	69	40	37	15	92	84	77	15	218	77	41.2	96.8	284.8
Dissolved Major Anions																																			
Sulfate as SO4^	mg/L	NC	1	<1	2	2	2	2	1	2	1	<1	1	1	5	2	<1	2	2	1	<1	4	<1	<1	1	2	1	<1	3	<1	5	2	1	2.6	6
Chloride																																			
Chloride	µg/L	NC	8000	5000	6000	11000	25000	17000	23000	5000	6000	20000	11000	8000	15000	17000	10000	4000	11000	11000	8000	37000	11000	8000	21000	14000	11000	9000	39000	4000	39000	11000	8000	18200	46600
Dissolved Major Cations																																			
Calcium	mg/L	NC	11	10	12	7	17	12	18	6	10	39	4	19	27	22	11	14	20	16	7	9	14	6	5	2	16	15	13	2	39	14	6.6	19.4	43.8
Magnesium	mg/L	NC	5	4	6	3	7	7	9	2	3	13	3	5	6	9	5	4	5	7	3	5	6	3	5	2	7	6	10	2	13	5	3	7	16
Sodium	mg/L	NC	11	7	12	12	22	14	18	6	8	37	8	13	22	18	9	7	17	9	8	38	8	9	15	10	9	5	27	5	38	9	8	19.6	45.8
Potassium	mg/L	NC	6	4	8	6	6	8	6	7	6	18	6	7	12	8	9	6	6	10	9	31	10	8	8	5	10	12	10	5	31	9	6	10.8	37
Total Metals																																			
Arsenic	µg/L	24	3	2	2	1	<1	1	2	2	2	2	1	5	13	2	2	5	4	1	2	15	2	2	2	2	1	<1	2	<1	15	2	2	4.6	16
Cadmium	µg/L	370	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	0.15	0.12	0.18	0.31
Chromium (Total)	µg/L	NC	<1	<1	3	3	<1	2	<1	3	5	<1	5	1	9	<1	1	1	3	<1	<1	28	<1	<1	<1	3	<1	<1	6	<1	28	4	1	6.6	29
Copper	µg/L	1.4	1	1	4	4	2	3	<1	4	4	2	6	3	11	2	6	2	5	2	2	25	1	<1	2	6	2	2	5	<1	25		2	6	27
Nickel	µg/L	11	<1	<1	2	2	<1	3	<1	3	6	<1	5	3	21	<1	2	3	5	2	<1	64	3	<1	3	3	2	2	7	<1	64	3	2	6.2	66
Lead	µg/L	3.4	3	3	6	4	3	4	4	2	3	2	3	2	12	3	1	2	4	<1	<1	17	<1	<1	<1	3	<1	<1	3	<1	17	3	2	3.8	19
Zinc	µg/L	8	<5	<5	<5	7	<5	<5	<5	9	6	<5	8	7	34	<5	<5	<5	14	<5	<5	40	7	<5	<5	<5	<5	8	10	<5	40	8	7	22	46.8
Iron	µg/L	NC	840	500	2620	3970	6700	3240	1650	3490	5540	480	5580	2820	1560	1260	2380	2030	5650	1890	2620	5470	4500	830	13000	4320	1890	6300	6980	<50	13000	2,820	1758	5608	14174
Ammonia as N																																			
Ammonia as N	µg/L	20	40	20	40	40	10	60	20	10	<10	30	90	10	26	20	40	<10	<10	<10	30	850	<10	<10	<10	10	<10	<10	20	<10	850	28	18	50	860
Nitrite as N																																			
Nitrite as N	µg/L	3	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	10	<10	<10	<10	<10	<10	<10	<10	<10	10	10	10	10	20
Nitrate as N																																			
Nitrate as N	µg/L	700	40	<10	<10	120	10	10	<10	30	50	40	30	20	70	<10	30	20	130	20	20	<10	20	20	10	20	20	10	30	<10	130	20	20	38	146
NOX as N																																			
Nitrite + Nitrate as N	µg/L	10	40	<10	<10	120	10	10	<10	30	50	40	30	20	70	<10	30	20	130	20	20	20	20	20	10	20	20	10	30	<10	130	20	20	36	147
Total Kjeldahl Nitrogen (TKN)																																			
Total Kjeldahl Nitrogen as N	µg/L	NC	500	400	600	600	200	200	<100	500	100	1500	200	200	2200	<10	500	800	800	800	1,600	2800	800	1200	600	400	800	1100	400	<10	2800	800	400	1380	3000
Total Nitrogen as N (TKN + NOx)																																			
Total Nitrogen as N	µg/L	250	500	400	600	700	200	200	<100	500	200	1600	200	200	2200	<10	500	800	900	800	1,600	2800	800	1200	600	400	800	1100	400	<10	2800	800	400	1440	3000
Total Phosphorus as P																																			
Total Phosphorus as P	µg/L	30	<10	<10	<10	<10	<10	<10	<10	330	380	160	210	90	650	<10	140	20	<10	50	190	560	120	30	<10	20	50	70	170	<10	650	130	50	210	675
Ionic Balance																																			
Total Anions	meq/L	NC	1.46	1.44	1.82	1.35	2.8	2.16	2.73	0.84	1.2	4.93	0.89	1.93	3.02	2.83	1.4	1.42	2.15	2.18	1.06	3.22	1.69	1.02	1.35	0.72	2.18	1.92	2.68	0.72	4.93	1.92	1.144	2.74	5.924
Total Cations	meq/L	NC	1.56	1.26	1.77	1.29	2.61	1.98	2.56	0.9	1.24	5.11	0.93	2.09	3.1	2.82	1.57	1.45	2.27	2.03	1.14	3.3	1.82	1.13	1.52	0.79	2.03	1.75	2.86	0.79	5.11	1.82	1.2	2.836	6.2
Ionic Balance	%	NC	-	-	-	-	-	-	-	-	-	1.8	-	-	1.43	-	-	-	-	-	-	1.32	-	-	-	-	-	-	-	-	1.8	1.43	1.364	1.652	3.142
Chlorophyll a & Pheophytin a																																			
Chlorophyll a	mg/m³	5	<1	<1	2	1	<1	12	<1	1	3	<1	<1	3	47	8	3	2	1	4	10	<1	4	<1	<1	<1	4	4	2	<1	47	4	2.4	6.4	49
Polychlorinated Biphenyls (PCB)																																			
Total Polychlorinated biphenyls	µg/L	NC	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Polynuclear Aromatic Hydrocarbons																																			
Naphthalene	µg/L	16	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Acenaphthylene	µg/L	NC	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Acenaphthene	µg/L	NC	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Fluorene	µg/L	NC	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Phenanthrene	µg/L	NC	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Anthracene	µg/L	NC	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Fluoranthene	µg/L	NC	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Pyrene	µg/L	NC	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Benz(a)anthracene	µg/L	NC	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Chrysene	µg/L	NC	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Benzo(b)fluoranthene	µg/L	NC	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Benzo(k)fluoranthene	µg/L	NC	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Benzo(a)pyrene	µg/L	NC	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	µg/L	NC	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Dibenz(a.h)anthracene	µg/L	NC	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Benzo(g.h.i)perylene	µg/L	NC	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Total PAH	µg/L	3	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Total Petroleum Hydrocarbons																																			
C6 - C9 Fraction	µg/L		<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
C10 - C14 Fraction	µg/L		<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
C15 - C28 Fraction	µg/L	NC	<100	<100	<100	<100	100	<100	100	100	110	240	140	<100	<100	<100	210	<100	<100	<100	390	490	<100	130	<100	<100	<100	<100	<100	110	490	210	132	360	612
C29 - C36 Fraction	µg/L		50	<50	<50	<50	<50	<50	50	<50	110	<50	<50	<50	<50	<50	70	<50	<50	<50	90	200	<50	<50	<50	<50	<50	<50	<50	<50	200	100	82	146	276
C10 - C36 Fraction (sum)	µg/L		50	<50	<50	<50	100	<50	150	100	110	350	140	<50	<50	<50	280	<50	<50	<50	480	690	<50	130	<50	<50	<50	<50	<50	110	690	591.43	132	454	812

Notes:
Where no Queensland Water Quality Guidelines criteria are available, ANZECC 2000 guidelines for 95% freshwater species protection have been used.