9-2015

Groundwater chemistry of the Weaber Plain (Goomig Farmlands): baseline results 2010–13

Adam Lillicrap

Richard J. George Dr

Arjen Ryder

D L. Bennett

Recommended Citation

Lillicrap, A, George, R J, Ryder, A, and Bennett, D L. (2015), *Groundwater chemistry of the Weaber Plain (Goomig Farmlands): baseline results 2010–13*. Department of Primary Industries and Regional Development, Western Australia, Perth. Report 392.

Department of
Agriculture and Food
GOVERNMENT OF
WESTERN AUSTRALIA

Groundwater chemistry of the Weaber Plain (Goomig Farmlands): baseline results 2010–13

Resource management technical report 392

Supporting your success

Groundwater chemistry of the Weaber Plain (Goomig Farmlands): baseline results 2010–13

Resource management technical report 392

Adam M Lillicrap, Richard George, Arjen Ryder and Don Bennett

September 2015

ISSN 1039-7205

Cover: Irrigation supply channel, Ord River Irrigation Area (Photo: RJ George)

Recommended reference

Lillicrap, AM, George, RJ, Ryder, A & Bennett, D 2015, 'Groundwater chemistry of the Weaber Plain (Goomig Farmlands): baseline results 2010–13', *Resource management technical report 392*, Department of Agriculture and Food, Western Australia, Perth.

Disclaimer

3 Baron-Hay Court, South Perth WA 6151
Telephone: (08) 9368 3333
Email: enquiries@agric.wa.gov.au
Website: agric.wa.gov.au

Contents

Acknowledgements

The Weaber Plain hydrological investigations underpinned the state's Ord Stage 2 Irrigation Expansion Project. The resulting irrigated area is now known as the Goomig Farmlands. The project was initiated in April 2010 and included about 450 days of field work and over 2000 days of planning, analysis and consultation. As a result, many people have supported this project.

We would like to thank Peter Stubbs (Department of Regional Development and Lands [DRDL], Kununurra), Brett Chivers (Benchmark Projects), Mark Pasalich (LandCorp) and Deb Pearce (DRDL). We also acknowledge support from Duncan Palmer and Chris Gunby (Department of Water).

Site access was provided by Northern Development Company (NDC), surveying by Survey North, and drilling was undertaken by Direct Drilling Kununurra.

Technical review was provided by a reference group in the first stage of the project and a specifically appointed Independent Review Group was commissioned as part of the *Environmental Protection and Biodiversity Conservation Act 1999* (Commonwealth) approvals process. The IRG undertook formal peer review of the science, advised the Australian Government Minister for the Environment and assisted the state's Ord Expansion Project Team. The IRG members were Dr Roy Green (Chair, Perth), Dr Ray Evans (Canberra), Dr Mark Silburn (Department of Natural Resources and Mines, Toowoomba) and Helen Larsen (Northern Territory Museum, Darwin), whose roles and advice we acknowledge.

We acknowledge Jenny McGuire, Hanna May and the staff at the Chemistry Centre for all their help, especially for promptly delivering results of water analysis.

We thank staff from the Department of Agriculture and Food, Western Australia (DAFWA) for help with logistics, analysis and review: Noel Wilson, Lorraine Hartle, Terry Hill, Anella Conrades, Peter Gardiner, Mark Pridham, Terry Ralston, Naomi Franich, Joanne Francis and Greg Henderson.

We acknowledge Paul Raper, Grant Stainer and IRG member, Ray Evans, for reviewing the final report and we thank Angela Rogerson and Julia Berney for their editorial services.

Dedication

We dedicate this report to our colleague Arjen Ryder who, with his wife Yvonne, was killed when Malaysia Airlines Flight MH17 was shot down over the Ukraine in July 2014. Arjen undertook two years of monitoring upon which this report is based and also participated in the 2011 drilling program. He worked with enthusiasm and enjoyed his time in the East Kimberley region, making friends of all he met. We thank him and miss him.

Summary

The Ord River Irrigation Area (ORIA) is located in the north-east of the Kimberley region of Western Australia, near the town of Kununurra. The irrigation area was established in 1963 and over time developed to the current extent of 14 000 hectares (ha). The Weaber Plain (Goomig Farmlands) area is located north-north-east of the existing irrigation area, 30km from Kununurra, and has been identified as being suitable for irrigated agriculture for many decades. However, it was not until 2009, with state government support, that the 7400ha project commenced, with construction starting in 2010.

State and Australian government environmental approvals required the proponent to install a groundwater monitoring network and develop a groundwater management plan. The groundwater monitoring network on the Weaber and Knox Creek plains consists of 20 high-intensity (data loggers and intensive sampling) and 30 low-intensity bores (lower level monitoring status). Of the 50 bores, two were dry during the baseline, pre-development, monitoring period. Another eight bores were set up as reference bores to act as long-term controls. Four of the reference bores are high-intensity and four are low-intensity.

The environmental approvals required seasonal monitoring of groundwater to establish baseline groundwater chemistry conditions. The monitoring bores were sampled for up to three years and showed a large variation in water type and water quality across the Weaber and Knox Creek plains. The highest salinities — over 3000mg/L total dissolved solids (TDS) (450mS/m) — were generally located on the northern and southern margins of the study area in association with Aquitaine soils and low permeability basement geology.

The groundwater was mainly alkaline and reducing. Sodium was the dominant cation and bicarbonate was the dominant anion for low salinity (<1400mg/L TDS or 200mS/m) groundwater. Chloride and sulfate were the dominant anions for higher salinity groundwater. Groundwater in the northern and southern margins often contained relatively high concentrations of metals, such as zinc, copper, lead, molybdenum and vanadium. Statistical analysis and geochemical modelling showed that geology and soils played important roles in determining the groundwater chemistry. The high concentrations of metals and metalloids are natural background levels likely caused by mineralised ore bodies and vadose zone processes. The Keep River also had naturally high background levels of aluminium, zinc, copper, lead and boron.

Comparing groundwater beneath the Weaber Plain with groundwater beneath the existing developed irrigation areas showed potentially hazardous metals and metalloids are unlikely to change with the development of agriculture. Only nutrients and pesticides are likely to slowly increase in groundwater in the irrigated areas of the Weaber Plain, based on the results from the ORIA. Using aquifer characteristics and available modelling, it would take 100–300 years for chemical hazards to reach the Keep River. Therefore, we conclude groundwater from beneath the Goomig Farmlands poses a relatively low and long-term risk to the receiving environment.

Strategen (2012a) developed a groundwater management plan which specifies options to manage watertable levels beneath the Weaber Plain in the future. If required, groundwater would be pumped into the M2 supply channel for reuse during

the dry season and at higher flows during the wet season, it would be pumped to the Keep River. Baseline data was used to derive the quality of the M2 supply channel for different scenarios using a range of proportions of groundwater to M2 supply water to ensure the final water mixture remained suitable for irrigation. Modelling showed that all of the water quality parameters were below the ANZECC and ARMCANZ (2000) long-term trigger values for irrigation. The modelled salinity of the supply channel water would increase from 26mS/m to around 30–35mS/m, which is suitable even for salt-sensitive crops.

The groundwater beneath the Weaber Plain is unsuitable for direct irrigation on to black soils of the area. However, based on the results of the mixing model and other studies, groundwater can be diluted with channel water and used for irrigation. The Aquitaine soils found on the northern and southern margins of the study area have high natural salt loads and irrigation with unmixed channel water is recommended until mixing waters is found suitable by further analysis.

Baseline groundwater results reported here are also used to recommend future changes to the approved groundwater monitoring regime that align with the *Environmental Protection and Biodiversity Conservation Act 1999* (Commonwealth) consent conditions and the groundwater management plan.

1 Introduction

The Ord River Irrigation Area (ORIA) is located in the north-east of the Kimberley region of Western Australia, near the town of Kununurra (Figure 1.1). The irrigation area was established in 1963 with the release of five farms and has developed to the current extent of 14 000ha.

The Weaber Plain (Goomig Farmlands) area is located north-north-east of the existing irrigation area, 30km from Kununurra. The area had been identified as suitable for irrigated agriculture for many decades. After initial environmental assessments, approval was given in 2002 by the Western Australian Government to develop the ORIA Stage 2, which included the Weaber Plain, subject to a number of conditions. After a hiatus, the Ord East Kimberley Expansion Project was recommenced in 2009 with state ($315m for development of irrigation on the Weaber Plain) and Australian Government support ($195m for community infrastructure).

The Weaber Plain is the first of several areas proposed to be developed for irrigated agriculture. The annual demand for irrigation water supply from Lake Argyle has been calculated at 80–120 gigalitres (GL) for the Weaber Plain and up to 865GL has been allocated for the entire Ord irrigation area (including 225GL used on the existing ORIA). There could potentially be 50 000ha of irrigated agriculture in the area.

Part of the state government approval conditions for ORIA Stage 2 required further investigations and development of specific management plans, including a groundwater management plan. Investigations to underpin the groundwater management plan (GMP) included better delineation of groundwater systems, installation of monitoring bores and development of a groundwater model for the area. DAFWA, with partners Kellogg Brown and Root Pty Ltd (KBR), started work on the GMP in 2009 (KBR 2010). At the same time, investigations also started to underpin other plans to manage the impact of the proposed development on the Keep River (GHD 2010, Bennett and George 2011, 2014).

The management plans were prepared in two stages. The first stage consisted of a suite of groundwater model simulations using updated groundwater level, regolith and climate data based on Lawrie et al. (2010) and CSIRO (2009). During this work, which was completed in February 2010 by DAFWA and KBR, it was determined that the existing groundwater data was inadequate for substantiating modelled options to manage shallow watertables and salinity (KBR 2010). Some of the data gaps directly related to the proposal to manage groundwater levels by pumping from the palaeochannel beneath the Weaber Plain. Specifically, there was a lack of groundwater chemistry data to determine the suitability, in terms of water quality, of mixing groundwater pumped from the palaeochannel with the irrigation supply.

The second stage of investigations consisted of field programs that commenced in 2010 and which updated the groundwater modelling by KBR (2011). The investigations also had to adapt to the timing of the approval processes, requiring a fast-tracked process of analysis and publication. As a result, the 2010 preliminary groundwater-related investigations were first published in 2011 (George et al. 2011, Lillicrap et al. 2011).

In addition to the state approvals process, in June 2010 the Australian Government determined that the project had the potential to significantly impact on Matters of National Environmental Significance and therefore the project required approval under the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act). This approval required an additional environmental impact statement and supporting studies. The Weaber Plain proposal was approved by the Australian Government in 2011, subject to additional conditions.

These EPBC conditions were incorporated into a revised groundwater management plan (Strategen 2012a) and a stormwater and groundwater discharge management plan (Strategen 2012b). The EPBC conditions required baseline data on the condition of groundwater and surface water systems, delineation of environmental triggers, assessment tools and specified management actions.

To meet EPBC approval conditions, an additional 23 bores at 16 sites were installed between July and August 2011. The resultant groundwater monitoring network consisted of the bores drilled in 2010 and 2011, as well as 16 existing groundwater bores. Bores were monitored over two to three years to establish baseline conditions and the chemistry results are published in this report.

Based on the experience from ORIA Stage 1, a rise in watertables caused by irrigated agriculture on the Weaber Plain could be a risk to the area's future agricultural development (Lillicrap et al. 2011). One of the proposed options to manage the risk of shallow watertables is pumping and reusing the groundwater. The GMP (Strategen 2012a), supported by groundwater modelling (KBR 2011), proposed pumping groundwater into the Keep River during the wet season and into the main M2 supply channel during the dry season. The option was tested by Lillicrap et al. (2011) based on data obtained mostly in 2010. This report updates the initial modelling of Lillicrap et al. (2011) by using the completed baseline analysis and additional bores drilled in 2011. Results for groundwater reuse and disposal to the M2 supply channel are compared to ANZECC and ARMCANZ (2000) irrigation water quality guidelines.

In summary, this report presents the results and analysis of the groundwater monitoring (2010–13) to provide baseline groundwater chemistry for future reference. We have re-analysed the efficacy of the proposed management option for groundwater reuse and disposal to the M2 supply channel and reviewed the requirement for ongoing high-intensity sampling of some bores and analytes. Based on the results of this baseline analysis, we also suggest changes, which remain within the scope and intent of the approved conditions, to the proposed future groundwater monitoring regime.

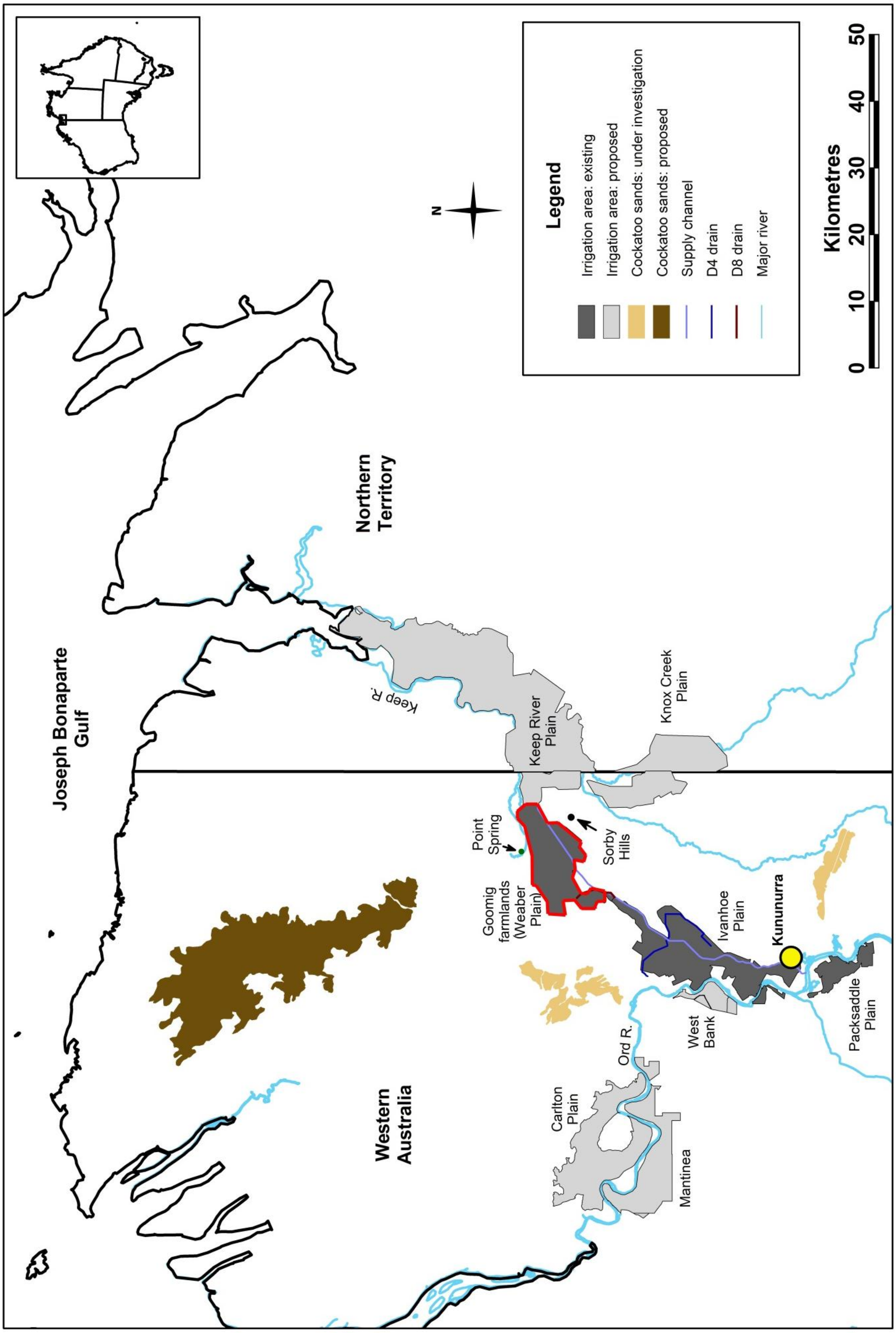

Figure 1.1 Location of the study area

2 Methodology

2.1 Groundwater chemistry

To meet the EPBC conditions, the groundwater monitoring network of 20 high-intensity bores (instrumented with loggers) and 30 low-intensity bores (non-instrumented) was set up across the proposed farmlands and buffer areas. Another eight bores were set up as reference bores to act as long-term controls (Figure 2.1 and Appendix A). Four of the reference bores are high-intensity monitoring sites and four are low-intensity. The rationale for the design of the monitoring network is outlined in Lillicrap et al. (2011).

In addition to the new bores, existing bores (drilled between 1964 and 1997 on the Weaber and Knox Creek plains) were assessed and used where possible. The existing bores were typically outside the proposed farmland. Some bores that were likely to be affected by infrastructure in strategic sites were redrilled as near as practical to the existing site (these sites have names with the suffix R) and used as either high- or low-intensity bores to capitalise on the longer-term groundwater level and salinity data. While many of the pre-2010 bores will be lost to during development for farmland, some may be retained and used as farm monitoring bores.

All bores were sampled twice a year — at the end of the wet and dry seasons — over at least two years (August 2011, November 2011, May 2012, October 2012, May–June 2013 and October 2013). Bores drilled in 2010 were sampled over a correspondingly longer period. The monitoring is longer than the 18-month baseline period specified in the EPBC conditions. Two of the shallow bores at low-intensity sites 10WP43S and 11WP52S remained dry throughout the baseline period.

The total depth drilled as well as the depth and length of screens and the aquifer screened for each bore, where possible were determined from drill logs (George et al. 2011, George et al. in prep., Humphreys et al. 1995, Laws 1983, Nixon 1997a, Nixon 1997b, Nixon 1997c, Nixon 1997d). The bedrock geology for each bore was determined by intersecting the bore data with regional hydrogeology (O'Boy et al. 2001) in a geographic information system (Appendix A).

2.1.1 Sample collection

All bores were developed by pumping until the casing was free of sediment and pumping rates could be estimated. The majority of bores were sampled with a low-volume electric pump (Proactive Environmental Products Hurricane 12v), and where pumping was not possible because of low hydraulic conductivity, a hand bailer was used. To ensure that aquifer water was sampled rather than stagnant water in the casing, samples were taken from just above the screen in pumped bores when the measured water quality parameters — electrical conductivity (EC), pH, and/or oxidation-reduction potential (ORP) — had stabilised. For wells sampled by bailer, three casing volumes were removed before sampling to ensure aquifer water was sampled. However, this was not always achieved because of the slow recovery rate of water within bores in areas with low hydraulic conductivities.

Water samples for metal analysis were filtered, acidified and stored in acid-washed containers. If there was insufficient time to filter samples for metal analysis, the samples were stored in acid-washed 125mL plastic containers that were completely filled to exclude air and then kept cool. Samples for nutrient and general chemistry analysis were stored in acid-washed 500mL plastic bottles, completely filled to exclude air and then kept cool. Water samples for atrazine were collected in acid-washed 50mL opaque glass bottles and then kept cool. All water samples collected in the field were refrigerated or frozen and sent to the laboratory within a week of collection.

EC (WTW TetraCon 325), temperature, pH (WTW Sentix 20), ORP (WTW ORP 900) and dissolved oxygen (WTW CellOx 325) were measured in the field. Total alkalinity (Hanna HI 3811) and total acidity (Hach AC-6) were measured either in the field or within 12 hours of collection.

2.1.2 Analysis and reporting of samples

All groundwater samples sent to the ChemCentre WA were analysed for:

- major ions (calcium, magnesium, sodium, potassium, bicarbonate/ carbonate, sulfate and chloride)
- minor ions (silicon, fluoride, bromide, boron, dissolved organic carbon)
- metals and metalloids (aluminium, antimony, arsenic, barium, beryllium, bismuth, cadmium, chromium, cobalt, copper, gallium, iron, lanthanum, lead, lithium, manganese, mercury, molybdenum, nickel, selenium, silver, thallium, tin, titanium, uranium, vanadium, zinc)
- nutrients (total nitrogen, oxidised nitrogen or nitrate and nitrite, ammonia, total phosphorus, soluble reactive phosphorus)
- general chemistry (acidity, alkalinity, EC, hardness, pH).

This list of analytes was specified in the EPBC Condition 12B (Appendix B) based on prior analysis (Lillicrap et al. 2011) and as set out in the groundwater management plan (Strategen 2012a).

Atrazine was the only farm chemical found in the chemical analysis of groundwater in the ORIA Stage 1 area (Smith et al. 2007) and therefore baseline analysis of farm chemicals for the Weaber Plain was restricted to atrazine.

Summary statistical analysis was performed on groundwater chemistry and field data as a whole and for individual bores using Data Desk 6.1 (Data Description) and Microsoft Excel. Concentrations in the range parts per million are reported as milligrams per litre (mg/L) and concentrations in the range of parts per billion are reported as micrograms per litre (µg/L). Any chemistry data that was below the laboratory limit of reporting (LOR) was assigned the value of half the LOR, which is consistent with ANZECC and ARMCANZ (2000) guidelines.

Maps showing the spatial distribution in mean concentrations for analytes that had samples greater than 40% above the LOR were created. The calculated means for the species of interest at each bore were interpolated in ArcGIS 10 to create grids using the inverse distance weighting method. The grids were confined to the bore network using a mask.

The temporal changes in TDS and groundwater levels are discussed in George et al. (in press).

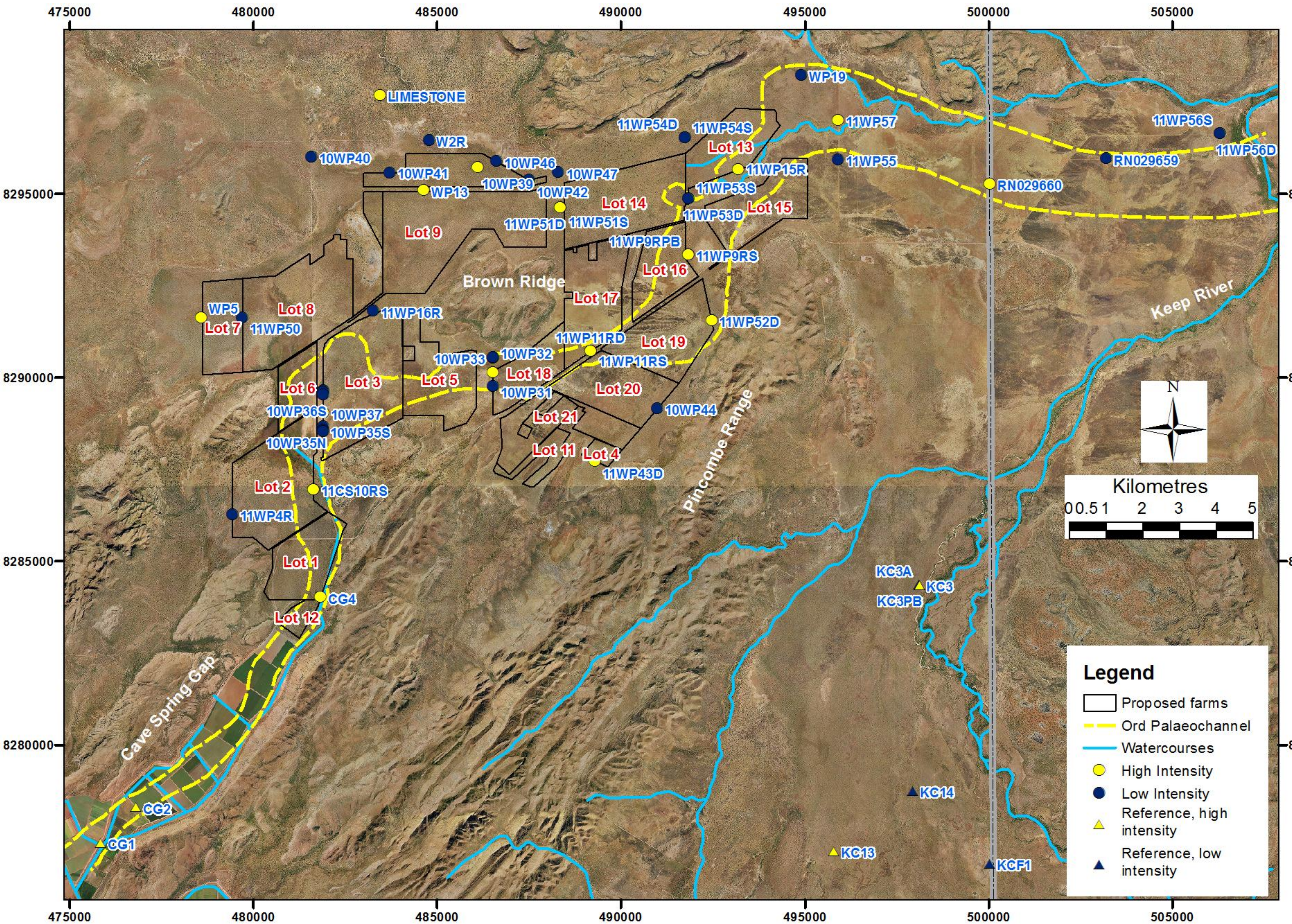

Figure 2.1 Location of monitoring bores on the Weaber and Knox Creek plains

2.2 Suitability of groundwater as a resource for agriculture

2.2.1 Suitability of groundwater for direct irrigation

The ANZECC and ARMCANZ (2000) irrigation guidelines were used to assess the suitability of groundwater for direct irrigation for all parameters except salinity and sodicity (Chapter 4.2 of this report). For species or parameters that have tolerance classes or that exceeded the ANZECC and ARMCANZ (2000) irrigation guideline long-term trigger values (LTV), distribution maps were created based on the mean concentration grids to show areas of different tolerance or exceeded guideline values.

For salinity and sodicity, the USDA (1954) classification system was used because the ANZECC and ARMCANZ (2000) irrigation guidelines require specific site details, such as soil type, crop type and management practices, which are not all currently available. Following the methodology of Taylor (1996), the USDA salinity classes used in this report were modified, based on Hart (1974).

The USDA (1954) defined the C2 category as medium salinity hazard, with electrical conductivities, as modified by Taylor (1996), between 28 and 800mS/m. We used the C2 category as the test for groundwater suitability based on its use by Ali et al. (2002) in the nearby established ORIA.

2.2.2 Mixing of groundwater with the M2 supply channel

The preferred option in the groundwater management plan to manage shallow watertables and excess soil salinity is to pump groundwater from the Ord palaeochannel under the Weaber Plain and discharge the water to either the main M2 supply channel or to the Keep River (Figure 2.2). To establish a representative composition of pumped groundwater to be discharged into the supply channel, the grids developed for each analyte (Chapter 2.1.2), specified in the ANZECC and ARMCANZ (2000) irrigation guidelines, were used. The concentration of these species at the dewatering bore sites proposed (Figure 2.2) in the groundwater management plan (KBR 2011, Strategen 2012a) was estimated from the interpolated grids. It was assumed that each bore was pumped at the same rate. The final mixed groundwater concentration for each species of interest was then estimated and used in subsequent runs of the mixing model outlined below.

The mixing model assumes that all species modelled behave conservatively and that aquifer conditions, such as redox state, remained similar to current levels. However, there are uncertainties:

- pumping groundwater into surface water could result in changes of redox conditions and chemical reactions may alter the composition of pumped groundwater
- it is possible that species, such as manganese, would precipitate and other metal species could be sorped or co-precipitated
- the conservative approach is likely to overestimate concentrations
- recharge from irrigation water could change the redox state of aquifers and result in chemical reactions that affect the chemistry of the aquifers

- there are dissolved salts stored in the regolith profile, based on downhole electromagnetic surveys (George et al. in press) and rising watertables could cause dissolution of these species, which would also alter the aquifer chemistry.

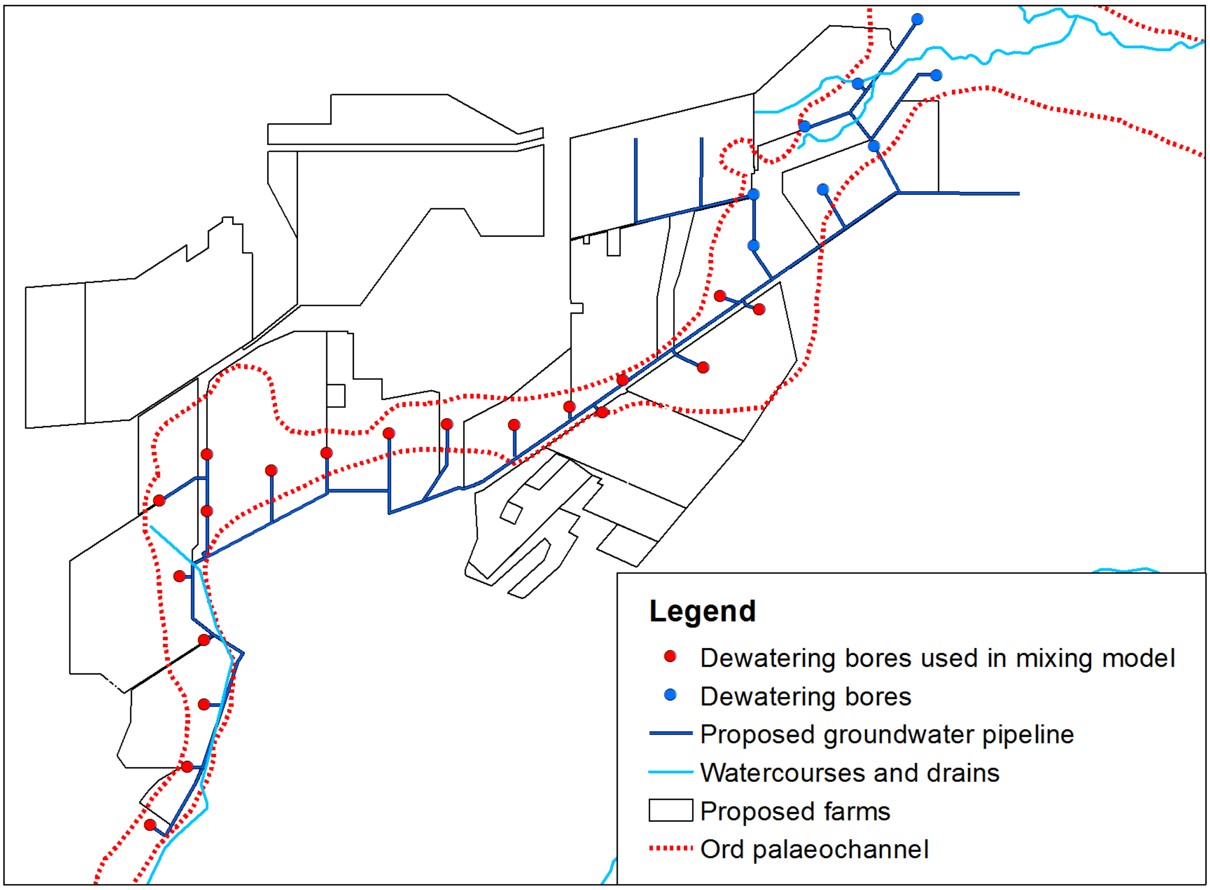

Figure 2.2 Location of Ord palaeochannel and groundwater dewatering bores used in the mixing model

Due to these uncertainties, the mixing model was limited to 20 years from the start of irrigation, rather than the 50 years used in the groundwater modelling (KBR 2011). Over this period, the groundwater model (KBR 2011) forecast that most of the south-west and central part of the model domain (i.e. about 80% of farmland) could have shallow watertables and may require management.

In the water quality model used in this report, two representative groundwater pumping scenarios from KBR (2011) were used: the expected or forecast condition, and the worst case or high groundwater pumping condition. Two supply channel flow conditions — average flow and peak flow — were also modelled, giving four modelling scenarios (Table 2.1). In Scenario A, groundwater is pumped at the forecast flow of 4.4GL over 200 days from the palaeochannel each year during the tropical dry season and discharged into the M2 supply channel flowing at average flow (540 megalitres per day, ML/d). In Scenario B, groundwater is pumped at the forecast flow and discharged into the supply channel flowing at peak flow (769ML/d). In Scenario C, groundwater is pumped at the highest flow of 6.15GL over 200 days from the palaeochannel each year during the tropical dry season and discharged into the supply channel flowing at average flow. In Scenario D, groundwater is pumped at the highest flow and discharged into the supply channel flowing at peak flow.

The future water quality of the M2 supply channel was assumed to be similar to the quality of the M1 supply channel (Lillicrap et al. 2011). The volumetric contribution of M2 water was derived by subtracting the volume of pumped groundwater discharge from the total irrigation supply flow required. The resultant water quality from mixing groundwater into the supply channel was estimated from mixing total volumes and total loads from different water sources as per Lillicrap et al. (2011). The EC was estimated from the TDS of the final water quality using a relationship developed from chemical sampling. The suitability for irrigation was assessed as in Chapter 2.2.1.

Table 2.1 The mixing scenarios used in the water quality model

Scenario	Description
A) Forecast groundwater flow, average channel flow	Groundwater pumped at 22ML/d, M2 channel flow at 540ML/d
B) Forecast groundwater flow, peak channel flow	Groundwater pumped at 22ML/d, M2 channel flow at 769ML/d
C) High groundwater flow, average channel flow	Groundwater pumped at 30.7ML/d, M2 channel flow at 540ML/d
D) High groundwater flow, peak channel flow	Groundwater pumped at 30.7ML/d, M2 channel flow at 540ML/d

3 Results

3.1 Groundwater chemistry

Summary statistics from baseline groundwater chemistry for all bores are shown in Table 3.1. Figures 3.1 to 3.7 show the average concentration of species that had greater than 40% of the samples above the LOR. Appendix C contains the mean concentration of species for each bore and Appendix D contains the summary statistics for species and bores. There was no statistical difference in water quality between the reference and baseline monitoring bores.

Groundwater salinity in the Weaber Plain ranges from 60 to 22 400mg/L TDS, with a mean TDS around 3500mg/L (Table 3.1, Figure 3.1 and Appendices C and D). The highest salinities occurred in the northern (Lots 13, 14, 7 and 8) and southern (Lot 20) margins of the study area.

The groundwater also had a highly variable chemical composition and resultant water types (Figure 3.8 and Appendix A). All bores showed enrichment (higher concentrations than expected) relative to seawater in at least one of the major ions. Sodium was the dominant cation in most of the bores and showed enrichment relative to seawater for bores with chloride concentrations less than 2000mg/L. In bores with chloride concentrations above 2000mg/L, the sodium–chloride ratio was similar to seawater (Figure G1). The sodium concentrations ranged from 5 to 5000mg/L, with a mean of 790mg/L (Table 3.1) and the highest concentrations occurring around the northern and southern margins of the study area.

Calcium was the dominant cation for bores W2R, Limestone, 10WP47, WP13, and 10WP39. Calcium showed enrichment relative to seawater in most bores, and calcium concentrations ranged from about 2 to 1200mg/L, with a mean of 150mg/L (Table 3.1, Figure 3.2 and Appendix A).

Magnesium was the dominant cation for bores KC3, 10WP31, 11WP43D and WP5. Magnesium in most bores was also enriched relative to seawater and had concentrations ranging from 1 to 2200mg/L, with a mean of 170mg/L (Table 3.1, Figure 3.2 and Appendix A).

The dominant anion for groundwater with a TDS less than 1400mg/L was bicarbonate. At higher salinities, the dominant anions were chloride and sulfate. Bicarbonate concentrations ranged from 8 to 8000mg/L, with a mean of 760mg/L. Chloride concentration ranged from 11 to 10 600mg/L, with a mean of 1170mg/L (Table 3.1, Figure 3.1 and Appendix A). In many instances, sulfate was enriched relative to seawater and concentration ranged from 0.5 to 6000mg/L, with a mean of 740mg/L (Table 3.1, Figure 3.2 and Appendix A).

Silicon concentration ranged from 1 to 48mg/L, with a mean around 30mg/L and bromide concentations ranged from 50 to 30 000µg/L, with a mean of 5700µg/L (Table 3.1). The distribution of bromide was similar to chloride (Figures 3.1 and 3.3). Fluoride concentrations ranged from 60 to 1800µg/L, with a mean of 600µg/L (Table 3.1) and the highest concentrations were mainly found in bores located on or near Antrim Volcanics (Figure 3.3 and Appendices A and C). Boron concentrations were 30–2500µg/L, with a mean of 370µg/L (Table 3.1).

Iron and manganese had the highest concentrations of the minor metals and metalloids, at 2100µg/L (bore 11WP50) and 7700µg/L (bore 10WP44), respectively (Appendix C). The mean concentration of iron was around 120µg/L and the mean concentration of manganese was around 400µg/L (Table 3.1). Lead and zinc had maximum concentrations around 100µg/L (bore 10WP37) and 200µg/L (bore 11WP54S), respectively, and the mean values were 2µg/L for lead and 20µg/L for zinc (Appendix C and Table 3.1). There are lead–zinc deposits in the study area.

Several bores (10WP44, 11WP9RPB, 11WP9RS, 11WP11, 11WP51, 11WP55) had extremely high concentrations (up to 50 000µg/L) of phosphorus (Appendix C). Upon further investigation, it was found that these bores are at sites with low permeability clays where development chemicals, such as Wellclean (AMC), that contain phosphate compounds had been used during drilling and bore construction. At these sites, development chemicals had contaminated the water samples and the chemicals were not removed by subsequent well pumping. Phosphorus data at these bores was excluded from further analysis.

The mean concentration of total phosphorus for non-contaminated bores was 90µg/L; the mean concentration of soluble reactive phophorus was 60µg/L; the mean concentration of total nitrogen was 600µg/L and the highest concentration of total nitrogen was around 7100µg/L (bore Limestone). Nitrite was below detection in most bores and the mean nitrate concentration was around 110µg/L. Nitrogen as ammonia was detectable in half the samples collected and had a mean concentration of 180µg/L (Table 3.1). Atrazine was not detected in any of the bores, including reference bores, on the Weaber and Knox Creek plains.

The summary statistics of field measurements for all bores is shown in Table 3.2 and for individual bores in Appendix D. The groundwater pH ranged from moderately acidic (pH around 5) to alkaline (greater than pH 8.0), with most being neutral to alkaline. Groundwater had a mean alkalinity around 530mg/L calcium carbonate ($CaCO_3$) and mean acidity around 100mg/L $CaCO_3$. For all bores, the alkalinity exceeded the acidity and therefore they are net alkaline. Groundwater beneath the Weaber Plain generally had reducing conditions, with a mean ORP around 1 milliVolt (mV). The reducing conditions of groundwater was also reflected in the low dissolved oxygen (DO) levels of groundwater, with an average concentration of 1.5mg/L.

There were slight differences between field and laboratory measured minimum and maximum EC; however, the mean and median values were similar (Tables 3.1 and 3.6). There were greater differences between field and laboratory measured pH, with field pH generally lower than the laboratory pH: the minimum field pH was 4.9 whereas the minimum laboratory pH was 5.5; the mean and median field pH was 7.2 whereas the mean and median laboratory pH was 7.5; the maximum field pH was 8.2 whereas the maximum laboratory pH was 8.8. These differences were also reflected in acidity, with mean field acidity (110mg/L $CaCO_3$) being much higher than the mean laboratory acidity (17mg/L $CaCO_3$). However, the mean field alkalinity (530mg/L $CaCO_3$) varied by less than 10% from the mean laboratory alkalinity (486mg/L $CaCO_3$) (Tables 3.1 and 3.6).

Table 3.1 Summary statistics for laboratory analysis of groundwater from all bores

Description	Unit	Number of samples	Per cent above LOR (%)	Median	Mean	Standard deviation	Min.	Max.	20th percentile	80th percentile
Acidity	$CaCO_3$- mg/L	335	95.5	13.0	16.3	12.7	3.0	96.0	6.0	23.2
Alkalinity	$CaCO_3$ mg/L	366	99.7	410	486	357	7.0	2 020	244	630
Aluminium	µg/L	366	75.7	17.0	22.8	25.9	5.0	240	10.2	25.0
Antimony	µg/L	366	27.6	0.2	0.3	0.4	0.1	2.9	0.1	0.4
Arsenic	µg/L	366	57.1	2.0	4.4	6.6	1.0	66.0	1.0	7.0
Atrazine	µg/L	213	0							
Barium	µg/L	366	100	55.0	71.9	60.6	8.0	370	31.0	95.0
Beryllium	µg/L	366	1.1	0.2	0.6	0.8	0.1	1.8	0.2	0.8
Bicarbonate	mg/L	366	99.7	482	760	1089	8.0	7 900	230.0	799
Bismuth	µg/L	366	0							
Boron	µg/L	366	98.1	230	372	396	30.0	2 500	90.0	600
Bromine	µg/L	259	98.5	700	3427	5699	50.0	30 000	250	4040
Cadmium	µg/L	366	6.3	0.2	0.4	0.5	0.1	2.4	0.1	0.4
Calcium	mg/L	366	100	58.6	155	237	1.6	1 210	26.1	195
Carbonate	mg/L	366	1.1	21.0	25	13.3	14.0	44.0	16.4	32.0
Chloride	mg/L	366	99.7	230	1172	2041	11.0	10 600	60.8	1394
Chromium	µg/L	366	38.0	2.0	2.9	3.5	0.5	23.0	1.0	3.1
Cobalt	µg/L	366	49.7	0.7	2.5	5.0	0.1	35.0	0.2	2.5
Copper	µg/L	365	71.8	0.7	2.2	4.3	0.1	36.0	0.3	2.6
Dissolved organic carbon	mg/L	31	29.0	4.1	15.9	35.4	1.4	110	1.9	7.8
Electrical conductivity	mS/m	366	99.7	176	508	681	5.2	2 950	94.3	831
Fluoride	µg/L	290	90.3	475	592	397	60.0	1 800	270	958
Gallium	µg/L	335	8.4	0.3	0.4	0.3	0.1	1.2	0.1	0.6
Hardness	mg/L $CaCO_3$	366	99.7	389	924	1519	8.0	12 000	190	960
Hydroxide	mg/L	226	0							
Iron	µg/L	366	80.6	21.0	124	259	5.0	2 100	8.0	152

Description	Unit	Number of samples	Per cent above LOR (%)	Median	Mean	Standard deviation	Min.	Max.	20th percentile	80th percentile
Lanthanum	µg/L	366	4.1	0.1	0.4	0.5	0.1	1.9	0.1	0.7
Lead	µg/L	366	78.1	0.5	2.3	8.5	0.1	97	0.2	1.5
Lithium	µg/L	364	82.1	18.0	39.2	90.7	0.5	730	3.3	39.0
Magnesium	mg/L	366	100	43.2	170	297	0.6	2 180	22.1	212
Manganese	µg/L	366	95	51.5	432	1135	1.0	7 700	6.0	280
Mercury	µg/L	344	1.7	0.3	0.5	0.6	0.1	1.6	0.1	0.4
Molybdenum	µg/L	366	44.5	3.0	6.8	10.4	1.0	53.0	1.4	8.0
Nickel	µg/L	366	24.6	2.0	4.7	4.4	1.0	18.0	1.0	8.0
Nitrogen, ammonia	µg/L	312	50.3	5	182	679	5	6000	5	80
Nitrogen, nitrate	µg/L	200	71.0	50	113	174	5	970	5	170
Nitrogen, nitrite	µg/L	113	6.2	5	6	4	5	30	5	5
Nitrogen, total	µg/L	353	99.2	280	593	853	10	7100	100	950
Oxidised nitrogen	µg/L	167	76.6	60	141	229	5	1300	5	183
pH		366	99.7	7.5	7.5	0.5	5.5	8.8	7.2	7.8
Phosphorus, total	µg/L	353	93.8	60	92	105	5	710	20	140
Phosphorus, soluble reactive	µg/L	366	89.6	40	65	82	5	650	10	90
Potassium	mg/L	366	100	5.4	10.1	11.4	0.3	74.5	2.6	18.1
Selenium	µg/L	366	29.5	4.0	5.9	8.0	1.0	47.0	2.0	6.0
Silicon	mg/L	366	100	29.0	27.6	9.5	1.1	48.0	18.0	36.0
Silver	µg/L	336	14.9	0.6	1.6	3.0	0.0	18.0	0.2	1.5
Sodium	mg/L	366	100	256	786	1161	5.4	5 180	83.5	1430
Sulfate, sulfur	mg/L	366	100	130	742	1259	0.5	5 970	43.5	1100
TDS by summation	mg/L	366	99.7	990	3282	4802	27	19 000	520	4920
Thallium	µg/L	281	9.6	0.2	0.6	0.7	0.1	2.2	0.1	1.1
Tin	µg/L	366	7.4	0.2	0.3	0.2	0.1	1.2	0.1	0.4
Titanium	µg/L	335	5.7	0.7	3.2	7.1	0.1	27.0	0.3	2.0
Uranium	µg/L	366	95.4	6.1	19.2	29.5	0.1	150	1.7	30.4
Vanadium	µg/L	335	87.8	17.5	29.4	38.4	0.2	250	4.2	40.4
Zinc	µg/L	366	88.0	13	20.0	21.1	1.0	200	8.0	26.0

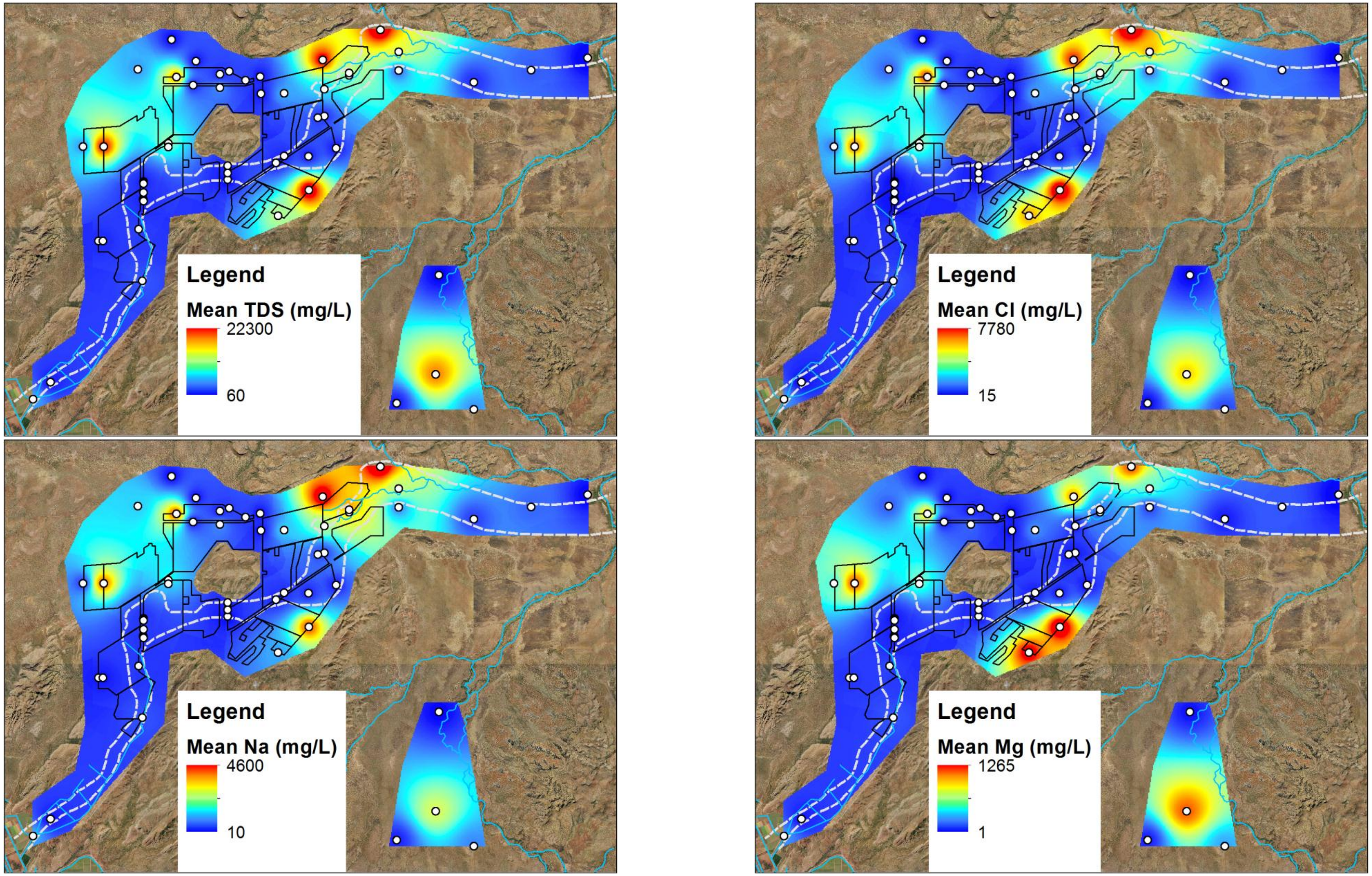

Figure 3.1 Mean groundwater concentration of total dissolved solids (TDS), chloride (Cl), sodium (Na) and magnesium (Mg) across the Weaber and Knox Creek plains

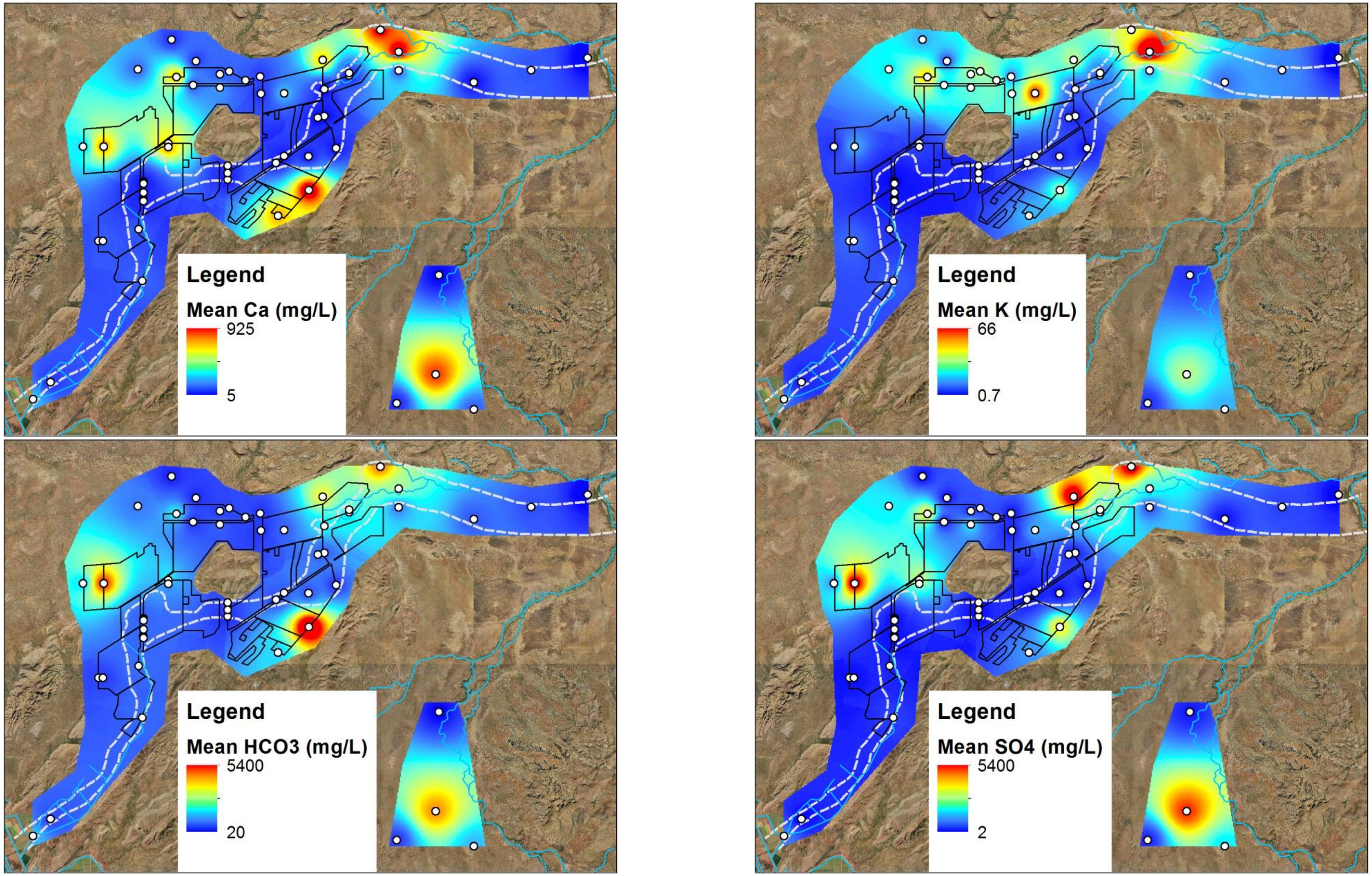

Figure 3.2 Mean groundwater concentration of calcium (Ca), potassium (K), bicarbonate (HCO_3) and sulfate (SO_4) across the Weaber and Knox Creek plains

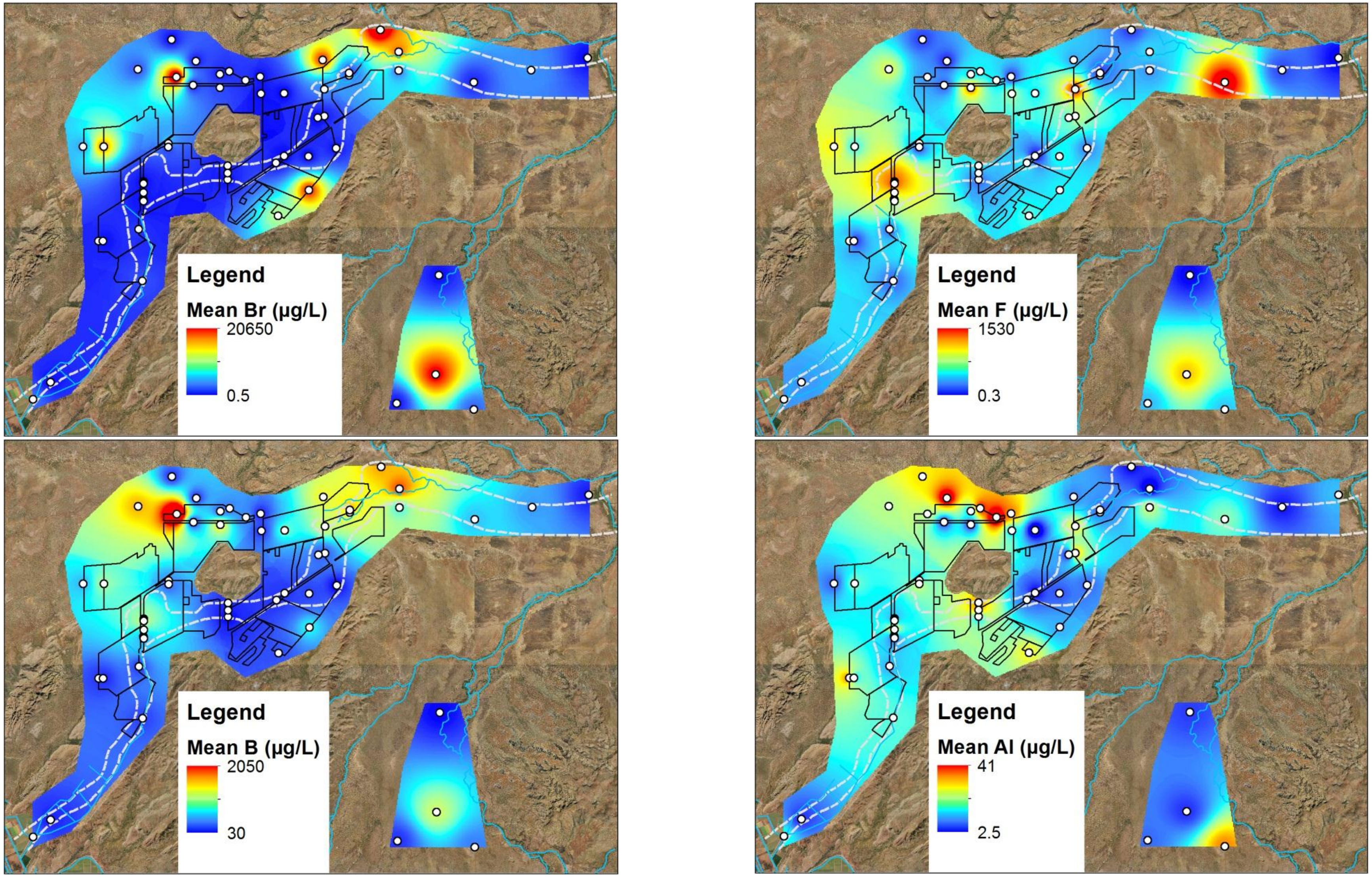

Figure 3.3 Mean groundwater concentration of bromide (Br), fluoride (F), boron (B) and aluminium (Al) across the Weaber and Knox Creek plains

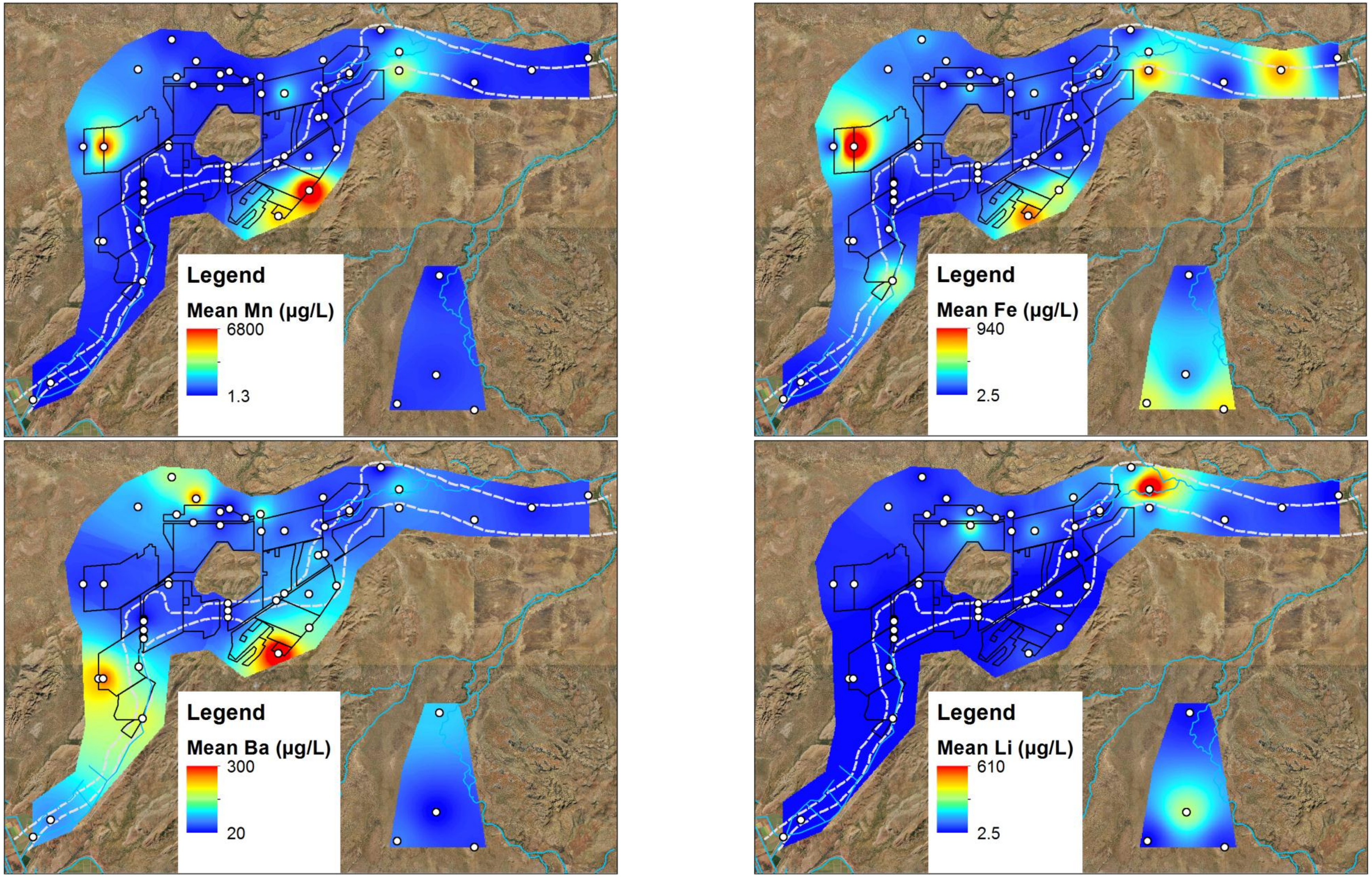

Figure 3.4 Mean groundwater concentration of manganese (Mn), iron (Fe), barium (Ba) and lithium (Li) across the Weaber and Knox Creek plains

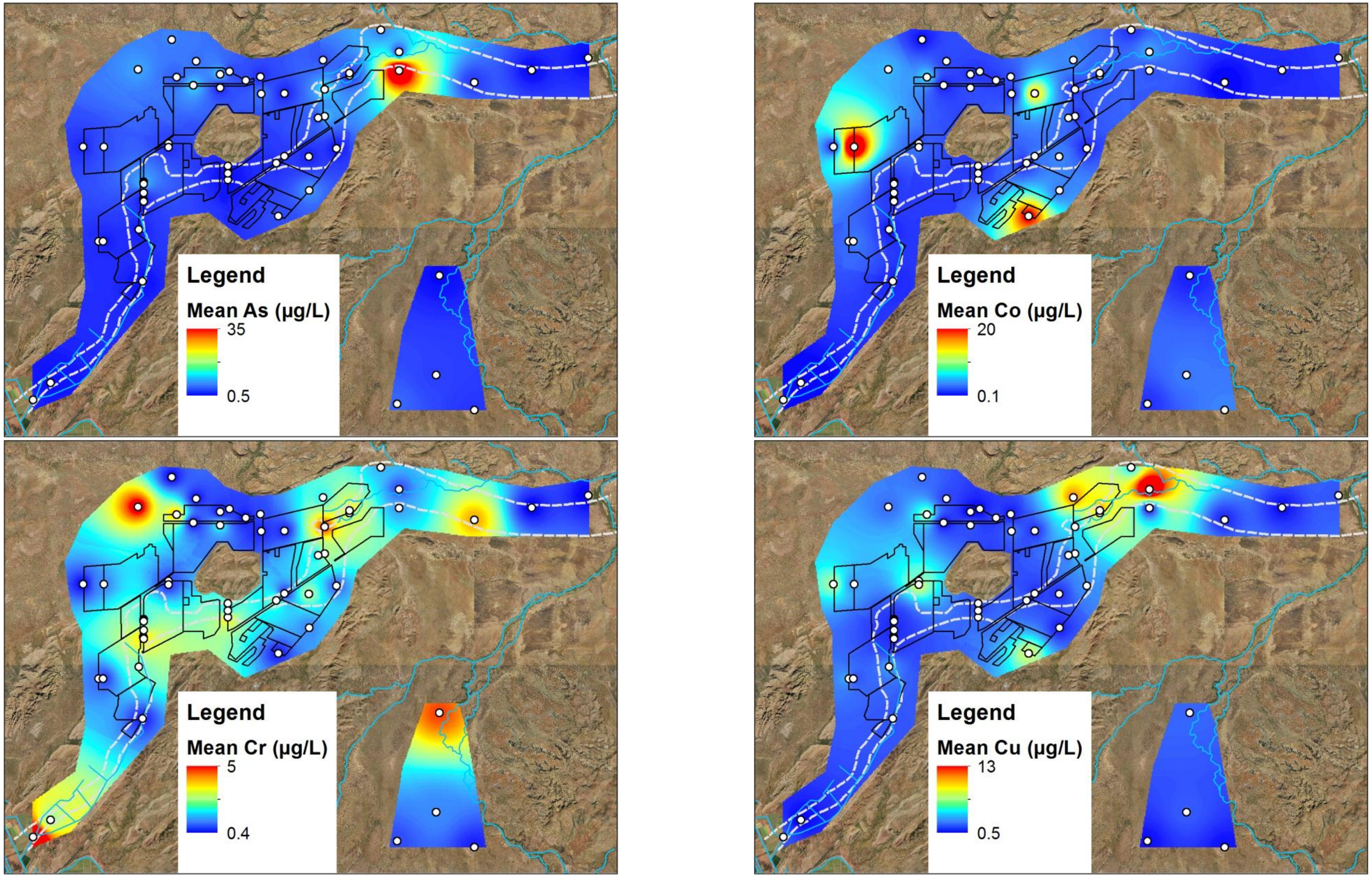

Figure 3.5 Mean groundwater concentration of arsenic (As), cobalt (Co), chromium (Cr) and copper (Cu) across the Weaber and Knox Creek plains

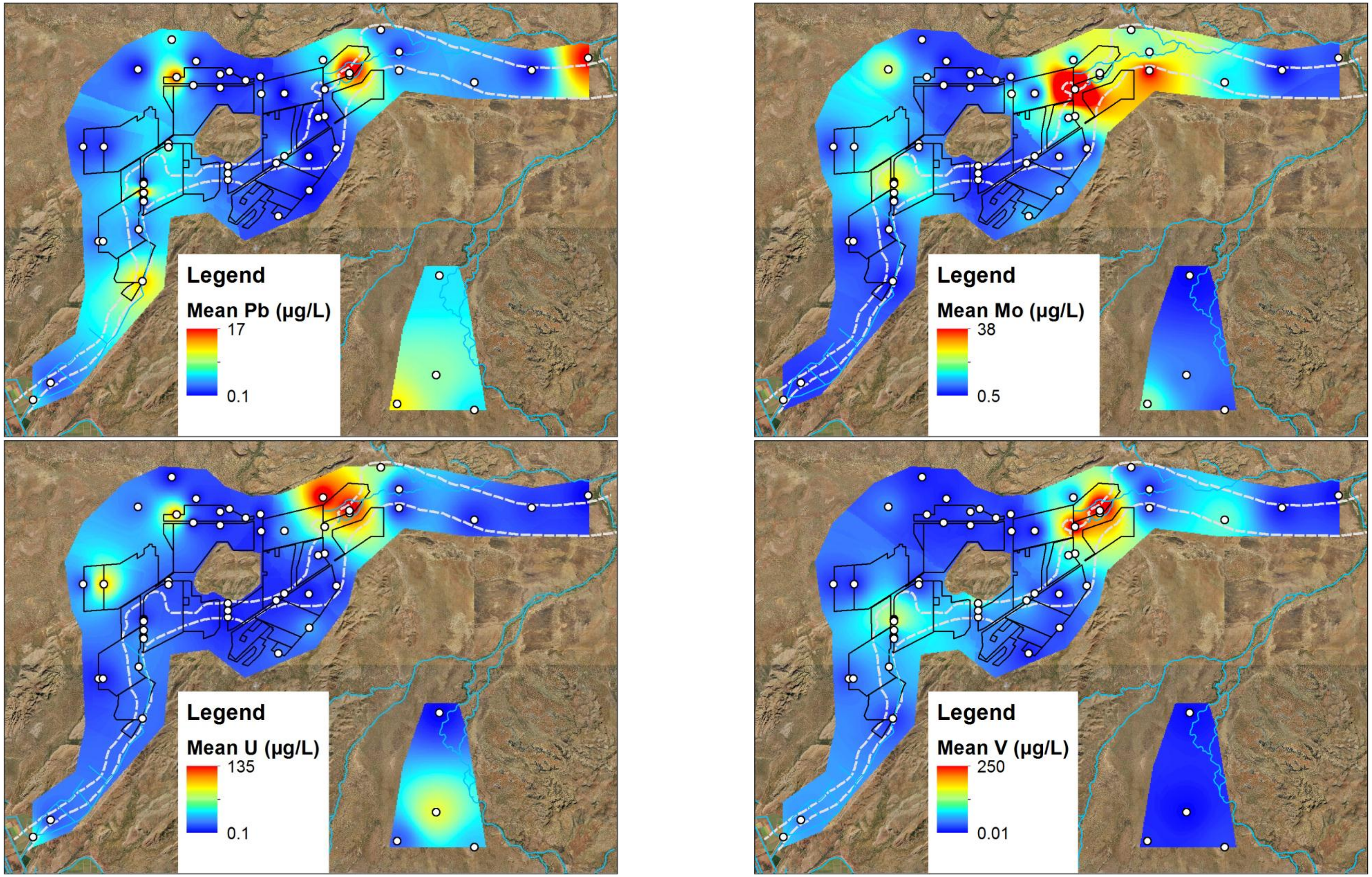

Figure 3.6 Mean groundwater concentration of lead (Pb), molybdenum (Mo), uranium (U) and vanadium (V) across the Weaber and Knox Creek plains

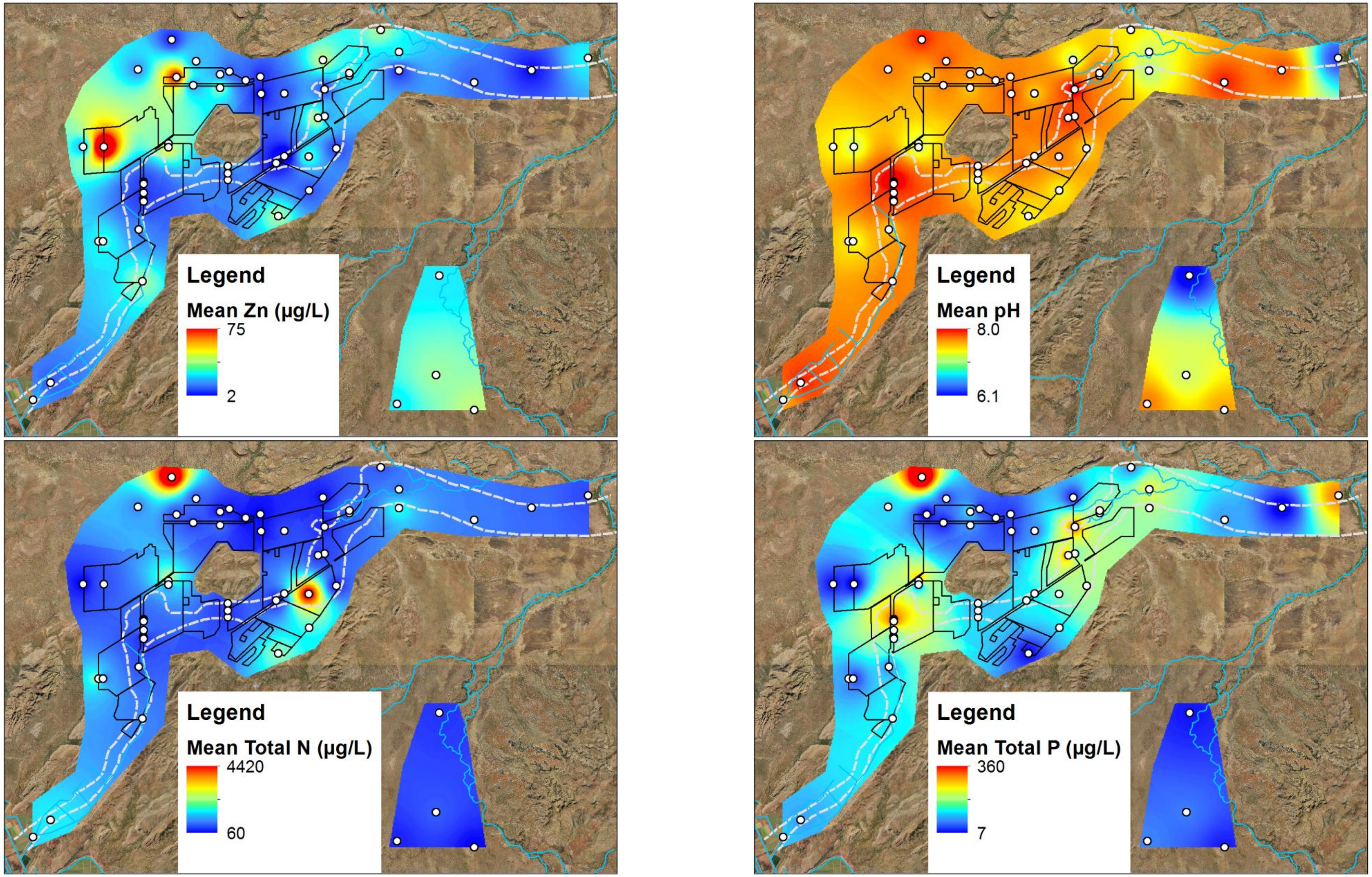

Figure 3.7 Map showing mean groundwater concentration of zinc (Zn), pH, total nitrogen (Total N) and total phosphorus (Total P) across the Weaber and Knox Creek plains

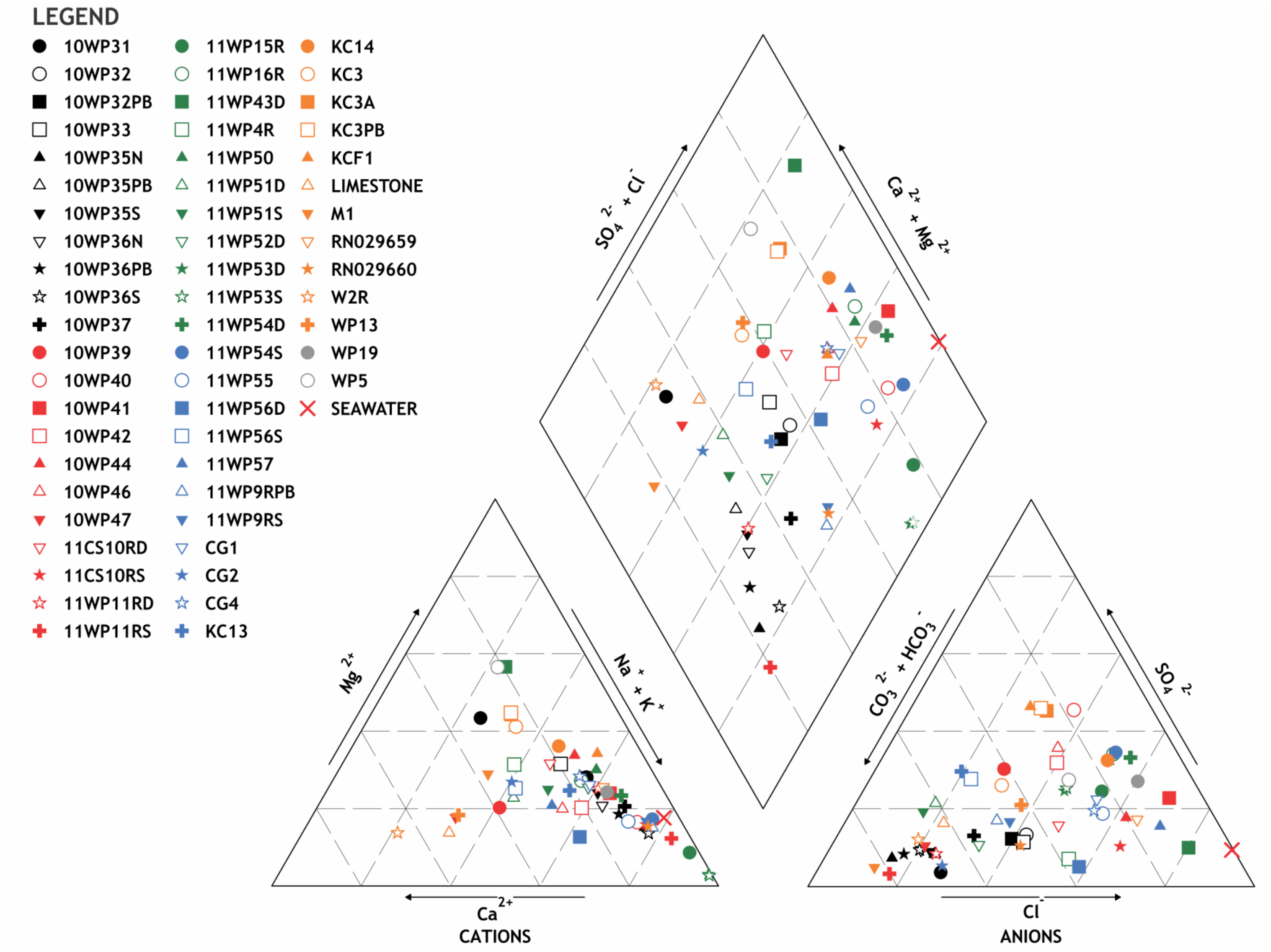

Figure 3.8 Piper diagram for groundwater monitoring bores across the Weaber and Knox Creek plains

Table 3.2 Summary statistics of field measurements of groundwater

Description	Number of samples	Median	Mean	Standard deviation	Min.	Max.	20th percentile	80th percentile
EC (mS/m)	331	172	504	664	7.4	2750	90.1	842
pH	250	7.2	7.2	0.5	4.9	8.5	7	7.5
Temperature °C	325	29.8	30	1.4	25.6	34.9	29	31
Total acidity mg/L $CaCO_3$	125	80	110	102	0	560	40	160
Total alkalinity mg/L $CaCO_3$	107	450	530	373	50	1950	300	676
ORP RAW – Hanna (mV)	56	36	1	128	-340	325	-137	89
ORP RAW – WTW (mV)	146	23	-2	144	-333	272	-156	132
DO initial (mg/L)	91	1.4	1.8	1.4	0.2	6.5	0.5	3.1
DO final (mg/L)	126	0.8	1.5	1.8	0	9.4	0.2	2.7
DO final %	88	11.2	20.6	23.6	1	127	2.3	34.3

3.2 Suitability of groundwater as a resource for agriculture

3.2.1 Suitability of groundwater for direct irrigation

Groundwater chemistry was assessed against modified USDA (1954) salinity and sodicity criteria for the suitability for direct irrigation and is shown in Figure 3.9. Groundwater bores with extremely high salinity (>550mS/m) were not included in Figure 3.9 because they are unsuitable for irrigation. Figure 3.10 shows the irrigation salinity classes of groundwater on the Weaber and Knox Creek plains. Figures 3.11 and 3.12 show the areas where groundwater concentrations have exceeded the ANZECC and ARMCANZ (2000) irrigation LTV and Figure 3.13 shows the plant sensitivity classes for sodium and chloride.

There are no areas within the current farmland lots that would be suitable for direct irrigation by groundwater (<80mS/m) (Figures 3.9 and 3.10). Groundwater in the palaeochannel south-west of Weaber Plain is in the high salinity category, however, most groundwater on the Weaber and Knox Creek plains is in the very high to extreme categories.

Groundwater in areas exceeded the ANZECC and ARMCANZ (2000) irrigation LTV for boron, fluoride, iron, lithium (for citrus crops), manganese, molybdenum, uranium and total phosphorus (Figures 3.11 and 3.12). Groundwater on the Weaber and Knox Creek plains is mostly suitable for plants that are moderately tolerant or tolerant to sodium and chloride (Figure 3.13). The areas that exceeded the irrigation LTV are generally too saline for direct irrigation.

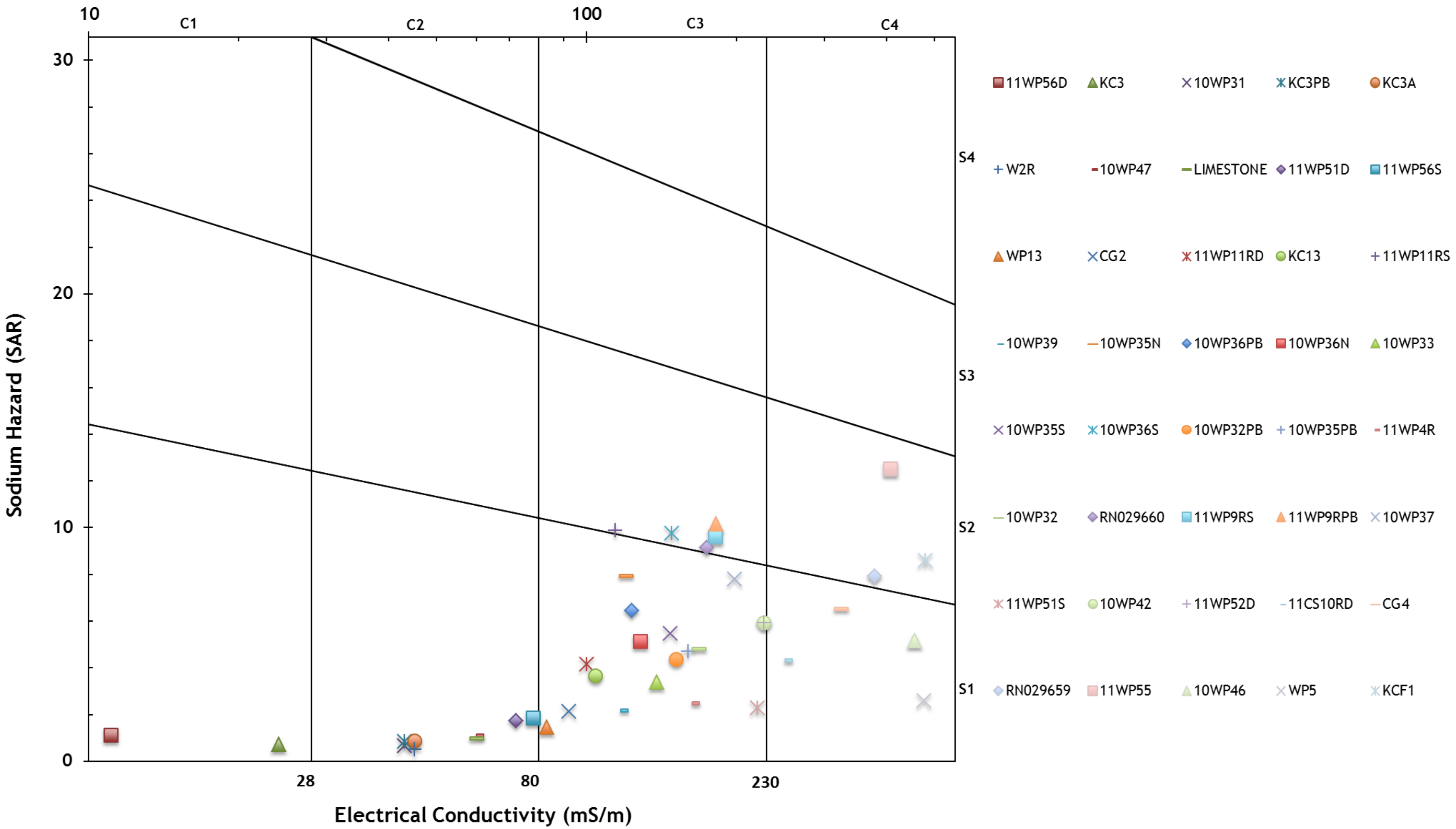

Figure 3.9 Modified Wilcox diagram showing the salinity and sodicty classes for groundwater on the Weaber and Knox Creek plains that are below 550mS/m

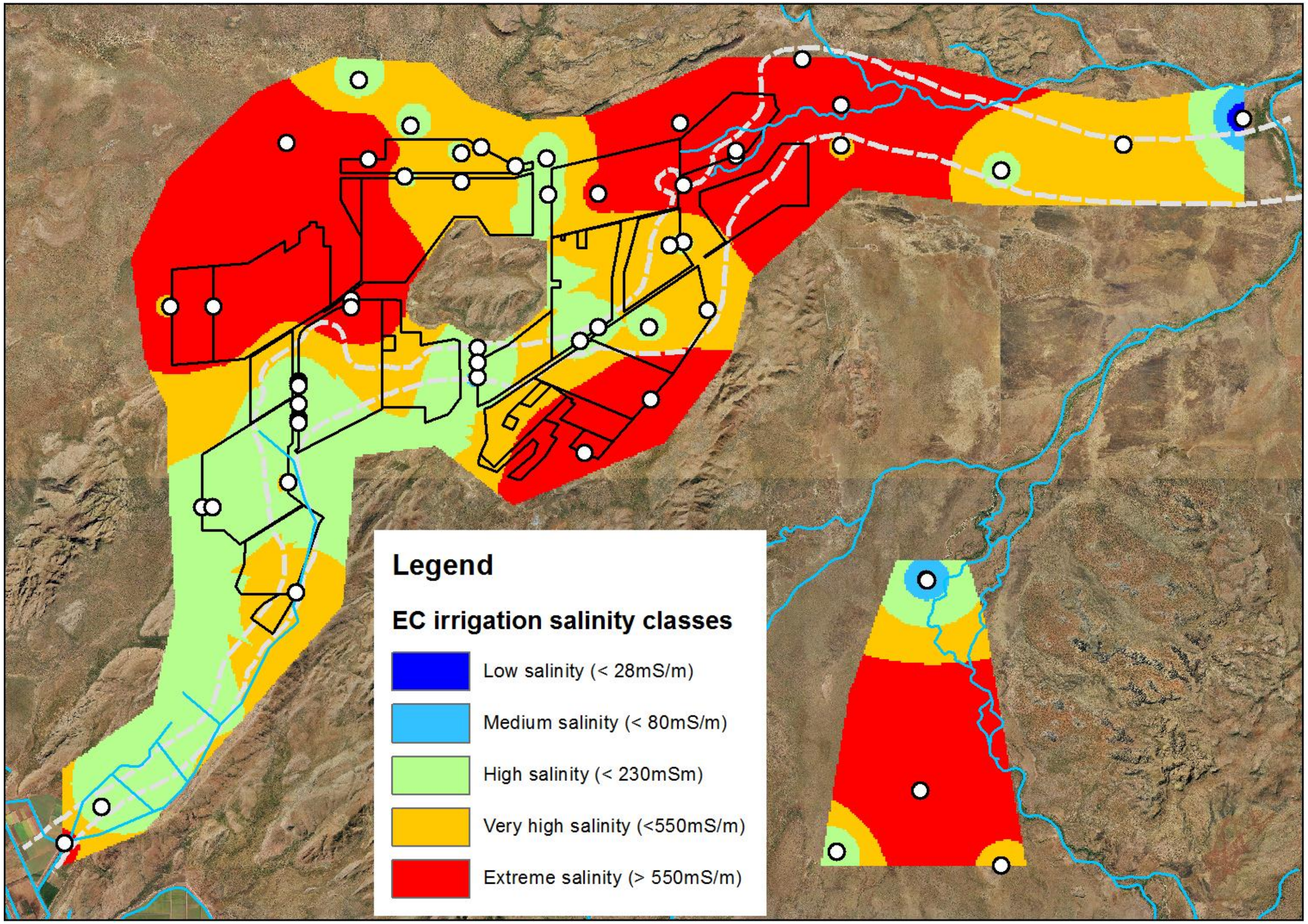

Figure 3.10 Irrigation salinity classes of groundwater on the Weaber and Knox Creek plains

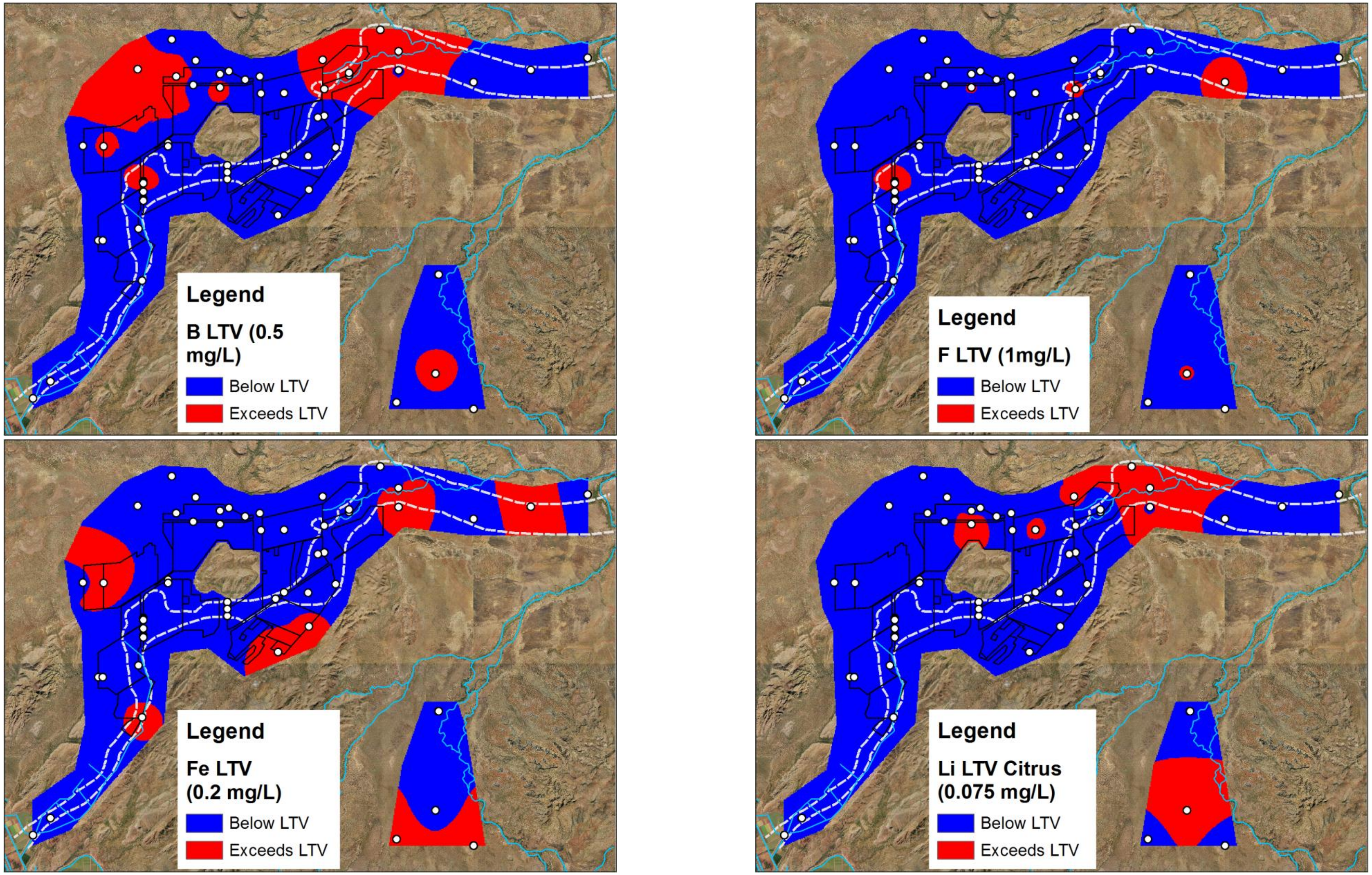

Figure 3.11 Areas where groundwater exceeds the irrigation long-term trigger values (LTV) for boron (B), fluoride (F), iron (Fe) and lithium (Li) for citrus crops across the Weaber and Knox Creek plains

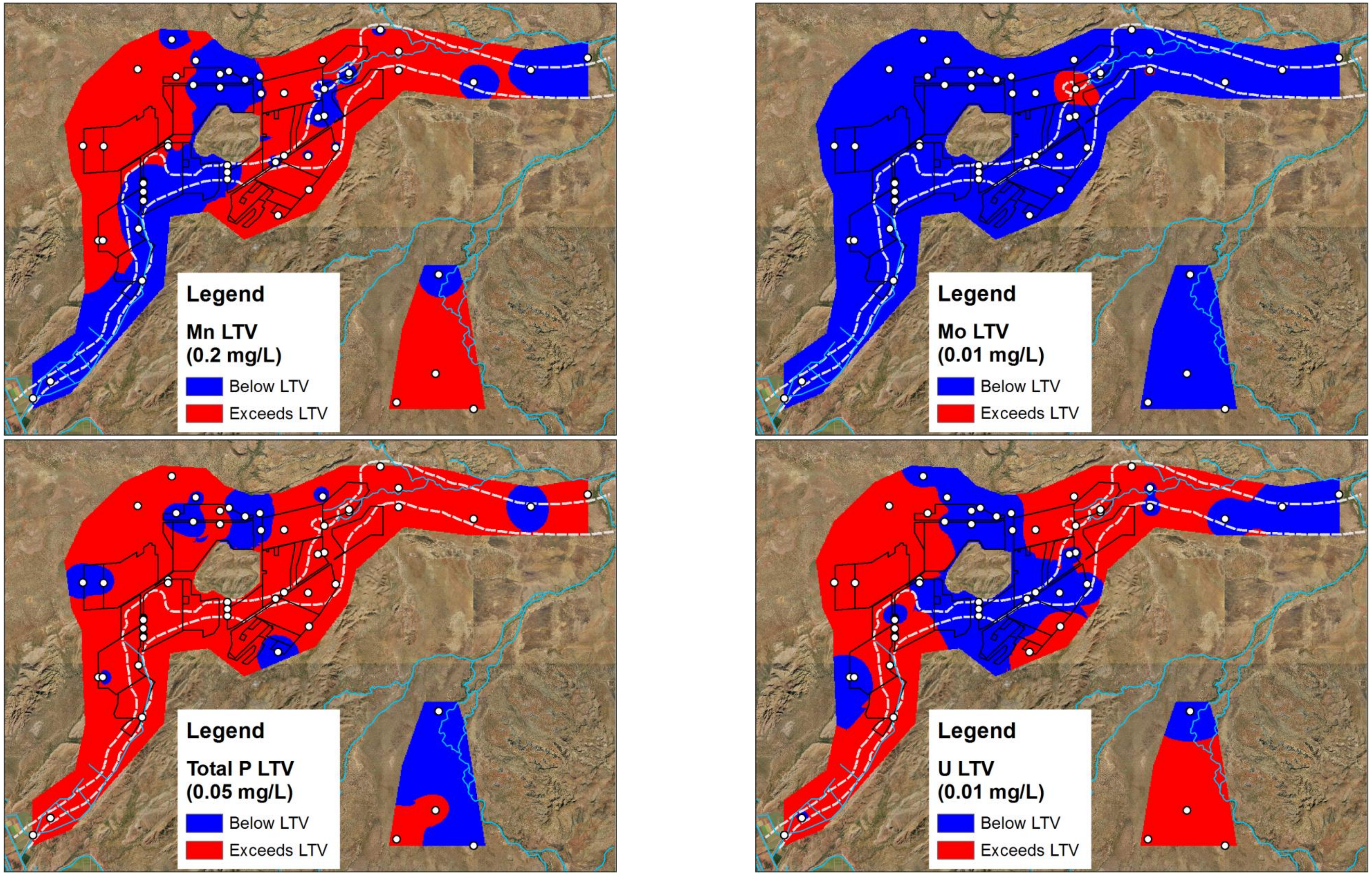

Figure 3.12 Areas where groundwater exceeds the irrigation long-term trigger values (LTV) for manganese (Mn), molybdenum (Mo), total phosphorus (Total P) and uranium (U) across the Weaber and Knox Creek plains

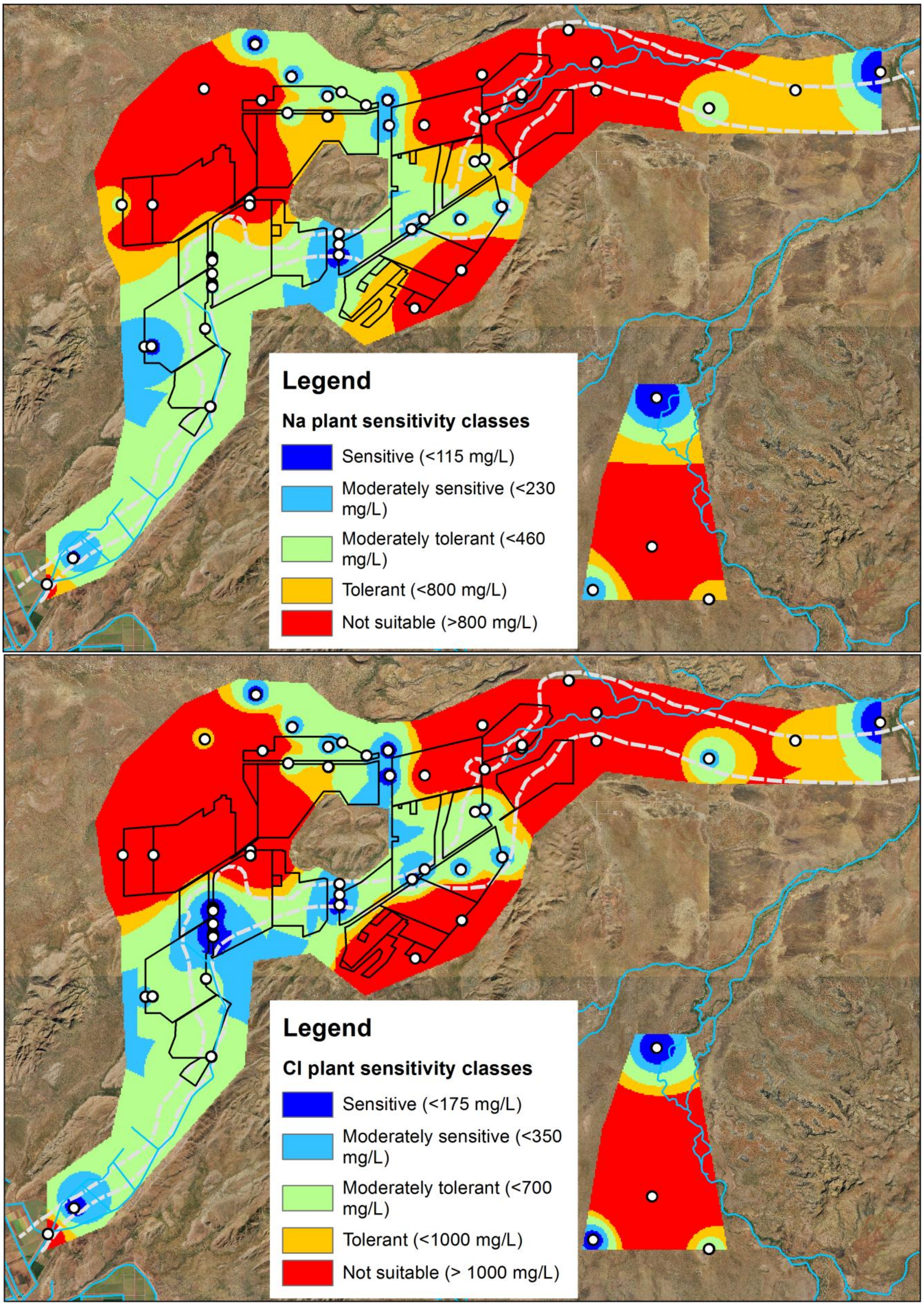

Figure 3.13 Map showing suitability of groundwater for irrigation based based on the sensitivity of plants to sodium (Na) and chloride (Cl) across the Weaber and Knox Creek plains

3.2.2 Mixing of groundwater with the M2 supply channel

The water quality from the dewatering bores was estimated from groundwater concentration grids (Figures 3.1 to 3.7). The water from the different dewatering bores was equally mixed together and the resultant water quality is shown in Table 3.3. The modelled final groundwater quality forecast to be pumped into the M2 supply channel after 20 years of development was about 1400mg/L TDS (200mS/m). This quality is similar to the salinity (1200mg/L) derived from the groundwater models (KBR 2011) at 50 years.

Table 3.7 shows the results of the four mixing model scenarios. For Scenario A (forecast groundwater flow, average channel flow), the resultant salinity was about 33mS/m. For Scenario B (forecast groundwater flow, peak channel flow), the resultant salinity was 31mS/m. For Scenario C (high groundwater flow, average channel flow), the resultant salinity was 35mS/m. For Scenario D (high groundwater flow, peak channel flow), the resultant salinity was 33mS/m.

For all scenarios, the modelled salinity (EC) was within the USDA (1954) C2 medium category (<80mS/m) and therefore suitable for irrigation. All modelled species were below the ANZECC and ARMCANZ (2000) irrigation LTV (Table 3.7 and Appendix F) and therefore suitable for irrigation.

For all scenarios, sodium and chloride concentrations are suitable for plants sensitive to these ions. Hardness and pH are also at levels suitable for irrigation and should not cause corrosion or fouling problems. For all scenarios, the sodium adsorption ratio and residual sodium carbonate index are low and indicate that irrigation water is not likely to cause soil structural problems.

Table 3.3 Modelled resultant water quality from mixing pumped groundwater with the water in the M2 supply channel and its suitability for irrigation under four scenarios (see Figures 3.11 to 3.13 and Appendix F for long-term trigger values (LTV))

Analyte	Unit	Modelled groundwater quality	M1 water quality	Scenario A water quality	Scenario A LTV	Scenario B water quality	Scenario B LTV	Scenario C water quality	Scenario C LTV	Scenario D water quality	Scenario D LTV
Aluminium	µg/L	17	16	16	Below	16	Below	16	Below	16	Below
Arsenic	µg/L	2	0.5	0.6	Below	0.6	Below	0.6	Below	0.6	Below
Boron	µg/L	217	30	37.36	Below	35	Below	40	Below	38	Below
Beryllium	µg/L	0.1	0.4	0.34	Below	0.3	Below	0.3	Below	0.3	Below
Cadmium	µg/L	0.07	0.05	0.05	Below	0.05	Below	0.05	Below	0.05	Below
Chloride	mg/L	300	11	23	Sensitive	20	Sensitive	26	Sensitive	23	Sensitive
Cobalt	µg/L	1.0	2.5	2.4	Below	2.5	Below	2.4	Below	2.4	Below
Chromium	µg/L	1.2	1.3	1.3	Below	1.3	Below	1.3	Below	1.3	Below
Copper	µg/L	1.7	1.0	1.0	Below	1.0	Below	1.0	Below	1.0	Below
EC	mS/m	195	26	33	Medium salinity	31	Medium salinity	35	Medium salinity	33	Medium salinity
TDS	mg/L	1400	140	230		220		250		230	
Fluoride	µg/L	544	190	204	Below	200	Below	209	Below	204	Below
Hardness	mg/L	551	124	141	Suitable	136	Suitable	147	Suitable	141	Suitable
Iron	µg/L	71	19	21	Below	21	Below	22	Below	21	Below
Mercury	µg/L	0.06	0.05	0.05	Below	0.05	Below	0.05	Below	0.05	Below
Lithium	µg/L	5.5	2.5	2.6	Below	2.6	Below	2.7	Below	2.6	Below
Manganese	µg/L	235	4.3	13	Below	11	Below	16	Below	14	Below
Molybdenum	µg/L	2.5	0.5	0.6	Below	0.6	Below	0.6	Below	0.6	Below
Nitrogen (reduced)	µg/L	38	5.0	6.3	Below	5.9	Below	6.8	Below	6.3	Below

Analyte	Unit	Modelled groundwater quality	M1 water quality	Scenario A water quality	Scenario A LTV	Scenario B water quality	Scenario B LTV	Scenario C water quality	Scenario C LTV	Scenario D water quality	Scenario D LTV
Nitrogen (oxidised)	µg/L	155	12	17	Below	16	Below	19	Below	17	Below
Nitrogen (total)	µg/L	522	193	206	Below	203	Below	211	Below	206	Below
Sodium	mg/L	278	16	27	Sensitive	24	Sensitive	30	Sensitive	27	Sensitive
Nickel	µg/L	1.0	0.5	0.5	Below	0.5	Below	0.5	Below	0.5	Below
Phosphorus (soluble reactive)	µg/L	113	8.3	12	Below	11	Below	14	Below	13	Below
Phosphorus (total)	µg/L	150	10	15	Below	14	Below	17	Below	16	Below
Lead	µg/L	1.5	0.1	0.2	Below	0.1	Below	0.2	Below	0.2	Below
pH		7.6	8.3	8.2	Suitable	8.2	Suitable	8.2	Suitable	8.2	Suitable
Selenium	µg/L	1.6	0.5	0.5	Below	0.5	Below	0.6	Below	0.5	Below
Uranium	µg/L	11	0.3	0.8	Below	0.7	Below	0.9	Below	0.8	Below
Vanadium	µg/L	32	3.8	4.9	Below	4.6	Below	5.3	Below	4.9	Below
Zinc	µg/L	14	8.8	9	Below	9.0	Below	9.1	Below	9.1	Below
Sodium ad-sorption ratio		6.0	0.8	1.2	Low	1.1	Low	1.4	Low	1.2	Low
Residual sodium carbonate index		0.9	0.5	0.5	Low	0.5	Low	0.5	Low	0.5	Low
Atrazine	µg/L	0.05	0.05	0.05	Below	0.05	Below	0.05	Below	0.05	Below

4 Discussion

4.1 Environmental hazards of groundwater

Condition 12 of the Australian Government Ministerial Conditions under the EPBC Act required the installation of high-intensity and low-intensity monitoring sites and reference bores 18 months prior to starting irrigation. Seasonal monitoring of specific analytes was stipulated in the EPBC conditions to provide pre-development or baseline groundwater chemistry. The analytes selected were based on ANZECC and ARMCANZ (2000) risk management and sampling methodologies as detailed in the groundwater management plan

By the end of 2013, 58 bores had been monitored seasonally over 2–3 years. Results of the baseline analysis of these bores are summarised in Table 3.1, Figures 3.1 to 3.7 and Appendix C. The monitoring regime was established to test whether groundwater posed a direct or indirect threat to the environmental assets of the Keep River and the dry season discharge to the irrigation system. Accordingly, a comprehensive suite of analytes was chosen for baseline assessment.

For surface water aquatic environmental assets, the analytes for baseline monitoring should include any substances that are known to harm the target aquatic species (ANZECC & ARMCANZ 2000). The target aquatic species requiring protection in this instance are the EPBC-listed threatened species: freshwater sawfish (*Pristis microdon*) and speartooth shark (*Glyphis glyphis*). While there was some general (e.g. Bartley & Spiers 2010) and local (e.g. Bennett & George 2011, 2014) data about the expected changes to water quality under tropical irrigated agriculture, there was no specific information about which water quality factors are of particular importance or risk to the EPBC-threatened species (Helen Larsen, IRG, 2011, pers. comm., November). Consequently, a precautionary approach was used to select the comprehensive list of analytes that ANZECC and ARMCANZ (2000) categorise as chemical hazards to aquatic biota. The list of analytes in Appendix B encompasses all of the chemical hazards listed in ANZECC and ARMCANZ (2000), including the herbicide atrazine. These were monitored in all 58 bores.

There are two determinants of the direct risk of groundwater on threatened species in the Keep River: the exposure pathways and travel time for a chemical hazard to move from farmland to the Keep River, and the nature of the chemical hazards in the groundwater (Chapter 4.1.1).

The travel time for a chemical hazard to move from the eastern edge of the irrigated farmlands to the Keep River can be estimated from aquifer characteristics and available modelling (KBR 2011, Bennett & George 2011, 2014, Paul et al. 2011). Using this data, travel times for a chemical hazard to reach the Keep River from the eastern edge of the Goomig Farmlands would be 90 to 180 years. If dewatering is implemented, as recommended in the management plans (KBR 2011, Strategen 2012a, b), it would take 100 to 300 years for chemical hazards to reach the river.

4.1.1 Forecasting long-term changes in groundwater quality of Goomig

The second determinant of risk to the Keep River is which chemical hazards are present in groundwater and how they will change with the introduction of irrigated agriculture to the Goomig Farmlands. These changes in water quality can be evaluated by comparing changes in groundwater quality in ORIA Stage 1, which has been irrigated for over 40 years, to groundwater quality in the Weaber Plain.

Smith et al. (2007) looked a broad range of analytes including 29 pesticides plus the herbicide atrazine in 31 monitoring bores in the ORIA Stage 1. When comparing mean groundwater quality in the ORIA Stage 1 to the baseline conditions in Weaber; TDS, metals and metalloids are largely unchanged by agriculture. Only three species changed significantly: the herbicide atrazine (mean concentration of 0.37µg/L) and two nitrogen species (total nitrogen – mean 4200µg/L and total oxidised nitrogen – mean 4035µg/L) (Table 4.1).

After 40 years of irrigation, atrazine was found in only six of 63 samples and in all other bores it was below the detection limit. The data suggests pesticides or herbicides may be slow to accumulate in groundwater beneath the black soil plains.

The speciation of nitrogen in groundwater has changed as a result of irrigated agriculture. Nitrogen in the ORIA Stage 1 was dominated by the oxidised nitrogen fraction (nitrate and nitrite) whereas in the Weaber baseline conditions oxidised nitrogen (mean concentration around 200µg/L) was around 15% of total nitrogen (mean concentration around 1300µg/L). The remainder of the total nitrogen consisted of organic nitrogen. Therefore, under agriculture, nitrogen speciation in the irrigated farmlands of the Weaber Plain is likely to be dominated by oxidised nitrogen that will be more bioavailable.

The specified monitoring regime (discussed below- Chapter 4.3) will detect changes in groundwater chemistry. If chemical hazards exceed baseline conditions, the groundwater management plan and related plans (Strategen 2012a, b) recommend a range of measures to mitigate hazards, ranging from specific actions for chemical use to direct aquifer management.

In summary, on the basis of water quality risk from data derived in the ORIA Stage 1 and travel times, groundwater from beneath the Goomig Farmlands poses a relatively low and long-term risk (100 years) to the receiving environment, the Keep River.

Table 4.1 Baseline chemistry for the Weaber Plain compared to modelled groundwater quality and water quality from the ORIA Stage 1 (Smith et al. 2007) after 40 years of irrigation. The ratio between mean ORIA and mean Weaber baseline concentrations for species is shown

Analyte	Unit	Number of samples (Weaber)	Number of samples (ORIA)	Mean (Weaber)	Modelled groundwater	Mean (ORIA)	Ratio
Alkalinity	$CaCO_3$ mg/L	366	63	486	452	437	0.90
Aluminium	µg/L	366	8	22.8	17	39.9	1.75
Atrazine	µg/L	213	6	LoR	0.05	0.37	n/a
Bicarbonate	mg/L	366	Calculated	760	551	533	0.65
Calcium	mg/L	366	61	155	61	100	0.65
Chloride	mg/L	366	62	1173	300	644	0.55
EC	mS/m	366	63	509	195	304	0.60
Fluoride	µg/L	290	59	593	544	842	1.42
Iron	µg/L	366	11	124	71	19.5	0.16
Magnesium	mg/L	366	63	170	61	122	0.71
Manganese	µg/L	366	33	432	235	140	0.32
Nitrogen, ammonia	µg/L	312	38	812	39	323	0.40
Nitrogen, nitrate	µg/L	200	Calculated	169		4016	23.81
Nitrogen, nitrite	µg/L	113	6	22.9		18.8	0.82
Nitrogen, total	µg/L	353	63	1267	522	4161	3.28
Oxidised nitrogen	µg/L	167	58	178	154	4035	22.70
pH		366	63	7.5	7.6	7.52	1.00
Phosphorus, total	µg/L	353	17	801	150	305	0.38
Phosphorus, soluble reactive	µg/L	366	63	562	113	70	0.13
Potassium	mg/L	366	58	10.1	4.1	18.2	1.80
Silicon	mg/L	366	16	27.6		25.7	0.93
Sodium	mg/L	366	63	786	278	459	0.58
Sulfate	mg/L	366	59	742	148	450	0.61
TDS by summation	mg/L	366	Calculated	3282	1403	2085	0.61

4.2 Use of groundwater for irrigation

4.2.1 Direct irrigation with groundwater

The baseline monitoring has been used to assess the hazard to irrigated agriculture posed by discharging groundwater into the M2 supply channel during the dry season. In terms of using groundwater for direct irrigation on agricultural crops, the updated baseline chemistry (Figure 3.10 and Appendix F) confirms the conclusions of Lillicrap et al. (2011) that the groundwater is unsuitable for direct irrigation in the proposed irrigated farmlands because the salinity is higher than 80mS/m.

Groundwater in the northern and southern margins of the proposed irrigated areas also have high chloride and sodium concentrations that make them unsuitable for irrigation (Figure 3.13). In these areas, groundwaters also exceed the ANZECC and ARMCANZ (2000) irrigation water quality LTV for total phosphorus.

Similarly, groundwater in the northern and southern margins exceeded the LTV for uranium, manganese, iron, boron and fluoride (Figures 3.11 and 3.12 and Appendix F). These areas are subject to inundation during the wet season and these analytes are species whose solubility is oxidation-reduction (redox) sensitive (Hem 1985, Drever 2002). Therefore, it is likely the concentrations are being controlled by the redox state of infiltrating waters.

The high concentrations of fluoride mainly occur in areas on or near the Antrim Volcanics (Appendix A). Basaltic and similar rocks can contain fluoride minerals (Hem 1985).

Groundwater beneath northern margins of the proposed farmlands and eastwards had relatively high concentrations of metals including zinc, copper, lead, molybdenum and vanadium. The high concentrations of metals and metalloids are natural background levels likely caused by mineralised ore bodies and vadose zone processes (Appendix G). The Keep River also had naturally high background levels of aluminium, zinc, copper, lead and boron (Bennett & George 2014). As the Weaber Plain retained its native vegetation during the baseline monitoring period, the high concentration of ions in the groundwater are naturally occurring.

4.2.2 Suitability of groundwater for reuse

The sustainability of pumping groundwater into the irrigation system and the risk to irrigated agriculture was first assessed by Lillicrap et al. (2011) using initial data collected up until 2011 and revised using the complete baseline data (2010–13). The modelling used delivery rates and quantity of pumped groundwater (Chapter 3.3.2 and Table 3.7) to the M2 supply channel as specified in disposal scenarios developed in the GMP (Chapter 3.2.2). Results of the updated mixing model show that for all the KBR (2011) pumping scenarios, including the maximum rate where the irrigation supply (94%) is mixed with groundwater (6%), the resultant water quality remained below the ANZECC and ARMCANZ (2000) LTV for irrigation (Table 3.7). These results are consistent with Lillicrap et al. (2011).

These results compare to a similar study for ORIA Stage 1 where Ali et al. (2002) found that mixing groundwater with water from the supply channel could be suitable for irrigation. Using similar criteria to this study, they found that groundwater with salinities up to 100mS/m required mixing with 70% scheme water before it was suitable for direct irrigation. The groundwater in the south-east of the Weaber Plain, mainly in the Ord palaeochannel, had the lowest salinities (<230mS/m). Based on the modelling by Ali et al. (2002) groundwater from this area would need to be mixed with around 85% scheme water before it would be suitable for direct irrigation. Therefore the proposed pumping scenarios in the management plans have dilution rates far greater than the minimum required for direct irrigation.

In addition to water quality, soil types affect the suitability of using mixed waters for irrigated agriculture. For example, Aquitaine soils found on the northern and southern margins of the Goomig Farmlands naturally accumulate low solubility salts, such as gypsum and carbonates, because of restricted drainage (Smolinski et al. 2011). Therefore, it is recommended these areas are only irrigated with scheme water.

As described in Chapter 2, the updated mixing model was based on the area of forecast shallow groundwater after 20 years of development (KBR, 2011; 80% of Goomig Farmlands) and baseline groundwater data from bores within that area. It was not derived from the 50-year KBR (2011) forecast pumping areas, owing to uncertainty in the water balance of future farming systems over that length of time. The mixing model determined a 20-year mean TDS of 1400mg/L for the defined bore field, which is similar to the 1200mg/L TDS determined by the 50-year forecast groundwater model (KBR 2011).

While the forecast for TDS provides confidence in the expected mass of solutes, changes from the baseline groundwater quality caused by agriculture are likely to occur, as shown by Smith et al. (2007) in ORIA Stage 1. From the comparison of ORIA Stage 1 to the Weaber baseline chemistry (Table 4.1) major ion chemistry is not expected to significantly change with agricultural development and only farm chemicals would increase in groundwater. In the mixing model, the modelled concentration for atrazine was half the limit of detection (0.05µg/L) and total nitrogen was 522µg/L which is less than the mean ORIA Stage 1 concentration (Table 4.1). The groundwater concentrations for atrazine and nutrients are probably underestimated in the mixing model, although they are diluted 25–35 times when the groundwater is mixed with the supply channel water. When the mean concentrations of atrazine and nutrients from the ORIA are diluted by the same scale as used in the mixing model, they are below the ANZECC and ARMCANZ (2000) irrigation LTV.

Future changes in water quality will be tracked by ongoing monitoring and there are requirements in the GMP (Strategen 2012a) and the stormwater and groundwater discharge management plan (Strategen 2012b) to update groundwater data and the mixing model every 2–4 years. Water quality parameters used in updating the models will be informed by regular monitoring (Chapter 4.3) and then used to underpin future management responses.

4.3 Monitoring groundwater

Future monitoring

The Ministerial Conditions and the GMP specify a required monitoring frequency during operation of the Goomig Farmlands. They also recommend a list of initial analytes. While some analytes are specified, the list is subject to ongoing determination by the Independent Review Group (IRG). In this chapter we recommend analytes to be monitored and changes to frequency based on the results from the baseline period, in the context of risks to agriculture and the environment.

Currently, the EPBC conditions require seasonal monitoring of various field and laboratory analytes at the high-intensity, low-intensity, reference and farm bores. These monitoring requirements are discussed below in terms of natural and agricultural chemical hazards.

Nutrients

Analysis of the groundwater chemistry in ORIA Stage 1 by Smith et al. (2007) indicated that agricultural nutrients, particularly nitrogen, can enter the groundwater and increase in concentration. For example, the mean baseline concentration of total nitrogen of 1.3mg/L in Weaber Plain baseline is less than the 4.2mg/L recorded in the ORIA. Based on these results, we suggest maintaining the current list of nutrients for analysis. Adding reduced nitrogen (ammonia) and total organic nitrogen to improve the understanding the fate of farm nutrients could further guide improvements to the existing management plans.

Metals and metalloids

The need for ongoing routine monitoring of metals in the proposed irrigated farmlands is not supported by the baseline data. Many of the baseline potentially hazardous metals and metalloids (e.g. boron, manganese, copper and zinc) exceed ANZECC and ARMCANZ (2000) Aquatic Ecosystem and Irrigation trigger values. As detailed in Appendix G, it is likely these values are the direct result of long-term interactions with basement geology and soil-forming processes. Furthermore, based on the comparison of values in the ORIA Stage 1 and baseline values in Goomig, it appears that irrigation practices have little effect on the concentrations of hazardous metal and metalloid species.

Similarly, Bennett and George (2014), who set baseline values for the Keep River, argue that metal and metalloid chemical species in run-off are unlikely to be a major risk factor to an environment. They found there are naturally high background levels of aluminium, boron, zinc and lead which regularly exceed water quality guidelines.

Given these potentially hazardous metals and metalloids are unlikely to change with the development of agriculture, and that major variations can be traced using TDS and conservative elements like chloride, we suggest that the sampling frequency of metals is reduced, as described in Chapter 4.3.1 and Table 4.2, or removed altogether.

Pesticides and herbicides

A risk assessment approach similar to that recommended for metals and metalloids is also appropriate for selecting farm chemical hazards for ongoing monitoring. ANZECC and ARMCANZ (2000) guidelines recommend that any detection of agricultural chemical hazards, such as pesticides and herbicides, could be grounds for investigation. Rather than routinely monitoring a wide array of farm chemicals that may or may not be used, it is more appropriate that chemical usage is monitored and the list of chemicals that are used on the Goomig Farmlands be considered. Those chemicals that are known to pose an eco-toxicological hazard should then be monitored.

For the ORIA Stage 1, there are limited risk assessments of groundwater. There is that which underpins the Smith et al. (2007) review and a related assessment conducted by Oliver and Kookana (2005) who report a risk assessment of off-site impact by farm chemicals that use a ‘pesticide impact rating index’ for sugar, melon, hybrid seed and mango crops locally in the ORIA. They concluded that atrazine, chlorpyrifos, chlorothalonil, cypermethrin, diuron, endosulfan, glyphosate, mancozeb, trifluralin and pendimethalin posed a risk, based on usage, site conditions and pesticide properties.

Without a suitable modelling methodology to accurately forecast risk, a list of farm chemicals to be routinely monitored in the Goomig Farmlands groundwater environments should be determined by assessing:

- the chemicals that are actually being used
- the chemicals that are likely to persist, and
- of those used, which are known to be a hazard to biota or agricultural reuse.

New or different chemicals may be used on the Goomig Farmlands and new or different agricultural enterprises may be pursued, so the groundwater data from the ORIA may not always provide a sufficient reference.

4.3.1 Future monitoring – other considerations

In addition to the nature of analytes to be monitored, consideration is also required of bore monitoring frequency and aspects related to site characteristics. This section looks at the EPBC conditions and makes some recommendations to improve the effectiveness of sampling based on the results of the baseline data evaluated above.

Monitoring frequency

Monitoring of analytes (discussed above Chapter 4.3) and frequency of sampling for use in the baseline period was determined in the Ministerial Conditions. While these conditions are assumed as the basis for continued use, some discussion of elements of the high-intensity, low-intensity, farm and reference bores is warranted.

High-intensity, low-intensity and farm bores defined by the conditions are primarily used to assess and monitor the impact of development and assist in its management (Figure 2.1). Apart from farm bores, which are to be constructed on-farm by the proponent prior to irrigation (not required to be assessed as part of the baseline monitoring), high-intensity and low-intensity bores are either located immediately adjacent to land to be irrigated or in the areas likely to affected (as determined by the groundwater model).

During the baseline period, all high-intensity and low-intensity bores were monitored at the same frequency for all analytes. For high-intensity bores, the baseline data indicates little change in major ion chemistry and metals or metalloids (from ORIA) but a probable increase in nutrients and farm chemicals. Therefore, for future monitoring we recommend the high-intensity bores are sampled annually for nutrients (total phosphorus, total nitrogen) and farm chemicals because these substances are most likely to increase with agriculture. We recommend the sampling for major ion chemistry and metals or metalloids as well as nutrient speciation is reduced to a triennial basis. All chemical sampling should be conducted towards the end of the dry season. This proposed chemical sampling is consistent with the risk assessment (low and long-term) in Chapter 4.1.

For low-intensity bores (Condition 12Bii) there was no requirement for major ions and metals/metalloids to be analysed and, as detailed above, we recommend these are only monitored if there is breach of trigger conditions. For nutrients and pesticides or herbicides, we recommend triennial measurement. This is consistent with the requirement for seasonal measurement at high-intensity bores being able to detect any changes in groundwater quality to trigger management responses and the conclusion of low and long-term risk to the Keep River (Chapter 4.1).

For farm bores, EPBC conditions (12C, D) determine that only EC and pH are required seasonally. In addition, the condition requests consultation with the IRG to determine parameters for ongoing monitoring. Baseline data suggests water levels should be measured seasonally and field measurements, such as EC, pH, chloride using an ion selective electrode and ORP, should be measured annually. Additionally, farm bores should be sampled triennially for key nutrients and farm chemicals (Table 4.2). Sampling would increase in intensity and include other analytes if any of the triggers identified in the management plans are exceeded or there was a breach of conditions.

Reference bores

Reference bores established under conditions 12I and 12J are currently only required to be monitored for EC, pH and water levels. While these bores were sampled for all parameters during the baseline period, there was no requirement specified for chemical hazards such as metals or metalloids, nutrients and pesticides or herbicides. As a result, without monitoring and/or change to this condition, these bores cannot be used for direct comparison with bores in the farmlands. It is recommended that the reference bores should be monitored for the same parameters as high-intensity bores, with water levels being logged and analysed seasonally for farm chemicals and nutrients.

Sentinel site

As a means of verifying the risk assessment and travel times for any contaminant to the Keep River, we recommend bore RN029660, located in the palaeochannel down gradient (about 5km) from the proposed farmlands, be used to detect threats to the Keep River. The chemistry analysis at this bore should be done seasonally as per Appendix B, which is more comprehensive than currently stipulated (Table 4.2), as well as for farm chemicals. The proposed analyses would detect any increases in potential contaminants from the farmlands and be used to establish the velocity of any plume.

Dewatering bores

A monitoring regime for the dewatering bores, has not been stipulated in the EPBC conditions (e.g. Condition 12H) or groundwater management plan. If dewatering bores are installed and operated then we recommend they have baseline chemistry data monitored over the same period as the bores used in the baseline analysis described here (about 18 months). When operating, groundwater discharge to the M2 supply channel should be continuously monitored for EC and chloride with loggers linked to the irrigation monitoring network plus monthly sampling of predetermined chemical hazards as per Table 4.2.

Summary of discussion on baseline and future monitoring

- Data collected in May and November 2014 could be included in the baseline dataset, given that irrigation had not yet started over this time.
- High-intensity bores should maintain seasonal monitoring for field parameters; agricultural chemical hazards (total nitrogen, total phosphorus and farm chemicals) should be monitored annually; and the frequency of monitoring general chemistry, major ions and metals/metalloids should be reduced to a triennial basis (Table 4.2).
- Low-intensity bores should be monitored seasonally for water levels and annually for field parameters. Nutrients (total nitrogen, total phosphorus) and farm chemicals should be analysed on a triennial basis (Table 4.2).
- Farm bores should be monitored seasonally for water levels, annually for EC, pH, ORP and chloride, and triennially for total nitrogen, total phosphate and farm chemicals (Table 4.2). Risk-based analysis should be used to inform triennial monitoring of agricultural chemical hazards based on exceedance levels as defined in the GMP.
- Reference bores should be monitored under the same guidelines as high-intensity bores to provide a means of comparative analysis of future trends and responses.
- After irrigation starts, bore RN029660 — a high-intensity bore — can be used specifically to aid risk assessment of the Keep River and inform the various management plans. Therefore, it should be seasonally monitored, as per Appendix B, as well as for farm chemicals.
- If dewatering bores are installed, the chemistry should be monitored as per environmental requirements (Appendix B) and done so monthly for 18 months to inform management models. The groundwater discharge points into the M2 supply channel should be continuously monitored with loggers linked to the irrigation monitoring network for flow, EC and chloride plus monthly determined agricultural chemical hazards.

Table 4.2 Recommended analytes and frequency of groundwater monitoring after irrigation starts

Description	High-intensity bores*	Low-intensity bores	Farm bores†	Reference bores*	Pumped groundwater discharge‡
Field measurements					
EC, 25°C	Seasonal	Annual	Annual	Seasonal	Continuous
pH	Seasonal	Annual	Annual	Seasonal	Monthly
Chloride mg/L (ion selective electrode)	Seasonal	Annual	Annual	Seasonal	Monthly
ORP as standard hydrogen electrode	Seasonal	Annual	Annual	Seasonal	Monthly
Alkalinity (as $CaCO_3$ mg/L)	Seasonal			Seasonal	Monthly
Acidity (as $CaCO_3$ mg/L)	Seasonal			Seasonal	Monthly
Water level	Loggers	Seasonal	Seasonal	Loggers	Continuous (flow rate)
Laboratory measurements					
Aluminium	Triennial			Triennial	Annual
Alkalinity, total (as $CaCO_3$ mg/L)	Triennial			Triennial	Annual
Arsenic	Triennial			Triennial	Annual
Boron	Triennial			Triennial	Annual
Beryllium	Triennial			Triennial	Annual
Calcium	Triennial			Triennial	Annual
Cadmium	Triennial			Triennial	Annual
Chloride	Triennial			Triennial	Annual
Cobalt	Triennial			Triennial	Annual
Carbonate	Triennial			Triennial	Annual
Chromium	Triennial			Triennial	Annual
Copper	Triennial			Triennial	Annual
EC, 25°C	Seasonal			Seasonal	Monthly
Fluoride	Triennial			Triennial	Annual
Iron	Triennial			Triennial	Annual
Hardness, total (as $CaCO_3$ mg/L)	Triennial			Triennial	Annual
Bicarbonate	Triennial			Triennial	Annual
Mercury	Triennial			Triennial	Annual
Potassium	Triennial			Triennial	Annual
Lithium	Triennial			Triennial	Annual

Description	High-intensity bores*	Low-intensity bores	Farm bores†	Reference bores*	Pumped groundwater discharge‡
Magnesium	Triennial			Triennial	Annual
Manganese	Triennial			Triennial	Annual
Molybdenum	Triennial			Triennial	Annual
Sodium	Triennial			Triennial	Annual
Nickel	Triennial			Triennial	Annual
Nitrogen, total	Annual	Triennial	Triennial	Annual	Monthly
Nitrogen – ammonia	Triennial			Triennial	Monthly
Nitrogen – oxidised nitrogen	Triennial			Triennial	Monthly
Nitrogen – total organic	Triennial			Triennial	Annual
Lead	Triennial			Triennial	Annual
pH	Triennial			Triennial	Annual
Phosphorus, persulphate total	Annual	Triennial	Triennial	Annual	Monthly
Phosphorus, soluble reactive	Triennial			Triennial	
Selenium	Triennial			Triennial	Annual
Silicon	Triennial			Triennial	Annual
Sulfate, sulfur expressed as sulfate	Triennial			Triennial	Annual
TDS	Triennial			Triennial	Annual
Uranium	Triennial			Triennial	Annual
Vanadium	Triennial			Triennial	Annual
Zinc	Triennial			Triennial	Annual
Selected farm chemical hazards	Annual	Triennial	Triennial	Annual	Monthly

* High-intensity monitoring bores and reference bores are to be monitored at the same frequency and for the same suite of analytes.

† Monitoring of farm bores is as specified in the EPBC conditions, with sampling for specified farm chemicals and nutrients as defined in the groundwater management plan for breach of conditions.

‡ Production bores are to be monitored for chemistry during use as per monthly for 18 months after installation and their frequency reviewed thereafter.

Appendices

A Groundwater sites sampled

B Analytical methods and detection limits

C Mean concentration of groundwater chemistry for individual bores

D Summary statistics of field measurements

E Summary statistics of groundwater chemistry

F Suitability of groundwater for irrigation

G Salinity processes

Appendix A Groundwater sampling sites

Table A1 Location and site characteristics of the groundwater sampling sites

Sampling site	Monitoring bore category	Easting	Northing	Depth drilled (m)	Screened interval (mBGL)	TDS (mg/L)	Water type (dominant ions)	Aquifer screened	Basement geology
10WP31	Low	486515	8289746	23.2	16.8–22.8	230	Mg-Ca-Na-HCO_3-Cl	clayey sands/sands/gravels	Proterozoic Pincombe Formation (siltstone, shale)
10WP32	Low	486513	8290520	24.5	17.4–23.4	960	Na-Mg-HCO_3-Cl	sand/silty sand/gravel	Proterozoic Pincombe Formation (siltstone, shale)
10WP32PB	Low	486513	8290535	23	9.5–21.5	820	Na-Mg-HCO_3-Cl	poorly sorted sands/sands and gravels	Proterozoic Pincombe Formation (siltstone, shale)
10WP33	High	486515	8290136	31.7	19.5–28.5	760	Na-Mg-HCO_3-Cl	coarse sand and medium gravel	Proterozoic Pincombe Formation (siltstone, shale)
10WP35N	Low	481886	8288653	18	12.1–18.1	700	Na-HCO_3	coarse sands and gravels	Proterozoic Pincombe Formation (siltstone, shale)
10WP35PB	Low	481888	8288569	35	9.4–27.4	930	Na-Mg-HCO_3-Cl	coarse sands and gravels above siltstone	Proterozoic Pincombe Formation (siltstone, shale)
10WP35S	Low	481887	8288527	29.5	16.8–25.8	850	Na-Mg-HCO_3-Cl	coarse and fine sands with some medium gravels	Proterozoic Pincombe Formation (siltstone, shale)
10WP36N	Low	481886	8289636	35.6	14.2–26.2	700	Na-Mg-HCO_3-Cl	coarse sand and gravels	Proterozoic Pincombe Formation (siltstone, shale)
10WP36PB	Low	481886	8289596	29	14.4–20.4	700	Na-HCO_3	coarse sand and gravels	Proterozoic Pincombe Formation (siltstone, shale)
10WP36S	Low	481886	8289517	18	12.1–18.1	880	Na-HCO_3	coarse sand and gravels	Proterozoic Pincombe Formation (siltstone, shale)
10WP37	High	481886	8289027	18	10.2–16.2	1 150	Na-Mg-HCO_3-Cl	sand (coarse to fine) and gravels	Proterozoic Pincombe Formation (siltstone, shale)
10WP39	High	486098	8295716	33	6.1–18.1	710	Ca-Na-HCO_3-SO_4-Cl	clay, sand, some gravels and calcarenite	Carboniferous Burvill Beds (sandstone, shale, limestone)
10WP40	Low	481573	8295995	7.3	4.1– 7.1	4 050	Na-SO_4-Cl	clay and sands (with quartzite as base)	Late Devonian Ningbing Limestone

Sampling site	Monitoring bore category	Easting	Northing	Depth drilled (m)	Screened interval (mBGL)	TDS (mg/L)	Water type (dominant ions)	Aquifer screened	Basement geology
10WP41	Low	483698	8295562	7.3	3.2–6.2	15 420	Na-Mg-Cl-SO_4	clay and fine sand (calcareous)	Carboniferous Milligans Beds (silty shale)
10WP42	Low	487500	8295383	35	15.3–20.3, 26.3–32.3	1 430	Na-Ca-Cl-SO_4-HCO_3	clay sand & gravels	Carboniferous Milligans Beds (silty shale)
10WP44	Low	490993	8289155	15.7	12.7-15.7	18 990	Na-Mg-Cl-HCO_3	clay sand	Cambrian Antrim volcanics (basalt)
10WP46	Low	486609	8295880	36	12.6–28.6	1 440	Na-Ca-Cl-SO_4-HCO_3	sand (fine to coarse)/sandy clay (calcareous)	Burvill Beds (sandstone, shale, limestone) Early Carboniferous
10WP47	Low	488298	8295577	36	28–34	350	Ca-Na-HCO_3-Cl	sandy clay/coarse sand (calcareous)	Carboniferous Milligans Beds (silty shale)
11CS10RD	High	481633	8286944	20	17.3–20.3	1 530	Na-Mg-Ca-Cl-HCO_3	gravels	Proterozoic Pincombe Formation (siltstone, shale)
11CS10RS	High	481633	8286944	10	7.1–10.1	4 460	Na-Cl-HCO_3	silty clay	Proterozoic Pincombe Formation (siltstone, shale)
11WP11RD	High	489177	8290712	24.5	19.6–22.6	540	Na-Mg-HCO_3-Cl	sand/gravels	Cambrian Antrim volcanics (basalt)
11WP11RS	High	489177	8290712	15	11.1–14.1	610	Na-HCO_3	silty clay (calcareous)	Cambrian Antrim volcanics (basalt)
11WP15R	High	493196	8295657	30	26.8–29.8	5 100	Na-Cl-SO_4-HCO_3	coarse sand/gravels	Late Devonian Hargreaves member (sandstone, marl, dolomite) Cockatoo Formation
11WP16R	Low	483253	8291803	14.5	11.6–14.6	9 130	Na-Mg-Cl-SO_4	silty clay (calcareous)	Late Devonian Cockatoo Formation (undifferentiated)
11WP43D	High	489292	8287719	21	17.7–20.7	9 570	Mg-Na-Cl	siltstone	Proterozoic Pincombe Formation (siltstone, shale)
11WP4R	Low	479412	8286267	24	20.8–23.8	900	Na-Mg-Ca-Cl-HCO_3	silty clay/gravels	Proterozoic King Leopold Sandstone
11WP50	Low	479695	8291619	19	11.8–14.8	17 160	Na-Mg-Cl-SO_4	silty clay	Carlton Group, predominantly silt sandstones
11WP51D	High	488354	8294621	33	24.8–27.8	430	Na-Ca-Mg-HCO_3-SO_4	sandy clay	Carboniferous Milligans Beds (silty shale)
11WP51S	High	488354	8294621	15	12.5–15.5	540	Na-Ca-Mg-HCO_3	sandy clay	Carboniferous Milligans Beds (silty

Sampling site	Monitoring bore category	Easting	Northing	Depth drilled (m)	Screened interval (mBGL)	TDS (mg/L)	Water type (dominant ions)	Aquifer screened	Basement geology
									shale)
11WP52D	High	492473	8291543	28.5	19.7–25.7	470	Na-Mg-HCO_3-Cl	sands, minor gravels	Proterozoic Pincombe Formation (siltstone, shale)
11WP53D	Low	491839	8294861	24.5	19.6–22.6	5 070	Na-Cl-HCO_3-SO_4	coarse sands/gravels	Cambrian Antrim volcanics (basalt)
11WP53S	Low	491839	8294861	19.2	15.6–18.6	5 540	Na-Cl-HCO_3-SO_4	clayey sands	Cambrian Antrim volcanics (basalt)
11WP54D	Low	491750	8296530	35.2	29.3–32.3	19 190	Na-Mg-Cl-SO_4	coarse sands/gravels	Carboniferous Milligans Beds (silty shale)
11WP54S	Low	491750	8296530	17.2	13.7–16.7	12 610	Na-Cl-SO_4	sand/sandy clay	Carboniferous Milligans Beds (silty shale)
11WP55	Low	495920	8295930	22	17.6–20.6	2 560	Na-Cl-HCO_3	clay	Carboniferous Milligans Beds (silty shale)
11WP56D	High	506320	8296634	22.5	19.1–22.1	40	Na-Ca-Cl-HCO_3	gravels/sands	Undifferentiated sandstone – Carboniferous, Cambrian, or Proterozoic
11WP56S	Low	506320	8296634	9.3	5.0–9.0	450	Na-Ca-Mg-HCO_3-SO_4-Cl	clayey sand	Undifferentiated sandstone – Carboniferous, Cambrian, or Proterozoic
11WP57	High	495920	8297000	22.5	17.7–20.7	11 090	Na-Ca-Cl	sandy gravels	Milligans beds (silty shale) Early Carboniferous
11WP9RPB	Low	491840	8293345	33.5	20.5–26.5	1 090	Na-HCO_3-Cl	coarse sands and gravels	Cambrian Antrim volcanics (basalt)
11WP9RS	High	491840	8293345	20.6	16.6–19.6	1 080	Na-HCO_3-Cl	gravels and sands	Cambrian Antrim volcanics (basalt)
CG1	Reference High	475842	8277312	38	29.3–35.3	3 870	Na-Mg-Cl-HCO_3-SO_4	sand/gravels	Proterozoic Wyndham Shale
CG2	Reference High	476802	8278290	30	19.0-–25.0	530	Na-Ca-Mg-HCO_3-Cl	clayey sands/sand to gravels	Proterozoic Wyndham Shale
CG4	High	481824	8284010	37	29.4–35.4	2 010	Na-Mg-Cl-HCO_3	sand and gravel	Proterozoic Wyndham Shale
KC13	Reference High	495809	8277098	30	24.0–30.0	660	Na-Mg-Ca-HCO_3-SO_4	limestone to limey sandstone	Carboniferous Burt Range Formation (limestone)
KC14	Reference Low	497959	8278736	32	26.0–32.0	14 270	Na-Mg-Cl-SO_4	clay/mudstone/shale	Carboniferous Milligans Beds (silty

Sampling site	Monitoring bore category	Easting	Northing	Depth drilled (m)	Screened interval (mBGL)	TDS (mg/L)	Water type (dominant ions)	Aquifer screened	Basement geology
									shale)
KC3	Reference Low	498123	8284349	30	18.0–24.0	140	Mg-Na-Ca-HCO_3-Cl-SO_4	silty clay/sandy clay	Carboniferous Septimus limestone
KC3A	Reference Low	498123	8284351	36	25.2–31.2	270	Mg-Na-Ca-SO_4-Cl-HCO_3	sand/clay/gravel	Carboniferous Septimus limestone
KC3PB	Reference High	498133	8284345	32.7	26.0–32.0	260	Mg-Na-Ca-SO_4-Cl-HCO_3	sand/clay/gravel	Carboniferous Septimus limestone
KCF1	Reference Low	500051	8276746	28.5	21.0–27.0	3 520	Na-Mg-SO_4-HCO_3-Cl	sand/clay	Cambrian Pretlove sandstone
LIMESTONE	High	483441	8297674	ND	ND	310	Ca-Na-HCO_3-Cl	ND	Carboniferous Milligans Beds (silty shale)
RN029659	Low	503209	8295952	39.7	33.0–37.1	2 240	Na-Mg-Cl	sands/gravel	Carboniferous Milligans Beds (silty shale)
RN029660	High	500048	8295266	29.7	19.4–23.4	1 020	Na-HCO_3-Cl	clay/sand/gravel	Carboniferous Milligans Beds (silty shale)
W2R	Low	484778	8296460	18	12.0–18.0	270	Ca-HCO_3	sand/clay	Carboniferous Milligans Beds (silty shale)
WP13	High	484628	8295088	18	12.0–18.0	590	Ca-Na-HCO_3-Cl-SO_4	limestone/sandstone/siltstone	Carboniferous Burt Range Formation (limestone)
WP19	Low	494914	8298225	37.5	29.3–35.3	20 510	Na-Mg-Cl-SO_4	sand/gravel	Carboniferous Milligans Beds (silty shale)
WP5	High	478568	8291625	24	18.0–24.0	3 440	Mg-Na-Cl-HCO_3-SO_4	basalt	Carlton Group – predominantly silt sandstones/Antrim volcanics (basalt)

ND No data

Appendix B Analytical methods and detection limits

Table B1 Analytical methods and detection limits for groundwater samples sent for laboratory measurements

Analyte	Method description	Limit of reporting	Unit
Acidity		2	mg/L $CaCO_3$
Silver	Coupled mass spectroscopy	0.0001	mg/L
Ion balance	Calculated	-50	%
Aluminium	Inductively coupled plasma atomic emission spectroscopy	0.005	mg/L
Alkalinity, total	Titration	1	mg/L $CaCO_3$
Arsenic	Coupled mass spectroscopy	0.001	mg/L
Atrazine	Liquid chromatography	0.2 or 0.1	µg/L
Boron	Inductively coupled plasma atomic emission spectroscopy	0.02	mg/L
Barium	Inductively coupled plasma atomic emission spectroscopy	0.002	mg/L
Beryllium	Coupled mass spectroscopy	0.0001	mg/L
Bismuth	Coupled mass spectroscopy	0.0001	mg/L
Bromide	Inductively coupled plasma atomic emission spectroscopy	0.02	mg/L
Calcium	Inductively coupled plasma atomic emission spectroscopy	0.1	mg/L
Cadmium	Coupled mass spectroscopy	0.0001	mg/L
Chloride	Colorimetric reaction and discrete analyser	1	mg/L
Cobalt	Inductively coupled plasma atomic emission spectroscopy	0.005	mg/L
Carbonate	Titration	1	mg/L
Chromium	Coupled mass spectroscopy	0.0005	mg/L
Chromium	Inductively coupled plasma atomic emission spectroscopy	0.001	mg/L
Copper	Inductively coupled plasma atomic emission spectroscopy	0.002	mg/L
Dissolved organic carbon	Colorimetry	1	mg/L
Electrical conductivity	Electronic probe, measured at 25°C	0.2	mS/m
Fluoride	Selective electricity probe	0.05	mg/L
Iron	Inductively coupled plasma atomic emission spectroscopy	0.005	mg/L
Gallium	Coupled mass spectroscopy	0.0001	mg/L
Hardness, total	Calculated from calcium and magnesium	1	mg/L $CaCO_3$
Bicarbonate	Titration	1	mg/L
Mercury	Vapour generation and spectroscopy	0.0001	mg/L
Mercury	Coupled mass spectroscopy	0.0001	mg/L
Potassium	Inductively coupled plasma atomic emission spectroscopy	0.1	mg/L
Lanthanum	Inductively coupled plasma atomic emission spectroscopy	0.005	mg/L
Lithium	Inductively coupled plasma atomic emission spectroscopy	0.005	mg/L
Magnesium	Inductively coupled plasma atomic emission spectroscopy	0.1	mg/L

Analyte	Method description	Limit of reporting	Unit
Manganese	Inductively coupled plasma atomic emission spectroscopy	0.001	mg/L
Molybdenum	Coupled mass spectroscopy	0.001	mg/L
Nitrogen, ammonia fraction	Colorimetric reaction and automated flow injection analysis colorimeter	0.01	mg/L
Nitrogen, nitrite fraction	Colorimetric reaction and automated flow injection analysis colorimeter	0.01	mg/L
Nitrogen, nitrate fraction	Cadmium reduction, colorimetric reaction and automated flow injection analysis colorimeter	0.01	mg/L
Nitrogen, total oxidised	Calculation: nitrite + nitrate	0.01	mg/L
Nitrogen, total	Persulphate digestion, cadmium reduction, colorimetric reaction and automated flow injection analysis colorimeter	0.02	mg/L
Sodium	Inductively coupled plasma atomic emission spectroscopy	0.1	mg/L
Nickel	Inductively coupled plasma atomic emission spectroscopy	0.001	mg/L
Phosphorus, soluble reactive	Phosphorus from phosphate by colorimetric reaction and automated flow injection analysis colorimeter	0.01	mg/L
Phosphorus, total	Persulphate digestion, colorimetric reaction and automated flow injection analysis colorimeter	0.01	mg/L
Lead	Inductively coupled plasma atomic emission spectroscopy	0.02	mg/L
Lead	Coupled mass spectroscopy	0.0001	mg/L
pH	Electronic probe	0.1	
Antimony	Coupled mass spectroscopy	0.0001	mg/L
Selenium	Coupled mass spectroscopy	0.001	mg/L
Silicon	Inductively coupled plasma atomic emission spectroscopy	0.05	mg/L
Tin	Coupled mass spectroscopy	0.0001	mg/L
Tin	Inductively coupled plasma atomic emission spectroscopy	0.02	mg/L
Sulfate	Inductively coupled plasma atomic emission spectroscopy	0.1	mg/L
TDS by analysis	Dry mass of evaporated filtrate	10	mg/L
TDS by summation	Summation	1	mg/L
Titanium	Coupled mass spectroscopy	0.0005	mg/L
Thallium	Coupled mass spectroscopy	0.0001	mg/L
Uranium	Coupled mass spectroscopy	0.0001	mg/L
Vanadium	Coupled mass spectroscopy	0.0001	mg/L
Vanadium	Inductively coupled plasma atomic emission spectroscopy	0.005	mg/L
Zinc	Coupled mass spectroscopy	0.001	mg/L
Zinc	Inductively coupled plasma atomic emission spectroscopy	0.005	mg/L

Appendix C Mean concentration of groundwater chemistry for individual bores

Table C1 Mean concentrations of analytes for bores 10WP31 to 10WP43

Analyte	10WP31	10WP32	10WP32PB	10WP33	10WP35N	10WP35PB	10WP35S	10WP36N	10WP36PB	10WP36S	10WP37	10WP38	10WP39	10WP40	10WP41	10WP42	10WP43
Acidity (mg/L $CaCO_3$)	14	16	14	17	15	19	18	10	12	11	17	18	9	22	38	12	32
Silver (µg/L)	0.4	0.7	0.4	0.8	<0.1	0.4	0.1	<0.1	<0.1	<0.1	<0.1	0.4	0.6	0.3	18.0	0.4	<0.5
Aluminium (µg/L)	14	9	38	44	20	22	17	22	14	23	28	10	16	20	21	43	20
Alkalinity (mg/L $CaCO_3$)	150	407	411	326	538	612	585	518	513	604	664	376	238	645	508	331	290
Arsenic (µg/L)	<1	1.2	1.2	<1	1.3	<1	2.0	4.3	4.2	8.9	1.3	<1	6.9	6.0	2.0	2.1	<5
Atrazine (µg/L)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Boron (µg/L)	33	104	99	73	357	278	293	426	559	896	489	756	157	933	2071	249	210
Barium (µg/L)	31	60	37	47	40	123	91	23	31	27	52	32	30	79	76	43	290
Beryllium (µg/L)	<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
Bismuth (µg/L)	<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
Bromine (µg/L)	152	754	570	608	253	448	394	316	346	434	596	1 382	388	2 040	20750	910	12 000
Calcium (mg/L)	26	53	45	53	24	59	49	39	32	30	44	160	90	130	629	95	745
Cadmium (µg/L)	<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	0.2	<0.1	<0.1	<0.1
Chloride (mg/L)	42	251	203	205	61	138	116	86	74	102	210	722	123	845	6616	341	5 930
Cobalt (µg/L)	0.8	<0.1	<0.1	0.1	0.1	0.1	0.4	0.1	0.1	<0.1	0.1	1.2	<0.1	3.9	6.7	0.1	21.0
Carbonate (mg/L)	<1	<1	24	<1	<1	<1	<1	<1	44	<1	<1	<1	<1	<1	<1	<1	<1
Chromium (µg/L)	2.7	3.0	1.7	1.5	23.0	1.0	6.8	3.6	0.7	6.5	9.0	3.9	<1	22.0	15.0	<1	<1
Copper (µg/L)	2.2	1.4	1.6	1.2	0.7	0.9	1.1	1.1	0.8	0.5	0.9	1.6	0.3	1.7	5.0	1.1	2.5
Dissolved organic carbon (mg/L)						110.0			4.3						2.6		

Analyte	10WP31	10WP32	10WP32PB	10WP33	10WP35N	10WP35PB	10WP35S	10WP36N	10WP36PB	10WP36S	10WP37	10WP38	10WP39	10WP40	10WP41	10WP42	10WP43
Electrical conductivity (mS/m)	43	168	151	138	120	160	147	128	123	148	198	461	117	590	2211	227	1 710
Fluoride (µg/L)	192	540	536	318	1180	415	498	1260	1100	1480	1040	1184	403	784	322	464	650
Iron (µg/L)	11	7	150	11	12	8	9	15	6	15	14	236	11	101	88	36	1 300
Gallium (µg/L)	<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	<0.5	<0.1	0.5
Hardness (mg/L $CaCO_3$)	163	408	389	360	289	470	442	360	280	320	472	868	330	960	3969	456	7 700
Bicarbonate (mg/L)	176	453	418	380	529	659	588	502	533	603	660	544	300	697	1264	416	354
Mercury (µg/L)	<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	<0.5	<0.1	<0.5
Potassium (mg/L)	3	4	3	4	2	3	3	2	2	2	3	17	22	17	36	21	13
Lanthanum (µg/L)	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	1.0	<5	<5
Lithium (µg/L)	2	3	2	3	2	3	3	3	3	4	4	223	40	53	28	40	72
Magnesium (mg/L)	22	57	49	51	25	57	47	32	28	28	52	135	28	131	742	56	1 410
Manganese (µg/L)	22	5	22	5	33	18	99	31	10	13	14	117	9	1 077	991	14	4 200
Molybdenum (µg/L)	<1	1	2	<1	2	1	2	5	6	10	6	2	<1	6	<5	1	<5
Nitrogen, ammonia (µg/L)	40	23	37	50	77	<10	10	145	<10	<10	243	292	25	272	110	13	530
Nitrogen, nitrite (µg/L)	<10	<10	<10	<10	<10	<10	<10	20	30	<10	20	<10	<10	<10	<10	<10	40
Nitrogen, nitrate (µg/L)	93	160	153	132	108	98	80	258	337	320	537	25	<10	190	20	40	320
Oxidised nitrogen (µg/L)	160	180	120	200	130	107	63	427	570	460	777	40	10	10	17	30	<10
Nitrogen, total (µg/L)	392	522	486	367	348	273	408	705	585	617	1 062	912	220	852	452	146	1 000
Sodium (mg/L)	22	216	184	149	232	215	225	182	193	297	325	710	95	1 095	3 710	301	1 080
Nickel (µg/L)	1	<1	2	2	2	2	3	1	<1	1	1	4	2	3	7	<1	11
Hydroxide (mg/L)	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1

Analyte	10WP31	10WP32	10WP32PB	10WP33	10WP35N	10WP35PB	10WP35S	10WP36N	10WP36PB	10WP36S	10WP37	10WP38	10WP39	10WP40	10WP41	10WP42	10WP43
Phosphorus, soluble reactive (µg/L)	64	67	66	57	123	69	73	207	180	199	109	13	14	50	10	21	<10
Phosphorus, total (µg/L)	85	88	71	71	132	94	94	208	210	243	128	111	84	87	17	26	<10
Lead (µg/L)	0.7	0.7	0.5	3.6	0.6	0.2	0.5	0.9	0.5	1.1	16.3	0.4	0.5	0.3	9.4	0.4	0.5
pH	7.2	7.7	7.7	7.5	7.8	7.6	7.6	7.8	8.0	7.9	7.7	7.5	7.6	7.6	7.4	7.6	7.1
Antimony (µg/L)	<0.1	0.3	0.1	0.1	0.2	<0.1	0.2	0.1	0.1	0.2	0.1	0.6	0.1	0.3	<0.5	0.1	<0.5
Selenium (µg/L)	<1	<1	4	3	<1	<1	<1	<1	<1	<1	6	<1	<1	<2	<5	1	<5
Silicon (mg/L)	36	36	33	32	27	29	26	35	35	39	32	14	34	35	16	37	10
Tin (µg/L)	0.4	0.2	0.1	20	20	0.1	20	20	20	20	20	20	20	0.3	20	0.1	20
Sulfate, sulfur (mg/L)	7	106	85	74	39	64	60	53	47	63	120	1 244	175	1 411	2 929	370	1 130
TDS by summation (mg/L)	217	946	826	737	707	897	850	707	687	881	1 143	3 043	679	3 857	14 571	1 371	10 000
Titanium (µg/L)	<2	<2	<2	<2	<2	<2	0.2	<2	<2	<2	<2	<2	0.1	<2	<2	<2	<2
Thallium (µg/L)	<0.1	0.5	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	0.1	<0.1	0.2	0.3	<0.2	1.4	0.3	<0.5
Uranium (µg/L)	0	3	4	4	15	25	22	5	5	6	18	3	1	13	81	9	10
Vanadium (µg/L)	15	45	63	20	36	22	16	48	41	124	34	8	12	22	8	13	<5
Zinc (µg/L)	13	10	39	13	9	12	16	11	10	13	9	30	17	16	50	14	24

Table C2 Mean concentrations of analytes for bores 10WP44 to 11WP53D

Analyte	10WP44	10WP46	10WP47	11CS10RD	11CS10RS	11WP11RD	11WP11RS	11WP15R	11WP16R	11WP43D	11WP4R	11WP50	11WP51D	11WP51S	11WP52D	11WP53D
Acidity (mg/L $CaCO_3$)	50	14	10	12	15	7	8	22	27	17	11	35	6	14	10	23
Silver (µg/L)	<0.5	0.7	0.1	1.2	0.9	0.1	0.1	0.3	0.6	<0.5	1.2	<0.5	0.1	<0.1	<0.1	0.4
Aluminium (µg/L)	17	42	26	19	14	15	77	20	15	21	33	22	16	32	13	37
Alkalinity (mg/L $CaCO_3$)	835	320	213	442	853	380	528	1 203	446	245	306	611	246	315	268	1 763
Arsenic (µg/L)	7.5	1.7	1.1	1.0	3.7	1.5	4.3	2.0	3.0	1.5	3.3	<5	4.2	3.0	1.0	7.3
Atrazine (µg/L)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Boron (µg/L)	413	223	73	105	805	95	168	517	330	143	125	558	92	142	40	718
Barium (µg/L)	116	21	134	114	88	71	42	53	48	283	198	39	64	142	98	35
Beryllium (µg/L)	<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
Bismuth (µg/L)	<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
Bromine (µg/L)	17 000	815	213	1 158	4 520	283	237	4 280	6 100	10 450	874	13 750	152	160	285	3 040
Calcium (mg/L)	929	114	61	112	123	29	11	37	465	639	88	641	50	45	27	14
Cadmium (µg/L)	<0.1	<0.1	<0.1	0.1	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	2.4	<0.1	<0.1	<0.1	<0.1	0.3
Chloride (mg/L)	7 758	327	45	474	1 801	79	57	1 588	2 960	5 330	329	5 555	46	53	97	1277
Cobalt (µg/L)	2.6	0.2	0.8	<0.1	1.5	<0.1	0.3	0.5	1.2	14.1	1.7	18.5	0.3	1.0	0.4	0.7
Carbonate (mg/L)	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Chromium (µg/L)	<1	<1	2.0	1.7	1.4	1.9	2.1	4.0	<1	<1	2.1	<1	1.0	<1	1.4	3.2
Copper (µg/L)	2.0	0.2	0.4	2.0	4.0	1.6	1.2	3.1	7.4	9.0	2.3	2.2	1.8	1.8	1.8	2.8
Dissolved organic carbon (mg/L)			1.4							4.9						

Analyte	10WP44	10WP46	10WP47	11CS10RD	11CS10RS	11WP11RD	11WP11RS	11WP15R	11WP16R	11WP43D	11WP4R	11WP50	11WP51D	11WP51S	11WP52D	11WP53D
Electrical conductivity (mS/m)	2 515	216	60	251	739	100	114	840	1 220	1 368	163	2 085	72	102	90	832
Fluoride (µg/L)	435	460	110	194	546	522	1 160	362	670	530	538	518	670	566	268	1 360
Iron (µg/L)	461	29	89	16	56	12	51	114	165	425	170	853	26	190	19	23
Gallium (µg/L)	0.7	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	0.6	0.2	0.7	<0.1	0.1	<0.1	<0.1
Hardness (mg/L $CaCO_3$)	4 217	518	218	613	756	289	277	803	2121	5 432	430	3 126	239	246	217	843
Bicarbonate (mg/L)	4 250	385	249	608	1191	371	468	1117	1440	1 117	392	3 094	269	362	283	1472
Mercury (µg/L)	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.3	<0.1	<0.1	<0.1	<0.1	<0.1	1.0
Potassium (mg/L)	19	24	9	5	1	2	1	6	4	13	7	12	18	22	3	6
Lanthanum (µg/L)	<5	<5	<5	0.1	0.2	<5	0.6	<5	<5	1.9	0.2	1.1	<5	0.1	<5	<5
Lithium (µg/L)	26	45	8	4	6	2	1	24	31	55	2	36	22	21	3	19
Magnesium (mg/L)	1 240	55	13	98	143	31	18	88	448	1 130	56	945	20	27	26	32
Manganese (µg/L)	6 550	42	212	5	275	7	26	143	424	3 475	1079	4 725	61	502	126	65
Molybdenum (µg/L)	5	1	<1	<1	16	2	2	5	<1	3	1	<1	2	6	1	39
Nitrogen, ammonia (µg/L)	12 700	50	38	50	170	<10	70	85	1836	398	1320	60	130	4114	50	140
Nitrogen, nitrite (µg/L)	<10	<10	<10	<10	<10	<10	20	20	<10	<10	10	<10	<10	<10	<10	<10
Nitrogen, nitrate (µg/L)	130	43	10	110	20	117	150	17	33	15	50	<10	10	10	67	40
Oxidised nitrogen (µg/L)	155	43	<10	150	<10	130	155	35	60	385	130	10	20	170	73	65
Nitrogen, total (µg/L)	17 475	236	189	487	392	318	533	290	2260	1 390	1873	538	438	3933	315	303
Sodium (mg/L)	3 523	275	40	270	1293	137	230	1730	1732	899	125	3 423	61	87	109	1915
Nickel (µg/L)	12	<1	<1	<1	2	2	3	<1	<1	8	5	10	<1	1	11	<1
Hydroxide (mg/L)	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1

Analyte	10WP44	10WP46	10WP47	11CS10RD	11CS10RS	11WP11RD	11WP11RS	11WP15R	11WP16R	11WP43D	11WP4R	11WP50	11WP51D	11WP51S	11WP52D	11WP53D
Phosphorus, soluble reactive (µg/L)	1 588	21	26	58	38	440	362	82	264	20	57	10	22	446	93	188
Phosphorus, total (µg/L)	1 720	25	31	66	58	686	572	105	271	42	76	18	32	417	133	240
Lead (µg/L)	0.6	0.4	0.4	1.0	1.8	0.3	0.4	1.1	1.3	1.4	1.1	0.9	1.5	15.4	0.4	0.6
pH	7.3	7.5	7.6	7.4	7.5	7.7	8.0	7.6	7.3	7.2	7.4	7.1	7.7	7.6	7.4	7.9
Antimony (µg/L)	0.4	0.1	0.1	<0.1	0.2	0.1	0.2	0.3	<0.1	0.6	0.5	0.6	0.3	0.4	0.1	0.4
Selenium (µg/L)	<1	<1	<1	2	<1	1	<1	5	<1	<1	<1	<1	<1	<1	1	7
Silicon (mg/L)	18	33	34	33	40	33	30	23	34	9	17	14	14	17	27	32
Tin (µg/L)	0.6	<20	<20	0.1	<20	<20	0.1	<20	<20	0.5	0.7	<20	0.2	0.2	<20	<20
Sulfate, sulfur (mg/L)	2 975	414	30	208	385	36	14	981	2658	887	56	4 725	75	85	42	942
TDS by summation (mg/L)	17 000	1400	329	1452	4200	547	647	5050	8183	9 225	855	15 750	420	502	468	5100
Titanium (µg/L)	<2	<2	<2	<2	<2	<2	2.8	<2	<2	27.0	0.7	<2	0.2	0.3	<2	1.1
Thallium(µg/L)	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.1	0.9	<0.2	<0.2	<0.2	2.0	0.2	0.1	<0.2	<0.2
Uranium (µg/L)	23	6	1	18	42	3	4	57	16	14	3	73	0	1	2	56
Vanadium (µg/L)	8	12	2	25	41	37	127	24	7	4	7	4	1	3	18	138
Zinc (µg/L)	12	15	14	14	16	9	10	18	18	28	23	69	10	31	10	13

Table C3 Mean concentrations of analytes for bores 11WP53S to KC3PB

Analyte	11WP53S	11WP54D	11WP54S	11WP55	11WP56D	11WP56S	11WP57	11WP9RPB	11WP9RS	CG1	CG2	CG4	KC13	KC14	KC3	KC3A	KC3PB
Acidity (mg/L $CaCO_3$)	18	35	22	22	11	6	27	10	14	25	10	14	8	27	7	12	13
Silver (µg/L)	1.1	2.1	1.7	<0.1	0.9	0.7	1.2	0.2	0.1	0.6	0.1	0.2	0.5	9.8	5.5	4.6	5.4
Aluminium (µg/L)	30	14	29	20	13	20	10	35	21	24	12	19	16	9	27	14	14
Alkalinity (mg/L $CaCO_3$)	1 903	682	1 200	437	31	296	380	517	464	737	331	412	315	306	45	28	29
Arsenic (µg/L)	7.5	1.0	3.0	34.2	<1	1.0	2.0	6.1	2.0	<2	1.0	1.0	3.4	<5	<1	<1	<1
Atrazine (µg/L)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Boron (µg/L)	842	760	978	440	62	80	1 110	170	168	187	66	125	93	672	40	38	42
Barium (µg/L)	49	37	43	77	40	62	94	50	55	75	69	157	59	32	65	86	87
Beryllium (µg/L)	<0.1	<0.5	<0.5	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.1	<0.1	<0.1
Bismuth (µg/L)	<0.1	<0.5	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.1	<0.1	<0.1
Bromine (µg/L)	3 400	16 600	10 940	2 600	122	225	14 600	602	598	2 475	233	1 633	356	17 000	154	250	262
Calcium (mg/L)	13	596	248	100	4	47	921	27	31	207	63	114	48	745	11	19	18
Cadmium (µg/L)	0.3	<0.5	0.8	0.1	<0.1	<0.1	0.4	<0.1	<0.1	<0.1	<0.2	0.1	0.1	0.3	0.4	1.1	0.4
Chloride (mg/L)	1 402	6 570	3 855	891	16	64	5 142	217	228	1 267	91	681	75	4 706	26	52	49
Cobalt (µg/L)	0.5	2.5	16.5	1.2	0.7	1.3	3.0	0.2	0.3	<0.2	<0.1	0.3	0.5	2.3	0.2	<0.1	0.2
Carbonate (mg/L)	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Chromium (µg/L)	2.2	4.0	7.5	4.0	<1	<1	0.5	2.1	1.5	4.8	1.7	1.0	1.0	2.0	0.8	1.0	3.6
Copper (µg/L)	0.6	12.2	4.3	0.6	1.8	1.2	15.9	2.6	0.6	2.1	0.7	1.7	0.5	1.6	0.8	1.8	1.4
Dissolved organic carbon (mg/L)												1.9					

Analyte	11WP53S	11WP54D	11WP54S	11WP55	11WP56D	11WP56S	11WP57	11WP9RPB	11WP9RS	CG1	CG2	CG4	KC13	KC14	KC3	KC3A	KC3PB
Electrical conductivity (mS/m)	898	2 425	1 682	408	9	78	1 598	182	181	606	92	324	104	1 752	24	45	43
Fluoride (µg/L)	1 320	338	272	270	<50	195	424	774	835	300	292	228	362	1 068	<50	<50	<50
Iron (µg/L)	36	28	89	670	11	35	207	26	13	17	7	334	378	131	22	8	24
Gallium (µg/L)	<0.2	<0.2	<0.5	0.3	<0.1	<0.1	0.4	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.5	<0.1	<0.1	<0.1
Hardness (mg/L $CaCO_3$)	912	3 500	2 057	464	35	332	2 898	301	314	1303	306	703	309	3 383	62	99	97
Bicarbonate (mg/L)	1 567	2 265	1 770	665	16	238	1 665	541	494	979	381	564	335	2 650	64	68	70
Mercury (µg/L)	<0.2	<0.2	<0.5	0.3	<0.1	<0.1	<0.5	0.3	0.1	<0.2	<0.1	<0.1	<0.1	<0.5	<0.1	<0.1	<0.1
Potassium (mg/L)	6	25	20	11	1	1	67	3	3	8	3	7	4	24	2	4	4
Lanthanum (µg/L)	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	0.1	0.1
Lithium (µg/L)	19	112	25	40	3	1	616	5	5	10	3	7	9	232	11	13	12
Magnesium (mg/L)	31	836	421	85	1	22	432	35	40	209	31	117	34	924	11	21	21
Manganese (µg/L)	143	507	1 310	3105	18	136	1 408	37	28	3	3	93	212	230	11	15	13
Molybdenum (µg/L)	40	<5	<5	11	<1	<1	12	4	2	<2	2	<1	5	<5	<1	<1	<1
Nitrogen, ammonia (µg/L)	140	30	233	574	55	<10	368	70	50	40	60	93	68	86	23	17	15
Nitrogen, nitrite (µg/L)	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Nitrogen, nitrate (µg/L)	20	<10	55	<10	113	10	<10	85	140	770	570	37	10	<10	190	157	147
Oxidised nitrogen (µg/L)	50	<10	35	20	93	60	<10	175	113	965	1 200	50	75	<10	240	180	167
Nitrogen, total (µg/L)	250	242	487	1142	552	103	635	543	440	1 213	1 192	677	170	404	362	325	243
Sodium (mg/L)	2 090	4 498	3 520	682	10	69	2 015	335	342	876	86	421	140	2 220	16	26	25
Nickel (µg/L)	<2	8	12	3	1	<1	4	1	<1	<2	<1	2	2	2	2	2	11

Analyte	11WP53S	11WP54D	11WP54S	11WP55	11WP56D	11WP56S	11WP57	11WP9RPB	11WP9RS	CG1	CG2	CG4	KC13	KC14	KC3	KC3A	KC3PB
Hydroxide (mg/L)	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Phosphorus, soluble reactive (µg/L)	175	32	57	22 333	30	57	72	1 800	434	57	50	35	20	15	13	17	10
Phosphorus, total (µg/L)	227	28	69	29 333	157	217	164	4 797	612	75	64	87	56	75	21	40	30
Lead (µg/L)	0.4	2.8	0.7	1.5	10.5	0.7	0.6	0.3	0.4	1.9	1.3	5.0	4.6	4.0	0.4	1.1	2.8
pH	8.0	7.1	7.4	7.1	6.1	7.1	7.1	7.7	7.7	7.5	7.8	7.6	7.6	7.1	6.7	6.3	6.1
Antimony (µg/L)	0.5	0.6	<0.5	0.7	0.3	0.4	<0.5	0.2	<0.1	<0.2	<0.2	0.3	1.3	<0.5	0.2	0.2	0.2
Selenium (µg/L)	6	7	5	<1	<1	<1	<5	4	5	37	2	1	<1	2	<1	<1	<1
Silicon (mg/L)	30	30	27	29	11	35	26	35	36	35	39	33	10	16	32	22	20
Tin (µg/L)	0.2	<20	0.5	0.3	<20	0.3	<20	<20	<20	<20	0.3	<20	<20	<20	<20	0.3	<20
Sulfate, sulfur (mg/L)	1 061	5 302	3 485	398	2	105	1 512	147	139	718	23	331	154	4 064	31	103	103
TDS by summation (mg/L)	5 583	17 667	12 083	2 367	55	477	10 167	1 044	1 074	3 733	498	1 900	640	13 000	126	243	240
Titanium (µg/L)	1.2	<2	<2	1.9	<2	0.5	<2	0.5	<2	<2	<2	<2	<2	<2	<2	0.3	<2
Thallium (µg/L)	<0.2	<0.5	<0.5	<0.1	<0.1	<0.1	1.2	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	2.2	<0.1	<0.1	0.1
Uranium (µg/L)	63	109	128	1	0	2	6	6	6	35	9	14	9	56	0	0	0
Vanadium (µg/L)	118	20	27	9	1	10	4	52	40	33	23	9	6	1	3	1	0
Zinc (µg/L)	17	28	49	15	21	61	22	16	9	24	18	25	21	31	20	27	19

Table C4 Mean concentrations of analytes for bores KCF1 to WP5

Analyte	KCF1	LIMESTONE	RN029659	RN029660	W2R	WP13	WP19	WP5
Acidity (mg/L $CaCO_3$)	19	10	10	9	9	5	28	27
Silver (µg/L)	2.2	<0.1	1.0	5.0	<0.1	1.4	<1	1.1
Aluminium (µg/L)	31	24	15	17	33	15	11	17
Alkalinity (mg/L $CaCO_3$)	715	163	273	450	160	193	447	541
Arsenic (µg/L)	1.5	5.2	<1	1.7	3.7	6.8	<10	1.7
Atrazine (µg/L)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Boron (µg/L)	222	97	278	327	75	103	928	319
Barium (µg/L)	38	174	34	49	232	62	25	37
Beryllium (µg/L)	1.8	<0.1	<0.1	<0.1	<0.1	<0.1	<1	<0.1
Bismuth (µg/L)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<1	<0.1
Bromine (µg/L)	2140	153	3 000	703	150	407	20 250	3 560
Calcium (mg/L)	110	58	96	29	58	95	823	241
Cadmium (µg/L)	0.3	<0.1	<0.1	0.1	<0.1	<0.1	0.5	0.2
Chloride (mg/L)	561	41	918	258	31	136	7 732	1 019
Cobalt (µg/L)	2.3	0.4	0.3	<0.1	1.3	<0.1	<1	0.5
Carbonate (mg/L)	<1	<1	14	<1	<1	<1	<1	<1
Chromium (µg/L)	0.8	<1	<1	3.0	0.6	<1	<1	<1
Copper (µg/L)	0.7	2.1	0.9	0.7	1.3	0.4	4.2	3.9
Dissolved organic carbon (mg/L)		1.9						
Electrical conductivity (mS/m)	480	60	379	174	45	99	2 566	476
Fluoride (µg/L)	398	197	158	1 500	105	185	165	936
Iron (µg/L)	360	197	533	13	105	11	14	20
Gallium (µg/L)	0.1	0.1	<0.1	<0.1	0.1	<0.1	<1	<0.1
Hardness (mg/L $CaCO_3$)	1095	189	616	264	173	295	3 729	1 783
Bicarbonate (mg/L)	976	193	423	493	196	260	2 776	1 090
Mercury (µg/L)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<1	<0.1
Potassium (mg/L)	12	12	10	9	6	15	29	4
Lanthanum (µg/L)	0.1	0.2	<5	<5	0.1	<5	<5	0.1
Lithium (µg/L)	22	14	40	30	7	25	92	25
Magnesium (mg/L)	229	9	115	33	7	22	946	390
Manganese (µg/L)	390	96	147	7	147	6	63	210
Molybdenum (µg/L)	1	1	<1	3	<1	<1	<10	2

Analyte	KCF1	LIMESTONE	RN029659	RN029660	W2R	WP13	WP19	WP5
Nitrogen, ammonia (µg/L)	30	3 820	30	30	575	<10	43	80
Nitrogen, nitrite (µg/L)	<10	<10	<10	<10	<10	<10	<10	<10
Nitrogen, nitrate (µg/L)	13	45	<10	390	<10	75	10	<10
Oxidised nitrogen (µg/L)	23	95	10	397	15	103	10	13
Nitrogen, total (µg/L)	113	25 350	532	740	618	312	486	260
Sodium (mg/L)	698	34	516	306	18	64	4 630	289
Nickel (µg/L)	2	<1	<1	<1	3	<1	<10	3
Hydroxide (mg/L)	<1	<1	<1	<1	<1	<1	<1	<1
Phosphorus, soluble reactive (µg/L)	18	350	15	57	30	10	34	20
Phosphorus, total (µg/L)	23	1165	21	66	47	20	64	20
Lead (µg/L)	2.2	2.6	0.4	2.0	0.5	0.9	1.6	0.6
pH	7.5	7.7	7.7	7.8	7.7	7.6	7.2	7.3
Antimony (µg/L)	0.2	0.2	0.2	0.2	0.1	0.3	<1	0.2
Selenium (µg/L)	6	<1	<1	<1	<1	<1	1	<1
Silicon (mg/L)	28	23	14	28	15	35	26	24
Tin (µg/L)	0.1	<20	<20	0.1	0.2	<20	<20	<20
Sulfate, sulfur (mg/L)	1320	40	328	86	27	103	4 686	844
TDS by summation (mg/L)	3267	317	2 147	977	243	546	19 000	3143
Titanium (µg/L)	<2	0.8	<2	<2	10.0	<2	<2	<2
Thallium (µg/L)	0.1	<0.1	<0.1	<0.1	<0.1	0.1	<1	<0.1
Uranium (µg/L)	25	1	6	3	0	1	45	9
Vanadium (µg/L)	10	3	2	46	1	6	11	7
Zinc (µg/L)	28	12	13	14	23	17	28	17

Appendix D Summary statistics of groundwater chemistry

Table D1 Concentration of acidity (mg/L $CaCO_3$)

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
10WP31	11.5	13.5	11.5	3	34	22.1	6	0
10WP32	17.0	15.8	5.8	5	21	20.3	6	0
10WP32PB	14.0	13.7	5.9	6	23	18.1	6	0
10WP33	16.5	17.3	8.4	8	30	24.4	6	0
10WP35N	15.5	14.7	6.8	5	22	21.3	6	0
10WP35PB	20.0	19.0	6.7	9	29	23.4	6	0
10WP35S	16.0	17.7	9.2	8	34	24.2	6	0
10WP36N	9.5	9.7	5.0	4	16	14.6	6	0
10WP36PB	8.0	10.3	8.1	1	22	19.2	6	17
10WP36S	10.5	11.0	5.6	5	17	17.0	6	0
10WP37	19.5	17.2	8.2	7	28	23.1	6	0
10WP39	8.0	9.3	2.2	8	13	11.6	6	0
10WP40	22.0	22.3	12.3	10	44	30.7	6	0
10WP41	34.0	37.7	18.8	16	70	53.2	6	0
10WP42	11.5	12.3	4.8	6	20	16.5	6	0
10WP44	44.5	49.5	35.9	13	96	84.3	4	0
10WP46	9.5	13.5	14.8	3	43	20.6	6	0
10WP47	9.0	10.0	4.5	6	17	14.2	6	0
11CS10RD	10.0	11.5	5.6	7	22	15.7	6	0
11CS10RS	14.5	15.2	8.8	4	26	24.6	6	0
11WP4R	6.5	10.7	8.4	5	26	18.3	6	0
11WP9RPB	10.0	10.3	6.6	3	22	15.7	7	0
11WP9RS	11.0	13.6	6.3	6	22	20.0	5	0
11WP11RD	6.0	6.8	3.1	4	11	10.3	6	0
11WP11RS	7.5	7.7	3.7	3	13	10.9	6	0
11WP15R	20.0	18.7	13.0	1	33	30.2	6	17
11WP16R	28.0	26.7	13.8	7	43	38.8	6	0
11WP43D	14.0	17.0	13.6	5	35	30.5	4	0
11WP50	34.5	35.0	18.1	14	57	51.9	4	0
11WP51D	4.5	5.7	3.4	3	12	8.5	6	0

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
11WP51S†	6.5	9.7	9.8	1	25	20.1	6	33
11WP52D	7.0	9.5	6.3	3	20	15.8	6	0
11WP53D	21.0	19.3	12.0	1	35	28.7	6	17
11WP53S	15.0	15.2	11.5	1	32	25.0	6	17
11WP54D	38.5	35.2	18.0	10	55	52.2	6	0
11WP54S	16.5	22.3	16.8	9	55	33.3	6	0
11WP55	20.5	22.0	9.6	11	39	29.2	6	0
11WP56D	9.5	10.7	8.7	3	25	17.3	6	0
11WP56S	6.0	6.3	1.5	5	8	7.8	3	0
11WP57	23.0	26.7	18.4	9	61	39.3	6	0
CG1	28.5	25.2	6.2	15	30	29.3	6	0
CG2	7.0	9.6	5.5	5	17	15.5	5	0
CG4	13.0	12.0	8.7	1	21	20.3	6	17
KC3	5.0	7.4	3.9	4	13	11.5	5	0
KC3A	10.5	12.2	9.5	3	24	22.6	6	0
KC3PB	13.0	12.8	8.9	4	28	18.9	6	0
KC13	5.5	6.5	4.3	1	13	10.9	6	17
KC14	30.0	27.4	13.4	10	46	38.5	5	0
KCF1	20.0	19.2	8.0	10	30	26.5	6	0
LIMESTONE	10.5	9.8	5.0	4	18	13.1	6	0
M1†	1.0	1.0	0.0	1	1	1.0	2	100
RN029659†	5.5	7.0	6.4	1	17	13.5	6	33
RN029660	8.0	8.7	4.9	4	14	14.0	6	0
W2R	8.5	8.0	5.3	1	16	11.8	6	17
WP5	28.0	26.7	12.3	8	39	37.6	6	0
WP13	4.0	5.4	3.0	3	10	8.5	5	0
WP19	29.0	28.3	14.7	12	43	41.5	4	0

† More than one-quarter of the samples are below the LOR

Table D2 Concentration of silver (µg/L)

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
10WP31†	0.05	0.11	0.14	0.05	0.40	0.16	6	83
10WP32†	0.05	0.16	0.27	0.05	0.70	0.25	6	83
10WP32PB†	0.05	0.11	0.14	0.05	0.40	0.16	6	83
10WP33†	0.05	0.18	0.31	0.05	0.80	0.28	6	83
10WP35N†	0.05	0.05	0.00	0.05	0.05	0.05	6	100
10WP35PB†	0.05	0.11	0.14	0.05	0.40	0.16	6	83
10WP35S†	0.05	0.06	0.02	0.05	0.10	0.07	6	83
10WP36N†	0.05	0.05	0.00	0.05	0.05	0.05	6	100
10WP36PB†	0.05	0.05	0.00	0.05	0.05	0.05	6	100
10WP36S†	0.05	0.05	0.00	0.05	0.05	0.05	6	100
10WP37†	0.05	0.05	0.00	0.05	0.05	0.05	6	100
10WP39†	0.05	0.14	0.22	0.05	0.60	0.22	6	83
10WP40†	0.10	0.12	0.09	0.05	0.30	0.16	6	83
10WP41†	0.25	3.21	7.25	0.25	18.00	5.58	6	83
10WP42†	0.05	0.11	0.14	0.05	0.40	0.16	6	83
10WP44†	0.25	0.25	0.00	0.25	0.25	0.25	4	100
10WP46†	0.05	0.19	0.26	0.05	0.70	0.39	6	83
10WP47†	0.05	0.06	0.02	0.05	0.10	0.07	6	83
11CS10†RD	0.05	0.43	0.87	0.05	2.20	0.80	6	67
11CS10†RS	0.10	0.23	0.33	0.05	0.90	0.34	6	83
11WP4R†	0.05	0.24	0.47	0.05	1.20	0.40	6	83
11WP9RP†B	0.05	0.09	0.07	0.05	0.20	0.20	7	71
11WP9RS†	0.05	0.06	0.02	0.05	0.10	0.08	5	80
11WP11RD†	0.05	0.06	0.02	0.05	0.10	0.07	6	83
11WP11RS	0.05	0.06	0.02	0.05	0.10	0.07	6	83
11WP15R†	0.10	0.13	0.08	0.10	0.30	0.16	6	83
11WP16R†	0.25	0.35	0.16	0.25	0.60	0.53	6	67
11WP43D†	0.18	0.23	0.20	0.05	0.50	0.43	4	100
11WP50†	0.25	0.25	0.00	0.25	0.25	0.25	4	100
11WP51D†	0.05	0.06	0.02	0.05	0.10	0.07	6	83
11WP51S†	0.05	0.06	0.02	0.05	0.10	0.07	6	100
11WP52D†	0.05	0.06	0.02	0.05	0.10	0.07	6	100

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
11WP53D†	0.10	0.15	0.12	0.10	0.40	0.19	6	83
11WP53S†	0.10	0.27	0.41	0.10	1.10	0.40	6	83
11WP54D†	0.25	0.87	1.22	0.25	3.30	1.62	6	67
11WP54S†	0.25	0.49	0.59	0.25	1.70	0.69	6	83
11WP55†	0.05	0.05	0.00	0.05	0.05	0.05	6	100
11WP56D†	0.05	0.19	0.35	0.05	0.90	0.31	6	83
11WP56S†	0.25	0.33	0.33	0.05	0.70	0.66	3	67
11WP57†	0.25	0.38	0.41	0.05	1.20	0.54	6	83
CG1†	0.10	0.25	0.28	0.10	0.80	0.45	6	67
CG2†	0.05	0.06	0.02	0.05	0.10	0.08	5	80
CG4†	0.05	0.08	0.06	0.05	0.20	0.10	6	83
KC3†	0.05	1.14	2.44	0.05	5.50	2.78	5	80
KC3A†	0.05	0.81	1.86	0.05	4.60	1.42	6	83
KC3PB†	0.05	0.94	2.18	0.05	5.40	1.66	6	83
KC13†	0.05	0.16	0.19	0.05	0.50	0.33	6	83
KC14††	0.25	2.12	4.29	0.05	9.80	5.03	5	80
CF1†	0.05	0.41	0.88	0.05	2.20	0.70	6	83
LIMESTONE†	0.05	0.05	0.00	0.05	0.05	0.05	6	100
M1†	0.05	0.05	0.00	0.05	0.05	0.05	2	100
RN029659†	0.05	0.21	0.39	0.05	1.00	0.34	6	83
RN029660†	0.05	0.88	2.02	0.05	5.00	1.54	6	83
W2R†	0.05	0.05	0.00	0.05	0.05	0.05	6	100
WP5†	0.05	0.23	0.43	0.05	1.10	0.40	6	83
WP13†	0.05	0.28	0.55	0.05	1.40	0.46	6	83
WP19†	0.50	0.44	0.13	0.25	0.50	0.50	4	100

† More than one-quarter of the samples are below the LOR

Table D3 Concentration of aluminium (µg/L)

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
10WP31	16.0	12.5	6.1	2.5	19	17.2	7	14
10WP32	7.0	7.6	4.6	2.5	17	9.8	7	14
10WP32PB†	6.0	22.8	43.1	2.5	120	23.7	7	43
10WP33†	15.0	26.1	42.2	2.5	120	31.8	7	43
10WP35N†	18.0	15.3	9.9	2.5	26	25.1	7	29
10WP35PB†	2.5	9.1	10.2	2.5	25	22.6	9	67
10WP35S†	12.0	10.6	8.0	2.5	20	18.2	7	43
10WP36N†	17.0	16.1	14.0	2.5	38	30.8	7	29
10WP36PB†	2.5	6.1	6.6	2.5	21	11.0	10	70
10WP36S†	18.0	17.0	11.5	2.5	31	30.1	7	29
10WP37	18.0	27.6	33.1	6.0	100	36.1	7	0
10WP39†	14.0	12.4	7.1	2.5	19	18.1	7	29
10WP40	20.0	19.7	6.6	7.0	26	25.1	7	0
10WP41	21.0	18.2	8.0	2.5	25	24.1	7	14
10WP42	16.0	37.4	67.6	2.5	190	35.2	7	14
10WP44	15.5	13.1	7.3	2.5	19	18.1	4	25
10WP46†	12.0	30.7	57.3	2.5	160	31.3	7	29
10WP47	17.0	26.4	37.2	6.0	110	27.2	7	0
11CS10RD†	10.5	13.2	12.2	2.5	35	23.1	6	33
11CS10RS	12.5	11.9	7.0	2.5	20	17.9	6	17
11WP4R	15.5	27.6	36.0	2.5	100	44.0	6	17
11WP9RPB†	15.0	26.0	42.1	2.5	120	29.1	7	29
11WP9RS	20.0	17.5	9.7	2.5	27	25.5	5	20
11WP11RD	13.5	12.6	6.7	2.5	21	18.2	6	17
11WP11RS	39.0	77.3	87.1	13.0	240	149.0	6	0
11WP15R†	14.0	14.2	11.4	2.5	26	26.0	6	33
11WP16R	13.0	12.8	7.9	2.5	22	19.9	6	17
11WP43D	21.0	21.3	6.7	15.0	28	27.4	4	0
11WP50	19.5	17.1	10.4	2.5	27	24.9	4	25
11WP51D	12.0	14.1	9.7	2.5	31	21.9	6	17
11WP51S	29.5	27.1	18.4	2.5	44	43.3	6	17
11WP52D	12.5	11.3	6.1	2.5	18	16.6	6	17

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
11WP53D†	30.5	25.5	18.9	2.5	46	42.5	6	33
11WP53S	36.0	29.7	16.2	9.0	48	41.7	6	0
11WP54D	12.0	11.9	7.3	2.5	22	18.5	6	17
11WP54S	30.5	28.5	16.2	6.0	47	43.5	6	0
11WP55	20.5	20.0	9.8	8.0	36	26.9	6	0
11WP56D	12.0	12.5	4.7	5.0	18	17.3	6	0
11WP56S	21.0	19.7	2.3	17.0	21	21.0	3	0
11WP57†	4.8	6.4	5.0	2.5	15	10.8	6	50
G1†	15.0	16.8	15.5	2.5	44	28.6	6	33
CG2†	10.0	8.4	5.8	2.5	16	13.5	5	40
CG4	15.0	16.4	10.3	2.5	34	23.5	6	17
KC3	18.0	27.0	17.7	13.0	55	44.5	5	0
KC3A†	12.5	10.0	6.0	2.5	16	14.6	6	33
KC3PB†	5.8	8.4	7.2	2.5	19	16.2	6	50
KC13†	12.5	11.5	7.7	2.5	20	19.3	6	33
KC14	6.0	9.0	4.1	6.0	14	13.5	5	0
KCF1	22.5	25.9	22.3	2.5	66	42.2	6	17
LIMESTONE	20.0	23.5	11.7	14.0	46	30.6	6	0
M1	15.0	16.0	5.6	11.0	22	21.3	3	0
RN029659†	8.3	8.9	7.2	2.5	18	15.2	6	50
RN029660	19.0	17.3	6.0	6.0	22	22.0	6	0
W2R	27.5	33.0	25.4	9.0	80	49.9	6	0
WP5†	8.0	10.6	8.8	2.5	21	21.0	7	43
WP13†	5.8	8.6	7.7	2.5	21	16.1	6	50
WP19†	6.0	7.6	5.8	2.5	16	13.5	5	40

† More than one-quarter of the samples are below the LOR

Table D4 Concentration of alkalinity (mg/L $CaCO_3$)

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
10WP31	150	150	6	140	156	156	7	0
10WP32	402	407	21	385	439	426	7	0
10WP32PB	403	411	31	375	475	417	7	0
10WP33	320	326	19	299	350	344	7	0
10WP35N	528	538	93	382	638	626	7	0
10WP35PB	620	612	55	530	682	661	9	0
10WP35S	580	585	65	499	662	640	7	0
10WP36N	529	518	29	481	561	538	7	0
10WP36PB	505	513	62	436	607	591	10	0
10WP36S	630	604	88	407	659	649	7	0
10WP37	697	664	54	590	721	706	7	0
10WP39	238	238	7	228	246	245	7	0
10WP40	655	645	76	550	780	686	7	0
10WP41	478	508	97	390	657	587	7	0
10WP42	333	331	27	285	358	355	7	0
10WP44	819	835	267	573	1130	1088	4	0
10WP46	285	320	97	276	540	320	7	0
10WP47	217	213	28	163	250	237	7	0
11CS10RD	457	442	42	368	478	475	6	0
11CS10RS	770	853	207	683	1230	1035	6	0
11WP4R	300	306	43	260	377	344	6	0
11WP9RPB	559	517	124	238	587	572	7	0
11WP9RS	555	464	147	278	581	578	5	0
11WP11RD	378	380	11	365	395	392	6	0
11WP11RS	539	528	29	471	553	546	6	0
11WP15R	1190	1203	22	1190	1240	1226	6	0
11WP16R	424	446	66	385	529	523	6	0
11WP43D	232	245	140	105	411	380	4	0
11WP50	614	611	9	598	619	618	4	0
11WP51D	247	246	9	235	258	252	6	0
11WP51S	395	315	140	99	414	413	6	0
11WP52D	277	268	40	192	303	297	6	0

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
11WP53D	1785	1763	59	1670	1810	1810	6	0
11WP53S	1910	1903	91	1760	2020	1978	6	0
11WP54D	678	682	25	655	715	711	6	0
11WP54S	1215	1200	85	1070	1300	1272	6	0
11WP55	543	437	227	26	605	592	6	0
11WP56D	14	31	43	7	117	52	6	0
11WP56S	295	296	61	235	357	351	3	0
11WP57	345	380	101	310	583	426	6	0
CG1	731	737	27	709	783	762	6	0
CG2	338	331	18	309	346	346	5	0
CG4	411	412	15	395	435	426	6	0
KC3	51	45	12	27	55	54	5	0
KC3A	28	28	2	26	30	29	6	0
KC3PB	29	29	2	25	31	30	6	0
KC13	310	315	40	260	384	341	6	0
KC14	365	306	142	53	384	378	5	0
KCF1	713	715	17	695	738	732	6	0
LIMESTONE	173	163	58	79	239	211	6	0
M1	105	105	0	105	105	105	3	0
RN029659	312	273	113	100	377	370	6	0
RN029660	444	450	20	428	480	471	6	0
W2R	182	160	42	81	187	186	6	0
WP5	560	541	72	381	590	583	7	0
WP13	215	193	51	102	219	218	5	0
WP19	463	447	36	384	473	470	5	0

† More than one-quarter of the samples are below the LOR

Table D5 Concentration of arsenic (µg/L)

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
10WP31†	0.5	0.5	0.0	0.5	0.5	0.5	7	100
10WP32	1.0	1.1	0.4	0.5	2.0	1.1	7	14
10WP32PB	1.0	1.1	0.4	0.5	2.0	1.1	7	14
10WP33†	0.5	0.5	0.0	0.5	0.5	0.5	7	100
10WP35N	1.0	1.2	0.6	0.5	2.0	2.0	7	14
10WP35PB†	0.5	0.5	0.0	0.5	0.5	0.5	9	100
10WP35S†	0.5	0.9	0.7	0.5	2.0	2.0	7	71
10WP36N	4.0	4.3	1.3	2.0	6.0	5.1	7	0
10WP36PB	4.5	4.2	2.3	1.0	8.0	6.0	10	0
10WP36S	7.0	8.9	3.7	5.0	15.0	13.2	7	0
10WP37	1.0	1.3	0.5	1.0	2.0	2.0	7	0
10WP39	7.0	6.9	0.7	6.0	8.0	7.1	7	0
10WP40	5.0	6.0	2.8	3.0	10.0	9.1	7	0
10WP41†	2.5	2.8	1.0	2.0	5.0	2.8	7	86
10WP42	2.0	2.1	0.4	2.0	3.0	2.1	7	0
10WP44†	4.3	5.0	3.1	2.5	9.0	8.1	4	50
10WP46	2.0	1.8	0.6	1.0	2.5	2.1	7	14
10WP47	1.0	1.1	0.4	1.0	2.0	1.1	7	0
11CS10RD†	0.8	0.8	0.3	0.5	1.0	1.0	6	50
11CS10RS†	1.0	2.3	2.8	1.0	8.0	3.8	6	50
11WP4R†	2.0	2.3	1.9	0.5	5.0	4.3	6	33
11WP9RPB	2.0	6.1	11.1	1.0	31.0	7.6	7	0
11WP9RS	2.0	2.0	0.7	1.0	3.0	2.5	5	0
11WP11RD†	1.0	1.2	0.9	0.5	3.0	1.6	6	33
11WP11RS	3.0	4.3	3.9	1.0	12.0	6.4	6	0
11WP15R	2.0	1.8	0.4	1.0	2.0	2.0	6	17
11WP16R	2.5	2.6	0.2	2.5	3.0	2.7	6	83
11WP43D†	1.5	2.3	1.9	1.0	5.0	4.1	4	50
11WP50†	2.5	2.0	1.0	0.5	2.5	2.5	4	100
11WP51D	3.5	4.2	1.6	3.0	7.0	5.6	6	0
11WP51S	3.0	3.0	1.4	1.0	5.0	4.3	6	0
11WP52D†	0.5	0.7	0.3	0.5	1.0	1.0	6	83

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
11WP53D	7.5	7.3	0.8	6.0	8.0	8.0	6	0
11WP53S	7.0	7.5	0.8	7.0	9.0	8.3	6	0
11WP54D†	2.5	2.3	0.6	1.0	2.5	2.5	6	83
11WP54S†	2.5	2.6	0.2	2.5	3.0	2.7	6	83
11WP55	29.5	34.2	15.9	23.0	66.0	42.2	6	0
11WP56D†	0.5	0.5	0.0	0.5	0.5	0.5	6	100
11WP56S†	1.0	1.3	1.0	0.5	2.5	2.4	3	67
11WP57†	2.5	2.3	0.3	2.0	2.5	2.5	6	67
CG1†	1.0	0.8	0.3	0.5	1.0	1.0	6	100
CG2†	0.5	0.6	0.2	0.5	1.0	0.8	5	80
CG4†	0.5	0.6	0.2	0.5	1.0	0.7	6	83
KC3†	0.5	0.5	0.0	0.5	0.5	0.5	5	100
KC3A†	0.5	0.5	0.0	0.5	0.5	0.5	6	100
KC3PB†	0.5	0.5	0.0	0.5	0.5	0.5	6	100
KC13	3.0	3.3	0.9	2.5	5.0	3.6	6	17
KC14†	2.5	1.7	1.1	0.5	2.5	2.5	5	100
KCF1	1.5	1.5	0.5	1.0	2.0	2.0	6	0
LIMESTONE	4.5	5.2	3.8	1.0	10.0	9.3	6	0
M1†	0.5	0.5	0.0	0.5	0.5	0.5	3	100
RN029659†	0.5	0.5	0.0	0.5	0.5	0.5	6	100
RN029660	2.0	1.7	0.5	1.0	2.0	2.0	6	0
W2R	4.0	3.7	2.1	1.0	7.0	4.9	6	0
WP5†	1.0	1.1	0.9	0.5	3.0	1.2	7	57
WP13	7.0	6.8	0.4	6.0	7.0	7.0	6	0
WP19†	5.0	3.6	2.0	0.5	5.0	5.0	5	100

† More than one-quarter of the samples are below the LOR

Table D6 Concentration of boron (µg/L)

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
10WP31	30	30	12	10	50	32	7	14
10WP32	110	104	33	50	160	115	7	0
10WP32PB	100	99	23	60	120	120	7	0
10WP33	70	73	19	50	110	83	7	0
10WP35N	370	357	55	240	400	391	7	0
10WP35PB	280	278	28	240	320	304	9	0
10WP35S	300	293	29	250	340	313	7	0
10WP36N	440	426	108	200	530	512	7	0
10WP36PB	565	559	104	340	720	640	10	0
10WP36S	890	896	128	690	1100	983	7	0
10WP37	490	489	36	440	540	522	7	0
10WP39	160	157	23	110	180	171	7	0
10WP40	870	933	309	600	1500	1140	7	0
10WP41	2200	2071	345	1500	2500	2230	7	0
10WP42	240	249	27	210	290	272	7	0
10WP44	415	413	43	370	450	450	4	0
10WP46	230	223	42	140	270	252	7	0
10WP47	70	64	30	10	90	90	7	14
11CS10RD	100	105	18	80	130	123	6	0
11CS10RS	870	805	315	320	1200	1060	6	0
11WP4R	125	125	23	90	160	139	6	0
11WP9RPB	170	170	24	140	200	191	7	0
11WP9RS	170	168	8	160	180	175	5	0
11WP11RD	105	95	24	60	120	113	6	0
11WP11RS	190	168	48	90	210	203	6	0
11WP15R	525	517	29	460	540	533	6	0
11WP16R	305	330	89	230	470	421	6	0
11WP43D	160	143	59	60	190	187	4	0
11WP50	555	558	32	530	590	587	4	0
11WP51D	95	92	25	60	120	113	6	0
11WP51S	100	120	89	10	230	223	6	17
11WP52D[†]	35	30	17	10	50	43	6	33

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
11WP53D	720	718	45	640	770	756	6	0
11WP53S	835	842	59	760	930	895	6	0
11WP54D	765	760	74	670	850	829	6	0
11WP54S	990	978	171	710	1200	1130	6	0
11WP55	440	440	24	400	470	463	6	0
11WP56D	60	62	8	50	70	70	6	0
11WP56S	80	80	20	60	100	98	3	0
11WP57	1150	1110	132	860	1200	1200	6	0
CG1	195	187	30	130	210	210	6	0
CG2	70	66	11	50	80	75	5	0
CG4	125	125	14	110	140	140	6	0
KC3	40	40	7	30	50	45	5	0
KC3A	35	33	14	10	50	43	6	17
KC3PB	40	37	15	10	50	50	6	17
KC13	90	93	5	90	100	100	6	0
KC14	700	672	93	540	790	745	5	0
KCF1	210	222	23	200	260	246	6	0
LIMESTONE	115	97	34	40	120	120	6	0
M1†	10	30	35	10	70	64	3	67
RN029659	320	278	123	30	350	350	6	0
RN029660	315	327	37	290	380	366	6	0
W2R	75	75	15	60	100	86	6	0
WP5	310	319	21	300	360	333	7	0
WP13	100	103	14	90	120	120	6	0
WP19	940	928	33	870	950	950	5	0

† More than one-quarter of the samples are below the LOR

Table D7 Concentration of barium (µg/L)

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
10WP31	32	31	6	22	36	36	7	0
10WP32	53	60	20	39	88	88	7	0
10WP32PB	36	37	15	13	53	52	7	0
10WP33	49	47	10	36	60	57	7	0
10WP35N	37	40	11	26	55	50	7	0
10WP35PB	130	123	39	65	170	157	9	0
10WP35S	89	91	36	37	140	122	7	0
10WP36N	19	23	7	17	36	28	7	0
10WP36PB	27	31	16	8	64	42	10	0
10WP36S	26	27	7	18	38	33	7	0
10WP37	53	52	14	34	66	66	7	0
10WP39	28	30	7	23	42	35	7	0
10WP40	69	79	30	51	130	112	7	0
10WP41	67	76	29	55	140	83	7	0
10WP42	45	43	7	32	53	47	7	0
10WP44	115	116	23	93	140	137	4	0
10WP46	23	21	4	15	26	24	7	0
10WP47	130	134	24	100	170	152	7	0
11CS10RD	107	114	36	69	160	153	6	0
11CS10RS	100	88	38	31	120	120	6	0
11WP4R	190	198	104	80	320	313	6	0
11WP9RPB	53	50	14	21	62	61	7	0
11WP9RS	57	55	9	45	65	63	5	0
11WP11RD	75	71	15	44	87	82	6	0
11WP11RS	41	42	12	28	55	55	6	0
11WP15R	43	53	31	25	110	79	6	0
11WP16R	48	48	15	28	67	64	6	0
11WP43D	285	283	91	190	370	364	4	0
11WP50	40	39	7	31	47	46	4	0
11WP51D	65	64	16	44	87	77	6	0
11WP51S	112	142	96	50	260	260	6	0
11WP52D	93	98	23	68	130	123	6	0

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
11WP53D	25	35	24	16	81	53	6	0
11WP53S	50	49	15	25	70	61	6	0
11WP54D	35	37	11	26	58	43	6	0
11WP54S	44	43	17	18	67	57	6	0
11WP55	68	77	51	18	150	129	6	0
11WP56D	22	40	49	13	140	60	6	0
11WP56S	55	62	33	34	98	94	3	0
11WP57	57	94	91	49	280	132	6	0
CG1	77	75	17	44	94	86	6	0
CG2	68	69	7	60	77	76	5	0
CG4	165	157	56	53	210	203	6	0
KC3	55	65	26	44	110	85	5	0
KC3A	91	86	12	65	95	94	6	0
KC3PB	88	87	11	71	100	97	6	0
KC13	58	59	11	46	78	66	6	0
KC14	26	32	18	21	63	46	5	0
KCF1	38	38	6	31	46	45	6	0
LIMESTONE	130	174	113	69	360	290	6	0
M1	30	31	1	30	32	32	3	0
RN029659	36	34	13	11	47	46	6	0
RN029660	43	49	18	37	85	57	6	0
W2R	240	232	44	180	280	273	6	0
WP5	33	37	11	30	61	40	7	0
WP13	59	62	6	56	70	69	6	0
WP19	25	25	4	20	29	29	5	0

† More than one-quarter of the samples are below the LOR

Table D8 Concentration of beryllium (µg/L)

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
10WP31†	0.05	0.11	0.17	0.05	0.50	0.10	7	100
10WP32†	0.05	0.11	0.17	0.05	0.50	0.10	7	100
10WP32PB†	0.05	0.18	0.22	0.05	0.50	0.50	7	100
10WP33†	0.05	0.11	0.17	0.05	0.50	0.10	7	100
10WP35N†	0.05	0.11	0.17	0.05	0.50	0.10	7	100
10WP35PB†	0.05	0.20	0.23	0.05	0.50	0.50	9	100
10WP35S†	0.05	0.11	0.17	0.05	0.50	0.10	7	100
10WP36N†	0.05	0.11	0.17	0.05	0.50	0.10	7	100
10WP36PB†	0.05	0.23	0.23	0.05	0.50	0.50	10	100
10WP36S†	0.05	0.11	0.17	0.05	0.50	0.10	7	100
10WP37†	0.05	0.11	0.17	0.05	0.50	0.10	7	100
10WP39†	0.05	0.11	0.17	0.05	0.50	0.10	7	100
10WP40†	0.10	0.14	0.16	0.05	0.50	0.14	7	100
10WP41†	0.25	0.32	0.12	0.25	0.50	0.50	7	100
10WP42†	0.05	0.18	0.22	0.05	0.50	0.50	7	100
10WP44†	0.25	0.25	0.00	0.25	0.25	0.25	4	100
10WP46†	0.05	0.21	0.21	0.05	0.50	0.50	7	100
10WP47†	0.05	0.18	0.22	0.05	0.50	0.50	7	100
11CS10RD†	0.05	0.13	0.18	0.05	0.50	0.19	6	100
11CS10RS†	0.10	0.16	0.17	0.05	0.50	0.22	6	100
11WP4R†	0.05	0.13	0.18	0.05	0.50	0.19	6	100
11WP9RPB†	0.05	0.11	0.17	0.05	0.50	0.10	7	100
11WP9RS†	0.05	0.14	0.20	0.05	0.50	0.28	5	100
11WP11RD†	0.05	0.13	0.18	0.05	0.50	0.19	6	100
11WP11RS†	0.05	0.13	0.18	0.05	0.50	0.19	6	100
11WP15R†	0.10	0.17	0.16	0.10	0.50	0.22	6	100
11WP16R†	0.25	0.29	0.10	0.25	0.50	0.33	6	100
11WP43D†	0.18	0.23	0.20	0.05	0.50	0.43	4	100
11WP50†	0.25	0.25	0.00	0.25	0.25	0.25	4	100
11WP51D†	0.05	0.13	0.18	0.05	0.50	0.19	6	100
11WP51S	0.05	0.13	0.18	0.05	0.50	0.22	6	100
11WP52D†	0.05	0.13	0.18	0.05	0.50	0.22	6	100

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
11WP53D†	0.10	0.17	0.16	0.10	0.50	0.22	6	100
11WP53S†	0.10	0.17	0.16	0.10	0.50	0.22	6	100
11WP54D†	0.25	0.29	0.10	0.25	0.50	0.33	6	100
11WP54S†	0.25	0.29	0.10	0.25	0.50	0.33	6	100
11WP55†	0.05	0.13	0.18	0.05	0.50	0.19	6	100
11WP56D†	0.15	0.18	0.17	0.05	0.50	0.29	6	50
11WP56S†	0.25	0.27	0.23	0.05	0.50	0.48	3	100
11WP57†	0.25	0.26	0.14	0.05	0.50	0.33	6	100
CG1†	0.10	0.10	0.00	0.10	0.10	0.10	6	100
CG2††	0.05	0.05	0.00	0.05	0.05	0.05	5	100
CG4†	0.05	0.13	0.18	0.05	0.50	0.19	6	100
KC3†	0.05	0.05	0.00	0.05	0.05	0.05	5	100
KC3A†	0.05	0.13	0.18	0.05	0.50	0.19	6	100
KC3PB†	0.05	0.13	0.18	0.05	0.50	0.19	6	100
KC13†	0.05	0.16	0.19	0.05	0.50	0.33	6	100
KC14†	0.25	0.21	0.09	0.05	0.25	0.25	5	100
KCF1†	0.05	0.42	0.70	0.05	1.80	0.89	6	83
LIMESTONE†	0.05	0.05	0.00	0.05	0.05	0.05	6	100
M1†	0.50	0.35	0.26	0.05	0.50	0.50	3	100
RN029659†	0.05	0.13	0.18	0.05	0.50	0.19	6	100
RN029660†	0.05	0.05	0.00	0.05	0.05	0.05	6	100
W2R†	0.05	0.05	0.00	0.05	0.05	0.05	6	100
WP5†	0.05	0.06	0.02	0.05	0.10	0.10	7	100
WP13†	0.05	0.13	0.18	0.05	0.50	0.19	6	100
WP19†	0.50	0.45	0.11	0.25	0.50	0.50	5	100

† More than one-quarter of the samples are below the LOR

Table D9 Concentration of bismuth (µg/L)

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
10WP31†	0.05	0.05	0.00	0.05	0.05	0.05	7	100
10WP32†	0.05	0.05	0.00	0.05	0.05	0.05	7	100
10WP32PB†	0.05	0.05	0.00	0.05	0.05	0.05	7	100
10WP33†	0.05	0.05	0.00	0.05	0.05	0.05	7	100
10WP35N†	0.05	0.05	0.00	0.05	0.05	0.05	7	100
10WP35PB†	0.05	0.05	0.00	0.05	0.05	0.05	9	100
10WP35S†	0.05	0.05	0.00	0.05	0.05	0.05	7	100
10WP36N†	0.05	0.05	0.00	0.05	0.05	0.05	7	100
10WP36PB†	0.05	0.05	0.00	0.05	0.05	0.05	10	100
10WP36S†	0.05	0.05	0.00	0.05	0.05	0.05	7	100
10WP37†	0.05	0.05	0.00	0.05	0.05	0.05	7	100
10WP39†	0.05	0.05	0.00	0.05	0.05	0.05	7	100
10WP40†	0.10	0.09	0.02	0.05	0.10	0.10	7	100
10WP41†	0.25	0.29	0.09	0.25	0.50	0.28	7	100
10WP42†	0.05	0.05	0.00	0.05	0.05	0.05	7	100
10WP44†	0.25	0.20	0.10	0.05	0.25	0.25	4	100
10WP46†	0.05	0.08	0.08	0.05	0.25	0.07	7	100
10WP47†	0.05	0.05	0.00	0.05	0.05	0.05	7	100
11CS10RD†	0.05	0.05	0.00	0.05	0.05	0.05	6	100
11CS10RS†	0.10	0.09	0.02	0.05	0.10	0.10	6	100
11WP4R†	0.05	0.05	0.00	0.05	0.05	0.05	6	100
11WP9RPB†	0.05	0.05	0.00	0.05	0.05	0.05	7	100
11WP9RS†	0.05	0.05	0.00	0.05	0.05	0.05	5	100
11WP11RD†	0.05	0.05	0.00	0.05	0.05	0.05	6	100
11WP11RS†	0.05	0.05	0.00	0.05	0.05	0.05	6	100
11WP15R†	0.10	0.10	0.00	0.10	0.10	0.10	6	100
11WP16R†	0.25	0.25	0.00	0.25	0.25	0.25	6	100
11WP43D	0.18	0.23	0.20	0.05	0.50	0.43	4	100
11WP50†	0.25	0.25	0.00	0.25	0.25	0.25	4	100
11WP51D†	0.05	0.05	0.00	0.05	0.05	0.05	6	100
11WP51S†	0.05	0.06	0.02	0.05	0.10	0.07	6	100
11WP52D†	0.05	0.06	0.02	0.05	0.10	0.07	6	100

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
11WP53D†	0.10	0.10	0.00	0.10	0.10	0.10	6	100
11WP53S†	0.10	0.10	0.00	0.10	0.10	0.10	6	100
11WP54D†	0.25	0.25	0.00	0.25	0.25	0.25	6	100
11WP54S†	0.25	0.25	0.00	0.25	0.25	0.25	6	100
11WP55†	0.05	0.05	0.00	0.05	0.05	0.05	6	100
11WP56D†	0.05	0.05	0.00	0.05	0.05	0.05	6	100
11WP56S†	0.05	0.12	0.12	0.05	0.25	0.23	3	100
11WP57†	0.25	0.22	0.08	0.05	0.25	0.25	6	100
CG1†	0.10	0.10	0.00	0.10	0.10	0.10	6	100
CG2†	0.05	0.05	0.00	0.05	0.05	0.05	5	100
CG4†	0.05	0.05	0.00	0.05	0.05	0.05	6	100
KC3†	0.05	0.05	0.00	0.05	0.05	0.05	5	100
KC3A†	0.05	0.05	0.00	0.05	0.05	0.05	6	100
KC3PB†	0.05	0.05	0.00	0.05	0.05	0.05	6	100
KC13†	0.05	0.08	0.08	0.05	0.25	0.11	6	100
KC14†	0.25	0.21	0.09	0.05	0.25	0.25	5	100
KCF1†	0.05	0.05	0.00	0.05	0.05	0.05	6	100
LIMESTONE†	0.05	0.05	0.00	0.05	0.05	0.05	6	100
M1†	0.05	0.05	0.00	0.05	0.05	0.05	3	100
RN029659†	0.05	0.05	0.00	0.05	0.05	0.05	6	100
RN029660†	0.05	0.05	0.00	0.05	0.05	0.05	6	100
W2R†	0.05	0.05	0.00	0.05	0.05	0.05	6	100
WP5†	0.05	0.06	0.02	0.05	0.10	0.10	7	100
WP13†	0.05	0.05	0.00	0.05	0.05	0.05	6	100
WP19†	0.50	0.45	0.11	0.25	0.50	0.50	5	100

† More than one-quarter of the samples are below the LOR

Table D10 Concentration of bromide (mg/L)

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
10WP31	0.13	0.15	0.05	0.10	0.20	0.20	5	0
10WP32	0.74	0.75	0.12	0.60	0.93	0.87	5	0
10WP32PB	0.57	0.57	0.14	0.40	0.78	0.69	5	0
10WP33	0.60	0.61	0.08	0.50	0.70	0.69	5	0
10WP35N	0.22	0.20	0.12	0.01	0.30	0.30	5	20
10WP35PB	0.48	0.45	0.08	0.30	0.50	0.50	5	0
10WP35S	0.43	0.39	0.09	0.30	0.50	0.47	5	0
10WP36N	0.40	0.32	0.16	0.05	0.43	0.42	5	0
10WP36PB	0.30	0.35	0.12	0.20	0.53	0.47	5	0
10WP36S	0.41	0.43	0.10	0.30	0.56	0.53	5	0
10WP37	0.60	0.60	0.12	0.40	0.70	0.69	5	0
10WP39	0.40	0.39	0.08	0.30	0.50	0.46	5	0
10WP40	2.10	2.04	0.31	1.70	2.50	2.30	5	0
10WP41	21.00	21.00	8.00	11.00	30.00	27.00	4	0
10WP42	0.92	0.91	0.08	0.80	1.00	0.98	4	0
10WP44	18.00	17.00	1.00	15.00	18.00	18.00	4	0
10WP46	0.84	0.82	0.09	0.70	0.88	0.88	4	0
10WP47	0.21	0.21	0.07	0.14	0.30	0.27	4	0
11CS10RD	1.10	1.16	0.38	0.59	1.60	1.50	5	0
11CS10RS	4.50	4.52	1.92	1.80	6.70	6.30	5	0
11WP4R	0.89	0.87	0.13	0.70	1.00	0.99	5	0
11WP9RPB	0.58	0.60	0.08	0.50	0.70	0.70	6	0
11WP9RS	0.60	0.60	0.18	0.40	0.80	0.77	4	0
11WP11RD	0.28	0.22	0.14	0.01	0.30	0.30	4	25
11WP11RS	0.21	0.18	0.12	0.01	0.30	0.27	4	25
11WP15R	4.20	4.28	0.28	3.90	4.60	4.55	5	0
11WP16R	7.40	6.10	3.16	0.50	8.10	7.80	5	0
11WP43D	10.00	10.00	8.00	5.00	16.00	16.00	2	0
11WP50	14.00	14.00	1.00	12.00	15.00	15.00	4	0
11WP51D	0.13	0.15	0.05	0.10	0.20	0.20	5	0
11WP51S	0.18	0.16	0.07	0.08	0.24	0.22	5	0
11WP52D	0.33	0.29	0.14	0.09	0.40	0.39	4	0

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
11WP53D	3.30	3.04	0.71	1.80	3.50	3.50	5	0
11WP53S	3.70	3.40	0.87	2.00	4.30	4.05	5	0
11WP54D	17.00	17.00	1.00	15.00	15.00	18.00	5	0
11WP54S	11.00	11.00	2.00	9.00	13.00	13.00	5	0
11WP55	2.50	2.60	0.23	2.40	3.00	2.80	5	0
11WP56D	0.07	0.12	0.10	0.07	0.30	0.20	5	0
11WP56S	0.23	0.23	0.04	0.20	0.25	0.25	2	0
11WP57	14.00	15.00	1.00	13.00	16.00	16.00	5	0
CG1	2.55	2.48	0.26	2.10	2.70	2.67	4	0
CG2	0.22	0.23	0.06	0.18	0.30	0.29	3	0
CG4	1.60	1.63	0.06	1.60	1.70	1.69	3	0
KC3	0.13	0.15	0.04	0.12	0.20	0.20	5	0
KC3A	0.22	0.25	0.05	0.21	0.30	0.30	5	0
KC3PB	0.21	0.26	0.09	0.19	0.40	0.35	5	0
KC13	0.36	0.36	0.05	0.30	0.40	0.40	5	0
KC14	17.00	17.00	2.00	16.00	18.00	18.00	5	0
KCF1	2.10	2.14	0.15	2.00	2.30	2.30	5	0
LIMESTONE	0.20	0.15	0.08	0.06	0.20	0.20	3	0
M1	No data							
RN029659	3.05	3.00	0.47	2.40	3.50	3.41	4	0
RN029660	0.71	0.70	0.10	0.60	0.80	0.79	4	0
W2R	0.15	0.15	0.06	0.10	0.20	0.20	4	0
WP5	3.60	3.56	0.36	3.00	4.00	3.85	5	0
WP13	0.40	0.41	0.01	0.40	0.42	0.42	3	0
WP19	20.00	20.00	3.00	17.00	25.00	24.00	4	0

Table D11 Concentration of calcium (mg/L)

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
10WP31	25	26	3	23	30	30	7	0
10WP32	50	53	14	34	71	69	7	0
10WP32PB	44	45	12	31	62	58	7	0
10WP33	49	53	9	41	65	63	7	0
10WP35N	23	24	7	15	33	32	7	0
10WP35PB	63	59	13	39	77	68	9	0
10WP35S	46	49	11	33	64	59	7	0
10WP36N	35	39	10	29	57	49	7	0
10WP36PB	26	32	17	8	69	45	10	0
10WP36S	29	30	10	16	45	40	7	0
10WP37	46	44	10	31	56	54	7	0
10WP39	90	90	9	76	102	99	7	0
10WP40	111	130	83	48	297	162	7	0
10WP41	692	629	178	353	833	746	7	0
10WP42	95	95	7	87	104	103	7	0
10WP44	952	929	75	821	992	983	4	0
10WP46	114	114	11	96	132	122	7	0
10WP47	64	61	8	45	69	67	7	0
11CS10RD	123	112	35	67	143	142	6	0
11CS10RS	127	123	69	20	222	181	6	0
11WP4R	90	88	23	48	113	109	6	0
11WP9RPB	27	27	7	17	36	35	7	0
11WP9RS	26	31	10	22	47	41	5	0
11WP11RD	30	29	3	23	32	31	6	0
11WP11RS	11	11	2	9	13	12	6	0
11WP15R	34	37	4	34	43	42	6	0
11WP16R	440	465	99	368	588	585	6	0
11WP43D	596	639	474	153	1210	1096	4	0
11WP50	656	641	43	578	676	670	4	0
11WP51D	51	50	4	44	55	54	6	0
11WP51S	52	45	18	18	64	60	6	0
11WP52D	27	27	4	21	32	32	6	0

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
11WP53D	12	14	5	10	23	20	6	0
11WP53S	12	13	3	11	17	16	6	0
11WP54D	584	596	34	562	652	630	6	0
11WP54S	258	248	26	210	276	266	6	0
11WP55	105	100	20	63	117	116	6	0
11WP56D	4	4	2	2	6	5	6	0
11WP56S	49	47	30	16	77	74	3	0
11WP57	932	921	81	766	992	984	6	0
CG1	202	207	25	179	254	221	6	0
CG2	64	63	5	54	67	66	5	0
CG4	114	114	12	99	128	128	6	0
KC3	10	11	1	9	12	12	5	0
KC3A	19	19	2	17	21	21	6	0
KC3PB	18	18	3	15	22	21	6	0
KC13	49	48	11	27	58	57	6	0
KC14	764	745	48	675	795	784	5	0
KCF1	112	110	7	99	118	117	6	0
LIMESTONE	62	58	15	36	76	70	6	0
M1	18	17	1	15	18	18	3	0
RN029659	117	96	57	10	144	143	6	0
RN029660	28	29	5	23	37	32	6	0
W2R	61	58	14	37	71	70	6	0
WP5	242	241	21	209	267	260	7	0
WP13	102	95	15	69	108	106	6	0
WP19	820	823	17	807	851	838	5	0

Table D12 Concentration of cadmium (µg/L)

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
10WP31†	0.05	0.05	0.00	0.05	0.05	0.05	7	100
10WP32†	0.05	0.05	0.00	0.05	0.05	0.05	7	100
10WP32PB†	0.05	0.05	0.00	0.05	0.05	0.05	7	100
10WP33†	0.05	0.05	0.00	0.05	0.05	0.05	7	100
10WP35N†	0.05	0.05	0.00	0.05	0.05	0.05	7	100
10WP35PB†	0.05	0.05	0.00	0.05	0.05	0.05	9	100
10WP35S†	0.05	0.05	0.00	0.05	0.05	0.05	7	100
10WP36N†	0.05	0.05	0.00	0.05	0.05	0.05	7	100
10WP36PB†	0.05	0.05	0.00	0.05	0.05	0.05	10	100
10WP36S†	0.05	0.05	0.00	0.05	0.05	0.05	7	100
10WP37†	0.05	0.05	0.00	0.05	0.05	0.05	7	100
10WP39†	0.05	0.05	0.00	0.05	0.05	0.05	7	100
10WP40†	0.10	0.10	0.05	0.05	0.20	0.11	7	86
10WP41†	0.25	0.29	0.09	0.25	0.50	0.28	7	100
10WP42†	0.05	0.05	0.00	0.05	0.05	0.05	7	100
10WP44†	0.25	0.25	0.00	0.25	0.25	0.25	4	100
10WP46†	0.05	0.08	0.08	0.05	0.25	0.07	7	100
10WP47†	0.05	0.05	0.00	0.05	0.05	0.05	7	100
11CS10RD†	0.05	0.06	0.02	0.05	0.10	0.07	6	83
11CS10RS†	0.10	0.11	0.05	0.05	0.20	0.13	6	83
11WP4R†	0.05	0.44	0.96	0.05	2.40	0.76	6	83
11WP9RPB†	0.05	0.05	0.00	0.05	0.05	0.05	7	100
11WP9RS†	0.05	0.05	0.00	0.05	0.05	0.05	5	100
11WP11RD†	0.05	0.05	0.00	0.05	0.05	0.05	6	100
11WP11RS†	0.05	0.05	0.00	0.05	0.05	0.05	6	100
11WP15R†	0.10	0.10	0.00	0.10	0.10	0.10	6	100
11WP16R†	0.25	0.25	0.00	0.25	0.25	0.25	6	100
11WP43D†	0.18	0.23	0.20	0.05	0.50	0.43	4	100
11WP50†	0.25	0.25	0.00	0.25	0.25	0.25	4	100
11WP51D†	0.05	0.05	0.00	0.05	0.05	0.05	6	100
11WP51S†	0.05	0.06	0.02	0.05	0.10	0.07	6	100
11WP52D†	0.05	0.06	0.02	0.05	0.10	0.07	6	100

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
11WP53D†	0.10	0.15	0.08	0.10	0.30	0.23	6	67
11WP53S†	0.10	0.15	0.08	0.10	0.30	0.23	6	67
11WP54D†	0.25	0.25	0.00	0.25	0.25	0.25	6	100
11WP54S†	0.25	0.34	0.22	0.25	0.80	0.42	6	83
11WP55†	0.05	0.06	0.02	0.05	0.10	0.07	6	83
11WP56D†	0.05	0.05	0.00	0.05	0.05	0.05	6	100
11WP56S†	0.05	0.12	0.12	0.05	0.25	0.23	3	100
11WP57†	0.25	0.28	0.06	0.25	0.40	0.30	6	83
CG1†	0.10	0.10	0.00	0.10	0.10	0.10	6	100
CG2†	0.05	0.05	0.00	0.05	0.05	0.05	5	100
CG4†	0.05	0.06	0.02	0.05	0.10	0.07	6	83
KC3†	0.05	0.12	0.16	0.05	0.40	0.23	5	80
KC3A†	0.05	0.23	0.43	0.05	1.10	0.37	6	83
KC3PB†	0.05	0.11	0.14	0.05	0.40	0.16	6	83
KC13†	0.05	0.09	0.08	0.05	0.25	0.15	6	83
KC14†	0.25	0.26	0.02	0.25	0.30	0.28	5	80
KCF1†	0.05	0.09	0.10	0.05	0.30	0.13	6	83
LIMESTONE†	0.05	0.05	0.00	0.05	0.05	0.05	6	100
M1†	0.05	0.05	0.00	0.05	0.05	0.05	3	100
RN029659†	0.05	0.06	0.02	0.05	0.10	0.07	6	83
RN029660†	0.05	0.06	0.02	0.05	0.10	0.07	6	83
W2R†	0.05	0.05	0.00	0.05	0.05	0.05	6	100
WP5†	0.05	0.09	0.06	0.05	0.20	0.11	7	86
WP13†	0.05	0.05	0.00	0.05	0.05	0.05	6	100
WP19†	0.50	0.50	0.00	0.50	0.50	0.50	5	80

† More than one-quarter of the samples are below the LOR

Table D13 Concentration of chloride (mg/L)

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
10WP31	43	42	6	33	49	47	7	0
10WP32	238	251	97	137	370	344	7	0
10WP32PB	214	203	71	110	312	266	7	0
10WP33	223	205	40	158	261	236	7	0
10WP35N	67	61	11	46	73	69	7	0
10WP35PB	144	138	37	96	205	162	9	0
10WP35S	130	116	35	58	158	146	7	0
10WP36N	80	86	15	73	107	106	7	0
10WP36PB	64	74	34	22	143	103	10	0
10WP36S	104	102	25	68	137	132	7	0
10WP37	225	210	28	161	234	233	7	0
10WP39	123	123	12	110	140	138	7	0
10WP40	790	845	243	570	1310	985	7	0
10WP41	7020	6616	1624	4330	8960	7565	7	0
10WP42	329	341	30	317	395	375	7	0
10WP44	7715	7758	126	7660	7940	7880	4	0
10WP46	329	327	16	303	348	342	7	0
10WP47	45	45	6	35	51	51	7	0
11CS10RD	496	474	195	240	706	668	6	0
11CS10RS	1665	1801	840	853	3130	2598	6	0
11WP4R	328	329	20	305	351	351	6	0
11WP9RPB	205	217	43	157	280	262	7	0
11WP9RS	224	228	27	199	265	256	5	0
11WP11RD	81	79	7	65	86	83	6	0
11WP11RS	55	57	6	52	68	62	6	0
11WP15R	1525	1588	207	1420	1990	1717	6	0
11WP16R	2965	2960	75	2840	3070	3014	6	0
11WP43D	4805	5330	4246	1110	10600	9460	4	0
11WP50	5560	5555	304	5250	5850	5829	4	0
11WP51D	46	46	5	41	55	50	6	0
11WP51S	49	53	39	15	127	75	6	0
11WP52D	100	97	17	75	121	110	6	0

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
11WP53D	1250	1277	82	1200	1410	1361	6	0
11WP53S	1380	1402	116	1300	1590	1499	6	0
11WP54D	6540	6570	447	5880	7240	6925	6	0
11WP54S	3925	3855	341	3220	4180	4103	6	0
11WP55	913	891	69	756	953	931	6	0
11WP56D	17	16	3	11	18	17	6	0
11WP56S	67	64	43	19	105	101	3	0
11WP57	5205	5142	603	4050	5820	5610	6	0
CG1	1270	1267	139	1060	1420	1399	6	0
CG2	93	91	8	82	100	98	5	0
CG4	681	681	60	585	757	736	6	0
KC3	26	26	4	20	31	30	5	0
KC3A	51	52	6	45	62	56	6	0
KC3PB	47	49	5	44	56	54	6	0
KC13	78	75	7	63	82	80	6	0
KC14	4720	4706	109	4550	4840	4800	5	0
KCF1	561	561	28	517	590	589	6	0
LIMESTONE	47	41	17	19	59	56	6	0
M1	9	11	4	9	16	15	3	0
RN029659	1026	918	437	87	1260	1260	6	0
RN029660	270	258	38	197	297	289	6	0
W2R	32	31	7	22	39	38	6	0
WP5	1020	1019	55	953	1110	1065	7	0
WP13	122	136	34	107	189	170	5	0
WP19	7810	7732	291	7230	7960	7930	5	0

Table D14 Concentration of cobalt (µg/L)

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
10WP31†	0.80	1.16	0.95	0.05	2.50	2.50	7	43
10WP32†	0.05	0.75	1.20	0.05	2.50	2.50	7	100
10WP32PB†	0.05	0.75	1.20	0.05	2.50	2.50	7	100
10WP33†	0.05	0.76	1.19	0.05	2.50	2.50	7	86
10WP35N†	0.10	0.79	1.17	0.05	2.50	2.50	7	57
10WP35PB†	0.10	1.14	1.29	0.05	2.50	2.50	9	89
10WP35S†	0.70	1.03	1.03	0.20	2.50	2.50	7	29
10WP36N†	0.05	0.76	1.19	0.05	2.50	2.50	7	86
10WP36PB†	1.30	1.28	1.29	0.05	2.50	2.50	10	90
10WP36S†	0.05	0.75	1.20	0.05	2.50	2.50	7	100
10WP37†	0.10	0.76	1.19	0.05	2.50	2.50	7	71
10WP39†	0.05	0.75	1.20	0.05	2.50	2.50	7	100
10WP40	3.50	3.69	1.76	1.60	6.00	5.64	7	14
10WP41†	2.90	4.61	3.43	0.50	9.60	8.70	7	43
10WP42†	0.10	0.76	1.19	0.05	2.50	2.50	7	71
10WP44	2.85	2.63	1.28	0.90	3.90	3.69	4	0
10WP46†	0.20	0.83	1.14	0.05	2.50	2.50	7	57
10WP47†	1.10	1.31	0.85	0.40	2.50	2.50	7	29
11CS10RD†	0.05	0.46	1.00	0.05	2.50	0.79	6	100
11CS10RS	1.60	1.67	0.88	0.60	2.80	2.59	6	17
11WP4R	2.00	1.83	0.65	0.70	2.50	2.36	6	17
11WP9RPB†	0.10	0.49	0.90	0.05	2.50	0.61	7	43
11WP9RS†	0.05	0.59	1.07	0.05	2.50	1.40	5	80
11WP11RD†	0.05	0.46	1.00	0.05	2.50	0.79	6	100
11WP11RS†	0.25	0.61	0.94	0.05	2.50	1.10	6	33
11WP15R	0.65	0.87	0.83	0.30	2.50	1.31	6	17
11WP16R†	1.05	1.23	0.84	0.25	2.50	2.08	6	33
11WP43D	13.50	14.10	5.33	8.40	21.00	19.20	4	0
11WP50	17.50	18.50	5.80	13.00	26.00	24.20	4	0
11WP51D	0.30	0.65	0.91	0.20	2.50	0.96	6	17
11WP51S	1.15	1.28	0.88	0.30	2.50	2.15	6	17
11WP52D†	0.20	0.63	0.95	0.05	2.50	1.24	6	50

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
11WP53D	0.65	1.03	0.88	0.30	2.50	1.94	6	17
11WP53S	0.55	0.87	0.80	0.50	2.50	1.17	6	17
11WP54D	1.90	2.52	1.34	1.80	5.20	3.31	6	17
11WP54S	14.00	16.52	10.57	4.10	35.00	25.20	6	0
11WP55	1.25	1.45	0.68	0.60	2.50	2.15	6	17
11WP56D	0.75	0.98	0.75	0.50	2.50	1.31	6	17
11WP56S†	2.20	1.67	1.19	0.30	2.50	2.47	3	33
11WP57	2.90	2.95	0.68	2.20	4.20	3.36	6	17
CG1†	0.10	0.10	0.00	0.10	0.10	0.10	6	100
CG2†	0.05	0.05	0.00	0.05	0.05	0.05	5	100
CG4	0.30	0.65	0.91	0.20	2.50	1.03	6	17
KC3†	0.05	0.09	0.07	0.05	0.20	0.15	5	60
KC3A†	0.05	0.46	1.00	0.05	2.50	0.79	6	100
KC3PB	0.20	0.57	0.95	0.10	2.50	0.96	6	17
KC13†	0.45	0.79	0.86	0.25	2.50	1.31	6	33
KC14	2.20	2.34	0.47	1.70	2.90	2.80	5	0
KCF1	2.40	2.30	0.50	1.40	2.90	2.62	6	17
LIMESTONE	0.25	0.37	0.29	0.10	0.90	0.62	6	0
M1†	2.50	2.50	0.00	2.50	2.50	2.50	3	100
RN029659†	0.40	0.64	0.92	0.05	2.50	1.03	6	33
RN029660†	0.05	0.05	0.00	0.05	0.05	0.05	6	100
W2R	0.10	1.09	2.31	0.05	5.80	2.02	6	17
WP5	0.50	0.79	0.77	0.30	2.50	0.97	7	14
WP13†	0.05	0.46	1.00	0.05	2.50	0.79	6	100
WP19†	0.50	0.85	0.93	0.25	2.50	1.50	5	100

† More than one-quarter of the samples are below the LOR

Table D15 Concentration of carbonate (mg/L)

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
10WP31†	0.5	0.5	0.0	0.5	0.5	0.5	7	100
10WP32†	0.5	0.5	0.0	0.5	0.5	0.5	7	100
10WP32PB†	0.5	3.9	8.9	0.5	24.0	2.9	7	86
10WP33†	0.5	0.5	0.0	0.5	0.5	0.5	7	100
10WP35N†	0.5	0.5	0.0	0.5	0.5	0.5	7	100
10WP35PB†	0.5	0.5	0.0	0.5	0.5	0.5	9	100
10WP35S†	0.5	0.5	0.0	0.5	0.5	0.5	7	100
10WP36N†	0.5	0.5	0.0	0.5	0.5	0.5	7	100
10WP36PB†	0.5	4.9	13.8	0.5	44.0	0.5	10	90
10WP36S†	0.5	0.5	0.0	0.5	0.5	0.5	7	100
10WP37†	0.5	0.5	0.0	0.5	0.5	0.5	7	100
10WP39†	0.5	0.5	0.0	0.5	0.5	0.5	7	100
10WP40†	0.5	0.5	0.0	0.5	0.5	0.5	7	100
10WP41†	0.5	0.5	0.0	0.5	0.5	0.5	7	100
10WP42†	0.5	0.5	0.0	0.5	0.5	0.5	7	100
10WP44†	0.5	0.5	0.0	0.5	0.5	0.5	4	100
10WP46†	0.5	0.5	0.0	0.5	0.5	0.5	7	100
10WP47†	0.5	0.5	0.0	0.5	0.5	0.5	7	100
11CS10RD†	0.5	0.5	0.0	0.5	0.5	0.5	6	100
11CS10RS†	0.5	0.5	0.0	0.5	0.5	0.5	6	100
11WP4R†	0.5	0.5	0.0	0.5	0.5	0.5	6	100
11WP9RPB†	0.5	0.5	0.0	0.5	0.5	0.5	7	100
11WP9RS†	0.5	0.5	0.0	0.5	0.5	0.5	5	100
11WP11RD†	0.5	0.5	0.0	0.5	0.5	0.5	6	100
11WP11RS†	0.5	0.5	0.0	0.5	0.5	0.5	6	100
11WP15R†	0.5	0.5	0.0	0.5	0.5	0.5	6	100
11WP16R†	0.5	0.5	0.0	0.5	0.5	0.5	6	100
11WP43D†	0.5	0.5	0.0	0.5	0.5	0.5	4	100
11WP50†	0.5	0.5	0.0	0.5	0.5	0.5	4	100
11WP51D†	0.5	0.5	0.0	0.5	0.5	0.5	6	100
11WP51S†	0.5	0.5	0.0	0.5	0.5	0.5	6	100
11WP52D†	0.5	0.5	0.0	0.5	0.5	0.5	6	100

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
11WP53D†	0.5	0.5	0.0	0.5	0.5	0.5	6	100
11WP53S†	0.5	0.5	0.0	0.5	0.5	0.5	6	100
11WP54D†	0.5	0.5	0.0	0.5	0.5	0.5	6	100
11WP54S†	0.5	0.5	0.0	0.5	0.5	0.5	6	100
11WP55†	0.5	0.5	0.0	0.5	0.5	0.5	6	100
11WP56D†	0.5	0.5	0.0	0.5	0.5	0.5	6	100
11WP56S†	0.5	0.5	0.0	0.5	0.5	0.5	3	100
11WP57†	0.5	0.5	0.0	0.5	0.5	0.5	6	100
CG1†	0.5	0.5	0.0	0.5	0.5	0.5	6	100
CG2†	0.5	0.5	0.0	0.5	0.5	0.5	5	100
CG4†	0.5	0.5	0.0	0.5	0.5	0.5	6	100
KC3†	0.5	0.5	0.0	0.5	0.5	0.5	5	100
KC3A†	0.5	0.5	0.0	0.5	0.5	0.5	6	100
KC3PB†	0.5	0.5	0.0	0.5	0.5	0.5	6	100
KC13†	0.5	0.5	0.0	0.5	0.5	0.5	6	100
KC14†	0.5	0.5	0.0	0.5	0.5	0.5	5	100
KCF1†	0.5	0.5	0.0	0.5	0.5	0.5	6	100
LIMESTONE†	0.5	0.5	0.0	0.5	0.5	0.5	6	100
M1†	0.5	2.3	3.2	0.5	6.0	5.5	3	67
RN029659†	0.5	2.8	5.5	0.5	14.0	4.6	6	83
RN029660†	0.5	0.5	0.0	0.5	0.5	0.5	6	100
W2R†	0.5	0.5	0.0	0.5	0.5	0.5	6	100
WP5†	0.5	0.5	0.0	0.5	0.5	0.5	7	100
WP13†	0.5	0.5	0.0	0.5	0.5	0.5	5	100
WP19†	0.5	0.5	0.0	0.5	0.5	0.5	5	100

† More than one-quarter of the samples are below the LOR

Table D16 Concentration of chromium (µg/L)

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
10WP31	1.90	2.74	1.93	1.70	7.00	3.40	7	0
10WP32	1.50	3.03	2.96	0.70	9.00	5.04	7	0
10WP32PB	1.90	1.70	0.49	1.00	2.20	2.02	7	0
10WP33†	0.70	1.06	0.93	0.50	3.00	1.65	7	43
10WP35N†	0.25	3.57	8.57	0.25	23.00	2.75	7	86
10WP35PB†	0.90	0.73	0.29	0.25	1.00	1.00	9	44
10WP35S†	0.50	3.11	6.60	0.25	18.00	3.60	7	57
10WP36N†	0.50	1.72	2.84	0.25	8.00	2.60	7	57
10WP36PB†	0.50	0.45	0.15	0.25	0.70	0.50	10	90
10WP36S†	0.25	2.07	3.99	0.25	11.00	2.90	7	71
10WP37†	0.25	1.57	3.28	0.25	9.00	1.35	7	86
10WP39†	0.25	0.36	0.13	0.25	0.50	0.50	7	100
10WP40†	0.50	3.50	8.16	0.25	22.00	2.65	7	86
10WP41†	0.50	2.79	5.40	0.50	15.00	2.63	7	86
10WP42†	0.50	0.39	0.13	0.25	0.50	0.50	7	100
10WP44†	1.25	1.06	0.38	0.50	1.25	1.25	4	100
10WP46†	0.50	0.54	0.34	0.25	1.25	0.58	7	100
10WP47†	0.50	0.61	0.63	0.25	2.00	0.65	7	86
11CS10RD	1.30	1.67	0.72	1.20	3.00	2.30	6	0
11CS10RS†	0.75	0.93	0.65	0.25	2.00	1.51	6	50
11WP4R†	0.38	0.89	1.08	0.25	3.00	1.67	6	67
11WP9RPB	1.40	2.09	1.77	1.00	6.00	2.49	7	0
11WP9RS	1.60	1.54	0.36	1.00	2.00	1.80	5	0
11WP11RD	1.85	1.87	0.67	1.00	3.00	2.30	6	0
11WP11RS	2.00	1.79	0.95	0.25	3.00	2.51	6	17
11WP15R†	0.50	1.67	2.62	0.50	7.00	2.80	6	67
11WP16R†	0.88	0.88	0.41	0.50	1.25	1.25	6	100
11WP43D†	0.50	0.69	0.38	0.50	1.25	1.03	4	100
11WP50†	1.25	1.06	0.38	0.50	1.25	1.25	4	100
11WP51D†	0.25	0.42	0.30	0.25	1.00	0.65	6	83
11WP51S†	0.38	0.38	0.14	0.25	0.50	0.50	6	100
11WP52D†	0.50	0.72	0.66	0.25	2.00	1.16	6	67

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
11WP53D	3.00	3.23	1.49	1.60	6.00	4.18	6	0
11WP53S	2.30	2.22	0.65	1.20	3.00	2.72	6	0
11WP54D†	1.25	1.46	1.30	0.50	4.00	2.08	6	83
11WP54S†	0.88	1.92	2.76	0.50	7.50	3.13	6	83
11WP55†	0.25	0.92	1.51	0.25	4.00	1.55	6	83
11WP56D†	0.25	0.33	0.13	0.25	0.50	0.50	6	100
11WP56S†	0.50	0.67	0.52	0.25	1.25	1.18	3	100
11WP57†	0.50	0.75	0.39	0.50	1.25	1.25	6	83
CG1	4.80	4.77	0.92	3.40	6.20	5.36	6	0
CG2	1.90	1.74	0.65	1.00	2.60	2.30	5	0
CG4†	0.38	0.46	0.29	0.25	1.00	0.65	6	83
KC3	0.60	0.70	0.23	0.50	1.10	0.90	5	20
KC3A†	0.25	0.42	0.30	0.25	1.00	0.65	6	83
KC3PB	3.00	3.62	1.93	2.00	7.20	5.17	6	0
KC13†	0.38	0.58	0.44	0.25	1.25	1.08	6	83
KC14†	1.25	1.05	0.69	0.25	2.00	1.63	5	80
KCF1†	0.50	0.50	0.23	0.25	0.80	0.73	6	67
LIMESTONE†	0.38	0.38	0.14	0.25	0.50	0.50	6	100
M1†	0.50	1.33	1.44	0.50	3.00	2.75	3	67
RN029659†	0.38	0.38	0.14	0.25	0.50	0.50	6	100
RN029660	3.00	2.98	0.16	2.70	3.20	3.06	6	0
W2R†	0.38	0.39	0.16	0.25	0.60	0.53	6	83
WP5†	0.50	0.39	0.13	0.25	0.50	0.50	7	100
WP13†	0.38	0.38	0.14	0.25	0.50	0.50	6	100
WP19†	1.25	1.45	1.01	0.50	2.50	2.50	5	100

† More than one-quarter of the samples are below the LOR

Table D17 Concentration of copper (µg/L)

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
10WP31	1.80	1.92	1.93	0.05	5.00	4.10	7	14
10WP32†	0.90	1.16	1.05	0.05	3.00	2.19	7	29
10WP32PB	1.10	1.53	1.21	0.40	4.00	2.20	7	14
10WP33†	1.00	0.98	0.71	0.05	2.10	1.65	7	43
10WP35N	0.50	0.76	0.59	0.30	2.00	1.10	7	14
10WP35PB†	1.00	0.96	0.44	0.40	1.70	1.35	9	44
10WP35S	1.00	1.06	0.91	0.30	3.00	1.29	7	14
10WP36N	0.80	1.11	1.31	0.20	4.00	1.30	7	14
10WP36PB†	1.00	0.84	0.74	0.05	2.60	1.00	10	60
10WP36S†	0.70	0.63	0.31	0.20	1.00	1.00	7	29
10WP37†	0.50	0.82	1.00	0.05	3.00	1.20	7	29
10WP39†	0.40	0.49	0.38	0.10	1.00	1.00	7	29
10WP40	0.70	1.43	1.48	0.10	4.00	3.10	7	14
10WP41†	2.10	3.74	4.38	0.25	11.00	9.20	7	29
10WP42†	0.60	1.09	1.33	0.10	4.00	1.30	7	29
10WP44†	0.25	0.69	0.88	0.25	2.00	1.48	4	75
10WP46†	0.50	0.56	0.43	0.10	1.00	1.00	7	57
10WP47†	0.60	0.63	0.37	0.20	1.00	1.00	7	43
11CS10RD	0.50	1.98	3.47	0.20	9.00	3.75	6	0
11CS10RS	0.55	3.33	6.71	0.10	17.00	6.15	6	17
11WP4R	0.35	2.30	3.56	0.10	9.00	5.29	6	0
11WP9RPB	0.30	2.63	5.91	0.10	16.00	2.77	7	0
11WP9RS	0.60	0.70	0.17	0.60	1.00	0.85	5	20
11WP11RD	0.55	1.31	1.85	0.05	5.00	2.41	6	17
11WP11RS	0.95	1.13	0.77	0.30	2.30	1.95	6	17
11WP15R	1.10	3.12	5.34	0.50	14.00	5.18	6	0
11WP16R†	0.25	2.63	5.57	0.25	14.00	4.76	6	67
11WP43D†	2.63	4.59	6.05	0.10	13.00	10.60	4	50
11WP50	1.85	1.69	1.18	0.25	2.80	2.71	4	25
11WP51D	0.30	1.53	3.17	0.05	8.00	2.68	6	17
11WP51S	0.85	1.67	1.89	0.10	5.10	3.35	6	17
11WP52D	0.65	1.80	2.62	0.20	7.00	3.43	6	0

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
11WP53D	0.65	2.35	3.82	0.10	10.00	4.54	6	17
11WP53S	0.60	0.67	0.34	0.20	1.10	1.03	6	17
11WP54D†	0.53	6.23	13.62	0.25	34.00	11.46	6	50
11WP54S†	2.05	2.97	3.07	0.25	8.00	6.04	6	33
11WP55†	0.45	0.54	0.39	0.05	1.00	1.00	6	33
11WP56D	1.40	1.65	1.11	0.30	3.00	2.93	6	17
11WP56S†	1.00	1.13	0.61	0.60	1.80	1.72	3	33
11WP57†	0.85	10.70	16.04	0.25	36.00	29.00	6	33
CG1†	1.65	1.58	0.96	0.10	2.70	2.49	6	33
CG2	0.80	0.76	0.42	0.30	1.30	1.15	5	20
CG4†	0.80	1.29	1.44	0.05	4.00	2.39	6	33
KC3	0.90	0.80	0.35	0.20	1.10	1.05	5	0
KC3A	1.05	1.70	1.76	0.10	4.10	3.82	6	17
KC3PB	0.85	1.35	1.31	0.20	3.80	2.40	6	17
KC13	0.50	0.62	0.35	0.30	1.10	1.03	6	17
KC14	1.50	1.35	1.03	0.25	2.90	2.20	5	20
KCF1	0.70	0.72	0.38	0.30	1.20	1.10	5	20
LIMESTONE†	0.75	1.41	2.19	0.05	5.80	2.44	6	50
M1†	1.00	1.00	0.00	1.00	1.00	1.00	3	100
RN029659†	0.80	0.63	0.48	0.05	1.10	1.03	6	67
RN029660†	0.85	0.80	0.38	0.20	1.30	1.09	6	33
W2R†	0.75	1.04	1.16	0.05	3.30	1.69	6	33
WP5	5.00	3.89	2.38	0.90	7.00	5.83	7	0
WP13†	0.40	0.53	0.39	0.05	1.00	1.00	6	50
WP19	1.90	3.37	3.40	0.25	9.00	6.45	5	20

† More than one-quarter of the samples are below the LOR

Table D18 Concentration of electrical conductivity (mS/m)

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
10WP31	42	43	3	39	47	46	7	0
10WP32	174	168	36	127	214	202	7	0
10WP32PB	150	151	22	118	188	166	7	0
10WP33	137	138	14	116	157	150	7	0
10WP35N	120	120	20	86	141	137	7	0
10WP35PB	166	160	17	133	180	175	9	0
10WP35S	154	147	21	112	167	167	7	0
10WP36N	126	128	10	116	144	141	7	0
10WP36PB	118	123	21	87	161	144	10	0
10WP36S	152	148	26	93	174	164	7	0
10WP37	193	198	11	184	215	207	7	0
10WP39	117	117	4	111	123	121	7	0
10WP40	554	590	195	377	955	682	7	0
10WP41	2310	2211	490	1530	2950	2491	7	0
10WP42	222	227	12	214	247	238	7	0
10WP44	2510	2515	44	2470	2570	2558	4	0
10WP46	221	216	15	187	230	226	7	0
10WP47	62	60	10	44	73	66	7	0
11CS10RD	243	251	73	174	350	330	6	0
11CS10RS	708	739	219	413	997	976	6	0
11WP4R	162	163	7	154	170	170	6	0
11WP9RPB	191	182	41	91	212	203	7	0
11WP9RS	198	181	44	102	206	206	5	0
11WP11RD	100	100	3	94	104	102	6	0
11WP11RS	113	114	9	100	128	121	6	0
11WP15R	838	840	15	824	858	855	6	0
11WP16R	1220	1220	38	1180	1280	1252	6	0
11WP43D	1269	1368	1071	374	2560	2386	4	0
11WP50	2085	2085	17	2070	2100	2100	4	0
11WP51D	75	72	8	58	81	78	6	0
11WP51S	99	102	51	24	155	145	6	0
11WP52D	90	90	6	81	99	95	6	0

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
11WP53D	822	832	35	805	898	858	6	0
11WP53S	901	898	19	872	925	912	6	0
11WP54D	2440	2425	60	2320	2480	2473	6	0
11WP54S	1700	1682	69	1550	1750	1722	6	0
11WP55	437	408	78	249	451	444	6	0
11WP56D	9	9	3	5	14	12	6	0
11WP56S	86	78	46	28	119	116	3	0
11WP57	1620	1598	112	1450	1730	1702	6	0
CG1	612	606	39	536	645	635	6	0
CG2	94	92	5	86	99	97	5	0
CG4	319	324	25	296	358	350	6	0
KC3	26	24	4	18	27	26	5	0
KC3A	44	45	3	42	51	46	6	0
KC3PB	44	43	1	41	44	44	6	0
KC13	108	104	9	86	110	109	6	0
KC14	1750	1752	23	1730	1790	1770	5	0
KCF1	481	480	10	466	496	489	6	0
LIMESTONE	63	60	24	29	94	80	6	0
M1	26	26	1	26	28	27	3	0
RN029659	428	379	168	51	498	491	6	0
RN029660	176	174	6	166	181	178	6	0
W2R	51	45	12	24	56	53	6	0
WP5	494	476	54	355	504	502	7	0
WP13	103	83	45	64	120	110	6	0
WP19	2620	2566	168	2270	2680	2670	5	0

Table D19 Concentration of fluoride (mg/L)

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
10WP31	0.20	0.19	0.02	0.16	0.21	0.21	5	0
10WP32	0.53	0.54	0.03	0.52	0.59	0.57	5	0
10WP32PB	0.55	0.54	0.03	0.48	0.56	0.56	5	0
10WP33	0.33	0.32	0.03	0.28	0.37	0.34	6	0
10WP35N	1.20	1.18	0.08	1.10	1.30	1.25	5	0
10WP35PB	0.44	0.42	0.09	0.28	0.53	0.47	6	0
10WP35S	0.49	0.50	0.10	0.40	0.66	0.58	5	0
10WP36N	1.20	1.26	0.19	1.00	1.50	1.45	5	0
10WP36PB	1.03	0.92	0.52	0.03	1.40	1.40	6	17
10WP36S	1.40	1.48	0.19	1.30	1.80	1.65	5	0
10WP37	1.00	1.04	0.05	1.00	1.10	1.10	5	0
10WP39	0.42	0.40	0.04	0.35	0.45	0.44	6	0
10WP40	0.73	0.78	0.12	0.66	0.96	0.91	5	0
10WP41	0.32	0.32	0.07	0.23	0.39	0.39	5	0
10WP42	0.49	0.46	0.06	0.37	0.51	0.51	5	0
10WP44	0.33	0.44	0.24	0.28	0.80	0.66	4	0
10WP46	0.47	0.46	0.03	0.42	0.48	0.48	5	0
10WP47	0.11	0.11	0.03	0.07	0.14	0.13	5	0
11CS10RD	0.21	0.19	0.04	0.12	0.23	0.22	5	0
11CS10RS	0.48	0.55	0.23	0.33	0.93	0.75	5	0
11WP4R	0.53	0.54	0.02	0.52	0.57	0.56	5	0
11WP9RPB	0.79	0.65	0.32	0.03	0.85	0.84	6	17
11WP9RS	0.87	0.84	0.06	0.74	0.87	0.87	4	0
11WP11RD	0.54	0.52	0.03	0.46	0.54	0.54	5	0
11WP11RS	1.20	1.16	0.05	1.10	1.20	1.20	5	0
11WP15R	0.38	0.36	0.03	0.32	0.38	0.38	5	0
11WP16R	0.58	0.67	0.13	0.56	0.82	0.82	5	0
11WP43D	0.54	0.53	0.12	0.39	0.66	0.64	4	0
11WP50	0.52	0.52	0.03	0.48	0.55	0.55	4	0
11WP51D	0.66	0.67	0.06	0.61	0.75	0.73	5	0
11WP51S	0.52	0.57	0.34	0.16	1.10	0.82	5	0
11WP52D	0.28	0.27	0.03	0.23	0.30	0.30	5	0

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
11WP53D	1.40	1.36	0.05	1.30	1.40	1.40	5	0
11WP53S	1.30	1.32	0.04	1.30	1.40	1.35	5	0
11WP54D	0.34	0.34	0.03	0.28	0.37	0.37	5	0
11WP54S	0.29	0.27	0.03	0.22	0.29	0.29	5	0
11WP55	0.27	0.27	0.09	0.16	0.36	0.36	5	0
11WP56D†	0.03	0.03	0.00	0.03	0.03	0.03	5	100
11WP56S	0.20	0.20	0.04	0.17	0.22	0.22	2	0
11WP57	0.43	0.42	0.03	0.38	0.45	0.45	5	0
CG1	0.31	0.30	0.02	0.26	0.33	0.32	6	0
CG2	0.28	0.29	0.03	0.26	0.34	0.33	5	0
CG4	0.24	0.23	0.02	0.20	0.24	0.24	5	0
KC3†	0.03	0.03	0.00	0.03	0.03	0.03	5	100
KC3A†	0.03	0.03	0.00	0.03	0.03	0.03	5	100
KC3PB†	0.03	0.03	0.00	0.03	0.03	0.03	5	100
KC13	0.37	0.36	0.03	0.32	0.39	0.39	5	0
KC14	1.00	1.07	0.12	0.96	1.20	1.20	5	0
KCF1	0.41	0.40	0.03	0.34	0.43	0.42	5	0
LIMESTONE†	0.14	0.13	0.10	0.03	0.24	0.23	5	40
M1	0.19	0.19	No data	0.19	0.19	0.19	1	0
RN029659	0.18	0.16	0.06	0.06	0.20	0.20	5	0
RN029660	1.50	1.50	0.12	1.40	1.70	1.60	5	0
W2R†	0.09	0.08	0.05	0.03	0.12	0.12	6	33
WP5	0.93	0.94	0.01	0.93	0.95	0.95	5	0
WP13	0.19	0.19	0.04	0.14	0.22	0.22	4	0
WP19	0.16	0.14	0.06	0.03	0.18	0.18	5	20

† More than one-quarter of the samples are below the LOR

Table D20 Concentration of iron (µg/L)

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
10WP31†	7	8	6	3	17	16	7	29
10WP32†	3	3	2	3	7	3	7	86
10WP32PB†	3	66	165	3	440	49	7	57
10WP33†	3	6	5	3	12	12	7	57
10WP35N†	6	8	8	3	25	12	7	43
10WP35PB	6	7	5	3	20	7	9	11
10WP35S†	6	6	4	3	11	10	7	43
10WP36N†	7	11	13	3	40	15	7	29
10WP36PB†	3	4	2	3	7	6	10	70
10WP36S†	3	8	10	3	31	9	7	57
10WP37	7	12	15	3	46	14	7	14
10WP39†	6	8	6	3	16	13	7	43
10WP40	43	101	146	7	410	185	7	0
10WP41	15	76	140	3	390	95	7	14
10WP42†	7	22	39	3	110	27	7	43
10WP44	417	461	494	11	1000	928	4	0
10WP46	12	26	34	3	99	42	7	14
10WP47	58	89	66	17	180	153	7	0
11CS10RD†	4	9	10	3	23	21	6	50
11CS10RS	31	56	65	11	180	101	6	0
11WP4R	116	170	174	10	490	301	6	0
11WP9RPB	8	26	38	6	110	42	7	0
11WP9RS	12	13	3	9	18	16	5	0
11WP11RD	13	12	5	6	18	17	6	0
11WP11RS	28	51	69	6	190	81	6	0
11WP15R	18	95	133	3	320	236	6	17
11WP16R	165	165	145	14	410	270	6	0
11WP43D	420	425	452	10	850	829	4	0
11WP50	645	853	883	23	2100	1680	4	0
11WP51D	23	26	14	8	43	42	6	0
11WP51S	65	159	220	3	580	328	6	17
11WP52D	10	19	21	6	59	35	6	0

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
11WP53D	19	23	20	6	58	39	6	0
11WP53S	42	36	18	13	59	50	6	0
11WP54D	28	28	17	6	49	43	6	0
11WP54S	39	75	112	3	300	124	6	17
11WP55	535	670	604	120	1400	1330	6	0
11WP56D	12	11	2	7	13	12	6	0
11WP56S	20	35	31	15	71	66	3	0
11WP57	230	207	128	37	370	314	6	0
CG1†	5	10	10	3	26	20	6	50
CG2†	3	3	2	3	7	5	5	80
CG4	415	334	199	66	560	476	6	0
KC3	18	22	11	10	40	33	5	0
KC3A	7	7	4	3	14	11	6	17
KC3PB	20	24	16	8	54	33	6	0
KC13	460	378	229	8	570	563	6	0
KC14	73	131	89	60	260	225	5	0
KCF1	285	360	335	37	970	613	6	0
LIMESTONE	138	197	173	28	460	383	6	0
M1	18	19	3	17	23	23	3	0
RN029659	450	533	509	31	1300	999	6	0
RN029660	13	13	6	6	19	19	6	0
W2R	74	88	95	3	270	143	6	17
WP5	19	18	10	3	35	23	7	14
WP13†	3	5	4	3	12	10	6	67
WP19	10	12	8	3	23	19	5	20

† More than one-quarter of the samples are below the LOR

Table D21 Concentration of gallium (µg/L)

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
10WP31†	0.05	0.05	0.00	0.05	0.05	0.05	6	100
10WP32†	0.05	0.05	0.00	0.05	0.05	0.05	6	100
10WP32PB†	0.05	0.05	0.00	0.05	0.05	0.05	6	100
10WP33†	0.05	0.05	0.00	0.05	0.05	0.05	6	100
10WP35N†	0.05	0.05	0.00	0.05	0.05	0.05	6	100
10WP35PB†	0.05	0.05	0.00	0.05	0.05	0.05	6	100
10WP35S†	0.05	0.05	0.00	0.05	0.05	0.05	6	100
10WP36N†	0.05	0.05	0.00	0.05	0.05	0.05	6	100
10WP36PB†	0.05	0.05	0.00	0.05	0.05	0.05	6	100
10WP36S†	0.05	0.05	0.00	0.05	0.05	0.05	6	100
10WP37†	0.05	0.05	0.00	0.05	0.05	0.05	6	100
10WP39†	0.05	0.05	0.00	0.05	0.05	0.05	6	100
10WP40†	0.10	0.13	0.06	0.05	0.20	0.20	6	50
10WP41†	0.25	0.29	0.10	0.25	0.50	0.33	6	100
10WP42†	0.05	0.05	0.00	0.05	0.05	0.05	6	100
10WP44	0.65	0.56	0.21	0.25	0.70	0.70	4	25
10WP46†	0.05	0.08	0.08	0.05	0.25	0.11	6	100
10WP47†	0.05	0.05	0.00	0.05	0.05	0.05	6	100
11CS10RD†	0.05	0.05	0.00	0.05	0.05	0.05	6	100
11CS10RS†	0.10	0.09	0.02	0.05	0.10	0.10	6	100
11WP4R†	0.05	0.10	0.08	0.05	0.20	0.20	6	67
11WP9RPB†	0.05	0.05	0.00	0.05	0.05	0.05	7	100
11WP9RS†	0.05	0.05	0.00	0.05	0.05	0.05	5	100
11WP11RD†	0.05	0.05	0.00	0.05	0.05	0.05	6	100
11WP11RS†	0.05	0.06	0.02	0.05	0.10	0.07	6	83
11WP15R†	0.10	0.10	0.00	0.10	0.10	0.10	6	100
11WP16R†	0.25	0.25	0.00	0.25	0.25	0.25	6	100
11WP43D	0.28	0.49	0.48	0.20	1.20	0.93	4	25
11WP50	0.70	0.61	0.26	0.25	0.80	0.80	4	25
11WP51D†	0.05	0.05	0.00	0.05	0.05	0.05	6	100
11WP51S†	0.05	0.07	0.03	0.05	0.10	0.10	6	83
11WP52D†	0.05	0.06	0.02	0.05	0.10	0.07	6	100

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
11WP53D†	0.10	0.10	0.00	0.10	0.10	0.10	6	100
11WP53S†	0.10	0.10	0.00	0.10	0.10	0.10	6	100
11WP54D†	0.25	0.25	0.00	0.25	0.25	0.25	6	100
11WP54S†	0.25	0.25	0.00	0.25	0.25	0.25	6	100
11WP55	0.35	0.28	0.15	0.10	0.40	0.40	6	0
11WP56D†	0.05	0.05	0.00	0.05	0.05	0.05	6	100
11WP56S†	0.05	0.12	0.12	0.05	0.25	0.23	3	100
11WP57†	0.25	0.28	0.17	0.10	0.60	0.36	6	67
CG1†	0.10	0.10	0.00	0.10	0.10	0.10	6	100
CG2†	0.05	0.05	0.00	0.05	0.05	0.05	5	100
CG4†	0.05	0.05	0.00	0.05	0.05	0.05	6	100
KC3†	0.05	0.05	0.00	0.05	0.05	0.05	5	100
KC3A†	0.05	0.05	0.00	0.05	0.05	0.05	6	100
KC3PB†	0.05	0.05	0.00	0.05	0.05	0.05	6	100
KC13†	0.05	0.08	0.08	0.05	0.25	0.11	6	100
KC14†	0.25	0.21	0.09	0.05	0.25	0.25	5	100
KCF1†	0.05	0.06	0.02	0.05	0.10	0.07	6	83
LIMESTONE†	0.05	0.06	0.02	0.05	0.10	0.07	6	83
M1†	0.05	0.05	0.00	0.05	0.05	0.05	2	100
RN029659†	0.05	0.05	0.00	0.05	0.05	0.05	6	100
RN029660†	0.05	0.05	0.00	0.05	0.05	0.05	6	100
W2R†	0.05	0.06	0.02	0.05	0.10	0.07	6	83
WP5†	0.05	0.07	0.03	0.05	0.10	0.10	6	100
WP13†	0.05	0.05	0.00	0.05	0.05	0.05	6	100
WP19†	0.50	0.44	0.13	0.25	0.50	0.50	4	100

† More than one-quarter of the samples are below the LOR

Table D22 Concentration of hardness (mg/L $CaCO_3$)

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
10WP31	170	163	26	130	190	187	7	0
10WP32	470	408	108	240	507	492	7	0
10WP32PB	400	389	126	240	579	500	7	0
10WP33	380	360	62	270	420	418	7	0
10WP35N	190	289	247	100	778	497	7	0
10WP35PB	420	470	199	250	807	689	9	0
10WP35S	380	442	186	250	775	626	7	0
10WP36N	280	360	187	200	644	612	7	0
10WP36PB	175	280	187	140	706	421	10	0
10WP36S	250	320	243	97	788	526	7	0
10WP37	370	472	268	230	858	855	7	0
10WP39	320	330	31	290	370	361	7	0
10WP40	780	960	435	670	1900	1090	7	0
10WP41	4600	3969	1985	583	6400	5500	7	0
10WP42	440	456	30	430	500	491	7	0
10WP44	4285	4217	3689	698	7600	7480	4	0
10WP46	500	518	68	450	659	552	7	0
10WP47	210	218	47	150	305	238	7	0
11CS10RD	519	613	213	430	890	876	6	0
11CS10RS	841	756	361	170	1200	1033	6	0
11WP4R	415	430	69	352	540	498	6	0
11WP9RPB	260	301	191	130	716	334	7	0
11WP9RS	339	314	86	200	402	391	5	0
11WP11RD	215	289	143	160	481	467	6	0
11WP11RS	110	277	266	94	662	600	6	0
11WP15R	510	803	526	410	1510	1468	6	0
11WP16R	2700	2121	1238	479	3400	2980	6	0
11WP43D	4800	5432	5673	129	12000	10890	4	0
11WP50	3027	3126	2746	750	5700	5580	4	0
11WP51D	220	239	46	190	305	292	6	0
11WP51S	265	246	72	120	330	295	6	0
11WP52D	205	217	68	140	339	266	6	0

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
11WP53D	210	843	1033	130	2210	2161	6	0
11WP53S	175	912	1165	140	2460	2397	6	0
11WP54D	4650	3500	2063	828	5200	4920	6	0
11WP54S	2200	2057	436	1510	2500	2430	6	0
11WP55	485	464	263	32	730	709	6	0
11WP56D	14	35	53	8	142	57	6	0
11WP56S	340	332	108	220	436	426	3	0
11WP57	3750	2898	1862	378	4400	4400	6	0
CG1	1300	1303	255	918	1700	1490	6	0
CG2	290	306	64	240	412	356	5	0
CG4	695	703	123	497	860	811	6	0
KC3	67	62	22	33	82	82	5	0
KC3A	125	99	52	32	140	140	6	0
KC3PB	115	97	50	35	150	136	6	0
KC13	290	309	108	160	468	409	6	0
KC14	5200	3383	2864	65	5800	5600	5	0
KCF1	1150	1095	174	873	1300	1230	6	0
LIMESTONE	200	189	40	140	240	219	6	0
M1	76	75	3	72	77	77	3	0
RN029659	625	616	325	140	960	960	6	0
RN029660	210	264	136	170	533	349	6	0
W2R	185	173	47	98	220	213	6	0
WP5	2300	1783	827	464	2400	2310	7	0
WP13	340	295	98	125	360	355	5	0
WP19	5800	3729	2928	468	5900	5900	5	0

Table D23 Concentration of bicarbonate (mg/L)

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
10WP31	180	176	17	140	190	190	7	0
10WP32	474	453	85	280	535	520	7	0
10WP32PB	488	418	118	180	500	500	7	0
10WP33	385	380	41	300	426	419	7	0
10WP35N	604	529	251	130	761	747	7	0
10WP35PB	720	659	164	340	831	790	9	0
10WP35S	705	588	240	210	807	781	7	0
10WP36N	598	502	230	140	684	656	7	0
10WP36PB	592	533	215	51	740	678	10	0
10WP36S	756	603	294	140	803	791	7	0
10WP37	744	660	234	250	879	853	7	0
10WP39	290	300	32	278	370	307	7	0
10WP40	798	697	234	340	952	836	7	0
10WP41	702	1264	1696	476	5100	1231	7	0
10WP42	406	416	55	348	520	444	7	0
10WP44	4155	4250	3771	790	7900	7660	4	0
10WP46	347	385	104	337	620	386	7	0
10WP47	256	249	29	199	287	268	7	0
11CS10RD	572	608	100	512	790	692	6	0
11CS10RS	1130	1191	300	872	1600	1530	6	0
11WP4R	367	392	110	270	570	492	6	0
11WP9RPB	672	541	240	170	695	689	7	0
11WP9RS	677	494	277	190	709	706	5	0
11WP11RD	450	371	137	180	475	465	6	0
11WP11RS	647	468	293	88	674	665	6	0
11WP15R	1445	1117	528	420	1490	1462	6	0
11WP16R	594	1440	1432	470	3700	3070	6	0
11WP43D	438	1117	1527	191	3400	2530	4	0
11WP50	3074	3094	2721	729	5500	5470	4	0
11WP51D	294	269	53	180	315	307	6	0
11WP51S	482	362	204	70	504	503	6	0
11WP52D	329	283	100	150	370	362	6	0

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
11WP53D	2065	1472	1030	130	2210	2203	6	0
11WP53S	2200	1567	1093	160	2390	2320	6	0
11WP54D	845	2265	2246	799	5500	5010	6	0
11WP54S	1515	1770	557	1300	2700	2350	6	0
11WP55	675	665	67	550	738	723	6	0
11WP56D	14	16	9	8	29	26	6	0
11WP56S	286	238	151	69	360	353	3	0
11WP57	430	1665	1925	412	4200	4130	6	0
CG1	891	979	209	864	1400	1089	6	0
CG2	383	381	50	300	422	422	5	0
CG4	509	564	151	482	870	633	6	0
KC3	64	64	3	59	67	67	5	0
KC3A	36	68	53	31	150	129	6	0
KC3PB	38	70	56	31	160	132	6	0
KC13	343	335	52	250	392	377	6	0
KC14	468	2650	3018	436	6200	5950	5	0
KCF1	877	976	185	848	1300	1160	6	0
LIMESTONE	210	193	77	96	292	257	6	0
M1	128	124	7	116	128	128	3	0
RN029659	411	423	298	122	960	610	6	0
RN029660	541	493	145	200	586	575	6	0
W2R	221	196	47	110	228	227	6	0
WP5	702	1090	692	665	2200	2020	7	0
WP13	262	260	7	250	267	266	5	0
WP19	568	2776	3041	549	6400	6100	5	0

Table D24 Concentration of mercury (µg/L)

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
10WP31†	0.05	0.05	0.01	0.03	0.05	0.05	6	100
10WP32†	0.05	0.05	0.01	0.03	0.05	0.05	6	100
10WP32PB†	0.05	0.05	0.01	0.03	0.05	0.05	6	100
10WP33†	0.05	0.05	0.01	0.03	0.05	0.05	7	100
10WP35N†	0.05	0.05	0.01	0.03	0.05	0.05	6	100
10WP35PB†	0.05	0.05	0.01	0.03	0.05	0.05	7	100
10WP35S†	0.05	0.05	0.01	0.03	0.05	0.05	6	100
10WP36N†	0.05	0.05	0.01	0.03	0.05	0.05	6	100
10WP36PB†	0.05	0.05	0.01	0.03	0.05	0.05	7	100
10WP36S†	0.05	0.05	0.01	0.03	0.05	0.05	6	100
10WP37†	0.05	0.05	0.01	0.03	0.05	0.05	6	100
10WP39†	0.05	0.05	0.01	0.03	0.05	0.05	7	100
10WP40†	0.05	0.06	0.03	0.03	0.10	0.10	6	100
10WP41†	0.25	0.25	0.15	0.03	0.50	0.33	6	100
10WP42†	0.05	0.05	0.01	0.03	0.05	0.05	6	100
10WP44†	0.18	0.16	0.11	0.03	0.25	0.25	4	75
10WP46†	0.05	0.08	0.08	0.03	0.25	0.11	6	100
10WP47†	0.05	0.05	0.01	0.03	0.05	0.05	6	100
11CS10RD†	0.05	0.05	0.01	0.03	0.05	0.05	6	100
11CS10RS†	0.10	0.08	0.03	0.03	0.10	0.10	6	100
11WP4R†	0.05	0.05	0.01	0.03	0.05	0.05	6	100
11WP9RPB†	0.05	0.08	0.10	0.03	0.30	0.08	7	86
11WP9RS†	0.05	0.06	0.03	0.03	0.10	0.08	5	80
11WP11RD†	0.05	0.05	0.01	0.03	0.05	0.05	6	100
11WP11RS†	0.05	0.05	0.01	0.03	0.05	0.05	6	100
11WP15R†	0.10	0.08	0.03	0.03	0.10	0.10	6	100
11WP16R†	0.25	0.18	0.11	0.03	0.25	0.25	6	100
11WP43D†	0.08	0.12	0.12	0.03	0.30	0.24	4	75
11WP50†	0.25	0.19	0.11	0.03	0.25	0.25	4	100
11WP51D†	0.05	0.05	0.01	0.03	0.05	0.05	6	100
11WP51S†	0.05	0.05	0.02	0.03	0.10	0.07	6	100
11WP52D†	0.05	0.05	0.02	0.03	0.10	0.07	6	100

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
11WP53D†	0.10	0.38	0.61	0.03	1.60	0.76	6	67
11WP53S†	0.10	0.08	0.03	0.03	0.10	0.10	6	100
11WP54D†	0.25	0.18	0.11	0.03	0.25	0.25	6	100
11WP54S†	0.25	0.18	0.11	0.03	0.25	0.25	6	100
11WP55†	0.05	0.05	0.01	0.03	0.05	0.05	6	100
11WP56D†	0.05	0.05	0.01	0.03	0.05	0.05	6	100
11WP56S†	0.05	0.12	0.12	0.05	0.25	0.23	3	100
11WP57†	0.15	0.15	0.11	0.03	0.25	0.25	6	100
CG1†	0.08	0.07	0.04	0.03	0.10	0.10	6	100
CG2†	0.05	0.05	0.01	0.03	0.05	0.05	5	100
CG4†	0.05	0.05	0.01	0.03	0.05	0.05	6	100
KC3†	0.05	0.05	0.01	0.03	0.05	0.05	5	100
KC3A†	0.05	0.05	0.01	0.03	0.05	0.05	6	100
KC3PB†	0.05	0.05	0.01	0.03	0.05	0.05	6	100
KC13†	0.05	0.08	0.08	0.03	0.25	0.11	6	100
KC14†	0.05	0.13	0.11	0.03	0.25	0.25	5	100
KCF1†	0.05	0.05	0.01	0.03	0.05	0.05	6	100
LIMESTONE†	0.05	0.05	0.01	0.03	0.05	0.05	6	100
M1†	0.05	0.05	0.00	0.05	0.05	0.05	3	100
RN029659†	0.05	0.05	0.01	0.03	0.05	0.05	6	100
RN029660†	0.05	0.05	0.01	0.03	0.05	0.05	6	100
W2R†	0.05	0.05	0.01	0.03	0.05	0.05	6	100
WP5†	0.05	0.05	0.02	0.03	0.10	0.07	6	100
WP13†	0.05	0.05	0.01	0.03	0.05	0.05	6	100
WP19†	0.25	0.27	0.23	0.03	0.50	0.50	5	100

† More than one-quarter of the samples are below the LOR

Table D25 Concentration of potassium (mg/L)

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
10WP31	3.2	3.2	0.4	2.7	4.0	3.6	7	0
10WP32	5.1	4.4	1.4	2.4	5.9	5.5	7	0
10WP32PB	3.5	3.3	1.5	0.6	5.2	4.2	7	0
10WP33	3.4	3.6	0.4	3.1	4.4	3.9	7	0
10WP35N	2.2	2.2	0.5	1.4	2.6	2.6	7	0
10WP35PB	3.3	3.1	0.6	2.2	3.8	3.8	9	0
10WP35S	3.2	3.2	0.4	2.6	3.8	3.5	7	0
10WP36N	2.1	2.2	0.7	0.9	3.3	2.8	7	0
10WP36PB	1.9	2.1	0.6	1.3	3.2	2.7	10	0
10WP36S	2.4	2.5	0.4	1.8	2.9	2.8	7	0
10WP37	2.8	2.5	0.5	1.6	3.0	2.8	7	0
10WP39	22.3	22.2	2.3	18.4	25.8	23.6	7	0
10WP40	17.5	16.8	4.8	11.6	25.7	19.3	7	0
10WP41	36.7	36.4	4.3	29.1	41.2	40.0	7	0
10WP42	21.3	21.3	2.0	18.8	24.1	23.4	7	0
10WP44	17.4	19.4	6.8	13.7	29.2	25.9	4	0
10WP46	24.4	24.3	2.3	20.4	28.0	25.7	7	0
10WP47	9.2	9.4	1.6	6.3	11.0	10.9	7	0
11CS10RD	4.5	4.7	0.9	3.7	5.8	5.7	6	0
11CS10RS	1.2	1.2	0.3	0.7	1.6	1.4	6	0
11WP4R	7.6	7.5	2.2	4.3	11.0	9.0	6	0
11WP9RPB	2.7	2.7	0.4	2.1	3.2	3.0	7	0
11WP9RS	2.5	2.5	0.4	2.1	3.0	2.9	5	0
11WP11RD	2.5	2.4	0.4	2.0	3.1	2.7	6	0
11WP11RS	0.8	0.8	0.2	0.5	1.2	1.0	6	0
11WP15R	5.6	5.5	0.4	5.0	6.0	5.9	6	0
11WP16R	4.5	4.3	1.2	2.2	5.4	5.4	6	0
11WP43D	13.0	12.7	5.4	5.9	19.0	17.3	4	0
11WP50	11.9	12.0	0.8	11.2	13.2	12.8	4	0
11WP51D	18.5	17.7	2.2	14.4	20.3	19.5	6	0
11WP51S	26.8	21.8	10.0	4.2	29.7	28.2	6	0
11WP52D	2.6	2.5	0.4	1.9	2.9	2.8	6	0

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
11WP53D	5.6	5.7	0.4	5.2	6.3	6.2	6	0
11WP53S	6.3	6.2	0.3	5.8	6.6	6.5	6	0
11WP54D	23.5	24.7	2.1	23.1	27.8	27.2	6	0
11WP54S	20.0	20.4	1.9	18.4	23.0	22.3	6	0
11WP55	10.9	10.6	1.5	8.6	12.6	11.8	6	0
11WP56D	0.6	0.8	0.5	0.3	1.4	1.3	6	0
11WP56S	1.1	0.9	0.4	0.4	1.2	1.2	3	0
11WP57	68.3	66.7	5.9	58.5	74.5	70.9	6	0
CG1	8.3	8.3	0.7	7.3	9.1	9.0	6	0
CG2	3.5	3.4	0.6	2.7	4.2	4.0	5	0
CG4	5.8	6.7	2.7	5.0	12.1	7.9	6	0
KC3	1.9	2.0	0.4	1.5	2.4	2.4	5	0
KC3A	4.5	4.5	0.4	3.8	5.1	4.8	6	0
KC3PB	4.6	4.4	0.6	3.7	5.2	4.9	6	0
KC13	4.2	4.1	0.3	3.7	4.5	4.4	6	0
KC14	24.7	24.3	2.2	21.5	27.2	26.2	5	0
KCF1	12.2	12.1	1.0	10.4	13.4	13.0	6	0
LIMESTONE	10.0	11.7	7.9	5.5	27.1	16.0	6	0
M1	2.4	2.4	0.1	2.3	2.5	2.5	3	0
RN029659	11.7	10.2	4.0	2.1	13.2	12.2	6	0
RN029660	8.5	8.5	1.0	7.4	9.9	9.5	6	0
W2R	6.6	6.3	2.3	3.3	8.5	8.4	6	0
WP5	4.1	4.0	0.8	3.1	5.5	4.4	7	0
WP13	15.2	15.1	1.4	13.4	16.6	16.5	6	0
WP19	28.7	28.6	2.4	26.4	32.3	30.7	5	0

Table D26 Concentration of lanthanum (µg/L)

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
10WP31†	2.50	2.15	0.93	0.05	2.50	2.50	7	100
10WP32†	2.50	2.15	0.93	0.05	2.50	2.50	7	100
10WP32PB†	2.50	2.15	0.93	0.05	2.50	2.50	7	100
10WP33†	2.50	2.15	0.93	0.05	2.50	2.50	7	100
10WP35N†	2.50	2.15	0.93	0.05	2.50	2.50	7	100
10WP35PB†	2.50	2.23	0.82	0.05	2.50	2.50	9	100
10WP35S†	2.50	2.15	0.93	0.05	2.50	2.50	7	100
10WP36N†	2.50	2.15	0.93	0.05	2.50	2.50	7	100
10WP36PB†	2.50	2.26	0.77	0.05	2.50	2.50	10	100
10WP36S†	2.50	2.15	0.93	0.05	2.50	2.50	7	100
10WP37†	2.50	2.15	0.93	0.05	2.50	2.50	7	100
10WP39†	2.50	2.15	0.93	0.05	2.50	2.50	7	100
10WP40†	2.50	2.16	0.91	0.10	2.50	2.50	7	100
10WP41†	2.50	2.29	0.57	1.00	2.50	2.50	7	86
10WP42†	2.50	2.15	0.93	0.05	2.50	2.50	7	100
10WP44†	2.50	1.94	1.13	0.25	2.50	2.50	4	100
10WP46†	2.50	2.15	0.93	0.05	2.50	2.50	7	100
10WP47†	2.50	2.16	0.91	0.10	2.50	2.50	7	86
11CS10RD†	2.50	2.10	0.98	0.10	2.50	2.50	6	83
11CS10RS†	2.50	2.12	0.94	0.20	2.50	2.50	6	83
11WP4R†	2.50	2.12	0.94	0.20	2.50	2.50	6	83
11WP9RPB†	2.50	2.15	0.93	0.05	2.50	2.50	7	100
11WP9RS†	2.50	2.01	1.10	0.05	2.50	2.50	5	100
11WP11RD†	2.50	2.09	1.00	0.05	2.50	2.50	6	100
11WP11RS†	2.50	2.18	0.78	0.60	2.50	2.50	6	83
11WP15R†	2.50	2.10	0.98	0.10	2.50	2.50	6	100
11WP16R†	2.50	2.13	0.92	0.25	2.50	2.50	6	100
11WP43D†	2.50	2.35	0.30	1.90	2.50	2.50	4	75
11WP50†	2.50	2.15	0.70	1.10	2.50	2.50	4	75
11WP51D†	2.50	2.09	1.00	0.05	2.50	2.50	6	100
11WP51S†	2.50	2.10	0.98	0.10	2.50	2.50	6	83
11WP52D†	2.50	2.09	1.00	0.05	2.50	2.50	6	100

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
11WP53D†	2.50	2.10	0.98	0.10	2.50	2.50	6	100
11WP53S†	2.50	2.10	0.98	0.10	2.50	2.50	6	100
11WP54D†	2.50	2.13	0.92	0.25	2.50	2.50	6	100
11WP54S†	2.50	2.13	0.92	0.25	2.50	2.50	6	100
11WP55†	2.50	2.09	1.00	0.05	2.50	2.50	6	100
11WP56D†	2.50	2.09	1.00	0.05	2.50	2.50	6	100
11WP56S†	2.50	2.50	0.00	2.50	2.50	2.50	3	100
11WP57†	2.50	2.13	0.92	0.25	2.50	2.50	6	100
CG1†	2.50	1.70	1.24	0.10	2.50	2.50	6	100
CG2†	2.50	2.01	1.10	0.05	2.50	2.50	5	100
CG4†	2.50	2.09	1.00	0.05	2.50	2.50	6	100
KC3†	2.50	2.01	1.10	0.05	2.50	2.50	5	100
KC3A†	2.50	2.10	0.98	0.10	2.50	2.50	6	83
KC3PB†	2.50	2.10	0.98	0.10	2.50	2.50	6	83
KC13†	2.50	2.09	1.00	0.05	2.50	2.50	6	100
KC14†	2.50	2.05	1.01	0.25	2.50	2.50	5	100
KCF1†	2.50	2.10	0.98	0.10	2.50	2.50	6	83
LIMESTONE†	2.50	2.12	0.94	0.20	2.50	2.50	6	83
M1†	2.50	2.50	0.00	2.50	2.50	2.50	3	100
RN029659†	2.50	2.09	1.00	0.05	2.50	2.50	6	100
RN029660†	2.50	2.09	1.00	0.05	2.50	2.50	6	100
W2R†	2.50	2.10	0.98	0.10	2.50	2.50	6	83
WP5†	2.50	2.16	0.91	0.10	2.50	2.50	7	86
WP13†	2.50	2.09	1.00	0.05	2.50	2.50	6	100
WP19†	2.50	2.10	0.89	0.50	2.50	2.50	5	100

† More than one-quarter of the samples are below the LOR

Table D27 Concentration of lithium (µg/L)

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
10WP31†	2.3	2.2	0.3	1.7	2.5	2.5	7	43
10WP32†	2.5	2.8	0.9	1.8	4.5	3.4	7	43
10WP32PB†	2.5	2.3	0.8	0.5	3.0	2.8	7	43
10WP33†	2.5	2.6	0.2	2.4	3.0	2.7	7	43
10WP35N†	2.5	2.5	0.4	1.7	2.8	2.7	7	43
10WP35PB†	2.5	2.7	0.4	2.5	3.6	3.1	9	56
10WP35S†	2.5	2.7	0.3	2.5	3.3	2.9	7	43
10WP36N†	2.5	2.5	0.7	1.1	3.4	2.9	7	43
10WP36PB†	2.5	2.5	0.6	1.6	4.1	2.5	10	60
10WP36S†	2.8	3.1	0.8	2.5	4.5	3.7	7	43
10WP37†	3.6	3.5	1.1	2.5	4.9	4.7	7	43
10WP39	41.0	40.1	3.5	35.0	44.0	43.1	7	0
10WP40	50.0	52.9	12.5	38.0	73.0	62.2	7	0
10WP41	27.0	27.9	6.5	17.0	37.0	34.3	7	0
10WP42	40.0	39.9	5.7	33.0	50.0	43.7	7	0
10WP44	25.5	26.3	2.6	24.0	30.0	28.8	4	0
10WP46	48.0	45.4	6.0	37.0	51.0	51.0	7	0
10WP47	8.0	8.2	1.4	6.0	10.0	9.7	7	0
11CS10RD†	3.5	3.5	0.9	2.5	5.0	4.2	6	33
11CS10RS	5.3	5.4	2.4	2.5	8.2	8.0	6	17
11WP4R†	2.4	2.3	0.3	1.7	2.5	2.5	6	33
11WP9RPB	4.6	4.4	1.1	2.5	6.0	5.3	7	14
11WP9RS	5.2	4.6	1.4	2.5	6.0	5.6	5	20
11WP11RD†	2.3	2.2	0.5	1.3	2.7	2.6	6	33
11WP11RS†	1.6	1.7	0.7	0.7	2.5	2.5	6	33
11WP15R	24.5	23.5	4.5	15.0	28.0	26.6	6	0
11WP16R	31.0	31.3	8.5	19.0	41.0	40.3	6	0
11WP43D	59.0	55.3	37.1	14.0	89.0	87.5	4	0
11WP50	36.5	36.0	3.2	32.0	39.0	38.7	4	0
11WP51D	22.0	21.7	5.8	12.0	28.0	27.3	6	0
11WP51S	24.0	21.0	12.6	2.2	33.0	33.0	6	0
11WP52D†	2.5	2.5	0.3	2.1	2.8	2.8	6	33

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
11WP53D	20.0	19.2	4.5	11.0	24.0	22.6	6	0
11WP53S	21.0	18.8	4.5	10.0	22.0	21.3	6	0
11WP54D	115.0	112.2	13.9	93.0	130.0	123.0	6	0
11WP54S	25.5	24.5	3.1	19.0	27.0	27.0	6	0
11WP55	40.5	40.2	5.6	32.0	47.0	45.6	6	0
11WP56D†	2.5	2.5	0.5	1.8	3.2	3.0	6	33
11WP56S†	1.2	1.6	0.8	1.0	2.5	2.4	3	33
11WP57	640.0	616.0	111.3	430.0	730.0	690.0	5	0
CG1	10.0	9.6	1.6	6.8	11.0	11.0	6	0
CG2†	3.0	2.8	0.3	2.5	3.2	3.1	5	40
CG4	6.5	5.9	1.7	2.5	7.0	6.7	6	17
KC3	11.0	11.1	2.0	8.8	14.0	13.0	5	0
KC3A	13.0	13.0	1.4	11.0	15.0	14.3	6	0
KC3PB	12.0	12.0	1.4	9.9	14.0	13.3	6	0
KC13	8.1	8.3	4.0	2.5	13.0	12.3	6	17
KC14	240.0	232.0	25.9	190.0	260.0	250.0	5	0
KCF1	22.0	21.7	3.3	18.0	26.0	24.6	6	0
LIMESTONE	16.5	14.1	5.9	5.4	19.0	19.0	6	0
M1†	2.5	2.5	0.0	2.5	2.5	2.5	3	100
RN029659	39.0	33.8	15.5	2.5	44.0	41.9	6	17
RN029660	30.5	29.8	1.9	27.0	32.0	31.3	6	0
W2R	7.4	6.7	3.7	1.8	10.0	10.0	6	0
WP5	25.0	25.0	2.4	22.0	28.0	28.0	7	0
WP13	25.5	25.0	1.8	22.0	27.0	26.3	6	0
WP19	85.0	91.8	12.7	80.0	110.0	105.0	5	0

† More than one-quarter of the samples are below the LOR

Table D28 Concentration of magnesium (mg/L)

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
10WP31	21.7	21.9	3.2	17.7	26.5	25.2	7	0
10WP32	59.7	57.4	15.7	37.7	77.1	73.5	7	0
10WP32PB	50.8	48.6	15.2	25.2	68.1	63.0	7	0
10WP33	48.4	51.3	8.4	42.0	62.9	60.9	7	0
10WP35N	23.8	24.6	7.0	15.7	33.5	32.2	7	0
10WP35PB	60.6	57.4	13.1	37.4	75.2	67.4	9	0
10WP35S	46.3	47.2	10.9	30.7	61.8	57.7	7	0
10WP36N	28.9	31.6	9.4	16.5	46.1	39.4	7	0
10WP36PB	22.5	27.9	14.1	7.6	55.8	41.5	10	0
10WP36S	27.2	27.6	9.2	14.2	40.2	37.9	7	0
10WP37	54.2	51.6	11.6	37.9	67.3	61.3	7	0
10WP39	28.5	28.4	3.2	24.2	33.3	31.5	7	0
10WP40	122.0	130.8	72.5	54.6	270.0	165.6	7	0
10WP41	813	742	213	442	1050	875	7	0
10WP42	57.5	56.4	4.8	51.0	64.1	60.2	7	0
10WP44	1205	1240	121	1140	1410	1359	4	0
10WP46	53.2	55.3	6.7	49.8	69.6	58.7	7	0
10WP47	12.7	13.1	2.1	9.5	15.7	15.0	7	0
11CS10RD	101.2	98.3	28.5	64.0	130.0	127.2	6	0
11CS10RS	157.5	143.4	80.0	28.3	245.0	209.3	6	0
11WP4R	55.2	55.7	11.7	37.5	69.7	67.0	6	0
11WP9RPB	34.5	34.5	8.3	22.2	46.3	41.7	7	0
11WP9RS	33.9	40.1	13.5	31.2	63.5	51.7	5	0
11WP11RD	31.6	30.5	3.3	25.2	33.4	33.3	6	0
11WP11RS	18.0	17.9	2.1	15.1	20.3	20.0	6	0
11WP15R	86.1	88.5	9.0	80.4	105.0	95.1	6	0
11WP16R	430	448	56	406	552	490	6	0
11WP43D	1061	1130	884	220	2180	1979	4	0
11WP50	957	945	30	902	966	966	4	0
11WP51D	20.5	20.1	1.8	17.3	22.2	21.6	6	0
11WP51S	31.3	26.8	13.6	6.3	42.5	37.0	6	0
11WP52D	25.1	25.6	4.4	21.1	31.1	30.5	6	0

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
11WP53D	29.4	32.1	9.1	25.4	49.7	37.9	6	0
11WP53S	31.2	31.0	1.6	28.2	32.9	32.3	6	0
11WP54D	816	836	63	773	942	897	6	0
11WP54S	408	421	43	377	491	462	6	0
11WP55	87	85	21	47	107	103	6	0
11WP56D	1.1	1.1	0.4	0.6	1.7	1.4	6	0
11WP56S	22.7	22.0	14.3	7.3	35.9	34.6	3	0
11WP57	445	432	44	351	469	464	6	0
CG1	204	209	24	182	253	224	6	0
CG2	32.5	31.1	3.5	24.8	33.3	33.0	5	0
CG4	113.5	116.5	13.8	102.0	133.0	132.3	6	0
KC3	10.2	10.8	1.6	8.8	12.5	12.5	5	0
KC3A	20.9	21.1	2.0	19.0	24.1	23.0	6	0
KC3PB	20.2	20.7	2.8	16.7	24.6	23.6	6	0
KC13	33.2	34.0	6.8	23.7	42.8	41.0	6	0
KC14	919	924	69	860	1030	988	5	0
KCF1	231	229	20	206	256	247	6	0
LIMESTONE	9.8	9.1	3.5	4.2	13.7	11.7	6	0
M1	7.9	8.0	0.2	7.9	8.2	8.2	3	0
RN029659	136.5	114.7	55.3	6.2	151.0	148.2	6	0
RN029660	31.9	33.2	5.4	27.5	42.7	37.6	6	0
W2R	8.2	7.4	2.1	4.4	9.8	9.1	6	0
WP5	400	390	28	348	421	409	7	0
WP13	21.2	21.6	2.4	19.5	25.7	23.4	6	0
WP19	932	946	54	906	1040	987	5	0

Table D29 Concentration of manganese (µg/L)

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
10WP31	11	22	31	4	89	34	7	0
10WP32†	2	4	3	1	9	6	7	29
10WP32PB	4	22	43	2	120	28	7	0
10WP33	5	5	3	1	10	9	7	0
10WP35N	22	33	35	6	110	39	7	0
10WP35PB	9	14	16	1	47	27	9	22
10WP35S	98	99	62	2	200	146	7	0
10WP36N	22	31	22	11	76	45	7	0
10WP36PB†	1	5	10	1	32	6	10	50
10WP36S	14	13	5	6	17	17	7	0
10WP37	11	14	10	4	27	25	7	0
10WP39	5	9	9	1	26	16	7	0
10WP40	770	1077	605	560	2000	1820	7	0
10WP41	1100	991	933	12	2500	1780	7	0
10WP42	12	12	9	1	24	23	7	14
10WP44	6350	6550	835	5800	7700	7370	4	0
10WP46	33	36	34	1	88	70	7	14
10WP47	180	182	113	1	330	303	7	14
11CS10RD†	4	4	3	1	8	6	6	33
11CS10RS	255	275	220	1	560	490	6	0
11WP4R	1115	1079	836	62	2000	1930	6	0
11WP9RPB	16	37	41	2	110	83	7	0
11WP9RS	18	28	24	10	69	48	5	0
11WP11RD	5	7	6	1	18	13	6	0
11WP11RS	24	26	21	1	56	47	6	0
11WP15R	122	143	92	34	260	246	6	0
11WP16R	335	424	348	56	930	797	6	0
11WP43D	3450	3475	818	2500	4500	4200	4	0
11WP50	4400	4725	2114	2600	7500	6780	4	0
11WP51D	55	61	31	21	100	94	6	0
11WP51S	460	502	390	2	1000	888	6	0
11WP52D	89	126	106	26	270	249	6	0

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
11WP53D	41	65	75	1	210	110	6	0
11WP53S	160	143	79	5	210	210	6	0
11WP54D	395	507	265	270	920	801	6	0
11WP54S	1300	1310	977	110	2700	2210	6	0
11WP55	3700	3105	1733	930	4800	4590	6	0
11WP56D	16	18	8	10	34	22	6	0
11WP56S	55	136	187	4	350	321	3	0
11WP57	545	1408	2059	400	5600	2282	6	0
CG1	3	2	2	1	5	4	6	17
CG2†	2	2	2	1	5	4	5	40
CG4	86	93	28	67	140	119	6	0
KC3	6	11	13	3	35	22	5	0
KC3A	7	15	22	3	60	24	6	0
KC3PB	12	13	11	3	32	19	6	0
KC13	255	212	105	2	270	270	6	0
KC14	220	230	44	180	280	275	5	0
KCF1	330	390	235	150	770	623	6	0
LIMESTONE	78	96	40	58	160	139	6	0
M1	4	4	2	3	6	6	3	0
RN029659	130	147	69	67	240	226	6	0
RN029660	6	7	4	2	15	9	6	0
W2R	55	147	263	4	680	261	6	0
WP5	180	210	100	99	410	266	7	0
WP13	4	5	5	1	12	11	6	17
WP19	41	63	79	8	200	130	5	0

† More than one-quarter of the samples are below the LOR

Table D30 Concentration of molybdenum (µg/L)

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
10WP31†	0.5	0.5	0.0	0.5	0.5	0.5	7	100
10WP32†	1.0	0.9	0.5	0.5	2.0	1.1	7	43
10WP32PB†	0.5	1.0	0.7	0.5	2.0	2.0	7	57
10WP33†	0.5	0.5	0.0	0.5	0.5	0.5	7	100
10WP35N	2.0	2.4	0.5	2.0	3.0	3.0	7	0
10WP35PB†	0.5	0.6	0.2	0.5	1.0	0.9	9	78
10WP35S†	1.0	1.1	0.9	0.5	3.0	1.2	7	43
10WP36N	5.0	5.1	2.1	2.0	9.0	6.3	7	0
10WP36PB	6.5	6.2	3.1	2.0	10.0	9.0	10	0
10WP36S	8.0	10.3	3.5	8.0	17.0	13.4	7	0
10WP37	5.0	5.6	1.1	4.0	7.0	7.0	7	0
10WP39†	0.5	0.5	0.0	0.5	0.5	0.5	7	100
10WP40	5.0	5.9	1.9	4.0	9.0	7.2	7	0
10WP41†	2.5	2.9	0.9	2.5	5.0	2.8	7	100
10WP42	1.0	1.3	0.5	1.0	2.0	2.0	7	0
10WP44†	2.5	3.1	1.3	2.5	5.0	4.3	4	75
10WP46†	1.0	1.0	0.7	0.5	2.5	1.2	7	57
10WP47†	0.5	0.5	0.0	0.5	0.5	0.5	7	100
11CS10RD†	0.5	0.5	0.0	0.5	0.5	0.5	6	100
11CS10RS†	4.0	11.2	17.1	1.0	45.0	21.9	6	33
11WP4R†	1.0	1.0	0.5	0.5	2.0	1.3	6	33
11WP9RPB	2.0	4.4	5.2	2.0	16.0	5.2	7	0
11WP9RS	2.0	2.4	0.5	2.0	3.0	3.0	5	0
11WP11RD†	1.0	1.2	0.7	0.5	2.0	2.0	6	33
11WP11RS†	0.5	0.8	0.6	0.5	2.0	1.0	6	83
11WP15R	4.5	4.5	1.4	3.0	6.0	6.0	6	0
11WP16R†	2.5	2.5	0.0	2.5	2.5	2.5	6	100
11WP43D†	2.8	2.9	1.7	1.0	5.0	4.4	4	75
11WP50†	2.5	2.5	0.0	2.5	2.5	2.5	4	100
11WP51D	2.0	1.8	0.9	0.5	3.0	2.3	6	17
11WP51S†	3.0	4.2	4.0	0.5	10.0	8.6	6	33
11WP52D†	0.5	0.7	0.3	0.5	1.0	1.0	6	83

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
11WP53D	36.5	38.5	7.6	30.0	51.0	45.4	6	0
11WP53S	36.0	39.7	7.8	33.0	53.0	47.4	6	0
11WP54D†	2.5	2.5	0.0	2.5	2.5	2.5	6	100
11WP54S†	2.5	2.5	0.0	2.5	2.5	2.5	6	100
11WP55	10.0	10.5	4.6	5.0	19.0	12.7	6	0
11WP56D†	0.5	0.5	0.0	0.5	0.5	0.5	6	100
11WP56S†	0.5	1.2	1.2	0.5	2.5	2.3	3	100
11WP57†	2.5	3.8	4.1	0.5	12.0	5.4	6	83
CG1†	1.0	1.0	0.0	1.0	1.0	1.0	6	100
CG2†	0.5	0.8	0.7	0.5	2.0	1.3	5	80
CG4†	0.5	0.5	0.0	0.5	0.5	0.5	6	100
KC3†	0.5	0.5	0.0	0.5	0.5	0.5	5	100
KC3A†	0.5	0.5	0.0	0.5	0.5	0.5	6	100
KC3PB†	0.5	0.5	0.0	0.5	0.5	0.5	6	100
KC13	2.3	4.3	3.7	2.0	11.0	7.5	6	17
KC14†	2.5	2.1	0.9	0.5	2.5	2.5	5	100
KCF1	1.0	1.2	0.4	1.0	2.0	1.3	6	0
LIMESTONE†	0.8	0.9	0.6	0.5	2.0	1.3	6	50
M1†	0.5	0.5	0.0	0.5	0.5	0.5	3	100
RN029659†	0.5	0.5	0.0	0.5	0.5	0.5	6	100
RN029660	3.0	3.3	0.8	3.0	5.0	3.6	6	0
W2R†	0.5	0.5	0.0	0.5	0.5	0.5	6	100
WP5†	1.0	1.1	0.6	0.5	2.0	2.0	7	57
WP13†	0.5	0.5	0.0	0.5	0.5	0.5	6	100
WP19†	5.0	4.5	1.1	2.5	5.0	5.0	5	100

† More than one-quarter of the samples are below the LOR

Table D31 Concentration of nitrogen ammonia (µg/L)

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
10WP31†	5	17	19	5	50	36	6	67
10WP32†	13	14	11	5	30	23	6	50
10WP32PB†	13	21	20	5	50	43	6	50
10WP33†	5	20	26	5	70	42	6	67
10WP35N†	18	41	47	5	110	96	6	50
10WP35PB†	5	5	0	5	5	5	8	100
10WP35S†	5	6	2	5	10	7	6	83
10WP36N†	5	52	103	5	260	99	6	67
10WP36PB†	5	5	0	5	5	5	9	100
10WP36S†	5	5	0	5	5	5	6	100
10WP37†	23	124	182	5	440	307	6	50
10WP39†	5	12	14	5	40	19	6	67
10WP40	180	228	212	5	590	401	6	17
10WP41†	60	75	81	5	220	136	6	33
10WP42†	8	9	6	5	20	13	6	50
10WP44	ND	ND	ND	ND	ND	ND	4/0*	0
10WP46†	5	20	24	5	60	46	6	67
10WP47	35	33	24	5	70	49	6	17
11CS10RD†	5	23	33	5	80	50	5	60
11CS10RS†	5	71	111	5	260	170	5	60
11WP4R	1300	1320	1061	60	2900	2250	5	0
11WP9RPB†	5	27	42	5	110	54	6	67
11WP9RS†	5	16	23	5	50	37	4	75
11WP11RD†	5	5	0	5	5	5	5	100
11WP11RS†	40	44	41	5	100	85	5	40
11WP15R†	5	37	50	5	120	85	5	60
11WP16R	320	1836	2343	40	5000	4350	5	0
11WP43D	240	398	410	110	1000	793	4	0
11WP50	35	46	45	5	110	89	4	25
11WP51D	80	130	131	20	330	260	5	0
11WP51S	60	57	45	10	100	96	5/3*	0
11WP52D†	5	14	20	5	50	28	5	80

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
11WP53D†	5	32	60	5	140	73	5	80
11WP53S†	10	86	110	5	230	205	5	40
11WP54D†	10	20	23	5	60	40	5	40
11WP54S†	20	142	206	5	480	340	5	40
11WP55	190	574	715	30	1700	1285	5	0
11WP56D†	5	25	33	5	80	55	5	60
11WP56S†	5	5	0	5	5	5	2	100
11WP57	350	368	89	250	490	450	5	0
CG1†	5	17	26	5	70	28	6	67
CG2†	5	16	25	5	60	33	5	80
CG4†	10	58	80	5	190	135	5	40
KC3†	10	16	19	5	50	30	5	40
KC3A†	10	12	10	5	30	20	5	40
KC3PB†	5	9	7	5	20	15	5	60
KC13	60	55	32	5	90	80	5	20
KC14	70	86	42	40	130	130	5	0
KCF1†	10	20	28	5	70	40	5	40
LIMESTONE	3500	3820	1599	1700	6000	5300	5	0
M1†	5	5	ND	5	5	5	1	100
RN029659†	20	20	15	5	40	35	5	40
RN029660†	5	15	15	5	40	30	5	60
W2R†	310	385	416	5	900	816	6	33
WP5†	5	18	31	5	80	28	6	83
WP13†	5	5	0	5	5	5	4	100
WP19†	10	28	30	5	70	60	5	40

† More than one-quarter of the samples are below the LOR

* Number of samples and number used in statistical analysis

ND No data

Table D32 Concentration of oxidised nitrogen (µg/L)

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
10WP31	130	123	58	40	190	177	7	0
10WP32	185	148	82	5	230	217	7	14
10WP32PB	140	140	51	90	205	187	7	0
10WP33	150	160	78	50	300	206	8/7*	0
10WP35N	115	119	26	90	150	146	7	0
10WP35PB	90	102	28	60	145	133	9	0
10WP35S	80	64	41	5	105	101	7	14
10WP36N	300	334	183	90	620	526	7	0
10WP36PB	360	377	297	5	990	585	10	10
10WP36S	370	381	116	260	600	443	7	0
10WP37	560	567	358	5	1100	857	7	14
10WP39†	10	8	3	5	10	10	7	71
10WP40†	5	60	139	5	375	51	7	57
10WP41	20	20	9	10	35	26	7	0
10WP42	30	32	20	10	60	51	7	14
10WP44	25	25	21	10	40	40	4/2*	25
10WP46	55	44	20	10	60	60	7	0
10WP47†	5	7	3	5	10	10	7	86
11CS10RD	120	132	45	80	190	183	6	0
11CS10RS†	5	9	8	5	25	15	6	83
11WP4R	60	72	53	5	160	118	6	17
11WP9RPB	135	101	74	5	200	155	7	14
11WP9RS	135	126	47	60	180	168	5	0
11WP11RD	130	104	59	5	155	148	6	17
11WP11RS	155	132	79	5	205	195	6	17
11WP15R	30	25	14	5	40	37	6	17
11WP16R	48	48	26	15	90	69	6	0
11WP43D	88	201	286	10	620	479	4	0
11WP50†	10	9	3	5	10	10	4	75
11WP51D†	8	10	6	5	20	17	6	67
11WP51S†	10	63	85	5	200	158	6	50
11WP52D	78	72	14	50	85	82	6	0

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
11WP53D	53	44	26	5	70	67	6	17
11WP53S	30	29	20	5	60	46	6	17
11WP54D†	5	7	3	5	10	10	6	100
11WP54S†	28	33	33	5	95	57	6	33
11WP55†	8	9	6	5	20	13	6	83
11WP56D	128	105	47	20	145	135	6	0
11WP56S†	10	25	30	5	60	55	3	33
11WP57†	5	7	3	5	10	10	6	100
CG1	913	838	225	390	980	977	6	0
CG2	850	824	390	405	1300	1200	5	0
CG4	48	45	14	20	60	57	6	0
KC3	210	212	40	160	270	248	5	0
KC3A	178	170	36	100	205	195	6	0
KC3PB	178	158	43	80	195	185	6	0
KC13†	10	31	36	5	90	69	6	50
KC14†	5	7	3	5	10	10	5	100
KCF1	20	20	9	10	30	30	6	0
LIMESTONE†	48	50	43	5	120	85	6	33
M1†	10	12	8	5	20	19	3	33
RN029659†	10	8	3	5	10	10	6	67
RN029660	418	395	77	270	475	458	6	0
W2R†	10	10	5	5	20	13	6	67
WP5†	10	10	5	5	20	11	7	57
WP13	100	93	30	50	130	118	5	0
WP19†	10	9	4	5	15	13	5	60

† More than one-quarter of the samples are below the LOR

* Number of samples and number used in statistical analysis

Table D33 Concentration of total nitrogen (µg/L)

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
10WP31	185	392	359	140	1000	769	6	0
10WP32	410	522	325	150	970	900	6	0
10WP32PB	270	486	458	120	1300	994	7	0
10WP33	190	367	297	140	960	591	7	0
10WP35N	210	348	371	150	1100	519	6	0
10WP35PB	160	273	273	90	890	461	9	0
10WP35S	230	408	540	100	1500	639	6	0
10WP36N	575	705	557	270	1800	995	6	0
10WP36PB	540	585	265	190	990	880	10	0
10WP36S	510	617	349	390	1300	810	6	0
10WP37	1000	1062	526	560	2000	1440	6	0
10WP39	100	190	267	10	780	240	7	14
10WP40	590	852	726	200	1800	1730	6	0
10WP41	375	452	240	160	820	701	6	0
10WP42	90	146	156	50	490	184	7	0
10WP44	ND	ND	ND	ND	ND	ND	4/0*	0
10WP46	140	236	292	30	860	383	7	0
10WP47	110	189	299	20	860	194	7	0
11CS10RD	250	487	434	180	1200	955	6	0
11CS10RS	110	392	499	50	1200	941	6	0
11WP4R	1500	1873	1686	170	4800	3330	6	0
11WP9RPB	170	543	715	70	2000	1082	7	0
11WP9RS	180	440	545	100	1400	880	5	0
11WP11RD	140	318	387	130	1100	519	6	0
11WP11RS	270	533	567	160	1600	998	6	0
11WP15R	90	290	346	30	760	725	6	0
11WP16R	995	2260	2604	230	5800	5450	6	0
11WP43D	1300	1390	697	660	2300	2060	4	0
11WP50	565	538	416	70	950	911	4	0
11WP51D	125	438	766	90	2000	733	6	0
11WP51S	400	425	330	100	800	740	6/4*	0
11WP52D	175	315	353	70	1000	566	6	0

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
11WP53D	100	303	410	50	1100	603	6	0
11WP53S	185	250	232	50	650	440	6	0
11WP54D	75	242	337	20	880	516	6	0
11WP54S	440	487	351	70	960	869	6	0
11WP55	930	1142	864	160	2400	2050	6	0
11WP56D	175	552	626	130	1500	1290	6	0
11WP56S	80	103	59	60	170	161	3	0
11WP57	475	635	394	300	1300	1034	6	0
CG1	1050	1213	447	900	2100	1470	6	0
CG2	1400	1192	423	460	1500	1450	5	0
CG4	385	677	813	60	2200	1318	6	0
KC3	320	362	206	220	720	520	5	0
KC3A	260	325	172	170	570	521	6	0
KC3PB	190	243	121	160	480	326	6	0
KC13	140	170	155	40	470	253	6	0
KC14	180	404	509	80	1300	810	5	0
KCF1	65	113	100	20	280	217	6	0
LIMESTONE	3500	4420	1766	2800	7100	6200	6/5*	0
M1	190	193	15	180	210	208	3	0
RN029659	355	532	564	40	1300	1160	6	0
RN029660	475	740	475	390	1400	1330	6	0
W2R	540	618	619	40	1600	1110	6	0
WP5	55	218	385	10	1000	398	6	17
WP13	140	312	442	70	1100	625	5	0
WP19	620	486	387	40	950	820	5	0

† More than one-quarter of the samples are below the LOR

* Number of samples and number used in statistical analysis

ND No data

Table D34 Concentration of sodium (mg/L)

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
10WP31	22	22	4	16	28	25	7	0
10WP32	238	216	52	153	270	269	7	0
10WP32PB	204	184	60	63	247	215	7	0
10WP33	142	149	18	123	168	168	7	0
10WP35N	247	232	43	163	294	258	7	0
10WP35PB	216	215	28	180	257	240	9	0
10WP35S	227	225	22	192	254	245	7	0
10WP36N	197	182	47	79	214	213	7	0
10WP36PB	193	193	18	170	222	210	10	0
10WP36S	294	297	29	254	340	323	7	0
10WP37	340	325	48	242	387	355	7	0
10WP39	93	95	14	78	120	108	7	0
10WP40	1090	1095	387	638	1820	1298	7	0
10WP41	3790	3710	602	2910	4380	4335	7	0
10WP42	301	301	39	262	364	330	7	0
10WP44	3505	3523	92	3430	3650	3608	4	0
10WP46	268	275	34	236	346	285	7	0
10WP47	38	40	13	21	64	48	7	0
11CS10RD	223	270	117	166	452	397	6	0
11CS10RS	1330	1293	324	726	1650	1552	6	0
11WP4R	127	125	26	78	158	145	6	0
11WP9RPB	335	335	52	259	405	392	7	0
11WP9RS	330	342	42	288	395	383	5	0
11WP11RD	141	137	13	119	149	148	6	0
11WP11RS	233	230	25	194	256	255	6	0
11WP15R	1770	1730	129	1520	1880	1824	6	0
11WP16R	1580	1732	350	1430	2220	2157	6	0
11WP43D	882	899	631	221	1610	1493	4	0
11WP50	3395	3423	109	3330	3570	3531	4	0
11WP51D	64	61	8	46	69	67	6	0
11WP51S	66	87	67	11	181	164	6	0
11WP52D	112	109	18	84	129	126	6	0

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
11WP53D	1925	1915	152	1680	2110	2047	6	0
11WP53S	2090	2090	65	1990	2180	2145	6	0
11WP54D	4440	4498	387	4060	5180	4774	6	0
11WP54S	3380	3520	407	3150	4090	3971	6	0
11WP55	652	682	124	553	917	759	6	0
11WP56D	11	10	3	5	14	13	6	0
11WP56S	70	69	47	21	115	110	3	0
11WP57	2025	2015	56	1910	2070	2056	6	0
CG1	854	876	90	793	1050	928	6	0
CG2	84	86	21	62	107	107	5	0
CG4	427	421	50	357	480	466	6	0
KC3	15	16	4	12	21	19	5	0
KC3A	25	26	4	21	31	29	6	0
KC3PB	25	25	4	20	29	28	6	0
KC13	137	140	30	107	175	171	6	0
KC14	2230	2220	175	1940	2390	2365	5	0
KCF1	674	698	67	618	805	765	6	0
LIMESTONE	40	34	12	15	44	43	6	0
M1	15	16	3	15	20	19	3	0
RN029659	604	516	246	31	705	657	6	0
RN029660	298	306	33	272	357	342	6	0
W2R	20	18	5	10	24	22	6	0
WP5	266	289	53	229	362	343	7	0
WP13	62	64	11	55	85	72	6	0
WP19	4670	4630	173	4360	4810	4770	5	0

Table D35 Concentration of nickel (µg/L)

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
10WP31†	0.50	0.57	0.19	0.50	1.00	0.55	7	86
10WP32†	0.50	0.50	0.00	0.50	0.50	0.50	7	100
10WP32PB†	0.50	0.71	0.57	0.50	2.00	0.65	7	86
10WP33†	0.50	0.79	0.57	0.50	2.00	1.10	7	71
10WP35N†	0.50	0.71	0.57	0.50	2.00	0.65	7	86
10WP35PB†	0.50	0.67	0.50	0.50	2.00	0.50	9	89
10WP35S†	0.50	1.07	1.02	0.50	3.00	2.10	7	71
10WP36N†	0.50	0.57	0.19	0.50	1.00	0.55	7	86
10WP36PB†	0.50	0.50	0.00	0.50	0.50	0.50	10	100
10WP36S†	0.50	0.57	0.19	0.50	1.00	0.55	7	86
10WP37†	0.50	0.57	0.19	0.50	1.00	0.55	7	86
10WP39†	0.50	0.71	0.57	0.50	2.00	0.65	7	86
10WP40	2.00	2.71	1.80	1.00	6.00	4.20	7	14
10WP41†	6.00	5.43	2.56	2.50	10.00	6.40	7	43
10WP42†	0.50	0.50	0.00	0.50	0.50	0.50	7	100
10WP44†	3.75	7.00	7.43	2.50	18.00	14.10	4	50
10WP46†	0.50	0.79	0.76	0.50	2.50	0.70	7	100
10WP47†	0.50	0.50	0.00	0.50	0.50	0.50	7	100
11CS10RD†	0.50	0.50	0.00	0.50	0.50	0.50	6	100
11CS10RS†	1.00	1.08	0.49	0.50	2.00	1.30	6	83
11WP4R†	1.50	3.17	4.86	0.50	13.00	5.30	6	33
11WP9RPB†	0.50	0.57	0.19	0.50	1.00	0.55	7	86
11WP9RS†	0.50	0.50	0.00	0.50	0.50	0.50	5	100
11WP11RD†	0.50	0.75	0.61	0.50	2.00	0.95	6	83
11WP11RS†	0.50	1.17	1.08	0.50	3.00	2.30	6	67
11WP15R†	1.00	1.00	0.00	1.00	1.00	1.00	6	100
11WP16R†	2.50	2.50	0.00	2.50	2.50	2.50	6	100
11WP43D	7.00	8.00	4.32	4.00	14.00	12.20	4	0
11WP50	10.50	9.75	1.89	7.00	11.00	11.00	4	0
11WP51D†	0.50	0.50	0.00	0.50	0.50	0.50	6	100
11WP51S†	0.75	0.75	0.27	0.50	1.00	1.00	6	67
11WP52D†	0.50	2.33	4.25	0.50	11.00	4.00	6	83

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
11WP53D†	1.00	1.00	0.00	1.00	1.00	1.00	6	100
11WP53S†	1.00	1.00	0.00	1.00	1.00	1.00	6	100
11WP54D†	2.50	3.42	2.25	2.50	8.00	4.15	6	83
11WP54S	11.50	10.08	3.85	2.50	13.00	12.30	6	17
11WP55†	0.75	1.58	1.53	0.50	4.00	3.30	6	50
11WP56D†	0.75	0.75	0.27	0.50	1.00	1.00	6	50
11WP56S†	0.50	1.17	1.15	0.50	2.50	2.30	3	100
11WP57†	2.50	2.83	1.08	2.00	5.00	3.25	6	67
CG1†	1.00	1.00	0.00	1.00	1.00	1.00	6	100
CG2†	0.50	0.50	0.00	0.50	0.50	0.50	5	100
CG4†	0.50	0.75	0.61	0.50	2.00	0.95	6	83
KC3†	0.50	0.80	0.67	0.50	2.00	1.25	5	80
KC3A	2.00	2.00	0.00	2.00	2.00	2.00	6	0
KC3PB	9.50	11.33	4.63	7.00	18.00	16.60	6	0
KC13†	0.75	1.17	0.88	0.50	2.50	2.15	6	67
KC14†	2.50	2.40	0.22	2.00	2.50	2.50	5	80
KCF1†	0.50	0.83	0.61	0.50	2.00	1.30	6	67
LIMESTONE†	0.50	0.50	0.00	0.50	0.50	0.50	6	100
M1†	0.50	0.50	0.00	0.50	0.50	0.50	3	100
RN029659†	0.50	0.50	0.00	0.50	0.50	0.50	6	100
RN029660†	0.50	0.50	0.00	0.50	0.50	0.50	6	100
W2R†	0.50	0.92	1.02	0.50	3.00	1.25	6	83
WP5†	1.00	1.21	1.25	0.50	4.00	1.30	7	71
WP13†	0.50	0.50	0.00	0.50	0.50	0.50	6	100
WP19†	5.00	4.50	1.12	2.50	5.00	5.00	5	100

† More than one-quarter of the samples are below the LOR

Table D36 Concentration of soluble reactive phosphorus (µg/L)

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
10WP31	70	64	29	20	100	91	7	0
10WP32	60	67	24	30	100	91	7	0
10WP32PB	70	66	17	40	90	81	7	0
10WP33	60	57	18	30	80	71	7	0
10WP35N	130	123	25	80	150	141	7	0
10WP35PB	70	69	24	30	100	94	9	0
10WP35S	70	73	36	30	130	103	7	0
10WP36N	200	207	57	150	310	256	7	0
10WP36PB	155	180	109	50	400	255	10	0
10WP36S	170	199	69	120	320	248	7	0
10WP37	110	109	46	60	200	128	7	0
10WP39	10	14	8	10	30	21	7	0
10WP40	40	50	38	10	120	84	7	0
10WP41	10	9	2	5	10	10	7	14
10WP42	20	21	11	10	40	31	7	0
10WP44	30	30	ND	30	30	30	4/1*	0
10WP46	20	21	12	10	40	31	7	0
10WP47	20	26	13	10	50	32	7	0
11CS10RD	65	58	24	20	80	80	6	0
11CS10RS	30	38	21	20	80	52	6	0
11WP4R	15	57	83	10	220	115	6	0
11WP9RPB	70	70	10	60	80	79	7/3*	0
11WP9RS	ND	ND	ND	ND	ND	ND	5/0*	0
11WP11RD	80	80	ND	80	80	80	6/1*	0
11WP11RS	100	100	ND	100	100	100	6/1*	0
11WP15R	85	82	29	40	120	106	6	0
11WP16R	30	224	311	10	650	615	6	17
11WP43D†	5	9	8	5	20	16	4	75
11WP50†	5	6	3	5	10	9	4	75
11WP51D	15	19	16	5	50	29	6	17
11WP51S	40	36	23	5	60	54	6/4*	17
11WP52D	90	93	20	70	120	113	6	0

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
11WP53D	235	188	88	70	260	253	6	0
11WP53S	205	175	90	60	260	253	6	0
11WP54D	30	32	12	20	50	43	6	0
11WP54S	45	57	43	20	120	99	6	0
11WP55	ND	ND	ND	ND	ND	ND	6/0*	0
11WP56D†	20	22	18	5	50	36	6	33
11WP56S	60	57	25	30	80	78	3	0
11WP57	35	64	74	10	210	112	6	17
CG1	60	57	24	30	90	76	6	0
CG2	60	50	28	20	80	75	5	0
CG4	35	35	21	10	60	53	6	0
KC3	10	11	5	5	20	15	5	20
KC3A†	8	11	10	5	30	16	6	50
KC3PB†	5	7	3	5	10	10	6	67
KC13	10	18	21	5	60	25	6	17
KC14†	10	13	9	5	25	23	5	60
KCF1	20	18	8	10	30	23	6	0
LIMESTONE	40	160	177	30	400	350	6/5*	0
M1†	10	8	3	5	10	10	3	33
RN029659†	5	8	6	5	20	13	6	67
RN029660†	60	57	15	40	80	66	6	0
W2R†	15	22	19	5	50	43	6	33
WP5	10	18	11	5	30	30	7	14
WP13	10	10	0	10	10	10	5	0
WP19	40	34	13	20	50	45	5	0

† More than one-quarter of the samples are below the LOR

* Number of samples and number used in statistical analysis

ND No data

Table D37 Concentration of total phosphorus (µg/L)

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
10WP31	85	85	15	60	100	100	6	0
10WP32	85	88	28	60	130	116	6	0
10WP32PB	80	71	17	40	90	81	7	0
10WP33	70	71	12	60	90	81	7	0
10WP35N	135	132	12	110	140	140	6	0
10WP35PB	100	94	34	60	170	107	9	0
10WP35S	86	94	20	80	130	109	6	0
10WP36N	210	208	27	170	250	229	6	0
10WP36PB	200	210	97	65	400	280	10	0
10WP36S	240	243	48	170	320	278	6	0
10WP37	115	128	39	90	200	158	6	0
10WP39	20	84	175	10	480	75	7	0
10WP40	90	87	42	30	140	126	6	0
10WP41†	10	13	10	5	30	22	6	33
10WP42	20	26	14	10	50	41	7	0
10WP44	ND	ND	ND	ND	ND	ND	4/0*	0
10WP46	23	25	13	10	40	40	7	0
10WP47	30	31	10	20	50	38	7	0
11CS10RD	70	66	26	20	96	85	6	0
11CS10RS	40	58	52	20	160	87	6	0
11WP4R	48	76	93	10	260	127	6	0
11WP9RPB	100	97	25	70	120	118	7/3*	0
11WP9RS	ND	ND	ND	ND	ND	ND	5/0*	0
11WP11RD	94	94	ND	94	94	94	6/1*	0
11WP11RS	190	190	ND	190	190	190	6/1*	0
11WP15R	96	105	20	90	140	126	6	0
11WP16R	49	227	309	5	650	615	6	17
11WP43D	30	33	26	5	65	58	4	25
11WP50†	8	12	10	5	26	21	4	50
11WP51D	25	32	30	10	90	49	6	0
11WP51S	65	83	46	50	150	126	6/4*	0
11WP52D	120	133	35	100	190	169	6	0

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
11WP53D	245	240	18	210	260	253	6	0
11WP53S	230	227	29	180	260	253	6	0
11WP54D	25	28	15	10	50	43	6	0
11WP54S	61	69	47	20	120	120	6	0
11WP55	ND	ND	ND	ND	ND	ND	6/0*	0
11WP56D	145	157	65	70	230	230	6	0
11WP56S	150	217	180	80	420	393	3	0
11WP57	40	138	266	5	680	239	6	17
CG1	73	75	9	66	90	83	6	0
CG2	60	64	12	48	80	75	5	0
CG4	57	87	86	30	260	134	6	0
KC3	20	21	11	10	34	32	5	0
KC3A†	10	28	45	5	120	49	6	33
KC3PB†	20	22	18	5	49	36	6	33
KC13	43	56	47	20	150	80	6	0
KC14†	10	47	80	5	190	108	5	40
KCF1	20	23	5	20	30	30	6	0
LIMESTONE	310	358	245	50	710	585	6/5*	0
M1	10	10	ND	10	10	10	1	0
RN029659†	13	13	9	5	22	21	6	50
RN029660	62	66	8	60	80	73	6	0
W2R	45	40	20	5	60	55	6	17
WP5	20	20	11	10	30	30	6	0
WP13	20	20	12	10	40	30	5	0
WP19	40	64	56	20	160	110	5	0

† More than one-quarter of the samples are below the LOR

* Number of samples and number used in statistical analysis

ND No data

Table D38 Concentration of lead (µg/L)

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
10WP31	0.20	0.62	0.72	0.05	1.80	1.53	7	14
10WP32	0.60	0.59	0.50	0.05	1.60	0.79	7	14
10WP32PB†	0.20	0.34	0.36	0.05	0.90	0.81	7	29
10WP33†	0.20	2.56	4.73	0.05	13.00	3.91	7	29
10WP35N†	0.10	0.43	0.87	0.05	2.40	0.42	7	29
10WP35PB†	0.20	0.16	0.11	0.05	0.30	0.27	9	44
10WP35S†	0.20	0.40	0.59	0.05	1.70	0.53	7	29
10WP36N†	0.10	0.55	1.17	0.05	3.20	0.59	7	43
10WP36PB†	0.08	0.27	0.51	0.05	1.70	0.25	10	50
10WP36S†	0.30	0.77	1.56	0.05	4.30	0.70	7	29
10WP37	0.10	13.99	36.60	0.05	97.00	9.97	7	14
10WP39	0.10	0.47	0.63	0.10	1.80	0.81	7	0
10WP40†	0.20	0.22	0.12	0.05	0.40	0.31	7	29
10WP41†	1.00	6.79	15.97	0.25	43.00	5.47	7	29
10WP42†	0.10	0.33	0.52	0.05	1.50	0.42	7	29
10WP44†	0.25	0.29	0.23	0.05	0.60	0.50	4	75
10WP46†	0.20	0.23	0.23	0.05	0.70	0.34	7	57
10WP47	0.20	0.32	0.27	0.05	0.70	0.61	7	14
11CS10RD	0.80	1.03	0.79	0.50	2.60	1.48	6	0
11CS10RS	0.25	1.53	2.08	0.10	4.60	4.04	6	17
11WP4R†	0.20	0.75	0.97	0.05	2.10	1.96	6	33
11WP9RPB	0.20	0.26	0.08	0.20	0.40	0.31	7	0
11WP9RS†	0.30	0.28	0.24	0.05	0.60	0.50	5	40
11WP11RD	0.20	0.28	0.23	0.10	0.70	0.49	6	0
11WP11RS	0.40	0.40	0.24	0.10	0.80	0.59	6	0
11WP15R	0.95	1.12	0.87	0.20	2.20	2.13	6	0
11WP16R†	0.25	0.60	0.70	0.25	2.00	1.02	6	67
11WP43D	1.35	1.05	0.64	0.10	1.40	1.40	4	25
11WP50†	0.48	0.58	0.41	0.25	1.10	0.98	4	50
11WP51D	0.90	1.23	1.37	0.05	3.80	2.19	6	17
11WP51S	1.00	15.37	31.89	0.10	80.00	30.93	6	0
11WP52D	0.40	0.43	0.20	0.20	0.70	0.63	6	0

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
11WP53D	0.70	0.62	0.21	0.30	0.80	0.80	6	0
11WP53S	0.30	0.42	0.18	0.30	0.70	0.63	6	0
11WP54D†	0.50	1.95	3.17	0.25	8.30	3.82	6	33
11WP54S†	0.43	0.46	0.24	0.25	0.80	0.66	6	50
11WP55	0.50	1.45	2.32	0.10	6.10	2.74	6	0
11WP56D	7.25	10.53	11.00	0.30	26.00	23.20	6	0
11WP56S†	0.20	0.48	0.63	0.05	1.20	1.10	3	33
11WP57†	0.55	0.50	0.21	0.25	0.70	0.70	6	33
CG1	1.00	1.92	1.80	0.40	4.60	4.04	6	0
CG2	1.20	1.30	0.97	0.10	2.80	2.10	5	0
CG4	0.60	4.95	7.01	0.20	14.00	14.00	6	0
KC3	0.20	0.31	0.39	0.05	1.00	0.60	5	20
KC3A	0.45	1.07	1.56	0.20	4.20	1.89	6	0
KC3PB	1.70	2.33	2.27	0.05	5.80	4.68	6	17
KC13	2.85	4.57	5.33	0.20	13.00	9.71	6	0
KC14	1.30	3.25	4.92	0.25	12.00	6.80	5	20
KCF1	0.40	2.20	4.31	0.30	11.00	3.79	6	0
LIMESTONE	0.75	2.63	3.84	0.20	9.90	5.77	6	0
M1†	0.05	0.10	0.09	0.05	0.20	0.19	3	67
RN029659†	0.10	0.30	0.49	0.05	1.30	0.53	6	33
RN029660†	0.15	1.37	3.01	0.05	7.50	2.46	6	33
W2R†	0.13	0.28	0.34	0.05	0.90	0.55	6	50
WP5	0.40	0.52	0.36	0.05	1.10	0.83	7	14
WP13	0.50	0.92	0.88	0.20	2.50	1.73	6	0
WP19†	0.50	1.14	0.90	0.50	2.40	2.10	5	40

† More than one-quarter of the samples are below the LOR

Table D39 Concentration of pH (Laboratory)

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
10WP31	7.1	7.2	0.5	6.7	8.2	7.2	7	0
10WP32	7.6	7.7	0.2	7.3	8.0	7.8	7	0
10WP32PB	7.7	7.7	0.3	7.5	8.4	7.8	7	0
10WP33	7.3	7.5	0.3	7.3	8.2	7.7	7	0
10WP35N	7.8	7.8	0.2	7.7	8.2	7.9	7	0
10WP35PB	7.5	7.6	0.2	7.3	8.1	7.7	9	0
10WP35S	7.6	7.6	0.1	7.5	7.7	7.7	7	0
10WP36N	7.8	7.8	0.1	7.7	8.0	7.8	7	0
10WP36PB	7.9	8.0	0.4	7.5	8.8	8.3	10	0
10WP36S	7.9	7.9	0.2	7.7	8.3	8.1	7	0
10WP37	7.7	7.7	0.1	7.5	7.9	7.8	7	0
10WP39	7.5	7.6	0.2	7.5	8.0	7.6	7	0
10WP40	7.6	7.6	0.2	7.3	7.9	7.7	7	0
10WP41	7.3	7.4	0.2	7.2	7.7	7.4	7	0
10WP42	7.5	7.6	0.3	7.4	8.2	7.6	7	0
10WP44	7.3	7.3	0.1	7.2	7.5	7.4	4	0
10WP46	7.5	7.5	0.4	7.0	8.2	7.6	7	0
10WP47	7.5	7.6	0.3	7.3	8.3	7.7	7	0
11CS10RD	7.4	7.4	0.1	7.3	7.5	7.5	6	0
11CS10RS	7.5	7.5	0.2	7.3	7.8	7.7	6	0
11WP4R	7.5	7.4	0.1	7.2	7.6	7.5	6	0
11WP9RPB	7.7	7.7	0.1	7.5	7.8	7.8	7	0
11WP9RS	7.7	7.7	0.1	7.5	7.9	7.8	5	0
11WP11RD	7.7	7.7	0.1	7.5	7.8	7.7	6	0
11WP11RS	8.0	8.0	0.2	7.6	8.3	8.2	6	0
11WP15R	7.6	7.6	0.1	7.5	7.7	7.6	6	0
11WP16R	7.3	7.3	0.1	7.1	7.4	7.3	6	0
11WP43D	7.3	7.2	0.2	7.0	7.4	7.4	4	0
11WP50	7.1	7.1	0.1	7.0	7.3	7.2	4	0
11WP51D	7.7	7.7	0.1	7.6	7.7	7.7	6	0
11WP51S	7.5	7.6	0.2	7.4	7.9	7.6	6	0
11WP52D	7.3	7.4	0.3	7.1	7.9	7.6	6	0

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
11WP53D	7.9	7.9	0.0	7.8	7.9	7.9	6	0
11WP53S	8.0	8.0	0.1	7.9	8.1	8.0	6	0
11WP54D	7.1	7.1	0.1	7.0	7.2	7.1	6	0
11WP54S	7.5	7.4	0.1	7.2	7.6	7.5	6	0
11WP55	7.3	7.1	0.5	6.1	7.4	7.3	6	0
11WP56D	6.2	6.1	0.5	5.5	6.9	6.6	6	0
11WP56S	7.2	7.1	0.2	6.9	7.3	7.3	3	0
11WP57	7.0	7.1	0.4	6.8	7.8	7.3	6	0
CG1	7.5	7.5	0.0	7.5	7.6	7.5	6	0
CG2	7.7	7.8	0.1	7.7	7.9	7.9	5	0
CG4	7.6	7.6	0.2	7.4	7.8	7.8	6	0
KC3	6.8	6.7	0.4	6.0	7.2	7.1	5	0
KC3A	6.2	6.3	0.2	6.0	6.5	6.5	6	0
KC3PB	6.2	6.1	0.2	5.8	6.3	6.2	6	0
KC13	7.7	7.6	0.3	7.1	7.8	7.8	6	0
KC14	7.2	7.1	0.2	6.7	7.2	7.2	5	0
KCF1	7.6	7.5	0.2	7.2	7.7	7.6	6	0
LIMESTONE	7.7	7.7	0.2	7.5	8.1	7.9	6	0
M1	8.3	8.3	0.2	8.1	8.4	8.4	3	0
RN029659	7.7	7.7	0.5	7.2	8.6	8.0	6	0
RN029660	7.9	7.8	0.2	7.5	7.9	7.9	6	0
W2R	7.7	7.7	0.2	7.5	8.0	7.8	6	0
WP5	7.3	7.3	0.3	6.8	7.7	7.4	7	0
WP13	7.5	7.6	0.2	7.4	7.8	7.7	5	0
WP19	7.2	7.2	0.1	7.2	7.3	7.3	5	0

Table D40 Concentration of antimony (µg/L)

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
10WP31†	0.05	0.05	0.00	0.05	0.05	0.05	7	100
10WP32†	0.05	0.09	0.09	0.05	0.30	0.08	7	86
10WP32PB†	0.05	0.06	0.02	0.05	0.10	0.10	7	71
10WP33†	0.05	0.06	0.02	0.05	0.10	0.06	7	86
10WP35N†	0.05	0.07	0.06	0.05	0.20	0.07	7	86
10WP35PB†	0.05	0.05	0.00	0.05	0.05	0.05	9	100
10WP35S†	0.05	0.08	0.06	0.05	0.20	0.11	7	71
10WP36N†	0.05	0.06	0.02	0.05	0.10	0.10	7	71
10WP36PB†	0.05	0.06	0.02	0.05	0.10	0.05	10	90
10WP36S†	0.05	0.08	0.06	0.05	0.20	0.11	7	71
10WP37†	0.05	0.06	0.02	0.05	0.10	0.06	7	86
10WP39††	0.05	0.06	0.02	0.05	0.10	0.06	7	86
10WP40†	0.20	0.24	0.17	0.10	0.60	0.33	7	29
10WP41†	0.25	0.29	0.09	0.25	0.50	0.28	7	100
10WP42†	0.05	0.06	0.02	0.05	0.10	0.06	7	86
10WP44†	0.25	0.29	0.08	0.25	0.40	0.36	4	75
10WP46†	0.05	0.09	0.07	0.05	0.25	0.12	7	86
10WP47†	0.05	0.06	0.02	0.05	0.10	0.06	7	86
11CS10RD†	0.05	0.05	0.00	0.05	0.05	0.05	6	100
11CS10RS†	0.15	0.17	0.08	0.10	0.30	0.23	6	50
11WP4R†	0.05	0.20	0.30	0.05	0.80	0.38	6	67
11WP9RPB†	0.05	0.11	0.13	0.05	0.40	0.13	7	57
11WP9RS†	0.05	0.05	0.00	0.05	0.05	0.05	5	100
11WP11RD†	0.08	0.08	0.03	0.05	0.10	0.10	6	50
11WP11RS†	0.08	0.14	0.14	0.05	0.40	0.26	6	50
11WP15R†	0.10	0.13	0.08	0.10	0.30	0.16	6	83
11WP16R†	0.25	0.25	0.00	0.25	0.25	0.25	6	100
11WP43D†	0.38	0.46	0.32	0.20	0.90	0.78	4	50
11WP50†	0.25	0.34	0.18	0.25	0.60	0.50	4	75
11WP51D†	0.05	0.12	0.11	0.05	0.30	0.23	6	67
11WP51S†	0.20	0.25	0.21	0.05	0.60	0.46	6	33
11WP52D†	0.05	0.07	0.03	0.05	0.10	0.10	6	83

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
11WP53D†	0.10	0.15	0.12	0.10	0.40	0.19	6	83
11WP53S†	0.10	0.23	0.28	0.10	0.80	0.38	6	67
11WP54D†	0.25	0.31	0.14	0.25	0.60	0.36	6	83
11WP54S†	0.25	0.25	0.00	0.25	0.25	0.25	6	100
11WP55	0.25	0.72	1.08	0.20	2.90	1.22	6	0
11WP56D†	0.05	0.12	0.11	0.05	0.30	0.23	6	67
11WP56S†	0.30	0.35	0.13	0.25	0.50	0.48	3	33
11WP57†	0.25	0.22	0.08	0.05	0.25	0.25	6	100
CG1†	0.10	0.10	0.00	0.10	0.10	0.10	6	100
CG2†	0.05	0.05	0.00	0.05	0.05	0.05	5	100
CG4†	0.05	0.13	0.18	0.05	0.50	0.22	6	67
KC3†	0.05	0.11	0.11	0.05	0.30	0.20	5	60
KC3A†	0.08	0.14	0.14	0.05	0.40	0.26	6	50
KC3PB†	0.05	0.10	0.10	0.05	0.30	0.16	6	67
KC13†	0.33	0.69	1.03	0.05	2.70	1.30	6	50
KC14†	0.25	0.21	0.09	0.05	0.25	0.25	5	100
KCF1†	0.08	0.11	0.10	0.05	0.30	0.16	6	50
LIMESTONE†	0.08	0.11	0.07	0.05	0.20	0.20	6	50
M1†	0.05	0.05	0.00	0.05	0.05	0.05	3	100
RN029659†	0.05	0.08	0.06	0.05	0.20	0.10	6	83
RN029660†	0.05	0.08	0.06	0.05	0.20	0.13	6	67
W2R†	0.10	0.13	0.06	0.05	0.20	0.20	6	17
WP5†	0.10	0.15	0.12	0.05	0.40	0.22	7	43
WP13	0.20	0.25	0.12	0.20	0.50	0.29	6	0
WP19†	0.50	0.45	0.11	0.25	0.50	0.50	5	100

† More than one-quarter of the samples are below the LOR

Table D41 Concentration of selenium (µg/L)

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
10WP31†	0.50	0.50	0.00	0.50	0.50	0.50	7	100
10WP32	3.00	3.43	1.27	2.00	5.00	5.00	7	0
10WP32PB	3.00	3.07	1.69	0.50	6.00	4.20	7	14
10WP33	3.00	2.57	0.53	2.00	3.00	3.00	7	0
10WP35N†	0.50	0.50	0.00	0.50	0.50	0.50	7	100
10WP35PB†	0.50	0.50	0.00	0.50	0.50	0.50	9	100
10WP35S†	0.50	0.50	0.00	0.50	0.50	0.50	7	100
10WP36N†	0.50	0.50	0.00	0.50	0.50	0.50	7	100
10WP36PB†	0.50	0.50	0.00	0.50	0.50	0.50	10	100
10WP36S†	0.50	0.50	0.00	0.50	0.50	0.50	7	100
10WP37	6.00	5.71	1.11	4.00	7.00	7.00	7	0
10WP39†	0.50	0.50	0.00	0.50	0.50	0.50	7	100
10WP40†	1.00	0.79	0.27	0.50	1.00	1.00	7	100
10WP41†	2.50	2.57	1.30	0.50	5.00	2.75	7	100
10WP42†	0.50	0.64	0.24	0.50	1.00	1.00	7	71
10WP44†	1.50	1.50	1.15	0.50	2.50	2.50	4	100
10WP46†	0.50	0.79	0.76	0.50	2.50	0.70	7	100
10WP47†	0.50	0.50	0.00	0.50	0.50	0.50	7	100
11CS10RD	2.00	2.17	0.41	2.00	3.00	2.30	6	0
11CS10RS†	1.00	0.92	0.20	0.50	1.00	1.00	6	100
11WP4R†	0.50	0.50	0.00	0.50	0.50	0.50	6	100
11WP9RPB	4.00	4.29	0.95	3.00	6.00	5.10	7	0
11WP9RS	5.00	5.00	0.71	4.00	6.00	5.50	5	0
11WP11RD†	1.00	1.00	0.55	0.50	2.00	1.30	6	33
11WP11RS†	0.50	0.50	0.00	0.50	0.50	0.50	6	100
11WP15R	4.50	4.83	0.98	4.00	6.00	6.00	6	0
11WP16R†	2.50	2.17	0.82	0.50	2.50	2.50	6	100
11WP43D†	0.75	1.75	2.18	0.50	5.00	3.80	4	100
11WP50†	2.50	2.00	1.00	0.50	2.50	2.50	4	100
11WP51D†	0.50	0.50	0.00	0.50	0.50	0.50	6	100
11WP51S†	0.50	0.58	0.20	0.50	1.00	0.65	6	100
11WP52D	1.00	1.17	0.41	1.00	2.00	1.30	6	17

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
11WP53D	6.00	6.50	0.84	6.00	8.00	7.30	6	0
11WP53S	6.00	6.17	1.33	4.00	8.00	7.30	6	0
11WP54D	7.00	7.00	0.89	6.00	8.00	8.00	6	0
11WP54S†	2.50	2.92	1.02	2.50	5.00	3.25	6	83
11WP55†	0.50	0.50	0.00	0.50	0.50	0.50	6	100
11WP56D†	0.50	0.50	0.00	0.50	0.50	0.50	6	100
11WP56S†	0.50	1.17	1.15	0.50	2.50	2.30	3	100
11WP57†	2.50	1.83	1.03	0.50	2.50	2.50	6	100
CG1	38.50	36.67	8.69	24.00	47.00	44.20	6	0
CG2	2.00	2.40	0.55	2.00	3.00	3.00	5	0
CG4†	1.00	1.00	0.55	0.50	2.00	1.30	6	33
KC3†	0.50	0.50	0.00	0.50	0.50	0.50	5	100
KC3A†	0.50	0.50	0.00	0.50	0.50	0.50	6	100
KC3PB†	0.50	0.50	0.00	0.50	0.50	0.50	6	100
KC13†	0.50	0.83	0.82	0.50	2.50	1.10	6	100
KC14†	2.50	2.00	0.87	0.50	2.50	2.50	5	80
KCF1	6.50	6.17	1.17	4.00	7.00	7.00	6	0
LIMESTONE†	0.50	0.50	0.00	0.50	0.50	0.50	6	100
M1†	0.50	0.50	0.00	0.50	0.50	0.50	3	100
RN029659†	0.50	0.50	0.00	0.50	0.50	0.50	6	100
RN029660†	0.50	0.50	0.00	0.50	0.50	0.50	6	100
W2R†	0.50	0.50	0.00	0.50	0.50	0.50	6	100
WP5†	0.50	0.64	0.24	0.50	1.00	1.00	7	100
WP13†	0.50	0.50	0.00	0.50	0.50	0.50	6	100
WP19†	5.00	3.70	1.86	1.00	5.00	5.00	5	80

† More than one-quarter of the samples are below the LOR

Table D42 Concentration of silicon (mg/L)

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
10WP31	35	36	2	33	40	37	7	0
10WP32	39	36	8	19	43	41	7	0
10WP32PB	39	33	11	17	43	41	7	0
10WP33	32	32	2	28	34	33	7	0
10WP35N	29	27	7	11	32	31	7	0
10WP35PB	29	29	3	23	32	31	9	0
10WP35S	28	26	6	13	30	30	7	0
10WP36N	38	35	10	15	44	41	7	0
10WP36PB	37	35	6	20	41	38	10	0
10WP36S	39	39	3	34	44	41	7	0
10WP37	31	32	2	30	36	33	7	0
10WP39	34	34	2	31	38	35	7	0
10WP40	35	35	5	29	40	39	7	0
10WP41	16	16	3	11	20	18	7	0
10WP42	38	37	8	21	44	42	7	0
10WP44	18	18	1	17	19	19	4	0
10WP46	36	33	8	15	39	37	7	0
10WP47	37	34	8	23	43	40	7	0
11CS10RD	34	33	2	29	35	35	6	0
11CS10RS	44	40	12	18	48	48	6	0
11WP4R	19	17	4	10	21	20	6	0
11WP9RPB	35	35	3	29	39	37	7	0
11WP9RS	37	36	2	33	38	38	5	0
11WP11RD	35	33	6	21	37	36	6	0
11WP11RS	35	30	10	10	36	35	6	0
11WP15R	24	23	2	20	25	24	6	0
11WP16R	33	34	8	25	45	42	6	0
11WP43D	9	9	2	6	11	10	4	0
11WP50	14	14	1	13	14	14	4	0
11WP51D	15	14	3	7	17	16	6	0
11WP51S	19	17	6	8	25	22	6	0
11WP52D	28	27	2	24	29	28	6	0

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
11WP53D	34	32	5	24	36	35	6	0
11WP53S	32	30	5	20	33	33	6	0
11WP54D	31	30	4	24	34	33	6	0
11WP54S	28	27	3	23	30	29	6	0
11WP55	28	29	3	25	33	32	6	0
11WP56D	11	11	1	9	13	12	6	0
11WP56S	35	35	5	31	40	40	3	0
11WP57	28	26	5	17	29	28	6	0
CG1	37	35	6	23	39	38	6	0
CG2	39	39	3	35	43	42	5	0
CG4	32	33	2	31	36	35	6	0
KC3	32	32	3	28	35	34	5	0
KC3A	22	22	2	19	23	23	6	0
KC3PB	21	20	2	17	22	21	6	0
KC13	10	10	1	9	11	10	6	0
KC14	16	16	2	14	18	18	5	0
KCF1	29	28	3	24	31	31	6	0
LIMESTONE	27	23	8	11	29	28	6	0
M1	6	6	0	6	6	6	2	0
RN029659	19	14	10	1	21	20	6	0
RN029660	28	28	2	24	31	30	6	0
W2R	15	15	3	11	18	18	6	0
WP5	24	24	2	21	26	25	7	0
WP13	37	35	3	29	38	37	6	0
WP19	26	26	1	25	28	27	5	0

Table D43 Concentration of tin (µg/L)

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
10WP31†	0.50	0.44	0.17	0.05	0.50	0.50	7	86
10WP32†	3.00	2.72	1.59	0.05	5.00	4.10	7	71
10WP32PB†	3.00	2.22	1.46	0.05	4.00	3.10	7	86
10WP33†	2.00	2.15	1.05	0.05	3.00	3.00	7	100
10WP35N†	0.50	0.44	0.17	0.05	0.50	0.50	7	100
10WP35PB†	0.50	0.45	0.15	0.05	0.50	0.50	9	89
10WP35S†	0.50	0.44	0.17	0.05	0.50	0.50	7	100
10WP36N†	0.50	0.44	0.17	0.05	0.50	0.50	7	100
10WP36PB†	0.50	0.46	0.14	0.05	0.50	0.50	10	100
10WP36S†	0.50	0.44	0.17	0.05	0.50	0.50	7	100
10WP37†	6.00	5.01	2.43	0.05	7.00	7.00	7	100
10WP39†	0.50	0.44	0.17	0.05	0.50	0.50	7	100
10WP40†	1.00	0.73	0.36	0.10	1.00	1.00	7	86
10WP41†	2.50	2.54	1.37	0.25	5.00	2.75	7	100
10WP42†	0.50	0.51	0.27	0.05	1.00	0.55	7	86
10WP44†	1.50	1.44	1.23	0.25	2.50	2.50	4	75
10WP46†	0.50	0.72	0.80	0.05	2.50	0.70	7	100
10WP47†	0.50	0.44	0.17	0.05	0.50	0.50	7	100
11CS10RD†	2.00	1.85	0.95	0.10	3.00	2.30	6	83
11CS10RS†	1.00	0.84	0.39	0.05	1.00	1.00	6	100
11WP4R†	0.50	0.43	0.18	0.05	0.50	0.50	6	67
11WP9RPB†	4.00	3.44	1.60	0.05	5.00	4.10	7	100
11WP9RS†	5.00	3.81	2.15	0.05	5.00	5.00	5	100
11WP11RD†	0.75	0.68	0.39	0.05	1.00	1.00	6	100
11WP11RS†	0.50	0.43	0.18	0.05	0.50	0.50	6	83
11WP15R†	4.50	4.18	2.19	0.10	6.00	6.00	6	100
11WP16R	2.50	2.13	0.92	0.25	2.50	2.50	6	100
11WP43D†	0.75	1.69	2.23	0.25	5.00	3.80	4	75
11WP50†	2.50	1.94	1.13	0.25	2.50	2.50	4	100
11WP51D†	0.50	0.43	0.18	0.05	0.50	0.50	6	83
11WP51S†	0.50	0.51	0.30	0.05	1.00	0.65	6	67
11WP52D†	1.00	0.84	0.39	0.05	1.00	1.00	6	100

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
11WP53D†	6.00	5.52	2.77	0.10	8.00	7.30	6	100
11WP53S†	6.00	5.18	2.82	0.10	8.00	7.30	6	83
11WP54D†	6.50	5.71	2.78	0.25	8.00	7.30	6	100
11WP54S†	2.50	2.13	0.92	0.25	2.50	2.50	6	83
11WP55†	0.50	0.43	0.18	0.05	0.50	0.50	6	67
11WP56D†	0.50	0.43	0.18	0.05	0.50	0.50	6	100
11WP56S†	0.50	1.17	1.15	0.50	2.50	2.30	3	67
11WP57†	2.50	1.79	1.10	0.25	2.50	2.50	6	100
CG1†	26.50	21.70	17.67	0.10	40.00	37.90	6	100
CG2†	2.00	2.02	1.18	0.10	3.00	3.00	5	60
CG4†	0.75	0.84	0.67	0.05	2.00	1.30	6	100
KC3†	0.50	0.41	0.20	0.05	0.50	0.50	5	100
KC3A†	0.50	0.43	0.18	0.05	0.50	0.50	6	83
KC3PB†	0.50	0.43	0.18	0.05	0.50	0.50	6	100
KC13†	0.50	0.76	0.87	0.05	2.50	1.10	6	100
KC14†	2.50	1.95	0.97	0.25	2.50	2.50	5	100
KCF1†	6.50	5.51	2.72	0.05	7.00	7.00	6	83
LIMESTONE†	0.50	0.43	0.18	0.05	0.50	0.50	6	100
M1†	0.50	0.50	0.00	0.50	0.50	0.50	3	100
RN029659†	0.50	0.43	0.18	0.05	0.50	0.50	6	100
RN029660†	0.50	0.43	0.18	0.05	0.50	0.50	6	83
W2R†	0.50	0.43	0.18	0.05	0.50	0.50	6	83
WP5†	0.50	0.58	0.33	0.05	1.00	1.00	7	100
WP13†	0.50	0.43	0.18	0.05	0.50	0.50	6	100
WP19†	5.00	3.60	2.04	0.50	5.00	5.00	5	100

† More than one-quarter of the samples are below the LOR

Table D44 Concentration of sulfate from sulfur (mg/L)

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
10WP31	7.9	7.1	2.1	3.3	9.5	8.5	7	0
10WP32	126	106	41	56	149	146	7	0
10WP32PB	93	85	34	19	122	111	7	0
10WP33	71.6	73.9	12.6	52.7	90.9	86.7	7	0
10WP35N	37.7	38.7	7.5	29.8	52.1	44.8	7	0
10WP35PB	67.1	63.7	12.6	45.0	83.4	73.2	9	0
10WP35S	61.9	60.5	9.0	49.0	70.0	68.8	7	0
10WP36N	50.7	52.7	15.3	28.9	75.3	67.2	7	0
10WP36PB	47.3	47.4	14.9	18.9	72.7	59.1	10	0
10WP36S	61.3	63.3	9.0	50.1	74.5	72.6	7	0
10WP37	121	120	12	102	141	125	7	0
10WP39	182	175	18	147	192	189	7	0
10WP40	1330	1411	758	622	2820	1938	7	0
10WP41	3200	2929	519	2180	3490	3283	7	0
10WP42	365	370	38	307	417	413	7	0
10WP44	3015	2975	182	2720	3150	3114	4	0
10WP46	424	414	54	340	500	456	7	0
10WP47	25.1	29.8	11.1	17.7	52.1	34.5	7	0
11CS10RD	195.5	208.3	91.3	101.0	345.0	300.2	6	0
11CS10RS	400.0	385.0	150.5	189.0	580.0	517.0	6	0
11WP4R	60.9	56.5	20.7	29.8	83.5	73.1	6	0
11WP9RPB	141.0	146.7	28.4	99.9	192.0	165.9	7	0
11WP9RS	141.0	139.0	17.1	120.0	165.0	153.0	5	0
11WP11RD	37.3	36.3	4.3	28.4	40.7	39.4	6	0
11WP11RS	10.3	14.4	10.1	9.6	34.9	18.7	6	0
11WP15R	999	981	67	876	1070	1028	6	0
11WP16R	2655	2658	180	2460	2910	2812	6	0
11WP43D	851	887	703	156	1690	1555	4	0
11WP50	4715	4725	421	4240	5230	5119	4	0
11WP51D	71.9	75.0	11.5	64.6	97.2	82.2	6	0
11WP51S	26.4	84.8	103.9	9.1	232.0	212.4	6	0
11WP52D	42.5	42.0	6.5	32.2	48.7	48.7	6	0

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
11WP53D	942	942	43	879	1010	973	6	0
11WP53S	1055	1061	129	880	1240	1177	6	0
11WP54D	5230	5302	446	4810	5970	5725	6	0
11WP54S	3395	3485	472	2920	4160	3992	6	0
11WP55	339	398	150	289	682	515	6	0
11WP56D	1.0	1.8	1.6	0.5	4.2	3.6	6	0
11WP56S	128	105	88	8	179	174	3	0
11WP57	1520	1512	120	1330	1630	1623	6	0
CG1	687	718	96	609	855	826	6	0
CG2	24.1	23.3	4.6	16.2	28.5	27.1	5	0
CG4	323	331	36	289	382	367	6	0
KC3	32.0	30.5	4.7	22.2	34.0	33.4	5	0
KC3A	104	103	8	90	111	110	6	0
KC3PB	103	103	8	95	115	110	6	0
KC13	153	154	31	103	190	184	6	0
KC14	4140	4064	430	3380	4560	4380	5	0
KCF1	1365	1320	166	1100	1520	1457	6	0
LIMESTONE	52.4	40.5	21.8	9.8	57.2	56.2	6	0
M1	5.6	5.9	0.6	5.5	6.5	6.4	3	0
RN029659	383	328	198	1	518	487	6	0
RN029660	76.7	86.0	20.8	72.2	126.0	101.4	6	0
W2R	28.4	27.0	8.3	14.3	35.0	34.9	6	0
WP5	839	844	66	750	923	902	7	0
WP13	99	103	11	91	124	111	6	0
WP19	4600	4686	400	4160	5260	5040	5	0

Table D45 Concentration of titanium (µg/L)

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
10WP31†	0.63	0.59	0.45	0.05	1.00	1.00	6	100
10WP32†	0.63	0.59	0.45	0.05	1.00	1.00	6	100
10WP32PB†	0.63	0.59	0.45	0.05	1.00	1.00	6	100
10WP33†	0.25	0.47	0.42	0.05	1.00	1.00	6	100
10WP35N†	0.63	0.59	0.45	0.05	1.00	1.00	6	100
10WP35PB†	0.63	0.59	0.45	0.05	1.00	1.00	6	100
10WP35S†	0.63	0.62	0.42	0.20	1.00	1.00	6	83
10WP36N†	0.63	0.59	0.45	0.05	1.00	1.00	6	100
10WP36PB†	0.63	0.59	0.45	0.05	1.00	1.00	6	100
10WP36S†	0.63	0.59	0.45	0.05	1.00	1.00	6	100
10WP37†	0.63	0.59	0.45	0.05	1.00	1.00	6	100
10WP39†	0.63	0.60	0.44	0.10	1.00	1.00	6	83
10WP40†	0.75	0.68	0.38	0.10	1.00	1.00	6	100
10WP41†	1.00	1.17	0.74	0.25	2.50	1.63	6	100
10WP42†	0.63	0.59	0.45	0.05	1.00	1.00	6	100
10WP44†	1.00	1.06	0.13	1.00	1.25	1.18	4	100
10WP46†	0.63	0.59	0.45	0.05	1.00	1.00	6	100
10WP47†	0.63	0.59	0.45	0.05	1.00	1.00	6	100
11CS10RD†	0.63	0.59	0.45	0.05	1.00	1.00	6	100
11CS10RS†	0.75	0.64	0.41	0.10	1.00	1.00	6	100
11WP4R†	0.85	0.67	0.42	0.05	1.00	1.00	6	83
11WP9RPB†	0.50	0.58	0.42	0.05	1.00	1.00	7	86
11WP9RS†	1.00	0.66	0.47	0.05	1.00	1.00	5	100
11WP11RD†	0.63	0.59	0.45	0.05	1.00	1.00	6	100
11WP11RS†	1.00	1.02	0.97	0.05	2.80	1.54	6	83
11WP15R†	0.75	0.68	0.38	0.10	1.00	1.00	6	100
11WP16R†	1.00	0.96	0.37	0.25	1.25	1.25	6	100
11WP43D†	1.13	7.56	12.96	1.00	27.00	19.28	4	75
11WP50†	1.00	1.06	0.13	1.00	1.25	1.18	4	100
11WP51D†	0.63	0.62	0.42	0.20	1.00	1.00	6	83
11WP51S†	0.65	0.63	0.40	0.25	1.00	1.00	6	83
11WP52D†	0.63	0.59	0.45	0.05	1.00	1.00	6	100

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
11WP53D†	1.00	0.78	0.40	0.10	1.10	1.03	6	83
11WP53S	1.00	0.80	0.41	0.10	1.20	1.06	6	83
11WP54D†	1.00	0.96	0.37	0.25	1.25	1.25	6	100
11WP54S†	1.00	0.96	0.37	0.25	1.25	1.25	6	100
11WP55†	1.00	1.14	0.86	0.05	2.70	1.58	6	67
11WP56D†	0.63	0.59	0.45	0.05	1.00	1.00	6	100
11WP56S†	0.50	0.52	0.48	0.05	1.00	0.95	3	67
11WP57†	1.00	0.96	0.37	0.25	1.25	1.25	6	100
CG1†	0.75	0.75	0.27	0.50	1.00	1.00	6	100
CG2†	1.00	0.70	0.41	0.25	1.00	1.00	5	100
CG4†	0.63	0.59	0.45	0.05	1.00	1.00	6	100
KC3†	1.00	0.70	0.41	0.25	1.00	1.00	5	100
KC3A†	0.65	0.63	0.40	0.25	1.00	1.00	6	83
KC3PB†	0.63	0.59	0.45	0.05	1.00	1.00	6	100
KC13†	0.63	0.59	0.45	0.05	1.00	1.00	6	100
KC14†	1.00	1.10	0.14	1.00	1.25	1.25	5	100
KCF1†	0.63	0.59	0.45	0.05	1.00	1.00	6	100
LIMESTONE†	1.00	0.92	0.44	0.30	1.60	1.18	6	50
M1†	0.05	0.05	0.00	0.05	0.05	0.05	2	100
RN029659†	0.63	0.59	0.45	0.05	1.00	1.00	6	100
RN029660†	0.63	0.59	0.45	0.05	1.00	1.00	6	100
W2R†	1.00	3.86	7.42	0.25	19.00	6.40	6	67
WP5†	0.75	0.64	0.41	0.10	1.00	1.00	6	100
WP13†	0.63	0.59	0.45	0.05	1.00	1.00	6	100
WP19†	1.00	1.38	0.75	1.00	2.50	2.05	4	100

† More than one-quarter of the samples are below the LOR

Table D46 Concentration of thallium (µg/L)

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
10WP31†	0.05	0.05	0.00	0.05	0.05	0.05	5	100
10WP32†	0.05	0.23	0.28	0.05	0.7	0.5	5	60
10WP32PB†	0.05	0.08	0.07	0.05	0.2	0.125	5	80
10WP33†	0.05	0.05	0.00	0.05	0.05	0.05	5	100
10WP35N†	0.05	0.05	0.00	0.05	0.05	0.05	5	100
10WP35PB†	0.05	0.05	0.00	0.05	0.05	0.05	5	100
10WP35S†	0.05	0.05	0.00	0.05	0.05	0.05	5	100
10WP36N†	0.05	0.05	0.00	0.05	0.05	0.05	5	100
10WP36PB†	0.05	0.08	0.07	0.05	0.2	0.125	5	80
10WP36S†	0.05	0.06	0.02	0.05	0.1	0.075	5	80
10WP37†	0.05	0.05	0.00	0.05	0.05	0.05	5	100
10WP39	0.2	0.21	0.12	0.05	0.4	0.3	5	20
10WP40†	0.1	0.08	0.03	0.05	0.1	0.1	5	100
10WP41†	0.25	0.53	0.50	0.25	1.4	0.95	5	80
10WP42†	0.05	0.1	0.11	0.05	0.3	0.175	5	80
10WP44†	0.25	0.2	0.10	0.05	0.25	0.25	4	100
10WP46†	0.05	0.09	0.09	0.05	0.25	0.15	5	100
10WP47†	0.05	0.05	0.00	0.05	0.05	0.05	5	100
11CS10RD†	0.05	0.05	0.00	0.05	0.05	0.05	5	100
11CS10RS†	0.1	0.09	0.02	0.05	0.1	0.1	5	100
11WP4R†	0.05	0.05	0.00	0.05	0.05	0.05	5	100
11WP9RPB†	0.05	0.05	0.00	0.05	0.05	0.05	6	100
11WP9RS†	0.05	0.05	0.00	0.05	0.05	0.05	4	100
11WP11RD†	0.05	0.05	0.00	0.05	0.05	0.05	5	100
11WP11RS†	0.05	0.06	0.02	0.05	0.1	0.075	5	80
11WP15R†	0.1	0.26	0.36	0.1	0.9	0.5	5	80
11WP16R†	0.25	0.25	0.00	0.25	0.25	0.25	5	100
11WP43D†	0.175	0.225	0.20	0.05	0.5	0.425	4	100
11WP50†	0.25	0.688	0.88	0.25	2	1.475	4	75
11WP51D†	0.05	0.08	0.07	0.05	0.2	0.125	5	80
11WP51S†	0.05	0.07	0.03	0.05	0.1	0.1	5	80
11WP52D†	0.05	0.06	0.02	0.05	0.1	0.075	5	100

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
11WP53D†	0.1	0.1	0.00	0.1	0.1	0.1	5	100
11WP53S†	0.1	0.1	0.00	0.1	0.1	0.1	5	100
11WP54D†	0.25	0.25	0.00	0.25	0.25	0.25	5	100
11WP54S†	0.25	0.25	0.00	0.25	0.25	0.25	5	100
11WP55†	0.05	0.05	0.00	0.05	0.05	0.05	5	100
11WP56D†	0.05	0.05	0.00	0.05	0.05	0.05	5	100
11WP56S†	0.15	0.15	0.14	0.05	0.25	0.25	2	100
11WP57	1.1	1.22	0.66	0.5	1.9	1.9	5	0
CG1†	0.1	0.1	0.00	0.1	0.1	0.1	6	100
CG2†	0.05	0.05	0.00	0.05	0.05	0.05	5	100
CG4†	0.05	0.05	0.00	0.05	0.05	0.05	5	100
KC3†	0.05	0.05	0.00	0.05	0.05	0.05	5	100
KC3A†	0.05	0.05	0.00	0.05	0.05	0.05	5	100
KC3PB†	0.05	0.06	0.22	0.05	0.1	0.075	5	80
KC13†	0.05	0.09	0.09	0.05	0.25	0.15	5	100
KC14†	0.25	0.6	0.90	0.05	2.2	1.225	5	80
KCF1†	0.05	0.07	0.03	0.05	0.1	0.1	5	60
LIMESTONE†	0.05	0.05	0.00	0.05	0.05	0.05	5	100
M1	No data							
RN029659†	0.05	0.05	0.00	0.05	0.05	0.05	5	100
RN029660†	0.05	0.05	0.00	0.05	0.05	0.05	5	100
W2R†	0.05	0.05	0.00	0.05	0.05	0.05	6	100
WP5†	0.05	0.06	0.02	0.05	0.1	0.075	5	100
WP13†	0.05	0.06	0.02	0.05	0.1	0.075	5	80
WP19†	0.5	0.438	0.13	0.25	0.5	0.5	4	100

† More than one-quarter of the samples are below the LOR

Table D47 Concentration of uranium (µg/L)

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
10WP31	0.3	0.3	0.1	0.1	0.4	0.3	7	0
10WP32	3.6	3.3	1.1	1.6	4.7	4.2	7	0
10WP32PB	3.8	4.0	0.6	3.4	4.6	4.6	7	0
10WP33	4.6	4.5	1.4	2.0	6.3	5.8	7	0
10WP35N	15.0	15.5	6.8	4.3	22.0	22.0	7	0
10WP35PB	30.0	25.3	9.4	9.7	35.0	33.0	9	0
10WP35S	24.0	22.2	10.0	5.6	33.0	32.1	7	0
10WP36N	5.5	5.4	1.4	3.1	7.5	6.4	7	0
10WP36PB	4.5	4.9	2.0	2.5	9.0	6.5	10	0
10WP36S	6.3	5.8	2.2	1.4	7.9	7.6	7	0
10WP37	20.0	18.5	7.0	4.3	24.0	24.0	7	0
10WP39	0.7	0.7	0.1	0.6	1.0	0.8	7	0
10WP40	9.1	13.4	11.5	4.9	38.0	18.2	7	0
10WP41	84.0	81.4	22.5	48.0	110.0	99.2	7	0
10WP42	9.1	9.4	1.3	7.5	11.0	11.0	7	0
10WP44	23.0	22.8	6.9	14.0	31.0	28.6	4	0
10WP46	6.5	6.5	0.6	5.6	7.3	7.0	7	0
10WP47	0.9	0.9	0.4	0.3	1.8	1.1	7	0
11CS10RD	19.0	18.0	3.6	12.0	22.0	20.6	6	0
11CS10RS	23.0	42.1	47.1	7.3	130.0	81.0	6	0
11WP4R	3.5	3.4	0.9	2.2	4.7	4.2	6	0
11WP9RPB	5.8	5.6	0.7	4.5	6.6	6.0	7	0
11WP9RS	6.1	6.0	0.6	5.2	6.8	6.6	5	0
11WP11RD	3.0	2.9	0.7	1.7	3.6	3.5	6	0
11WP11RS	4.0	4.0	1.3	1.9	5.9	5.1	6	0
11WP15R	57.5	56.5	2.1	53.0	58.0	58.0	6	0
11WP16R	15.0	15.7	3.2	12.0	20.0	19.3	6	0
11WP43D	8.3	13.5	15.8	1.5	36.0	29.1	4	0
11WP50	73.0	73.0	1.6	71.0	75.0	74.4	4	0
11WP51D	0.5	0.4	0.1	0.2	0.5	0.5	6	0
11WP51S	1.1	1.2	0.9	0.2	2.2	2.2	6	0
11WP52D	2.3	2.3	0.8	1.2	3.4	3.1	6	0

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
11WP53D	56.0	55.7	3.5	50.0	61.0	57.5	6	0
11WP53S	62.0	63.0	3.0	60.0	68.0	65.9	6	0
11WP54D	110.0	109.2	10.2	95.0	120.0	120.0	6	0
11WP54S	125.0	128.3	11.7	120.0	150.0	136.0	6	0
11WP55	1.4	1.4	0.8	0.4	2.2	2.1	6	0
11WP56D†	0.2	0.1	0.1	0.1	0.2	0.2	6	33
11WP56S†	1.3	1.3	1.1	0.3	2.4	2.3	3	33
11WP57	4.6	6.0	3.9	4.0	14.0	7.5	6	0
CG1	35.5	34.5	6.5	23.0	41.0	40.3	6	0
CG2	8.9	8.6	1.1	7.2	9.9	9.5	5	0
CG4	13.5	13.5	1.0	12.0	15.0	14.3	6	0
KC3†	0.1	0.2	0.2	0.1	0.5	0.4	5	40
KC3A†	0.1	0.1	0.0	0.1	0.1	0.1	6	83
KC3PB†	0.1	0.1	0.1	0.1	0.2	0.1	6	67
KC13	4.6	9.0	11.7	1.5	32.0	16.2	6	0
KC14	56.0	56.4	2.3	54.0	60.0	58.5	5	0
KCF1	25.0	24.5	1.8	22.0	27.0	25.6	6	0
LIMESTONE†	0.4	0.4	0.4	0.1	1.2	0.7	6	33
M1	0.3	0.3	0.1	0.3	0.4	0.4	3	0
RN029659	5.4	4.9	4.1	0.1	9.6	9.2	6	17
RN029660	3.5	3.4	0.3	2.9	3.8	3.7	6	0
W2R	0.2	0.4	0.5	0.1	1.4	0.6	6	0
WP5	9.3	8.9	2.6	3.4	11.0	11.0	7	0
WP13	1.0	1.0	0.2	0.8	1.3	1.1	6	0
WP19	45.0	45.0	2.7	41.0	48.0	47.5	5	0

† More than one-quarter of the samples are below the LOR

Table D48 Concentration of vanadium (µg/L)

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
10WP31	15.5	15.3	1.2	14.0	17.0	16.3	6	0
10WP32	42.5	45.3	16.2	21.0	65.0	62.9	6	0
10WP32PB	67.0	63.0	12.6	41.0	75.0	72.9	6	0
10WP33	19.5	19.5	1.0	18.0	21.0	20.3	6	0
10WP35N	38.0	36.0	6.7	25.0	42.0	41.3	6	0
10WP35PB	22.5	22.2	2.1	19.0	24.0	24.0	6	0
10WP35S	18.0	16.5	5.3	5.9	20.0	20.0	6	0
10WP36N	52.0	47.8	13.5	25.0	63.0	57.4	6	0
10WP36PB	38.5	41.0	25.2	16.0	82.0	61.7	6	0
10WP36S	120.0	123.5	34.4	85.0	180.0	152.0	6	0
10WP37	35.5	34.2	2.9	30.0	37.0	36.3	6	0
10WP39	12.0	12.0	1.5	10.0	14.0	13.3	6	0
10WP40	14.2	18.9	19.6	2.5	54.0	33.7	6	17
10WP41	6.6	6.8	3.1	2.5	11.0	9.6	6	17
10WP42	12.0	12.7	2.0	11.0	16.0	14.6	6	0
10WP44	7.9	7.9	4.2	3.9	12.0	11.7	4	0
10WP46	12.0	11.8	1.3	10.0	13.0	13.0	6	0
10WP47†	2.5	2.1	0.9	0.8	3.0	2.7	6	50
11CS10RD	25.0	24.8	1.6	23.0	27.0	26.3	6	0
11CS10RS	21.0	41.5	50.5	7.8	140.0	76.3	6	0
11WP4R	5.6	6.1	3.4	2.5	11.0	9.6	6	17
11WP9RPB	40.0	51.9	30.4	36.0	120.0	57.0	7	0
11WP9RS	41.0	40.0	4.1	34.0	44.0	43.5	5	0
11WP11RD	36.0	36.7	9.5	22.0	50.0	45.1	6	0
11WP11RS	130.0	126.7	49.3	40.0	190.0	162.0	6	0
11WP15R	23.0	23.7	4.2	19.0	30.0	27.9	6	0
11WP16R	4.2	6.4	4.4	2.5	13.0	11.6	6	17
11WP43D	3.2	3.6	1.3	2.5	5.5	4.9	4	25
11WP50	3.8	3.6	0.8	2.5	4.3	4.2	4	25
11WP51D†	1.6	1.6	0.8	0.3	2.5	2.5	6	33
11WP51S†	2.5	2.5	0.5	2.0	3.4	2.8	6	33
11WP52D	19.0	17.7	3.5	12.0	21.0	20.3	6	0

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
11WP53D	150.0	138.3	36.0	70.0	170.0	163.0	6	0
11WP53S	115.0	118.2	30.3	69.0	150.0	150.0	6	0
11WP54D	20.0	19.5	3.3	14.0	23.0	22.3	6	0
11WP54S	30.0	26.7	9.7	14.0	39.0	33.4	6	0
11WP55	2.5	7.6	13.5	0.6	35.0	12.8	6	17
11WP56D†	0.6	1.2	1.0	0.4	2.5	2.5	6	33
11WP56S	9.7	9.9	1.0	9.0	11.0	10.9	3	0
11WP57†	3.8	3.5	0.8	2.5	4.2	4.2	6	33
CG1	34.5	33.2	5.3	23.0	38.0	36.6	6	0
CG2	22.0	22.6	3.0	20.0	27.0	25.5	5	0
CG4†	8.1	7.0	3.7	2.5	11.0	10.3	6	33
KC3	2.6	2.8	0.4	2.4	3.3	3.2	5	20
KC3A†	0.9	1.3	0.9	0.6	2.5	2.5	6	33
KC3PB†	0.6	1.1	1.1	0.2	2.5	2.5	6	33
KC13†	2.0	4.1	6.9	0.1	18.0	7.2	6	33
KC14†	0.3	0.8	1.0	0.3	2.5	1.5	5	80
KCF1	9.5	9.5	1.5	7.0	11.0	11.0	6	0
LIMESTONE†	2.5	2.5	2.2	0.4	6.6	3.7	6	50
M1†	3.8	3.8	1.8	2.5	5.0	5.0	2	50
RN029659†	2.5	2.4	0.3	2.0	2.7	2.6	6	50
RN029660	47.0	46.2	7.5	37.0	56.0	53.2	6	0
W2R†	2.2	1.8	0.9	0.4	2.5	2.5	6	33
WP5	6.9	6.9	0.7	6.0	8.0	7.5	6	0
WP13	6.0	5.9	1.0	4.7	7.0	7.0	6	0
WP19	10.8	10.7	1.6	9.0	12.0	12.0	4	0

† More than one-quarter of the samples are below the LOR

Table D49 Concentration of zinc (µg/L)

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
10WP31	11	13	6	7	25	15	7	0
10WP32†	9	8	4	3	12	12	7	29
10WP32PB†	8	28	40	3	98	76	7	29
10WP33	12	11	6	3	21	16	7	14
10WP35N	8	8	5	1	13	13	7	14
10WP35PB	12	11	7	3	25	15	9	11
10WP35S	14	14	6	3	22	18	7	14
10WP36N	12	11	4	4	18	14	7	0
10WP36PB†	6	7	6	3	20	12	10	30
10WP36S	12	13	7	5	28	16	7	0
10WP37	8	8	4	3	15	11	7	14
10WP39	11	15	13	3	37	30	7	14
10WP40	13	16	13	3	44	20	7	0
10WP41	26	50	47	7	140	89	7	0
10WP42	11	12	8	3	27	16	7	14
10WP44	13	12	2	9	13	13	4	0
10WP46†	9	11	10	3	31	16	7	29
10WP47†	6	9	10	3	30	15	7	43
11CS10RD	13	14	8	5	26	20	6	0
11CS10RS	11	16	13	9	41	22	6	0
11WP4R	13	19	18	3	49	39	6	17
11WP9RPB	13	14	9	3	28	22	7	14
11WP9RS	6	7	5	3	14	12	5	20
11WP11RD	6	9	6	5	19	14	6	0
11WP11RS	10	9	6	2	15	14	6	17
11WP15R	15	16	8	3	27	24	6	17
11WP16R	16	18	7	12	30	23	6	0
11WP43D	18	28	27	10	67	54	4	0
11WP50	54	69	49	27	140	115	4	0
11WP51D†	4	8	8	3	21	15	6	33
11WP51S†	22	22	18	3	41	40	6	33
11WP52D	9	10	3	7	16	12	6	0

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
11WP53D	12	11	5	3	19	16	6	17
11WP53S†	11	12	10	3	25	23	6	33
11WP54D	20	28	17	14	55	46	6	0
11WP54S	20	49	75	5	200	82	6	0
11WP55	6	13	14	2	32	29	6	17
11WP56D	15	21	15	8	49	32	6	0
11WP56S†	21	41	52	3	100	92	3	33
11WP57	17	22	18	10	57	31	6	0
CG1	20	24	17	9	56	36	6	0
CG2	14	18	13	8	40	28	5	0
CG4	23	25	17	4	50	42	6	0
KC3	16	20	13	8	42	32	5	0
KC3A	21	27	24	8	74	41	6	0
KC3PB	16	19	14	8	45	28	6	0
KC13	23	21	9	8	29	28	6	0
KC14	20	31	23	8	64	55	5	0
KCF1	14	28	34	8	97	47	6	0
LIMESTONE†	9	9	6	3	16	15	6	33
M1†	11	9	6	3	13	13	3	33
RN029659†	4	8	8	3	24	14	6	50
RN029660	10	12	9	3	26	22	6	17
W2R†	6	16	20	3	52	34	6	33
WP5	17	17	11	5	33	29	7	0
WP13	11	15	13	3	39	24	6	17
WP19	28	28	9	14	37	36	5	0

† More than one-quarter of the samples are below the LOR

Table D50 Concentration of total dissolved solids (mg/L)

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
10WP31	332	335	27	295	369	360	7	0
10WP32	1 234	1 178	265	828	1 488	1 487	7	0
10WP32PB	1 062	1 024	287	448	1 358	1 246	7	0
10WP33	893	947	104	851	1 103	1 073	7	0
10WP35N	967	938	270	449	1 225	1 189	7	0
10WP35PB	1 230	1 225	204	876	1 455	1 427	9	0
10WP35S	1 241	1 115	303	641	1 448	1 370	7	0
10WP36N	1 015	932	303	398	1 191	1 177	7	0
10WP36PB	968	949	269	359	1 309	1 155	10	0
10WP36S	1 308	1 164	334	600	1 434	1 421	7	0
10WP37	1 508	1 445	272	914	1 722	1 699	7	0
10WP39	840	868	66	807	1 000	919	7	0
10WP40	4 193	4 360	1 735	2 332	7 524	5 303	7	0
10WP41	16 829	15 942	3 667	11 124	20 734	19 427	7	0
10WP42	1 574	1 638	154	1474	1 932	1 729	7	0
10WP44	20 603	20 712	3 823	17 083	24 559	24 217	4	0
10WP46	1 569	1628	209	1 443	2 083	1 666	7	0
10WP47	485	481	65	357	561	529	7	0
11CS10RD	1 898	1 808	485	1 228	2 400	2 235	6	0
11CS10RS	4 711	4 977	1 526	2 847	7 218	6 468	6	0
11WP4R	1 048	1 071	180	823	1 345	1 229	6	0
11WP9RPB	1 477	1 340	329	777	1 619	1 579	7	0
11WP9RS	1 474	1 313	357	925	1 666	1 617	5	0
11WP11RD	781	718	143	512	848	828	6	0
11WP11RS	1 028	829	332	398	1 072	1 051	6	0
11WP15R	5 891	5 570	610	4 765	6 094	6 004	6	0
11WP16R	9 157	9 741	1 525	8 241	12 309	11 228	6	0
11WP43D	10 104	10 023	6 617	2 064	17 822	16 074	4	0
11WP50	18 408	18 409	3 144	15 331	21 490	21 259	4	0
11WP51D	583	555	68	429	607	603	6	0
11WP51S	772	698	406	142	1 166	1 081	6	0
11WP52D	645	613	130	422	745	735	6	0

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
11WP53D	6 168	5 690	1 087	4 202	6 705	6 540	6	0
11WP53S	6 708	6 200	987	4 871	7 023	6 927	6	0
11WP54D	19 254	20 122	2 666	17 375	24 156	23 061	6	0
11WP54S	13 222	13 346	1 469	11 489	15 611	14 594	6	0
11WP55	2 817	2 859	238	2 572	3 246	3 067	6	0
11WP56D	57	61	14	43	78	77	6	0
11WP56S	655	581	369	181	908	883	3	0
11WP57	11 071	11 779	2 173	9 354	14 599	14 388	6	0
CG1	4 249	4 300	420	3 760	4 772	4 763	6	0
CG2	699	717	45	670	773	765	5	0
CG4	2 207	2 268	268	2 017	2 726	2 480	6	0
KC3	198	192	16	168	208	204	5	0
KC3A	296	314	61	256	417	373	6	0
KC3PB	278	310	72	254	431	386	6	0
KC13	827	799	112	654	951	885	6	0
KC14	13 327	15 350	3 472	12 341	19 571	19 117	5	0
KCF1	3 911	3 935	378	3 494	4 524	4 279	6	0
LIMESTONE	432	411	132	211	562	523	6	0
M1	189	189	4	186	192	192	3/2*	0
RN029659	2 715	2 423	1 173	295	3 519	3 263	6	0
RN029660	1 255	1 242	151	973	1 408	1 366	6	0
W2R	398	360	85	215	427	422	6	0
WP5	3 617	3 902	687	3 276	5 019	4 781	7	0
WP13	713	728	75	645	839	800	6/5*	0
WP19	19 680	21 648	3 102	19045	25 512	25 015	5	0

* Number of samples and number used in statistical analysis

Table D51 Concentration of sodium adsorption ratio

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
10WP31	0.7	0.8	0.1	0.6	1.1	0.8	7	0
10WP32	5.3	4.9	0.6	4.0	5.4	5.4	7	0
10WP32PB	4.7	4.5	1.2	2.0	5.7	5.2	7	0
10WP33	3.6	3.5	0.2	3.1	3.8	3.6	7	0
10WP35N	8.4	8.0	0.9	6.2	8.8	8.7	7	0
10WP35PB	5.0	4.8	0.3	4.4	5.3	5.0	9	0
10WP35S	5.4	5.6	0.6	4.9	6.8	5.8	7	0
10WP36N	5.6	5.2	1.1	2.9	6.3	6.0	7	0
10WP36PB	6.5	6.5	1.6	4.2	10.3	7.1	10	0
10WP36S	9.3	9.8	2.4	7.5	15.0	10.7	7	0
10WP37	7.9	7.9	0.8	6.7	9.2	8.3	7	0
10WP39	2.1	2.2	0.3	2.0	2.7	2.4	7	0
10WP40	16.6	16.6	1.1	15.0	18.4	17.2	7	0
10WP41	23.8	24.0	1.4	22.3	26.3	25.2	7	0
10WP42	5.9	6.0	0.6	5.5	6.9	6.5	7	0
10WP44	17.9	17.8	0.5	17.2	18.2	18.2	4	0
10WP46	5.2	5.3	0.4	4.7	6.1	5.5	7	0
10WP47	1.2	1.2	0.3	0.7	1.8	1.4	7	0
11CS10RD	3.8	4.4	1.3	3.3	6.6	5.8	6	0
11CS10RS	17.5	22.3	12.9	13.8	48.2	29.2	6	0
11WP4R	2.6	2.6	0.3	2.1	2.9	2.7	6	0
11WP9RPB	9.5	10.2	2.3	8.6	15.2	10.7	7	0
11WP9RS	10.2	9.7	0.7	8.8	10.3	10.2	5	0
11WP11RD	4.3	4.3	0.2	3.9	4.5	4.4	6	0
11WP11RS	9.7	10.0	0.9	9.0	11.5	10.9	6	0
11WP15R	35.3	35.3	2.1	31.8	38.4	36.8	6	0
11WP16R	12.5	13.9	3.4	10.7	18.4	18.2	6	0
11WP43D	4.9	4.7	1.7	2.7	6.4	6.2	4	0
11WP50	20.1	20.1	0.5	19.6	20.6	20.6	4	0
11WP51D	1.9	1.8	0.2	1.5	2.0	2.0	6	0
11WP51S	1.8	2.4	1.6	0.6	4.8	4.0	6	0
11WP52D	3.7	3.6	0.5	2.9	4.3	4.0	6	0

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
11WP53D	66.0	65.3	4.9	56.7	70.0	69.6	6	0
11WP53S	72.6	71.8	4.4	66.3	76.4	75.9	6	0
11WP54D	27.3	27.9	2.0	25.4	31.4	29.6	6	0
11WP54S	32.0	31.6	2.8	28.5	34.2	34.2	6	0
11WP55	10.9	12.6	4.3	10.2	21.3	14.7	6	0
11WP56D	1.3	1.2	0.4	0.8	1.7	1.5	6	0
11WP56S	2.1	2.0	0.8	1.1	2.7	2.7	3	0
11WP57	13.5	13.8	0.9	13.0	15.5	14.3	6	0
CG1	10.1	10.3	0.5	9.9	11.2	10.6	6	0
CG2	2.1	2.2	0.6	1.6	3.0	2.9	5	0
CG4	6.7	6.6	0.5	6.0	7.1	7.1	6	0
KC3	0.8	0.8	0.1	0.7	1.0	0.9	5	0
KC3A	0.9	1.0	0.1	0.8	1.1	1.0	6	0
KC3PB	1.0	0.9	0.1	0.8	1.0	1.0	6	0
KC13	3.9	3.8	0.5	3.1	4.3	4.2	6	0
KC14	13.2	12.8	0.7	11.7	13.3	13.3	5	0
KCF1	8.6	8.7	0.5	8.1	9.5	9.2	6	0
LIMESTONE	1.2	1.1	0.3	0.6	1.3	1.3	6	0
M1	0.7	0.8	0.2	0.7	1.0	1.0	3	0
RN029659	8.7	8.0	3.5	1.1	11.3	10.3	6	0
RN029660	9.1	9.2	0.4	8.9	9.8	9.6	6	0
W2R	0.6	0.6	0.1	0.4	0.8	0.7	6	0
WP5	2.4	2.7	0.4	2.2	3.3	3.1	7	0
WP13	1.5	1.5	0.2	1.3	1.9	1.6	6	0
WP19	26.0	26.1	1.0	24.9	27.2	27.1	5	0

Table D52 Concentration of atrazine (µg/L)

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
10WP31†	0.03	0.04	0.05	0.01	0.10	0.09	4	100
10WP32†	0.10	0.07	0.04	0.01	0.10	0.10	5	100
10WP32PB†	0.08	0.08	0.04	0.05	0.10	0.10	2	100
10WP33†	0.01	0.01	0.02	0.01	0.05	0.03	5	100
10WP35N†	0.01	0.03	0.04	0.01	0.10	0.07	6	100
10WP35PB†	0.01	0.02	0.02	0.01	0.05	0.04	4	100
10WP35S†	0.05	0.05	0.05	0.01	0.10	0.10	3	100
10WP36N†	0.03	0.04	0.05	0.01	0.10	0.09	4	100
10WP36PB†	0.05	0.05	0.05	0.01	0.10	0.10	7	100
10WP36S†	0.03	0.03	0.03	0.01	0.05	0.05	2	100
10WP37†	0.08	0.06	0.05	0.01	0.10	0.10	4	100
10WP39†	0.03	0.04	0.05	0.01	0.10	0.09	4	100
10WP40†	0.01	0.03	0.04	0.01	0.10	0.08	5	100
10WP41†	0.01	0.02	0.02	0.01	0.05	0.04	4	100
10WP42†	0.01	0.02	0.03	0.01	0.05	0.05	3	100
10WP44†	0.05	0.05	ND	0.05	0.05	0.05	1	100
10WP46†	0.05	0.05	0.05	0.01	0.10	0.10	3	100
10WP47†	0.01	0.03	0.04	0.01	0.10	0.08	5	100
11CS10RD†	0.01	0.03	0.04	0.01	0.10	0.08	5	100
11CS10RS†	0.01	0.02	0.03	0.01	0.05	0.05	3	100
11WP4R†	0.05	0.05	0.05	0.01	0.10	0.10	3	100
11WP9RPB†	0.08	0.06	0.05	0.01	0.10	0.10	4	100
11WP9RS†	0.03	0.03	0.03	0.01	0.05	0.05	2	100
11WP11RD†	0.01	0.02	0.03	0.01	0.05	0.05	3	100
11WP11RS†	0.01	0.03	0.04	0.01	0.10	0.08	5	100
11WP15R†	0.01	0.02	0.03	0.01	0.05	0.05	3	100
11WP16R†	0.01	0.03	0.04	0.01	0.10	0.07	6	100
11WP43D†	0.03	0.04	0.05	0.01	0.10	0.09	4	100
11WP50†	0.05	0.05	ND	0.05	0.05	0.05	1	100
11WP51D†	0.05	0.05	0.05	0.01	0.10	0.10	5	100
11WP51S†	0.08	0.06	0.05	0.01	0.10	0.10	4	100
11WP52D†	0.01	0.02	0.03	0.01	0.05	0.05	3	100

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples	Per cent below LOR
11WP53D†	0.03	0.04	0.05	0.01	0.10	0.09	4	100
11WP53S†	0.03	0.03	0.03	0.01	0.05	0.05	2	100
11WP54D†	0.05	0.05	0.05	0.01	0.10	0.10	3	100
11WP54S†	0.01	0.02	0.03	0.01	0.05	0.05	3	100
11WP55†	0.01	0.02	0.02	0.01	0.05	0.04	4	100
11WP56D†	0.01	0.02	0.02	0.01	0.05	0.04	4	100
11WP56S†	0.01	0.01	ND	0.01	0.01	0.01	1	100
11WP57†	0.10	0.09	0.03	0.05	0.10	0.10	4	100
CG1†	0.03	0.03	0.03	0.01	0.05	0.05	4	100
CG2†	0.05	0.05	0.05	0.01	0.10	0.10	3	100
CG4†	0.01	0.02	0.03	0.01	0.05	0.05	3	100
KC3†	0.01	0.03	0.04	0.01	0.10	0.08	5	100
KC3A†	0.05	0.05	ND	0.05	0.05	0.05	1	100
KC3PB†	0.08	0.06	0.05	0.01	0.10	0.10	4	100
KC13†	0.01	0.02	0.03	0.01	0.05	0.05	3	100
KC14†	0.01	0.02	0.03	0.01	0.05	0.05	3	100
KCF1†	0.01	0.03	0.04	0.01	0.10	0.08	5	100
LIMESTONE†	0.03	0.04	0.05	0.01	0.10	0.10	6	100
RN029659†	0.01	0.02	0.02	0.01	0.05	0.04	4	100
RN029660†	0.01	0.02	0.03	0.01	0.05	0.05	3	100
W2R†	0.05	0.05	0.05	0.01	0.10	0.10	3	100
WP5†	0.05	0.05	0.05	0.01	0.10	0.10	3	100
WP13†	0.01	0.02	0.02	0.01	0.05	0.04	4	100
WP19†	0.01	0.02	0.03	0.01	0.05	0.05	3	100

† More than one-quarter of the samples are below the LOR

ND No data

Appendix E Summary statistics of field measurements

Table E1 Concentration of electrical conductivity (mS/m)

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples
10WP31	43.0	42.1	3.6	37.2	46.3	45.8	9
10WP32	176.8	170.3	34.8	122.1	211.0	205.9	8
10WP32PB	154.0	152.2	24.9	123.5	184.0	175.9	5
10WP33	126.6	132.8	14.7	114.8	153.5	151.2	8
10WP35N	122.3	125.7	18.1	108.7	151.0	144.3	8
10WP35PB	171.5	171.5	5.1	164.5	179.0	176.1	6
10WP35S	152.9	149.3	18.8	115.0	172.6	164.6	8
10WP36N	136.1	133.8	8.6	120.0	142.9	142.3	8
10WP36PB	131.0	128.8	27.5	90.1	159.6	154.5	6
10WP36S	151.2	155.3	10.4	144.9	171.6	167.6	8
10WP37	210.0	200.3	13.7	179.6	213.0	211.0	9
10WP39	120.1	293.6	429.3	111.6	1170.0	436.3	6
10WP40	612.0	601.0	166.2	360.0	943.0	649.4	9
10WP41	2370	2151	396	1496	2520	2394	7
10WP42	238.0	192.6	96.0	22.0	244.0	243.5	5
10WP44	2340	2266	337	1636	2530	2523	6
10WP46	227	629	1016	23	2440	1338	5
10WP47	58.1	55.0	6.2	46.4	60.6	60.1	5
11CS10RD	248.0	243.3	76.6	167.0	356.0	323.6	7
11CS10RS	662.5	703.3	211.4	407.0	1044.0	879.5	6
11WP11RD	102.6	101.4	4.6	92.6	106.4	104.0	6
11WP11RS	118.8	128.3	21.3	113.6	169.5	144.2	6
11WP15R	850.0	852.3	19.9	833.0	890.0	863.4	6
11WP16R	1176	1188	62	1110	1264	1258.2	8
11WP43D	931	1084	788	384	1937	1836	3
11WP4R	165.8	162.3	9.1	151.0	172.4	169.2	6
11WP50	2145	2128	47	2060	2160	2160	4
11WP51D	77.6	78.7	6.7	70.0	93.3	82.6	9
11WP51S	97.0	114.4	67.2	25.4	199.4	188.4	7
11WP52D	93.7	92.1	5.1	85.4	97.2	96.6	6
11WP53D	833	830	34	791	884	855	6

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples
11WP53S	889	891	45	827	943	938	6
11WP54D	2455	2066	899	237	2490	2483	6
11WP54S	1739	1680	113	1494	1760	1759	5
11WP55	440.0	438.1	6.8	430.0	449.0	442.7	7
11WP56D	10.0	9.8	2.3	7.0	12.2	12.0	6
11WP56S	76.8	69.9	62.1	0.0	126.0	123.7	4
11WP57	1650	1531	290	794	1705	1674	9
11WP9RPB	201.0	201.4	7.7	190.1	209.0	208.5	5
11WP9RS	202.0	200.1	5.7	190.1	205.0	204.3	6
CG1	590.0	581.4	74.4	457.0	645.0	638.5	5
CG2	91.9	91.9	5.9	85.7	98.0	97.3	4
CG4	310.0	317.9	28.9	289.0	354.0	351.3	7
KC13	101.8	100.1	12.1	82.8	113.1	110.8	8
KC14	1754	1745	29	1705	1769	1768	4
KC3	26.4	28.5	7.0	22.6	44.6	29.7	8
KC3A	41.3	43.1	2.7	41.1	49.1	45.0	9
KC3PB	44.8	43.8	2.1	40.7	45.6	45.4	5
KCF1	481.0	477.8	18.7	456.0	497.0	495.5	5
LIMESTONE	50.9	51.0	19.5	30.0	72.1	69.1	4
M1	25.3	25.2	1.1	24.1	26.2	26.1	3
RN029659	400.0	356.7	177.1	50.4	485.0	477.5	5
RN029660	179.6	177.6	5.3	170.0	181.4	181.3	4
W2R	49.8	47.8	8.5	37.0	54.7	54.6	4
WP13	107.2	105.9	7.4	97.5	119.5	109.4	8
WP19	2690	2688	45	2640	2750	2730	5
WP5	505.0	499.4	11.5	486.0	510.0	509.0	5

Table E2 Concentration of pH (field)

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples
10WP31	7.0	8.0	1.8	6.5	10.5	10.4	9
10WP32	7.5	8.3	1.5	7.2	10.7	10.4	8
10WP32PB	7.3	7.4	0.1	7.2	7.6	7.5	5
10WP33	7.2	8.4	1.9	6.8	10.8	10.7	8
10WP35N	7.6	8.4	1.6	7.4	11.1	10.4	8
10WP35PB	7.2	7.2	0.2	7.0	7.5	7.5	6
10WP35S	7.5	8.1	1.2	7.1	10.2	9.7	8
10WP36N	7.6	8.2	1.3	7.2	10.4	10.0	8
10WP36PB	7.5	7.7	0.6	7.1	8.9	8.0	6
10WP36S	7.8	8.4	1.4	7.3	10.7	10.3	8
10WP37	7.6	8.5	1.5	7.3	10.9	10.3	9
10WP39	7.2	7.2	0.1	7.0	7.4	7.4	6
10WP40	7.5	8.1	1.2	7.2	9.8	9.7	9
10WP41	7.1	7.4	1.0	6.9	9.6	7.4	7
10WP42	7.2	7.2	0.1	7.0	7.4	7.3	5
10WP44	7.2	7.1	0.2	6.9	7.3	7.3	6
10WP46	7.1	7.2	0.1	7.1	7.3	7.3	5
10WP47	7.1	7.2	0.1	7.1	7.3	7.3	5
11CS10RD	7.1	7.9	1.4	6.9	10.1	9.9	7
11CS10RS	7.1	7.8	1.4	7.0	10.6	8.6	6
11WP11RD	7.4	7.7	0.8	7.1	9.3	8.1	6
11WP11RS	7.8	8.0	0.6	7.7	9.2	8.2	6
11WP15R	7.4	7.4	0.1	7.2	7.6	7.5	6
11WP16R	7.1	8.0	1.5	6.8	10.0	9.8	8
11WP43D	7.1	7.1	0.3	6.8	7.4	7.4	3
11WP4R	7.2	7.5	0.7	7.0	9.0	7.9	6
11WP50	6.8	6.8	0.1	6.6	6.9	6.9	4
11WP51D	7.7	8.9	1.8	7.2	11.3	10.9	9
11WP51S	7.5	8.4	1.8	7.1	11.0	10.9	7
11WP52D	7.1	7.3	0.7	6.8	8.6	7.6	6
11WP53D	7.7	7.9	0.5	7.5	8.7	8.1	6
11WP53S	7.8	8.1	0.9	7.6	9.9	8.6	6

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples
11WP54D	6.9	7.2	0.9	6.6	9.0	7.6	6
11WP54S	7.1	7.1	0.2	6.7	7.4	7.3	5
11WP55	7.1	7.8	1.3	6.9	9.9	9.4	7
11WP56D	5.6	5.8	1.2	4.7	7.9	6.7	6
11WP56S	7.2	7.4	0.8	6.7	8.3	8.2	3
11WP57	7.2	7.6	1.1	6.5	8.9	8.8	9
11WP9RPB	7.5	7.5	0.3	7.2	8.0	7.7	5
11WP9RS	7.4	7.8	1.0	7.1	9.8	8.2	6
CG1	7.1	7.1	0.1	7.0	7.2	7.1	5
CG2	7.4	7.3	0.1	7.2	7.4	7.4	4
CG4	7.2	8.0	1.4	6.9	10.0	9.8	7
KC13	7.5	7.7	0.8	6.6	9.3	8.2	8
KC14	6.7	6.7	0.1	6.6	6.9	6.8	4
KC3	6.3	7.2	1.5	5.6	9.1	9.0	8
KC3A	6.4	6.3	0.6	5.3	7.0	6.9	9
KC3PB	5.5	5.6	0.1	5.4	5.7	5.7	5
KCF1	7.1	7.1	0.1	7.1	7.3	7.2	5
LIMESTONE	7.4	7.4	0.1	7.3	7.5	7.5	4
M1	8.5	8.5	0.0	8.4	8.5	8.5	3
RN029659	7.6	7.7	0.6	7.3	8.7	8.2	5
RN029660	7.5	7.5	0.1	7.4	7.7	7.6	4
W2R	7.3	7.3	0.2	7.2	7.5	7.5	4
WP13	7.4	8.5	1.7	7.1	10.6	10.5	8
WP19	6.9	6.8	0.1	6.7	7.0	6.9	5
WP5	7.0	6.9	0.2	6.7	7.1	7.0	5

Table E3 Concentration of temperature (°C)

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples
10WP31	30.8	30.9	0.9	29.5	33	31.5	9
10WP32	29.6	29.7	1.2	28.1	31	30.9	8
10WP32PB	30.8	30.7	0.4	30.3	31	31.0	5
10WP33	30.0	30.1	0.8	29.0	32	30.7	8
10WP35N	28.0	28.7	1.5	27.2	32	30.0	8
10WP35PB	29.2	29.0	0.4	28.4	29	29.3	5
10WP35S	28.4	28.7	0.8	27.7	30	29.7	8
10WP36N	29.1	28.8	1.0	26.7	30	29.4	8
10WP36PB	29.6	30.0	0.8	29.3	31	30.8	5
10WP36S	29.6	29.2	1.4	26.3	31	30.0	8
10WP37	29.5	29.6	1.7	26.9	33	30.6	9
10WP39	30.2	30.4	0.9	29.3	32	31.1	5
10WP40	30.3	30.3	1.4	28.3	32	31.6	8
10WP41	29.6	29.2	1.2	27.6	31	30.4	7
10WP42	29.4	29.5	0.7	28.7	31	30.2	5
10WP44	30.1	30.1	1.5	28.6	33	31.2	6
10WP46	30.8	30.5	0.5	29.6	31	30.9	5
10WP47	28.6	28.9	0.6	28.4	30	29.5	5
11CS10RD	31.1	31.0	0.8	29.5	32	31.6	7
11CS10RS	31.0	30.8	0.6	30.0	31	31.2	6
11WP11RD	30.8	30.8	1.3	29.2	33	32.2	6
11WP11RS	30.7	30.3	1.6	27.8	32	31.5	6
11WP15R	30.8	30.7	0.5	30.0	31	31.1	6
11WP16R	29.4	29.5	1.5	26.7	32	30.8	8
11WP43D	30.0	29.8	0.5	29.3	30	30.2	3
11WP4R	32.2	32.1	1.8	29.9	35	33.9	6
11WP50	29.6	29.5	0.3	29.0	30	29.7	4
11WP51D	29.3	29.4	0.9	28.3	31	30.3	9
11WP51S	29.7	29.8	1.0	28.5	32	30.7	7
11WP52D	31.4	31.4	1.6	29.0	34	32.4	6
11WP53D	29.3	29.3	0.5	28.7	30	29.7	6
11WP53S	29.4	29.4	0.7	28.3	30	30.0	6

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples
11WP54D	29.0	29.0	0.6	28.3	30	29.6	6
11WP54S	28.9	28.8	0.9	27.3	30	29.5	5
11WP55	30.4	30.1	2.6	26.7	35	31.2	7
11WP56D	31.7	31.9	0.8	30.8	33	32.6	6
11WP56S	31.6	31.0	1.1	29.7	32	31.7	3
11WP57	29.8	30.2	0.7	29.5	32	30.8	9
11WP9RPB	30.5	30.6	0.6	29.9	32	31.1	5
11WP9RS	30.4	30.5	0.7	29.6	32	30.9	6
CG1	30.0	29.6	0.8	28.5	30	30.3	5
CG2	29.9	29.9	0.5	29.4	31	30.4	4
CG4	30.5	30.3	0.8	29.4	31	30.8	7
KC13	30.1	30.2	0.9	29.2	32	30.8	8
KC14	31.8	32.2	1.0	31.4	34	33.2	4
KC3	30.8	30.4	0.9	29.0	31	31.1	8
KC3A	30.8	30.8	0.3	30.3	31	31.0	9
KC3PB	31.2	31.2	0.2	30.9	32	31.4	5
KCF1	31.4	32.4	2.2	31.0	36	34.2	5
LIMESTONE	34.0	34.0	0.3	33.6	34	34.3	4
M1	26.8	27.7	2.7	25.6	31	30.4	3
RN029659	30.3	30.3	0.4	29.8	31	30.7	5
RN029660	30.7	30.7	0.5	30.1	31	31.1	4
W2R	33.9	33.8	1.0	32.4	35	34.7	4
WP13	28.9	29.0	0.9	27.9	30	30.1	8
WP19	30.0	30.0	0.5	29.6	31	30.5	5
WP5	29.4	29.3	0.4	28.9	30	29.6	4

Table E4 Concentration of total acidity (mg/L $CaCO_3$)

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples
10WP31	60	73	42	40	120	No data	3
10WP32	40	67	46	40	120	No data	3
10WP32PB	100	100	57	60	140	No data	2
10WP33	110	110	71	60	160	No data	2
10WP35N	40	67	46	40	120	No data	3
10WP35PB	100	120	35	100	160	No data	3
10WP35S	60	87	64	40	160	No data	3
10WP36N	60	80	53	40	140	No data	3
10WP36PB	60	60	No data	60	60	No data	1
10WP36S	40	67	46	40	120	No data	3
10WP37	60	87	64	40	160	No data	3
10WP39	80	80	40	40	120	No data	3
10WP40	100	100	40	60	140	No data	3
10WP41	120	87	76	0	140	No data	3
10WP42	30	30	42	0	60	No data	2
10WP44	No data						
10WP46	30	30	42	0	60	No data	2
10WP47	30	30	42	0	60	No data	2
11CS10RD	140	140	113	60	220	No data	2
11CS10RS	220	220	170	100	340	No data	2
11WP11RD	90	90	42	60	120	No data	2
11WP11RS	80	80	28	60	100	No data	2
11WP15R	190	190	127	100	280	No data	2
11WP16R	150	150	71	100	200	No data	2
11WP43D	0	0	No data	0	0	No data	1
11WP4R	90	90	71	40	140	No data	2
11WP50	400	400	No data	400	400	No data	1
11WP51D	70	70	42	40	100	No data	2
11WP51S	90	90	42	60	120	No data	2
11WP52D	110	110	71	60	160	No data	2
11WP53D	150	150	127	60	240	No data	2
11WP53S	130	130	127	40	220	No data	2

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples
11WP54D	340	340	311	120	560	No data	2
11WP54S	330	330	297	120	540	No data	2
11WP55	250	250	127	160	340	No data	2
11WP56D	130	130	99	60	200	No data	2
11WP56S	100	100	85	40	160	No data	2
11WP57	210	210	156	100	320	No data	2
11WP9RPB	80	80	57	40	120	No data	2
11WP9RS	140	140	No data	140	140	No data	1
CG1	0	0	No data	0	0	No data	1
CG2	0	0	No data	0	0	No data	1
CG4	20	20	28	0	40	No data	2
KC13	80	80	57	40	120	No data	2
KC14	340	340	No data	340	340	No data	1
KC3	170	170	42	140	200	No data	2
KC3A	40	40	No data	40	40	No data	1
KC3PB	160	160	57	120	200	No data	2
KCF1	190	190	42	160	220	No data	2
LIMESTONE	0	0	No data	0	0	No data	1
M1	20	20	0	20	20	No data	3
RN029659	20	20	28	0	40	No data	2
RN029660	0	0	No data	0	0	No data	1
W2R	0	0	No data	0	0	No data	1
WP13	20	20	28	0	40	No data	2
WP19	230	230	71	180	280	No data	2
WP5	250	250	184	120	380	No data	2

Table E5 Concentration of total alkalinity (mg/L $CaCO_3$)

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples
10WP31	156	161	17	147	180	No data	3
10WP32	423	448	45	420	500	No data	3
10WP32PB	458	458	53	420	495	No data	2
10WP33	357	357	47	324	390	No data	2
10WP35N	550	581	85	516	678	No data	3
10WP35PB	630	614	39	570	642	No data	3
10WP35S	600	589	119	465	702	No data	3
10WP36N	492	500	34	470	537	No data	3
10WP36PB	450	450	12	438	462	No data	3
10WP36S	660	647	42	600	680	No data	3
10WP37	680	664	81	576	735	No data	3
10WP39	238	238	25	220	255	No data	2
10WP40	707	707	52	670	744	No data	2
10WP41	550	561	117	450	684	No data	3
10WP42	340	340	57	300	380	No data	2
10WP44	No data						
10WP46	320	320	14	310	330	No data	2
10WP47	155	155	92	90	220	No data	2
11CS10RD	439	439	54	400	477	No data	2
11CS10RS	898	898	116	816	980	No data	2
11WP11RD	380	380	28	360	400	No data	2
11WP11RS	565	565	78	510	620	No data	2
11WP15R	1233	1233	81	1176	1290	No data	2
11WP16R	485	485	91	420	549	No data	2
11WP43D	160	160	No data	160	160	No data	1
11WP4R	318	318	4	315	320	No data	2
11WP50	No data						
11WP51D	320	320	No data	320	320	No data	1
11WP51S	380	380	No data	380	380	No data	1
11WP52D	300	300	No data	300	300	No data	1
11WP53D	1803	1803	38	1776	1830	No data	2
11WP53S	1875	1875	106	1800	1950	No data	2

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples
11WP54D	705	705	50	669	740	No data	2
11WP54S	1050	1050	No data	1050	1050	No data	1
11WP55	680	680	No data	680	680	No data	1
11WP56D	50	50	No data	50	50	No data	1
11WP56S	360	360	No data	360	360	No data	1
11WP57	450	450	No data	450	450	No data	1
11WP9RPB	585	585	8	579	590	No data	2
11WP9RS	591	591	No data	591	591	No data	1
CG1	450	450	No data	450	450	No data	1
CG2	450	450	No data	450	450	No data	1
CG4	585	585	191	450	720	No data	2
KC13	270	270	No data	270	270	No data	1
KC14	No data						
KC3	No data						
KC3A	90	90	No data	90	90	No data	1
KC3PB	80	80	No data	80	80	No data	1
KCF1	800	800	No data	800	800	No data	1
LIMESTONE	300	300	No data	300	300	No data	1
M1	130	131	18	114	150	No data	3
RN029659	240	240	85	180	300	No data	2
RN029660	375	375	No data	375	375	No data	1
W2R	150	150	No data	150	150	No data	1
WP13	210	210	42	180	240	No data	2
WP19	No data						
WP5	600	600	No data	600	600	No data	1

Table E6 Concentration of oxidation–reduction potential, standard hydrogen electrode (mV) – Hanna meter

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples
10WP31	166	166	No data	166	166	No data	1
10WP32	126	126	No data	126	126	No data	1
10WP32PB	110	110	No data	110	110	No data	1
10WP33	133	133	No data	133	133	No data	1
10WP35N	37	37	No data	37	37	No data	1
10WP35PB	41	41	No data	41	41	No data	1
10WP35S	-11	-11	No data	-11	-11	No data	1
10WP36N	11	11	No data	11	11	No data	1
10WP36PB	53	53	No data	53	53	No data	1
10WP36S	78	78	No data	78	78	No data	1
10WP37	-228	-228	No data	-228	-228	No data	1
10WP39	80	80	No data	80	80	No data	1
10WP40	-148	-148	No data	-148	-148	No data	1
10WP41	89	89	No data	89	89	No data	1
10WP42	-152	-152	No data	-152	-152	No data	1
10WP44	-340	-340	No data	-340	-340	No data	1
10WP46	45	45	No data	45	45	No data	1
10WP47	-123	-123	No data	-123	-123	No data	1
11CS10RD	68	68	No data	68	68	No data	1
11CS10RS	-162	-162	No data	-162	-162	No data	1
11WP11RD	68	68	No data	68	68	No data	1
11WP11RS	27	27	No data	27	27	No data	1
11WP15R	32	32	No data	32	32	No data	1
11WP16R	325	325	No data	325	325	No data	1
11WP43D	-169	-169	No data	-169	-169	No data	1
11WP4R	-205	-205	No data	-205	-205	No data	1
11WP50	16	16	No data	16	16	No data	1
11WP51D	-137	-137	No data	-137	-137	No data	1
11WP51S	-122	-122	No data	-122	-122	No data	1
11WP52D	35	35	No data	35	35	No data	1
11WP53D	80	80	No data	80	80	No data	1

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples
11WP53S	-83	-83	No data	-83	-83	No data	1
11WP54D	-89	-89	No data	-89	-89	No data	1
11WP54S	46	46	No data	46	46	No data	1
11WP55	-170	-170	No data	-170	-170	No data	1
11WP56D	146	146	No data	146	146	No data	1
11WP56S	-40	-40	No data	-40	-40	No data	1
11WP57	-167	-167	No data	-167	-167	No data	1
11WP9RPB	89	89	No data	89	89	No data	1
11WP9RS	40	40	No data	40	40	No data	1
CG1	-5	-5	No data	-5	-5	No data	1
CG2	No data						
CG4	82	82	No data	82	82	No data	1
KC13	-77	-77	No data	-77	-77	No data	1
KC14	73	73	No data	73	73	No data	1
KC3	159	159	44	128	190	No data	2
KC3A	No data						
KC3PB	187	187	No data	187	187	No data	1
KCF1	-59	-59	No data	-59	-59	No data	1
LIMESTONE	-156	-156	No data	-156	-156	No data	1
M1	No data						
RN029659	-209	-209	No data	-209	-209	No data	1
RN029660	70	70	No data	70	70	No data	1
W2R	12	12	No data	12	12	No data	1
WP13	69	69	No data	69	69	No data	1
WP19	79	79	No data	79	79	No data	1
WP5	106	106	No data	106	106	No data	1

Table E7 Concentration of oxidation–reduction potential, standard hydrogen electrode (mV) – WTW meter

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples
10WP31	335	341	28	317	377	369	4
10WP32	348	348	28	318	378	374	4
10WP32PB	334	336	22	315	359	357	3
10WP33	335	332	7	323	336	336	3
10WP35N	54	95	117	8	265	210	4
10WP35PB	312	300	35	249	328	324	4
10WP35S	313	286	111	130	389	370	4
10WP36N	190	176	166	-13	339	324	4
10WP36PB	216	208	140	45	355	335	4
10WP36S	124	157	107	67	312	256	4
10WP37	98	91	117	-31	201	195	4
10WP39	273	264	27	225	286	284	4
10WP40	97	156	146	58	372	294	4
10WP41	219	215	103	80	318	314	5
10WP42	136	122	92	1	215	200	4
10WP44	-64	-50	38	-80	-7	-13	3
10WP46	76	115	121	24	285	236	4
10WP47	85	78	26	42	97	97	4
11CS10RD	206	230	59	187	298	289	3
11CS10RS	29	63	60	27	132	122	3
11WP11RD	342	281	138	123	378	374	3
11WP11RS	220	225	63	165	290	283	3
11WP15R	23	66	101	-7	181	166	3
11WP16R	1	31	74	-23	115	104	3
11WP43D	104	101	51	48	150	146	3
11WP4R	12	13	10	4	24	22	3
11WP50	138	121	39	77	148	147	3
11WP51D	14	15	18	-1	34	32	3
11WP51S	-6	19	67	-32	95	85	3
11WP52D	339	310	84	215	376	372	3
11WP53D	-2	44	111	-37	171	153	3

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples
11WP53S	1	20	50	-19	77	69	3
11WP54D	145	143	87	55	229	220	3
11WP54S	192	168	107	51	261	254	3
11WP55	48	74	55	37	138	129	3
11WP56D	437	449	22	434	474	470	3
11WP56S	No data						
11WP57	38	36	5	30	40	40	3
11WP9RPB	294	305	20	293	328	325	3
11WP9RS	276	276	44	232	319	315	3
CG1	307	303	40	235	336	333	5
CG2	319	303	62	217	355	351	4
CG4	152	193	94	137	334	283	4
KC13	59	65	12	57	79	77	3
KC14	200	174	69	96	226	223	3
KC3	396	377	48	322	412	411	3
KC3A	454	460	21	442	483	480	3
KC3PB	425	430	9	424	440	438	3
KCF1	133	148	107	49	261	248	3
LIMESTONE	-8	-10	52	-74	48	36	4
M1	379	379	No data	379	379	No data	1
RN029659	-16	-42	59	-130	-6	-6	4
RN029660	324	327	44	280	379	369	4
W2R	88	114	127	1	281	240	4
WP13	337	336	44	282	389	373	4
WP19	243	242	42	191	293	281	4
WP5	284	282	52	220	340	329	4

Table E8 Concentration of dissolved oxygen (mg/L)

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples
10WP31	2.86	3.68	2.21	2.09	6.90	5.83	4
10WP32	3.32	3.31	0.92	2.18	4.41	4.14	4
10WP32PB	4.20	3.94	1.53	2.29	5.32	5.21	3
10WP33	2.62	2.75	0.26	2.58	3.05	3.01	3
10WP35N	0.31	0.94	1.01	0.09	2.18	2.04	5
10WP35PB	0.24	0.79	0.94	0.05	2.20	1.75	5
10WP35S	0.18	0.89	1.07	0.09	2.36	2.03	5
10WP36N	0.17	0.90	1.07	0.05	2.12	2.07	5
10WP36PB	0.82	1.19	1.08	0.15	2.50	2.34	5
10WP36S	0.25	0.87	1.01	0.04	2.14	1.97	5
10WP37	0.22	1.03	1.22	0.08	2.52	2.36	5
10WP39	0.36	0.82	0.95	0.19	2.49	1.61	5
10WP40	2.28	2.71	1.20	1.41	4.30	3.95	5
10WP41	2.32	2.19	1.36	0.35	4.00	3.36	5
10WP42	0.35	0.85	1.09	0.22	2.49	1.85	4
10WP44	0.38	1.19	1.47	0.30	2.89	2.64	3
10WP46	0.73	1.10	0.93	0.46	2.47	1.99	4
10WP47	0.22	0.72	1.06	0.15	2.31	1.68	4
11CS10RD	0.64	1.32	1.59	0.30	3.69	2.78	4
11CS10RS	2.21	2.68	2.89	0.08	6.20	5.50	4
11WP11RD	2.84	2.86	0.18	2.70	3.08	3.04	4
11WP11RS	1.90	1.99	0.66	1.35	2.81	2.63	4
11WP15R	0.32	0.83	1.21	0.06	2.62	1.98	4
11WP16R	0.15	0.79	1.17	0.08	2.14	1.94	3
11WP43D	1.55	1.75	1.03	0.83	2.86	2.73	3
11WP4R	1.10	1.20	0.93	0.41	2.20	2.07	4
11WP50	0.85	1.07	0.89	0.35	2.21	1.95	4
11WP51D	0.49	0.89	1.00	0.22	2.35	1.86	4
11WP51S	0.63	1.01	1.09	0.17	2.60	2.06	4
11WP52D	1.85	1.97	0.85	1.21	2.96	2.79	4
11WP53D	0.26	0.70	1.00	0.08	2.19	1.64	4
11WP53S	0.25	0.72	1.06	0.09	2.30	1.72	4

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples
11WP54D	0.53	0.85	0.98	0.08	2.24	1.80	4
11WP54S	2.00	2.06	0.68	1.31	2.92	2.70	4
11WP55	0.38	0.83	1.15	0.04	2.54	1.93	4
11WP56D	3.77	3.65	1.00	2.35	4.73	4.51	4
11WP56S	0.36	0.36	No data	0.36	0.36	No data	1
11WP57	0.28	0.80	1.20	0.07	2.58	1.94	4
11WP9RPB	1.93	1.90	0.50	1.38	2.38	2.34	3
11WP9RS	1.66	1.69	0.57	1.16	2.29	2.22	4
CG1	2.38	2.43	1.27	0.94	4.01	3.59	4
CG2	2.07	2.07	0.17	1.95	2.19	2.19	2
CG4	0.62	1.20	1.49	0.14	3.41	2.60	4
KC13	1.24	1.25	1.01	0.30	2.21	2.16	4
KC14	1.60	1.50	1.18	0.12	2.68	2.55	4
KC3	3.99	3.79	1.39	2.21	5.56	5.07	5
KC3A	3.11	3.04	0.71	2.29	3.71	3.65	3
KC3PB	2.97	4.41	3.38	2.26	9.42	7.61	4
KCF1	1.38	1.61	1.18	0.56	3.10	2.77	4
LIMESTONE	0.12	0.64	1.07	0.07	2.25	1.61	4
M1	5.89	5.89	No data	5.89	5.89	No data	1
RN029659	0.18	0.71	1.08	0.13	2.33	1.69	4
RN029660	4.72	4.51	1.93	2.45	6.16	6.16	4
W2R	0.16	0.67	1.06	0.12	2.26	1.63	4
WP13	0.89	1.20	0.71	0.76	2.25	1.85	4
WP19	0.27	0.81	0.97	0.15	2.43	1.72	5
WP5	0.21	2.06	3.21	0.06	7.56	4.92	5

Table E9 Concentration of dissolved oxygen (%)

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples
10WP31	38.95	49.18	28.73	28.10	90.70	77.29	4
10WP32	44.35	43.50	11.46	29.00	56.30	53.63	4
10WP32PB	55.90	53.97	21.96	31.10	74.90	73.00	3
10WP33	34.50	36.60	4.17	33.90	41.40	40.71	3
10WP35N	14.10	14.93	13.28	2.90	28.60	27.22	4
10WP35PB	10.45	12.95	12.84	1.90	29.00	25.58	4
10WP35S	12.00	14.83	15.59	1.70	33.60	30.03	4
10WP36N	13.75	14.30	14.18	1.90	27.80	27.05	4
10WP36PB	6.70	10.98	12.07	2.00	28.50	22.71	4
10WP36S	12.90	13.93	13.43	1.60	28.30	26.53	4
10WP37	16.05	16.25	15.96	1.90	31.00	30.43	4
10WP39	7.65	12.85	14.30	2.40	33.70	26.71	4
10WP40	28.55	33.38	16.33	19.50	56.90	48.98	4
10WP41	31.00	28.10	17.58	4.00	51.70	42.60	5
10WP42	4.45	11.23	14.60	2.90	33.10	24.55	4
10WP44	5.10	17.53	24.36	1.90	45.60	41.55	3
10WP46	9.70	14.78	12.81	6.00	33.70	27.01	4
10WP47	2.85	9.63	14.12	2.00	30.80	22.46	4
11CS10RD	8.70	21.20	25.74	4.10	50.80	46.59	3
11CS10RS	20.00	28.63	26.43	7.60	58.30	54.47	3
11WP11RD	40.40	39.30	2.72	36.20	41.30	41.21	3
11WP11RS	29.10	29.63	8.71	21.20	38.60	37.65	3
11WP15R	6.50	14.83	18.38	2.10	35.90	32.96	3
11WP16R	2.40	10.60	15.34	1.10	28.30	25.71	3
11WP43D	20.90	25.83	17.53	11.30	45.30	42.86	3
11WP4R	24.80	20.20	12.93	5.60	30.20	29.66	3
11WP50	4.90	13.07	14.58	4.40	29.90	27.40	3
11WP51D	3.40	12.60	16.46	2.80	31.60	28.78	3
11WP51S	5.80	14.70	18.62	2.20	36.10	33.07	3
11WP52D	32.10	30.47	11.83	17.90	41.40	40.47	3
11WP53D	4.40	11.73	14.56	2.30	28.50	26.09	3
11WP53S	5.00	12.17	15.63	1.40	30.10	27.59	3

Site	Median	Mean	Standard deviation	Min.	Max.	80th percentile	Number of samples
11WP54D	9.30	14.23	13.78	3.60	29.80	27.75	3
11WP54S	24.10	23.43	5.83	17.30	28.90	28.42	3
11WP55	6.90	15.40	18.02	3.20	36.10	33.18	3
11WP56D	55.10	50.87	16.46	32.70	64.80	63.83	3
11WP56S	No data						
11WP57	6.00	14.57	19.05	1.30	36.40	33.36	3
11WP9RPB	26.00	25.47	6.82	18.40	32.00	31.40	3
11WP9RS	27.90	25.03	7.15	16.90	30.30	30.06	3
CG1	30.00	31.60	16.92	12.70	53.70	47.19	4
CG2	27.10	27.10	2.26	25.50	28.70	28.70	2
CG4	6.50	15.43	20.96	2.00	46.70	34.76	4
KC13	27.00	21.10	13.09	6.10	30.20	29.88	3
KC14	31.20	26.80	12.02	13.20	36.00	35.52	3
KC3	61.20	55.23	23.33	29.50	75.00	73.62	3
KC3A	41.90	41.20	10.07	30.80	50.90	50.00	3
KC3PB	45.10	67.47	51.99	30.40	126.90	118.72	3
KCF1	27.70	26.83	15.52	10.90	41.90	40.48	3
LIMESTONE	1.70	8.88	14.82	1.00	31.10	22.34	4
M1	80.00	80.00	No data	80.00	80.00	No data	1
RN029659	2.45	9.48	14.76	1.40	31.60	22.96	4
RN029660	57.80	50.65	38.80	4.00	83.00	82.76	4
W2R	2.30	9.33	14.52	1.60	31.10	22.49	4
WP13	11.45	15.85	9.88	9.90	30.60	25.08	4
WP19	8.65	13.15	13.89	2.70	32.60	26.93	4
WP5	2.70	11.70	15.85	2.40	30.00	27.27	3

Appendix F Suitability of groundwater for irrigation

Table F1 Key for the tables in Appendix F and the irrigation water quality trigger values from ANZECC and ARMCANZ (2000)

Analyte	Parameter	Value
Electrical conductivity, EC (mS/m)	Low salinity	<28
	Medium salinity	80
	High salinity	230
	Very high salinity	550
	Extremely high salinity	>550
Sodium adsorption ratio	Low	See section 2.2.1
	Medium	
	High	
	Very high	
Chloride, Cl (mg/L)	Sensitive (S)	<175
	Moderately sensitive (MS)	350
	Moderately tolerant (MT)	700
	Tolerant (T)	1000
	Not suitable (N)	>1000
Sodium, Na (mg/L)	Sensitive (S)	<115
	Moderately sensitive (MS)	230
	Moderately tolerant (MT)	460
	Tolerant (T)	800
	Not suitable (N)	>800
Aluminium, Al (mg/L)	Short-term trigger value (STV)	20
	Long-term trigger value (LTV)	5
Arsenic, As (mg/L)	Short-term trigger value (STV)	2
	Long-term trigger value (LTV)	0.1
Beryllium, Be (mg/L)	Short-term trigger value (STV)	0.5
	Long-term trigger value (LTV)	0.1
Boron, B (mg/L)	Short-term trigger value (STV)	Plant specific (P)
	Long-term trigger value (LTV)	0.5
Cadmium, Cd (mg/L)	Short-term trigger value (STV)	0.05
	Long-term trigger value (LTV)	0.01
Chromium, Cr (mg/L)	Short-term trigger value (STV)	1
	Long-term trigger value (LTV)	0.1

Analyte	Parameter	Value
Cobalt, Co (mg/L)	Short-term trigger value (STV)	0.1
	Long-term trigger value (LTV)	0.05
Copper, Cu (mg/L)	Short-term trigger value (STV)	5
	Long-term trigger value (LTV)	0.2
Fluoride, F (mg/L)	Short-term trigger value (STV)	2
	Long-term trigger value (LTV)	1
Iron, Fe (mg/L)	Short-term trigger value (STV)	10
	Long-term trigger value (LTV)	2
Lead, Pb (mg/L)	Short-term trigger value (STV)	5
	Long-term trigger value (LTV)	2
Lithium, Li (mg/L)	Short-term trigger value (STV)	2.5
	Long-term trigger value (LTV)	2.5
Lithium, Li (citrus) (mg/L)	Short-term trigger value (STV)	0.075
	Long-term trigger value (LTV)	0.075
Manganese, Mn (mg/L)	Short-term trigger value (STV)	10
	Long-term trigger value (LTV)	0.2
Mercury, Hg (mg/L)	Short-term trigger value (STV)	0.002
	Long-term trigger value (LTV)	0.002
Molybdenum, Mo (mg/L)	Short-term trigger value (STV)	0.05
	Long-term trigger value (LTV)	0.01
Nickel, Ni (mg/L)	Short-term trigger value (STV)	2
	Long-term trigger value (LTV)	0.2
Selenium, Se (mg/L)	Short-term trigger value (STV)	0.05
	Long-term trigger value (LTV)	0.02
Uranium, U (mg/L)	Short-term trigger value (STV)	0.1
	Long-term trigger value (LTV)	0.01
Vanadium, V (mg/L)	Short-term trigger value (STV)	0.5
	Long-term trigger value (LTV)	0.1
Zinc, Zn (mg/L)	Short-term trigger value (STV)	5
	Long-term trigger value (LTV)	2
Nitrogen, N (as total nitrogen) (mg/L)	Short-term trigger value (STV)	12–125
	Long-term trigger value (LTV)	5
Phosphorus, P (as total phosphorus) (mg/L)	Short-term trigger value (STV)	0.8–12
	Long-term trigger value (LTV)	0.05
pH	Low (high corrosion potential)	<5
	High (increased fouling potential)	>8.5

Table F2 Suitability of groundwater for irrigation based on ANZECC and ARMCANZ (2000) for bores 10WP33 to M1. Y(es) meets criteria; N(o) does not meet criteria (see Table F1 for analyte description)

Analyte	10WP33	10WP37	10WP39	11CS10RD	11CS10RS	11WP11RD	11WP11RS	11WP15R	11WP43D	11WP51D	11WP51S	11WP52D	11WP56D	11WP57	CG4	LIMESTONE	RN029660	WP13	WP5	CG1	CG2	KC13	KC3PB	KC14	KC3	KC3A	KCF1	M1
EC	H	H	H	V	E	H	H	E	E	H	E	E	L	E	V	H	H	H	V	E	H	H	M	E	L	M	V	L
SAR	L	H	L	M	VH	L	H	VH	VH	L	M	M	L	VH	M	L	H	L	M	VH	L	L	L	VH	L	L	H	L
Cl	MS	MS	S	T	N	S	S	N	N	S	S	S	S	N	T	S	MS	MS	N	N	S	S	S	N	S	S	MT	S
Na	MS	MT	MS	MT	N	MS	MT	N	N	S	MS	MS	S	N	T	S	MT	S	MT	N	S	MS	S	N	S	S	N	S
Al LTV	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Al STV	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
As LTV	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
As STV	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Be LTV	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Be STV	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
B LTV	Y	N	Y	Y	N	Y	Y	N	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y
B STV	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
Cd LTV	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Cd STV	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Cr LTV	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Cr STV	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Co LTV	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Co STV	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Cu LTV	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

Analyte	10WP33	10WP37	10WP39	11CS10RD	11CS10RS	11WP11RD	11WP11RS	11WP15R	11WP43D	11WP51D	11WP51S	11WP52D	11WP56D	11WP57	CG4	LIMESTONE	RN029660	WP13	WP5	CG1	CG2	KC13	KC3PB	KC14	KC3	KC3A	KCF1	M1
Cu STV	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
F LTV	Y	N	Y	Y	Y	Y	N	Y	Y	Y	N	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y
F STV	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Fe LTV	Y	Y	Y	Y	Y	Y	Y	N	N	Y	N	Y	Y	N	N	N	Y	Y	Y	Y	Y	N	Y	N	Y	Y	N	Y
Fe STV	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Pb LTV	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Pb STV	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Li LTV	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Li STV	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Li Citrus LTV	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y
Li Citrus STV	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y
Mn LTV	Y	Y	Y	Y	N	Y	Y	N	N	Y	N	N	Y	N	Y	Y	Y	Y	N	Y	Y	N	Y	N	Y	Y	N	Y
Mn STV	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Hg LTV	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Hg STV	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Mo LTV	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y
Mo STV	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Ni LTV	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Ni STV	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Se LTV	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y
Se STV	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

Analyte	10WP33	10WP37	10WP39	11CS10RD	11CS10RS	11WP11RD	11WP11RS	11WP15R	11WP43D	11WP51D	11WP51S	11WP52D	11WP56D	11WP57	CG4	LIMESTONE	RN029660	WP13	WP5	CG1	CG2	KC13	KC3PB	KC14	KC3	KC3A	KCF1	M1
U LTV	Y	N	Y	N	N	Y	Y	N	N	Y	Y	Y	Y	N	N	Y	Y	Y	N	N	Y	N	Y	N	Y	Y	N	Y
U STV	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
V LTV	Y	Y	Y	Y	N	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
V STV	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Zn LTV	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Zn STV	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
N LTV	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
N STV	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
P LTV	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	Y	N	N	N	Y	N	Y	N	Y	Y
P STV	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pH High	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pH Low	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	N	N	Y	Y

Table F3 Suitability of groundwater for irrigation based on ANZECC and ARMCANZ (2000) for bores 10WP31 to 11WP9RS. Y(es) meets criteria; N(o) does not meet criteria (see Table F1 for analyte description)

Analyte	10WP31	10WP32	10WP32PB	10WP35N	10WP35PB	10WP35S	10WP36N	10WP36PB	10WP36S	10WP40	10WP41	10WP42	10WP44	10WP46	10WP47	RN029659	W2R	WP19	11WP16R	11WP4R	11WP50	11WP53D	11WP53S	11WP54D	11WP54S	11WP55	11WP56S	11WP9RPB	11WP9RS
EC	M	H	H	H	H	H	H	H	H	E	E	V	E	E	M	V	M	E	E	H	E	E	E	E	E	VH	H	H	H
SAR	L	M	M	M	M	M	M	H	H	VH	VH	M	VH	VH	L	VH	L	VH	VH	L	VH	VH	VH	VH	VH	VH	L	VH	H
Cl	S	MT	MS	S	MS	S	S	S	S	N	N	MT	N	MS	S	N	S	N	N	MT	N	N	N	N	N	T	S	MS	MS
Na	S	MT	MT	MT	MT	MT	MS	MS	MT	N	N	MT	N	MT	S	T	S	N	N	MS	N	N	N	N	N	N	MS	MT	MT
Al LTV	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Al STV	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
As LTV	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
As STV	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Be LTV	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Be STV	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
B LTV	Y	Y	Y	Y	Y	Y	N	N	N	N	N	Y	Y	Y	Y	Y	Y	N	Y	Y	N	N	N	N	N	Y	Y	Y	Y
B STV	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
Cd LTV	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Cd STV	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Cr LTV	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Cr STV	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Co LTV	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Co STV	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Cu LTV	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

Analyte	10WP31	10WP32	10WP32PB	10WP35N	10WP35PB	10WP35S	10WP36N	10WP36PB	10WP36S	10WP40	10WP41	10WP42	10WP44	10WP46	10WP47	RN029659	W2R	WP19	11WP16R	11WP4R	11WP50	11WP53D	11WP53S	11WP54D	11WP54S	11WP55	11WP56S	11WP9RPB	11WP9RS
Cu STV	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
F LTV	Y	Y	Y	N	Y	Y	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y
F STV	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Fe LTV	Y	Y	N	Y	Y	Y	Y	Y	Y	N	N	Y	N	Y	Y	N	N	Y	N	N	N	Y	Y	Y	N	N	Y	Y	Y
Fe STV	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Pb LTV	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Pb STV	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Li LTV	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Li STV	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Li Citrus LTV	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y
Li Citrus STV	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y
Mn LTV	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Y	N	Y	N	N	N	Y	N	N	N	N	N	N	N	N	N	Y	Y
Mn STV	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Hg LTV	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Hg STV	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Mo LTV	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Y	Y	N	Y	N	Y
Mo STV	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y
Ni LTV	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Ni STV	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Se LTV	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

Analyte	10WP31	10WP32	10WP32PB	10WP35N	10WP35PB	10WP35S	10WP36N	10WP36PB	10WP36S	10WP40	10WP41	10WP42	10WP44	10WP46	10WP47	RN029659	W2R	WP19	11WP16R	11WP4R	11WP50	11WP53D	11WP53S	11WP54D	11WP54S	11WP55	11WP56S	11WP9RPB	11WP9RS
Se STV	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
U LTV	Y	Y	Y	N	N	N	Y	Y	Y	N	N	N	N	Y	Y	Y	Y	N	N	Y	N	N	N	N	N	Y	Y	Y	Y
U STV	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y
V LTV	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y	N	Y
V STV	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Zn LTV	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Zn STV	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
N LTV	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
N STV	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
P LTV	N	N	N	N	N	N	N	N	N	N	Y	Y		Y	Y	Y	N	N	N	N	Y	N	N	Y	N		N	N	
P STV	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	
pH High	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
pH Low	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

Appendix G Salinity processes

G1 Introduction

The groundwater salinity on the Weaber Plain ranges from 27mg/L TDS to 24 000mg/L TDS, with an average TDS around 3000mg/L. Using chloride isotope data, Tickell et al. (2007) showed that chloride has resulted from atmospheric disposition and has accumulated with time. Other ions that also resulted from atmospheric deposition would have likewise accumulated through time. Under the current Groundwater Management Plan (Strategen 2012a) for the Weaber Plain, it is proposed to pump this saline groundwater into the irrigation water supply and then reapply it to the irrigation areas. The resultant irrigation water will be considerably more saline than rainfall. Salts have accumulated in the landscape over time through introduction via rainfall. Therefore, what will be the longer term impacts of these management practices on the salinity of soil and groundwater on the Weaber Plain?

The chemical composition of groundwater on the Weaber Plain is also highly variable. The major ions, sodium, calcium, magnesium, sulfate and alkalinity species all show enrichment relative to chloride. However, potassium shows depletion relative to chloride. What are the major factors controlling the groundwater quality and chemistry? Through understanding these geochemical processes, the longer term risks of salinity caused by irrigation of agriculture on the Weaber Plain can be assessed.

G2 Methodology

To identify the main geochemical processes controlling salinity and major ion concentrations, we investigated the statistical relationships between factors, such as soils and lithology, which were potentially controlling the processes. To increase the statistical robustness of the analysis, the chemistry dataset was expanded to include chemistry data from other areas of the ORIA with similar soils and hydrogeological conditions (Lillicrap et al. 2011). The additional chemistry data was screened for reliability and any bore that had a charge balance error of more than 10% was discarded. The major ion data was transformed by logging the data to obtain normal distributions. Any outliers were investigated and if the values could not be substantiated, such as concentrations of an analyte were significantly less than other related analytes for no obvious reasons, they were discarded. For each bore the major ion concentrations were divided by chloride to normalise the data ('normalised value'). This approach accounted for the influence of evapo-concentration and helped to identify other geochemical processes that were influencing the concentration of the ion.

The correlations between major ions and TDS were determined using GenStat 16th edition (VSN International Ltd). The effect of lithology and soil type on the major ions and TDS were also statistically analysed using a mixed model (Restricted Maximum Likelihood [REML]). Both the mean major ion concentrations and normalised values were used in the statistical analysis.

The rock type and soil for each bore used in the analysis was determined in a geographic information system by intersecting the bore location data with regional hydrogeology (O'Boy et al. 2001) and soil landscapes (Aldrick et al. 1990, Dixon 1996, Schoknecht & Grose 1996). The bores were assigned to a rock type based on the dominant lithology. To aid statistical analysis, smaller groups with similar lithology were aggregated. The rock types used in the analysis were basalt, limestone, sandstone, sandstone/wackes/limestone and shale/siltstone. Bores in similar soil types were also aggregated, based on the presence of the tree, *Excoecaria parivifolia* (gutta percha) — an indicator of seasonal inundation — and the presence of gypsum in the subsoil in all of the units. The soil types used were Aquitaine/Cununurra gypsic clays, Cununurra clays, Keep clays and sand/silt.

To understand the causes of the correlations identified in the statistical analysis, and the evolution of groundwater types on the Weaber Plain, inverse modelling was undertaken in PHREEQCI (Parkhust & Appelo 2013). Inverse modelling identifies a suite of possible chemical reactions that can cause the evolution of an initial solution to a final solution. The initial solution, used in all PHREEQCI models, simulated meteoric conditions and was based on DAFWA unpublished data and Hingston and Gailitis (1976). The final solutions used were the mean values of major and select minor ions (calcium, magnesium, sodium, potassium, chloride, bicarbonate, sulfate, bromide, silicon) for bores with chloride concentrations above 2000mg/L.

The phases, based on soil and geological records, used in the PHREEQCI inverse modelling were ion exchange reactions, biotite (ferromagnesian mica), plagioclase/albite (sodium plagioclase), halite (NaCl), sylvite (KCl), illite (clay with potassium bonding the interlayers), calcite ($CaCO_3$), dolomite ($MgCa(CO_3)_2$), gypsum ($CaSO_4$) and evapotranspiration. Salinity processes in the soil and regolith were then derived from the results.

G3 Results and discussion

Statistical analysis of groundwater chemistry for the ORIA showed that all the major ions, except for potassium, were highly correlated ($r^2 \geq 0.67$) with each other and TDS (Table G1). From Figures G1 to G3, all the major ions increase with increasing chloride concentration. Tickell et al. (2007) showed chloride concentrations in groundwater had increased from evapotranspiration and therefore the other major ions would also have increased in concentration through evapotranspiration. The increase in concentrations of major ions due to evapotranspiration explains the correlations between the major ions evident in Table G1.

Except for sodium and potassium, all major ions at higher salinity concentrations — chloride concentration was used a surrogate for salinity — had chloride ratios greater than seawater, indicating enrichment relative to meteoric or seawater ratios (Figure G1). Therefore, there are additional sources besides atmospheric deposition. The sodium–chloride ratios at higher salinities were similar to seawater (>2000mg/L chloride) whereas at lower concentrations, sodium showed enrichment. Potassium–chloride ratios were less than the seawater ratio, indicating there was a depletion of potassium.

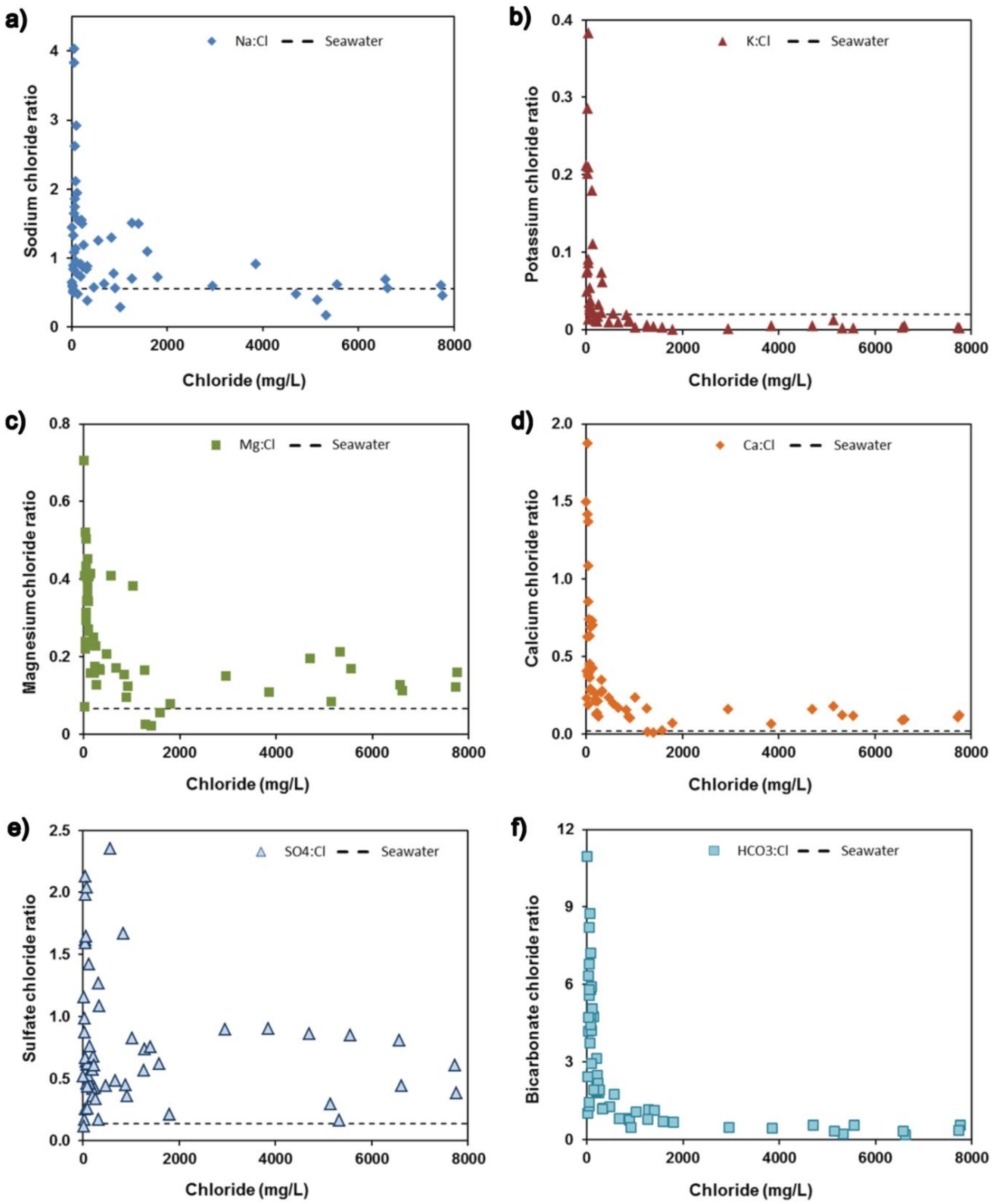

Figure G1 Major ion chloride ratios (in mg/L) plotted against chloride concentration. Chloride is a conservative ion that is a surrogate for salinity. The dashed black line is the seawater ratio, which is the expected chloride ratio for rainfall and atmospheric fallout

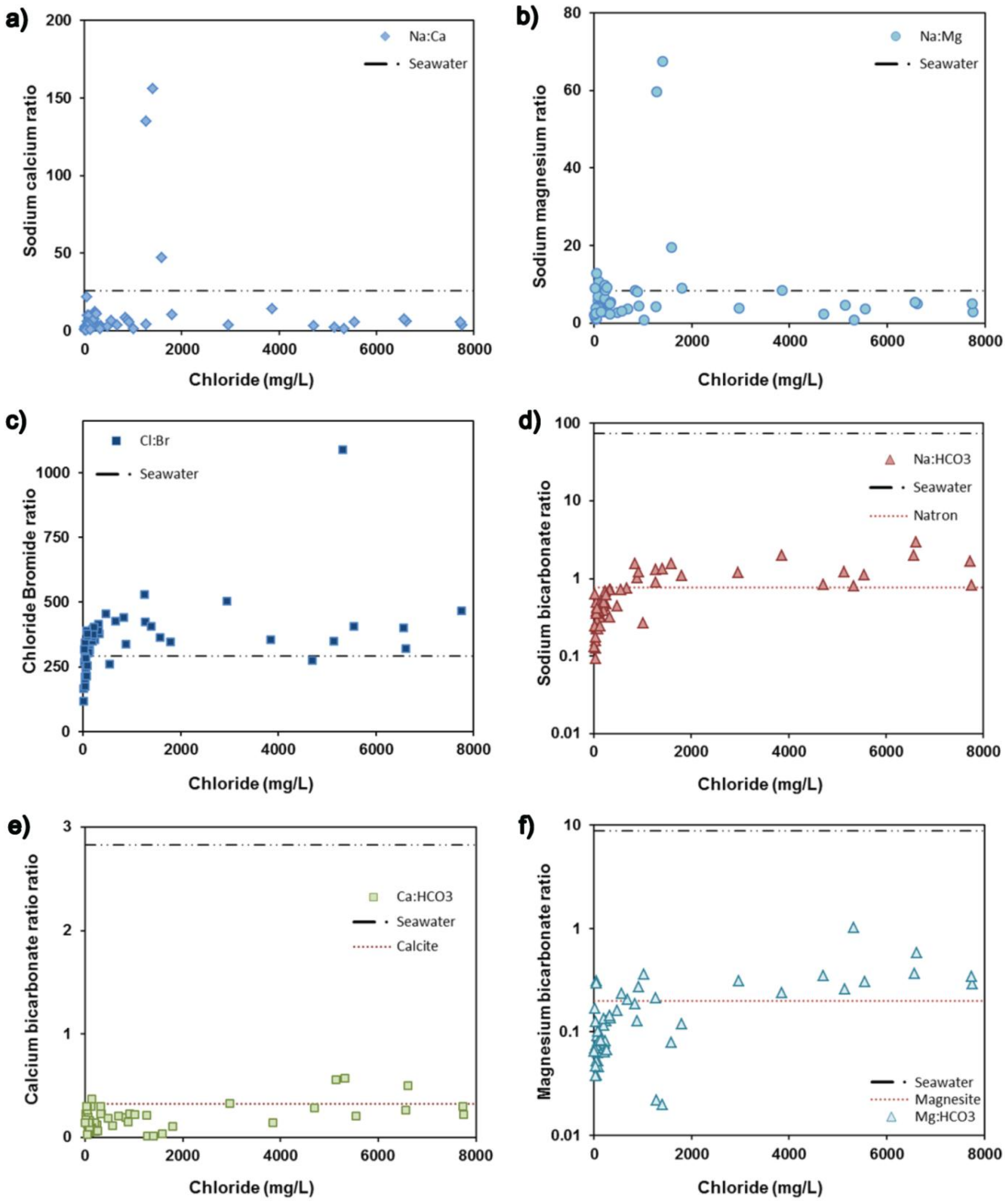

Figure G2 Ratio of major ions (in mg/L) plotted against chloride concentration. Chloride is a conservative ion that is a surrogate for salinity. The dashed black line is the seawater ratio, which is the expected ratio for rainfall and atmospheric fallout. The red dotted lines represent the ratios associated with the dissolution of common minerals: d) natron (Na_2CO_3); e) calcite ($CaCO_3$) and f) magnesite ($MgCO_3$)

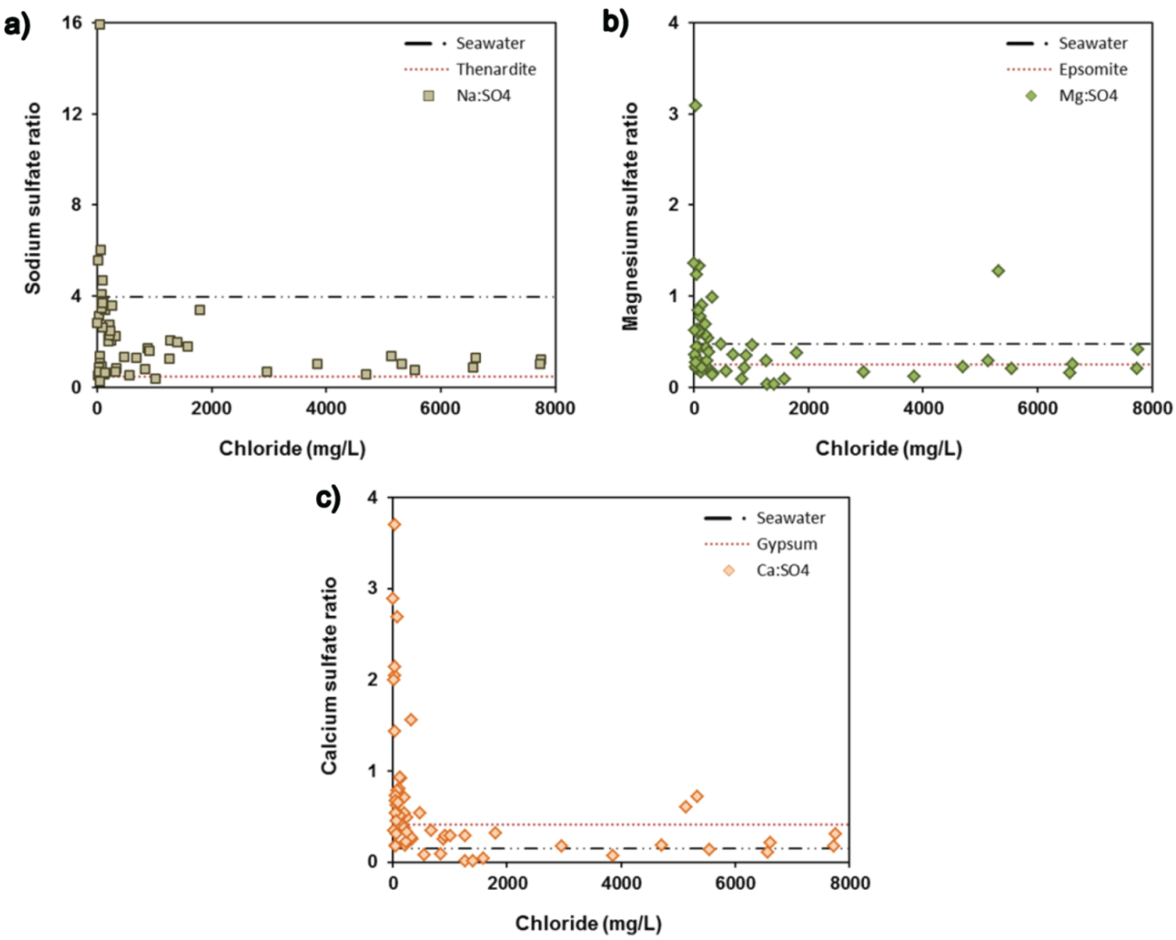

Figure G3 The ratio of major ions to sulfate (in mg/L) plotted against chloride concentration, a conservative ion that is a surrogate for salinity. The dashed black line is the seawater ratio, which is the expected ratio for rainfall and atmospheric fallout. The red dotted lines represent the ratios associated with the dissolution of common minerals: a) thenardite (Na_2SO_4); b) epsomite ($MgSO_4$); and c) gypsum ($CaSO_4$).

The major ionic ratios (major ions plotted against other major ions) are shown in Figures G2 and G3. Bromide, another conservative halogen ion, shows depletion relative to chloride. Bromide is more likely to be sorbed than chloride (Davis et al. 1998). Conversely, calcium and magnesium show enrichment in concentrations relative to sodium.

The sodium:bicarbonate ratios at higher salinities (Figure G2) show enrichment of bicarbonate relative to sodium when compared to seawater, although these ratios are less than what would occur if sodium carbonate minerals, such as natron (Na_2CO_3), had dissolved. The magnesium:bicarbonate ratios show a similar trend — bicarbonate is enriched relative to magnesium when compared to seawater, but less than what would occur if magnesium carbonate minerals, such as magnesite ($MgCO_3$), had dissolved. On the other hand, the calcium:bicarbonate ratio shows an enrichment of bicarbonate relative to calcium when compared to seawater, but the ratios are similar to what would occur if the calcium carbonate minerals, such as calcite ($CaCO_3$), had dissolved.

Both the calcium:chloride and sulfate:chloride ratios showed enrichment of calcium and sulfate, respectively, relative to seawater ratios. Though, the calcium:sulfate ratios for the Weaber groundwater were similar to seawater ratios (Figure G3). The calcium:sulfate ratios were less than the dissolution ratios of calcium sulfate minerals, such as gypsum ($CaSO_4$). The magnesium:sulfate ratio, at higher salinities, shows enrichment of sulfate relative to magnesium when compared to seawater and has a similar ratio to the dissolution of magnesium sulfate minerals, such as epsomite ($MgSO_4$). The sodium:sulfate ratios at higher salinities also show enrichment of sulfate relative to sodium when compared to seawater (Figure G3). Though sodium:sulfate ratios on the Weaber Plain were less than dissolution of sodium sulfate minerals, such as thenardite (Na_2SO_4), at higher salinities, they were an average molar ratio of 4.0.

Table G1 Statistical correlations between major ions

	TDS mg/L	SO_4 mg/L	Na mg/L	Mg mg/L	K mg/L	HCO_3 mg/L	Cl mg/L	Ca mg/L
Calcium (Ca) mg/L	0.87	0.80	0.72	0.90	0.28	0.71	0.91	
Chloride (Cl) mg/L	0.98	0.90	0.92	0.91	0.24	0.75		
Bicarbonate (HCO_3) mg/L	0.80	0.69	0.76	0.67	0.22			
Potassium (K) mg/L	0.27	0.26	0.22	0.24				
Magnesium (Mg) mg/L	0.89	0.87	0.72					
Sodium (Na) mg/L	0.95	0.89						
Sulfate (SO_4) mg/L	0.95							
TDS mg/L								

Comparing the variability in major ions of different rock types showed there were statistically significant variations ($p<0.05$) in bicarbonate, sulfate, calcium, magnesium and potassium (Table G2).

Table G2 The mean concentration and statistical correlations between factors influencing the strength of major ions

Parameter	TDS mg/L	Cl mg/L	HCO_3 mg/L	HCO_3:Cl	SO4 mg/L	SO_4:Cl	Ca mg/L	Ca:Cl	Mg mg/L	Mg:Cl	Na mg/L	Na:Cl	K mg/L	K:Cl
Lithology														
Basalt	2255	629	724	5.64	268	0.52	61	0.37	76	0.27	564	2.12	7.6	0.07
Limestone	1929	388	381	1.97	621	1.51	112	0.42	84	0.30	384	0.97	19.3	0.06
Sandstone	2561	762	465	1.79	504	0.76	71	0.27	81	0.20	657	0.93	19.2	0.10
Sandstone/wackes/limestone	5887	1860	926	2.59	1423	0.98	203	0.45	320	0.28	1255	1.01	30.6	0.10
Shale/siltstone	3036	1024	658	3.30	571	0.57	139	0.39	145	0.25	658	1.28	12.3	0.06
p (logged values)	0.053	0.102	0.010	0.009	<0.001	<0.001	<0.001	0.127	0.003	0.353	0.232	0.001	<0.001	0.933
Soils														
Aquitaine/Cununurra gypsic clays	3869	1266	673	2.66	854	0.85	148	0.39	195	0.26	867	1.10	17.4	0.08
Cununurra clays	2360	696	659	4.75	352	0.52	87	0.36	82	0.27	553	1.82	10.4	0.06
Keep clays	2168	538	748	1.83	154	0.31	42	0.16	50	0.15	561	1.03	5.1	0.01
Sand/silt	3043	846	672	2.59	761	0.80	140	0.55	166	0.20	542	0.89	35.7	0.20
p (logged values)	0.315	0.174	0.697	0.026	0.019	0.001	0.489	0.153	0.381	0.369	0.326	0.141	0.005	0.011
Interactions between lithology and soils														
p (logged values)	0.845	0.678	0.986	0.261	0.611	0.276	0.197	0.037	0.671	0.195	0.743	0.385	0.747	0.212

When the effects of evapotranspiration were removed by dividing the ion concentrations by chloride, only bicarbonate, sulfate and sodium remained statistically significant. This analysis supports the conclusion by Tickell et al. (2007) that one of the main controls on groundwater chemistry and individual ion concentrations is evapotranspiration.

The variations in bicarbonate, sulfate and sodium are explained by differences in local geology and mineralogy. Inverse modelling with PHREEQCI indicated that the variation in bicarbonate is because of the dissolution of limestone, with calcium carbonate causing enrichment relative to other rock types. Inverse modelling showed that differences in sodium concentrations are likely caused by the weathering of plagioclase found in the basalts of the Antrim Volcanics (Hem 1985). The difference in sulfate concentrations is likely caused by the weathering of sulfide ores in the Sorby Hills, which are located between the Weaber and Knox Creek plains.

The statistical analysis also found significant relationships ($p<0.05$) between soil type and bicarbonate, sulfate and potassium concentrations in groundwater (Table G2). The soils of the Weaber Plain have high potassium concentrations (Smolinski et al. 2011) and contain up to 20% illite (Dixon 1996). Inverse modelling indicated illite is the sink for potassium, leading to depletion in groundwater relative to seawater. The relationship between soil type and depletion of potassium in groundwater is most likely because of the sorbing of potassium from atmospheric deposition by soils.

There was also a statistically significant interaction ($p<0.05$) between soils and rock type for calcium. Inverse modelling showed that gypsum and carbonate minerals such as calcite are likely sources of sulfate and some of the bicarbonate enrichment in groundwater. The modelling also indicates that calcium concentrations in the groundwater are controlled by calcite solubility, which is reflected in Figure G2e. Some soils on the ORIA, particularly the Aquitaine family of soils, naturally accumulate salts, mainly the less soluble salts such as carbonates and gypsum (calcium sulfate), because drainage is restricted (Dixon 1996, Schoknecht & Grose 1996, Smolinski et al. 2011). Statistical and geochemical modelling indicates that gypsum and carbonates accumulate in the subsoil and are subsequently redissolved and flushed to groundwater through recharge, leading to enrichment of sulfate and bicarbonate in groundwater. George (1983) showed that Aquitaine soils experienced a reduction in subsoil salinity after the introduction of irrigation, further supporting that leakage occurs beneath these soils.

The results of the statistical and geochemical modelling provides complications for irrigation on the Weaber Plain because some soils naturally accumulate salts, particularly the Aquitaine soils with restricted subsoil drainage. Irrigation of Aquitaine and similar soils with water containing increased salt loads will lead to more rapid build-up of soil salinity. Therefore, until the data substantiates the use of mixtures, these types of soils should only be irrigated with unmixed scheme water to minimise the risk of salinity.

Shortened forms

$CaCO_3$	calcium carbonate
EC	electrical conductivity
EPA	Environmental Protection Authority
EPBC Act	*Environmental Protection and Biodiversity Conservation Act 1999*, the main Australian Government environmental legislation
EPBC conditions	Conditions imposed on developments by the Australian Government Minister for the Environment assessed under the EPBC Act
GL	gigalitre (1 billion litres)
GMP	groundwater management plan
IRG	Independent Review Group
LOR	limit of reporting (a substance is undetectable below this concentration)
LTV	long-term trigger value
Max.	maximum value
mBGL	metres below ground level
mg/L	milligrams per litre
Min.	minimum value
ML/d	megalitres (1 million litres) per day
mS/m	milliSiemens per metre (measurement of electrical conductivity)
ORIA	Ord River Irrigation Area
ORP	oxidation–reduction potential
Redox	reduction–oxidation reaction
TDS	total dissolved solids
µg/L	micrograms per litre

References

Aldrick JM, Clarke AJ, Moody PW, van Cuylenberg MHR & Wren BA 1990, *Soils of the Ivanhoe Plain, East Kimberley, Western Australia*, Technical Bulletin no. 82, Western Australian Department of Agriculture, Perth.

ANZECC 1992, *Australian water quality guidelines for fresh and marine waters*, National Water Quality Management Strategy Paper no. 4, Australian and New Zealand Environment and Conservation Council, Canberra.

ANZECC and ARMCANZ 2000, *National Water Quality Management Strategy Paper no. 4: Australian and New Zealand Guidelines for Fresh and Marine Water Quality*, vol. 1 The Guidelines October 2000, Australian and New Zealand Environment and Conservation Council, and Agriculture and Resource Management Council of Australia and New Zealand.

Ali R & Salama R 2003, *Groundwater quality in the Ord irrigation area, its suitability for irrigation and prediction of salinity and sodicity hazards*, CSIRO Land and Water Technical Report 07/03, June 2003.

Ali R, Salama R, Pollock D & Bates L 2002, *Geochemical interactions between groundwater and soil, groundwater recycling and evaporation in the ORIA*, CSIRO Land and Water Technical Report 21/02.

Bartley R & Speirs W 2010, *Review and summary of constituent concentration data from Australia for use in catchment water quality models*, eWater Cooperative Research Centre Technical Report, Canberra.

Bennett DL & George RJ, 2011, 'Surface Water characteristics of the Weaber Plain and Lower Keep River Catchments', *Resource management technical report 370*, Department of Agriculture and Food, Western Australia, Perth.

Bennett D & George R 2014, 'Goomig Farmlands development: baseline water quality in the lower Keep River', *Resource management technical report 393*, Department of Agriculture and Food, Western Australia, Perth.

CSIRO 2009, *Water in the Ord-Bonaparte region of the Timor Sea Drainage Division*, Report to the Australian Government from the CSIRO Northern Australia Sustainable Yields (NASY) project.

Davis SN, Whittmore DO & Fabryka-Martin J 1998, 'Uses of chloride/bromide ratios in studies of potable water', *Groundwater*, vol. 36, no. 2, pp. 338–50.

DNR 1997, *Salinity management handbook*, Queensland Department of Natural Resources, Brisbane.

Dixon J 1996, 'Soils of the Weaber Plain, East Kimberley, Western Australia', *Resource management technical report no. 152*, Department of Agriculture, Western Australia, Perth.

Drever JI 2002, *The geochemistry of natural waters: surface and groundwater environments*, 3rd edn, Prentice Hall, New Jersey.

EPA 2002, *Ord River Irrigation Area Stage 2 (M2 supply channel), Kununurra*, Environmental Protection Authority Statement 585.

EPA 2010, *Ord River Irrigation Area Stage 2 (M2 supply channel), Kununurra*, Environmental Protection Authority Statement 830.

George PR 1983, *Soil salinity and sodicity in relation to land use—Ivanhoe Plains Ord River Project Area*, Division of Resource Management, Western Australian Department of Agriculture, Perth.

George R, Simons J, Paul B, Raper P, Bennett D & Smith R 2011, 'Weaber Plain Hydrogeology: Preliminary Results', *Resource management technical report 360,* Department of Agriculture and Food, Western Australia, Perth.

George R, Bennett D, Raper P, Simons J, Ryder A & Smith R in press, *Weaber Plain (Goomig Farmlands) hydrogeology: results 2010–13*, Department of Agriculture and Food, Western Australia, Perth.

GHD 2010, *Report for Ord Irrigation Expansion Project, Weaber Plains farmlands hydrology and hydraulic modelling*, Report for LandCorp, Western Australia.

GHD 2011, *Report for the Ord East Kimberley Expansion Project, Weaber Plains farmlands: Catchment–River and hydrodynamic modelling project*, report prepared for LandCorp, Western Australia.

Hart BT 1974, *A compilation of Australian water quality criteria*, Australian Water Resources Council Technical Paper no. 7, Department of Environment and Conservation Research Project 71/36 AGPS, Canberra.

Hem JD 1985, *Study and interpretation of the chemical characteristics of natural water*, (3rd edn), Water-Supply Paper 2254, US Geological Survey.

Hingston FJ & Gailitis V 1976, 'The geographic variation of salt precipitated over Western Australia', *Australian Journal of Soil Research*, vol. 14, pp. 319–35.

Humphreys G, Tickell S, Yin Foo D & Jolly P 1995, *Subsurface hydrology of the Keep River Plain*, Technical Report no. 25/95D, Power and Water Authority, Northern Territory.

KBR (Kellogg Brown & Root Pty Ltd) 2010, *Weaber Plain groundwater modelling report Stage 1 results*, report prepared for LandCorp, Western Australia.

KBR 2011, *Ord East Kimberley Expansion Project; Weaber Plains groundwater modelling report – final (including Stage 4 results),* report prepared for LandCorp, Western Australia.

Lawrie KC, Tan KP, Clarke JC, Munday TJ, Fitzpatrick A, Brodie RS, Apps H, Halas L, Cullen K, Pain CF, Kuske TJ, Cahill K & Davis A 2010, *Using the SkyTEM time domain airborne electromagnetics (AEM) system to map aquifer systems and salinity hazard in the Ord Valley, Western Australia*, Geoscience Australia Professional Opinion 2010/01.

Laws AT 1983, *Groundwater conditions in the Ord Irrigation Project Area, Kununurra, WA (Weaber Plain)*, Hydrogeological Report 2519, Western Australia Geological Survey.

Lillicrap A, Raper P, George R & Bennett D 2011, 'Hydrochemistry of the Ivanhoe and Weaber Plain', *Resource management technical report 368*, Department of Agriculture and Food, Western Australia, Perth.

Macpherson GL 2009, ‘CO_2 distribution in groundwater and the impact of groundwater extraction on the global C cycle’, *Chemical Geology,* vol. 264, no. 1–4, pp. 328–36.

Nixon RD 1997a, *Ord River Irrigation Area drilling project, bore completion report on the Knox Creek Plain*, Hydrogeology Report no. 65/1997, Water and Rivers Commission, Western Australia.

Nixon RD 1997b, *Ord River Irrigation Area drilling project, bore completion report on the Weaber Plain*, Hydrogeology Report no. 66/1997, Water and Rivers Commission, Western Australia.

Nixon RD 1997c, *Ord River Irrigation Area drilling project, bore completion report on the Cave Spring Gap*, Hydrogeology Report no. 71/1997, Water and Rivers Commission, Western Australia.

Nixon RD 1997d, *Ord River Irrigation Area drilling project, bore completion report on the Weaber and Knox Creek Plains*, Hydrogeology Report no. 72/1997, Water and Rivers Commission, Western Australia.

O’Boy CA, Tickell SJ, Yesertener C, Commander DP, Jolly P & Laws AT 2001, ‘Hydrogeology of the Ord River Irrigation Area, Western Australia and Northern Territory’, *Hydrogeological Record Series*, Report HG 7, Water and Rivers Commission.

Oliver DP & Kookana RS 2005, *Pesticide use in the Ord River Irrigation Area, Western Australia, and risk assessment of off-site movement using Pesticide Impact Rating Index (PIRI)*, CSIRO Land and Water Technical Report 10/05, CSIRO, Adelaide.

Paul RJ, Raper GP, Simons JA, Stainer GS & George RJ 2011, ‘Weaber Plain aquifer test results’, *Resource management technical report 367*, Department of Agriculture and Food, Western Australia, Perth.

Parkhurst DL and Appelo CAJ, 2013, Description of input and examples for PHREEQC version 3—A computer program for speciation, batch-reaction, one-dimensional transport, and inverse geochemical calculations: U.S. Geological Survey Techniques and Methods, Book 6, chapter A43, http://pubs.usgs.gov/tm/06/a43

Schoknecht N & Grose C 1996, ‘Soils of the Knox Creek Plain, East Kimberley, Western Australia and Northern Territory’, *Resource management technical report 153*, Agriculture Western Australia, Perth.

Smith A, Pollock D, Palmer D & Price A 2007, *Ord River Irrigation Area (ORIA) groundwater drainage and discharge evaluation: survey of groundwater quality 2006*, CSIRO Land and Water Science Report 44/07.

Smolinski H, Laycock J & Dixon J 2011, ‘Soil assessment of the Weaber Plain farmlands’, *Resource management technical report 369*, Department of Agriculture and Food, Western Australia, Perth.

Strategen 2012a, *Ord River Irrigation Area – Weaber Plain Development Project Groundwater Management Plan*, Strategen Environmental Consultants.

Strategen 2012b, *Ord River Irrigation Area – Weaber Plain Development Project Stormwater and Groundwater Discharge Management Plan*, Strategen Environmental Consultants.

Taylor S 1996, *Dryland Salinity Introductory Extension Notes*, 2nd edn, Department of Land and Water Conservation, Sydney.

Tickell SJ, Cook P, Sumner J, Knapton A & Jolly P 2007, *Evaluating the potential for irrigation induced salinisation of the Keep River Plains*, Technical Report No.30/2006D, Northern Territory Department of Natural Resources the Environment and the Arts.

United States Department of Agriculture 1954, *Diagnosis and improvement of saline and alkali soils Agriculture Handbook no. 60*, United States Department of Agriculture.

USEPA 1998, *Guidelines for Ecological Risk Assessment*, US Environmental Protection Agency, Washington DC.